Assessing factors associated with rising caesarean section rates in urban Nepal: a hospital-based study

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Copyright Statement

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Abstract

Background

Caesarean section (CS) rates are rising in urban hospitals in Nepal. However, the reasons behind these rising CS rates are not well understood. Therefore, this PhD study explores contributing factors to rising CS rates in two urban hospitals and seeks strategies to make rational use of CS.

Methods

This cross-sectional mixed-methods study was conducted in 2021 in two hospitals: Paropakar Maternity and Women's Hospital (PMWH) and Kathmandu Model Hospital (KMH) in Kathmandu. The quantitative part included a record-based study of 661 births (KMH=276 & PWMH=385) for the fiscal year 2018/19. The qualitative part included interviews with 14 health professionals (doctors, nurses & midwives) and five key informants (two hospital directors and one representative from Nepal Society of Obstetrics and Gynaecologists, one from Midwifery Society of Nepal and one from Ministry of Health and Population Nepal), and four focus group discussions with pregnant women in antenatal clinics. Quantitative data were analysed using SPSS v28. Qualitative data were organised through NVivo v12 and thematically analysed.

Results

The overall CS rate was very high (50.2%). CS rate was almost double in KMH than in PMWH (68.5% vs. 37.1%). Previous CS was the leading indication for performing CS. Non-medical indications for CS were maternal request (2.7%) and CS for non-specified reasons (5.7%). The odds of CS were significantly higher in KMH, women aged 25 years and above, four or more antenatal clinic visits, breech presentation, urban residency, high caste, gestational age 37- 40 weeks, spontaneous labour and no labour. Robson group five (13.9%) was found the largest contributor to overall CS rate followed by groups one (13.4%), two (8.8%), three (4.4%) and six (2.9%). Similarly, the risk of undergoing CS was significantly high in Robson group five, six, seven, nine and two. The qualitative analysis yielded five key themes affecting rising CS rates: (1) medical factors; (2) sociodemographic factors; (3) financial factors; (4) non-medical factors; and (5) health service-related factors. Four main strategies were identified to stem the rise of CS: (1) adequate resources (SBAs, midwives and birthing centres); (2) raising awareness on mode of childbirth (antenatal education and counselling); (3) reforming CS policies/protocols; and (4) promoting physiological birth.

Conclusion

The rate of CS was extremely high, particularly in the private hospital. It reflects the medicalisation of childbirth, a public health issue which needs urgent addressing. Multiple factors affecting rising CS rates were identified in urban hospitals. Therefore, a combination of multiple strategies is required to stem the rise of CS rates and to make rational use of CS. This thesis provides basic insights of both factors affecting the rising CS rate and strategies for rational use of CS in urban hospitals in Nepal.

Keywords: Caesarean section; Obstetric care, Urban; Hospital; Nepal

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Declaration of Authorship

I, Sulochana Dhakal-Rai, declare that the work represented in the thesis entitled "Assessing factors associated with rising caesarean section rates in urban Nepal: a hospital-based study" is my own work. I confirm that:

- All quotations have been distinguished by quotation marks.
- All sources of information have been acknowledged appropriately.
- Any personal data have been processed in accordance with the provisions of the Data Protection Act 1998.
- This work has not been submitted previously for a degree at this university or any other university.

Sulochana Dhakal Rai

January 2023

List of Abbreviations

ACOG	American College of Obstetricians and Gynaecologists
AIDS	Acquired Immuno-Deficiency Syndrome
ANC	Antenatal Clinic
ANM	Auxiliary Nurse Midwife
APH	Antepartum Haemorrhage
ASBA	Advanced Skill Birth Attendant
BOH	Bad Obstetric History
BU	Bournemouth University
CBS	Centre Bureau of Statistics
CM	Centimetre
CPD	Cephalopelvic Disproportion
CASP	Critical Appraisal Skill Programme
CS	Caesarean Section
CTG	Cardiotocography
DFID	Department of International Development
DHS	Department of Health Services
DTA	Deep Transverse Arrest
FCHV	Female Community Health Volunteer
FGD	Focus Group Discussion
FIGO	Federation of International Gynaecologists and Obstetrics
FHD	Family Health Division
GDM	Gestational Diabetes Mellitus
GDP	Gross Domestic Product
HDP	Hypertensive Disorders in Pregnancy
HIV	Human Immunodeficiency Virus
ICM	International Confederation of Midwives
IRC	Institutional Review Committee
IUI	Intrauterine Insemination
IUFD	Intrauterine Foetal Death
IUGR	Intrauterine Growth Retardation
IVF	In-vitro fertilisation
KM	Kilometre
KMH	Kathmandu Model Hospital
LSCS	Lower Segment Caesarean Section

MCHW	Maternal and Child Health Worker
MNSC	Maternal and Newborn Service Centre
MDG	Millennium Development Goal
MIDSON	Midwifery Society of Nepal
NMIS	National Maternity Incentive Scheme
MMR	Maternal Mortality Ratio
MoHP	Ministry of Health and Population
NESOG	Nepal Society of Obstetrics and Gynaecologists
NICE	National Institute for Health and Care Excellence
NJOG	Nepal Journal of Obstetricians and Gynaecologists
NPOL	Non-progress of Labour
NRCTG	Non-reactive Cardiotocography
NDHS	Nepal Demographics and Health Survey
NHS	National Health Service
OPD	Out-patient Department
OT	Operation theatre
PHECT	Public Health Concern Trust
PhD	Doctor of Philosophy
PIH	Pregnancy Induced Hypertension
PICO	Population (P), Intervention (I), Comparison (C), Outcome (O)
PLHA	Patient Living with HIV & AIDS
PMWH	Paropakar Maternity and Women's Hospital
PNC	Postnatal Care
POH	Poor Obstetric History
PROM	Premature Rupture of Membrane
RCOG	Royal College of Obstetricians and Gynaecologists
RMC	Respectful Maternity Care
SBA	Skilled Birth Attendant
SDG	Sustainable Development Goal
SDIP	Safe Delivery Incentive Programme
SSMP	Support for the Safe Motherhood Programme
SPOL	Spontaneous Progression of Labour
SPSS	Statistical Package for Social Sciences
SROM	Spontaneous Rupture of Membranes
TGCS	Ten Group Classification of System

TLTL	Too Little Too Late
TMTS	Too Much Too Soon
UHC	Universal Health Coverage
UK	United Kingdom
UPI	Uteroplacental Insufficiency
UN	United Nations
VBAC	Vaginal Birth After Caesarean
WHO	World Health Organization

Chapter 1 INTRODUCTION

1.1 Background

Caesarean section (CS) is a lifesaving major surgical intervention for childbirth in high-risk pregnancy when vaginal birth can be life-threatening to mother and foetus. The term 'caesarean section' refers to the surgical intervention for giving birth to one or more babies through an incision made in the mother's abdominal wall and uterus. This operation is the oldest surgical procedure in the history of mankind and medicine, which was originally started as a post-mortem procedure to separate a baby from a dead mother (Boley 1991; Sewell 1993). However, the reasons of performing CSs have been changed throughout history (Lurie 2005). In the twenty-first century, CS operation is perceived to be safer due to technological and professional advancement and it has been a frequently performed procedure for childbirth (Todman 2007). In 1985, the World Health Organization (WHO) recommended a CS rate of 10-15% at the population level (World Health Organization 1985) and stressed for optimum use of CS only for medical indications (World Health Organization 2015). The CS rate is an indicator of obstetric care. Rates higher than 10% at the population level are not found to be significantly useful for reductions in maternal and new-born mortality rates (Betran et al. 2015; Ye et al. 2016). However, CS rates are rising unexpectedly high worldwide (Boerma et al. 2018). Therefore, rising CS rate is a global public health problem. The rates of CS are also rising in Nepal, especially increasing to high rates in hospitals in urban settings and cities (Dhakal Rai et al. 2019). Therefore, this thesis has focused on assessing key indications and factors associated with rising CS rates in two urban hospitals in Nepal, as well as possible strategies to make rational use of CS.

1.1.1 Brief history and indications of CS

The purpose of CS use has evolved throughout the history of medicine. Indication of CS has been shaped mainly by religion, law, technology and attitudes of both doctors and pregnant women towards it (Todman 2007; Dhakal-Rai et al. 2021a). The following published literature review provides insight into the history of CS. The article is cited as following:

Dhakal-Rai, S., van Teijlingen, E., Regmi, P. R., Wood, J., Dangal, G. and Dhakal, K. B., 2021a. A brief history and indications for cesarean section. Journal of Patan Academy of Health Sciences, 8 (3), 101-111. https://doi.org/10.3126/jpahs.v8i3.27657. This article is licensed under Creative Commons Attribution-NonCommercial 4.0 International License. The articles search strategy is in Appendix 1.

Published review 'A brief history and indications for Caesarean Section'

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A brief history and indications for cesarean section

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Abstract

Cesarean section (CS) is one of the oldest surgical operations. Originally, this surgery was performed post-mortem by cutting open the woman's abdomen to remove a dead or alive fetus. It was therefore not intended for saving the mother in ancient times. Roman law and religious rituals shaped the procedure until the Middle Ages. At that time, the indication of CS was only post-mortem. Although CS became a medical procedure in the Renaissance, maternal mortality was extremely high, mainly due to hemorrhage and puerperal infection. The reason for performing CS was to rescue the mother and fetus from protracted labor as a last resort. Since the late 19th century, with the introduction of chloroform and the developments of surgical techniques, and the availability of blood transfusion in the early twentieth century, CS became a relatively safe procedure, further helped by the introduction of antibiotics after World War II. Then, CS was increasingly an intervention to preserve the health and safety of both mother and fetus. During the 21st century, CS has been performed even without medical indication, such as maternal choice. Advancement of obstetric practice technologically and professionally during the period as well as changing attitudes of both obstetricians and childbearing women meant indications for CS are no longer limited to medical/obstetric indications. CS is perceived as a safer mode of childbirth. Therefore, the indications of CS have been changed drastically from ancient times (rescuing a baby from dying or dead mother) to the 21st century (maternal choice/reproductive rights).

Keywords: Cesarean section, indication, history

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Introduction

Cesarean section (CS) is a surgical procedure to remove a fetus from the uterus of a mother through an incision made in the abdominal wall and uterus. CS has been around for millennia. CS is perhaps one of the oldest surgical operations. which originated as a post-mortem procedure to separate dead mother and child in ancient India and Egypt.[1,2] The early history of CS remains covered in myths with doubtful accuracy in folklores of ancient societies in Europe, Asia, and the Middle East. CS was performed either to rescue a live baby from the womb of a dead or dying mother or to bury the dead mother and dead infant separately.[2]

Apart from myths, there is little evidence of maternal survival from a CS before 1500 A.D.[3] The purpose of performing the CS was gradually changed towards saving the lives of both mother and child in the modern age. The indications of CS have been changed accordingly from ancient to modern times. Since middle of 19th century, both maternal and foetal outcomes of CS has been significantly increased due to the development in surgical techniques and aseptic environment such as antibiotic, anaesthesia, blood transfusion.[4] In the twentieth century, the advancement of CS both technically and professionally widened the boundaries of indications for CS beyond its medical limits. Hence, performing a CS has become a sophisticated and frequently performed childbirth procedure. The reasons for performing CS are not only concerned with saving the lives of the mother and the child but also related to preferences/choice of the mother and the child's rights.[4]

The review was conducted aiming to explore insight on the brief CS history and changing indications for performing CS from ancient times to the twenty-first century. We strongly believe it is important for practitioners of any discipline to understand its history, and in this case the history of its obstetrical procedures, to help improve maternity care in the future and avoid the mistakes made in the past. Therefore, our research question is: How has the CS developed over time as an obstetric intervention and what indications have been accepted for performing a CS from ancient times till the twenty-first century? The review has briefly explored the history and changing indications for CS since ancient to present-day.

Method

A scoping review[5] was conducted related to the history of CS from ancient till 2019 using several bibliographic electronic databases such as PubMed, MEDLINE, EMBASE, SCOPUS, CINAHL, and Web of Science as well as Open Access journals such as NepJol, BanglaJol. Articles on CS history were searched from ancient era to contemporary era using Medical Subject Headings (MeSH) heading such as cesarean (both UK and USA spelling), c-section was combined with the specific keywords such as ancient or middle age or medieval age or renaissance age or modern age. Additional articles were searched from the reference list of the selected articles. Articles highlighting the issues around the history were included and a simple content analysis[6] was conducted. Studies highlighting history and indications of CS and written in English published from 1961 to 2020 were search and included in this review. All selected articles were assessed for inclusion eligibility by first author (SD). Titles and abstracts of the identified articles were initially scanned. Then, full text of each article was analyzed individually, and relevant data were extracted. Extracted data were checked for accuracy by other authors (EvT, JW, PR, GD, KBD). Any discrepancies/disagreement over eligibility or quality of studies were discussed with reviewers and resolved based on consensus. The narrative synthesis of history and indications for CS was categorized (ancient, medieval, renaissance, modern period and twentieth century and beyond) using content analysis.[6]

Result

Origin of the term "Cesarean Section"

The origin of the term "cesarean section" has seemingly been debatable in its accuracy over time. The origin of the term cesarean section is still clearly not known.[7] The term "cesarean", commonly misperceived that it is derived from the surgical birth of Roman Emperor Julius Caesar (100-44 BC).[1,2] It is very unlikely that he was born by CS. The surgical procedure was performed during that time only when the mother was dead or dying to save the unborn child whereas Julius Caesar's mother, Aurelia, was alive until when he was an adult.[1,2] There are also no documents from caesar's time referring to his birth by abdominal incision.[8] The Dutch term for CS keizersnede hints in the direction of this origin as it translates as emperor's cut.

Another theory refers to the Roman law Lex Regia. The Rome king, Numa Pompilius (715-673 BC),[1,2,4] declared in his Royal Law (Lex Regia), that to comply with Roman ritual and religious custom it was forbidden to bury a pregnant woman before her fetus has been cut out of the womb.[2] This Lex Regia became Lex Caesarea later on in the Roman Empire.[1,2] Therefore, the term cesarean might be derived from this Roman law Lex Caesarea, not from the birth of Julius Caesar.[9]

A third explanation is that the word "Cesarean" originated from the Latin verb "caedare," meaning 'to cut'. The term "caesones" was applied to the infants delivered by post-mortem CS.[2] Until the sixteenth century the procedure was known as "cesarean operation". The term "cesarean birth" was first used in medical literature by François Rousset in 1581.[10] Jacques Guillimeau introduced first the term "operation" in his 1598 book on midwifery.[2] The term "operation" was gradually replaced by "section" and the term "cesarean section" was widely used in the 20th century.[7]

The mythology of the cesarean section

Mythology and legends of CS not only highlight the importance of being 'superhuman,[9] but also, a reflection of the reality of contemporary medical practice.[11] The fetal outcome of CS was very poor in ancient societies, therefore, if a newborn baby survived by CS, then, it was believed that the Gods must have intended for this person an outstanding future.[4] In Greek mythology, a live child born by CS is symbolized as the glorification of God. For example, Asclepius, the god of medicine, was born by a post-mortem CS. His father (Apollo), the God of light and the sun rescued him from the funeral pyre of his dead mother, Coronis.[11]

In Roman writings, there are many heroes born by a CS such as Scipio Africanus, the Roman general who defeated Hannibal, who was born by a post-mortem CS in 237 BC.[8,9] Similar stories appear in Persian mythology such as Rustam, the most famous superhero of the great Persian epic of the kings, was born by a CS.[8] In Irish mythology a royal child was born alive by CS in 200 BC, the boy was called Furbaidh from the Gaelic word urbaidh meaning to cut.[12] In religious myth, CS has been portrayed as a "clean delivery", to avoid the passage through the dark birth canal. Buddha, Prince Siddhartha Gautama (563-486 BC), was born pure and clean from the right flank of his mother Maya.[8,9,13] Brahma was believed to be born through the umbilicus of his mother.[13] The myths of CS maybe not only the way of expression of glorification of superheroes but also the reflection of existing normal medical practice in ancient societies.

Cesarean Section in Ancient Times

The CS appears to be one of the oldest surgeries in the history of medicine. Post-mortem CS was widely practised in ancient societies in Europe, the Middle East, and Asia.[2] It was a mysterious and ambiguous operation that comprised of mutilation of the body of a dead woman to rescue a living fetus.[3] If a woman died during labor, then her abdomen was cut by a knife to open it, and the child was extracted. In ancient Indian societies, post-mortem CS was conducted to purify a woman's corpse before incineration by removing an impure neonate from her body.[8] Sage Sushruta, one of the founders of ancient Hindu medicine, described post-mortem CS delivery

in his medical treatise ''Susruta Samhita''.[13] Lord Krishna, the Hindu God, was also born by CS and CS was performed by sage Susruta.[13]

The first living child born by a post-mortem CS in the ancient world was Gorgias (483-376 BC), a Greek sophist and rhetorician, who was born in Syracuse.[1,2] The successful outcome of CS in living women is also described in ancient Jewish writings such as the Mishnah and Talmud.[3,14] Unfortunately, none of the ancient medical documents are stating the exact indications for CSs.[15] The possible justification could be that during the period, post-mortem CS was performed by priests, not by doctors.[4]

Cesarean Section in Medieval Period

During the period, the indication of CS was only post-mortem; to rescue live fetus from dead or dying mother or to bury dead infant separately from the mother as commonly required by religious edicts.[2] Robert II, king of Scotland was also born in 1316 in this fashion.[16] CS was usually performed by midwives in the early Middle Age after the mother had died or was dying and if she wished that her neonate should be cut off her womb.[15] Bernard of Gordon, a Montpellier physician first mentioned post-mortem CS in 1305.[4] Muslim physicians were also familiar with the CS, but it was carried out only when the mother had died or dying and there was a chance to rescue a live fetus.[17]

The Roman Catholic Church had a great influence in post-mortem CS during the Middle Age, especially in Europe. For example, in 1280, the church councils across the Holy Roman Empire made it mandatory to do this operation to save the child and to offer their souls for salvation through baptism.[2,9,18] However, there is no evidence CS performed on live women. Therefore, CS in the medieval period seemed to be just a cultural-religious event rather than a medical procedure.[4]

Cesarean Section in Renaissance and Modern Period

The first recorded successful CS was performed in a living woman in Switzerland in 1500 and both the mother and the baby survived. Jacob Nufer, a pig gelder performed the CS on his wife, who was suffering from prolonging labor. Nufer cut the abdomen and uterus wall with a knife, pulled out the baby, and sutured the abdominal wall. The mother lived and gave birth vaginally to five other children.[1,2] However, the success story was not recorded until eight decades later. CS was the last resort and not aimed to save the mother's life.[2] The main indication for CS was protracted labor, typically for several days possibly with intrauterine fetal death.[15]

In 1581, Francois Rousset, a French physician, first suggested performing CS on living women and published a revolutionary work on CS including its indications such as excessive fetal size, malformed fetus, dead fetus, twins, malpresentation, extremely young or old mother, too narrow maternal pelvis, or not elastic enough.[19] This helped change the CS from a post-mortem operation to a more medical procedure. Increasing awareness of human anatomy and the establishment of medical education since the 16th century enhanced and enriched the development of CS as a medical procedure.[2]

The first successful CS was performed by a surgeon on a living woman was in Germany by Jeremias Trautman in 1610. The reason for CS was a huge abdominal hernia through which the uterus protruded, and a spontaneous delivery was impossible.[1] The first successful CS on a living woman in the British Empire was conducted by James Barry in South Africa between 1815 to 1821, the indication was unknown.[20] The earliest published successful CS in the USA (United States of America) was by John Richmond in 1827 on a patient woman who suffered from eclampsia with convulsion after 30-hour labor.[1]

Maternal and perinatal mortality of CS was extremely high, almost 100%, during this period until the 19th century due to septic infection (septicemia/ peritonitis), hemorrhage, and exhaustion (protracted labor).[1,2,9] Obstetricians were reluctant to perform CS on live patients. Not a single woman survived CS in Paris between 1787 and

1876. In the middle of the 19th century, maternal mortality was still high (up to 85%). The main reasons for the high maternal mortality were lack of infection control precautions/aseptic techniques in hospital practice, leaving uterine incision open, and performing CS only when women were close to death.[1,2,9]

During the last quarter of the 19th century, CS was transformed both technically and professionally as modern surgery. In 1876, Eduardo Porro, promoted suprapubic hysterectomy during CS to control uterine hemorrhage and prevent peritonitis but it left the woman unable to have any more children.[1,21] An important advancement in CS was the introduction of effectively suturing the uterine incision by Max Sanger in 1882. The suturing technique was equally successful in reducing mortality rates as the Porro operation.[1,2] Similarly, the introduction of the handwashing technique by Semmelweis in 1847, carbolic spray in 1867 by Joseph Lister, and chloroform (anesthesia) by James Young Simpson in 1847 improved the efficacy and safety of the operation. Then, obstetricians gradually moved forwards to preserve the health and safety of both mother and fetus performing CS on time rather than waiting.[2]

Cesarean Section in Twenty and Twenty-first Century

At the beginning of twenty century, rickets and pelvic deformity were highly prevalent even in industrialized countries and the only indication for CS was contracted pelvis/pelvic deformity.[22] CS operation was still crude and hazardous. CS was performed mainly through a classical uterine incision. The famous dictum of Craigin 'once a cesarean, always a cesarean appeared in 1916.[23] This statement symbolized the belief that once a woman had undergone a CS, she would require the surgery for all subsequent deliveries.[23] This notion had influenced on obstetric practice mostly in high-income countries and the trend of CS has steadily accelerated since 1940 especially in high-income countries. The rate of CS was about 5% in 1970 but it was risen to 24.7% by 1988 in the USA.[2] Thus, WHO (World Health Organization) recommended a CS rate of 10-15% in 1985.[24] In 1988, the guidelines of trial for Vaginal Birth After Cesarean section (VBAC) were developed.[2]

The most effective transverse lower uterine segment incision in CS was promoted in the 1920s by a British obstetrician, John Munro Kerr.[25] The incision technique had advantages in subsequent pregnancies/births such as low bleeding, low infection rate, and low uterine rupture.[16,26] The procedure is still popular today. The scope and rise of CS were influenced during the twenty century by many factors such as rapid urbanization, the continued growth in the number of hospitals, advancement of technologies, development of medical research, improvement in patient care, and numerous other factors.[2] Advancement of anesthesia and aseptic technique had boosted CS as a safer procedure. Blood transfusion was widely available in the early twentieth century. Availability of antibiotics such as sulphonamides (1935)[27] and penicillin (1940)[2] significantly reduced maternal mortality from sepsis.[2,27] Likewise, medical research flourished and promoted evidence-based practice. Additionally, the introduction of electronic fetal monitoring (the 1970s), scalp pH monitoring, and ultrasound (late 1940s) not only increased the ability to detect fetal warning signs on time but also extended its indications such as fetal distress, abnormal fetal growth, etc.[2,27] During the 20th-century indications of CS gradually extended such as breech/malpresentation, obstructed labor, pre-eclampsia, placenta previa, eclampsia, dystocia, elderly primiparous, medical conditions complicating pregnancy, etc.[22] The main indications for performing CS during the twentieth century are classified roughly as protracted labor, non-reassuring fetal heart rate, fetal distress, malpresentation of the fetus, previous CS, placental abnormalities with heavy bleeding, and maternal reasons.[4,28] CS provides a safe obstetric surgical intervention for women who experienced complications during pregnancy, labor, and delivery.[2]

The CS rate has been rising over the past four decades globally. The latest estimation showed that the CS rate increased worldwide from 12.1% in 2000 to 21.1% in 2015 (from 7.2% in 2000 to 18.1% in 2015 in South Asia) .[29] Similarly, hospital-based studies reported that the CS rate is rising unexpectedly high in urban Nepal[30] and cities in South Asian countries.[31] Thus, the WHO recommended CS rate of 10-15% in 1985[24] has been controversial in the 21st century and there is a question on optimal rate of CS.[32] The WHO Statement on Cesarean Section Rates has emphasized that "Every effort should be made to provide cesarean sections to women in need, rather than striving to achieve a specific rate".[33] Evidence showed that CS rate of more than 10% at the population level is not associated decrease in maternal and neonatal mortality rate although this operation is effective to preserve mother and fetus lives.[34] The main concern is the reduction of unnecessary CS and improvement of optimal use of CS. Robson classification can be the best tool to monitor the CS. Robson classification, a standardized internationally accepted classification system, was proposed in 2001 to monitor and compare CS rates in a consistent and action-oriented manner within and between the health facilities.[35]

The CS has been a frequently performed surgical procedure for childbirth in obstetric practice in the 21st century.[36] The number of medical indications for CS grew as did the non-medical indications such as maternal choice.[37-49] WHO emphasizes to perform CS only for medical indication[33] because CS is associated with severe maternal outcome.[34] However, CS performed on maternal request without medical indications is rising due to perceiving medical benefits as well as many other cultural and psychological factors as maternal fear of childbirth or maternal request.[37-40] A global survey reported that CS conducted without medical indication was 1.0% of total birth.[37] A systematic review showed that the rate of CS on maternal requests ranging from 0.2% to 24.7%.[50] A hospital-based study mirrored the changing indications for an elective CS, which reported that the indications for CS were a fetal lie or a uterine factor in 1992, but in 2005 psychosocial indications such as maternal fear of childbirth/maternal request without any medical indication.[40] Maternal requests as an indication for performing CS are evident also in South Asian countries like Nepal[41-43] Bangladesh[44-46], India[47,] and Pakistan[48,49].

Fear of childbirth, fear of labor pain, fear of health of their baby and themselves or perception of safer option, previous negative childbirth experience, maintain pelvic floor integrity, convenient and preserve sexual function are reported the main reasons of requesting CS by women.[51] Chang et al. (2015) reported that CS was associated with increased prevalence of depression at 3 mo and higher pain level up to 6 mo postpartum, but no difference in sexual function between vaginal birth and CS after 6 weeks.[52] However, Qian et al.(2016) reported that CS can have higher adverse effects on postpartum sexual function.[53] The increased risk for developing anal incontinence after CS is lower than the risk after vaginal delivery.[54] Additionally, the availability of ultrasound examination during pregnancy and lack of pain relief medication and social support during labor can encourage women to choose a CS as a safer mode of childbirth.[50] Higher educational achievement, use of assisted reproductive technology, history of previous operative childbirth, and miscarriages are found to be significantly associated with the CS on maternal request.[55]

The guidelines for counseling and treatment regarding maternal requests suggest that the request for a CS is appropriate to consider if a woman persists in her request after counseling with enough serious reasons.[56] In the hospital situation, the medical expertise and authority of doctors can influence a woman to choose a CS.[57] The main reason of decision-making and willingness to perform a CS by care providers on maternal request is reported to be defensive practice for avoiding litigation or lawsuit if something goes wrong[58,59] and financial incentives (especially in the private health sector).[60]

Performing a CS on maternal choice has been a hotly debated topic both legally and ethically in recent obstetric practice.[38,39,61,62] CS on maternal choice is a complex issue and beyond the women's autonomy.[61] Firstly, women may not have sufficient knowledge on the mode of childbirth or indications, risks, and benefits of CS.[63] Secondly, women may request CS due to reasons related to fetal well-being or cosmetic or sexual factors. In this situation, women would not be empowered and self-determined to make a voluntary choice of CS.[50,63] Patient to be well informed about risks and benefits of CS for the promotion of informed choice (voluntary informed consent) based on the relevant information.[39,61,62] Obstetricians are legally accountable to inform and counsel women by providing clear, concise, unbiased, truthful, and evidence-based information with all alternatives to allow the patient to have an informed choice.[38, 39,61,62] However, evidence shows that women are not well informed on the process of receiving voluntary informed consent, and the request for a CS made by women often mislead by poor knowledge.[63]

Great emphasis has to be given to the assessment of the risk and benefits of the procedure. Decision-making on CS by obstetricians on maternal request without medical indications be focused on maximizing the empowerment of women to consider reproductive rights by ensuring voluntary informed choice.[61] Most importantly, the provision of CS to those women who need it the most should not be affected by performing CS on non-medical reasons – maternal request.[62] Obstetricians must identify the reasons for the maternal request for CS at first, provide unbiased evidence-based information about CS, and then, provide individual modifications to the management of labor to reconsider preference of CS and promote informed choice. [39,61,62]

Conclusion

The indications for performing CS have been shaped mainly by religion, culture, and technology. The indications for CS have varied and changed tremendously throughout history from ancient times to the twenty-first century. The post-mortem CS was used until the Middle Ages and the operation was developed into a medical procedure during the Renaissance period. After around the middle of the 20th century, CS became a relatively safe procedure due to the development of antibiotics, technology, and patient care. Changing the attitude of obstetricians and women, CS is performed also for non-medical indications like maternal requests.

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Conflict of Interest

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Author Contribution

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1.2 Healthcare system in Nepal

The health system in Nepal has primarily developed based on vertical programmes over many years which has been influenced by multiple donors (Sharma et al. 2018a). The National Health Policy 1991 initiated community participation, local resources mobilisation, multisector co-ordination, decentralisation of planning and management for widening the coverage for rural populations and strengthening the overall health system (World Health Organization 2007; Ministry of Health and Population 2014). The comprehensive emergency obstetric services are

available at district hospital level; antenatal, delivery and postnatal care at primary health-care centres/birthing centres; antenatal and postnatal care at sub-health posts; and antenatal care and birth preparation counselling by female community health volunteers (FCHV) at a community level (KC et al. 2011; Panday et al. 2017). Although maternal health is improving, there are still lots of challenges, such as social inequalities in maternal health services, political instability, and low socio-economic status of women, teenage marriage and early pregnancy, poor distribution of human resources for health, unavailability and unaffordability of quality care (Bhusal et al. 2015). Likewise, geography is a great challenge on logistic supply, communication and retention of health workers, affecting the quality of health services in rural public health centres (Karkee and Jha 2010). The National Health Policy of Nepal 2019 emphasised universal health coverage (UHC) for equitable quality care and free health services to all (Ministry of Health and Population 2019), but the coverage of health services and financial protection for marginalized communities remains challenging (Ranabhat et al. 2019). Nepal was declared a federal republic with three autonomous governance levels (the federation/national, provincial, and the local level) in 2015 (Thapa et al. 2019). The federal health system offers an opportunity to reform the existing health system by speeding up devolution processes, reducing disparities in access to healthcare, and improving health outcomes (Khanal and Mishra 2019). Despite the many challenges, such as unclear delegation of responsibility and lack of effective communication among different government levels including human resource management, the federal health system offers an ample opportunity for achieving UHC by strengthening the health system in Nepal (Regmi et al. 2017a; Khanal and Mishra 2019).

In Nepal, healthcare services are greatly influenced by politics. Most of the health facilities are centred in its capital in Kathmandu. The private sector has been encouraged for investing in the production of health workers and for providing quality health services in Nepal (World Health Organization 2007). There were 125 public hospitals in 2019/20 and in 2013 there were 301 private hospitals in Nepal (Central Bureau of Statistics 2021). Although there are certain parameters set by the Government of Nepal to be met by private hospitals, the private hospitals are run autonomously. The number of private hospitals is growing significantly. Majority of private hospitals are situated in Kathmandu valley. Quality healthcare service and the poor performance of public hospitals have provided massive opportunities for private hospitals to run their business in Nepal. There is a big gap between the demand and supply in healthcare services creating a situation wherein private hospitals can continue to grow and make financial

benefits in Nepal (Neupane and Devkota 2017). However, the quality of both private and public ambulatory health care in low and middle-income countries are reported to be poor and both sectors need to improve care delivery and outcomes for the poor (Berendes et al. 2011).

Access to emergency obstetric care and timely referral systems, along with comprehensive emergency obstetric care can greatly reduce maternal mortality and disability. Utilization of emergency obstetric care depends on many factors such as late decision making at households, inadequate transport facilities, high cost of health services, unfriendly service providers, poorly equipped health facilities, timely referral, location and geographical conditions (Bhandari and Dangal 2014). The referral system of maternity care in Nepal is not adequate, especially in rural areas and women are losing their lives due to complications related to childbirth. However, self-referral is common in Nepal. A study conducted among 146 service users in a hospital in Nepal showed that 86% were self-referred compared to 14% referred through health services (Jahn et al. 2000). The Government of Nepal has been promoting maternity care through birthing centres at the community level (Primary Health Centres, Health Posts, Sub-Health Posts) for those pregnant women without complications (Mahato et al. 2016). However, many pregnant women avoid their nearest birthing centres (Karkee et al. 2015; Shah 2016). In one study 70.2% of women bypassed local birthing centres to give birth in hospital (Karkee et al. 2015). Rich, higher caste, older women, having low parity and experiencing complications are more likely to bypass their nearest birthing centres to go to larger hospitals (Karkee et al. 2015; Shah 2016).

Quality of maternity care is rated higher in private hospitals than public hospitals or birthing centres in Nepal. A large community-based longitudinal study among service users found that private hospitals were perceived to be of higher quality for maternity services by women compared to public hospitals and birthing centres. Similarly, public hospitals were rated the lowest quality with respect to adequacy of space, water supply, clean environment, maintaining privacy and providing adequacy of information (Karkee et al. 2014). Quality of service was positively correlated with patient satisfaction. Private hospitals in Nepal are providing a high level of service quality in the view of patients. Patient satisfaction is high at the private hospitals (Neupane and Devkota 2017). However, highly expensive private health care is not affordable to poor women in Nepal.

1.3 Geographical background of Nepal

Nepal is a small, low-income, landlocked country in South Asia, situated in between two powerful countries, India and China. Nepal has a diverse geography; it is divided into three elongated geographical areas: Terai plain area in the south; hills in the central belt (hills, valleys and lakes) and the beautiful Himalayas in the north. Nepal includes the world's highest mountain, Mount Everest (8848.86 meters), and the birthplace of Lord Buddha in the south. Nepal occupies 147,181 square kilometres and has a federal government system including seven provinces (Fig.1.1) and 753 local level government authorities. It has diversity in culture and ethnicity and has multilingual, multicultural, multireligious, and multi-ethnic society (Khanal 2020). The population of Nepal in 2021 was 30,378,055. Unfortunately, about one fourth of the population is still living on the poverty line. The preliminary estimate of gross domestic product (GDP) per capita was US$ 1,191 for the fiscal year 2020/21. The literacy rate in 2011 was overall 65.9% (male-75.1% & female-57.4%), 82.2% in urban areas and 62.5% in rural areas. Most people (81.3%) were Hindu in 2011 (Central Bureau of Statistics 2021).

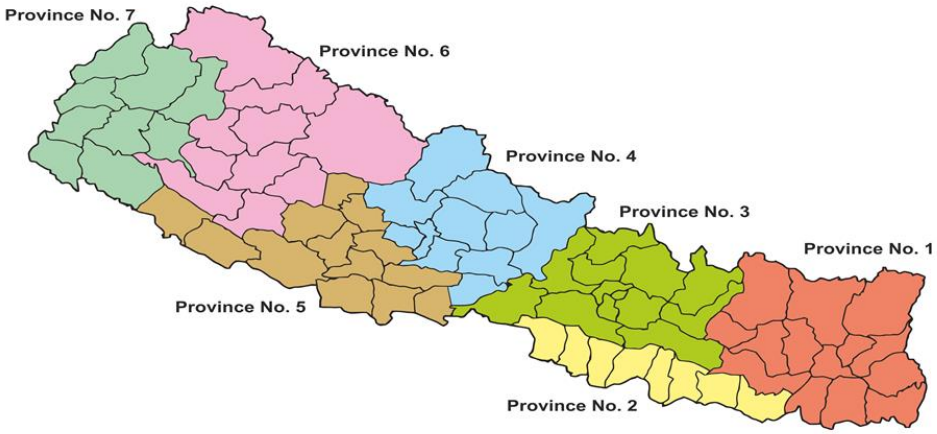

Figure 1.1: Map of Nepal (Amended from Wikimedia commons 2015)

1.3.1 Location of the study

The research study was conducted in two hospitals in Kathmandu Metropolitan City, Bagmati Province. Kathmandu valley encompasses three major cities (Kathmandu, Lalitpur and Bhaktapur). Density of population is very high in these cities. Kathmandu is the capital city and is situated in the middle geographical belt of Nepal. Kathmandu Metropolitan City is the

largest city of the Kathmandu valley (Dhungel 2017). Many public and private hospitals are centralised in Kathmandu Metropolitan City.

1.3.1.1 Paropakar Maternity and Women's Hospital (public hospital)

Paropakar Maternity and Women's Hospital; generally known as 'Prasuti Griha', is the first and biggest hospital for maternity care in Nepal. This hospital was established in August 1959 in memory of the late queen - Indra Rajya Laxmi Devi Shah, who died of pregnancy related causes. The name of the hospital was changed to 'Paropakar Maternity and Women's Hospital' in December 2007 (Paropakar Maternity and Women's Hospital 2023a). This is a public hospital, governed by its Board with a Chair appointed by the Ministry of Health and Population (MoHP) and the Director of the hospital acts as the Member Secretary of the Board.

Figure 1.2: Paropakar Maternity and Women's Hospital (Amended from Paropakar Maternity and Women's Hospital 2023a)

This hospital is situated in the heart of Kathmandu city - on the north bank of Bagmati river and close to Thapathali Bridge. Currently, this hospital has total 415 beds and 627 staff, including 54 doctors, 172 nurses including three midwives (Paropakar Maternity and Women's Hospital 2023a). PMWH has been providing maternity care for low-risk pregnant women and trying to promote physiological birth from a birthing centre, also called Maternal and New-born Service Centre (MNSC). A birthing centre or MNSC was established in PMWH in 2007 (MNSC Department 2023). In this centre, SBAs and midwives are providing antepartum care, assisting birth and providing postpartum care (MNSC Department 2023).

1.3.1.2 Kathmandu Model Hospital (Private Hospital)

Kathmandu Model Hospital is a private hospital, run by a non-governmental organisation, called the Public Health Concern Trust (PHECT), Nepal. This hospital was established in 1993

as a community referral centre with 18 beds. The hospital was enlarged to 50 beds in 1995 and upgraded to a tertiary hospital in 2003. Currently, this hospital has 50 beds including 16 maternity beds. This hospital is situated in Pardarsani Marg, Kathmandu, and provides various speciality services including obstetrics and gynaecology (phect-NEPAL).

Figure 1.3: Kathmandu Model Hospital (Amended from phect-NEPAL)

1.4 Maternal Mortality and Safe Motherhood Programme in Nepal

The Second Long Term Health Plan of Nepal (1997-2017) aimed to reduce the maternal mortality ratio (MMR) to 250 per hundred thousand live birth and to reduce infant mortality ratio (IMR) to 34.4 per thousand live births (Ministry of Health and Population 2007a). The United Nations (UN) implemented eight Millennium Development Goals (MDGs) in 2000, and MDG 5 focused on the improvement of maternal health and Nepal aimed to reduce MMR to 213/100,000 live births by 2015 and to increase the proportion of births attended by a skilled birth attendant (SBA) to 60% (National Planning Commission 2015). After the MDGs' era, the world adapted a new agenda with 17 goals for 2016-2030, called the Sustainable Development Goals (SDGs). Under the SDG 3, Nepal has set the targets to be achieved by 2030 – for the MMR to be reduced to less than 70% and for the proportion of births attended by SBAs to increase to 90% (National Planning Commission 2015).

The National Safe Motherhood Programme was started in 1997 in Nepal, as a national priority programme. The main aims of the programme are to reduce maternal and neonatal mortality and morbidity, by managing avoidable factors related to complications of pregnancy and childbirth (Ministry of Health and Population 2014). At that time, MMR (539 per 100,000 live births) was very high (Ministry of Health and Population 2007b). The Nepal Safer Motherhood Project (1997-2004) was initiated in Nepal in 1997 to increase access to quality emergency obstetric care, funded by the UK Department for International Development (DFID) (Rath et

al. 2007). Although, there were big problems, such as sustainability on functioning, lack of skilled doctors, anaesthesia and blood management, the project was successful in providing comprehensive-level care from selected hospitals by improving infrastructure and equipment (Rath et al. 2007). In addition, this project played a crucial role in community awareness in danger signs of pregnancy and childbirth, establishment of community emergency funds for obstetric complications and policy development (Rath et al. 2007). A second five-year project, funded by DFID, was established in 2004, called Support to the Safe Motherhood programme (SSMP). This project provided technical and financial support to the Government of Nepal in policy development, services strengthening, development of SBAs, increasing equity and access, incentive schemes and monitoring to improve the quality of obstetric care (Barker et al. 2007). Accessing skilled institutional maternity care services is unaffordable for many poor and rural women in Nepal (Borghi et al. 2006; Acharya 2016). In August 2005, the government of Nepal introduced the National Maternity Incentive Scheme (NMIS) to address financial constraints by offering transport costs to all pregnant women who wanted to give birth at a health facility (Barker et al. 2007). In July 2006, the scheme was changed to the Safe Delivery Incentive Programme (SDIP) to cover the high costs associated with accessing care for childbirth in 25 districts of Nepal with a low human development index (all mountain regions and some hilly regions) offering transportation cost incentives to women giving birth in health facilities and financial incentives to health workers for assisting childbirth either in health facilities or at home (Family Health Division 2006). However, incentive for conducting a CS is higher than assisting a vaginal birth (Khanal 2019). The NMIS and SDIP programmes were found to be associated with an increase in health facility-based delivery and birth with a skilled health worker. However, it was most beneficial to geographically accessible areas and wealthy families (Ensor et al. 2017).

In January 2009, 'Aama Surakshya Karyakram' was formed by the Government of Nepal, adding free delivery services and removing user fees for all types of childbirths under the SDIP. The funds for the free delivery policy are found to be adequate to cover the main costs of services (Witter et al. 2011). Cash incentives to women for completing four antenatal (ANC) visits in designated months (four, six, eight, and nine month of pregnancy) was started in 2009 and merged with the 'Aama Surakshya Karyakram' in 2012 (Ministry of Health and Population 2014). The incentive programme was found to be significantly associated with an increase in the utilisation of four ANC visits (AOR=6.006, P<0.001) and institutional deliveries (AOR=5.116, P<0.001) in Nepal (Bhatt et al. 2018). However, 'Aama Surakshya Karyakram'

has been effective and efficient in reducing health facility related barriers and financial barriers to access maternal health services but only for geographically accessible areas in Nepal (Bhusal et al. 2011). The reduction in the MMR was found to be encouraging. The MMR of 539 per 100,00 live births in 2006 (Ministry of Health and Population 2007b) was decreased to 239 per 100,00 live births in 2016 (Ministry of Health and Population 2017).

1.5 Institutional childbirth and skilled Birth Attendant in Nepal

Institutional birth is being promoted by the Government of Nepal by expanding of birthing centres in the community level and providing 24-hour comprehensive emergency obstetric care at hospitals (Department of Health Service 2014). However, a lack of skilled maternity care during childbirth is still an issue for maternity care, particularly in rural Nepal (Dhakal et al. 2011). Health facility-based childbirth rates in Nepal have been increasing since the removal of official user fees for all types of childbirth in 2009 and the introduction of incentive schemes (Witter et al. 2011). Institutional birth in Nepal has increased from 35% in 2011 (Ministry of Health and Population 2012b) to 57% in 2016 (Ministry of Health and Population 2017). The National Safe Motherhood and Neonatal Health Long Term Plan (2006-2017) aimed to increase the number of births conducted by SBAs to 60% by 2017 and increase the number of births in health facilities to 40% by 2017 (Ministry of Health and Population 2007a). One of the national targets of the SDGs of Nepal for 2030 is to raise the proportion of births attended by SBAs to 90% (National Planning Commission 2015). Despite the provision of free delivery services and transport costs, a study conducted in Chitwan district reported many barriers to giving birth at health facilities, including the quality of services (Shah et al. 2018). A shortage of skilled health workers, particularly qualified midwives is a major challenge (Rath et al. 2007; Bogren et al. 2013b). In Nepal, maternal and child health workers (MCHWs) and auxiliary nurse midwives (ANMs) have been responsible for providing maternal and child health services, including obstetric first aid at the village level, since the 1990s. However, these types of health workers cannot work successfully as SBAs, for several reasons, such as inadequate components of midwifery and clinical training including lack of support from the healthcare system to train them to provide emergency obstetric and neonatal care especially for life-threatening complications (World Health Organization 2007).

In Nepal, the policy on SBAs was implemented in 2005 (World Health Organization 2007). The process of imparting remaining skills (two months training on core maternal and new-born skills) to be an SBA, the government has been providing competency training to health workers

(doctors, staff nurses and ANMs). According to the internationally recognised definition of SBAs, only limited health workers in Nepal are qualified as SBAs (World Health Organization 2007). An SBA is defined as "a skilled attendant is an accredited health professional - such as a midwife, doctor or nurse - who has been educated and trained to proficiency in the skills needed to manage normal (uncomplicated) pregnancies, childbirth and the immediate postnatal period, and in the identification, management and referral of complications in women and new-borns" (World Health Organization 2004, p.1). A lack of qualified midwives is the main problem in maternity care in Nepal. Nepal needs midwives not only for the reduction of MMR, but also for the reduction of rising rates of CS and promotion of physiological birth (Bogren et al. 2013b).

1.6 Midwife and Model of maternity care

A midwife is the most appropriate health professional to provide person-centred maternity care for women during pregnancy, labour and the post-partum period (Moghasemi et al. 2018). They are specialists in normal pregnancy, birth and postnatal care. They can protect, support, and enhance the normal physiology of labour and childbirth. They view pregnancy and childbirth as a normal part of a woman's life and focus on a woman's expectations and experience of her pregnancy as a unique individual (Rooks 1999). Therefore, midwives have primary responsibility for the care of women with low-risk pregnancies in most of developed counties (Rooks 1999; Sharma et al. 2012; Moghasemi et al. 2018).

A lack of skilled birth attendants for childbirth provides great opportunity for the midwifery profession in Nepal, however, midwifery is poorly recognised in Nepal (Bogren et al. 2013b). Although a three-year bachelor's degree in midwifery has now been started in some universities in Nepal, with support from of the Ministry of Health and several development partners (the UN Population Fund, WHO, and Deutsche Gesellschaft für internationale Zusammenarbeit), the number of midwives in Nepal is very short (Bogren et al. 2013a; Goyet et al. 2017). At the time of this study, only two midwives were employed in PMWH, but not one midwife in KMH. Moreover, there are many challenges in the development and strengthening of the midwifery profession in Nepal. The main challenges are national commitments without complete supporting policy documents, different political interests or priorities, minimal public support and lack of professional recognition due to the perception that midwifery is not different from the nursing profession (Bogren and Erlandsson 2018). Developing an autonomous midwifery profession in Nepal requires a comprehensive and collaborative approach supported by a

political commitment with contextualised global standards and guidelines incorporated into national policies and plans (Bogren and Erlandsson 2018; Bogren et al. 2021).

There are two different models of maternity care: the medical/obstetric model and the midwifery/social model (Rooks 1999; van Teijlingen 2005). The medical model emphasises the pathological potential of pregnancy and childbirth. The focus of this model is diagnosis and treatment of pregnancy complications that affect the pregnant women and or foetus. Physicians have main responsibility for the care of pregnant women who have serious complications, however, most pregnancies are healthy or low risk. Antenatal care in this model mainly gives attention to the foetus and screening for pathology. Doctors are more likely to be the key decision-makers to make use of medical technology and to enhance their expertise (Rooks 1999). The medical model uses a doctor-centred approach and has a biomedical focus (van Teijlingen 2005). It is assumed that labour is not a natural process, meaning that it is to be treated as an illness (Adams 2006; Moghasemi et al. 2018). This model is extensively used in North America. Obstetricians are involved primarily in antenatal care and childbirth, and nurses provide intrapartum and postnatal care (Sandall 2012). Historically, this model of maternity care was promoted in America by Joseph Bolivar DeLee, who was a physician in the early twentieth century in Chicago, USA. He has been blamed for encouraging the over medicalisation of childbirth in USA by using and encouraging the use of unnecessary medical interventions in childbirth. He believed that labour was a pathological condition, which can put women's lives and health at risk, and therefore, medical interventions were required to assist women to give birth (LEAVrIr 1988). The medical model is promoting medicalisation of pregnancy and childbirth introducing unnecessary interventions (Moghasemi et al. 2018). In the 21st century, childbirth has been increasingly influenced by modern medical technology and this natural process is widely becoming medical event (Akhter and Schech 2018; Prosen and Krajnc 2019).

On the other hand, the midwifery/social model of maternity care is based on midwifery principles and philosophy, professional midwifery continuity care, provision of high-quality care by a competent midwife from the beginning of pregnancy until six weeks after childbirth, including supporting natural labour without intervention (Moghasemi et al. 2018). This model of maternity care believes that pregnancy and childbirth is a natural process that should be treated as normal until there are any signs of complications (Rooks 1999). The midwifery model is a holistic women-centred approach to providing individualised counselling, prenatal care and education and continuous support during childbirth and the postnatal period,

monitoring the physical, psychological and social well-being of pregnant women and ensuring timely identification and referral of pregnant women who require obstetrical attention whilst minimising technological interventions (Choudhary et al. 2020). Pregnant women are empowered to make decisions by taking an active role in their own care and by having the information and support they need (Rooks 1999). This midwifery-led model has been practised in high-income countries. Evidence shows that the midwifery model has several benefits for both mother and baby such as increased chances of spontaneous labour, reduction of poor pregnancy outcomes, increased empowerment of women, reduction in medical interventions, increased satisfaction with care and reduction of costs (Sandall et al. 2016; Moghasemi et al. 2018; Choudhary et al. 2020).

In Nepal, birthing centres at community level are trying to provide midwifery-led maternity care by SBAs (Mahato et al. 2016) because of the scarcity of midwives (Bogren et al. 2013a). Although a birthing centre in PMWH has been initiating midwifery-led maternity care for low-risk pregnant women (MNSC Department 2023), however, almost all hospital-based maternity care is dominated by the medical model.

1.7 Respectful Maternity Care

Respectful maternity care (RMC) is a significant element of quality maternity care. Clinical care provision and women's experiences of the care they received during childbirth are equally important for improving quality care given during childbirth (Tunçalp et al. 2015). Women's experience of childbirth can have a life-long impact. These experiences are often shared with other women and create an environment of either confident or doubt on childbearing. Hence, the interpersonal relationship between women seeking maternity care and their care providers (health workers and health system) is extremely important (White Ribbon Alliance 2011). A negative birth experience during a previous pregnancy is reported by many studies (Fenwick et al. 2010; Obed et al. 2013; Schantz et al. 2019).

WHO recommends RMC, "which refers to care organized for and provided to all women in a manner that maintains their dignity, privacy and confidentiality, ensures freedom from harm and mistreatment, and enables informed choice and continuous support during labour and childbirth" (World Health Organization 2018b, p.3). RMC is universal right of all childbearing women, because the pregnancy and childbirth are important periods of their lives and is characterised a time of intense vulnerability. RMC aims to remove disrespect and abuse during pregnancy and childbirth. Therefore, safe motherhood must not be limited to only the

prevention of morbidity or mortality, it must be expanded to include respect for women's basic human rights, women's autonomy, dignity, feelings, choices, preferences and choice of companionship wherever possible (White Ribbon Alliance 2011).

A qualitative evidence synthesis has developed twelve areas of respectful maternity care from the perspectives of women and healthcare providers as "Being free from harm and mistreatment; Maintaining privacy and confidentiality; Preserving women's dignity; Prospective provision of information and seeking informed consent; Ensuring continuous access to family and community support; Enhancing quality of physical environment and resources; Providing equitable maternity care; Engaging with effective communication; Respecting women's choices that strengthen their capabilities to give birth; Availability of competent and motivated human resources; Provision of efficient and effective care; and Continuity of care" (Shakibazadeh et al. 2018, p.935).

Global evidence shows that not all women receive RMC. More efforts are required to make clear guidelines and provision of RMC as well as to remove disrespect and abuse (Bohren et al. 2020). A review on 'Exploring Evidence for Disrespect and Abuse in Facility-based Childbirth' identified seven categories of disrespect and abuse (Bowser and Hill 2010). The White Ribbon Alliance (2011) highlights seven universal Rights of childbearing women (White Ribbon Alliance 2011). The categories of disrespect and abuse women face during maternity care and the corresponding seven rights of childbearing women outlined by the White Ribbon Alliance (2011) are brought together and displayed in Table 1.1.

Table 1.1: Categories of Disrespect and Abuse in relation to Universal Rights of childbearing women

Seven Categories of Disrespect and Abuse (Amended from Bowser and Hill 2010)	Linking Seven Universal Rights of childbearing women (Amended from White Ribbon Alliance 2011)
Physical abuse	Freedom from harm and ill treatment
Non-consented care	Right to information, informed consent and refusal, and respect for choices and preferences, including the right to companionship of choice wherever possible
Non-confidential care	Confidentiality, privacy
Non-dignified care	Dignity, respect
Discrimination based on specific patient attributes	Equality, freedom from discrimination, equitable care
Abandonment of care	Right to timely healthcare and to the highest attainable level of health
Detention in facilities	Liberty, autonomy, self-determination, and freedom from coercion

The WHO has issued a statement for global actions to prevent and eliminate disrespect and abuse during facility-based childbirth and emphasised women's right to dignified and respectful care throughout pregnancy and childbirth (World Health Organization 2014a). Unfortunately, many women experiences disrespect and abuse during childbirth, especially in low-income countries. A study conducted in Pakistan showed that overall, 27.2% women reported disrespect and abuse during childbirth, but 99.7% women had objectively experienced at least one of its forms (Azhar et al. 2018). Furthermore, another study conducted in Pakistan revealed that primigravida and poor women, lesser educated on birth preparedness and postnatal care, and less empowered women were more likely to be mistreated. The different types of mistreatments include women; ineffective communication (100%); lack of supportive care (99.7%); loss of autonomy (97.5%); failure of meeting professional clinical standards (84.4%); lack of resources (76.3%); verbal abuse (15.2%); physical abuse (14.8%); and discrimination (3.2%) (Hameed et al. 2021). Similarly, a study conducted in Nigeria showed 98.0% of women suffered at least one form of disrespectful and abusive care during their last childbirth experience. Abandonment or neglect during childbirth (29.1%), non-confidential care (26.0%), detention in the health facility (22.0%), and discrimination (20.0%) were classified as disrespect and abuse (Okafor et al. 2015).

The new concept, RMC is an emerging approach in maternity care in many low and middle-income countries like Nepal. In Nepal, SBAs are responsible for providing respectful maternity care, because of the shortage of professional midwives. A qualitative study conducted in Nepal among SBAs concluded that they knew the importance of respectful maternity care but "safety comes before comfort" (Erlandsson K. 2014, p.59). Disrespectful maternity care is evident in Nepal (Pathak and Ghimire 2020; Ghimire et al. 2021; Gurung et al. 2021). RMC goes beyond the preserving of women's dignity while giving birth. It is also showing empathy, providing women-centred care and protecting rights (Moridi et al. 2020). In Nepal, RMC is very new concept and lack of resources as well as awareness are the main challenges to promoting RMC.

1.8 Rising rates of CS

CS rates have been rising dramatically worldwide including in low and middle-income countries like Nepal. Such rise of CS rates has been a global public health problem as discussed below.

1.8.1 Global rising of CS rates

Despite the WHO recommendation for CS rates of 10-15%, CS rates have been rising progressively and have reached unacceptably high rates around the globe. A study based on data from 150 countries from 1990 to 2014 showed that the overall global CS rate was 18.6%; the highest was in Latin America and the Caribbean (40.5%) and the lowest was in Africa (7.3%). In other continents, the CS rate was: 25.0% in Europe, 19.2% in Asia and 31.1% in Oceania (Betrán et al. 2016b). Another study based on data from 169 countries, found CS rates steadily increasing around the world and almost doubling from 2000 (12.1%) to 2015 (21.1%) with huge disparities between regions, countries and within countries. The CS rate was again found to be the highest in Latin America (44.3%) and lowest (4.1%) in West Africa (Boerma et al. 2018). Similarly, country-wise the rate in South Sudan was 0.6% and 58.1% in the Dominican Republic (Boerma et al. 2018). A recent study based on data from 2010 to 2018 from 154 countries also revealed that the rate of CS is rising continuously worldwide with similar trends over the last three decades. The overall global CS rate was 21.1%; with the lowest rate (5.0%) in Sub-Saharan Africa and the highest rate (42.8%) again in Latin America (Betran et al. 2021). The study also predicted that the rate of global CS rate will increase to 28.5% in 2030 with lowest rate (7.1%) in Sub-Saharan Africa and highest (63.4%) in Eastern Asia (Betran et al. 2021). Additionally, a huge disparity is noticed between rich and poor in access to CS. Wealthy women overuse the operation, but poor women in low and middle-income countries have less or no access to CS (Boerma et al. 2018).

1.8.2 Rising CS rates in South Asia.

CS rates are rising fast in South Asia as well, the CS rate has increased from 7.2% in 2000 to 18.1% in 2015. The overall CS rate is still found to be low (13%) in South and South-East Asia, but an institutional based rate of CS was reported to be 19.0% (Verma et al. 2020). Similarly, the CS rate in South Asia was 19% in 2018 (Betran et al. 2021). However, there is disparity in CS use between countries and within the countries. It shows women are not receiving the life-saving childbirth procedure when they are in need. In Afghanistan, the overall CS rate is reported to be low (3.4%) (Mumtaz et al. 2017). The CS rate is increasingly high in Bangladesh, with highest rates in urban and private hospitals (Khan et al. 2017; Amjad et al. 2018; Hasan et al. 2019). The CS rate is rising in India with inequality in the use of CS between urban (higher) and rural areas (lower) (Narzary et al. 2017; Verma et al. 2020) as well as between private and public health facilities (Singh et al. 2018; Lee et al. 2021). In the Maldives, the

overall CS rate is reported to be high; even higher in urban (Verma et al. 2020). The facility-based CS rate is reported to be high in Pakistan (Kanji et al. 2019; Murtaza et al. 2021), India (Patel et al. 2020), Sri Lanka (Goonewardene et al. 2016), and Bhutan (Dorji et al. 2021). The CS rate is increasing also in Pakistan; reported to be higher in urban areas and amongst educated and wealthy women (Mumtaz et al. 2017). Several hospital-based studies report rising rates of CS, especially in city hospitals in South Asia (Dhakal-Rai et al. 2019). Nepal faces a similar situation in CS utilisation as outlined in below (section 1.8.3).

1.8.3 Rising CS rates in Nepal

The rate of CS is rising at an unacceptable rate in Nepal. The rate increased four-fold between 2001 (1.2%) and 2011 (5.4%) (K C and Neupane 2014). Similarly, there has been a three-fold increase in CS rates in private hospitals in 2016 (26.3%) compared to 1996 (8.9%) (Bhandari et al. 2020). Figure 1.4 shows that the overall rate of CS has increased along with vaginal births in hospital and births attended by SBA, as reported by Nepal Demographic and Health Surveys.

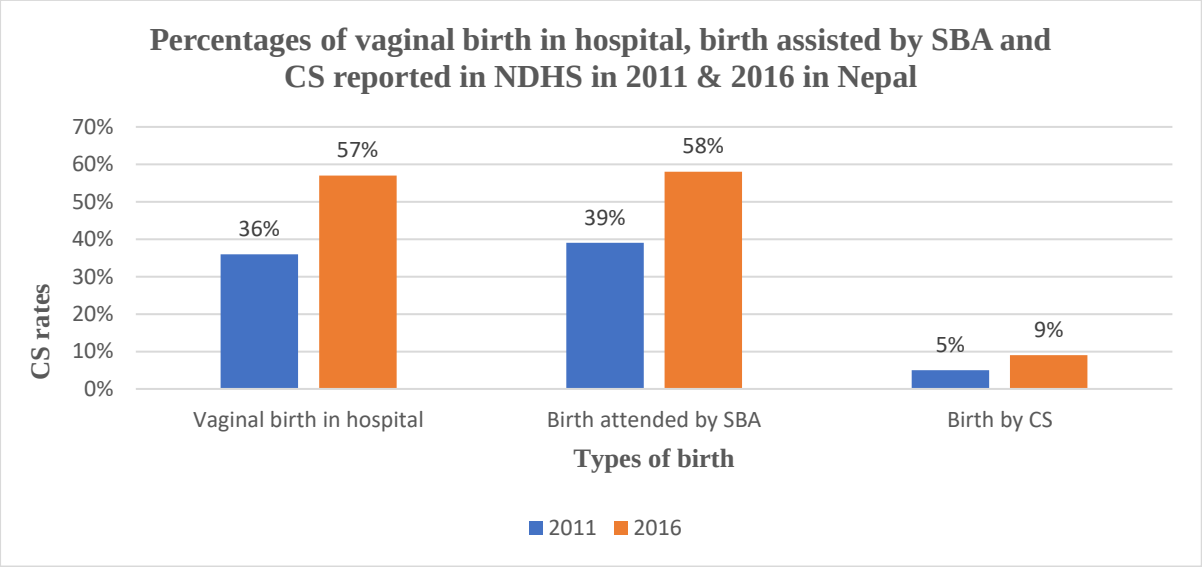

Figure 1.4: Percentages of vaginal birth in hospital, birth assisted by SBA and CS in 2011 &2016 (Amended from Ministry of Health and Population 2012a, 2017)

In Nepal, vaginal birth usually includes both spontaneous and instrumental birth/assisted birth because both types of birth occur through vaginal canal. In this study, both spontaneous and instrumental birth/assisted births are counted as vaginal birth.

1.8.3.1 Rising rates of caesarean section in urban Nepal

The rising rates of CS in urban Nepal is a public health problem (Dhakal Rai et al. 2019). This increase could be driven partly by private health services (Neuman et al. 2014). Many hospital-based studies show that the CS rate is rising in urban Nepal in both public and private hospitals. However, CS rates are considerably higher in private hospitals (Table 1.2).

Table 1.2: CS rates in urban hospitals in Nepal reported by hospital-based studies

Authors & year	Hospitals	CS (%)
(Maskey et al. 2019)	Kist Medical College, Kathmandu	36.8*
(Poudel et al. 2019)	Kathmandu Model Hospital, Kathmandu	66.1*
(Subedi et al. 2019)	Manipal Teaching Hospital, Pokhara	36.76*
(Darnal and Dangal 2020)	Paropakar Maternity and Women's Hospital, Kathmandu	30.7%#
(Pageni et al. 2020)	Matri Shishu Miteri Hospital, Gandaki Province, Pokhara	21.76%#
(Shrestha and Shrestha 2020)	Paropakar Maternity and Women's Hospital, Kathmandu	31.1%#
(Das et al. 2020)	BP Koirala Institute of Health Sciences, Dharan	33.40%#
(Rawal et al. 2020)	Tribhuvan University Teaching Hospital, Kathmandu	53.2%#
(Baral et al. 2021)	Paropakar Maternity and Women's Hospital, Kathmandu	32.15%#
(Shrestha et al. 2021a)	Manipal Teaching Hospital, Pokhara	54.7%*
(Shrestha et al. 2021c)	Birendra Hospital, Kathmandu	34.4%#
(Tamrakar et al. 2021)	Chitwan Medical College, Chitwan	44.22%*
(Acharya et al. 2022)	Kathmandu university, Dhulikhel Hospital, Kavre	39.7%*
(Gurung et al. 2022)	Patan Hospital, Lalitpur	57.7%#
(Shrestha et al. 2023)	Nobel Medical Collage Teaching Hospital, Biratnagar	33.04%*
(Subedi et al. 2023)	Manipal Teaching Hospital, Pokhara	51%*

*Urban private hospital; # Urban public hospital

1.8.3.2 Published article on "Rising Rates of Caesarean Section in Urban Nepal"

An article on 'Rising Rates of Caesarean section in Urban Nepal' was published in the Journal of Nepal Health Service Research Council in 2018. The following article has highlighted the magnitude of the problem of rising CS rates in urban Nepal and the need for urgent attention. The article is cited as following:

Dhakal Rai, S., Regmi, P.R., Teijlingen, E.V., Wood, J., Dangal, G. and Dhakal, K.B., 2019. Rising Rates of Caesarean Section in Urban Nepal. Journal of Nepal Health Research Council, 16 (41), 479-480. http://dx.doi.org/10.33314/jnhrc.v16i41.1750. This article is licensed under Creative Commons Attribution-NonCommercial 4.0 International License.

Rising Rate of Caesarean Section in Urban Nepal

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ABSTRACT

The rising rate of caesarean section in urban Nepal is alarming as the lack of access for women in rural areas to emergency obstetric care, putting lives at risk. The latter is referred to as 'Too little too late'. At the same time, the sharp rise in caesarean section rates in cities presents the other extreme: "Too much too soon". The overuse of caesarean section causes harm, unnecessary costs, and misuse of health resources. Availability of private hospitals and increasing hospital childbirth may contribute to the rising rate of caesarean section. This article highlights the rising rate of caesarean section in urban Nepal.

Keywords: Caesarean section; emergency obstetric care; Nepal.

INTRODUCTION

Caesarean section (CS) is a life-saving surgical procedure for delivering a baby when complications arise. The World Health Organization recommends a CS rate of 10-15%.[1] *The Lancet* series warns about the global rising CS rate, from 12.1% in 2000 to 21.1% in 2015.[2] Unnecessary excessive use of CS can harm maternal and child health. Whilst inadequate access to CS in low-income countries with rates below 10% also leads to unnecessary morbidity and mortality.[2]CS can cause adverse effect in subsequent pregnancy such as placenta previa, stillbirth and miscarriage. CS can cause many short-term and long-term health effects on mother and child.

NEPAL SCENARIO

The CS rate is rising in Nepal, whilst huge inequalities exist between urban and rural and private and public hospitals (Table 1). *The Lancet* series described increasing CS use as being driven by more women giving birth in health facilities as well as the increasing use of CS within facilities and the privatisation of health services.[2] As expected, the CS rate is significantly higher in urban areas than in rural Nepal. Overall CS rate in Nepal was 9% in 2016 (7.1% in rural as compared to 19% in urban).[3] The Government of Nepal has been promoting safe motherhood through initiatives such as offering free delivery care and transportation incentive schemes to women who give birth in hospital. Hence, institutional births have increased from 35% in 2011 to 57% in 2016.[3]

Table 1. CS rates in hospital-based studies in Nepal.[4-10]

Hospital[1]	CS rate
@*BP Koirala Health Science Teaching Hospital	28.6%
&* Tribhuvan University Teaching Hospital	25.4%
$* Kritipur Hospital	50.9%
@* Patan hospital	41.9%
&+Okhaldunga Community Hospital	9.5%
$* Kathmandu Medical College hospital	48.81%
&# Mid-Western Regional Hospital	18.9%

*Urban, +Rural,# Semi-urban, & Government,@ semi-government,$ Private hospital

The CS rate is substantially higher in private hospitals than in government hospitals.However, there are wide disparities in access to CS between urban and rural women in Nepal. The CS rate is significantly higher in urban hospitals than in rural. The dramatic rise in CS could be linked to increased institutionalised childbirth, increased educational status of women and easily available private health services in Nepal.[2] In some hospitals these rising rates could be due to 'unnecessary intervention' and medicalisation.

TOO LITTLE TOO LATE (TLTL) versus TOO MUCH TOO SOON (TMTS)

TLTL refers to lack of resources, low standard of quality of services and unavailability or withholding of care until too late. TMTS describes the overuse of emergency obstetric care as well as unnecessary use of non-

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evidence-based interventions and over-medicalisation. TMTS causes harm, misuses of resources and increases health cost. CS is a well-known indicator of obstetric care having both TLTL and TMTS with disparities between and within countries.

Massive inequality of access to CS between urban and rural Nepal indicates the coexistence of TLTL and TMTS. Double burden occurs with very low numbers of CSs in poor remote rural areas and very high in wealthier urban areas. Poor, lowly educated and vulnerable women who are in need have less or non- access to emergency obstetric care in rural areas. This is due to underdeveloped local health systems in remote areas with limited provision of safe and timely CS procedure to save lives of mother and foetus. Whereas, easily available private hospitals and education of women have been suggested as factors for rising of rates of CS in urban settings. Over-medicalisation of childbirth may cause not only severe maternal and foetal outcomes but also financial burden to low-income countries like Nepal.

The worrying rise of CS rates in urban Nepal needs to be addressed urgently. The first general step as set out in *The Lancet* series is to develop scientifically tested and locally tailored multifaceted strategies to reduce CS and increase physiological birth for healthy women and babies.Additional steps should include: (a) legislation to ensure that doctors and hospitals get the same fee for attending both CS and vaginal deliveries; (b) targeting men to actively support their partners and act as their supporter as well as advocates for normal birth; (c) have on-call senior obstetricians who teach more junior doctors in how to keep CS rates low; and (d) expand the small but growing midwifery profession in Nepal to ensure 24 hours midwifery coverage in any hospital as midwives are the experts in physiological childbirth.At the national level provide adequate access to skilled birth attendance, appropriate foetal surveillance and assisted births or emergency obstetric care in rural areas.

CONCLUSIONS

The evidence outlined here demonstrates that there is a genuine need to explore why CS rate is high in urban areas and how to make rational use of CS delivery in order to benefit women and their infants. We aware that Nepal is often good at developing appropriate legislation and protocols, but poor at its implementation. If any of our recommendations are accepted Nepal needs to ensure that implementation is appropriately policed and that sanctions are in place for hospitals and doctors widely missing CS targets (for example).

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1.8.3.3 Too Little Too Late versus Too Much Too Soon in CS use

There is co-existence of the two extreme situations on utilisation of CS in Nepal: Too Much Too Soon (TMTS) and Too Little Too Late (TLTL) as mentioned in above article, on rising CS rates in urban Nepal. The unequal co-existence in utilisation of CS between urban and rural areas is highlighted by that published article ((Dhakal Rai et al. 2019) in section 1.8.3.2. In urban Nepal, CS rates are very high in urban hospitals because of the availability of CS, unnecessary utilisation of the life-saving procedure and the over-medicalisation of normal pregnancy and childbirth. TMTS can be harmful when applied routinely or overused but it also increases health costs (Miller et al. 2016). Similarly, timely access to the emergency procedure is not usually possible in rural and remote areas of Nepal due to lack of resources (hospitals and skilled human resources), low standard of care or services and unavailability of obstetric procedures or CS until too late. Many women in Nepal still give birth at home. Wealth status, education and place of residency significantly contribute to inequality of access to hospital for childbirth (Bhusal 2021). Many poor women do not have the access to emergency obstetric care in rural Nepal. Women die due to the complications of childbirth before reaching to hospital. Therefore, TLTL is a fundamental problem associated with high maternal mortality and morbidity in low-income countries like Nepal (Miller et al. 2016). The vast disparity in CS utilisation directly affects maternal and child health in Nepal. Urban, wealthy and educated women use CS needlessly. On the other hand, rural poor, lowly educated or illiterate women have no or little access to CS when they need it (K C and Neupane 2014; Ministry of Health and Population 2017). In rural areas in Nepal, local health systems have poor infrastructure with limited provision of timely and safe obstetric procedures to save the lives of mothers and foetus. Furthermore, poor roads and transport facilities are a big challenge for timely referral in cases of emergency. Therefore, TLTL is a problem that exists in emergency obstetric care in rural areas. On the other hand, health facilities are centralised in urban areas in Nepal. Well-equipped private hospitals are growing in city areas. Rich urban educated women can receive CS easily on their request and hospitals also fulfil their request. TMTS in the use of CS in urban Nepal and the over-medicalisation of childbirth (Mainali 2019) is the same as in India (Ghosh 2010). Therefore, Nepal is facing the double burden in CS utilisation in the same way as other South Asian countries like Bangladesh (Khan et al. 2022).

1.9 Consequences of rising CS rates

Caesarean section is a major surgical intervention. Therefore, it has several negative health effects to mother and child as well as financial implications.

1.9.1 Health risks associated with CS

The major obstetric intervention, CS, can be harmful for both mother and child. Evidence suggests that caesarean sections are associated with the increased risk of death, severe morbidity, postpartum antibiotic treatment, admission to intensive care units, blood transfusion and hysterectomy (Villar et al. 2006; Souza et al. 2010). CS can cause short and long-term health effects on women, which includes severe outcomes such as admission to intensive care units, severe haemorrhage, blood transfusion, complications associated with anaesthesia, obstetric shock, thromboembolism, major puerperal infection, and haematoma (Sandall et al. 2018). Planned CS in low-risk pregnancies is found to be associated with increased risks of cardiac arrest, wound hematoma, hysterectomy, major puerperal infection, anaesthetic complications, venous thromboembolism, and haemorrhage requiring hysterectomy, and longer hospital stays during the postpartum period (Liu et al. 2007).

Moreover, there are many adverse outcomes after CS in subsequent pregnancies such as placenta previa, hysterectomy, uterine rupture, ectopic pregnancy, miscarriage, stillbirth and preterm birth (Marshall et al. 2011; O'Neill et al. 2013; Keag et al. 2018). Although there are some identified benefits of CS, such as less frequency of urinary incontinence and urogenital prolapse (Keag et al. 2018), multiple CSs can cause undesirable long-term health effects such as pelvic adhesions, chronic pain, subfertility and hysterectomy (O'Neill et al. 2013; Sandall et al. 2018). CS is linked with decreased chance of subsequent pregnancy and live birth due to multiple causes of subfertility after CS including intra-abdominal adhesions (Hinterleitner et al. 2021). There are many short-term health risks for children born by CS, such as allergy, atopy, asthma, alteration of immune development and reduced intestinal gut microbiome diversity and long-term health problems such as such as leukaemia, bowel disease, juvenile arthritis, asthma, systemic connective tissue disorders and inflammatory immune dysfunction (Sandall et al. 2018).

1.9.2 Financial impact of rising CS

Performing a CS is much costlier than supporting a vaginal birth. CS is a big surgical procedure that needs considerable resources. It can put financial burden not only on the patient or family,

but also on the health system by using health resources unnecessarily. Moreover, if CS is done for non-medical reasons, it would be the unrealistic cost. The global cost of medically indicated CS is found to be very high (approximately $ 432 million in 2008). Similarly, the global estimated cost of performing CS for non-medical indications was high (approximately $ 2.32 billion in 2008) ((Gibbons et al. 2010). A few studies suggest that pre-labour or planned CS could be less costly than planned vaginal birth in some clinical situations (Khan and Zaman 2010; Petrou and Khan 2013; Haider et al. 2018), but elective CS or overall CS would be more costly than vaginal birth (spontaneous or instrumental) in low-risk populations (Khan and Zaman 2010; Petrou and Khan 2013). Although, the cost effectiveness depends on the success of trial of vaginal birth after a CS (VBAC), it can be more cost-effective than elective CS (Petrou and Khan 2013). CS performed during labour is found to be more costly (Allen et al. 2005), the cost of CS could be about 10% more expensive if epidural anaesthesia is also used during labour (Bost 2003).

Unnecessary use of CS can put unrealistic financial burden on both individuals/family and the health system especially in middle or low-income developing countries like Nepal, Bangladesh and Pakistan. For example, in Bangladesh, about 70% of maternity care expenditure of total health expenditure was made up by CS in 2010 (Haider et al. 2018). Similarly, the cost of CS is found to be more than a month's income for 74% of all households in Pakistan (Khan and Zaman 2010). The hidden costs (cost for food drink, clothes and transport) for CS are found to be higher than vaginal birth in Nepal (Acharya et al. 2016).

1.10 Monitoring the rates of CS using Robson Classification

The rising CS rate has been a major global public health issue. The effective system for monitoring of CS rates can play a vital role at the centre of debate on defining optimal rates of CS (Betran et al. 2014; World Health Organization 2015). At the hospital level, an appropriate system is necessary not only to understand the rising trends and its causes, but also to implement effective measures where necessary to stem the rise. The Robson classification, also called the 10-group classification system (TGCS), was recommended by WHO in 2015 as a global standard tool to assess, monitor and compare CS rates within healthcare facilities over time, and between facilities (World Health Organization 2015). This system classifies all women at admission, at a specific health facility to give a birth, into 10 groups based on five basic obstetric characteristics (parity, gestational age, onset of labour, foetal presentation and

number of foetuses). The Robson classification was proposed initially by Dr Michael Robson in 2001 (Robson 2001) as shown in below Table 1.3.

Table 1.3: Robson classification ((Amended from Robson 2001)

Robson groups	Description
1	Nulliparous, single cephalic, =>37 weeks in spontaneous labour
2	Nulliparous, single cephalic, =>37 weeks in induced labour or CS before labour
3	Multiparous, excluding previous CS, single cephalic, =>37 weeks in spontaneous labour
4	Multiparous, single cephalic, =>37 weeks in induced labour or prelabour CS
5	Previous CS, single cephalic, =>37 weeks
6	All nulliparous breeches
7	All multiparous breeches (including previous CS)
8	All multiple pregnancies (including previous CS)
9	All abnormal lies (including previous CS)
10	All single, cephalic, =<36 weeks (including previous CS)

The Robson classification is the standardised internationally recognised classification system to monitor CS in a meaningful, reliable, and action-oriented manner in each health facility. This classification is easy and simple and mutually exclusive, highly reproducible, easily applicable, and useful to change clinical practice. It has many strengths such as simplicity, flexibility (further subdivisions can be made to increase homogeneity within groups) (World Health Organization 2015, 2017). It is a simple system which provides a common initial platform for further detailed analysis within perinatal events, so that, outcomes can be measured and compared (Robson et al. 2015; World Health Organization 2017). This classification system is useful for not only clinicians, facility administrators, public health authorities but also women themselves. It helps to identify and analyse the contribution of each group to overall CS rates. It also helps to recognise the main groups of women who contribute most and least to the overall CS rates (Betran et al. 2014; World Health Organization 2017). This classification helps to identify and analyse the contribution of each group to overall CS rates. It also allows to distinguish the main group of women who contribute most and least to the overall CS rates. It also allows reliable comparisons of CS rates across time and settings/institutions, regions, and countries (Vogel et al. 2015; World Health Organization 2015). Moreover, it reports the facts in the best standardised way, and it helps to recognise the categories of population served by hospitals. The Robson classification system can be used as a common starting point to analyse, screen, audit, and compare caesarean rates across different health facilities, countries, or regions as well as to form, compare and modify strategies for the reduction of unnecessary CS rates (World Health Organization 2017; Tontus and Nebioglu 2020).

The Robson Classification has been found to be easily applicable. The use of Robson classification has been increasing speedily worldwide since it was proposed in 2001 and it has become a very popular tool over the last years in many countries and is being used widely to examine trends and determinants of CS use in health-care facilities around the globe (Torloni et al. 2011; Betran et al. 2014; Vogel et al. 2015). A systematic review conducted by WHO in 2011 determined that the Robson classification that is based on obstetric characteristics at admission is the most appropriate classification system to achieve current international and local needs (Torloni et al. 2011; World Health Organization 2017). In 2014, WHO conducted a second systematic review which explored several strengths such as simple to implement, robust, reliable, flexible and directness of initial interpretation but missing data and misclassification are found to be challenges (Betran et al. 2014). WHO Robson Classification Implementation Manual supports and guides healthcare facilities worldwide for adopting and implementing the Robson classification system including how to minimise missing data and misclassification (World Health Organization 2017). The Society of Obstetrics and Gynaecologists of Canada (SOGC) also recommended the modified Robson criteria to evaluate and compare the contributors to the CS rate and their impact (Farine et al. 2012). Robson classification is not used routinely in hospitals in Nepal. A scoping review showed that the utilisation of Robson classification is rising in South Asia including Nepal (Rai et al. 2021), more details chapter 2.1.4.

1.11 Rationale of the Study

The rate of CS is rising in urban hospitals in Nepal, as stated above in section.1.8.3. Nepal demographic health surveys also reported that CS rates were higher in urban Nepal. Several hospital-based studies showed sharp rises in CS rates with variation in private and public hospitals (Dhakal Rai et al. 2019; Rai et al. 2019). The CS rate is found to be high in both selected hospitals: Kathmandu Model Hospital (Poudel et al. 2019) and Paropakar Women's and Maternity Hospital (Shrestha and Shrestha 2020). Similarly, hospital records for both hospitals also showed the CS rate was high. Therefore, the rising rate of CS is an urgent public health problem to be addressed immediately in Nepal (Dhakal Rai et al. 2019). The rising rates could be due to 'unnecessary intervention' and over-medicalisation of childbirth (Mainali 2019) as reported in India (Ghosh 2010) and Bangladesh (Rukhsana 2016). However, the contributing factors behind the rise of CS rates at urban hospitals are still not clearly understood, due to the lack of research. Locally tailored multifaceted strategies are required to

reduce CS use and increase physiological birth for healthy women and babies (Betran et al. 2018). Obstetricians and hospitals as well as the Government of Nepal need evidence-based information on how or why the CS rate has increased and what needs to be done to stem the rise. The evidence outlined above demonstrates that there is a genuine need to explore why the CS rate is rising in urban hospitals in Nepal and how to make rational use of CS birth to benefit women and their infants. Therefore, this PhD study has explored the contributing factors to rising CS rate in two selected urban hospitals in Nepal as well as sought the strategies to make rational use of CS.

1.12 Aim and objectives of the study

The main aim of this study is to:

- Explore the factors associated with high rates of CS in two urban hospitals in Nepal.

Specific objectives are to:

1. Estimate the proportion of CS birth in the study sample population and each Robson category.
2. Identify key factors contributing to a higher rate of CS.
3. Seek strategies/recommendations to improve the reasonable use of CS.

The study will be conducted with the aim of answering the following research questions.

- What is the current rate of CS in the two hospitals?
- Do CS rates among each Robson category vary in the two hospitals?
- What are the factors contributing to the increasing CS rates in the two hospitals?
- What are the strategies/recommendations for rational use of CS?

1.13 Timeline of the study

The data collection of this study was hugely influenced by COVID-19 pandemic. Data collection in two hospitals in Nepal was not possible due to the lockdown and travel restrictions according to the original plan. Data collection activities was delayed by about two years due to travel restriction of COVID-19 pandemic**.** However, scoping and systematic reviews were conducted during the time. Eventually, data were collected by a local data collector. A local data collector was hired and trained for the study's data collection in mid-August 2021. There has been an extension of more than one year for data collection and thesis writing.

1.14 Brief lay-out of the thesis

The thesis is divided into eight chapters as below.

Chapter 1: Background information of the study including aim and objectives.

Chapter 2: Literature review: Section 1 - scoping reviews; Section 2 - Systematic review

Chapter 3: Methodology and Methods

Chapter 4: Quantitative results

Chapter 5: Qualitative results

Chapter 6: Discussion

Chapter 7: Conclusions

Chapter 8: Recommendations

1.15 Brief background of the researcher

The postgraduate researcher who conducted this study is originally from Nepal, so benefited from having no language or cultural barriers during the process of research. The study is regarding 'CS'. Being a woman with experience of childbirth added extra understanding and practical knowledge on mode of childbirth or CS. After completing a MSc in Health Services and Public Health Research from Aberdeen University in 2006, the researcher has been working as registered nurse in the UK. She has experience working as a nurse since 2007 in various nursing homes and NHS hospitals in Scotland. The researcher has influenced her research career by publishing research articles from her MSc thesis and the thesis on 'Utilisation of Maternity Care Among Rural Women Nepal' published by Lambert Academic Publishing. Furthermore, the researcher has done extra research involving other researchers in Nepal and published it. The researcher has a deep interest in research, especially about maternity care. The utilisation of CS is rising in urban Nepal. That is why the researcher selected this subject for her PhD study.

1.16 Chapter summary

The rate of CS is rising sharply around the globe including Nepal. Although CS is a lifesaving obstetrics intervention, it is associated with many health risks to mother and baby. Additionally,

the rising CS rate poses a financial burden to women, family and the nation. The factors underlying the rise of CS in urban hospitals in Nepal need to be explored. The strategies to stem the rise of CS rate need to be sought. The study explores both the factors of rising CS and the strategies for rational use of CS. The study contributes to knowledge about the scenario of rising CS use in city hospitals in Nepal. This knowledge will be valuable for informing policy makers, obstetricians, healthcare professionals and research communities working on designing interventions for the optimal use of CS in hospitals in Nepal.

Chapter 2 LITERATURE REVIEW

2.1 Introduction

The literature review was conducted: (i) to provide an overview of rising CS rates (ii) to identify key indications for CS, including non-medical indications; (iii) to provide information on classification of CS using the Robson Classification (iv) to identify factors associated with rising CS rates. The literature was searched using electronic data bases such as MEDLINE Complete, Science Direct, Scopus, NepJOL, BanglaJOL, CINAHL Complete, Google Scholar, Web of Sciences and PubMed. The review started at the beginning of the PhD study to find supportive literature evidence mainly from Nepal but also including other South Asian countries, to shape the research questions, aim and objectives.

This chapter presents the literature review using both scoping review and systematic review. The literature reviews fill the gaps in knowledge and display the evidence of rising CS rates. Four scoping reviews and one systematic review were conducted and published all in open access international journals. One scoping review on "A brief history and indications for caesarean section". This scoping review highlighted the history briefly and changing indications for CS from ancient to 21st centuries. Therefore, it is placed in chapter 1, section 1.1.2. Other three scoping reviews and one systematic review are placed in this chapter. Although three topics of scoping reviews also might be appropriate for systematic review, but these topics were considered for scoping review due to time and resources constraints.

Scoping review on "Caesarean Section rates in South Asian cities: Can midwifery help stem the rise?" overviewed evidence on rising CS rates as well as reasons for performing CS in South Asia countries: Bangladesh, India, Nepal and Pakistan. This scoping review highlighted that CS rates are rising high in urban hospitals in South Asia. The rates of CS were reported to be alarming high in city hospitals. Rising CS rate is a matter of concern in public health. The reasons of performing CS were reported to be both medical (foetal distress, previous CS) and non-medical (maternal request). This scoping review has addressed partially the number 1 and 2 specific objective and research question number 1 and 2 of the study (Table 2.1). Another scoping review on "Caesarean Section for non-medical reasons: A Rising Public Health Issue" overviewed the non-medical reasons for performing CS. This scoping review highlighted the main non-medical reasons for conducting CS. The main non-medical reasons for performing CS were maternal request, financial incentive and defensive CS. This scoping review has addressed partially the specific objective 2 and research question 3 (Table 2.1). Similarly,

scoping review on "Classification of Caesarean Section: A Scoping Review of the Robson classification" highlighted the application of Robson classification for optimal use of CS in hospital setting. This scoping review highlighted the use of Robson Classification for assessing and monitoring CS rate meaningful and action-oriented manner in each hospital setting. Use of Robson classification to classify CS in to ten groups is found to be rising in South Asia. This scoping review has addressed partially the specific objective 1 and research question 2 (Table 2.1). Similarly, the systematic review on "Factors contributing to rising caesarean section rates in South Asian countries: a systematic review" conducted to address the specific objective 2 and research question 3 (chapter 1, section 1.12). This systematic review highlighted both key indications and key associated factors for rising CS rates. Foetal distress was the major medical indication for CS followed by previous CS, APH, CPD, fail induction, HDP and NPOL. Maternal request was key indication for performing CS. The major associated factor for rising CS rate was maternal age followed by maternal education, urban residency, economic status, ANC visits, place of birth (private hospital), obesity of pregnant women, previous CS, pregnancy complications and low parity. Maternal preference also reported to be associated with rising CS. The following Table 2.1 displays more details on literature reviews and addressing objectives and research questions of the study.

Table 2.1: Literature review and addressing objective & research questions

Literature review	Title of review	Specific objectives of study	Research questions of study
Scoping review	Caesarean Section rates in South Asian cities: Can midwifery help stem the rise?	Estimate the proportion of CS deliveries in study sample and each Robson category. Identify key factors contributing to a higher rate of CS.	What is the current rate of CS in the two hospitals? What are the factors contributing to the increasing CS rates in the two hospitals?
	Caesarean Section for non-medical reasons: A Rising Public Health Issue	Identify key factors contributing to a higher rate of CS.	What are the factors contributing to the increasing CS rates in the two hospitals?
	Classification of Caesarean Section: A Scoping Review of the Robson classification	Estimate proportion of CS deliveries in study sample and each Robson category.	Do CS rates among each Robson category vary in the two hospitals?
Systematic review	Factors contributing to rising caesarean section rates in South Asian countries: a systematic review	Identify key factors contributing to a higher rate of CS.	What are the factors contributing to the increasing CS rates in the two hospitals?

Firstly, section 1 of this chapter describes a short introduction, aims, methods of the scoping review and published scoping reviews. Secondly, section 2 of this chapter briefly describes the introduction, steps of the systematic review and published systematic review.

2.2 Chapter 2 Section 1: Scoping review

2.2.1 Introduction

Scoping reviews present an overview of the current literature on CS, which includes a brief history of CS, rising rates of CS especially in South Asia including Nepal, non-medical reasons for performing a CS and the Robson classification.

A thorough literature review is fundamental in a research dissertation (Boote and Beile 2005). The chapter has included scoping reviews. According to Arksey and O'Malley there are four reasons to conduct a scoping review such as: "1) To examine the extent, range and nature of research activity; 2) To determine the value of undertaking a full systematic review; 3) To summarize and disseminate research findings; 4) To identify research gaps in the existing literature" (Arksey and O'Malley 2005, p.21). A scoping review is a relatively new approach to synthesise research evidence and is different from a systematic review. This method now appears to be a valid approach in those areas where systematic review is not able to meet the criteria (Munn et al. 2018). A scoping review's purpose is to identify the nature and extent of the research evidence, including ongoing research (Grant and Booth 2009). In this thesis, the purpose of a scoping reviews is to provide an overview of the available evidence on rising rate of CS and to identify knowledge gaps (Arksey and O'Malley 2005; Munn et al. 2018a). Although scoping reviews do not perform a critically appraised and synthesised result or answer to a particular question (Munn et al. 2018a), they do explain existing literature and other sources of information and embrace evidence from variety of study designs and methods to achieve in-depth and broad results on diverse topics related to rising CS rates. The thorough and comprehensiveness of a literature review is required on the study issue because literature review is fundamental in writing a dissertation (Boote and Beile 2005).

The scoping review covers research studies conducted up to 2020. Any new research published afterward has been incorporated into the discussion section (chapter 6). All scoping reviews are included in section 1.

2.2.2 Aim of scoping review

Although, each review has described the specific objective for conducting review, the overall aim is to identify and review existing literature on rising CS rates as a public health problem; to reveal a gap in knowledge and to justify the current study (Table 2.1).

2.2.3 Review methods

A brief method is described in all scoping reviews. Scoping reviews have followed the methodological framework (Arksey and O'Malley 2005) as follows:

Stage 1: Identifying the research question.

At first, the research question was identified for each scoping review. The research question or aim of the scoping review was broadly and clearly defined in each topic of a scoping review. The research question was broad in scope to maintain a wide coverage (see published articles on Section 2.2.4).

Stage 2: Identifying relevant studies.

The field of a scoping review should be as comprehensive as possible. Therefore, the search strategy for electronic databases is developed in each scoping review on the basis of the research question. The literature written in English were searched thoroughly and broadly using 'My Search' the Bournemouth University library database, reference lists, hand searches and relevant organisations such as WHO, FIGO. Due to the word limitations of the journal articles, the search strategy is described briefly in each published article below (section 2.2.4) and for more details on article search strategies please see Appendix 1 to 4.

Stage 3: Study selection

In each scoping review, all searched literature were read (mainly titles and abstracts) initially and those which were not relevant to the research question were removed. Then, selected full text articles were read and assessed for inclusion eligibility. However, bias assessment was not performed as it is optional, not mandatory (Sucharew and Macaluso 2019). Both quantitative and qualitative studies are included in one review and only quantitative studies were included in the rest of reviews below (section 2.2.4).

Stage 4: Charting the data.

Relevant data were extracted from selected studies. The extracted data from the reviewed literatures were recorded in a charting form, then extracted data were checked for accuracy by the PhD supervisors. Then, content analysis (Stemler 2015) was performed.

Stage 5: Collating, summarising and reporting the results.

This stage of a scoping study involves organising, summarising and reporting the results. All scoping reviews present an overview of all included articles. A scoping study needs some thematic construction to present a narrative account of existing literatures. The narrative account of findings is presented in tables and charts with some narrative explanation according to distinct categories.

2.2.4 Published articles on scoping reviews.

Three published scoping reviews are included in this section. At first, the scoping review on rising CS rates in South Asian cities is placed in this section. This article was cited as following:

Dhakal Rai, S., Poobalan, A., Jan, R., Bogren, M., Wood, J., Dangal, G., Regmi, P., van Teijlingen, E., Dhakal, K.B., Badar, S.J. and Farhana, S., 2019. Caesarean Section rates in South Asian cities: Can midwifery help stem the rise? *Journal of Asian Midwives*, 6 (2), 4 - 22**.** https://ecommons.aku.edu/jam/vol6/iss2/2/**.** This article is licensed under Creative Commons Attribution Non-commercial 4.0 International**.** The article search strategy for the following review is placed in Appendix 2.

Another scoping review on 'Caesarean Section on Non-medical reasons: A rising Public Health Issue' was also published in *Journal of Karnali Academy of Health Sciences* in 2021. The article search strategy for this review is placed in Appendix 3. This article is placed after the first scoping review in this section.

Similarly, third scoping review was on Robson Classification at last in this section. The article search strategy for this review is placed in Appendix 4. This article was cited as following:

Dhakal-Rai, S., van Teijlingen, E., Regmi, P., Wood, J., Dangal, G. and Dhakal, K. B., 2021. Classification of Caesarean Section: A Scoping Review of the Robson classification. Nepal Journal of Obstetrics and Gynaecology, 16 (1), 2 -9. http://doi/org/10.3126/njog.v16i1.37409. This article is licensed under Creative Commons Attribution-NonCommercial 4.0 International License.

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Caesarean Section rates in South Asian cities: Can midwifery help stem the rise?

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Caesarean Section rates in South Asian cities: Can midwifery help stem the rise?

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Abstract

Introduction: Caesarean section (CS) is a life-saving surgical intervention for delivering a baby when complications arise in childbirth. World Health Organization recommends a rate of CS from 10% to 15%. However, CS rates increased steadily in recent decades and have almost doubled from 12.1% in 2000 to 21.1% in 2015. Therefore, this has become a global public health problem. The main purpose of the scoping review article is to give an overview and analysis of the rising CS use in four South Asian countries: Bangladesh, India, Nepal and Pakistan.

Methods: A scoping review was carried-out using several bibliographic electronic databases (MEDLINE, EMBASE, SCOPUS, CINAHL and Web of Science), organizational websites and open access journal databases. Literature was searched from December 2011 to December 2018 for articles reporting hospital-based CS rates. Inclusion criteria were primary studies conducted in institutional setting in Bangladesh, India, Nepal and Pakistan and published in the English language.

Results: We have included 43 studies. Together these studies show that the rate of CS is increasing in all four countries: Nepal, Bangladesh, Pakistan and India. However, this is uneven with very low rates in rural and very high rates in urban settings, the co-existence of 'Too Little Too Late & Too Much Too Soon'. Hospital based studies have shown that the CS rate is higher in urban and private hospitals. Age, education and socio-economic status of women, urban residence and distance from health facility are associated with CSs. CS is higher among highly educated affluent urban women in private hospitals in South Asian Countries.

Conclusion: Rising CS rates in South Asian cities, particularly in specific groups of women, present a challenge to hospital staff and managers and policy-makers. The challenge is to avoid 'Too Much Too Soon' in otherwise healthy urban women and avoid 'Too Little Too Late' in women living in remote and rural area and in poor urban women.

Keywords: *Caesarean Section, South Asia, Scoping review, midwifery*

Introduction

Caesarean section (CS) is a surgical procedure which is performed to reduce the risk of mortality or morbidity in the mother and foetus. The World Health Organization (WHO) recommends a CS rate of 10 to 15%, irrespective of geographical region, because, from a health point of view, there is no justification to have a rate of CS higher than this.[1] Experts emphasize that, because of the risks associated with it, CS should be performed only based on medical indications [2—5]. In spite of this, CSs are regularly carried out without clear medical indications.[5] At a population level, a rate of CS higher than 10-15% is not associated with a reduction in maternal and new-born mortality rate.[2] Nevertheless, it is advanced obstetric care which has been gaining popularity in the modern world particularly in urban settings.[3-7]

On the one hand, a huge rise in CS use, often for non-medical reasons, is harmful for both mother and baby. On the other hand, inadequate access to CS in most low-income countries and several middle-income countries is a major health issue. Underuse of CS (<

complications, death and disability especially in setting where the infra-structure is not well-developed and material resources are short.[2]

The Lancet series (2018) on optimising caesarean section use has emphasized the significance of increased understanding of short-term and long-term health effects of CS on women and children.[9] These include severe maternal outcomes of CS such as admission to intensive care units, severe haemorrhage/ blood transfusion, hysterectomy, complications associated with anaesthesia, obstetric shock, thromboembolism, major puerperal infection, cardiac failure, acute renal failure, in-hospital wound disruption, intubation and haematoma.[9] High rates of CS are positively associated with postpartum antibiotic treatment and severe maternal morbidity and mortality.[4]

There are many adverse outcomes for women after CS in subsequent pregnancies, which is particularly significant in areas with limited access to emergency obstetric care. These include increased risk of abnormal placentation (placenta previa), hysterectomy, uterine rupture, ectopic pregnancy, stillbirth, preterm birth and miscarriage.[9,10-15] Multiple CS birth increases the risk of severe maternal morbidity in subsequent pregnancies.[10-11] Although there are some benefits of CS identified, such as less frequency of urinary incontinence and urogenital prolapse, multiple CSs can cause undesirable long- term health effects such as pelvic adhesions, small bowel obstruction, menorrhagia, dysmenorrhoea, sexual dysfunction, chronic pain and subfertility.[9,12,14] Furthermore, a study revealed that CS can have negative effects on the quality of life of primiparous women.[15]

In addition to negative maternal outcomes, infants born by CS incur adverse health outcomes due to exposure to a different medical, hormonal, bacterial and physical environment as compared to infants born vaginally. The Lancet series (2018) has highlighted many short-term health risks for children born by a caesarean birth, such as allergy, atopy, asthma, alteration of immune development and reduced intestinal gut microbiome diversity.[9]

Children born by CS are more prone to several chronic health conditions such as leukaemia, bowel diseases, juvenile arthritis, asthma, systematic connective tissue disorders and inflammatory immune deficiencies.[16] Additionally, CS is negatively associated with successful breast feeding initiation.[17] A study reported that infants born by elective CS had significantly higher rates of mortality, respiratory morbidity and risk of special care admission as compared to planned vaginal delivery.[18] Similarly, other studies showed associations with childhood obesity,[12,19] asthma[12] and type 1 diabetes[20].

Global rising of Caesarean Section Rate

The rate of CS has risen steadily worldwide, and has now reached unprecedented levels.[3-7] Betran et al. (2016) reported the rising global CS rate with 12.4% increase from 1990 (6.7%) to 2014(19.1%) with the highest CS rate being in the Caribbean (40.5%), followed by Northern America (32.3%), Oceania (31.1%), Europe (25.0%), Asia (19.1%) and the lowest in Africa (7.3%).[6] *The Lancet* series (2018) highlighted the global rising trend of CS rate of 21.1% in 2015 (29.7 million births), which was almost double that of 2000 (12.1%, 16.0 million births). According to this report, the CS rate was the highest in Latin America and the Caribbean (44.3%) and lowest in West and Central Africa (4.1%).[7]

CS utilisation was higher among rich and educated women.[7] Huge inequality in use of CS exists between, within countries and higher and lower resources settings.[3-7] CSs was very low in South Sudan (0.6%) and very high in the Dominican Republic (58.1%).[7] Out of 169 countries, CS rate was still less than 10% in 47 countries with women are struggling to receive lifesaving emergency obstetric care. The wide variations in use of CS between high-income and middle/low-income countries as well as urban and rural settings exist. The rising rate of CS world-wide has become an alarming issue in public health.[3-7] In the growing economies of South Asia, the number of hospitals and especially private ones is growing rapidly and therefore, the risk of increased CS birth. This scoping review aims to highlight the prevalence of CS in Bangladesh, India, Nepal and Pakistan.

Methods

A scoping review of the published literature of CS rates was carried-out using bibliographic electronic databases such as MEDLINE, EMBASE, SCOPUS, CINAHL and Web of Science. In addition, organizational websites such as WHO, and open access journal databases such as Nepal journals on-line (NepJOL) and Bangladesh journals on-line (BanglaJOL) were also searched. Databases were searched from January 2011 to December

2018 especially for articles reporting hospital-based CS rates. Inclusion criteria were primary studies reporting the CS rates, conducted in institutional setting in Bangladesh, India, Nepal and Pakistan and published in English language. Mesh terms and Key words for 'caesarean'; 'cesarean'; C-section' was combined with the specific country using Boolean operators (and/or). Titles and abstracts of the identified citations were initially scanned for the rates of caesarean sections to assess eligibility. Full text articles of eligible studies were appraised, and relevant data was extracted, and proportions of C- sections were reported. Articles highlighting the issues around the increase in CSs and the potential reasons were also included, and a simple content analysis was conducted. [21]

Results

We initially found 1518 primary studies but most articles were on obstetric issues and only mentioned CS as a cause or consequence. After scanning of titles and abstracts we included 43 papers, five were from Bangladesh, 18 from India, 12 from Nepal, and eight were from Pakistan. Most prevalence studies were retrospective studies of hospital records. The results showed that the CS is steadily rising in all four South Asian countries (especially in urban settings).[6,13-15] However, as in Africa, there is a huge inequality in access to CS use between rich and poor women.[22] CS use is higher among highly educated urban women in private hospitals in South Asian Countries.[23] There are concerns about the rising rate of CS with wide variation between urban and rural, private and public hospital, and with no evidence of associated reductions in morbidities or mortalities.

Rising Caesarean Section Rate in Bangladesh

Caesarian sections have become increasingly common in Bangladesh (Table 1) and have increased alarmingly in recent decades. Despite the rising trend of institutional births from 23% in 2010 to 47% in 2016, maternal deaths are still as high as 194 per 100,000 live births.[24] In Bangladesh, CS rate increased from 3.5% in 2004 to 23.0% in 2014 with wide variation in access to CS use between urban (40%) and rural women (18.7%).[25] Among women, older age and high educational status;[25-28] residing in urban area and obesity;[25,26] high socio-economic status;[25,27] access to antenatal care[25,26,28] and birth order[25,27] were found to be associated with CS delivery.

Table 1: CS rates in hospital-based studies in Bangladesh

Authors & year	Hospitals in Bangladesh	CS rate (%)

Nazneen et al., 2011[29]	Holy Family Red Crescent Medical Collage Hospital, Dhaka	70.55*
Aminu et al., 2014[30]	Five Rural Public Hospitals, Thakurgoan Districts	21.2+
Husan et al., 2015[31]	Four Hospitals, Rajshahi City	77.3*
Islam et al., 2015[32]	Six Hospitals, Narsingdi	32.3#
Ara et al. 2018[33]	Combined Military Hospital (CMH), Savar, Dhaka	70.3*

**Urban hospital; # semi-urban hospital; + rural hospital*

Rising Caesarean Section Rate in India

CS rates are steadily increasing in India with 2.9% in 1992/93, 7.1% in1998/99, 8.5% in 2005/6 and 17.2% in 2015/16.[34] Similar to other South Asian countries, there was disparity in CS rate between urban and rural areas as well as different states of India. In 2015/16, CS rate was 12.9% in rural India as compared to 28.3% in urban areas. The lowest CS rate was in Nagaland (5.8%) and the highest rate in Telangana (58.0%). CS rate was high in Andhra Pradesh (40.1%), Kerala (35.8%), Tamil Nadu (34.1%), Jammu & Kashmir (33.1%) and Goa (31.1%). The proportion of institutional birth has increased from 38.7% in 2005/06 to 78.9% in 2015/16.[34] It is also worth noting that the CS rate has increased from 26.6% in 2007/08 to 40.7% in 2010/11 in the state of Madhya Pradesh in India, where the National Janani Swastha Yojana (YSY) scheme was implemented. YSY is a conditional cash transfer paid to the mother when they present to deliver their baby in a health facility.[35] Interestingly, in 2003, Sreevidya and Sathuyasekaran reported a high CS rate (32.6%) in urban India with higher CS rate in the private sector (47%) as compared to charitable (38%) and public (20%).[36] That trend has continued, with increased CS rate in private hospitals from 27.7% in 2005/6 to 40.9% in 2015/16 but it declined in public hospitals from 15.2% in 2005/6 to 11.9% in 2015/16.[36] Similarly, Mittal and colleagues also reported a rising trend of CS rate in tertiary care hospital in Western India where CS rate has increased from 69.03% in 2001 to 72.62% in 2011.[37] Age and education of mother, parity, previous history of CS and distance from the health facility were found to be important determinants of CS.[38] Furthermore, hospital-based studies stress the rise of CS rate in India (Table 2).

Table 2: CS rates in hospital-based studies in India

Authors & year	**Hospitals in India**	**CS rate (%)**
Padamleela et	Government Teaching Hospital, Andra Pradesh	31*

al.,2013[39]		
Santhanalakshmi et al., 2014[40]	Karpaga Vinayaga Inst Med Sciences, Kancheepra	12.5#
Bade et al.,2014[41]	Government Medical College, Latpur	23.97#
Yadav RG, 2015[42]	Baroda Medical Collage, Vadadara	25.17#
Nikhil et al., 2015[43]	GMERS Medical College, Ahmedabad	25.18*
Subhashini et al., 2015[44]	Adhra Medical Collage, Andra Pradesh	25.66*
Yadav et al., 2016[45]	MMIMSR Mullana, Haryana	21.60#
Sarma et al., 2016[46]	Tezpur Medical Collage & Hospital, Assam	27.60*
Saxena et al., 2016[47]	Shri Guru Ram Rai Inst Med & Health Sci, Dehradun	31.18*
Jawa et al., 2016[48]	Mahatma Gandi Medical Sciences & hospital, Jaipur	31.80*
Das et al., 2016[49]	NEIGRIHMS, Shillong	33.1*
Preetkamal et al., 2017[50]	Sri Guru Das Inst Med Sci Research, Punjab	33.2*
Chavada et al., 2017[51]	P. D. U Medical Collage, Gujrat	19.9#
Gupta et al., 2017[52]	RUSH Collage of Medical Sciences, Jaipur	31.46*
Bala et al., 2017[53]	JK Ion Hospital & Medical Collage, Kota	39.6*
Kaul et al., 2017[54]	Defence Zonal hospital, Varanasi	45.5*
Banergee et al.,2018[55]	Silchar Medical Collage, Assam	34.1*
Das et al.,2018[56]	IMS& SUM Medical Collage, Odisha	34.45*

**Urban hospital; # semi-urban hospital; + rural hospital*

Rising Caesarean Section Rate in Nepal

The prevalence of CS increased more than four times from 2001 to 2011 in Nepal.[57] Similarly, the rate of CS was 4.6% in 2011, [58] 8.6% in 2014[59] and 9.0% in 2016.[60] However, there is wide inequality in access to CS between urban and rural women. Studies have reported that CS rate is significantly higher (12-19%) in urban areas than in rural Nepal (3.5 -7.1%).[57-60] Additionally, the most recent Nepal Demographic and Health Survey (2016) discovered that CS rate is substantially higher in private hospitals (35.5%) than public hospitals (12.5%).[59] Some studies showed that older women, women with good education, residing in city and rich women are more likely to undergo CS delivery.[57-58] The Government of Nepal has been promoting safe motherhood through initiatives such as offering free

delivery care and transportation incentive schemes to women who give birth in hospital. The percentage of institutional birth has increased from 35% in 2011 to 57% in 2016.[60] The growing trend of birth in hospital is contributing to rising rate of CS in Nepal.[7] Amatay et al reported an increase in CS rates at Tribhuvan University Teaching hospital from 16.6% in 2005 to 25.4% in 2009.[61] Furthermore, individual hospital-based studies on CS in different hospitals in Nepal show the rising CS rate (Table 3).

Table 3: CS rates in hospital-based studies in Nepal

Authors & year	Hospitals in Nepal	CS rate (%)
Chhetri et al., 2011[62]	B P Koirala Health Science Teaching Hospital, Dharan	33.7*
Subedi, 2012[63]	Nobel Medical College, Biratnagar	19.89*
Suwal et al., 2013[64]	Nepal Medical College Hospital, Kathmandu	22.30*
Amatya et al., 2014[65]	Khadbari District Hospital, Sankhuwasabha	18.5#
Pradhan et al., 2014[66]	Kirtipur Hospital, Kirtipur	50.9*
Pradhan et al., 2015[67]	Patan hospital, Lalitpur	41.9*
Samdal et al., 2016[68]	Okhaldunga Community Hospital, Okhaldunga	9.5+
Singh et al., 2017[69]	Western Regional Hospital, Pokhara	25*
Prasad et al., 2017[70]	Kathmandu Medical College Teaching hospital	48.81*
Dhakalet al., 2018[71]	Mid-Western Regional Hospital, Surkhet	18.9#
Vaidya Malla et al., 2018[72]	Nepalese Army Shree Birendra Hospital, Kathmandu	22.57*
Chaudhary et al., 2018[73]	Paschimanchal Community hospital, Pokhara	63.2*

**Urban hospital; # semi-urban hospital; + rural hospital*

Rising Caesarean Section Rate in Pakistan

Similar trends and inequalities of CS rates are observed in Pakistan, where the CS rate increased from 2.7% in 1990–'91 to 15.8% in 2012–'13 with a big difference between urban (25.6%) and rural (11.5%) as well as the poorest (5.5%) and the richest (35.3%).[74] Similarly, highly educated women (40.3%) are more likely to have access to CS delivery than non-

educated women (7.7%).[74] Hospitals based studies reflect rising CS rate in Pakistan (Table 4).

Table 4: CS rates in hospital-based studies in Pakistan

Authors & year	Hospitals in Pakistan	CS rate (%)
Karim et al., 2011[75]	Civil hospital & Dow university health science, Karachi	27.94*
Jabeen et al., 2013[76]	CMH. Rawalpindi	56*
Hafeez et al., 2014[77]	Sharif Medical & Dental collage, Lahore	21.4#
Bano et al., 2015[78]	Aga Khan Hospital for women, Karachi	31.26*
Baig et al.,2016[79]	CMH, Hyderabad	41.96*
Latif et al., 2017[80]	Nawas Sharif Social Security hospital, Lahore	81%*
Naeem et al., 2018[81]	Government Sardar Begam Hospital, Sialkot	40%*
Tahir et al., 2018[82]	Combined Military hospital, Abbottabad	46.7%*

**Urban hospital; # semi-urban hospital; + rural hospital*

There are wide variations also in the CS rates across South Asia, comparing urban and rural populations/hospitals. The private health providers/hospitals may be partly influencing the rise of CS rate in South Asian countries.[23] The rising rates in the cities are possibly linked to 'unnecessary intervention of CS. However, the actual reasons behind this and the wide variations reported across facilities are unclear.

Discussion

The data presented above show a range of CS rates within each country and with a trend of increases over time. There are a range of possible explanations as listed in the next section.

Reasons of Caesarean Section

There are many medical and non-medical reasons for performing CS delivery. In South Asian countries, the most common indications of CS are foetal distress[33,39,40,42-47,49,50,52-56,62-64,66,67,75,76,78-81], foetal malpresentation/malposition[29-32,39,40,42-44,46,47,49-56,62,63,65-

[73,75,76,78-81], previous CS[29-31,39,40,42-56,62-64,65,73,75-78], non-progressing labour/prolong/obstructed labour[29-33,40,42,44-50,51,54,56,62-67,68-73,75-81], failed induction[29,30,42,44-46,50,52,64-7275,79,80], cephalo-pelvic disproportion (CPD)[39,30,39,40,42,43,44,47,49,40,52-56,62,63,65,66,68,70,72,7375,78], pregnancy induced hypertensive disorder including pre-eclampsia/eclampsia[29-31,40,42,44,45,47,49,50,56,63,72,78-81], and oligohydramnios[30.31,40,42,43,47,49,50,56,65,66,69,70,72,7375].

There are several other indicators for CS which are noteworthy such as antepartum haemorrhage[29,31,33,40,42,45,50,53,63,6971,75,78], multiple pregnancy[39,40,49,52-56,62,63,69,70,72], intra uterine growth retardation (IUGR)[39,40,43,44,46,49,51,56,75], placenta previa/abruptio[29,31,33.44,49,72,73,81], postdate pregnancy[30,31,43,46,47,53], meconium stained liquor[32,62,65,67,70,71], bad obstetric history/complicating pregnancy[39,47,53,56,69,72,81] and big baby[33,43,44,52,56]. Similarly, some studies show premature rupture of membrane (PROM) [30,31,68], cord prolapse[33,66], chorio-amnionitis[79,80], cervical dystocia[32,33], obesity[33], previous traumatic delivery[68] and congenital malformation as causes for CS.[52]

Most importantly, some studies have highlighted that CSs are performed for non-medical indications such as demand of women and family.[39,43,53,56,63,66,75,79-] Some of the demand for CSs are due to either bad obstetric history or precious pregnancy due to the subfertility.[39,75,79,80 81] This trend is increasing in South Asia.

The role of midwifery in keeping childbirth normal

There is international consensus that midwifery care is the most cost effective way of supporting normal childbirth. Midwives are trained to use minimal intervention but to refer timely when complications arise. Midwifery care can decrease maternal and new-born mortality in low and lower-middle income countries.[83 , 84] To ensure positive maternal and newborn health outcomes, high quality intrapartum care, especially through the promotion of spontaneous vaginal births with a minimum of medico-technical interventions is central.[85,86] The outcome of the care for women and newborns around the time of birth in health facilities reflects the evidence-based practices used and the overall quality of services provided. The quality of care during childbirth in health facilities depends on the physical infrastructure, human resources, knowledge, skills and capacity to deal with both normal pregnancies and complications that require prompt, life-saving interventions.[87] There is evidence to suggest that midwives who work in the communities in which they live and are known are most effective at delivering effective care.[88]

Combatting 'Too little, too late' (TLTL) and 'Too much too soon' (TMTS)

TLTL refers to lack of resources, low standard of quality of care/services and unavailability of care until too late. TMTS describes the over use of emergency obstetric care as well as unnecessary use of non-evidence-based intervention and over-medicalisation of normal pregnancy and childbirth.[89] The rate of CS has been increasing in developing countries with socio-economic disparity.[22] Massive inequality exists in access to CS among poor and middle-income developing countries.[6,7,21] Similarly, there is wide variation in CS rate between rural and urban areas as well as between private and public hospitals.[23] In South Asia, there is a double burden with low numbers of CSs in poor remote rural areas and very high in wealthier urban areas. The former is due to underdeveloped local health systems in remote areas with limited provision of timely and safe CS procedure to save the lives of mother and fetus.[22] Provision of adequate access to skilled care is essential in rural areas. In contrast, emergency obstetric care is easily accessible in urban areas. Easily available private facilities (oversupply of hospital beds) and education of women have been suggested as factors for the rising rates of CS in urban settings.[23] Dhakal et al recently highlighted the rising rates of CS in urban Nepal.[89] Overuse of CS may cause not only severe maternal and foetal outcome but also financial burden to low-income countries and low and middle-income families in those countries.

The rising CS rate in South Asian countries is an alarming public health problem. The issue of growing CS rate in South Asia need to be reduced in effective ways by implementing evidence-based interventions to reduce unnecessary caesarean sections in healthy women. *The Lancet* series (2018) highlights the need for multicomponent and locally tailored interventions which address both women's' and professionals' concerns as well as health system and financial factors.[90] Similarly, same fee for CS and vaginal delivery, comprehensive information on benefits and risk of CS to women, uniform classification system for CS and annual CS rate publication by hospitals are also needed to reduce the high CS rate.[91] Routine information on all aspect of childbirth and adoption of standard classification systems (Robson's10 groups classification) are needed for comparison and improvement of CS use.[92]

Conclusion

The CS rates are growing at an alarming rate in urban settings in South Asian countries warranting immediate attention. Further research needs to be conducted to explore the factors/reasons associated with rising CS in urban settings both from the patient's and the health system perspectives. This will help to develop appropriate tailored interventions.

Improving the quality of intrapartum care through midwifery care in health facilities is an important focus in the pursuit to reducing unnecessary CS and end preventable mortality and morbidity among mothers and newborns.

Conflict of Interest

None declared by authors

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Review Article

Caesarean Section for Non-Medical Reasons: A Rising Public Health Issue

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ABSTRACT

Background: Caesarean section (CS) is a life-saving surgical intervention for childbirth. Emphasis is given to performing CS only for valid medical reasons. However, performing CS on non-medical indications is increasing worldwide. The scoping review aims to explore the non-medical reasons for performing CS.

Methods: Articles on CS for non-medical reasons were searched using several electronic databases: PubMed, MEDLINE, CINAHL and open access journal databases such as Nepal journals online (NepJOL) and Bangladesh journals online (BanglaJOL). Additional articles were searched from the reference list of the selected articles and organizational websites. Eligible full-text articles were appraised, and relevant data were extracted. A narrative synthesis of extracted data was performed using content analysis.

Results: Maternal request is the most common non-medical indication of performing CS. The main reason for women's preference for a CS is to avoid labour pain followed by certainty/convenience, avoid damage to the pelvic floor and vaginal trauma, and safer for baby. Similarly, the main reason for requesting a CS is fear of labour pain followed by fear of childbirth, safer mode of birth for both mother and baby and maintaining pelvic floor integrity. The main reasons of willingness to perform CS by obstetrician were fear of litigation, financial incentives and convenience. The ethical aspect of non-medically indicated CS remains complex.

Conclusions: Performing CS without medical indications is a rising public health issue which has created medical, financial and ethical dilemmas in obstetrics care. The reasons for maternal request for a CS should be explored well. Obstetric care must include education of pregnant women on mode of childbirth including indications, risks and benefits of CS during antenatal visits.

Keywords: Caesarean Section, Maternal Preference, Maternal Request, Litigation, Convenience

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INTRODUCTION

Caesarean section (CS) is a life-saving surgical procedure for childbirth and this surgical procedure must be accessible to all women in need.[1] Due to the several short and long-term effects of CS to mother and child health,[2] this procedure should be performed only for medical indications.[3] CS is medically indicated when a significant risk of an adverse outcome for mother &/or foetus is present if the CS is delayed.[4] The incident of CS for non-medical indications such as maternal request is increasing and it reflects changing attitudes of women and obstetricians towards mode of childbirth.[5,6]

CS rates have been rising steeply worldwide for decades.[7] Evidence show that CS rates are rising also in South Asia.[8] This trend is often referred to as too much too soon.[9] However, CS rates greater than 10% at the population level are not useful for decreasing in maternal and neonatal mortality rates.[10] CS is perceived to be a safer procedure in recent years due to improvement of anaesthesia, surgical techniques and medications to treat infection and blood clots.[1,11] Meanwhile, the incidence of performing CS without medical indications such as maternal request is increasing.[12,13]

The rising incidence of CS for non-medical indications may be a significant contributor to the rise in overall CS rates.[1,14,15] It is linked with the cultural acceptability of CS as a safer mode of childbirth,[1,15] which in turn changes the childbirth to a medical event.[16] Evidence showed that the pregnant women are encouraged to request CS by informing diagnosis of nuchal cord of their unborn baby using ultrasound.[17] Schantz et al. (2019) reported the incidence of CS for maternal request for CS ranged from 0.2% to 24.7%.[17] Similarly, Mozzani et al. (2011) revealed that global preference of CS was 15.6% and middle-income countries had higher preferences for CS (22.1%).[18] However, studies on maternal preference and request are lacking in low-income countries.[17,18]

Health risks associated with CS

CS is associated with many short-term and long-term health problems to women and children.[2] CS also increases the adverse risks in subsequent pregnancies.[19,20] Multiple CSs can increase the risks of hysterectomy, blood transfusion, placenta previa.[21] Sauza et al. (2010) reported there is higher risk of death, admission to intensive care units, blood transfusion and hysterectomy in CS without medical indications.[22] Children born by maternal request elective CS prior to 39 weeks gestation are found more likely to have emotional problems and difficulties in behaviour at preschool age.[23] Low-risk planned CS is found associated with increased postpartum health risks (cardiac arrest, major puerperal infection etc.) and longer hospital stay as compared to planned vaginal birth.[24]

Costs

Performing CSs for non-medical indications can increase unreasonable and disproportionate use of health resources. For example, the estimated cost of unnecessary CS was approximately $ 2.32 billion globally in 2008, whereas the cost of the global medically indicated CS was approximately $ 432 million.[25] The cost of prelabour CS is higher than spontaneous vaginal birth ($P<0.01$).[26] CS during labour is found to be more costly.[26] The total costs of CS in labour can exceed about 10% if epidural anaesthesia is also used.[27]

Unnecessary CSs can put financial pressure on both individuals/family and the health system in low-income countries. In Bangladesh, maternity care made up 10.3% of total health expenditure, and CS made up nearly 70% of that cost (6.9% of total health expenditure) in 2010.[28] A study showed that the average cost for a CS was higher and it was more than a month's income for 74% of all households in Pakistan.[29] Similarly, the hidden cost for CS

was higher than normal delivery in two hospitals in Western Nepal.[30]

The review aims to answer the question: What are the non-medical reasons for performing CS?

METHODS & MATERIALS

A scoping review[31] of articles highlighting the issues around CS performing on non-medical reasons were searched using several bibliographic electronic databases: PubMed, MEDLINE, CINAHL and open access journal databases such as Nepal journals on-line (NepJOL) and Bangladesh journals on-line (BanglaJOL). Articles on CS for non-medical reasons were searched using Medical Subject Headings (MeSH) heading such as caesarean, cesarean, c-section was combined with the specific key words such as non-medical, preference, request, demand, choice, litigation, convenience using Boolean operators (and/or). Additional articles were searched from the reference list of the selected articles and organizational websites such as WHO and FIGO (The International Federation of Gynaecology and Obstetrics).

Quantitative and qualitative studies highlighting non-medical indications, published from 2000 to 2020 and written in English were included in this review. All selected articles were assessed for inclusion eligibility by first author (SD). Titles and abstracts were screened initially and then, full text of individual article analysed and relevant data extracted. Extracted data were checked for accuracy by other authors (EvT, JW, PR, GD, KBD). Any discrepancies/disagreement over eligibility of studies were discussed with reviewers and resolved based on consensus. Then, content analysis[32] was performed. A total of 10,382 articles were found and on appraisal 69 were used.

FINDINGS

The incidence of CS performed for non-medical indications is witnessed by many hospitals record-based studies in South Asian countries (Table 1).

Requesting a CS without a medical/obstetrical indication is rising. A study showed in West Africa that most obstetricians (94.4%) had received request for a CS during antenatal care (ANC) and most obstetricians (81.2%) performed CS on maternal request.[51]

Why do women express a preference for CS prior to birth?

A cohort study of six northern European countries reported that CS was preferred by 3.5% of primiparous and 8.7% of the multiparous women.[52] Similarly, a Norwegian study reported that 3.5% of the primiparous women and 9.6% multiparous women stated a preference for CS.[53] CS preference constituted 15% in Ghana,[54] 16.7% in China,[55] 16.7% - 22.9% in Hong Kong.[56,57] Many reasons for preferring a CS by women are revealed as below (Table 2).

Many factors were found significantly associated with preference of CS, such as: fear of childbirth, negative childbirth experience, previous CS, advanced age,[51,52,59] lower education,[52,59] depressive symptoms,[52,53] history of abuse,[52] giving birth at hospital with high CS rate[59] and history of previous pregnancy complications.[60]

Why do women request/demand CS?

Women's preferences for mode of childbirth may change as their pregnancies progress because it is neither fixed nor final until the moment of giving childbirth.[61] However, pregnant women expressed preference for CS as mode of childbirth are found to be associated with both elective and emergency CS.[62] In Italy, the incidence of CS on maternal request was 8.60%.[63] The incidence of maternal request was increased more than

doubled from 2002 (2.1%) to 2008 (5.1%) at a tertiary care clinic in Switzerland.[13]

Table 3 lists the key reasons women give for requesting a CS.

Table 1: Studies Reporting Non-Medical Indications in South Asia

Author & year	Country	Non-medical indications	Rate of CS %
Nazneen et al., 2011[33]	Bangladesh	Maternal choice	0.4% - 2000-01 0.7% - 2002 0.8% - 2003-04
Aminu et al., 2014[34]	Bangladesh	Labour pain No indication	0.3% 0.6%
Shamina et al., 2018[35]	Bangladesh	Patients desire	45%
Santhanalakshmi et al., 2013[36]	India	Precious Pregnancy	3.96%
Birla et al., 2016[37]	India	Precious Pregnancy	Primi – 1.68%; Multi – 0.73%
Patil et al., 2017[38]	India	Precious Pregnancy	3.2% primary; 8.4% repeat CS
Shenoy et al., 2019[39]	India	Maternal request	0.5%
Chhetri et al., 2011[40]	Nepal	On request	1.0% - 2006; 0.3% - 2007
Subedi et al., 2012[41]	Nepal	Caesarean on Demand	1.25%
Pradhan et al., 2014[42]	Nepal	Maternal request	1.0%
Samdal et al., 2016[43]	Nepal	Previous traumatic birth experience	2.2% (5.7% - Multipravida)
Poudel et al., 2019[44]	Nepal	Maternal request	6.0%
Makey et al., 2019[45]	Nepal	On request	1%
Kanji et al., 2020[46]	Pakistan	Maternal request Precious pregnancy	0.2% 0.2%
Latif et al., 2017[47]	Pakistan	Precious pregnancy Patient's request	1.67% 2.87%
Karim et al., 2011[48]	Pakistan	Precious pregnancy	1.9%
Naeem et al., 2015[49]	Pakistan	Maternal Wish (with bilateral tubal ligation)	4.3%
Tahir et al., 2018[50]	Pakistan	Maternal request	0.2%

Table 2: Reasons for Preference of CS by women

Reasons for Women's Preference of CS	References
Avoid labour pain/less pain/painless/fear of pain	Akhter et al.,2018;[16] Walana et al., 2017;[54] Zhang et al., 2017;[55] Pang et al., 2007;[56] Loke et al., 2015;[57] Ajeet et al., 2011[58]
Certainty of time & birth/astrological calendar /an auspicious time/ Allows a better control of time and birth	Zhang et al., 2017;[55] Pang et al., 2007;[56] Loke et al., 2015;[57] Ajeet et al., 2011[58]
Avoid damage to pelvic floor/ vaginal trauma/perineal tear	Zhang et al., 2017;[55] Pang et al., 2007;[56] Loke et al., 2015;[57] Ajeet et al., 2011[58]
Safer for the baby/ low risk of foetal distress and birth trauma	Zhang et al., 2017;[55] Pang et al., 2007;[56] Loke et al., 2015;[57] Ajeet et al., 2011[58]
Quick restoration of sexual activities/better sexual satisfaction	Zhang et al., 2017;[55] Loke et al., 2015[57]
Less stressful/ Easy with no labour stress	Walana et al., 2017;[54] Zhang et al., 2017[55]
Fear of vaginal birth	Akhter et al.,2018;[16] Pang et al., 2007[56]
Safer for mother	Zhang et al., 2017[55]
Avoid birth trauma and respiratory trauma	Loke et al., 2015[57]
Large baby/twins/triplets	Loke et al., 2015[57]
Negative experience from previous childbirth	Zhang et al., 2017[55]

Doctor's advice	Walana et al., 2017[54]
Avoidance of emergency CS	Zhang et al., 2017[55]
A fashion	Zhang et al., 2017[55]
Previous CS	Zhang et al., 2017[55]
Avoid episiotomy	Zhang et al., 2017[55]
Being pregnant at an advanced age	Loke et al., 2015[57]
Social pressure/life-style choice	Akhter et al.,2018[16]
Lack of family support	Akhter et al.,2018[16]

Table 3: Reasons of CS on Maternal Request

Reasons for maternal request of CS	References
Fear of labour pain/ avoid labour pain/pain -free method/ Friends advised CS is painless	Akhter et al., 2018;[16] Obed et al., 2013;[51] Wiklund et al., 2007;[64] Dursun et al., 2011;[65] Schantaz et al., 2016;[66] Okonkwo et al., 2012;[67] Diema K et al., 2019;[68] Stutzer et al., 2017[69]
Fear of childbirth/Tokophobia/primary fear of birth/lack of courage to undergo labour	Akhter et al., 2018;[16] Wiklund et al., 2007;[64] Schantaz et al., 2016;[66] Stutzer et al., 2017;[69] Eide et al., 2019[70]
Safer mode of Birth (safer option for baby/ Safer for mother & baby/ CS is safer than before)	Schantaz et al., 2016;[66] Okonkwo et al., 2012;[67] Diema K et al., 2019;[68] Stutzer et al., 2017;[69] Fenwick et al., 2010[71]
Maintain pelvic floor integrity (Avoid pelvic organ prolapse, trauma or perineal tear)/ Fear of faecal and urinary incontinence	Obed et al., 2013;[51] Dursun et al., 2011;[65] Schantaz et al., 2016;[66] Okonkwo et al., 2012;[67] Diema et al., 2019;[68] Eide et al., 2019[70]
Negative/traumatic experience of previous birth	Obed et al., 2013;[51] Schantaz et al., 2016;[66] Stutzer et al., 2017;[69] Fenwick et al., 2010[71]
Advice from husband/ presence of relative/husband or family support to request CS/ Religious reasons/advice	Obed et al., 2013;[51] Okonkwo et al., 2012;[67] Stutzer et al., 2017;[69] Eide et al., 2019[70]
Convenient to choosing specific delivery date and time/better predictability/ Bringing luck and joy to the family/Uncertainty about normal delivery process	Akhter et al., 2018;[16] Obed et al., 2013;[51] Okonkwo et al., 2012;[67] Eide et al., 2019[70]
Fear for episiotomy	Diema K et al., 2019;[68] Stutzer et al., 2017[69] Eide et al., 2019[70]
Anxiety about foetal injury or death (in labour)/ Fear of labour outcomes/complications/Minimize the risk of foetal distress	Obed et al., 2013;[51] Dursun et al., 2011;[65] Schantaz et al., 2016;[66] Diema K et al., 2019;[68] Stutzer et al., 2017[69]
Anxiety for loss of control /emotional aspects/ Issues about control and safety	Dursun et al., 2011;[65] Stutzer et al., 2017[69] Fenwick et al., 2010[71]
Anxiety of lack of support from staff	Dursun et al., 2011;[65] Diema K et al., 2019[68]
Birth satisfaction/ CS is more satisfactory mode of birth	Stutzer et al., 2017[69] Eide et al., 2019[70]
Perseveration/resumption of sexual function/fear of sexual discomfort and attraction	Stutzer et al., 2017[69] Eide et al., 2019[70]
Having no more energy during labour	Okonkwo et al., 2012[67]
Precious pregnancy/Infertility	Obed et al., 2013[51]
Devaluing of the female body and birth process	Fenwick et al., 2010[71]
Logistics/security challenges/Physician's convenience	Obed et al., 2013[51]
Fear of needing an emergency CS/Hereditary for complicated birth among female relatives/History of sexual violence/ Depression/depressed themselves	Dursun et al., 2011[65]
Anxiety for gynaecological examination/Fear of their own health/life	Dursun et al., 2011[65]
Unwilling to wait for labour to commence/ Family tradition of CS	Akhter et al., 2018[16]

Past medical illness/Avoid stress of labour/ Being advanced age	Obed et al., 2013[51]
Wanted repeat CS	Stutzer et al., 2017[69]
Self-perceived risks for emergency CS (narrow pelvis, hereditary factors, birth outcomes)/ Requests based on unknown reasons/ Postnatal stressed experience	Fenwick et al., 2010[71]
Over usage of ultrasound examinations.	Okonkwo et al., 2012[67]

Previous c-section,[63,66,72] negative previous birth experience,[72,73] delivering in a private health facility, being older than median at the time of sexual debut,[66] high educational attainment, use of assisted reproductive technology, and miscarriages within the obstetric history,[63] fear of childbirth[73] are found to be significantly associated with maternal request of a CS.

Why are Obstetricians willing to perform CS for non-medical indications?

A study conducted in Argentina reported that providers (74.4%) highly support their patient's right to choose a CS in the absence of a medical indication, 66.7% would perform a CS upon maternal request.[74] Obstetricians' willingness to oblige to the maternal request without medical indications is influenced by many factors.

Avoiding Litigation

The fear of malpractice litigation is a strong factor of obstetrician choice of CS.[75] Defensive practice is deeply rooted in obstetrics practice and frequently CS are conducted to avoid litigation.[76,77] CS rate in Brazil is high perhaps obstetricians in Brazil perform defensive CS for fear of lawsuits.[78] A study conducted in Romania also revealed that the majority obstetricians (69.9%) perform defensive CS and for most (86.3%) this choice of mode of childbirth is influenced by the risk of being accused of malpractice.[77] In Israel also 97% of obstetricians feel that their daily practice is influenced by concern about being sued for medical negligence, and 87% would offer CS even in the absence of a clear medical indication to avoid litigation.[76] Similarly, a study conducted in Turkey shows high CS rate was found to be related to increasing practice of defensive CS.[79] Obstetricians in European countries perform CS on maternal request to avoid possible legal consequences if something goes wrong.[80] Studies conducted in India[81] and Bangladesh[36,82] also revealed that fear of legal action was an important factor for decision-making and performing CS.

Financial Motives

Financial incentive is also reported to be a major factor influencing the decision-making of obstetricians to perform CS. Private providers are more willing to perform a CS on maternal request in Argentina[74] to fulfil maternal demand for a CS. A qualitative study conducted in India also revealed that private hospitals have commercial interest with financial motives (for individuals and healthcare organisations) and pressurise obstetricians to fulfil patient demands for a CS.[81] In Bangladesh 'brokers' from private hospitals attend public hospitals to convince patients there to refer themselves to private hospitals for CS and receive a financial reward for every CS performed.[36,82]

Convenience/time pressure

Obstetrician's personal convenience is one of the reasons for influencing the decision to perform a CS.[51,83] Elective CS can be of great convenience to help doctors plan their time schedule and get closer to daylight and social hours.[11,83] The convenience of CS is vital to obstetrics practice.[11] A study conducted in India reported that obstetricians' convenience and time pressures, particularly owing to the

high prevalence of solo obstetric practice was a key reason for performing CS.[81]

Demand from patient/family

Private hospitals in India agree to women (or their family) demanding a CS for non-medical reasons in order not to lose that patient and their income.[81] Patient or patients' families from affluent background frequently try to influence obstetricians' decision-making on CS for non-medical indication in Bangladesh.[36] In Europe, there is increasing issue respecting patient autonomy on maternal request, which is the most cited reason for a physician to perform a CS on request without any medical indications.[80] However, obstetricians' willingness to perform a CS for non-medical reasons differ largely between regions and countries.[80]

Lack of comprehensive clinical guideline

A lack of comprehensive clinical guideline or context specific guidelines and monitoring systems can result in unnecessary CSs.[81-83] Similarly, poor adherence to existing protocols on emergency obstetric care is also a reason reported behind rising CS in Bangladesh.[36] Private hospitals are partially to blame for performing unnecessary CS due to lack of regulations and reporting system in place or lack of clinical guidelines in India.[81] About 43% of physicians in Egypt were not aware of the presence of standardized guidelines in their respective hospitals.[83]

Lack of training and supervision

Obstetricians' decision to perform CS is influenced largely by a lack of confidence and poor skills to attend vaginal births due to lack of training on vaginal birth and continuing professional development (CPD).[36,81,83] A critical knowledge gaps among obstetricians, particularly the indications for and timing of elective CS is found in Bangladesh.[82]

Ethical and legal issues on non-medically indicated CS

Non-medically indicated CS such as maternal request is a legally and ethically complex and controversial issue.[84,85] The balance of benefit versus harm between CS and vaginal delivery is crucial to this debate.[14,84] Consequently, performing a CS should be ethically sound, genuinely safer and more beneficial than vaginal delivery.[14,84] The key ethical issues are obstetricians' obligation not to harm both women and foetus (non-maleficence) and to benefit (beneficence) women and foetus, women's autonomy/informed choice (voluntary informed consent) and allocation of health resources wisely on the basis of a net benefits to health.[10.85]

Obstetricians have the right to refuse CS without medical indication, which has potential risks for the woman and baby.[11,14,84] FIGO highlights that obstetricians' professional duty not to perform anything that can harm their patients.[86]

Autonomy and voluntary informed choice of a patient is the main ethical issue on performing CS on non-medical indication like maternal choice.[85] Although, informed consent for childbirth is different from consent from other medical areas because childbirth is an unavoidable physiological process.[14] Patient has rights to be well informed about risks and benefits of the CS before providing voluntary informed consent.[85] FIGO calls for respecting patient's autonomy and emphasizes to make informed choice.[86] Obstetricians have legal responsibility to inform and counsel women by providing clear, concise, unbiased, truthful and evidence-based information with all alternatives to give the patient an opportunity to have an informed consent.[14,84] Obstetricians must not use power to influence the patient's choice.[85] Additionally, there is a question about empowerment of women on decision-making on CS especially in low-income countries.[11,85] The debate of women's request for CS must be integrated in women's

empowerment and reproductive rights to ensure that women's empowerment is maximised. [85]

Another ethical issue surrounding the maternal request or demand of CS is justifiable allocation resources to procedure or treatment for net benefits to health.[10,11,85] If women receive a CS on their request without medical reasons, there will be less resources left for the rest of health care.[11] Performing CS for non-medical reasons must not affect the provision of medically indicated CS.[14,84]

DISCUSSION

Maternal request is found to be the most frequent non-medical indication. The main reason for preferring a CS and request a CS is related to labour pain. In the context of low-income countries, poor quality of care such as deficit of monitoring of the childbirth process and epidural anaesthesia has been reported to be a leading factor of maternal request CS.[51] Many women feared about labour pain understand that CS is a way to negotiate their labour pain due to lack of effective pharmacological pain relief medication or social support during labour. They would request CS as an expression of their pain during labour and a demand for a response to their suffering.[17] A study reported that using a partograph is effective in reducing maternal preference for CS.[60] The improvement of quality of care for women in labour can reduce the maternal demand of CS.

Fear of childbirth is found to be another common reason of maternal request for CS. It is strongly associated with a preference for elective caesarean section.[73] Women are perceiving childbirth as a fearful event and they perhaps distrust their own natural capability of giving birth due to the fear.[71] Lack of knowledge on mode of childbirth or CS aggravates women's fear on labour pain and CS is offered to women as a safe option for painless childbirth.[16]

The main reason of obstetrician's willingness to perform CS on non-medical indications is found to be fear of litigation. CS is perceiving as the safer mode of childbirth.[10,11] Locally tailored evidence-based comprehensive guidelines must be required for not only to follow by both hospitals and obstetricians to promote optimal use of CS, but also to support obstetricians morally and legally.[89,83] Ethically, women must give informed voluntary consent to undergo a CS. Poor knowledge about CS may leads to wrong choice of mode of childbirth[16,66] Therefore, in the case of maternal choice of CS to be assessed ethically with careful manner.[10,14,63,84]

CONCLUSION

Performing CS without medical indications is a rising public health issue which is creating medical, financial and ethical dilemmas in obstetrics care. Maternal request is the most frequent non-medical indication. The reasons for maternal request for a CS should be studied, documented and discussed. Then, the case should be managed based on individual needs. Provision of quality obstetric care can reduce unnecessary CS. It must include social support during labour, appropriate labour monitoring, analgesic medication during labour, counselling/educating of pregnant women on mode of childbirth including indications, risks and benefits of CS during antenatal visits, and adherence to evidence-based practice/guidelines. More research studies should be conducted on CS on non-medical indications in South Asia.

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Classification of Caesarean Section: A Scoping Review of the Robson classification

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ABSTRACT

Caesarean section (CS) rate is rising dramatically worldwide. WHO recommended CS rate of 10-15% at populational level would not be the ideal rate at the hospitals level due to the differences on population they have been serving. At the hospital level, a perfectly effective system is necessary to understand the trends and causes of rising trends of CS as well as to implement effective measures where necessary to control the same. Hence, WHO recommended the Robson classification, which is also called the 10-group classification of CS (TGCS) as a global standard tool to assess, monitor and compare CS rates within healthcare facilities over time, and between health facilities. The Robson classification, proposed by Dr Michael Robson in 2001, is a system that classifies all women at admission at a specific health facility for childbirth into 10 groups based on five basic obstetric characteristics (parity, gestational age, onset of labour, foetal presentation and number of foetuses). This classification is easy and simple and mutually exclusive, highly reproducible, easily applicable, and useful to change clinical practice. It has many strengths such as simplicity, flexibility (further subdivisions can be made to increase homogeneity within groups). This classification helps to identify and analyse the contribution of each group to overall CS rates. It also allows distinguishing the main group of women who contributes most and least to the overall CS rates; so that the CS rates can be monitored in a meaningful, reliable, and action-oriented manner in each health facilities for optimal use of CS.

Key words: Caesarean section, Classification system, Robson classification.

INTRODUCTION

The Caesarean section (CS) rate is rising dramatically worldwide.[1,2] The rising CS rate has been a major global public health issue because of its association with potential health risks to mother and baby,[3,5] and adverse risks in subsequent pregnancy,[4] Additionally, the rise of CS unnecessarily can cause an financial burden in the health system.[6]

CS rates are also rising in South Asian city hospitals.[7,8] Obstetricians and hospitals need evidence-based information regarding how or why the CS rate has increased and what needs to be done for stemming the rise. The World Health Organization (WHO) recommended CS rate of 10 -15% at population level in 1985.[9] Although, a debate is ongoing about the optimal rate of CS,[10] a CS rate greater than 10% at population level[11] does not contribute to the preservation of maternal and foetal health.[12] The population-based recommended CS rate 10 – 15% would not be realistic at the hospital level due to the complexity of the population they serve.[13] Monitoring CS rates at hospital level by using overall CS rates is also difficult for inter-

pretation and comparison due to variations in several factors such as differences in hospital practice, the characteristics of the local obstetric population they serve and clinical management protocols.[13] The Robson classification system is a vital tool at the centre of the debate around defining the optimal rate of CS. In April 2015, WHO proposed the Robson classification to assess, monitor and compare the rates of CS rates within a health institution overtime, between different health institutions, countries and regions in a meaningful, reliable, and action-oriented manner.[10,13-15] The objective of this article is to explore basic information on the Robson Classification and its use in South Asia.

METHODS

A short scoping review of articles[16] highlighting the issues around Robson's Classification were searched using several bibliographic electronic databases such as PubMed, MEDLINE, EMBASE, SCOPUS, CINAHL and Web of Science as well as open access journals. Articles on Robson's Classification were searched using Medical Subject Headings (MeSH) heading such as caesarean, cesarean, c-section was combined with the specific key words such as Robson Classification using Boolean operators (and/or). Additional articles were searched from the reference list of the selected articles and organizational websites such as WHO, and open access journal databases such as Nepal journals on-line (NepJOL) and Bangladesh journals on-line (BanglaJOL) were also searched. Titles and abstracts of the identified articles were initially scanned and then, eligible full-text articles were appraised, and relevant data was extracted, then simple content analysis performed.[17] Quantitative studies conducted in South Asia using the Robson classification from January 2010 to December 2020 and written in English language were included in this review. A total of 1,170 articles were found and on appraisal 26 were used in this scoping review.

CLASSIFICATIONS OF CS

There are mainly four types of classification systems commonly used to classify CS. Classification based on indications lacks of uniform definition of indications of CS, low reproducibility and insufficient comparison; based on degree of urgency has many weaknesses such as the lack of clear and unambiguous definitions that could compromise inter-rater reproducibility, comparability, and interpretation; and other bases like site and surgeon are limited by their utility.[18] A systematic review conducted by WHO in 2011 determined that the Robson classification that is based on obstetric characteristics at admission is the most appropriate classification system to achieve current international and local needs.[19]

ROBSON CLASSIFICATION

The Robson classification, which is also called the 10-group classification of CS (TGCS), proposed by Dr Michael Robson in 2001[20] is a system that classifies all women admitted at a specific health facility for childbirth into 10 groups based on five basic obstetric characteristics which are mutually exclusive and absolutely comprehensive. The system does not include the indications for CS. The maternal obstetric characteristics are: parity (nulliparous, multiparous with and without previous caesarean section); gestational age (preterm or term); onset of labour (spontaneous, induced or pre-labour caesarean section); foetal presentation (cephalic, breech or transverse); and number of foetuses (single or multiple). The 10 groups with specific obstetric characters as Robson Classification[16] are tabulated. [Table-1]

The Robson Classification categorizes all women who give birth in any health institution irrespective of route of delivery. It can be applied prospectively on admission. Every woman who gets admitted to the hospital for childbirth can be directly classified based on maternal obstetric characteristics as described above. These characteristics are usually collected routinely in maternity wards everywhere.[13-15,19-22] This classification provides common initial platform for further detailed analysis within perinatal events, so that outcomes can be measured and compared. [13-15]

STRENGTHS AND WEAKNESSES OF THE ROBSON CLASSIFICATION

In 2014, WHO conducted a second systematic review and explored several strengths and weaknesses of Robson classification from the users of this classification.[19] The main strengths of the Robson classification are: simple to implement, robust, reliable, flexible and directness of initial interpretation. Other many studies also reported that the

Table-1: The Robson Classification

Group	Obstetric population
1	Nulliparous women with a single cephalic pregnancy, ≥37 weeks gestation in spontaneous labour
2	Nulliparous women with a single cephalic pregnancy, ≥37 weeks gestation who had labour induced or were delivered by CS before labour
3	Multiparous women without a previous CS, with a single cephalic pregnancy, ≥37 weeks gestation in spontaneous labour
4	Multiparous women without a previous CS, with a single cephalic pregnancy, ≥37 weeks gestation who had labour induced or were delivered by CS before labour
5	5 All multiparous women with at least one previous CS, with a single cephalic pregnancy, ≥37 weeks gestation
6	All nulliparous women with a single breech pregnancy
7	All multiparous women with a single breech pregnancy including women with previous CS(s)
8	All women with multiple pregnancies including women with previous CS(s)
9	All women with a single pregnancy with a transverse or oblique lie, including women with previous CS(s)
10	All women with a single cephalic pregnancy < 37 weeks gestation, including women with previous CS(s)

Robson classification has been found to be easily applicable.[18,21,22,24-51] The main weaknesses of the Robson's classification are: (1) missing data by which it cannot be classified in any 10 group as an indicator of quality of data; some suggest to create a group "99" and WHO recommends to report at footnote; (2) misclassification of women and; (3) lack of definition or consensus on core variables of the classification.

WHO has developed and published a Robson classification Implementation Manual[14] in 2017 to support and guide healthcare facilities worldwide for adopting and implementing this classification. The WHO manual[14] can improve common understanding to resolve the weakness of the Robson Classification, because it describes a standard approach in implementation and interpretation of the classification, including standardization of terms and definitions of core variables as well as the way of managing missing data.[14] Misclassification and missing data can be minimised by providing training/ guidelines, educational inputs and regular audit.[10]

MODIFICATIONS OF ROBSON CLASSIFICATION

WHO (Robson Classification Implementation Manual) has introduced the sub-classifications in Robson group 2 (2a: Labour induced and 2b: Pre-labour CS), group 4 (4a: Labour induced and 4b: Pre-labour CS) and group 5 (5a: With one previous CS and 5b: With two or more previous CSs) to bring common point on classification.14 For the improvement of the classification for local use and to increase homogeneity within the groups, several subdivisions in each of the 10 groups have been suggested. However, group 5 (women with previous CS) has received the largest number of suggestions for sub-division.[19]

The Society of Obstetrics and Gynaecologists of Canada (SOGC) recommended the modified Robson criteria, which can be used to enable comparison of CS rates and indications. This modified classification of CS allows evaluation and comparison of the contributors to the Caesarean section rate and their impact. Group 2 and 4 each subdivided into A (induced labour) and B (CS before labor); Group 5 to 10 each subdivided into A (induced labor), B (CS before labor) and C (spontaneous labor).[23]

Use of the Robson Classification in South Asia

Use of Robson classification is growing in South Asia as witnessed by many hospital-based studies.[24-45] Only a few studies have used modified Robson classification. Out of a total of 21 studies, 19 studies were retrospective and 2 were prospective. Out of a total 19 studies[24-43] conducted for assessing CS rates, one study[44] was conducted for assessing trends and another[45] for comparison of protocols of foetal heart rate monitoring (intermittent and continuous). However, there is paucity of large-scale studies comparing between institutions, countries and multi-centre interventions as well as further analysis of all perinatal events and outcomes adding significant epidemiological variables.

Only one study, Mittal et al (2019)[44] reported the CS trend using Robson classification in North India to assess the trend of CS rate for 3 years and it shows a static rate of CS in each group over the years. [Figure-1]

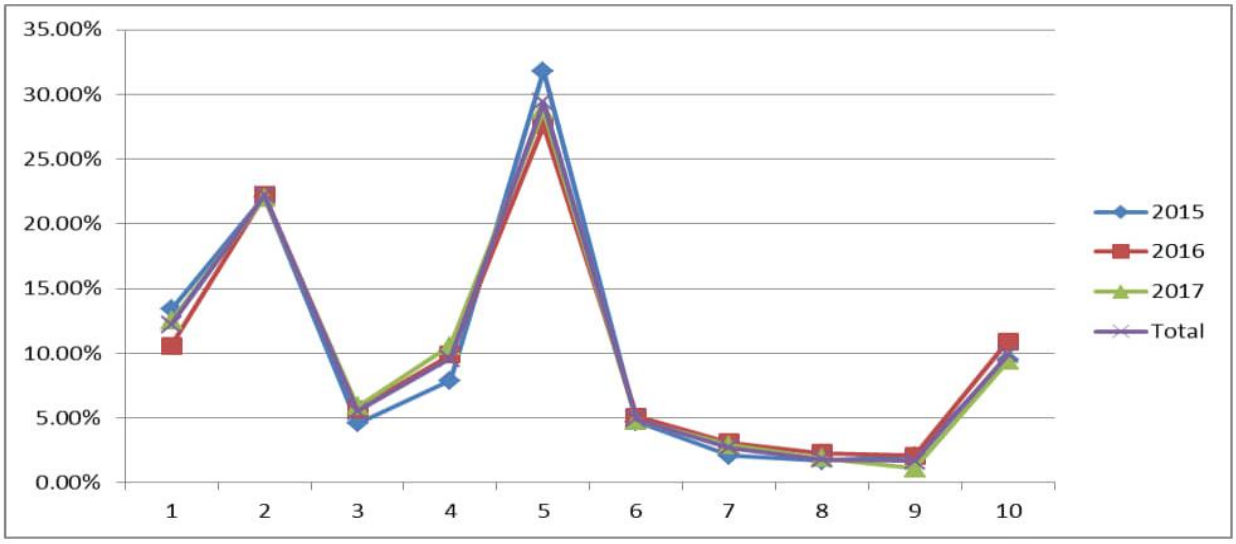

Figure-1: Trends of CS rates in Robson Groups by Mittal et al (2019)[44]

Many hospital-based studies adapt the Robson Classification for monitoring CS rates.[24-43] The group 5 is found to be the high risk group and the major contributor to overall CS rates by several studies.[24-26,28-34,38,40,41] Few studies found Robson groups 1 to be the greatest contributor to overall CS rate.[27,37,42-44] The other major contributor to overall CS rate were group two,[24,25,28,31-33,43,44] group three[35,39,42,44] group four,[27] and group ten.[27,44] Kandhari et al conducted a hospital-based study in 2019 using Robson classification among low risk cases to compare intrapartum monitoring protocols (intermittent and continuous foetal monitoring) and found decreased operative intervention and a better neonatal outcome in continuous monitoring group.[45] Neonatal outcome was improved in Robson group 2A, 4A, 7A and 10A and CS was decreased in Robson group 2A.[45] [Table-2]

Table-2: Contribution of each group of Robson classification to the overall CS rates.

Authors & year (Total delivery & CS)	Contribution made by each Robson group to the overall CS rate %									
	1	2	3	4	5	6	7	8	9	10
Nazneen et al. 2011[24] (21149; 58.8%)	5.06	15.65	4.33	14.46	22.15	1.60	1.34	1.18	2.42	2.32
Dhodapker et al. 2015[25] (1123; 32.6%)	24.0	14.2	3.5	2.5	40.1	5.4	2.7	3.5	1.4	7.4
Das et al. 2016[26] (4392; 33.1%)	6.37	3.7	3.46	2.1	11.9	0.9	1.3	0.6	0.2	2.2
Yadav et al. 2016[27] (40986; 17%)	37.62	4.23	15.0	1.6	17.06	5.83	3.44	1.17	1.0	12.9
Ray et al. 2017[28] (162428.9%)	1.52	4.93	0.73	1.34	8.29	2.43	1.21	3.78	1.21	3.41
Kant et al. 2018[29] (531; 58.86%)	7.34	36.71	1.04	2.4	36.0	2.09	0.6	3.14	0.6	9.7
Mehta et al. 2018[30] (4785; 41.96%)	9.69	2.08	2.02	0.71	21.98	1.19	0.71	0.83	0.58	2.13
Jogia et al. 2019[31] (650; 28.3%)	7.61	21.20	0.54	4.35	36.96	8.15	7.61	2.17	3.26	8.15
Shenoy et al. 2019[32] (655; 27.24%)	15.60	24.33	0.26	2.26	27.24	3.70	1.32	4.23	1.85	18.78
Senanayake et al. 2019[33] (7504; 30.0%)	4.2	6.1	1.4	1.7	8.9	1.5	1.2	0.8	0.6	3.4
Gilani et al. 2020[34] (6155; 33.3%)	4.8	4.2	2.0	2.7	13.8	0.8	1.0	1.2	0.16	2.7
Das et al. 2020[35] (4394; 33.40%)	7.73	9.84	2.66	3.29	5.75	1.45	0.65	0.20	0.27	1.52
Mittal et al. 2019[44] (81784; 23.7%)	12.2	22.2	5.2	9.6	29.4	4.9	2.7	1.8	1.7	9.9

DISCUSSION

The Robson classification/TGCS is an internationally accepted classification system for monitoring CS rates. The review found that use of Robson classification is rising in South Asia. It reported that Robson group 5 (All multiparous women with at least one previous CS, with a single cephalic pregnancy, ≥37 weeks gestation) is the most vulnerable group and greatest contributor to overall CS rate. Similar findings are reported in Turkey,[15] Australia,[46] Canada[47] and Brazil.[48] Trend analysis showed Robson group 5 is expanding because of performing CS for group 1 – 4 which may then require repeat CS.[15] Although, the Robson group 1 (Nulliparous women with a single cephalic pregnancy, ≥37 weeks gestation in spontaneous labour) is low risk pregnancy group, this group was also reported as the main contributor to overall CS rate by some studies in South Asia. A similar finding is reported by other studies.[49,50,51] Robson group 2 (Nulliparous women with a single cephalic pregnancy, ≥37 weeks gestation who had labour induced or were delivered by CS before labour),[48,50,51] group 3 (Multiparous women without a previous CS, with a single cephalic pregnancy, ≥37 weeks gestation in spontaneous labour),[48,50] group 4 (Multiparous women without a previous CS, with a single cephalic pregnancy, ≥37 weeks gestation who had labour induced or were delivered by CS before labour) and group10 (All women with a single cephalic pregnancy < 37 weeks gestation, including women with previous CS (s))[52] also are major contributor to overall CS rate. These groups are those which are most likely to contribute to the high CS rate and therefore need close monitoring and could be targeted for reduction of CS rates. For example, unnecessary primary and elective CS should be avoided in low risk pregnancy such as group 1 and provision of evidence-based practice for vaginal birth after CS (VBAC).

The Robson classification itself does not show the reasons of CS but can be the common starting platform to identify the reasons of performing CS by performing further analysis of indications for CS in Robson group as required.[55] Likewise, this classification can be the starting point for further detailed analysis and comparison of all perinatal events and outcomes and adding epidemiological variables.[56]

A study conducted by Robson et al in Dublin (2015) showed that the Robson Classification can be used as the common starting point to analyse all labour events processes (for example: rates of oxytocin usage, postpartum haemorrhage, neonatal outcomes, and duration of labour) along with outcomes (stillbirth rate, low birth weight rate, incidence of preeclampsia, and maternal mortality) by incorporating significant epidemiological variables (age, body mass index).[57] This classification would be useful for auditing all perinatal events worldwide and it could provide an opportunity for obstetricians to learn from each other.[57]

The review noted that there is a deficit of large-scale studies in South Asia (as in other countries) such as comparison across health institutions or regions using the Robson classification including CS trend analysis,[15,47,48,51,53,54] multi-centre interventional studies[54] and perinatal auditing using the Robson classification.

CONCLUSIONS

The use of the Robson classification of CS is increasing in South Asia and Robson group 5 is found to be the main contributor to overall CS rate followed by group 1 and 2. The clinical strategies/ practice could be modified to optimize CSs in health facilities.

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2.3 Chapter 2 Section 2: Systematic Literature Review

This section presents a systematic review of literature on indications for performing CS and factors significantly associated with rising CS rates in South Asia. This section first describes a short introduction of the systematic review (2.2.1). Then, this section (2.2.2) has included the published article on the systematic review. This article was published in Journal of Asian Medical Sciences in 2022.

2.3.1 Introduction

Literature reviews are becoming important in health and social care due to the growing importance of evidence-based practice (Aveyard 2018). A systematic review aims to summarise up-to-date empirical evidence on health and health care by systematically assessing the primary research to make decisions (Higgins et al. 2019). A systematic review plays a vital role in providing an overview of the evidence (Munn et al. 2018b). It is a gold standard for a literature review. A systematic review is a scientific tool for appraising, synthesising, summarising and communicating the results and implications of several research studies conducted separately to bring together (Green-Hennessy 2013). However, a reviewer must follow a specific protocol to ensure that the review process is systematic and rigorous to identify, critically appraise and synthesise relevant studies in order to answer a predefined question (Aveyard 2018). A protocol for this systematic review was developed by the review team. It was registered in PROSPERO (CRD42019131237) in 2019 and was followed to conduct the review systematically (Appendix 5). The review is conducted systematically and comprehensively to identify, to critically appraise, to synthesis, to summarise and to communicate the evidence on rising CS in South Asian countries. The aim and objectives of the review is given in section 2 (see in published article below). The main purpose of the review is to produce quality empirical evidence on rising CS rates in South Asian countries, to identify gaps or lacking in the current evidence as well as to rationalise the current study. Applying appropriate methods in a systematic review is paramount. An explicit, rigorous and formal method was applied as mentioned in the protocol in this systematic review to minimise the bias (Green-Hennessy 2013; Munn et al. 2018b). The systematic review has followed the following steps (Higgins et al. 2019).

Firstly, the main purpose of systematic review was to minimise bias by pre-specified defined research question (Higgins et al. 2019). In this systematic review, the specific research question was: What are the contributing factors (sociodemographic, medical/obstetric, non-medical) to

rising CS rates in South Asian countries? All literatures relevant to the topic of the study as above were reviewed systematically to answer the review research question. Secondly, searching literature which should be clear and transparent in the systematic review (Higgins et al. 2019). Literature relevant to the topic of review, published from 1st January 2010 to 30th December 2018 in South Asia reporting factors, reasons, causes, determinants, and indications for CS were searched mainly using 'My Search', the Bournemouth University library databases: MEDLINE complete, Scopus, PubMed, Web of Science, CINAHL complete, NepJOL, and BanglaJOL (See below Supplementary Table 1). Any new research published after 30th December 2018 or during the review study has been included in the discussion section (chapter 6). Thirdly, selecting studies according to inclusion criteria described in the protocol of the review. Studies were selected on the basis of inclusion and exclusion criteria as stated in study protocol. Only quantitative studies were included in this systematic review. Systematic reviews should be conducted by an expert review team (Higgins et al. 2019). Therefore, this systematic review was conducted by a review team. Data were extracted from eligible studies using a form developed by review team (detail are in published article). Fourth step is quality assessment of selected studies that was performed by using Critical Appraisal Skills Programme (CASP) Checklists (Critical Appraisal Skills Programme 2018). To maintain quality and avoid risks of bias, studies CASP scored below 20 were excluded. Pre-specified methods are included in the protocol to reduce bias (Higgins et al. 2019). Two members of the review team appraised individual articles critically. Any discrepancy over eligibility of a study was discussed with reviewers and solved based on consensus. Final step, this stage was combining the results of included studies. For successful completion of a systematic review, adequate data management is extremely important (Higgins et al. 2019). Data were analysed, combined and displayed in overview tables. All relevant results are integrated and presented in one overview table (see below). This systematic review revealed the key indications of CS and key factors associated with CS in South Asia.

2.4 Published systematic review

Published systematic review is placed in this section and cited as following:

Dhakal-Rai, S., van Teijlingen, E., Regmi, P., Wood, J., Dangal, G. and Dhakal, K.B., 2022. Factors contributing to rising cesarean section rates in South Asian countries: A systematic review. *Asian Journal of Medical Sciences*, 13 (2), 143 - 174. https://doi.org/10.3126/ajms.v13i2.40904.

SYSTEMATIC REVIEW ASIAN JOURNAL OF MEDICAL SCIENCES

Factors contributing to rising cesarean section rates in South Asian countries: A systematic review

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ABSTRACT

Rising cesarean section (CS) rates are a global public health problem. The systematic review investigates key indications for performing CS and factors significantly associated with the rising rate of CS in South Asia. Primary studies in South Asia published between January 2010 and December 2018 were searched using relevant electronic databases: MEDLINE, Scopus, PubMed, Web of Science, CINAHL, NepJOL, and BanglaJOL. A narrative synthesis of the indications for performing CS and factors significantly associated with the rising CS rates was performed using content analysis. A total of 68 studies were included in this review. The most common medical indication for CS was fetal distress, followed by previous CS, antepartum hemorrhage (including placenta previa/abruption), cephalopelvic disproportion, failed induction, hypertensive disorders in pregnancy, oligohydramnios, and non-progress of labor. Maternal request was the most common non-medical indication for conducting CS. Higher maternal age was the most common significant factor associated with the rising CS rate followed by higher maternal education, urban residency, higher economic status, previous CS, pregnancy/childbirth complications, and lower parity/nulliparity. Preference for CS and increasing private number hospital were also factors contributing to the rising rate. Several key indicators and factors significantly associated with rising CS rate are revealed. These key indicators and significant factors reflect the global trend. Reduction in the use of primary CS, unless medically warranted, would help stem rates of CS. Realistic and candid explanation to pregnant women and their families regarding the benefits of vaginal birth for women and babies should form an integral part of maternity care as these are issues of public health.

Key words: Cesarean section; Indication; South Asia; Systematic review

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INTRODUCTION

The rising rate of cesarean section (CS) is a global public health problem. The World Health Organization (WHO) recommended CS rates of 10–15%.[1] A CS rate >10% at the population level does not reduce maternal and new-born mortality rates.[2] Globally, the CS rate nearly doubled between 2000 (12.1%) and 2015 (21.1%).[3] In the light of this, there is an emphasis on the optimum use of CS for medically indicated reasons to avoid unnecessary interventions in low-risk pregnancies.[4,5] However, it is apparent that CS is often performed without medical

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indication, and this is associated with an increased risk of severe maternal outcomes.[6] CS is associated with many short and long-term maternal and infant health problems and can also adversely affect subsequent pregnancies.[7] The risk of serious maternal morbidity rises with each repeat CS.[8] In addition, unnecessary CS is costly for families and health systems.[9] Thus, CS should only be performed when medically necessary and where its benefits compensate for the associated costs and risks.[10]

In the South Asia, the CS rate almost tripled between 2000 (7.2%) and 2015 (18.1%),[3] and the highest CS rates are in cities.[11] In Bangladesh, CS rates increased over fivefold from 2004 (3.5%) to 2014 (23%).[12] A higher prevalence of CS was reported in urban areas (62.88%).[13] In India, the estimated overall CS rate 2010–2016 was17.2%[14] with high CS rates reported in urban (27.20%)[13] and in private health facilities (29.5%).[15] Furthermore, the disparity in CS rate between private and public hospitals has increased over the years in India.[16] In Nepal, the overall CS rate is 12.21%,[13] but the CS rates are rising in urban areas.[17] CS rates in private hospitals increased three-fold from 1996 (8.9%) to 2016 (26.3%).[18] In Pakistan, the overall CS rate increased about five-fold from 1991–1992 (2.7%) to 2012–2013 (15.8%) and higher in urban (27.79%).[19] In Sri Lanka, a study reported an increased CS rates (from 29.6% in 2008 to 33.6% in 2010).[20] Similarly, in the Maldives, the CS rate is reported to be high in urban areas (30.18%).[13] The utilization of CS is still low (3.4%) in Afghanistan.[21] A hospital-based study showed that the CS rate was 18.7% in Bhutan.[22] The rising rates of CS in South Asia raise questions about performing CS for unnecessary reasons. A study conducted in Nepal also revealed that CSs are performed for suboptimal indications in relation to fetal distress and prolonged labor, because fetal heart rate monitoring was poor for the diagnosis of fetal distress and use of partograph was also poor to diagnose prolong labor proceeding the decision for the emergency CSs.[23] Hence, there is a need to explore the key indications and factors underlying the rising CS rates not only to address the CS rate itself but also to avoid over medicalization of childbirth in South Asia. By considering the range of key indications for CS, and factors associated with, rising CS in South Asian countries, this systematic review aims to answer the question: What are the factors contributing to the rising CS rates in South Asian countries?

Aims and objectives

Aim: To assess factors contributing to rising cesarean section rates in South Asian countries.

Objectives: To investigates key indications for performing CS and factors significantly associated with the rising rate of CS in South Asia.

MATERIALS AND METHODS

This systematic review included studies according to the protocol registered in PROSPERO in 2019 (ID: CRD42019131237).

Inclusion and exclusion criteria

Primary quantitative cross-sectional and cohort studies which focussed on the indications/factors/determinants for CS from 2010 to 2018 in South Asia and written in English were included in this review. For mixed-methods studies, only quantitative data were included. In addition, studies accessible online database until 30 May 2019 were included. All case control studies, interventional studies, studies using only secondary data and studies with critical appraisal skills program (CASP) scoring <20 were excluded.

Search strategy

The systematic review used the following electronic databases: MEDLINE, Scopus, PubMed, Web of Science, CINAHL, NepJOL, and BanglaJOL. Databases were searched for articles published from 1st January 2010 to 30th December 2018 reporting factors, reasons, causes, determinants, and indications for CS. Medical subject headings terms and key words for "cesarean;" "cesarean," "C-section," were combined with countries (Nepal, India, Pakistan, Bangladesh, Afghanistan, Sri Lanka, Maldives, Bhutan) using Boolean operators. Titles and abstracts were screened for the reasons, factors, indications and determinants of CS. The search strategy also included hand searching of journals and reference lists of included articles. Key articles cited by multiple authors were checked on Google Scholar, and authors of relevant published protocols were contacted if necessary (Supplementary Table 1).

Data extraction and study outcome

All extracted articles were assessed for inclusion eligibility by the first author (SD). Titles and abstracts comprising factors/causes/indications/reasons for CS were included, after which the full text of each article was considered. The data extraction form was developed by the research team. Data extraction included: Author, Published Year, Country/Setting, Study design/method, Study population/ Sample size, Key findings (Supplementary Tables 2 and 3). Extracted data were checked for accuracy by other authors (EvT, JW, PR, GD, KBD). Any discrepancies/disagreement over eligibility of studies were discussed with reviewers and resolved based on consensus.

Risk of bias (quality) assessment

All selected eligible articles were reviewed independently by two reviewers (SD and EvT or another one reviewer). CASP checklists were used to assess the quality of studies.[24]

Any disagreements between reviewers were discussed and resolved with a third reviewer. The selected studies were appraised for strengths and weaknesses. The quality of evidence was assessed for each study. Studies with CASP score of more than 20 out of 33 were included in this review (Supplementary Table 4).

Data synthesis

A narrative synthesis was applied to the findings from the different studies included in this review. First, data were summarized and presented in a tabular form and discussed within the research team to ensure they were relevant. The narrative synthesis of the indications for CS and significant factors associated with CS was divided into the distinct categories using content analysis.[25] The indications for CS and significant factors associated with CS was divided into medical/obstetrical and non-medical indications. Likewise, significant factors associated with CS were classified into sociodemographic, medical/obstetrical, and non-medical factors. Overview tables (Tables 1 and 2) were created to summarize the findings on indications and significant factors associated with CS in each category. Two researchers (SD and EvT/another co-author) conducted the data synthesis. Lack of homogeneity and the amount of data meant that a meta-analysis was not feasible.

RESULTS

We identified a total of 1543 studies, of which 524 duplicates were removed using EndNote. Of 1019 studies, 925 studies were excluded after initial screening and a further 23 were removed after assessing the full text, leaving 71 which were assessed for quality. Three studies were excluded after the quality assessment (CASP score <20). We included 68 studies (Figure 1); 63 were cross-sectional

Table 1: Indications for overall CS reported by studies in South Asia

Indications for CS	%	References
1. Medical and obstetrics Indications		
Foetal Clinical Characteristics		
Foetal distress	1.3–46%	27-54,56,58-76,78
Breech presentation	2.38–16.8%	28,30,31,35,37-40,42,44,45,50,54,56,58-61,65,66,69,70,75,76
Malpresentation	0.53–34.3%	27,29-34,36,38,40,44,46,49,51-53,55,58,60,63,64,67-70,72-74,77
Transverse/abnormal lie	1.04–25.3%	31,37,39,48,54,61,62,77
IUGR	0.52–9.31 %	28,30,31,33,42,44,48,49-54,56,58,61,63,65,68,69
Post-term	0.63–13%	29,34,48,51,56,58,68,70,76
Pre-term	0.11–5.6%	29,38,46,53,68
Oligohydramnios	0.1–27.9%	27-31,33,35,36,38-40,44,48-52,54,58,59-62,64-70,75-77
Meconium stained liquor	9.6–32.4%	37,40,59,71,75,77
Multiple gestation/pregnancy	0.32–3.5%	29,30,31,32,35-39,42,44,46,48-51,54,55,58,59,61,63,65,66,68,69,70,73-75
PROM	1.1–6%	28,29,46,50,51,58,62,68,70,76,77
Cord presentation/prolapse	0.1–4.2%	30,31,36,37,44,47-49,53,60,66
Maternal indications		
• CPD	0.9–30.9%	27,28,30-33,35,36-39,41,44,46,48-56,58-61,63-66,68-70,72,73,75,77
• HDP	0.21–15.8%	27,28,34,37-40,42-44,46,48-52,54,56,58,60,61,63,65-68,70,72-76,78
• APH/Placenta praevia/abruptio	0.2–7.05%	27,29-31,33,35-40,42,44,48-54,56,58-66,68-70,72-77
• Scar tenderness	1.5–31.22%	38,42,41,54,69
• Previous hysterotomy/myomectomy	0.3%	42,50,53,69
• Medical disorders/ conditions	0.2–5.8%	29,30,31,38,39,42,44,49-51,53,58,60,61,63,67-70,73
Obstetrics history		
• Previous CS 1 or more	2.9–48%	27,28-48,50-52,54,56,58,59-70,72-77,78
• Refuse of after CS (VBAC)	2.85–22.4%	38,41,42,69
• History of subfertility/Infertility	0.78–4.99%	28.29,48,63
• BOH	0.29–5%	29,31,33,37,38,42,44,46,48-50,52,60,63-65,67,68,70
Labor abnormalities		
• Obstructed Labor	0.4–3.9%	30,31,34,36,37,39,40,47,48,50,54,58,61,64,66,69,70,76
• Prolonged Labour	0.8–33.2%	29,33,34,47,50,56,64,70,73,76
• NPOL	0.7–29%	27,28,30,32,33,35-37,40,42,43,45,46,48,49,52-54,58-61,66-69,72,75,77,78
• Failed induction	0.40–15.7%	27,28,30-33,36,37,39,40,43,44,46-53,56,58-60,63-66,68-71,75,77,78
• Others	0.5–36.2%	34,35,37,39,40,47,52,60,75,76
2. Non-medical indications		
Maternal request/demand	0.1–3.97%	29,37,42,56,66,67
Labour pain	0.2%	70
Previous traumatic birth experience	2.2%	62
Precious pregnancy	0.47–3.96%	36,42,50,63,68
No indication recorded	0.6–8.9%	68,70,73,76

IUGR: Intrauterine growth retardation, APH: Antepartum haemorrhage, CPD: Cephalopelvic disproportion, HPD: Hypertensive disorders of pregnancy, VBAC: vaginal birth after CS, BOH: Bad obstetric history, PROM: Premature rupture of membrane, NPOL: Non-progress of labor, CS: Caesarean section

Table 2: Factors significantly associated with rising CS rates reported by studies in South Asia

Category of factors	Significant associated factors	Total number of studies	References
Socio-demographic factors	Higher age of mother	8	34,39,88-93
	Higher education of mother	7	34,39,88,90,92-94
	Urban residency	3	88,92,94
	Higher socioeconomic status	3	34,81,90
	Higher number of ANC visits	3	34,39,90
	Place of birth: Private hospitals	3	81,90
	Obesity of mother	2	91,92
	Birth weight: >4 kilograms	2	71,89
	Low nutritional food intake during the pregnancy	2	92,93
	Lower birth order	2	34,93
	Not using contraceptive method	1	93
	Length of baby >45 centimeters	1	93
	Distance to health facility	1	39
Medical and obstetric factors	Previous CS	3	39,92,93
	Complications in pregnancy and childbirth	3	88,90,93
	Lower parity: Nullipara or primipara	3	39,89,94
	Gestational week (pre or post)	2	81,89
	Prolong labour	2	71,93
	Multiple pregnancy/birth	1	90
	Bishop's score 5 or less	1	71
	Abnormal foetal presentation	1	89
	Bad obstetric history (Foetus loss)	1	34
	Umbilical cord prolapse	1	91
	Three doses misoprostol in labour induction	1	71
Non-medical factors	Patient's preference	1	91
	Increasing number of private hospitals	1	91
	Poor condition of public hospitals	1	91
	Unavailability of good quality health care and hospital in rural areas	1	91

ANC: Antenatal clinic, CS: Caesarean section

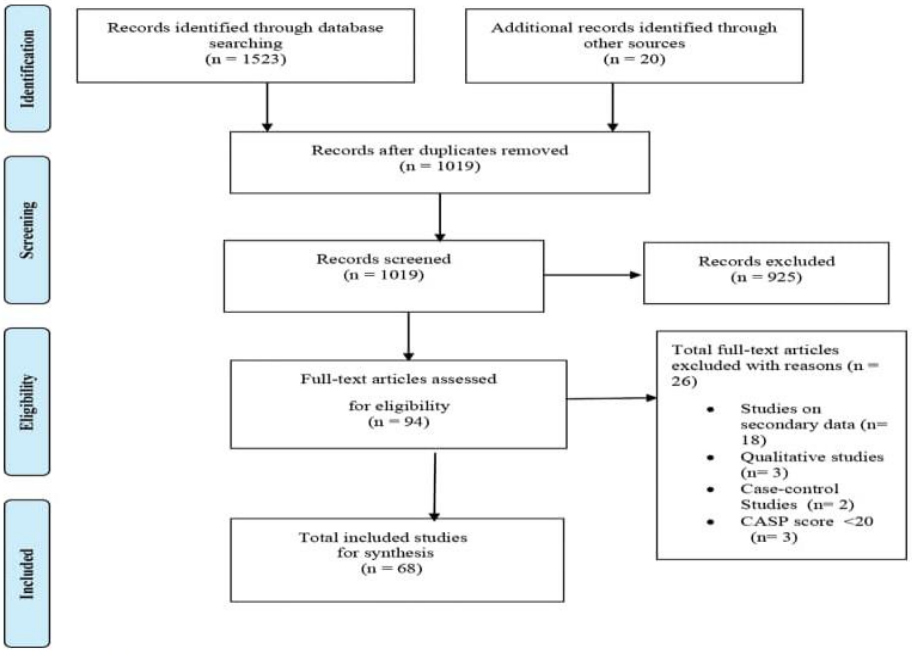

Figure 1: PRISMA flow diagram[26]

studies and 5 were cohort studies. Almost all included studies applied a quantitative approach (n=67) and one was a mixed methods study.

A total 61 studies illustrated the indications for CS, and 11 described factors which were significantly associated with rising CS (4 out of 11 studies reported both indications and

significant associated factors). Figure 1 shows the Preferred Reporting Items for Systematic Reviews and Meta-analysis flow diagram[26] of the progress.

Indications for CS in South Asia

We divided indications for CS into two categories: medical/obstetrical and non-medical. The medical/obstetrical indications were further divided into fetal clinical characteristics, maternal clinical characteristics, obstetric history, labor abnormalities and other.

Key indications for overall CS

A total 51 studies[27-78] reported the overall indications for CS (Table 1). More details are given in Supplementary Tables 2 and 5.

Medical and obstetric indications

Fetal distress is the most common key indicator for CS followed by previous CS, antepartum hemorrhage (APH) including placenta previa/placenta abruption, cephalopelvic disproportion (CPD), failed induction, oligohydramnios, hypertensive disorders of pregnancy (HDP) (pregnancy-induced hypertension, pre-eclampsia, and eclampsia), non-progress of labor (NPOL), multiple pregnancy, fetal malpresentation, breech presentation and intrauterine growth retardation (IUGR) (Table 1).

Many studies[34,35,37,39,40,47,52,60,75,76] categorized some indications to other indication/miscellaneous (0.5–36.2%). Some studies used vague terminology such as maternal indication, fetal indication, obstetric indication[32,53,55] antepartum complications.[41] Similarly, there is evidence of use of non-standardized terminology/abbreviations for some indications such as "DLOC with head floating."[31] These unspecified and vague indications are not included in the overview table.

Non-medical indications

The non-medical indications included maternal request/choice/demand,[29,37,42,56,66,67] precious pregnancy,[36,42,50,63,68] labor pain,[70] previous traumatic birth experiences.[62] CS performed without indication (0.6–8.9%) was also apparent (Table 1).

Key indications for elective CS and emergency CS

A total 16 studies[29,40,42,49,57,58,65,70,73,74,77,79-83] reported the indications for elective CS. The most common indication for elective CS was previous CS (9.4–78.72%),[29,40,42,49,57,58,65,70,73,74,77,79-82] followed by malpresentation,[40,29,49,57,58,70,73,74,77,80,82,83] CPD,[43,49,57,65,70,73,79,80-83] HDP,[29,42,49,57,65,70,73,74,80,83] maternal medical conditions,[29,42,43,49,58,70,73,80,82,83] APH/placenta previa/abruptio,[29,42,49,57,65,73,74,80,82] oligo/severe oligohydramnios,[49,57,65,70,77,80,82,84] breech,[40,42,49,57,58,65,70] multiple pregnancy,[29,57,58,70,80,82] IUGR[42,49,65,80,82,83] bad obstetric history (BOH),[29,43,49,57,65,70,79] and post-term.[42,58,70,78] History of subfertility,[29,43,83,84] and elderly mother/primipara,[43,70,82] were notable indications for elective CS. Non-medical indications were maternal request,[29,57] and precious pregnancy,[80,83] in elective CS. Two studies[70,73] showed that 0.6–5.6% elective CS was performed without indication.

Similarly, a total of 16 studies[40,42,43,49,57,58,65,70,73,74,77,79-81,83,85] reported indications for emergency CS. The most common indication for emergency CS was fetal distress (7.7–61%)[40,42,43,49,57,58,65,70,73,74,79,80,81,83,85] followed by previous CS,[42,49,57,58,65,70,73,74,77,79,80,85] PIH (Pregnancy-Induced Hypertension)/pre-eclampsia/eclampsia,[42,49,57,58,65,70,73,74,80,85] APH/Placenta previa/abruption,[49,57,58,65,70,73,74,77,80,85] malpresentation,[40,49,57,58,70,73,74,77,80,83] CPD,[49,57,58,65,70,73,80,83,85] NPOL,[40,42,43,49,57,58,77,79,81] oligohydramnios,[49,58,65,70,77,79,80,83] breech,[40,42,49,57,58,65,70] multiple pregnancy,[57,58,65,70,73,74,80] obstructed labor,[49,57,58,70,80,85] failed induction,[43,57,58,65,70,79] cord presentation,[49,57,74,70] and medical disorders,[42,70,80,85] Precious pregnancy,[80,83] and labor pain[70] were non-medical indications in emergency CS. Surprisingly, one study[73] reported that 7.9% of emergency CS were performed without indication (See more details in Supplementary Tables 2 and 6).

Key indications in terms of primary CS and repeat CS

Eight studies[50,55,67,70,80,83,84,86] illustrated the indications for primary CS. The most common indication for primary CS was fetal distress (5.58–60.8%),[50,55,67,70,80,83,86] followed by CPD,[50,55,70,80,83,84,86] malpresentation,[55,67,80,83,84] HDP,[50,67,80,84,85] NPOL,[67,70,80,84,85] obstructed labor,[50,70,80,84,85] failed induction,[70,80,84,85] APH/placenta previa/abruptio,[50,80,84,86] and oligohydramnios,[80,83,84,86] precious pregnancy,[80,83,84,86] and maternal request,[67,82] were non-medical indications for primary CS.

Similarly, a total of seven studies[44,48,50,55,70,80,83] illustrated the indications for repeat CS. The most common indications for repeat CS were previous CS (1.31–48.5%),[44,48,50,55,70,83] fetal distress,[44,48,50,55,80,83] CPD,[44,48,50,55,80,83] scar tenderness,[44,48,55,80,83] breech,[44,48,55,80,83] and multiple pregnancy,[44,48,50,55,80] oligohydramnios,[44,48,80,83] IUGR,[44,48,80,83] HDP,[44,48,50,80] APH/placenta previa/abruption,[44,48,50,80] medical disorders,[44,48,80,83] big baby,[44,48,83] and malpresentation.[44,48,50] precious pregnancy,[80,83] was given as a non-medical indication for repeat CS (See details in Supplementary Tables 2 and 7).

Key indications in terms of parity

Seven studies[43,58,62,70,82,86,87] illustrated the indications for CS in primigravidae. The most common indication for CS in primiparous women was fetal distress (8.3–53%),[43,58,62,70,86,87] followed by CPD,[43,58,70,82,86] oligohydramnios,[58,62,82,86] abnormal fetal lie,[62,82,86] breech,[58,82,86] IUGR,[58,82,86] HDP,[82,86,87] placenta previa/abruptio,[62,82,86] NPOL,[43,86,87] Obstructed

labor,[58,86,87] and failed induction.[43,86,87] Elderly primipara/elderly mother[43,82] and subfertility,[43,82] were also indications for CS in primiparous women. Precious pregnancy,[86,87] and patient request[87] were non-medical indications for CS in primiparous women.

Similarly, four studies[43,58,62,86] presented the indications for CS in multigravida. Fetal distress (11.4–61%)[43,58,62,86] was the most common indication for CS in multiparous women followed by oligohydramnios,[58,62,86] failed induction,[43,63,86] breech,[58,86] abnormal fetal lie,[62,86] premature rupture of membrane (PROM),[62,86] IUGR,[58,86] CPD,[58,86] placenta previa/abruptio,[62,86] obstructed labor,[58,86] NPOL.[43,58] Traumatic experience in previous childbirth[62] was a non-medical indication in multiparous women (See more details in Supplementary Tables 2 and 8).

Factors significantly associated with rising CS rates in South Asia

Several significant factors associated with rising CS rates were reported in South Asia (Table 2). These factors are divided into three major categories: (1) sociodemographic; (2) medical and obstetric; and (3) non-medical factors. (See more details in Supplementary Table 3).

Sociodemographic factors

We found that higher maternal age,[34,39,88-93] and higher maternal education[34,39,88,90,92,93,94] were the key factors significantly associated with rising CS rate in South Asia. Other factors significantly associated CS included urban residency,[88,92,94] higher economic status,[34,81,90] and higher number of antenatal clinic (ANC) visits,[34,39,90] childbirth in a private hospital,[81,90] birthweight of baby (>4 kg),[71,89] low nutritional food intake during the pregnancy,[92,93] lower birth order,[34,93] not using contraceptive method,[93] length of baby (>45 cm)[93] and distance to health facility[39] (Tables 2).

Medical/obstetric factors

Previous CS,[39,92,93] complications in pregnancy and childbirth,[88,90,93] lower parity (nullipara),[88,90,93] gestational week (pre or post)[81,89] prolonged labor,[71,93] multiple pregnancy,[90] abnormal fetal presentation,[89] BOH (fetal loss),[34] umbilical cord prolapse,[91] and 3 doses misoprostol used in labor induction[71] were medical/obstetric factors that significantly associated with rising CS rates in South Asia (Tables 2).

Non-medical factors

Regarding non-medical factors for rising CS rates in South Asia, patients' preference for CS, increasing number of private hospitals, the poor condition of public hospitals and the unavailability of good quality health care in rural areas were reported[91] (Tables 2).

DISCUSSION

This systematic review reports various key indications for performing CS and several factors significantly associated with rising CS rates in South Asia.

Key indications for CS in South Asia

Fetal distress is found to be the major key indication for performing CS in this review as reported by other studies.[20,95-98] Fetal distress is an emergency condition; however, it was given as an indication also for performing elective CS in some studies.[42,43,49,73,79] Early and accurate diagnosis of fetal distress can reduce the risk of perinatal mortality. Fetal heart rate monitoring and partograph are fundamental to diagnose fetal distress and progress of labor, but Litorp et al.,[23] identified that fetal heart rate monitoring was only performed in one-third (36%) of total CS cases. However, the diagnosis of fetal distress is notoriously difficult. Shortage of resources such as staff (obstetricians/qualified midwives)[70] and shortage of diagnostic resources in most parts of South Asia may add to the imprecision of the diagnosis of fetal distress.

Previous CS was another key indication for CS;[95,96] for both elective[97] and repeat CS.[99] Recent studies have reported that previous CS is the key leading indication of CS.[22,100-103] The growing number of primary CS may influence the decision-making around mode of birth. The majority of pregnant women who have a history of previous CS would decline vaginal birth after CS (VBAC).[96,97,99] Although trial of VBAC is often the best option, it may be riskier than repeating CS where resources are lacking, and repeat CS may be the first choice in low-resource countries like South Asia.[104] This is because successful VBAC depends on many factors such as clinical expertise; resources; good obstetric history and positive attitude of women who are going through the VBAC; proper management of fear and providing unbiased information to women. Unfortunately, these criteria for VBAC are often scarce in most places in low-resource countries.[104]

As reported by several previous studies, our review documents many other common key indications for CS: APH/placenta previa/abruption,[22,96,101,103] CPD,[22,95,96,100,103] HDP,[22,95,96,103] failed induction,[22,96,100,103] NPOL,[95,96,100-103] oligohydramnios,[95,100,103] multiple pregnancy,[22,95,101,103] malpresentation,[95,96] breech presentation,[22,100,103] and IUGR,[95,101] Similarly, CPD is found to be a key indicator for elective CS.[95,97,98] emergency CS,[95,96,98] primary CS,[99] repeat CS[99] and CS in primigravida.[20] HDP was reported as a key indication for elective CS,[95,98] emergency CS,[95,97,98] primary CS,[99] repeat CS,[99] CS in primigravidae,[99] and multigravida.[99]

APH/placenta previa/abruptio was also a key indication for elective CS,[97,98] primary CS,[99] repeat CS,[99]

CS in primigravida,[99] and multigravida.[99,105] Similarly, oligohydramnios was common indication for elective CS,[95,98] emergency CS,[97,98] primary CS,[99] repeat CS,[96] CS in primigravida,[99] and multigravida.[99,105] Breech presentation was a common indication for elective CS,[98] emergency CS,[98] primary CS, repeat CS,[96,99] CS in primigravida and multigravida.[105] IUGR was also a common indication for elective CS,[98] emergency CS,[98] primary CS, repeat CS,[99] CS in primigravida and multigravida.[105] Similarly, other common indications were: malpresentation (elective CS,[98] emergency CS,[97,98] primary CS,[99] repeat CS,[99] fail induction (emergency CS,[95,98] primary CS,[99] multigravida,[99] multiple pregnancy (elective CS,[98] emergency CS,[99] primary CS, and repeat CS,[99]), obstructed labor[105] (emergency CS, primary CS, CS in primigravida and multigravida), NPOL (emergency CS[95] and primary CS[99] and maternal medical conditions (elective CS,[98] and emergency CS[96]), BOH[98] was key indication for elective CS and cord presentation[98] was for emergency CS. Scar tenderness[96] and large baby were also key indications for repeat CS.

Subfertility[98,99] and advanced maternal age,[20,99] were found to be notable indications for elective CS and CS in primigravidae. A history of infertility in nulliparous women can increase the risk of childbirth by CS.[106] Increasing education, empowerment, and improved socioeconomic status of women in South Asia may encourage them to consider pregnancy at an advanced age. This may also be associated with pregnancy complications and increase the risk of CS.[107]

Maternal request was a major non-medical indication for CS.[95,99,101,102] Indications for elective CS are increasingly likely to be for psychological indications.[108] Women may perceive CS as a safer and easier way of giving birth because of fear of labor pain and fear of loss of baby.[109] Schantz et al.,[110] revealed that pregnant women are not well informed in the process of giving consent for CS. Lack of knowledge on mode of childbirth may lead to wrong choices in their birth plan.[110-112] In addition, women may feel pressurized to request CS for fetal well-being, cosmetic reasons, maintain pelvic floor damage or sexual satisfaction rather than to protect their autonomy or own reproductive rights.[111]

In this review, CS performed with no stated indications (0.6–8.9%) was also apparent.[68,70,73,76] Such surgical procedures do not only affect maternal and neonatal health adversely, but also add unnecessary costs to the family and the misuse of precious health resources. Furthermore, we found some vague terminology used for indications; along with the use of non-standardized terminology/abbreviations; and indications of CS categorized as "other." These are difficult to understand/interpret thus reflect poor practice. The data highlight the necessity of adherence to locally tailored comprehensive guidelines and evidence-based practice in obstetric care.

Factors associated with rising CS in South Asia

Higher maternal age is found to be the most common key contributing factors for rising CS rates in South Asia as reported by several studies.[12,13,18,113-116] Increased maternal age can increase the risk of assisted reproductive technology, gestational diabetes/diabetes mellitus, preeclampsia and placenta previa/placental abruption.[107] It can be argued that increasing empowerment and improving socioeconomic status of women in South Asia possibly encourage them to consider pregnancy at an advanced age. Similarly, higher education of the mother is found to be another key factor significantly associated with increasing CS rates.[12,13,18,19,21,113,115] Increasing the educational status of women has offered them independence as well as more control over their birth plan, however, better education of women may not provide them with better knowledge of the risks and benefits of CS or mode of childbirth.[112]

Place of residency (urban residency) is significantly associated with the rising CS rate.[12,13,18,19,21,116] The availability of modern obstetric care private facilities in urban areas probably encourage women to utilise modern technology for childbirth by CS.[112] This is also true of the higher economic status of women.[12,18,19,21,113,116] Richer/richest women or families have more choices of obstetric services and could afford the cost of CS. Similarly, higher number of ANC check-up (3 or more visits) is also found to be a factor significantly associated with rising CS.[12,112,114,115] Lack of adequate counselling on mode of childbirth or/and lack of information on risk versus benefits of CS perhaps encourage pregnant women to choose CS.[117] Recently, Doraiswamy and colleagues[118] reported that inadequate communication between physicians and pregnant women is one of the factors for the rising CS rate in Bangladesh. Childbirth in private hospitals/place of birth is also found to be a significantly associated with rising CS rate in South Asia as claimed by previous studies.[13,15,18,114,115,119] Private care providers perhaps motivate pregnant women by suggesting CS is an easy and safe way to give birth.[117]

History of previous CS is found to be the most common medical/obstetrics factor significantly associated with rising CS in South Asia. Previous CS is a strong predictor of repeat CS.[120] This highlights the need to avoid primary CS wherever possible and the need for antenatal education. Similarly, complications in pregnancy are also found to be common significant medical factors associated with rising CS rates. In Bangladesh, Karim et al.,[119] also found that CS was 3.6 times higher among women who reported complications during the last birth than those who did not report any complication. Adherence to evidence-based

guidelines on indications for CS is essential in considering whether these factors are sufficient reason for preforming CS in any individual case.

Maternal preference for CS is one of the most significant non-medical factors for rising CS rates. Wealthy urban women perceives CS either as a modern childbirth method or lifestyle choice as in Bangladesh.[112] Higher maternal age, education and socioeconomic status of women as well as residing in urban areas appear to be correlated with maternal preference of CS. In addition, lack of adequate knowledge about risks, benefits of mode of childbirth, and medical indications of CS[110,112,117] along with poor communication between obstetricians and women[118] possibly boost the maternal preference of CS.

Increasing numbers of private hospitals are associated with rising CS rates. Private healthcare is a fast-growing business in South Asia and may partly be to blame for the rising CS rate. A qualitative study conducted in India revealed that private providers would accept maternal request and perform more CS to be commercially successful.[121] Private health facilities contribute to rising CS rates in India,[15,16] Nepal,[18] and Bangladesh.[117,121]

Limitations of the study

The review has not included qualitative studies, case-control studies, studies based on secondary analysis and other interventional studies. Importantly, it only includes studies reported in English. Similarly, meta-analysis or other statistical analysis of data could not be performed because of heterogeneous data. There were no eligible studies from Bhutan and Maldives for this review. Further studies are needed to consider the contribution of evidence from qualitative and interventional studies.

CONCLUSION

This review reveals key indications for performing CS and their significant factors in South Asia. It concludes that fetal distress and previous CS are the most common key medical indications followed by APH/placenta previa/abruptio, CPD, HDP, failed induction, NPOL, oligohydramnios, multiple pregnancy, malpresentation, breech presentation, and IUGR. Fetal distress was a prime indication for all types of CS except elective CS. Previous CS was the chief indication for elective and repeat CS. CPD is found to be a key indicator also for elective/emergency/primary/repeat CS and CS in primigravida. HDP was reported as a key indication also for elective/emergency/primary/repeat CS, CS in primigravida and multigravida. Maternal request is the most important non-medical indication for CS. The use of imprecise terminology for indications of CS and carrying out CS without indication were also apparent. Higher maternal age, higher maternal education, urban residency, higher economic status, higher numbers of ANC visits, previous CS, complications of pregnancy/childbirth, and lower parity are found to be the most common factors significantly associated with rising CS rates in South Asia. Maternal preference for CS and rising numbers of private hospitals are found to be the most important non-medical factors significantly associated factors for rising CS rates in South Asia. These key indicators and significant factors reflect global trends of CS and suggest that a global strategy is required to stem the rise of unnecessary CS. Realistic and candid explanations to pregnant women and their family regarding the benefits of vaginal birth for women and babies should form an integral part of maternity care as these are issues of public health. The strategies for optimizing the use of CS should include greater precision in diagnosis of fetal distress; keeping primary CS to a minimum; educating pregnant women/family on indications, risks and benefits of CS; avoiding CS for non-medical reasons; and adherence to evidence-based guidelines for CS.

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SUPPLEMENTARY

Supplementary Table 1: Search Strategy

Databases	Filter	Search Term	Results
Web of Science	English language Date: 2010 – 2018	(TI = (Caesarean or Cesarean or C-section) or AB = (Caesarean or Cesarean or C-section) (TI = (Nepal or India or Bangladesh or Pakistan or Bhutan or Shri Lank or Maldives) or AB= (Nepal or India or Bangladesh or Pakistan or Bhutan or Shri Lank or Maldives)	465
Scopus	English language Date: 2010 – 2018	(TITLE-ABS-KEY (caesarean OR cesarean OR c-section) AND TITLE-ABS-KEY (nepal* OR india* OR pakistan* OR bhutan* OR bangladesh* OR afghanistan* OR "SRI LANKA" * OR sri-lanka* OR maldives*)	67
PubMed	English language Date: 2010 – 2018	(("Caesarean" OR "caesarean" OR "C-section") ("Caesarean" AND "caesarean" AND "C-section"))	180
CINAHL Compete – CINAHL Headings	English language Date: 2010– 2018	(Caesarean or Cesarean or C-Section) AND (Nepal* or India* OR Bangladesh* OR Afghanistan* OR "Sri Lanka"* OR Maldives* OR Bhutan*	185
Medline Complete – MeSH Headings	English language Date: 2010 – 2018	TI (Caesarean* OR Cesarean* OR "C-Section"*) OR AB (Caesarean* OR Cesarean* OR "C-Section"*) TI (Nepal* OR India* OR Pakistan* OR "Sri Lanka"* OR Bangladesh* OR Maldives* OR Bhutan* OR Afghanistan*) OR AB (Nepal* OR India* OR Pakistan* OR "Sri Lanka"* OR Bangladesh* OR Maldives* OR Bhutan*)	365
NepJOL	English language Date: 2010 – 2018	Caesarean or caesarean or C-section	218
BanglaJOL	English language Date: 2010 – 2018	Caesarean or caesarean or C-section	43
Hand Search	English language Date: 2010 – 2018	Additional records through other sources	20
Total			1,543

Supplementary Table 2: Summary of indications of CS in South Asia

Authors and Year	CS rates	Location of study/ Settings	Study design	Study population/ Sample size	Indications of CS
Nazneen et al., (2011)	70.5%	Bangladesh	Retrospective Observational Longitudinal study	21149 Women	Repeat C/S (17.2–31.4%), Pre-eclampsia (7.3–21.7%), Foetal distress (6.5–17.9%), Prolong labour (2.2–6%), Breech (1.7–8.1%), Failed induction (1–6.7%), Cervical dystocia (1–17.1%), PROM (0.7–2.6%), IUGR (1.5–4.1%), Obstructed Labour (0.2–4.6%), Eclampsia (0.3–1.6%), APH (1–2.6%), CPD (4.0–7.7%), Post-term (1.2–3%), Maternal choice (0.4–0.8%)
Aminu et al., (2014)	38.2%	Bangladesh	Cross-sectional Mixed Method Study	530 Women	Previous CS (29.4%), Foetal distress (15.5 %), CPD (10.2%), Prolonged labour/Obstructed labour (8.3%), Post-term (7%), HDP (4.5%, Rupture of membrane (4.2%), Breech (4%), Fail Induction (3.6%), Oligohydramnios (2.8%),POH (2.5%), Malpresentation (2.1%), APH (1.1%), Reduced foetal Movement (1.1%), Unfavourable cervix (0.9%), Multiple gestation (0.6%), Maternal distress (0.4%), Older primipara (0.4%), Rhesus incompatibility (0.2%), Anaemia (0.2%), Recurrent UTI (0.2%), Labour pain (0.2%), No indication recorded (0.6%) Elective CS: Previous CS (51.8%), CPD (6.8%),Post-term (4.1%), HDP (4.5%, Breech (3%), Oligohydramnios (6%), POH (7.3%), Malpresentation (0.6%), Reduced foetal movement (1.2%), Unfavourable cervix (1.2%), Multiple gestation (1.2%), Older primipara (1.2%), Rhesus incompatibility (0.6%), Recurrent UTI (0.6%), No indication recorded (0.6%) Emergency CS: Previous CS (19.2%), Foetal distress (22.8%), CPD (12.2%), Prolonged labour/Obstructed labour (12.2%), Post-term (2.5%), HDP (5%), Rupture of membrane (6.1%), Breech (4.2%), Fail Induction (5.3%), Oligohydramnios (2.5%), POH (0.3%), Malpresentation (2.8%), APH (1.7%), Reduced foetal Movement (1.1%), Unfavourable cervix (0.8%), Multiple gestation (0.3%), Maternal distress (0.6%), Anaemia (0.3%), Labour pain (0.3%), Unfavourable cervix (0.9%) Primary CS: Foetal distress, CPD, Post-term, Obstructed labour, Breech, Rupture of membrane, Fail induction Repeat CS: Previous CS Primigravida: Post-term (19%), CPD (9.3%), Foetal distress (8.3%)
Sultan et al., (2017)	25%	Bangladesh	Cross-sectional Prospective Study	100 Women	Emergency CS: Previous caesarean section (25.0%), Foetal distress (18.0 %), Obstructed labour (11.0%), Placenta Previa (7.0 %), Abruptio Placentae (1.0 %), Preeclamptic toxaemia (7.0%), Eclampsia (5.0%), PIH (1.0 % Malpresentation (7.0 %), Prolonged labour (6.0%), CPD (4.0%), Failed trial labour (4.0 %), Bad obstetric history (2.0%), Cord prolapse (1.0%), Diabetes Mellites (1.0%)
Ara et al., (2017)	78.7%	Bangladesh	Cross-sectional Prospective study	1253 Women	Previous CS (42.45%), History of subfertility (4.99%). HDP (9.76%), Diabetes mellitus (4.31%), Patient's desire (3.97%), BOH (2.61%), Prolonged labour and cervical dystocia (7.7%), Post-dated pregnancy with oligohydramnios (5.6%), Malpresentation (5.7%),PROM and oligohydramnios (3.2%), Foetal distress (5.1%), Placenta praevia (1.5%), Multiple pregnancy (1.9%), APH (1.3%) Elective CS: Previous caesarean section (55.7%), History of subfertility (6.3%), HDP (12.4%), Malpresentation (7.2%), Diabetes mellitus (5.5%), Patient's desire (5.1%), Placenta praevia (1.9%), BOH (3.3%), Multiple pregnancy (2.5%)
Begum et al., (2017)	35%	Bangladesh	Retrospective Cross-sectional Study	2549 Women	Previous CS (24%), Foetal distress (21%), Prolonged labour and obstructed labour (16%), Amniotic fluid disorder (14%), Post-term (13%), Malpresentation (3%), HDP (3%), Other (6%)

(Contd...)

Supplementary Table 2: (*Continued*)

Authors and Year	CS rates	Location of study/ Settings	Study design	Study population/ Sample size	Indications of CS
Islam and Yoshimura, (2015)	32%	Bangladesh	Retrospective Cross-sectional Study	1075 Women	Previous CS (24.1%), Foetal distress (21.9%), Obstructed/prolonged labour (20.5%), Post-term (11.1%), Oligohydramnios (6.1%), Breech (3.7%), Pre-eclampsia and eclampsia (3.2%), PROM/leaking (2.4%), APH or placenta previa (1.4%), No indication recorded (1.2%), Others (4.3%)
Das et al., (2018)	35.45%	India	Retrospective Cross-section Study	1619 Women	Foetal distress (32.38%), Scar tenderness (20%), CPD (15.74%), Previous CS 1 or more (12.38%), PIH (2.85%), Refusal of vaginal delivery (2.85%), Oligohydramnios/IUGR (2.38%), Breech (2.38%), Big baby-3.5 kg or more (1.42%), Multifetal gestation (1.42%), Malpresentation (1.42%), APH (1.42%), Prematurity (1.42%), Medical disorder (0.95%), BOH (0.95%)
Jain U., (2018)	17.49%	India	Retrospective Cross-sectional Study	768 Women	Previous CS (30.98%), CPD (16.92%), NPOL (7.55%), Fail induction (7.42%), PIH (5.07%), Obstructed Labour (1.30%), Placenta previa (1.04%),Prolong Infertility (0.78%), Abruption (0.52%), BOH (0.52%), Advanced age (0.52%), Foetal distress (7.05%), Breech (5.98%), Severe oligohydramnios (5.46%), Post-term (3.25%), Twin (1.43%), Transverse lie (1.04%), Malposition (1.04%), Large baby (1.04%), Severe IUGR (0.52%), Cord prolapsed (0.52%) Repeat CS: CPD (30.25%), Foetal distress (15.96%), Scar tenderness (14.7%),PIH (10.08%), Oligohydramnios (8.4%), Breech (6.78%), BOH (2.52%), Twin (2.1%), Malpresentation (2.1%), Big baby (1.68%), Previous 2 LSCS (1.68%), IUGR (1.68%), APH (0.84%), Prematurity (0.84%), Medical disorder (0.42%)
Bade et al., (2014)	23.97%	India	Retrospective Cross-sectional Study	2136 Women	Previous CS (24.8%), CPD (17.6%), Failure to progress (16.6%), Threatened rupture (20%), HIV/ Genital lesion (1.2%), APH (2.1%), Obstructed labour (3.1%), Fail induction (2.1%), Foetal distress (11.7%), Malpresentation (3.9%), Multiple gestation (2.9%), Breech (2.9%), IUGR (2.0%), Cord prolapsed (1.2%), Oligohydramnios (2.0%), Other (3.1%)
Subhashini R and Uma N., (2015)	25.66%	India	Retrospective Cross-sectional Study	8121 Women	Primary Emergency CS: Foetal distress (32.03%), CPD + Medical disorders (22.54%), Big baby–3.5 kg or more (11.22%), Pelvic abnormality (4.74%), Precious Pregnancy (4.85%), Malpresentation (3.88%), IUGR (4.31%), Oligoamnios (8.52%) Primary Elective CS: Foetal distress (5.58%), CPD + Medical disorders (26.56%), Big baby (5.58%), Pelvic abnormality (8.4%), Precious Pregnancy (2.92%), Malpresentation (7.88%), IUGR (5.05%) Repeat Emergency CS: Scar tenderness (13.13%), Foetal distress (10.39%), CPD + Medical disorders (6.02%), Big baby (4.14%), Pelvic abnormality (5.52%), Precious Pregnancy (2.53%), Malpresentation (6.91%), IUGR (7.37%) Repeat Elective CS: CPD + Medical disorders (39.81%), Big baby (9.54%), Pelvic abnormality (9.35%), Precious Pregnancy (4.40%), Malpresentation (3,31%), IUGR (7.70%), Oligoamnios (4.58%)
Dayanand R. D., (2015)	25.7%	India	Retrospective Cross-sectional Study	873 Women	Previous CS 1 or mote (45.77%), Foetal distress (14.97%), PIH (8.86%), Malpresentation (6.11%), Failure of Induction (5.06 %), CPD (4.64%), Labour abnormalities (4.43%), APH (3.53%), Multiple pregnancies (2.11%), Oligohydramnios (1.89%), PROM (1.89 %), IUGR (0.63%, Post-terms (0.63%), Medical disorders (0.42%), BOH (1%), Cord prolapse (0.5%), Hand prolapse (0.25%)

(Contd...)

Supplementary Table 2: (*Continued*)

Authors and Year	CS rates	Location of study/ Settings	Study design	Study population/ Sample size	Indications of CS
Bala et al., (2017)	39.6%	India	Retrospective Cross-sectional Study	11477 Women	Previous CS 1 or more (43.07%), Foetal distress (11.15%), Oligohydramnios +_IUGR (9.31%), Breech (7.5%), CPD (5.94%), Arrest of labour (4.61%), PIH+_APE (4.40%), Fail induction (3.67%), APH (2.96%), Obstructed labour (2.59%, DLOC with head floating (2.45%), Malpresentation or abnormal lie (1.06%), Multiple pregnancy (0.48%), Others (medical diseases, BOH, cord prolapse etc.: 0.8%)
Nikhill et al., (2015)	25.18%	India	Retrospective Cross-sectional Study	1632 Women	Previous 1 or more CS (48.90%), Foetal distress (10.94%), NPOL+ fail induction (10.94%), Breech (6.32%), CPD (6.32%), Oligoaminos and/or IUGR (3.89%), APH (2.43%), Pre-eclampsia/PIH (1-94%), Malpresentation (1.94%), Obstructed labour (1.45%), Twins (1.70%), Other (HIV, PROM, Uterus rupture, ovarian cyst, post-term, fibroid, 4 previous CS (3.16%) Elective CS: Previous CS 1 more (78.72%), Previous CS + post-term (1.51%), Previous CS + HIV (3.02%), Breech (9.06%), Fibroid uterus (3.02%), PLHA (1.51%), Ovarian cyst (1.51%), Twin + traverse lie (1.51%) Emergency CS: Previous CS (40.28%), Foetal distress (13.04%), NPOL + fail induction (13.04%), CPD (7.53%), Breech (5.79%), Oligoamines +/or IUGR (4.63%), Obstructed labour (1.45%), Malpresentation (1.94%), Pre-eclampsia/PIH (1.94%), APH (2.89%), Twins (1.70%), Others (4.34%). Primigravida: NPOL (30%), Foetal distress (33%), Breech (20%), CPD (23%), Malpresentation (1%), Obstructed labour (4%), Oligohydramnios/IUGR (15%) Multigravida: NPOL (15%), Foetal distress (12%), Breech (6%), CPD (3%), Malpresentation (7%), Obstructed labour (2%), Oligohydramnios/IUGR (1%)
Sarma et al., (2016)	27.60%	India	Observational Study	2278 Women	Foetal distress (30.99%), Repeat C/S (23.00%, Induction failure (14.00%), PIH (12.99%), Oligohydramnios (5.0%), CPD (2.02%), Malpresentation (3.03%), Obstructed labour (2.94%), APH (2.02%), Prolonged labour (2.99%), BOH (1.01%)
Patil et al., (2017)	48.18%	India	Retrospective Cross-sectional Longitudinal Study	1143 Women	Primary CS: Foetal distress (34.3%), CPD (18.1%), Malpresentation (9.7%), Oligohydramnios with IUGR (8%), APH (1.3%), Severe pre-eclampsia/eclampsia (2.3%), Multiple pregnancy (2.9%), NPOL (12.6%), Fail induction (4.2%), Precious pregnancy (3.2%), Obstructed labour (1.3%) Primary Elective: Malpresentation (22.2%), CPD (20%), Precious Pregnancy (13.3%), Placenta previa/ APH (4.4%), IURG with oligo hydramnios (24.4%), Multiple pregnancy (15.5%) Primary Emergency: Foetal distress (40.2%), NPOL (14.8%), Malpresentation (7.6%), CPD (17.8%), Precious Pregnancy (1.5%), APH (0.8%), Severe oligohydramnios (7.6%), Multiple pregnancy (0.8%), Severe pre-eclampsia/eclampsia (2.7%), Obstructed labour (1.5%) Repeat CS: Scar tenderness (21%), Foetal distress (7.7%), Malpresentation (11.2%), Severe oligo (8.4%), Severe pre-eclampsia/Eclampsia (0.7%), Post-term (0.7%), CPD (8.4%), PROM (5.6%), Precious pregnancy (8.4%), Previous CS (26.5%), Others: Cord around neck, APH (1.4%) Repeat Emergency CS: Scar tenderness (21%), Foetal distress (7.7%), Malpresentation (11.2%), Severe oligohydramnios (8.4%), Severe pre-eclampsia/ Eclampsia (0.7%), PROM (0.7%), CPD (8.4%), PROM (5.6%), Precious pregnancy (8.4%), Previous CS (9.9%), Others: Multiple pregnancy, RHD, APH (1.4%)

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Supplementary Table 2: (*Continued*)

Authors and Year	CS rates	Location of study/ Settings	Study design	Study population/ Sample size	Indications of CS
					Repeat Elective CS: Post-term (1.6%), Malpresentation (16.1%), Severe oligohydramnios with IUGR (16.1%), Severe pre-eclampsia/Eclampsia (1.6%), CPD (16.1%), Precious pregnancy (9.7%), Previous CS (48.5%), Others: Multiple pregnancy, RHD, APH (1.4%)
Desai et al., (2017)	9.5% and 15.6%	India	Retrospective Cress-sectional Longitudinal Study	19923 Women	Tribal mother: Foetal distress (31.2%), Previous Caesarean sections (23.2%), Prolonged Labour (11.2%), Breech (16.0%), Transverse lie (5.2%), Obstructed Labour (2.5%), Placenta previa (2.7%), Multiple births (2.0%), CPD (1.8%), Placental abruption (1.3%), Failed induction of labour (0.7%), PIH (15.8%), Eclampsia (4.8%), Sickle Cell disease (2.8%), Anaemia (5.8%), Oligohydramnios (1.5%), Other (7.7%) Non-Tribal mother: Foetal distress (30.6%), Previous Caesarean sections (12%), Prolonged Labour (33.2%), Breech (12,2%), Transverse lie (2.8), Obstructed Labour (1,7%), Placenta previa (1,6%), Multiple births (1,3%), CPD (1.2%), Placental abruption (1.2%), Failed induction of labour (0.7%), PIH (15.4%), Eclampsia (4.8%), Anaemia (5.8%), Oligohydramnios (1.5%), 0ther (8,4%)
Birla et al., (2016)	31.61%	India	Prospective Cross-sectional Study	4,981 Women	Primary CS/Primigravida: Foetal distress (32.21%), CPD (13.4 %), Breech (12.63%), Failed progress (10.7%), PIH (9.26%), Obstructed labour (8.2%), Oligohydramnios (6.53%), IUGR (6.31%), Failed induction (6.10 %), APE (4.42%), Foetal hypoxia (3.16%), PROM (2.10%), Abruptio placenta (1.89%), UPI (1.68%), Precious pregnancy (1.68 %), DTA (1.47%), Transverse lie (1.26%), Brow presentation (0.84%), Cord prolapse (0.63%), Face presentation(0.21%), Impending eclampsia (0.21%) Primary CS/Multigravida: Foetal distress (17.45%), CPD (13.82%), Breech (10.18%), Failed progress (8.73%), PIH (9.09%), Obstructed labour (6.54 %), Oligohydramnios (7.64%), IUGR (4.73%,) Failed induction (3.64 %), APE (Retrospective Longitudinal Study 0.73%), Foetal hypoxia (2.18%), PROM (4.73%), Abruptio placenta (12.73 %), UPI (2.54 %), Precious pregnancy (0.73%), DTA (0.73 %), Transverse lie (5.45 %), Brow presentation (1.09 %), Cord prolapse (1.45%), Face presentation (0.73%), BOH (11.27 %), Placenta previa (8.73 %), Impending rupture (0.73 %), Vasa previa (0.36%), Cord presentation (0.36% , Medical indication (0.36%)
Jain and Patel, (2016)	18.5%	India	Retrospective Cross-sectional Study	7295 Women	Primary CS: Malpresentation (34.3%), APH/placenta abruption/praevia (5.6%), Non-reassuring foetal status (8.2%), Severe oligohydramnios (3.4%), Meconium stain liquor (22%), Obstructed labour (3.9%), NPOL (4.1%), DTA (0.7%), CPD (0.9% Absent end diastolic flow (0.4%), Failure of induction (12.7 %), Demand LSCS (0.2%), Precious pregnancy in case of infertility (0.7%), Cervical fibroid (0.2%), Cervical dystocia (0.2%), Generalized contracted pelvis (2.6%)
Jawa et al., (2016)	31.8%	India	Retrospective Cross-sectional Study	1645 Women	Previous LSCS (23.90%), Foetal distress (16.06%), Breech (6.69%), CPD (5.93%), PIH (11.66%), APH (3.25%), Obstructed labour (2.10%), Malpresentation (2.68%), Multifetal gestation (2.10%), Oligohydramnios/ IUGR (5.93%) ,Cord prolapse (0.96%), BOH (1.53%), NPOL/failed induction (13.0%), Medical disorders excluding HDP(4.21%) Emergency CS: Previous LSCS (18%), Foetal distress (22%), NPOL (18%), Breech (2.5%), CPD (7%), HDP (14%), APH (4.5%), Obstructed labour (3%), Malpresentation (2%), Oligohydramnios/IUGR (6%), Cord prolapse (0.5%), BOH (1%)

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Supplementary Table 2: (*Continued*)

Authors and Year	CS rates	Location of study/ Settings	Study design	Study population/ Sample size	Indications of CS
					Elective CS: Previous LSCS (38%), Foetal distress (2%), NPOL (5%), Breech (19%), CPD (1%), HDP (6.5%), Malpresentation (4.5%), Oligohydramnios/ IUGR (6.5%), Cord prolapse (0.5%), BOH (4.5%,), Medical disorders (13 %)
Santhanalakshmi et al., (2013)	12.5%	India	Retrospective Cross-sectional Study	530 Women	Previous CS (43.3%),CPD (15.47%),Failed induction (10%), Foetal distress (6.60 %), Malpresentations (3.39 %), Multiple pregnancy (2.45 %), Precious Pregnancy: BOH, infertility (3.96%),Tumours (1.32 %), APH (1.13 %), Uterine malformations (0.18 %), Cervical dystocia (0.18 %), Severe PIH (2.45 %), IUGR (4.9 %), Medical disorders (4.3 %)
Preetkamal and Nagpal, (2017)	33.2%	India	Retrospective Cross-sectional Study	3233 Women	Repeat CS (29.9%), Placenta Previa (3.9%), Abruptio Placenta (2.6%), NPOL (5.4%), CPD (5.3%), Pre-Eclampsia (3.7%), Eclampsia (1.3%), Obstructed labour (0.7%), Fibroid (0.7%), Foetal distress (17.8%), Breech (16.8%), Transverse Lie 1.3%, IUGR (3 .9%), Severe oligohydramnios (3.5%), Twin pregnancy (3.2%)
Chavda et al., (2017)	19.9%	India	Cross sectional study	1000 Women	Previous CS (39.9%), Foetal distress (19.1%), Malpresentation (18.6%), Failed induction (7.3%), CPD (4.8%), Placenta previa (3.5%), Severe Oligo hydramnios (2.0%), Obstructed labour (1.8%), NPOL (0.9%), Cord prolapse (0.8%), Precious pregnancy (0.6%), Multifetal gestations (0.6%), Abruptio placenta (0.2%)
Dhodapkar et al., (2015)	32.6%	India	Retrospective Cross-sectional Study	1123 Women	Antepartum complication (31.2%), CPD (3.6%), Contracted pelvis (5.4%), Foetal distress (1.3%), Not willing for TOLAC (22.4%), Previous 2 LSCS (10.8%), Scar tenderness (2.2 %), Unfavourable cervix (2.0%)
Saxena et al., (2016)	32.18%	India	Retrospective Cross-sectional Study	2,707 Women	Previous CS (33%), Foetal distress (26.2%), Breech (8.8%), Refusal of VBAC (7.5%), Placenta previa (5.8%), NPOL (4.5%), Unclear indications (4.6%), Multiple gestation (3.5%), Failed induction (3.5%), Obstructed labour (3.3%), IUGR/Abnormal Doppler (1.8%), Malpresentation (1.5%), Scar tenderness (1.5%), CPD (1.5%), Previous hysterotomy (0.3%), Oligohydramnios (0.1%), Fibroid (0.1%)
Jayanthi and Ratna, (2017)	43%	India	Prospective Descriptive Study	1929 Women	Elective/Primigravida: Oligohydramnios (29.1%), PIH (11.9%), Breech (19.17%), CPD (9.5%, Short primi (7.6%), Transverse lie (2.33%), Doppler changes (2.3%), Elderly primi (2.3%), Twins (2.3%), Previous abortions (1.91%), GDM (5.4%), Triplets (0.4%), IUGR (3.3%), Fibroid in LUS (0.4%), Placenta previa (0.4%), Contracted pelvis (0.4%), Long marital life (2.3%)
Banerjee et al., (2018)	34.1%	India	Retrospective Cross-sectional Study	75685 Women	Foetal distress (32.8%), Malpresentation (7.33%), Post caesarean pregnancy (26.76%), Failed induction (3.67%, Failed progression (10.5%), CPD (1.84%), Multiple pregnancy (2.7%), Maternal indication (1.9%), Obstetric indication (8.2%), Foetal indication (4.2%)
Mehta et al., (2018)	41.92%	India	Retrospective Cross-sectional Study	4785 Women	Previous 1 CS with scar tenderness (31.22%), Previous 2 CS (11.91%), Foetal distress (20.74%), NPOL (9.34%), Breech (4.67%), PIH/eclampsia (2.97%, Obstructed labour (3.08%), Severe oligohydramnios/IUGR (1.43%), CPD (9.45%), APH (1.64%), Multiple pregnancies (2.05%), Abnormal lies/ compound presentations (1.43%), More than one Indications (3.03%)
Mittal et al., (2014)	28,93%	India	Retrospective Cross-sectional Study	19,990 Women	Primary CS: Foetal distress (11.06%), Arrest of labour (2.42%), Dilatation (1.68%), Descent (0.74%), Malpresentation (3.29%), Multiple gestation (0.52%), Obstetric indication (1.45%), Maternal indication (0.17%), Foetal indication (0.77%), CPD (1.29%)

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Supplementary Table 2: (*Continued*)

Authors and Year	CS rates	Location of study/ Settings	Study design	Study population/ Sample size	Indications of CS
					Repeat CS: Foetal distress (18.67%), Arrest of labour (0.75%), Dilatation (0.65%), Descent (0.10%), Malpresentation (0.64 %), Multiple gestation (0.28%), Obstetric indication (0.19%, Maternal indication (0.04%), Foetal indication (0. 23%), CPD (1.63 %), C2 Caesarean section (1.31%), Scar tenderness (0.72%), Refusal of Vaginal Birth (0.23%)
Ajeet and Nandakishore, (2013)	40.8%	India	Cross-sectional Study	272 Women	Elective CS: Post caesarean pregnancy, Cephalopelvic disproportion Emergency CS: Foetal distress, Failure of progression of labour
Manjulatha and Sravanthi, (2015)	22.4%	India	Retrospective Cross-sectional Longitudinal Study		Post caesarean pregnancy (9.69 %), Obstetric Indications (2.61%: Placenta previa, abruptio placenta, placenta accrete, and cord prolapse), Failed Progression (1.55%), Maternal Indications (1.14%: Vesico-vaginal fistula repair, post myomectomy, complete perineal tear, and medical causes), Multiple gestation (0.32%, Foetal Indications (0. 07%: Intrauterine growth restriction, prematurity, and congenital malformations), Failed Induction (0.40%), Malpresentation (1.98%), CPD (2.66%, Foetal Distress (1.99%)
Gupta and Garg, (2017)	31.46%	India	Retrospective Cross-sectional Study	2959 Women	Previous C-Section (36.52%), Arrest of Labour (13.65%), CPD (12.03%), Foetal Distress (11.82%), Breech (7.52%), Oligohydramnios/IUGR (5.16%), Failed Induction (3.54%), PIH 3.54%, Obstructed labour (2.90%), APH (1.40%), BOH (0.64%), Malpresentation (0.53%), Multifetal gestation (0.32%), Medical disorders excluding HDP (0.21%), Cord prolapse (0.11%), Prematurity (0.11%) Repeat CS: Foetal distress (32.65%), Scar tenderness (20.87%), CPD (15.88%), ≥2 CS (12.65%), PIH (3.24%), Refusal of vaginal birth (3.24%), Breech (2.94%), Oligohydramnios/IUGR (2.94%), Big baby 3.5 kg and more (1.47%), Multifetal gestation (1.18%), Malpresentation (0.88 %), APH (0.59 %), Prematurity (0.59%), Medical disorders excluding HDP (0.59%), BOH (0.29%)
Chhetri and Singh, (2011)	33.7%	Nepal	Prospective Cross-sectional Study	11,964 Women	Meconium stained liquor (22.7%), Previous CS (15.6%), Breech (12.1%), Foetal distress (10.7%), NPOL (16.5%), CPD (5.3%), Placenta previa (5%), Abruptio placenta (0.4%), Failed induction (3.2%), Twin pregnancy (2.1%), Pre-eclampsia (2.1%), Eclampsia (2.1%), Transverse lie (1.9%), Obstructed labour (1.2%), Cord prolapse (0.9%), Deep transverse arrest (1.3%), Bad obstetric history (0.7%), Previous 2 CS (0.9%), Others (4.6%), On request (0.3%)
Subedi S., (2012)	19.89%	Nepal	Retrospective cross-sectional Study	2011 Women	Foetal distress (6.25%), Previous CS (21.25%), Failed induction (11.25%, NPOL (10%), Breech (10%), CPD (4%), Preeclampsia and eclampsia (3.75%), APH (3.25%), Severe Oligohydramnios (2.5%), Multiple pregnancy (2.5%), Obstructed labour (1.5%), Uterine rupture (1.25%), Cord prolapse (1.25%), CS on Demand (1.25%)
Pradhan et al., (2014)	50.9%	Nepal	Retrospective cross-sectional Study	1295 Women	Foetal distress (40.2%), Previous CS (13.5%), Oligohydramnios (8.9%), NPOL (7.8%), Failed induction (5.9%), Breech (5.3%), Cord round neck (4.2%), CPD (2.8%), PIH/preeclampsia (2.7%), BOH (1.5%), Malpresentation (2.8%), APH (1.2%), Maternal request (1.0%), Intrahepatic cholestasis (0.7%), Others (1.45%)
Gurung et al., (2016)	41.26%	Nepal	Retrospective Cross-sectional Study	2627 Women	CPD (28%), Foetal distress (25%), Previous CS (14%), Malpresentation (7%), PROM (6%), Preeclampsia (6%), Failed induction (5%), NPOL (5%), BOH (2%), Twins (1%), APH (1%)

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Supplementary Table 2: (*Continued*)

Authors and Year	CS rates	Location of study/ Settings	Study design	Study population/ Sample size	Indications of CS
Acharya S. and Raut B., (2017)	17.34%	Nepal	Retrospective cross-sectional Study	1367 Women	Previous CS (20.89%), NPOL (17.9%), CPD (16.2%), Failed induction (15.7%), Malpresentation (7.75%), Foetal distress (5.1%), Severe oligohydramnious with unfavourable cervix (6.9%), Gestational hypertension and eclampsia (4.4%), Placenta previa and APH (1.8%)
Dhakal et al., (2018)	18.8%	Nepal	Retrospective cross-sectional Study	3,694 Women	Foetal distress (20.1%), Previous CS (17.8 %), Meconium stained liquor (17.7%), NPOL (17.1%), Breech/malpresentation (15.8%), Failed vacuum/ instrumental (2.3%), Obstructed labour (2.2%), Eclampsia (2.0%), APH/placenta previa (2%), Failed induction (1.7%), Oligohydramnios (0 .1%), Other (1.0%) Emergency CS: Foetal distress (24.3%), Meconium stained liquor (21.3%), NPOL (20.6%), Breech/ malpresentation (13.3%) Elective CS: Previous CS (61.9%), Breech/ malpresentation (28.0%)
Singh et al., (2017)	25%	Nepal	Retrospective cross-sectional Study	2250 Births	CPD (32.21%), Previous CS (21.88%), Foetal Distress (13.87%), PIH (2.30%), Oligohydramnios (9.6%), Breech (6.76%), IUGR (0.71%), Fail Induction (8.18%), Polyhydramnios (0.17 %), BOH (0.93%), Twin (0.93%), APH (2.49%) Elective CS: CPD (35.23%), Previous CS (38.64%), PIH (2.27%), Oligohydramnios (4.55%), Breech (5.52%), IUGR (2.27%), Fail Induction (5.68%), BOH (2.84 %), APH (3.41%) Emergency CS: CPD (30.83%), Previous CS (24.25%), Foetal Distress (20.21%), PIH (2.33%), Oligohydramnios (11.92%), Breech (7.52%), Fail Induction (9.33%), Polyhydramnios (0.26%), Twin (1.30%), APH (2.07%)
Mall et al., (2018)	22.57%	Nepal	Retrospective Cross-sectional Longitudinal Study	4892 Women	Previous CS (28.7%), Foetal distress (18.8%), Abnormal presentation (12.0%), CPD (11.9%), Oligohydramnios (6.3%), Fail induction (5.1%), NPOL (4.2%), PIH (3.8%), APH (3.2%), IUGR (2.6%), Subfertility (2.23%), Others (7.4%)
Poudyal et al., (2014)	39.23%	Nepal	Retrospective Cross-sectional Longitudinal Study	38,770 Women	Emergency CS: Foetal distress (41.9%), Oligohydramnios (9.69%), Previous CS (5.57%), NPOL (5.45%), Failed induction (4.03%) Elective CS: Previous CS (9.4%), Breech (1.9%), Subfertility (1.24%), BOH (1.21%), CPD (0.98%)
Bhandari B.R., (2015)41	42.6%	Nepal	Cross-sectional Study	327 Women	Foetal distress (42.6%), Failed induction (15%), Abnormal presentation (14.6%), Severe oligohydramnios (8%), BOH (5%), NPOL (5%), CPD (3.6%), Prolonged second stage of labour (3%), APH (2%), IUGR (1.2%)
Chaudhary et al., (2018)	63.27%	Nepal	Retrospective Cross-sectional Study	275 Women	Oligohydramnios (41%), CPD (34%), NPOL (29%), Previous CS (25%), Foetal distress (21%), Breech (10%), Twins (2%), APH (2%), Triplets (1%), Others (9%)
Prasad et al., (2017)	45.81%	Nepal	Retrospective Cross-sectional Study	1172 Women	Failed induction (7.3%), Foetal distress (19.55%), Previous LSCS (11.5%), Pervious LSCS with other risk factors (9.8%), CPD (10.8%), Meconium stained liquor (9.6 %), Breech/Malpresentation (8.5%), HDP (2.7%), Oligohydramnios (2.22%), Multiple pregnancy (2.04%), APH (2%), NPOL (0.7%), DTA (0.3%), Others (0.9%)
Rijal P., (2014)	-	Nepal	Prospective Observational Study	348 Women	Failed induction (24.7%), Foetal distress (46.0%), Meconium stained liquor (15.5%), Dystocia (13.8%)
Amatya et al., (2013)	25.4%	Nepal	Retrospective Cross-sectional Study	5907 Women	Foetal distress (33.9%), PROM (1.8%), CPD (3.5%), Previous CS (14.7%), Impending Eclampsia (2.1%), IUGR (2.1%), NPOL (6.7%), Failed induction (4.2%), Infertility (1.8%), Primi breech (5.1%), Oligoamines (7.5%), PIH (2.0%), DTA (0.9%), Others (13.5%)

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Supplementary Table 2: (*Continued*)

Authors and Year	CS rates	Location of study/ Settings	Study design	Study population/ Sample size	Indications of CS
Samdal et al., (2016)	9.5%	Nepal	Cross-sectional Prospective Study	864 Women	Prolonged labour/failed induction (26.4%), Abnormal foetal lie (25.3%), Foetal distress (19.8%), Pelvic anatomy (13.2%), Previous CS (7.7%), Previous traumatic delivery (2.2%), PROM (2.9%), Severe oligohydramnios (3.3%) Primigravida: Prolonged labour/failed induction (33.3%), Abnormal foetal lie (27.8%), Foetal distress (24.1%), Pelvic anatomy (11.1%), Previous traumatic delivery (5.7%), PROM (1.1%), Placenta abruption (1.9%), Severe oligohydramnios (1.9%) Multigravida: Prolonged labour/failed induction (17.1%), Abnormal foetal lie (22.9%), Foetal distress (11.4%), Pelvic anatomy (14.3%), Previous CS (20.0%), Previous traumatic delivery (2.2%), PROM (1.1%), Placenta abruption (1.1%), Severe oligohydramnios (5.7%)
Amatya YR and Sapkota D, (2014)	18.5%	Nepal	Retrospective Cross-sectional Study	369 Women	Oligohydramnios (27.9%), CPD (30.9%), Placenta Previa (1.5%), NPOL (10.3%), Failed induction (2.9 %), Maternal distress (1.5%), Previous CS (2.9%), PROM (1.5%), Malpresentation/Malposition (11.8%), Meconium stained Liquor (32.4%) Elective CS: Oligohydramnios (26.5%), CPD (2.9%), Failed induction (2.9%), Previous CS (1.5%), PROM (1.5%, Malpresentation/Malposition (4.4%) Emergency CS: Oligohydramnios (1.5%), CPD (27.9%), Placenta Previa (1.5%), NPOL (10.4%), Maternal distress (1.5%), Previous CS (1.5%), Malpresentation/ Malposition (7.5%), Meconium stained Liquor (32.5%)
Pradhan et al., (2015)	41.9%	Nepal	Retrospective Cross-sectional Longitudinal Study	44713 Women	CPD (19.9%), Previous CS (16.5%), Foetal distress (14.3%), Meconium stained liquor (12.3%), Failed induction (9.8%), NPOL (8.9%), Breech (4.9%), Severe oligohydramnios (4.5%), APH (2.7%), Twin pregnancy (1.9%)
Latif et al., (2017)	81%	Pakistan	Retrospective Cross-sectional Study	1354 Women	Primigravida: Failure progression (31%), Foetal distress (22%), Fail induction (14%), Malpresentation (14%), PIH (8.3%), Patients' request (2.87%), Chorioamnionitis (2.1%), Precious pregnancy (1.67%), Obstructed Labour (0.47%)
Jabeen et al., (2013)	56%	Pakistan	Cross-sectional Study	3049 Women	Previous scar (40.37%), Failed induction (13.58%), Foetal distress (11.23%), Malpresentation (6.73%), Failure to progress (4.39%), CPD (3.22%), Polyhydramnios (0.47%), Oligohydramnios (4.68%), PIH (3.92%), IUD (0.29%), Preterm (0.70%), APH (1.64%), IUGR (2.05%), Twins (0.53%), Post-term (0.53%), Decreased Foetal movements (0.99%), Poor Bishop (1.05%), PROM (0.76%), BOH (0.29 %), GDM (1.05%), SROM (0.29%), Precious pregnancy (0.47%), Unspecified (0.76%)
Karim et al., (2013)	27.94%	Pakistan	Cross-sectional Descriptive Case Series Method	778 Women	Previous cs (47.17%), Prolonged Labour (6.2%), Obstructive Labour (3.9%), Breech (9.8 %), Foetal Distress (9.2 %), CPD (9.1 %), Pre-eclampsia (5.3%), Eclampsia (1.02%), APH (5%), Abruptio placenta (2.4%), Placenta previa (2.6%), Twins (2.3 %), Miscellaneous - 13.8 %: PROM (2.6%), Bad obstetrical history (2.6%), Medical disorders including GDM (2.2%), Failed induction (2%), IUGR/Scanty Liquor (1.8%), Precious pregnancy (1.3%), Chorioamnionitis (0.9%), H/O Myomectomy (0.5%)} Primary CS: Prolonged Labour (9.5%), Obstructive Labour (7.1%), Breech (15.8%), Foetal Distress (15.1%), CPD (9.9%), Pre-eclampsia (9.5%), Eclampsia (1.5%), Abruptio placenta (4.1%), Placenta previa (3.2%), Twins (3.2%), Miscellaneous (18.2%)

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Supplementary Table 2: (*Continued*)

Authors and Year	CS rates	Location of study/ Settings	Study design	Study population/ Sample size	Indications of CS
					Repeat CS: Previous cs (47.17%), Prolonged Labour (7.5%), Obstructive Labour (0.8%), Breech (10%), Foetal Distress (8.3%), CPD (25%), Pre-eclampsia (1.7%), Eclampsia (1.7%), Abruptio placenta (1.7%), Placenta previa (5,8%), Twins (4.2%), Miscellaneous (27.5%)
Ehtisham et al., (2014)	44.8%	Pakistan	Retrospective Cress-sectional Study	1491 Women	Repeat Caesarean section (30.9%), Previous scar in labour (5.7%), Foetal distress (15.2%), NPOL (13.9%), Breech presentation (6.6%), Pre-eclampsia/Eclampsia (3.9%), Placental abruption (3.1%), Placenta previa (2.8%), Refusal of labour trial (2.7%), IUGR (2.4%), Good size baby (0.6%), GDM/Uncontrolled Diabetes (0.6%), Miscellaneous (11.5%: Twins pregnancy (1.49%), Precious pregnancy /BOH - 2.09%, Scar tenderness (1.57%), Decreased foetal movements (1.2%), Patient wish (1.04%), Maternal medical disorders (2.1%) {*includes medical disorders like epilepsy, cardiac disease, Renal disease, liver disease, obstetric cholestatic and ITP}, Foetal anomalies –0.6% (includes diaphragmatic hernia, hydrocephalus), Fibroids/history of myomectomy (0.4%), Perineal tear (0.29%) Emergency CS: Repeat Caesarean section (1.04%), Previous scar in labour (5.6%), Foetal distress (15.2%), NPOL (13.9%), Breech (3.7%), Pre-eclampsia/Eclampsia (3.2%), Placental abruption (3.1%), Placenta previa (2.24%), Refusal of labour trial (2.24%), IUGR (1.04%), Good size baby (0.14%), GDM/Uncontrolled Diabetes (0.14%), Miscellaneous (6.72%) Elective CS: Repeat Caesarean section (29.89%), Breech (2.8%), Pre-eclampsia/Eclampsia (0.59%), Placenta previa (0.59%), Refusal of labour trial (0.44%), IUGR (1.3%), Good size baby (0.44%), GDM/ Uncontrolled Diabetes (0.44%), Miscellaneous (4.7%)
Tahir et al., (2018)	46.7%	Pakistan	Cross-sectional Study	1,093 Women	Previous CS (59.4%), Foetal distress (26.9%), NPOL (32.2%), Malpresentation (7.7%), PIH (6.0%), BOH (2.2%), Abnormalities of placenta (1.8%), GDM (1.2%), Haemorrhagic disorders (0.5%), Maternal request (0.1%), Other (0.5%) Primary CS: Foetal distress (60.8%), NPOL (36.6%), Malpresentation (14.1%), PIH (8.2%), BOH (4.0%), Abnormalities of placenta (2.3%), GDM (1.4%), Haemorrhagic disorders (0.9%), Maternal request (0.2%), Other (0.9%)
Ishaq et al,, (2017)	13.1%	Pakistan	Retrospective Cross-sectional Study	1192 Women	Previous CS (39.1%), Obstructed labour (12.9%), Long labour (0.8%), Fail induction (3.1%), Breech (4.1%), Foetal distress (2.4%), Cord prolapse (1.4%), Others (36.2%)
Rafique and Raana, (2012)	55%	Pakistan	Retrospective Cross-sectional Study	1115 Women	Previous CS (56.3%), Foetal distress (17.5%); Failure to progress (14.3%), malpresentation (3.2%), PIH (3.2%), Placenta praevia (2.93%), Placental abruption in 6 (0.9%), Twin in 8 (1.3%) Elective CS: Previous CS (23%), malpresentation (2.6%), PIH (3.2%), Placenta praevia (2.6%), Placental abruption (2.6%), Twin in 8 (0.98%) Emergency CS: Previous CS (33.2%), Foetal distress (17.5%); Failure to progress (14.3%), malpresentation (0.65%), PIH (0.98%), Placenta praevia (0.3%), Placental abruption in 6 (0.98%), Twin (0.3%)
Baig et al., (2016)	41.96%	Pakistan	Cross-sectional Study	2874 Women	Previous CS (30.51%), CPD and malpresentation (20.14%), Failed progress of labour (19.0%), Foetal distress (16.08%), Eclampsia/Pre-eclampsia (7.22%), APH (7.05%)

(Contd...)

Supplementary Table 2: (*Continued*)

Authors and Year	CS rates	Location of study/ Settings	Study design	Study population/ Sample size	Indications of CS
Hafeez et al., (2016)	21.40%	Pakistan	Cross-sectional Study	1149 Women	Previous CS (22.26%), Failed progress of labour (18.29%), Foetal distress (15.44%), Breech (14.25%)
Naeem et al., (2015)	21.7%	Pakistan	Cross-sectional Descriptive Study	966 Women	Elective CS: Previous CSs (34.0%), Marked Oligohydramnios (13.0%), CPD (13.0%), PIH (10.8%), Breech (8.6%, Twins with some complication (8.6%), BOH (8.6%), Maternal Wish with bilateral tubal ligation (4.3%), Placenta Praevia (4.3%), Miscellaneous (6.5%) Emergency CS: Foetal Distress (21.9%), Obstructed Labour/Failure to progress (20.7%), Previous (9.7%), Breech (9.7%), Failed Induction (7.3%), APH (6.7%), Primary Dysfunctional Labour (6.4%), Transverse lie (5.5%), CPD (4.3%), PIH/eclampsia (4.3%), Cord Prolapse (2.4%), Twin and first breech (2.4%), Miscellaneous (5.5%)
Goonewardene et al., (2012)	31/8% in 2010	Sri Lanka	Retrospective Longitudinal Study	4689 Women	Previous CS (35.6%), Foetal distress (22.3%), Failure to progress (10.8%), Fail induction (2.5%), Severe preeclampsia (6.6%), Cervix unfavourable for IOL (7%), Primigravida: Elective CS: Foetal distress (23%), Primary Subfertility (14%, Elderly mother (9%), CPD (7%), Cervix unfavourable for IOL (7%) Emergency CS: Foetal distress (46-53%), Fail induction (18%), Fail progression of Labour (29-41%) Multigravida: Emergency CS: Foetal distress (54-61%), Fail induction /fail progression (30-39%) Elective CS: Foetal distress (17%), Vaginal varices (22%), BOH (11%)
Goonewardene et al., (2016)	31.4%	Sri Lanka	Retrospective Longitudinal Study	3174 Women	Previous CS (36.2%), Foetal distress (21.2%), Failure to progress in labour (3.9%), Fail induction (1.9%), Severe preeclampsia (3.8%)
Kim et al., (2012)	Varied <2–28%	Afghanistan	Cross-sectional Study	173 Women	Placenta praevia/abruption (17.7%), Maternal distress (2.4%), Previous scar (8.9%), Eclampsia/ severe pre-eclampsia (4.1%), CPD/prolonged labour (27.2%), Vesico-vaginal fistula (0.6%), Cord prolapse/presentation (3%), Foetal distress (12.4%), Malpresentation (14.2%), Multiple gestation (0.6%), No information (8.9%) Emergency CS: Placenta praevia/abruption (19.2%), Maternal distress (2%), Previous scar (7.3%), Eclampsia/severe pre-eclampsia (4%), CPD/prolonged labour (27.8%), Cord prolapse/presentation (3.3%), Foetal distress (13.2%), Malpresentation (14.6%), Multiple gestation (0.7%), No information (7.9%) Elective CS: Placenta praevia/abruption (5.6%), Maternal distress (5.6%), Previous scar (22.2%), Eclampsia/severe pre-eclampsia (5.6%), CPD/ prolonged labour (22.2%), Vesico-vaginal fistula (5.6%), Foetal distress (5.6%), Malpresentation (22.2%), No information (5.6%)

Supplementary Table 3: Summary of significant factors associated with rising CS rates in South Asia

Authors and Year	Study setting	Study design	Sample Size	Major findings: Statistically significant factors associated with rising CS rates
Khanal et al., 2016	Nepal	Community-based Cohort Study	735 women having an infant <1 year	Urban women (AOR: 3.41, 95% CI: 2.01–5.78. P<0.001) Women education secondary and above (AOR: 2.56, 95% CI: 1.28–5.14, <0.001) Parity: Primiparous (AOR: 1.85, 95% CI: 1.16–2.95, P<0.010)
Karkee et al., 2014	Nepal	Prospective Community-based Cohort	658 women/ births	Higher age (OR: 1.08, 95% CI:1.02–1.15, P< 0.004) Higher education: • Primary (OR:1.65, 95% CI:0.52–5.21) • Secondary (OR: 2.12, 95% CI: 0.70–6.3) • College (OR: 3.43, 95% CI: 1.17–10.07, P< 0.040) Residential location: Urban (OR: 2.94, 95%CI:1.68–5.15, P< 0.001) Intrapartum complications (severe bleeding, prolong labour, swollen hand/body etc.): Yes (OR: 4.15, 95% CI: 2.49–6.9, P< 0.001)
Rijal et al., 2014	Nepal	Hospital-based Prospective Cohort Study	348 pregnant women induced during labour	3 doses of misoprostol (OR: 6.027, 95% CI: 1.832–19.839, P 0.003) Prolonged latent phase of labour (OR: 16.039, 95% CI: 3.985–64.551, P<0.000) Prolonged active phase of labour (OR: 9.627, 95% CI: 3.914–23.684, P<0.000) Birth weight <4kg (OR: 4.384, 95% CI: 1.702–11.109, P<0.002) Bishop's score 5 or more (OR: 1, 95% CI: O.13-0.816, P<0.034)
Neuman et al., 2014	Bangladesh (rural), India (rural and urban) and Nepal Rural)	Cross-sectional Study	45327 births (21 560 in rural Bangladesh, 8541 in rural India, 10 236 in urban India and 4931 in rural Nepal).	Place of birth: Private hospitals • Bangladesh (OR:6.82, 95% CI: 5.96–7.81 and AOR: 5.91,95% CI: 5.15–6.78) • Nepal (OR: 2.42, 95% CI: 1.48–3.94, and AOR: 2.37, 95% CI: 1.62–3.44) • Urban India (OR: 1.36, 95% CI: 1.21–1.52 and AOR: 1.22, 95% CI: 1.09–1.38) ANC 4 visits +: • Bangladesh (AOR: 1.46, 95% CI: 1.26–1.69) • Nepal (AOR: 1.92,95% CI: 1.43–2.58) Serious complications in pregnancy/delivery: symptoms of eclampsia • Rural India (AOR: 1.77, 95% CI: 1.17–2.67) • Urban India (AOR:1.71, 95% CI:1.39–2.11) • Nepal (AOR: 4.87, 95% CI: 2.51–9.47) Multiple birth: • Urban India (AOR: 3.01, 95% CI: 2.14–4.23) • Nepal (AOR: 3.42, 95% CI:1.77–6.61 Higher maternal age: Urban India (AOR: 1.79, 95% CI: 1.27–2.53) Wealth quintile: Richest women • Bangladesh: (AOR: 1.36, 95% CI: 1.09–1.70) • Rural India (AOR: 2.16, 95% CI: 0.87–5.33) • Urban India (AOR: 1.50,95% CI: 1.2—1.78) Education of women: • Bangladesh: Secondary (AOR 1.44, 95% CI 1.13 to 1.84) and bachelor's or higher (AOR 2.44, 95% CI 1.52 to 3.92) • Urban India: Secondary (AOR 1.22, 95% CI 1.04 to 1.42) and bachelor's or higher 1.62, 95% CI 1.30 to 2.02, P<0.001)
Desai et al., 2017	India	Cross-sectional Longitudinal Study	19923 births	Higher age of women: • Tribal mother: 25–29 (AOR: 1.9, 95% CI: 1.40–2.8, P<0.000), 30 and above (AOR: 3.32, 95% CI: 2.19–5.03, P<0.000) Higher education: • Non-tribal women: 8–12 years (AOR: 1.45, 95% CI: 1.07–1.98, P<0.018), 12 years and more (AOR: 0.73, 95% CI: 0.54–0.98, P<0.039) Low Parity: Primiparous Tribal women and Non-tribal women (P< 0.000) History of previous CS: • Tribal women (AOR: 44.7, 95% CI: 34.74–57.51, P<0.000) and Non-tribal (AOR: 57.51, 95% CI: 41.97–78.82, P<0.00). ANC visits 3 or more: • Non-tribal (AOR: 1.67, 95% CI: 1.16–2.41, P<0.006) Distance from the health facility 26–50 Kilometres: • Tribal (AOR: 1.31, 95% CI: 1.07–1.59, P<0.007)

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Supplementary Table 3: (*Continued*)

Authors and Year	Study setting	Study design	Sample Size	Major findings: Statistically significant factors associated with rising CS rates
Begum et al., 2017	Bangladesh	Retrospective Cross-sectional Study	2549 Births	Higher age of mother: • 30–34 years (AOR: 2.15, 95% CI: 1.48–3.29, P<0.005) and 35 years or more (AOR: 2.00, 95% CI: 1.18–3.40, P<0.005) Higher education: • Higher secondary and above (AOR: 2.06, 95% CI: 1.24–3.25, P<0.005) Birth order: • 1 (AOR:1), 2 (AOR: 0.56, 95% CI: 0.46–0.76, P<0.005) and 3 or more (AOR:0.32, 95% CI: 0.23–0.44, P<0.005) Wealth Quintiles: • Rich (AOR: 1.90, 95% CI: 1.37–2.58, P<0.005) and Richest (AOR: 2.47, 95% CI: 1.78–3.34, P<0.005) Number of ANC visits: • 3 (AOR:1.40, 95% CI: 1.11–1.76, P<0.005) and >3 (AOR: 2.19, 95% CI: 1.67–2.82, P< 0.005) History of foetal loss (AOR: 1.38, 95% CI: 1.10–1.73, P<0.005)
Ajeet and Nandkishore, 2013	India	Cross-sectional Study House to house survey	272 Women who had a child under five years	Place of delivery: Private/nursing home (AOR: 2.73, 95% CI: 1.51–4.94, P<0.05) Pregnancy duration: Pre/post-term (AOR: 1.85, 95% CI: 1.01–3.39, P<0.05) Socioeconomic status: Rich (Class I, II, and III) (AOR: 2 .53, 95% CI: 1.45–4.40, P<0.05)
Yadav et al., 2015	India	Cross-sectional Longitudinal Study	40,086 births	Birth weight >4 Kg (Coefficient: - −0.09257, P<0.0001) Abnormal foetal presentation (Coefficient: 0.7302, P<0.0001) Increasing gestational age (>37 weeks) (Coefficient: −0.4523, P<0.001) Increasing maternal age (>35 years) (Coefficient: 0.01187, P<0.0001) Parity: Nulliparous (Coefficient: −0.1158, P<0.0001)
Ali et al., 2018	Pakistan	Questionnaire Survey using DEMATEL method	Gynaecologists working in either public or private hospitals	Medical factors: • Obesity (Matrices value: ri+ci = −45.35909106, ri−ci = 1.748565604) • Age of mother (Matrices value: ri+ci = −31.8434601, ri−ci = 2.172376183) • Umbilical cord prolapse (Matrices value: ri+ci = −31.54166732, ri−ci = 0.630270284) Non-medical factors: • Patient's preference towards CS (Matrices value: ri+ci = 85.76431003, ri−ci = 7.654406112) • Increasing number of private hospitals (Matrices value: ri+ci = 86.36295414, ri−ci = 7.836383342) • The poor condition of public hospitals (Matrices value: ri+ci = 78.90532342, ri−ci = 0.32802823) • The unavailability of good quality health care and hospital in rural areas (Matrices value: ri+ci = 77.82678084, ri−ci = 0.709594802)
Hasan et al., 2015	Bangladesh	Cross-sectional Study	194 Women interviewed within 24–48 h after giving birth	Overweight of mother (P<0.01); underweight (OR: 0.021, 95% CI: 0.002–0.196, P<0.01) and normal weight women (OR: 0.048, 95% CI: 0.013–0.176, P<0.01) Higher age of mother: 25 year and above (P<0.01); 15–20 years (OR: 0.050, 95% CI: 0.010–0.248, P<0.01) and 20-25 years (OR: 0.140, 95% CI: 0.410–0.479). Higher education of mother's education (P<0.05); primary educated women (OR: 0.192, 95% CI: 0.045–0.818, P<0.05). Using contraceptive method (P<0.01); Women using contraceptive Devices (OR: 0.229, 95% CI: 0.076–0.687, P<0.01) History of previous CS (P<0.01); Women who did not have history of CS (OR: 0.008, 95% CI: 0.023–0.414, P<0.01). • Mother's weight: Underweight (OR: 0.021, 95% CI: 0.002-0.196, P<0.01) and normal weight women (OR: 0.048, 95% CI: 0.013-0.176, P<0.01) were very less likely having a CS than overweight women. • Previous CS: Women who did not have history of CS (OR: 0.008, 95% CI: 0.023–0.414, P<0.01) were very less chances having a CS than women who had a previous CS.

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Supplementary Table 3: (*Continued*)

Authors and Year	Study setting	Study design	Sample Size	Major findings: Statistically significant factors associated with rising CS rates
Rahman et al., 2014	Bangladesh	Cross-sectional Study Interview	1142 women admitted in hospitals for giving birth	History of previous CS (OR: 20.184, 95% CI: 10.464–25.582, P<0.01) Pregnancy-induced swollen Leg (OR: 1.334, 95% CI: 0.994–1.790, P<0.05) Prolonged labour (OR: 0.172, 95% CI: 0.127–0.235, P<0.01) Mother's education: Secondary (OR: 2.199, 95% CI: 1.551–3.118, P<0.01) and higher (OR: 2.687, 95% CI: 1.588–4.549, P<0.01) Mother's Age: 25-29 (OR: 2.740, 95% CI: 1.588–4.729, P<0.01) and 30+ (OR: 5.078, 95% CI: 2.319–11.123, P<0.01) Duration of taking balanced diet: Rarely (OR: 1.870, 95% CI: 1.244-2.818, P<0.05) and once a week (OR: 1.457; 95% CI: 0.953–2.229, P<0.01) Length of baby >45 cm (OR: 1.456, 95% CI: 1.048–2.023, P<0.05), Order of Bi • rth: 1 (OR: 1), 2 (OR: 0.744, 95% CI: 0.493–1.125, P<0.01)

Supplementary Table 4: Summary of Quality Assessment of included Studies using CASP check lists (CASP Scores)

Studies	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Total score
Acharya et al., 2017[27]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Amatya et al., 2013[28]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Ara et al., 2018[29]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Bade et al., 2014[30]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Bala et al., 2017[31]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Banerjee et al., 2018[32]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Bhandari et al., 2017[33]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Begum et al., 2017[34]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Chaudhary et al., 2018[35]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Chavda et al., 2017[36]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Chhetri et al., 2011[37]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Das et al., 2018[38]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Desai et al., 2017[39]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Dhakal et al., 2018[40]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Dhodapkar et al., 2015[41]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Ehtisham et al., 2014[42]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Goonewardene et al., 2012[43]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Gupta et al., 2017[44]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Hafeez et al., 2014[45]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Gurung et al., 2016[46]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Ishaq et al., 2017[47]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Jain et al., 2018[49]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Jawa et al., 2016[49]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Karim et al., 2011[50]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Dayanada et al., 2015[51]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Malla et al., 2018[52]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Manjulatha et al., 2015[53]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Mehta et al., 2018[54]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Mittal et al., 2014[55]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Nazneen et al., 2011[56]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Naeem et al., 2015[57]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Nikhil et al., 2015[58]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Pradhan et al., 2014[59]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Pradhan et al., 2014[60]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Preetkamal et al., 2017[61]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Samdal et al., 2016[62]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Santhanalakshmi et al., 2016[63]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Sarma et al., 2016[64]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Singh et al., 2018[65]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Subedi et al., 2018[66]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Tahir et al., 2018[67]	3	3	3	3	3	NA	3	3	3	3	3	3	33

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Supplementary Table 4: (*Continued*)

Studies	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Total score
Jabeen et al., 2013[68]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Saxena et al., 2016[69]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Aminu et al., 2014[70]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Rijal et al., 2014[71]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Baig et al., 2016[72]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Kim et al., 2012[74]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Rafique et al., 2012[75]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Prasad et al., 2017[76]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Islam et al., 2015[77]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Amatya et al., 2014[78]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Patil et al., 2017[79]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Subhashini et al., 2015[80]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Sultana et al., 2017[81]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Birla et al., 2016[82]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Jain et al., 2016[83]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Jayanthi et al., 2017[85]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Latif et al.,2017[86]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Paudyal et al., 2014[84]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Goonewardene et al., 2016[86]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Ajeet et al., 2013[84]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Khanal et al., 2016[87]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Karkee et al., 2014[94]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Yadav et al., 2016[88]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Neuman et al., 2014[89]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Ali et al., 2018[91]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Hasan et al., 2015[92]	3	3	3	3	3	NA	3	3	3	3	3	3	33
Rahman et al., 2014[93]	3	3	3	3	3	NA	3	3	3	3	3	3	33

Studies	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Total score
Sultana et al., 2017	2	1	1	1	1	NA	1	2	2	2	2	2	17
Gurung et al., 2017	2	2	1	1	1	NA	1	2	2	2	2	2	18
Suwal et al., 2013	2	2	1	1	2	NA	1	2	2	2	2	2	19

Supplementary Table 5: Indications for CS reported by studies in South Asia

Indications for CS	%	References
1. Medical and obstetrical Indications		
Foetal Clinical Characteristics		
Foetal distress	1.3–46%	27-54,56,58-76,78
Reduced foetal Movement	0.99–1.1%	42,68,70
Breech/Primiparous breech	2.38–16.8%	28,30,31,35,37-40,42,44,45,50,54,56,58-
Malpresentation/Abnormal presentation	0.53–34.3%	61,65,66,69,70,75,77
		27,29-34,36,38,40,44,46,49,51-53,55,58,60,63,64,67-70,72-74
Malposition	1.04%	31,48,54
Transverse lie/Abnormal lie	1.04–25.3%	31,37,39,48,54,61,62,77,83
Deep Transverse Arrest (DTA)	0.3–1.3%	28,37,75
Intra-uterine growth retardation (IUGR)	0.52–9.31 %	28,30,31,33,42,44,48,49-54,56,58,61,63,65,68,69
Abnormal Doppler	1.8%	69
Intra-uterine Death (IUD)	0.29%	68
Foetal anomalies/malformation	0.6%	42,53
Big baby - 3.5 kg or more	0.59–1.42%	38,42,48
Post-term	0.63–13%	29,34,48,51,56,58,68,70,76
Pre-term/Prematurity	0.11–5.6%	29,38,46,53,68
Oligohydramnios/Severe oligohydramnios	0 .1–27.9%	27-31,33,35,36,38-40,44,48-52,54,58,59-62,64-70,75-77
Polyhydramnios	0.17%	65,68
Amniotic fluid disorder	14%	34
Meconium stained liquor	9.6–32.4%	37,40,59,71,75,77
Multiple gestation/pregnancy (Twins/Triplets)	0.32–3.5%	29,30,31,32,35-39,42,44,46,48-51,54,55,58,59,61,63,65,66,68,69,70,73-75
Premature Rupture of Membrane (PROM)	1.1–6%	28,29,46,50,51,58,62,68,70,76,77
Spontaneous rupture of membrane (SROM)	0.29%	68
Chorioamnionitis/leaking	0.59–0.9%	42,50
Cord prolapse/Presentation/round neck	0.1–4.2%	30,31,36,37,44,47-49,53,60,66
Maternal Clinical Characteristics		
Cephalo-pelvic disproportion (CPD)	0.9–30.9%	27,28,30-33,35,36-39,41,44,46,48-56,58-61,63-66,68-70,72,73,75,77
Contracted pelvis/pelvic anatomy	2.6–5.4%	41,62
PIH/Pre-eclampsia/Eclampsia/HDP	0.21–15.8%	27,28,34,37-40,42-44,46,48-52,54,56,58,60,61,63,65-68,70,72-78
APH/Placenta praevia/Abruptio placenta	0.2–7.05%	27,29-31,33,35-40,42,44,48-54,56,58-66,68-70,72-77
Abnormalities of placenta	1.8%	67
Maternal distress	0.4%	70,73,77
Scar tenderness	1.5–31.22%	38,42,41,54,69
Perineal tear	0.29%	42,53,70
Advanced age /Older primipara	0.4–0.52%	42,48
Uterine malformations	0.18	63
Threatened rupture/uterine rupture	1.25–20%	30,66
Previous hysterotomy/myomectomy	0.3%	42,50,53,69
Medical disorders/conditions (Cervical fibroid/Fibroid Gestational diabetes mellitus/Diabetes mellitus, Rhesus incompatibility, Anaemia, Sickle Cell disease, Recurrent Urinary Tract Infection, Vesico-vaginal fistula, HIV/Genital lesion, Tumours, Intrahepatic cholestasis, Haemorrhagic disorders)	0.2–5.8%	29,30,31,38,39,42,44,49-51,53,58,60,61,63,67-70,73
Obstetrics history		
Previous CS 1 or more	2.9–48%	27,28-48,50-52,54,56,58,59-70,72-78
Refusal of Vaginal Birth After Caesarean Section (VBAC)	2.85–22.4%	38,41,42,69
History of subfertility/Infertility	0.78–4.99%	28.29,48,63
Bad Obstetrics History (BOH)	0.29–5%	29,31,33,37,38,42,44,46,48-50,52,60,63-65,67,68,70
Labour abnormalities		
Obstructed Labour	0.4–3.9%	30,31,34,36,37,39,40,47,48,50,54,58,61,64,66,69,70
Prolonged Labour	0.8–33.2%	,76
		29,33,34,47,50,56,64,70,73,76
Labour abnormalities	4.43%	51
Arrest of labour/Dilatation/Descent	0.74–13.65%	31,44,55
Non-progress/Failure to progress (NPOL)	0.7–29%	27,28,30,32,33,35-37,40,42,43,45,46,48,49,52-54,58-61,66-69,72,75,77,78

(Contd...)

Supplementary Table 5: (*Continued*)

Indications for CS	%	References
Failed induction	0.40–15.7%	27,28,30-33,36,37,39,40,43,44,46-53,56,58-60,63-66,68-71,75,77,78
Dystocia	13.8%	71
Failed vacuum/instrumental	2.3%	40
Poor Bishop	1.05%	68
Cervical dystocia	0.2–7.7%	29,56,63
Unfavourable cervix	0.9–6.9%	27,41,70
Others	0.5–36.2%	34,35,37,39,40,47,52,60,75,76
2. Non-medical indications27		
Maternal choice/Request/Demand	0.1–3.97%	29,37,42,56,66,67
Labour pain	0.2 %	70
Previous traumatic birth experience	2.2%	62
Precious pregnancy	0.47–3.96%	36,42,50,63,68
No indication recorded/Unspecified	0.6–8.9%	68.70,73,76

Supplementary Table 6: Indications for elective CS and emergency CS

Indications	Elective CS		Emergency CS	
1. Medical and Obstetric Indications	**%**	**References**	**%**	**References**
Foetal Clinical Characteristics				
Foetal distress	2–23%	42,43,49,73,83	7.7–61%	40,42,43,49,57,58,65,70,73,7
Reduced foetal Movement	1.2%	70	1.1%	4,79,80,81,83,85 70
Breech	1.9–19.17%	40,42,57,58,65,70,79,82	2.5–9.7%	40,42,49,57,58,65,70
Malpresentation	0.6–22.2%	40,29,49,57,58,70,73,74,77,80,82,83	1.94–14.6%	40,49,57,58,70,73,74,77,80,83
Oligohydramnios/Sever oligohydramnios	4.58–29.1% -	49,57,65,70,77,80,82,84 -	7.6–11.92% 0.26%	49,58,65,70,77,79,80,83 65
Polyhydramnios	-	-	21.3-32.5%	40,77
Meconium stained liquor				
Intrauterine Growth Retardation (IUGR)	1.3–24.4% 2.3%	42,49,65,80,82.83 83	1.04–7.37% -	42,49,58,83 -
Doppler changes				
Multiple pregnancy/Twins/ Triplets	0.4–15.5%	29,57,58,70,80,82	0.30–1.70%	57,58,65,70,73,74,80
Big baby–3.5 kg or more	0.44–9.54%	42,83	0.14–11.22%	42,83
Post-term	1.6–4.1%	42,58,70,80	2.5%	70
Cord prolapse/presentation	0.5%	49	0.5–3.3%	49,57,74,70
Premature Rupture of Membrane (PROM)	1.5%	77	0.7–9.9%	70,80
Hydrocephalus	2.3%	80	-	-
Maternal Clinical Characteristics				
Cephalopelvic disproportion (CPD)	0.98-39.81%	43,49,57,65,70,73,79,80-83 80,82	2.5–39.89% 4.74–5.52%	49,57,58,65,70,73,80,83,85 80
Contracted pelvis/Pelvic abnormality	0.4–9.35%			
PIH/HDP/Pre-eclampsia/ Eclampsia	0.59–12.4%	29,42,49,57,65,83,70,73,74,80	0.7–14%	42,49,57,58,65,70,73,74,80,85
APH/Placenta praevia/abruption	0.4–5.6%	29,42,49,57,65,73,74,80,82	0.8–6.7%	49,57,58,65,70,73,74,77,80,85
Short stature primipara	7.6%	82	-	-
Maternal distress	5.6%	73	0.6–2%	70,73,77
Elderly mother/Elderly primipara	1.2–9%	43,70,82	-	-
Scar tenderness	-	-	13.13–37%	82,85
History of subfertility	1.24–14%	29,43,83,84	-	-
Medical disorders (GDM/ Uncontrolled mellitus, Fibroid, PLHA/HIV, Ovarian cyst Vaginal varices, Vesico-vaginal fistula, Rhesus incompatibility, Recurrent UTI, RHD, Anaemia etc.)	0.4–39.81%	29,42,43,49,58,70,73,80,82,83	0.14–22.54 %	42,70,80,85
Obstetrics history				
Previous CS 1 or more	9.4–78.72%	29,40,42,49,57,58,65,70,73,74,77,79-82	1.04–40.28%	42,49,57,58,65,70,73,74,77, 79,80,85
Refusal of vaginal birth after CS (VBAC)	0.44%	42	2.24%	42
Bad obstetric history (BOH)	1.21–11%	29,43,49,57,65,70,79	0.3–2.0%	49,70,85
Previous abortions	1.91%	82	-	-
Labour abnormalities				
Non-progress/failure of labour (NPOL)	0.5 %	49	5.45–41%	40,42,43,49,57,58,77,79,81
Obstructed labour	-	-	1.5–20.7%	49,57,58,70,80,85
Prolong labour	2.3%	73	6.0%	70,84
Unfavourable cervix	1.2–7%	43,70	0.8–0.9%	70
Failed Induction	2.9-5.68%	65,77	4.03–18%	43,57,58,65,70,79
Failed trial labour	-	-	4.0%	79
Others	4.7–6.5%	42,57	4.34–6.72%	42,57,58
2. Non-medical Indications				
Maternal request	4.3–5.1%	29,57	-	-
Precious pregnancy	2.92–13.3%	80,83	1.5–8.4%	80,83
Labour pain	-	-	0.3%	70
No indication/information	0.6–5.6%	70,73	7.9%	73

Supplementary Table 7: Indications for primary CS and repeat CS

Indications	Primary CS		Repeat CS	
1. Medical and Obstetric Indications	**%**	**References**	**%**	**References**
Foetal Clinical Characteristics				
Foetal distress	5.58–60.8%	50,55,67,70,89,83,86	5.96–32.65%	44,48,50,55,80,83
Non-reassuring foetal status	8.2%	84	-	-
Foetal hypoxia	3.16%	86	-	-
Absent end diastolic flow	0.4%	84	-	-
Malpresentation,	3.29–34.3%	55,67,80,83,84	2.94–10%	44,48,50
Breech	15.8–19.17	50,70,86	0.64–16.1%	44,48,55,80,83
Deep transverse arrest (DTA)	0.7–1.47%	84,86	-	-
Transverse lie	1.26%	86	-	-
Brow presentation	0.84%	86	-	-
Face presentation	0.21%	86	-	-
Multiple gestation/pregnancy (Twins/Triplets)	0.4–15.5%	50,55,80	0.28–4.2%	44,48,50,55,80
Severe Oligohydramnios/Oligohydramnios	3.4–29.1%	80,83,84,86	4.58–8.4%	44,48,80,83
Meconium stain liquor	22%	84	-	-
Intrauterine Growth Retardation (IUGR)	3.3–6.31%	80,83,86	1.68–7.70%	44,48,80,83
Premature Rupture of Membrane (PROM)	2.10%	70,86	0.7–5.6%	80
Cord prolapse /cord round neck	0.63%	86	1.4%	80
Big baby–3.5 kg or more	5.58–11.22%	83	1.68%	44,48,83
Prematurity	-	-	0.59–0.84%	44,48
Post-term	-	-	0.7–1.6%	80
Hydrocephalus	-	-	2.3%	80
Maternal Clinical Characteristics				
Cephalopelvic disproportion (CPD)	0.9–20%	50,55,70,80,83,84,86	1.63–30.25%	44,48,50,55,80,83
Pelvic abnormality/Contracted pelvis	0.4–8.4%	84,85	5.52–9.35%	80
APH/Placenta previa/Abruptio placenta	0.4–5.6%	50,80,84,86	0.59–5.8%	44,48,50,80
Abnormalities of placenta	2.3%	67		
Uteroplacental insufficiency (UPI)	1.68%	86		
PIH/Severe pre-eclampsia/eclampsia	2.3–11.9%	50,67,80,84,86	0.7–10.08%	44,48,50,80
Scar tenderness		-	0.72–21%	44,48,55,80,83
Medical disorders (RHD, Cervical fibroid, GDM, Haemorrhagic disorders)	0.4–5.4%	67,84	0.42–2.3%	44,48,80,83
Obstetric history				
Bad obstetrics history (BOH)	4.0%	67	0.29–2.52%	44,48
Previous CS 1 or more	-	-	1.31–48.5%	44,48,50,55,70,83
Refusal of Vaginal Birth	-	-	0.23–0.23	44,55
Labour abnormalities				
Obstructed labour	1.3–8.2%	50,70,80,84,86	7.5%	50
Prolonged Labour	9.5%	50	0.8%	50
Non/fail progression of labour (NPOL)	12.6–36.6%	67,70,80,84,86	-	-
Cervical dystocia	2.42%	55,84	-	-
Arrest of labour/Dilatation/Descent	0.2–1.68%	55	0.10–0.75%	55
Fail induction	4.2–12.7%	70,80,84,86	-	-
Others	0.9–18.2%	50,67	0.10–0.75%	55
2. Non-medical indications				
Maternal request	0.2%	67,82	-	-
Precious Pregnancy	1.5–13.3%	80,83,84,86	2.53–9.7%	80,83

Supplementary Table 8: Indications for CS in terms of parity

Indications of CS	Primigravida		Multigravida	
1. Medical & Obstetric Indications	**%**	**References**	**%**	**References**
Foetal Clinical Characteristics				
Foetal distress	8.3–53%	43,58,62,70,86,87,	11.4–61%	43,58,62,86
Foetal hypoxia	3.16%	86	2.18%	86
Malpresentation	1–14%	58,87	7%	58
Breech	12.63%	58,82,86	6–10.18%	58,86
Brow presentation	0.84%	86	0.73%	86
Face presentation	0.21%	86	1.09%	86
Abnormal foetal lie/Transverse lie	1.26–27.8%	62,82,86	5.45–22.9%	62,86
Deep Transverse Arrest (DTA)	1.47%	86	0.73 %	86
Oligohydramnios/Severe oligohydramnios	1.9–29.1%	58,62,82,86	1–7.64%	58,62,86
Chorioamnionitis	2.1%	86	-	-
Premature Rupture of Membrane (PROM)	2.10%	86	1.1–4.73%	62,86
Intra-uterine Growth Retardation (IUGR)	3.3–6.31%	58,82,86	1–4.73%	58,86
Doppler changes	2.3%	82	-	-
Multiple pregnancy (Twins /Triplets)	0.4–2.3%	82	-	-
Post-term	19%	70	-	-
Cord prolapse/Cord presentation	0.63%	86	0.36–1.45%	86
Vasa previa	-	-	0.36%	86
Maternal Clinical Characteristics				
Cephalo-pelvic Disproportion (CPD)	7%–23%	43,58,70,82,86	3–13.82%	58,86
Contracted pelvis/Pelvic anatomy	0.4–11.1%	62,82	14.3%	62
PIH\Eclampsia/HDP	0.21–11.9%	82,86,87	9.09%	85
Elderly primipara /Elderly mother	2.3–9%	43,82	-	-
Short stature primipara	7.6%	82	-	-
Placenta previa/Placenta abruption	0.4–1.9%	62,82,86	1.1–12.73%	62,86
Uteroplacental insufficiency (UPI)	1.68%	85	2.54 %	86
Medical disorders (GDM, Fibroid in uterus,	0.4–5.4%	82	-	-
Vaginal varices)	-	-	22%	43
Obstetric history				
Primary Subfertility/Long marital life	2.3–14%	43,82	-	-
Previous abortions/Bad obstetric history (BOH)	1.91%	82	11–11.27 %	43
Previous CS	-	-	20%	62
Labour abnormalities				
Obstructed labour	0.47–8.2%	58,85,87	2–6.54 %	58,86
Prolonged labour	33.3%	62	17.1%	63
Non/Failed progress of Labour (NPOL)	10.7–41%	43,86,87	8.73–15%	43,58
Failed induction	6.10–33.3%	43,86,87	3.64–39 %	43,63,86
Unfavourable cervix	7%	43	-	-
2. Non-medical Indications				
Patients' request	2.87%	87	-	-
Precious pregnancy	1.67–1.68%	89,87	-	-
Previous traumatic birth experience	-	-	5.7%	62

2.5 Summary of the chapter

The scoping reviews revealed that CS rates are rising in city hospitals in South Asia, including Nepal. The rate of CS is higher in private hospitals compared to public hospitals. The rising rate of CS is a major public health problem that must be addressed urgently. The WHO stresses that CS must be performed only for medically indicated reasons but performing CS for non-medical reasons is also common. The Robson classifications is recommended by the WHO to assess, compare and monitor CS rate within health facilities and between health facilities and use of this classification is rising in South Asia.

Several key indications and key factors for rising CS rates in South Asia are revealed by the systematic review. The key indications were foetal distress and previous CS. Similarly, higher maternal age, higher maternal education (sociodemographic factors), previous CS, complications in pregnancy (medical factors), maternal preference of CS and increasing private hospitals (non-medical factors) are main factors for rising rates of CS in South Asia.

Chapter 3 METHODOLOGY and METHODS

3.1 Introduction

This chapter describes the methodology and methods used for this cross-sectional mixed methods study. It summarises the philosophical assumptions and the paradigm associated with mixed methods and its methodology. It includes an introduction to the chosen philosophical underpinning, methodology, the rationale for using a mixed methods approach, as well as details on the individual methods used in the study. Additionally, this chapter includes the pilot study and ethical considerations.

3.2 Philosophical Assumptions

Research philosophy is the theoretical framework underpinning a research study that consists of four philosophical assumptions: ontology (the nature of reality); epistemology (knowledge about the world, how we gain knowledge, the relationship between the investigator and the participants); axiology (beliefs about the role of values and ethics in research); and methodology (understanding of research methods for systematic inquiry of knowledge) (Mertens 2010; Creswell 2013). Research 'paradigm' refers to the 'philosophical assumptions'; the basic set of beliefs that guide the actions and describe the researcher's worldview (Lincoln et al. 2011; Kaushik and Walsh 2019). Principally, a researcher must adapt a paradigm or a worldview to guide and shape the study. Philosophical assumption or paradigm helps researchers to know the stand and nature of the research. There are four types of research paradigms: post-positivism/positivism, constructivism/interpretivists, transformative and pragmatism in social research (Mackenzie and Knipe 2006; Creswell 2014). Although, these assumptions can be modified over time in a field as research advances (Creswell 2013). Each paradigm encompasses its own ontological, epistemological, axiological and methodological perspective (Creswell 2009). Positivists and constructive researcher are in two opposite camps (Onwuegbuzie and Leech 2005). Positivists/post-positivists believe that there is a single reality (ontology); the investigator and object of study are independent (epistemology); inquiry to be value-free (axiology); and advocate the use of quantitative approaches (methodology). On the other side, interpretivists/constructivists believe that there are multiple socially constructed realities (ontology); the researcher; object of study are dependent (epistemology); inquiry is value-bound (axiology); and use of qualitative approach (methodology) (Onwuegbuzie and Leech 2005). Transformative paradigm mainly emphasises issues of social justice and marginalised peoples and researchers can apply both qualitative and quantitative methods

(Mackenzie and Knipe 2006). However, pragmatism paradigm bridges the gap between the scientific methods and structuralist approaches and the naturalistic methods accepting the existence of both single and multiple realities for empirical inquiry (Creswell 2009; Creswell and Plano Clark 2011). The following section 3.2.1 describes pragmatism in more details.

3.2.1 Pragmatism as research paradigm

Pragmatism originated in America in the late 19th century (Kaushik and Walsh 2019). Pragmatism emphasises human experience as the continual interaction of beliefs and action rather metaphysical philosophical assumptions about the nature of reality and truth (Kaushik and Walsh 2019). It focuses on beliefs that are more straight linked to actions. It is a system of beliefs and practices which guides researchers to select both qualitative and quantitative research questions and the methods they use in their study (Morgan 2007). Philosophical underpinning of pragmatist epistemology is that knowledge is always created by experience; everybody has unique knowledge and experience; knowledge is socially shared and become shared experiences (Morgan 2014; Kaushik and Walsh 2019). The pragmatic paradigm enables the researcher to put the research problem at the centre and allows them to apply all possible methods to solve the research problem. So that, the researcher can address the 'what' and 'how' of the research problem (Mackenzie and Knipe 2006; Creswell and Plano Clark 2007). Furthermore, pragmatist researchers put the research questions before the philosophical considerations (Onwuegbuzie and Leech 2005; Tashakkori and Teddlie 2008). Therefore, pragmatism offers the philosophical basis for the mixed-methods approach (Morgan 2007; Creswell 2014) by providing a set of philosophical assumptions which differentiate from post-positivism/positivism and interpretivism/constructivism (Johnson and Onwuegbuzie 2004). It provides the freedom to choose the range of research methods to answer the research question (Mertens 2010). Therefore, researchers can apply diverse methodological approaches, giving importance to both quantitative and qualitative data to address the complex research questions and produce robust desirable outcomes (Morgan 2007). Moreover, pragmatism gives recognition to the value of the different approaches and offers an opportunity to integrate methodology (qualitative and quantitative) appropriately (Morgan 2007).

Pragmatism focuses on "what works" (Morgan 2014) and draws perspective using diverse methods focusing the research problems and questions, providing worth to both subjective and objective facts (Creswell and Plano Clark 2011). Mackenzie and Knipe (2006) argued that "Without nominating a paradigm as the first step, there is no basis for subsequent choices

regarding methodology, methods, literature or research design" (Mackenzie and Knipe 2006, p.2). Therefore, the PhD study is underpinning pragmatism paradigm to address on 'how many' and 'why' of research questions as stated on chapter 1.12 to produce desirable research outcome, using mixed methods approach. This study did not consider other philosophical approaches such as critical realism because of not only the time constraint and resources deficit, but also suitability of pragmatic philosophical approach to answer the research questions of this mixed method study.

3.3 Methodology

Traditionally, there are two distinct research methodologies: quantitative in one pole and qualitative in another pole (Johnson and Onwuegbuzie 2004; MacKenzie Bryers et al. 2014). To end the polarisation, the mixed methods research has been recognised as a third major methodological movement (Johnson et al. 2007). In the mixed methods research, researchers use both quantitative and qualitative methods and data to address a research problem (Creswell 2009). The mixed-methods approach is defined as "it offers an immediate and useful middle position philosophically and methodologically; it offers a practical and outcome-oriented method of inquiry that is based on action and leads, iteratively, to further action and the elimination of doubt; and it offers a method for selecting methodological mixes that can help researchers better answer many of their research questions." (Johnson and Onwuegbuzie 2004, p.17)

Mixed methods approach is the third methodological approach to bridge the gap between quantitative and qualitative research approach based on pragmatic philosophical framework (Johnson and Onwuegbuzie 2004). This approach has been popular in health and health services research (Cameron and Miller 2007; MacKenzie Bryers et al. 2014; Mahato et al. 2018a). It allows researchers to be flexible in research methods to address a range of research questions. Mixed methods research includes the collection or analysis or integration of both quantitative and/or qualitative data in a single study in the process of research (Creswell 2003). However, the mixed methods can be expensive and more time consuming than using a single method and can be challenging in the analysis and interpretation due to different underlying philosophies and this can pose challenges (MacKenzie Bryers et al. 2014). By combining diverse methods, the researcher can gain deep and wide understanding into the research problem; can answer complex research questions and be confident in triangulation of results (corroborate or confirm the findings). A mixed-methods study requires at least one overarching

mixed (integrated) research question or a limited number of explicitly formulated mixed methods questions (Tashakkori and Creswell 2007). There are many strengths of mixed methods. Combining quantitative and qualitative approaches offers a better insight of research problems or answers research questions well that cannot be completed using a singular method (Creswell and Plano Clark 2007). The utilisation of a mixed methods approach can offset the limitations of qualitative and quantitative methods and can deliver stronger and more accurate inferences or maximise the strengths (Bryman 2008). Similarly, mixed methods can answer complex research questions, provide stronger evidence for a conclusion through convergence and corroboration of findings and increase the generalisability of the study results (Johnson and Onwuegbuzie 2004).

This PhD research study has implemented the mixed methods approach underpinned by pragmatism for systematic enquiry to produce a more comprehensible and complete result of the research. The mixed methodology has provided flexibility to choose appropriate methods such as interview, FGD and secondary data from hospital records to address research study questions as described in section 1.12. There are three mixed-method designs: convergent, explanatory sequential and exploratory sequential. Some say convergent design is beneficial in nursing and healthcare research (Doyle et al. 2016). Convergent concurrent design of mixed methods is used in this study (Creswell and Plano Clark 2011). This design also called the concurrent triangulation design, and it is a popular mixed-methods design (Creswell 2003). Both quantitative and qualitative data were collected simultaneously. Both types of data were analysed separately and combined two sets of data at the discussion phase (Creswell et al. 2011; Doyle et al. 2016). Quantitative data (secondary data obtained from medical records) and qualitative data (interviews and FGDs) are equally important in this research study. Convergent concurrent design is the selective design to compare results or to validate, confirm, or corroborate quantitative results with qualitative findings (Creswell and Plano Clark 2011). However, the mixed methods research can be time consuming than using a single method and can be challenging in the analysis and interpretation due to different underlying philosophy and this can pose challenges (MacKenzie Bryers et al. 2014).

3.3.1 Justification for mixed methods in this thesis

The mixed methods approach addresses both types of research questions (how many and why) that a single method is unable to do; it provides stronger inference; it reduces the weaknesses of a single method; and it validates the results of each other (Tashakkori and Teddlie 2003;

Creswell and Tashakkori 2007; Bryman 2008). The main reason for using a mixed methods approach in this PhD research study is to produce research with valid and well-substantiated conclusions on 'Factors contributing to rise CS rates in urban hospitals in Nepal' drawn from both quantitative and qualitative results. Singular method is inadequate to address the research questions of this study, as stated in chapter 1.12. Neither quantitative nor qualitative methods themselves are sufficient to explore multiple perspectives or a complete understanding about 'how' and 'why' the CS rate is rising in two urban hospitals in Nepal ((Creswell et al. 2011; Doyle et al. 2016). For example, the perspectives of both service providers (interviews) and service users (FGDs) are explored on why the CS rate is rising in urban hospitals in Nepal and how to use CS reasonably using a qualitative method. The quantitative method (secondary data from medical records) identified the key indications for CS, CS rate and significant associated factors with CS. Thus, convergent design is used because it is an effective design, it focuses on an overarching research question, and it is used to converge for complete understanding of phenomena (Doyle et al. 2016). The aim of this convergent mixed methods study is to assess the contributing factors to rising CS rates in two urban hospitals in Nepal. In the study, a quantitative approach was used to assess CS rates, key indications and significant factors associated with rising CS rates in two hospitals. At the same time, qualitative approaches were used to assess wider perspectives on factors contributing to rising CS rates and strategies to stem the rise or rational use of CS from key informants, health services providers as well health services users. It is used to produce comprehensive understanding of factors associated with rising CS rates by merging quantitative and qualitative data. It is also used to validate or triangulate both quantitative and qualitative results. Therefore, a mixed-methods approach provides a complete and more comprehensive picture of 'how' and 'why' the CS rate is rising in two urban hospitals in Nepal (Bryman 2008; Creswell et al. 2011; Doyle et al. 2016). Similarly, this approach increases validity in this study by seeking corroboration between quantitative data about 'how many women are giving birth by CS' and qualitative data about 'why the CS rate is rising'. The triangulation approach is used to validate as well as to increase the understanding of research (Olsen 2004).

3.3.2 Development of data collection tools

Data collection tools were developed to obtain accurate data for this study. First, questionnaires were collected from other hospital-based studies on CS, the Nepal Demographic and Health Surveys and from the wider literatures. Then, a draft questionnaire was developed to address research questions, which was pre-tested in Nepal to find out weaknesses or drawbacks and to

avoid similar pitfalls and errors in the main study (van Teijlingen and Hundley 2001). Some modifications were made after pre-testing the questionnaires, consulting with supervisors and senior obstetricians in Nepal. The questionnaire was originally developed in English, and then translated into Nepali. The questionnaire for key informants was tested by interviewing a medical director and the questionnaire for health professionals was tested on two nurses and two doctors in Karnali Province Hospital, Nepal. Similarly, guidelines for FGDs were pre-tested in two FGDs with pregnant women in the ANC clinic in the same hospitals. Unclear, ambiguous words or questions were noted. The form for recording the maternity-record data (record format) was tested by filling it with extracted data from medical records at Karnali Province Hospital to establish the appropriateness of the record format. Some minor modifications were made in the research tools after they were piloted in Karnali Province Hospital (van Teijlingen and Hundley 2001). All data collection tools are placed in Appendix 6: Record form (Appendix 6.i), questionnaires for health professionals (Appendix 6. ii) and key informants (Appendix 6.iii), and FGD guidelines (Appendix 6.iv). Similarly, participants information sheet and participant agreement form were developed. The participant information sheet and agreement sheet for FGD was translated in Nepali language. All participant information sheets are in Appendix 7: for FGDs (Appendix 7.i) and for interviews (Appendix 7.ii). Participant agreement forms are also placed in Appendix 8: for FGDs (Appendix 8.i) and for interviews (Appendix 8.ii).

3.3.3 Validity and reliability of the study tools

Reliability and validity are important ways not only for representing and displaying the rigour of research processes but also the truthfulness of research findings (Heale and Twycross 2015). The accuracy and consistency of research tools is an important aspect of validity and reliability (Taherdoost 2016). Validity defines how well the collected data covers actual areas of enquiry which are intended to be measured accurately in a quantitative study (Heale and Twycross 2015; Taherdoost 2016). To maintain the validity and reliability, questionnaires and record formats are formulated based on previous studies on the relevant topic and these tools are pretested in the pilot study (van Teijlingen and Hundley 2001). Furthermore, the pilot study assessed feasibility and applicability of research protocol (van Teijlingen and Hundley 2001).

Systematic random sampling was applied to collect data from hospital medical records by using record format. The face validity of research tools used in this study was established by the research student, her supervisors and experts (obstetricians) in Nepal by checking the

questionnaire and record format for whether each of the measuring items in the instrument appeared to be relevant, reasonable, unambiguous and clear (Oluwatayo 2012; Taherdoost 2016), The construct/convergent validity was assessed by employing data enumerators, who were trained and allowed for collecting the data and compared with those which was collected by the researcher for quality control purpose (Taherdoost 2016). Content validity was assessed by reviewing the literature and consulting supervisors and experts to ensure that it included all the items that were essential and eliminated undesirable items (Taherdoost 2016).

For the qualitative methods a Nepali-speaking female data collector, who had considerable knowledge and experience on conducting interviews and FGDs, was hired locally and trained and then constantly supervised throughout the data collection process by the researcher and the local supervisor. One extra note-taker also engaged to improve quality of the FGDs. The guidelines were followed strictly while selecting the interviewees and conducting the interviews (obstetricians, midwives, nurses and key informants) and FGDs with pregnant women for reduction of researcher bias in selecting and interpretation of qualitative research. The interviewees were selected purposively from the maternity departments of selected hospitals. The participants for FGDs were also selected purposively from antenatal clinics.

Some interview transcripts were checked by supervisors for comments and suggestions regarding quality checking. Additionally, quality checks on the collected data were performed by re-entering 10% of the quantitative data into SPSS by the researcher for verification and for checking the completeness of data entry. Similarly, some first interviews were back translated into Nepali to check the transcript reflected what it meant.

Reliability in quantitative research refers to the consistency of a measure, or the ability/accuracy of research tools or procedures, to produce the same results each time used in similar situations repeatedly (Heale and Twycross 2015). The questionnaire reliability was ensured by providing training to the data enumerator and confirmed that the same results would be obtained by the trained enumerator for each data collection. The first few interviews and one FGD were checked carefully to assess homogeneity, stability and equivalence of the research tools (Heale and Twycross 2015). The questionnaire used for this study was adapted from various validated questionnaires, such as hospital-based studies conducted on CS and Nepal Demographic and Health Surveys and subsequently pilot tested to increase its reliability and validity.

3.4 Ethical approval

Ethical approval from the relevant authorities is an important process, to do the research ethically (van Teijlingen and Simkhada 2012). Ethical approval has been granted by Bournemouth University (BU) Research Ethics Committee (REC) on 22/07/2019 (Appendix 9.i), Nepal Health Research Council (NHRC) on 03/07/2019 (Appendix 9. ii), Institutional Review Committee (IRC) of Kathmandu Model Hospital on 24/04/2019 (Appendix 9.iii) and from Paropakar Maternity and Women's Hospital on 05/07/2019 (Appendix 9.iv). Ethical approval for the pilot study was obtained from Karnali Province Hospital (Appendix 9.v). Prior to the data collection, interviewees were informed about the study through a participant information sheet in Nepali for FGDs. Obtaining voluntary informed consent is mandatory in the research process, to conduct research ethically (Regmi et al. 2017b). Therefore, informed consent was obtained using an agreement form from participants before interviews or FGDs. The agreement form was translated into Nepali for FGDs. The opportunity of right to decline interview was provided to each individual participant. Confidentiality was maintained highly at every step of the research process. For quantitative data collection, formal and informal authorisation was granted by management bodies before starting to collect data.

3.5 Pilot study

Undertaking a pilot study is considered to be best practice in a research study (van Teijlingen and Hundley 2001). A pilot study was carried out in Karnali Province Hospital in Nepal in September/October 2019 to ensure that data record format, interview questions and focus group discussion guidelines were culturally appropriate and had adequate information (van Teijlingen and Hundley 2001).

3.5.1 Reflection from the pilot study

At first, the hospital authority was contacted to get approval for the pilot study. After receiving approval, identifying the potential interviewees for interview was done through discussion with the Head of Department for Gynaecology and Obstetrics. Purposive sampling technique was used in this study instead of convenient sampling to select interviewees based on their characteristics, knowledge and experiences rather than selecting only based on availability, willingness and easily accessibility (Etikan et al. 2016).

A participant information sheet (appendix 7.ii) was provided to all selected potential interviewees. After obtaining voluntary informed consent (appendix 8.ii) from individual

interviewees, interview sessions were conducted in private. A total of four interviews were conducted with various levels of nurses working in maternity ward and doctors working in the department of gynaecology and obstetrics. A key informant's interview was also conducted with the medical director of the hospital. All interviewees understood the questions and answered confidently. Arrangement of time for interview with doctors and nurses was little bit challenging because of workload and shortage of staff.

Two FGDs were conducted with pregnant women who were attending antenatal clinics (ANC). Potential pregnant women were selected purposively from the waiting area of the clinic. A participant information sheet was provided to all potential interviewees and informed consent was obtained from individual pregnant woman. An extra room was not available in the ANC; therefore, the ANC room was used for focus group discussion during the first hour before starting the check-ups. There were six pregnant women in one FGD group. However, only one or two interviewees interacted actively in discussion. This experience taught the researcher to change the way they encouraged more active contribution from everybody in the discussion group, providing opportunity to speak one by one. Additionally, during FGDs some disturbances were encountered such as banging/knocking the door, answering the phone calls and people coming in and going out (van Teijlingen et al. 2013). Thus, the pilot study was necessary to be able to learn from these drawbacks or mistakes (van Teijlingen and Hundley 2001).

The maternity ward and medical record section of the hospital were contacted for secondary data. Some secondary data (216 births) from the most recent date during the pilot study were collected from the discharge register and logbook of CS. Individual case files of patients admitted to the maternity ward were also checked and it was found that patients' demographic data such as education and occupation of patient were not filled in. The main challenges were staff on holiday, festival time, manual data and unsystematic record keeping. The two selected hospitals were also visited to assess the data quality of their medical records. Although, both hospitals used electronic patient admission, patients' demographic characters such as education and occupation were still missing.

Some practical lessons were learned from this pilot study. The researcher needed to be careful about the time of interviews with health professionals to avoid uncertainty and disturbances. The researcher needed to focus on the practical skill of how to gain the active contribution of all in FGDs as well arranging for the provision of separate room for conducting FGDs in

private, although there could be challenges on conducting FGDs (van Teijlingen et al. 2013). Some minor changes on questions are made such as wording to be made for better understanding. Enough time should be allocated for secondary data collection. Data collection time should not be planned during special occasions, for example during national festivals/holiday.

Findings from the qualitative part of the pilot study were analysed and written as an article and submitted to Nepal Journal of Obstetrics and Gynaecologists (Appendix 10).

3.6 Methods used in this thesis.

This cross-sectional mixed methods study was carried out in two hospitals in Kathmandu, Nepal namely: Paropakar Maternity & Women's Hospital (PMWH), a public hospital and Kathmandu Model Hospital (KMH), a private hospital. A mixed methods approach (quantitative method - section 3.6.1 and qualitative methods - section 3.6.2) was applied to collect, analyse and interpret data as this approach supports the use of the pragmatic approach and system of philosophy (Morgan 2014). The case-study method was not considered as it would have had to be two case studies of two hospitals which was not feasible within the resources and time available. Researcher was not able to collect required data for case study due to travel restriction of COVID pandemic. Therefore, case study method was not included in methods of this study. However, selected mixed methods (Record-based data, interview and FGD) were able to address aim, objectives and research questions of this study. The data collected for this study will be kept by the Bournemouth University for five years after this study and will be deleted after the period in accordance with the Bournemouth University Research Ethics Code of Practice.

3.6.1 Quantitative method

The quantitative study is based on medical records from the two selected hospitals. Retrospective data on the births from a fiscal year were extracted from medical records of the selected hospitals using systematic random sampling.

3.6.1.1 Study population

All births in both hospitals for the fiscal year in Nepal 2075/76 (which is similar to the British years 2018-2019) were included, but miscarriage or abortion were excluded. The study population was the total births of one fiscal year (16/07/2018–15/07/2019).

3.6.1.2 Data collection

Data were retrieved from secondary sources such as medical record/case files/discharge registered by using a record format. Retrospective data were collected from medical records from the chosen fiscal year (16/07/2018–15/07/ 2019). The sampling strategy was guided by pragmatic selections to select samples because of dealing with manual records of hospital data as well as resources constraints. Therefore, 661 births were selected using systematic random sampling rather than including all total data from the selected fiscal year.

The COVID-19 pandemic greatly affected the research process, mainly in data collection. Data collection was delayed by about two years from the original plan, due to COVID-19 pandemic travel restrictions. Data were collected in August – October 2021. A local data collector was hired and after providing online training to the data collector, data were collected. Collected data were checked by the researcher every day or on a regular basis for accuracy. Quantitative data were collected along with qualitative data. Data were re-checked by the researcher after completing all data collection activities.

3.6.1.3 Sampling Method

Systematic random sampling method was used to collect samples in this study. A birth was the sampling unit. The hospital discharge register was taken as the sampling frame. Then, required samples were selected from the medical record by using a systematic random sampling method within the sampling frame. The first unit of sample was computer generated (a random number) and then sample unit (n) was identified systematically from the sampling population (N). The sampling interval (R=N/n) was identified and applied to select the sample (for example, interval gap between two samples was 57 in PMWH and 2 interval gap in KMH) (Singh and Masuku 2014). Patient identification number of selected sample was used to track the patient information at medical record section.

3.6.1.4 Sample Size

The required sample size for this study was 661. The sample was drawn from the fiscal year 2075/2076 (16 July 2018–15 July 2019). The sample size was calculated in PMWH, based on the following formula (Arya et al. 2012):

$$n = z^2p(1-p)/d^2$$

n = Required sample size,

z = Statistic for the level of confidence (1.96 at 95% confidence interval)

P = Expected prevalence (35%)

d = allowable error (5%).

Therefore, the sample size was 340 and by adding an extra 10% sample, the total sample size was 385 in PMWH.

The prevalence of CS in KMH was high (69.4%) in the chosen fiscal year 2075/2075 (16 July 2018–15 July 2019), and so the sample size was adjusted after discussion with statistician/experts and supervisors adopting the formula: 5% margin of error, 95% confidence level and representing 50% of sample proportion. The extra 10% data collected was to compensate for poor or incomplete records. Total sample size was 276 in KMH.

3.6.1.5 Study Variables

In this study, independent variables were hospital types, age, place of residency, religion, ethnicity, birth order, parity, number of foetuses, gestational age, foetal lie, foetal presentation, onset of labour, parity, birth order, time of delivery, number of antenatal visits, sex of baby, birth weight, medical condition, bad obstetric history and Apgar scores at one and five minutes. For Robson's classification (Robson 2001) study variables are characterised based on mainly five obstetric characteristics (parity, gestational age, onset of labour, foetal presentation and the number of foetuses) as stated in chapter 1, Table 1.3**.**

Similarly, dependent variables (outcome variables) were mode of childbirth (CS and vaginal delivery including instrumental birth). In Nepal, instrumental birth/assisted birth usually includes with vaginal birth. Therefore, vaginal birth includes both spontaneous and instrumental birth in this study.

3.6.2 Qualitative methods

Interviews with health professionals and key informants and FGDs with pregnant women were conducted for qualitative data collection. Qualitative data were collected at the same time as quantitative data collection.

3.6.2.1 Sampling method and size

Non-probability sampling, the purposive sampling technique is a common sampling method for qualitative study. Purposive sampling was applied to select interviewees for interviews and FGDs in this study. The reasons for applying the purposive sampling in this research study

were: (1) to select interviewees who were better be able to assist with the purpose of research study with their expertise, knowledge, and experience on mode of childbirth; (2) to determined sample size by data saturation not by statistical power analysis; (3) to minimise bias (Etikan et al. 2016).

A total of 14 health professionals from various levels, who were working in selected hospitals, five key informants from relevant organizations and 22 pregnant women in four FGDs who were attending ANC were selected purposively. Data was collected until data saturation was reached (Saunders et al. 2018).

3.6.2.2 Interviews

Interview is an important strategy for data collection that can facilitate a rich and detailed account of the participants' knowledge and experience on a research subject (Baumbusch 2010). Face-to-face interviews are commonly used in qualitative methods in health-related research (van Teijlingen et al. 2011). A semi-structured interview with health professionals and key informants was carried out. A participant information sheet (appendix 7.ii) was provided to all potential interviewees before selecting for interview. A written consent was obtained from all interviewees before the interview. Opportunity for right to discontinue or to leave interview process was provided to every single interviewee. Interviews were audio recorded, transcribed and translated into English. Potential participants for health professionals' interviews were identified from hospital organization chart/consulting head of department or individual approach. The key informants were identified by consulting the Ministry of Health/Family Health Division of Nepal or related organizations such as Nepal Society of Obstetrics and Gynecologists (NESOG) and Midwifery Society of Nepal (MIDSON). Fourteen health professionals (doctors, nurses & midwives) from various levels and five key informants (representatives from Ministry of Health and Population of Nepal, representative of NESOG, MIDSON and Medical Directors of two hospitals) were interviewed. Semi-structured interviews were conducted in a quiet and convenient place after obtaining written consent. Confidentiality was maintained during the interview process. Conducting interviews was terminated when stopped finding new ideas, opinion or perspectives, theme (Saunders et al. 2018).

The interview guidelines were translated into the Nepali language by the researcher and interviews were conducted in the Nepali language by a local data collector. The interviews

aimed to explore mainly the following issues: Reasons for rising CS rates, decision making process, reasons unnecessary CS/challenges to minimize unnecessary CS, adherence to evidence-based protocol and strategies for reasonable use of CS.

3.6.2.3 Focus Group Discussions (FGDs)

Focus groups discussions (FGDs) refer to group meetings with a group of people having similar characteristics with a facilitated discussion by a researcher (van Teijlingen and Pitchforth 2006). Four FGDs (two FGDs in each hospital) were conducted with pregnant women at antenatal clinics. A participant information sheet translated in Nepali (Appendix 7.i) was provided to all pregnant women who were potential to participate in FGDs. A written consent was obtained from all pregnant women who were willing to participate in a FGD before starting discussion. FGDs were conducted by a local female data collector in Nepali language. A note taker also made available for noting down main points of discussions. All FGDs were audio recorded. The right atmosphere, sitting round in circle and a comfortable setting are necessary for successful focus groups discussion (van Teijlingen and Pitchforth 2006). Therefore, FGDs were conducted in comfortable setting as much as possible. The recommended composition of focus groups is variable (van Teijlingen and Pitchforth 2006). Each FGD had a target for 6-8 pregnant women with second or third trimester of pregnancy with/without history of previous CS (Tang and Davis 1995). However, only four pregnant women were able to participate in one FGD. Rather than focusing on an ideal number of pregnant women, the main focus should be having a minimum number of interviewees to generate a group discussion, but it should not be overcrowded (van Teijlingen and Pitchforth 2006). Guidelines for focus group discussions were developed and translated into the Nepali language (appendix 6.iv). The perspectives of pregnant women were mainly on CS use, reasons for choosing CS birth by women and their suggestions for minimizing unnecessary CS were explored in FGDs. Although it is challenging to maintain privacy and confidentiality in the Nepalese context (van Teijlingen et al. 2013) it is a widely used qualitative method in health research to seek opinions and experiences of service users and health care providers (van Teijlingen et al. 2011). More details about the number of pregnant women and other details are provided in Appendix 14.

3.7 Study site justification

The study was conducted in two hospitals (PMWH and KMH) in Kathmandu city. Justifications of selecting the two hospitals named above as study sites were as follows:

- Significant case load for the study
- A good mix of health professionals
- Big hospitals with ideal location and representative public and private hospital
- Appropriate to allow comparison
- The availability of data for study and feasibility of supervision and monitoring from local supervisor.

3.8 Data management, analysis and interpretation

Due to the travel restriction of COVID-19, a data collector was employed locally to collect the data in selected hospitals. Quantitative data entry in Statistical Package for Social Sciences (SPSS) and analysis were conducted by the researcher with statistical support. Each single quantitative data was categorised into one Robson group of ten group Robson classification and enter in SPSS. Similarly, interviews and FGDs were transcribed and translated into English by the researcher. Then, qualitative data were analysed using NVivo 12 and thematic analysis. Qualitative (chapter 5) and quantitative data (chapter 4) were analysed and displayed separately and both data are merged/integrated in the discussion section (chapter 6).

3.8.1 Quantitative data analysis

Quantitative data were analyzed using SPSS version 28. Statistical significance was set at $p<0.05$. Descriptive analysis of study variables, Chi-square test, logistic regressions and risk ration were performed. Advanced statistical support was sought from outside of the university. Additionally, the R program for statistical computing was also used in partial analysis such as logistic regression and risk ratio.

3.8.1.1 Descriptive findings

Descriptive analysis of study variables such as frequencies, percentages and proportions are calculated and presented appropriately using tables, graphs and charts (chapter 4).

3.8.1.2 Chi-square test

The Chi-square test is commonly used to answer questions about the association or difference between categorical variables (Franke et al. 2012). The Chi-square test was conducted to test any relationship between two categorical variables (Field 2014). Cross tabulation was performed between indications of CS and types of hospitals (Table 4.1); indications of CS and types of CS (Table 4.2); and indications of CS and parity (Table 4.3). In this study, association

between independent variables (hospital types, age, place of residency, religion, ethnicity, birth order, parity, number of foetuses, gestational age, foetal lie, foetal presentation, onset of labour, parity, birth order, time of delivery, number of antenatal visits, sex of baby, birth weight, medical condition, bad obstetric history and Apgar score at one and five minutes) and outcome variables (mode of birth - CS and vaginal birth) was assessed by applying the Chi-square test (chapter 4, Table 4.4). Similarly, the Chi-square test was applied to assess the association or difference in contribution of each Robson group to the overall CS rates in total sample population (Table 4.6). Likewise, the Chi Square test was applied to assess the association or differences in contribution of each Robson group to overall CS rate in two hospitals (chapter 4, Table 4.7). Cross tabulation of Robson ten groups and indications of CS done to highlight the role of each factor (chapter 4, Table 4.8). However, only 11 key indications could accommodate in Table 4.8 (chapter 4).

3.8.1.3 Logistic regression

Logistic regression was applied to assess the independent association of significant variables with binary outcomes (CS or vaginal childbirth). Logistic regression is a strong and efficient method to assess independent variables (both continuous and categorical) contributions to a binary outcome (Stoltzfus 2011). Binary logistic regression was applied because of the nature of independent and dependent variables: binary outcomes (Field 2014). Only those independent variables (hospital types, age, place of residency, ethnicity, gestational age, foetal presentation, onset of labour, number of antenatal visits and Apgar score at five minutes) which were significant in the Chi-square test were entered into the logistic regression model to calculate odd ratio (OR with 95% confidence interval). Odd ratio (OR) and adjusted odd ratio (AOR) explores the association between two variables (dependent variables and independent variables. The null value of OR/AOR is 1(95% confident interval), >1 means positive association between them and <1 means negative association between them. A 95% confident interval is a range where 95% true population samples lie within the range. Although OR is difficult to interpret, but it is applicable to all types of research (Simon 2002; George et al. 2020). Bivariate logistic regression analysis was performed to calculate odd ratio (OR with 95% confidence interval) and multivariate logistic regression analysis was performed to calculate adjusted odd ratio (AOR with 95% confidence interval) as shown in chapter 4, Table 4.5. In the logistic regression, the baseline reference category does not affect the predictive power of the model or the overall statistical significance of the variables. It affects only in interpretation of the odds ratio in relation to the chosen reference category. In this study,

induced labour was chosen as the baseline of reference rather than spontaneous labour in the logistic regression to present significant and correct/meaningful interpretation of odds ratio (Table 4.5). Expert statistic help was sought in this analysis.

3.8.1.4 Risk Ratio

Risk ratio (RR) compares the likelihood of a CS occurring between Robson groups. It is easy to interpret but not applicable to all research design such as case control. The null value of RR = 1 which indicates no difference in CS risk. However, RR = >1 indicates risk is higher and RR = <1 indicates CS risk is lower (Simon 2002; George et al. 2020). RR was applied to determine association in CS risk status based in Robson groups. It was used to measure the risk of undergoing CS in one Robson group compared to the risk of conducting CS in other Robson groups. The risk of undergoing CS for childbirth (RR with 95% confidence interval) in each Robson group was calculated to estimate risk or incidence of CS in each Robson group (group one to ten). Details of the risk of undergoing CS (RR with 95% confidence interval) in each Robson group is displayed in chapter 4, Table 4.9. Similarly, two hospitals data were analysed separately to calculate incidence of CS in each Robson group in these two hospitals. Details of hospital-wise risk ratio of CS (RR with 95% confidence interval) calculated in each Robson group is displayed in chapter 4, Table 4.10.

3.8.2 Qualitative data analysis

All interviews and FGDs were audio recorded, transcribed and translated into English. Qualitative data were organised using NVivo 12 and analysed using thematic analysis (Braun and Clarke 2006; van Teijlingen et al. 2011). Inductive method was adopted for analysis of qualitative data. All data were entered in NVivo 12. Analysis of interviews and FGDs data were carried out together. Data triangulation was conducted according to themes and sub-themes. Themes and sub-themes formed on the basis of data and the most appropriate data selected for the particular theme and sub-theme from both interviews and FGDs. According to Braun and Clarke “thematic analysis is a process for identifying, analysing and reporting patterns (themes) within qualitative data” (Braun and Clarke 2006, p.79). This study accommodates these six steps to do thematic analysis of qualitative data as below.

Step 1: Familiarising with data

The researcher was familiarized with the data by listening to each audio recording several times and then, transcribing and translating the recorded interviews of 14 health professionals, five key informants and four FGDs into English (Braun and Clarke 2006). All audio recordings were transcribed first into Nepali and then translated into English by the researcher. Initial ideas were noted down. Translation and transcription of audio recordings was carried out after each interview and focus group discussion was conducted. So that the researcher was able to know whether the collected data could address the research questions or not. Transcripts were printed out in hard copies, checked against the audio recordings and then read many times.

Step 2: Generating initial codes

After being familiarized with the data, preliminary codes were generated by highlighting with a highlighter pen and writing a short note in the transcripts. A code is "the most basic segment or element of raw data that can be assessed in a meaningful way regarding the phenomenon" (Braun and Clarke 2006, p.88). Codes are more specific and numerous than themes. Many codes were identified, merged and developed into an initial coding frame from the dataset to obtain insight on a complex issue. NVivo 12 was used to organize the codes.

Step 3: Searching for themes

In this stage potential themes were searched by interpretive analysis of collated codes. This process was started by analyzing codes and combining different codes to produce overarching themes. Codes which did not fit into any of the themes were separated and later discarded. Braun and Clarke highlighted that "A theme captures something important about the data in relation to the research question and represents some level of patterned response or meaning within the data set." (Braun and Clarke 2006, p.82). Many themes were identified. NVivo 12 was applied to search and identified themes.

Step 4: Reviewing themes

In this phase identified themes were reviewed and refined whether to combine, refine, separate or discard to formulate a thematic map. (1) Extracts from each theme and basic theme were reviewed to find coherent patterns at first. (2) Entire data were re-read to find out the accuracy of themes in relation to the data set and to code any additional data that had been missed. Individual themes were considered in relation to the data set and research questions. Some

extracts that did not fit with the themes were discarded from the analysis (Braun and Clarke 2006). All works regarding reviewing themes were completed by using NVivo 12.

Step 5: Defining and naming themes

After formulating a satisfactory thematic map, themes were redefined, refined and structured according to the aspects of the data. Themes were labeled/named or provided with an operational definition that could capture the spirit of each theme (Braun and Clarke 2006). NVivo 12 was used for defining and naming the themes.

Step 6: Producing the report

The final step involves the producing a concise, coherent and logical report by using selected themes and research questions (Braun and Clarke 2006). The results are presented in chapter 5 of the thesis. Many key themes including sub-themes are included in the results of qualitative study. The sub-themes and main themes were formed using inductive approach. Data were triangulated from multiple data sources (interviews with health professionals (doctors, nurses and midwives) and key informants and FGDs with pregnant women) to form sub-themes and themes. Then, the most appropriate data are presented with quotation mark under those sub-themes and themes (chapter 5). The thematic network is presented in chapter 5 (Figures 5.1 and 5.2).

3.8.2.1 Quality control of qualitative results

The validity and reliability of qualitative methods refers to the trustworthiness it was maintained by adapting specific principles for quality control of qualitative study proposed by Guba: 1) credibility; 2) transferability; 3) dependability; and 4) confirmability (Guba 1981).

Credibility is an important criterion of trustworthiness of qualitative research to establish confidence in truth of data (Connelly 2016). Credibility of the qualitative data was achieved in this study through various ways. Pretested questions/guidelines were used for semi-structure interviews with health professionals and key informants as well as FGDs with pregnant women who were attending antenatal clinics and data were triangulated from multiple sources (Guba 1981 (Guba 1981); Shenton 2004). FGDs were conducted by a female interviewer to allow pregnant women to express themselves freely. The interviewer was trained prior to data collection and ensured the interviewer had the required knowledge and skill to carry out the role. The interviewer was also supervised on data collection by local supervisor. The

interviewer who came from the same culture as the interviewees took time and established rapport with interviewees before collecting the data (Shenton (Shenton 2004) 2004). Rapport and trust with interviewees were built meeting with them and providing detail information about the study before collecting data. The interviewer visited to selected hospitals many times and she was engaged about 4 weeks in each hospital with potential interviewees (Guba 1981). The interviews (audio records) were sent to the researcher after completing interviews and FGDs for analysis. The interviewer was contacted constantly by researcher during data collection to encourage and discuss any issues. Each audio record was checked against the transcription several times by researcher. Some English transcriptions were back translated. Some interview transcriptions were sent back to interview for validation (member checking). Some interview transcriptions were checked by three academic supervisors for quality control. Peer debriefing was conducted through regular meetings and discussions with supervisors who were expert in qualitative research (Guba 1981; Forero et al. 2018).

Transferability (generalisability) was established in the study through detail descriptions of the research context or background information, location and study population (Guba 1981; Connelly 2016). A process logbook was made for recording all research activities. Similarly, purposive sampling was used to select interviewees for data collection to ensure appropriate representation of targeted population across the two urban hospitals. Moreover, interviews and FGDs were conducted up to the data saturation or data collection process was continued until no new issues emerged from the data set (Forero et al. 2018).

Dependability (stability and consistency of data overtime) of qualitative study was upheld by rich descriptions of the study methods, audit trial and measuring coding accuracy ((Guba 1981; Forero et al. 2018). Descriptions of process, design, methods, data analysis of the study were made transparent to establish dependability. A detailed study protocol regarding methods of study such as semi-structured interviews and FGD was prepared and followed. The details of activities and decisions happening on the study during research such as who were included in interviews and FGDs, how many and where, were noted in a process logbook. The consistency of the qualitative data and analysis was validated by three academic supervisors by reading at least one transcription and generating code and themes independently. These code and themes were compared to those codes and themes which were produced by the researcher for validation. Any new themes produced by my supervisors were acknowledged and considered.

Confirmability (Neutrality) was established by conducting rigorous data collection and analysis to capture participants experiences and reduce researcher bias (Guba 1981). Confirmability was maintained through methodological triangulation by applying semi structure interviews and FGDs and data on the phenomenon were collected from multiple sources (doctor, nurses, midwives, key informants and pregnant women) (Guba 1981). Data were collected by a locally hired interviewer which helps reduce researcher bias. For conformation of data, regular contact with interviewer and meeting with supervisors were conducted regularly. In addition, random transcripts were read and provided feedback individually by supervisors as a form of quality check (Connelly 2016). Moreover, the study results were presented in NESOG conference in April 2023 in Kathmandu and received feedback on themes and sub-themes from few interviewees (doctors).

3.9 Integration of quantitative and qualitative research

Integration of quantitative and qualitative research is a vital part of mixed methods research. Merging both data boosts the value of mixed method research (Bryman 2006; Creswell and Plano Clark 2011; Fetters et al. 2013). Integration of quantitative and qualitative studies occurs basically in three stages of the research process: design (exploratory sequential, explanatory sequential and convergent), method (connecting, building, merging and embedding) and interpreting and reporting phase (narrative weaving, data transformation and joint display) (Fetters et al. 2013). The point of integration of data takes place according to the mixed-method design (Doyle et al. 2009; Creswell et al. 2011). The PhD study has applied convergent concurrent design to integrate the qualitative and quantitative approach. In this design both types of data (qualitative and quantitative) were collected at the same time. Both quantitative and qualitative data were analysed separately, and findings are also presented separately. Then, triangulation took place to merge quantitative and qualitative results are merged during the discussion of findings (Johnson and Onwuegbuzie 2004). In this study, integration occurred through connecting and comparing the results from the quantitative study with results from the qualitative study in discussion (chapter 6). Data integration was performed through a narrative technique using a weaving approach. The weaving approach includes writing both qualitative and quantitative findings together relating theme to theme or concept-by-concept (Fetters et al. 2013). The results of the quantitative study are compared with themes that emerge from the qualitative data during data interpretation (Creswell et al. 2011).

3.10 Summary of the chapter

The philosophical assumption or paradigm is the principle of the research. The pragmatism paradigm is the philosophical underpinning of this mixed methods study. The mixed methods approach is applied to address the research questions. The thesis adopts a mixed methods convergent design; quantitative method (retrospective cross-sectional) and qualitative method (interview, FGDs). Ethical approval was granted from relevant authorities. A pilot study was conducted to pre-test research tools.

Chapter 4 QUANTITATIVE RESULTS

4.1 Introduction

This chapter presents the results from the quantitative data collected from medical records in two hospitals included in this study. Data were analysed using SPSS version 28. Frequency, percentage, proportion, cross tabulation (Chi-square test), logistic regression (odd ratio) and risk ration were considered for analysing and presenting the data. This chapter includes mainly CS rates, indications for CS, significant variables and the Robson classification contributing to rise CS rates.

4.2 Key results

4.2.1 Overall CS rates in two hospitals in three consecutive fiscal years

Figure 4.1 shows CS rates from hospital records for the three consecutive fiscal years 2017/2018 to 2019/2020, with increasing trends of CS rates in both hospitals. CS rates were more than double in KMH compared to PMWH for each year. For more details on mode of birth and birth outcomes during the period (2017/2018 to 2019/2020) in Appendix 11.

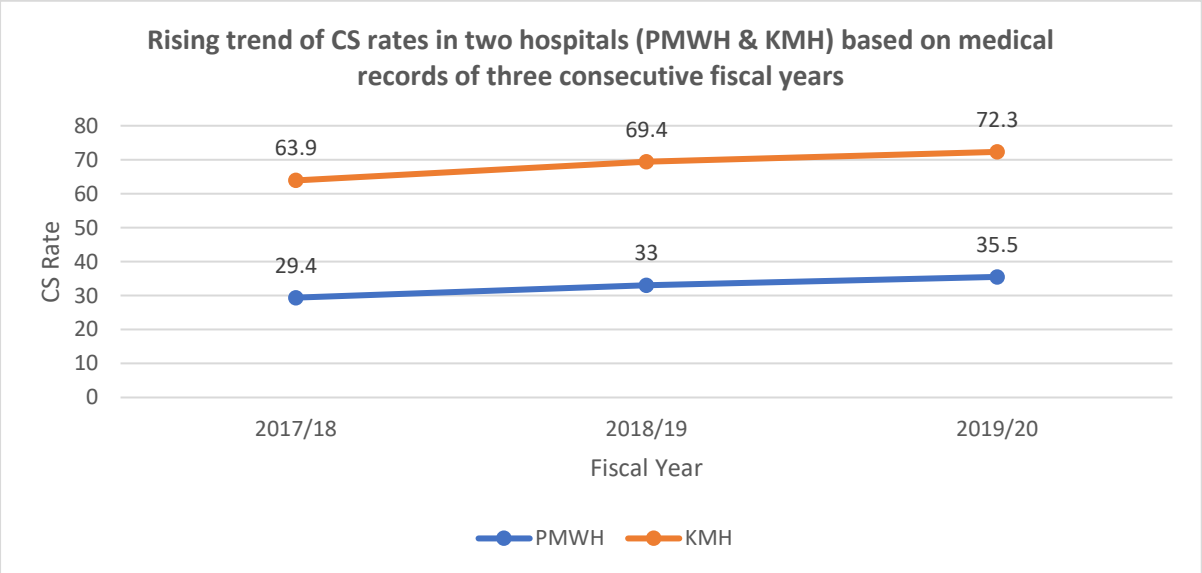

Figure 4.1: CS rates of three years in two hospitals (PMWH and KMH)

4.2.2 Study sample-based CS rates in two hospitals

Study sample was taken from hospital records for the fiscal year 2075/76 in the Nepalese calendar, representing the period 16/07/2018 to 15/07/2019 in both hospitals. A total of 661 childbirth data (385 from PMWH and 276 from KMH) were selected using systematic random

sampling. The overall CS rate was very high (50.2%, 332/661) in the study sample (Figure 4.2), and higher in KMH (68.5%, 189/276) than in PMWH (37.1%, 143/385).

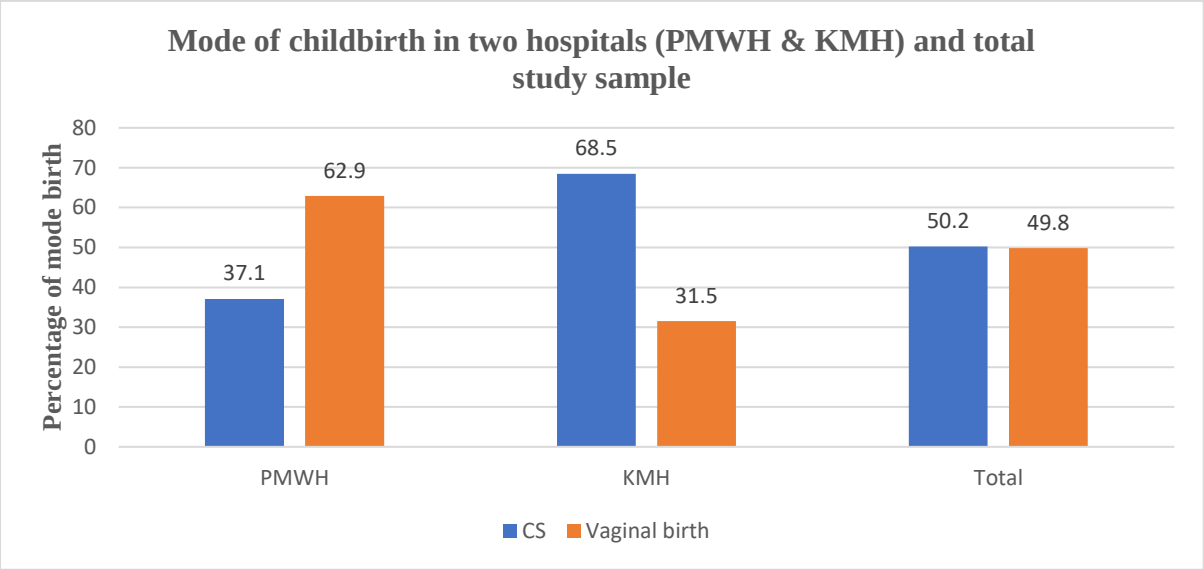

Figure 4.2: Mode of childbirth in two hospitals (PMWH & KMH) and total study sample

Elective CS is found to be higher (55.7%, n=185) than emergency CS (44.3%, n=147) in this study. However, in PMWH, the emergency CS rate (52.4%, n=75) was higher than the elective CS rate (47.6%, n=75). In contrast, the elective CS rate (61.9%, n=117) was higher than the emergency rate (38.1%, n=68) in KMH. The majority of nullipara women (54.2%; n=180) ended up with a CS and slightly less than half of multipara women had CS (45.8%, n=152). All women (100%, n=96) who had CS in previous childbirth had a repeated CS, and the incidence of repeated CS was 28.9%. Similarly, all women who had a breech presentation ended up with a CS (100%, n=30). The primary CS rate was 71.1% (n=236).

4.2.3 Indication of CS

4.2.3.1 Overall indications of CS

Figure 4.3 showed that across the two hospitals previous CS (27.4%, n=91) was the most common indication for performing CS, followed by foetal distress (14.5%, n=48), CPD (10.8%, n=36) and breech (7.8%, n=26). Maternal request (2.7%, n=9) was the main non-medical indication. Additionally, CS for unspecified reasons was 5.7% (n=19).

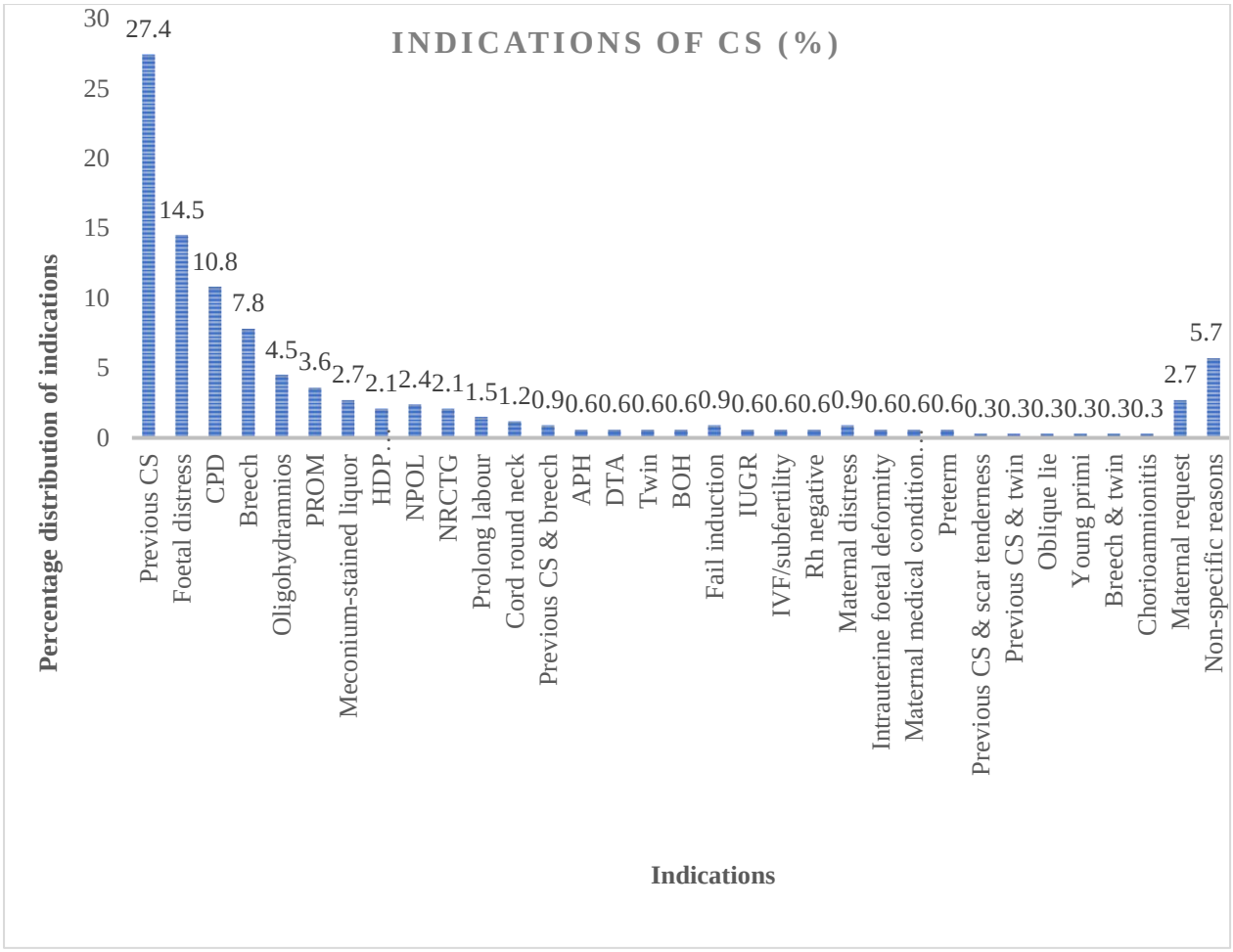

Figure 4.3: Indications of CS (%)

4.2.3.2 Indications of CS in two hospitals (PMWH & KMH)

Previous CS was the most common indication in KMH (Table 4.1). Moreover, performing CS for previous CS was more than two-fold higher in KMH than PMWH (18.7%, n= 62 vs 8.7%, n=29). Similarly, CS for foetal distress is found to be another more common indication of CS. Furthermore, performing CS for foetal distress was more than two-fold higher in PMWH (10.5%, n=35) as compared to KMH (4%, n=13). CPD and breech were also common indications for CS in both hospitals. Surprisingly, conducting CS for maternal request (2.7%, n=9/332) was only recorded in KMH (9/189; 4.8%). Performing CS for none specified reasons was also evident in both PMWH (2.7%, n=9) and KMH (3.0%, n=10). Bad obstetric history or poor obstetric history refers to having history of miscarriage, stillbirth and IUFD and CS was done for this reason only in KMH (0.6%, n=2). Cross-tabulation showed indications and types of hospital is significantly associated (Chi-square test, $p<0.001$).

Table 4.1: Indications of CS in two hospitals (PMWH & KMH)

Indications of CS	PMWH No. (%)	KMH No. (%)	Total No. (%)
1. Medical indication			
Foetal distress	35 (10.5)	13 (4)	48 (14.5)
Previous CS	29 (8.7)	62 (18.7)	91 (27.4)
Cephalopelvic disproportion (CPD)	15 (4.5)	21 (6.3)	36 (10.8)
Breech	17 (5.1)	9 (2.7)	26 (7.8)
Oligohydramnios	8 (2.4)	7 (2.1%)	15 (4.5)
Premature rupture of membrane (PROM)	-	12 (3.6)	12 (3.6)
Meconium-stained liquor	5 (1.5)	4 (1.2)	9 (2.7)
HDP (Hypertensive disorders in pregnancy)	2 (0.6)	5 (1.5)	7 (2.1)
Non-progression of labour (NPOL)	1 (0.3)	7 (2.1)	8 (2.4)
Non-reactive cardiotocography (NRCTG)	7 (2.1)	-	7 (2.1)
Prolong labour	-	5 (1.5)	5 (1.5)
Cord round neck	-	4 (1.2)	4 (1.2)
Antepartum haemorrhage (APH)	3 (0.9)	1 (0.3)	4 (1.2)
Previous CS & breech	2 (0.6)	1 (0.3)	3 (0.9)
Deep transverse arrest (DTA)	1 (0.3)	2(0.6)	3 (0.9)
Twin	1 (0.3)	1 (0.3)	2 (0.6)
Bad obstetric history (BOH)	-	2 (0.6)	2 (0.6)
Fail induction	-	2 (0.6)	2 (0.6)
Intra-uterine growth retardation (IUGR)	-	2 (0.6)	2 (0.6)
Invitro-fertilisation (IVF)/subfertility	-	3 (0.9)	3 (0.9)
Rh negative	-	2 (0.6)	2 (0.6)
Maternal distress	-	2 (0.6)	2 (0.6)
Intrauterine foetal deformity	-	2 (0.6)	2 (0.6)
Maternal med. condition (seizure, hypothyroidism)	2 (0.6)	-	2 (0.6)
Preterm	1 (0.3)	-	1 (0.3)
Previous CS & scar tenderness	-	1 (0.3)	1 (0.3)
Previous CS & twin	1 (0.3)	-	1 (0.3)
Oblique lie	1 (0.3)	-	1 (0.3)
Young primipara	1 (0.3)	-	1 (0.3)
Breech & twins	1 (0.3)	-	1 (0.3)
Chorioamnionitis	1 (0.3)	-	1 (0.3)
2. Non-medical indications			
Non specified reason	9 (2.7)	10 (3.0)	19 (5.7)
Maternal request	-	9 (2.7)	9 (2.7)
Total	143 (43.1)	189 (56.9)	332 (100.0)

*p<0.00

4.2.3.3 Indication of CS in elective and emergency CS

The most common indication for elective CS was having had a previous CS (27.4%, n=91), followed by breech (7.2%, n=24), CPD (5.7%, n=17) and oligohydramnios (3.3%, n=11) shown in Table 4.2. Likewise, foetal distress (14.2%, n=48) was recorded as the most frequent indication for performing an emergency CS followed by CPD (5.7%, n=19) and PROM (3.6%, n=11). Non-medical indication was maternal request with 2.7% (n=9) and elective CS was conducted for maternal request. Additionally, CS undergone without any specific reason was

higher in emergency CS than elective CS (3.9%, n= 13 vs 1.8%, n=6). Cross-tabulation showed indications and types of CS are significantly associated (Chi-square test, p<0.001).

Table 4.2: Indications of CS in elective and emergency CS

Indications of CS	Elective No. (%)	Emergency No. (%)	Total No. (%)
1. Medical indications			
Foetal distress	-	48 (14.5)	48 (14.5)
Previous CS	91 (27.4)	-	91 (27.4)
Cephalopelvic disproportion (CPD)	16 (5.1)	18 (5.7)	36 (10.8)
Breech	24 (7.2)	2 (0.6)	26 (7.8)
Oligohydramnios	11 (3.3)	4 (1.2)	15 (4.5)
Premature rupture of membrane (PROM)	1 (0.3)	11 (3.3)	12 (3.6)
Meconium-stained liquor	-	9 (2.7)	9 (2.7)
Non-progression of labour (NPOL)	-	8 (1.8)	8 (2.4)
HDP (Hypertensive disorders in pregnancy)	5 (1.8)	2 (0.6)	7 (2.1)
Non-reactive cardiotocography (NRCTG)	-	7 (2.1)	7 (2.1)
Prolong labour	-	5 (1.5)	5 (1.5)
Cord round neck	-	4 (1.2)	4 (1.2)
Antepartum haemorrhage (APH)	-	4 (1.2)	4 (1.2)
Previous CS & breech	3 (0.9)	-	3 (0.9)
Deep transverse arrest (DTA)	-	3 (.9)	3 (0.9)
Invitro-fertilisation (IVF)/subfertility	3 (0.9)	-	3 (0.9)
Twin	2 (0.6)	-	2 (0.6)
Bad obstetric history (BOH)	2 (0.9)	-	2 (0.6)
Fail induction	-	2 (0.9)	2 (0.9)
Intra-uterine growth retardation (IUGR)	2 (0.9)	-	2 (0.6)
Rh negative	2 (0.6)	-	2 (0.6)
Maternal distress	-	2 (0.9)	2 (0.9)
Spinal bifida/intrauterine abnormality	1 (0.3)	1 (0.3)	2 (0.9)
Maternal medical condition (seizure, hypothyroidism)	1 (0.3)	1 (0.3)	2 (0.9)
Preterm	-	1 (0.3)	1 (0.3)
Previous CS & scar tenderness	-	1 (0.3)	1 (0.3)
Transverse lie	1 (0.3)	-	1 (0.3)
Previous CS & twin	1 (0.3)	-	1 (0.3)
Young primigravida	1 (0.3)	-	1 (0.3)
Breech & twin	1 (0.3)	-	1 (0.3)
Chorioamnionitis	-	1 (0.3)	1 (0.3)
2. Non-medical indications			
Non specified reason2	6 (1.8)	13 (3.9)	19 (5.7)
Maternal request	9 (2.7)	-	9 (2.7)
Total	185 (55.7)	147 (44.2)	332 (100.0)

*p<0.00

4.2.3.4 Indications of CS in nullipara and multipara

The most common indication for performing CS in nullipara was foetal distress (11.5%, n=38) followed by CPD (9.6%, n=32), breech presentation (5.7%, n=19), oligohydramnios (3.6%, n=12), and PROM (2.7%, n=9). About 4% (n=13) of CS was performed without specific reasons and nearly 2% (n=6) of CS were maternal requests from nullipara women (Table 4.3).

Previous CS (27.4%, n=91) was the principal indication for conducting CS in multipara women followed by foetal distress (3%), breech presentation (2.1%, n=7), oligohydramnios (2.1%, n=7) and CPD (1.8%, n=6). Similarly, about 4% (n=13) CS was performed for maternal request and nearly 2% (n=6) CS was conducted without specific reasons among multipara women (Table 4.3). Cross-tabulation showed indications and parity are significantly associated (Chi-square test, p<0.001).

Table 4.3: Indications of CS in nullipara and multipara

Indications of CS	Nullipara No. (%)	Multipara No. (%)	Total No. (%)
1. Medical indications			
Foetal distress	38 (11.5)	10 (3.0)	47 (14.4)
Previous CS	-	91 (27.4)	9 1 (27.4)
Cephalopelvic disproportion (CPD)	32 (9.6)	4 (1.8)	36 (10.8)
Breech	19 (5.7)	7 (2.1)	26 (7.8)
Oligohydramnios	12 (3.6)	7 (2.1)	15 (4.5)
Premature rupture of membrane (PROM)	9 (2.7)	3 (0.9)	12 (3.6)
Meconium-stained liquor	6 (1.8)	3 (0.9)	9 (2.7)
HDP (Hypertensive disorders in pregnancy)	7 (2.1)	1 (0.3)	8 (2.4)
Non-progression of labour (NPOL)	6 (1.8)	2 (0.6)	8 (2.4)
Non-reactive cardiotocography (NRCTG)	4 (1.2)	3 (0.9)	7 (2.1)
Prolong labour	3 (0.9)	2 (0.6)	5 (1.5)
Cord round neck	3 (0.9)	1 (0.3)	4 (1.2)
Antepartum haemorrhage (APH)	2 (0.6)	2 (0.6)	4 (1.2)
Previous CS & breech	-	3 (0.9)	3 (0.9)
Deep transverse arrest (DTA)	3 (0.6)	-	3 (0.9)
Twin	1 (0.3)	2 (06)	3 (0.9)
Invitro-fertilisation (IVF)/subfertility	3 (0.9)	-	3 (0.9)
Bad obstetric history (BOH)	2 (0.6)	-	2 (0.6)
Fail induction	-	2 (0.6)	2 (0.9)
Intra-uterine growth retardation (IUGR)	2 (0.6)	-	2 (0.9)
Rh negative	1 (0.3)	1 (0.3)	2 (0.9)
Maternal distress	2 (0.6)	-	2 (0.9)
Intrauterine foetal abnormality	2 (0.6)	-	2 (0.9)
Maternal medical condition (seizure, hypothyroidism)	1 (0.3)	1 (0.3)	2 (0.9)
Preterm	1 (0.3)	-	1 (0.3)
Previous CS & scar tenderness	-	1 (0.3)	1 (0.3)
Transverse lie	-	1 (0.3)	1 (0.3)
Previous CS & twin	-	1 (0.3)	1 (0.3)
Young primi	1 (0.3)	-	1 (0.3)
Breech & twin	1 (0.3)	-	1 (0.3)
Chorioamnionitis	1(0.3)	-	1 (0.3)
2. Non-medical indications			
Non specified reason	13 (3.9)	6 (1.8)	19 (5.7)
Maternal request	6 (1.8)	3 (0.9)	9 (2.7)
Total	180 (57.2)	152 (45.8)	332 (100)

*p<0.00

4.2.4 Characteristics of study variables (sociodemographic and obstetric)

The majority of birth data were from PMWH (58.2%). Mean age of women was 26 years, and the standard deviation (SD) was 5.09869. Mean gestational week of pregnancy was 38.2 weeks

with SD 2.22173. Similarly, mean Apgar score at five minutes was 7.6 and standard deviation was 1.302. The majority women in the study were aged 20- 29 (65.1%, n=430), Hindu (71.3%, n=471), middle caste (56.9%, n=376), urban resident (52.2%, n=345), women with 37-40 weeks pregnancy (81.7%, n=577), nullipara (57.5%, n=380), without medical conditions (95.6%, n=632) and no bad obstetric history (92%, n=608). Most of women had ANC visits four times or more (64.3%, n=422). Only 11.5% (n=76) women had labour induction, 26.8% (n=177) had no labour and 34.2% (n=96) women had a previous CS. The majority babies (53.7%, n=355) were male, had a birth weight of 2.5-3.9 kg (78.8%, n=521), 7-10 Apgar score at one minute (54.9%, n=363) and five minutes (96.2%, n =628). Only one delivery (0.2%) was a transverse foetal lie and 30 (4.5%) were breech. More details on characteristics of study variables in Appendix 12.

4.2.5 Association between sociodemographic and obstetric variables and mode of childbirth

The association between mode of childbirth with the following independent variables was assessed by applying the Chi-square test. Table 4.4 presents the proportion of women having CS and vaginal birth by their characteristics and the significance level. It shows that out of 20 variables assessed, only nine variables are found to be statistically significant with mode of childbirth: type of hospital ($p<0.001$), age of mother ($p<0.001$), gestational age ($p=0.006$), foetal presentation ($p<0.001$), onset of labour ($p<0.001$), number of ANC visits ($p<0.001$), ethnicity ($p=0.007$), Apgar score at five minutes ($p=0.050$) and place of residency ($p=0.003$).

Table 4.4: Association between mode of childbirth and sociodemographic/obstetrics characteristics

Sociodemographic/obstetrics Characteristics	**Category**	**Mode of birth**		**P-value**
		Normal (%)	C S (%)	
Types of hospital	PMWH	242(62.9)	143(37.1)	0.000*
	KMH	87(31.5)	189(68.5)	
Age of mother	<20	37(72.5)	14(27.5)	0.000*
	20-24	148(66.1)	76(33.9)	
	25-29	80(38.8)	126(61.2)	
	30-34	55(38.5)	88(61.5)	
	35+	9(24.3)	28(75.7)	
Gestational Age	<30	6(66.7)	3(33.3)	0.002*
	30-36	38(71.7)	15(28.3)	
	37-40	271(47.0)	306(53.0)	
	>40	14(63.6)	8(36.4)	
Parity	Nulliparous	200(52.6)	180(47.4)	0.130

	Multiparous	129(45.9)	152(54.1)	
Number of pregnancies	Single	329(50.1)	328(49.9)	0.135
	Multiple	0(0.0)	4(100.0)	
Foetal lie	Longitudinal	329(49.8)	331(50.2)	
	Transverse	0(0.0)	1(100.0)	1.000
Foetal presentation	Cephalic	329(55.2)	301(47.8)	
	Breech	0(0.0)	30(100.0)	
	Other	0(0.0)	1(100.0)	0.000*
Onset of labour	Spontaneous	267(65.4)	141(34.6)	
	Induced	62(81.6)	14(18.4)	
	No labour	0(0.0)	177(100.0)	0.000*
Birth other	1	200(52.6)	180(47.4)	
	2	92(46.0)	108(54.0)	
	3+	37(45.7)	44(54.3)	0.232
Apgar score at 1 minute	0-3	16(69.6)	7(30.4)	
	4-6	131(47.6)	144(52.4)	
	7-10	182(50.1)	181(49.9)	0.100
Apgar score at 5 minutes	0-3	14(77.8)	4(22.2)	
	4-6	8(53.3)	7(46.7)	
	7-10	307(48.9)	321(51.1)	0.050*
Birth weight	<2.5	65(50.4)	64(49.6)	
	2.5-3.9	261(50.1)	260(49.9)	
	>=4	3(27.3)	8(72.7)	0.300
Medical condition of mother	Yes	15(51.7)	14(48.3)	
	No	314(49.7)	318(50.3)	1.000
Bad obstetric history	Yes	26(49.1)	27(50.9)	
	No	303(49.8)	305(50.2)	1.000
Sex of baby	Male	150(49.0)	156(51.0)	
	Female	179(50.4)	176(49.6)	0.800
Number of ANC visit	0	3(50.0)	3(50.0)	
	1-3	151(64.8)	82(35.2)	
	4+	175(41.5)	247(58.5)	0.000*
Religion	Hindu	230(48.8)	241(51.2)	
	Buddhist	85(53.8)	73(46.2)	
	Christian	10(40.0)	15(60.0)	
	Muslim	4(57.1)	3(42.9)	0.500
Ethnicity	High	109(42.2)	149(57.8)	
	Middle	207(55.1)	169(44.9)	
	Dalit	13(49.1)	14(51.9)	0.007*
Place of residence	Urban	152(44.1)	193(55.9)	0.003*
Time of childbirth	Morning	163(51.9)	151(48.1)	
	Afternoon	132(47.6)	145(52.4)	
	Night	34(48.6)	36(51.4)	0.573

*p<0.00

4.2.6 Factors significantly associated with rising CS rate in two hospitals

Table 4.5 displays the bivariate and multivariate logistic regression analyses between various factors and modes of childbirth. Odd ratio (OR) and adjusted odd ratio (AOR) with a 95% confident interval were applied to assess significant association between dependent variables (CS and vaginal birth) and independent variables which were significant in Chi-Square test (Table 4.4). The chance of giving birth to a baby by CS was 1.37 times (OR=1.37; 95% CI:1.27-1.47) higher in KMH than in PMHW. Similarly, age of mother at the time of childbirth was significantly associated with CS. Maternal aged 25-29 were 1.40 times (OR=1.40; 95% CI: 1.21-1.62), 30–34 year old women were 1.41 times (OR=1.41; 95% CI: 1.21-1.98) and those 35 year and older were 1.62 times (OR=1.62; 95% CI: 1.09-1.51) more likely to undergo CS than women aged 20 or younger. Women in gestational week 30-36 were 0.74 times (OR=0.74; 95% CI: 0.69-1.05) less likely to have a CS compared to women in gestational week 37-40. Women with a breech presentation were 1.69 times (OR=1.69; 95% CI: 1.45-2.02) more likely to undergo CS compared to those with a cephalic presentation. Women who had spontaneous labour were 1.18 times (OR=1.18; 95% CI: 1.07-1.30) and women who had no labour during childbirth were more 2.26 times more likely (OR=2.26; 95% CI: 2.03-2.52) to undergo CS than women who had induced labour. Similarly, women who attended four or more ANC visits had 1.26 times (OR=1.26; 95% CI: 1.17-1.37) higher probability of undergoing a CS than those who had 1-3 ANC visits. High caste women were 1.14 times (OR=1.14; 95% CI: 1.15-1.25) more likely to have a CS than middle-caste women. Likewise, women residing in urban areas were 1.09 times (OR=1.09; 95%CI: 1.01-1.17) more likely to have a CS than rural women. Additionally, new-born babies who had an Apgar score of 7-10 at five minutes were 1.33 times (OR=1.33; 95% CI: 1.06-1.69) more likely to have been birthed by CS than babies who had an Apgar score of 0-3 at five minutes. Table 4.5 also shows the results of the multivariate regression model of significant factors associated with rising CS. Women in KMH were 1.32 times (AOR=1.32; 95% CI: 1.22-1.44) more likely to have a CS compared to PMWH. The age of the women was also a factor for CS. Women age group 25 to 29 years old was 1.17 times (AOR=1.17: 95% CI: 1.04-1.32) and age more than 35 was 1.29 times (AOR=1.29; 95% CI: 1.04-1.32) more likely to undergo CS compared to the women aged less than 20 years. Women undergoing spontaneous labour were 1.16 times (AOR=1.16; 95% CI: 1.06-1.27) and no labour were 1.96 times (AOR=1.96; 95% CI: 1.76-2.18) more likely to undergo CS compared to those having induced labour. The reason for choosing induced labour as the baseline of reference rather than spontaneous labour is to present significant of odds ratio as well as to interpret

meaningful way (Table 4.5). Similarly, women visiting ANC four or more times during pregnancy were 1.26 times (AOR=1.26; 95% CI: 1.06-1.19) more likely to undergo CS compared to those who visited ANC 1 to 3 times during pregnancy.

Table 4.5: Bivariate/multivariate logistic regression selected variables by mode of childbirth

Variables	Category	COR	95% CI	P-value	AOR	95% CI	P-value
Types of Hospital	PMWH	Ref			Ref		
	KMH	1.37	1.27-1.47	0.0000*	1.32	1.22-1.44	0.0000*
Age of mother in years	<20	Ref					
	20-24	1.07	0.92-1.23	0.3800	1.05	0.93-1.17	0.4499
	25-29	1.40	1.21-1.62	0.0000*	1.17	1.04-1.32	0.0076*
	30-34	1.41	1.21-1.64	0.0000*	1.23	0.99-1.78	0.0652
	35+	1.62	1.32-1.98	0.0000*	1.29	1.09-1.51	0.0024*
Gestational age in week	<30	0.82	0.53-1.14	0.2374	1.25	0.90-1.74	0.1809
	30-36	0.78	0.68-0.89	0.0005*	0.94	0.85-1.05	0.2886
	37-40	Ref			Ref		
	≥40	0.85	0.69-1.05	0.1222	0.92	0.78-1.08	0.3158
Foetal presentation	Cephalic	Ref			Ref		
	Breech	1.69	1.45-2.02	0.0000*	1.08	0.93-1.25	0.3080
	Other	1.69	0.65-4.40	0.2900	1.00	0.48-2.12	0.9803
Onset of labour	Spontaneous	1.18	1.07-1.30	0.0012*	1.16	1.06-1.27	0.0016*
	Induced	Ref			Ref		
	No labour	2.26	2.03-2.52	0.0000*	1.96	1.76-2.18	0.0000*
Apgar score at 5 minutes	0-3	Ref					
	4-6	1.32	0.77-2.27	0.3140	1.39	0.99-1.93	0.0565
	7-10	1.33	1.06-1.69	0.0160*	1.39	0.98-1.99	0.0764
Number of ANC visit	0	1.16	0.78-1.72	0.4600	1.32	0.98-1.79	0.0732
	1-3	Ref					
	4+	1.26	1.17-1.37	0.0000*	1.26	1.06-1.19	0.0002*
Ethnicity of mother	High	1.14	1.05-1.23	0.0015*	1.00	0.95-1.07	0.8469
	Middle	Ref					
	Dalit	1.07	0.88-1.30	0.4861	1.04	0.90-1.21	0.5632
Place of Residence	Urban	1.09	1.01-1.17	0.0330*	0.98	0.92-1.04	0.4601
	Rural	Ref					

*p<0.00

4.2.7 Robson groups contribution for increasing CS rate in study sample population

The sample data were successfully classified according to Robson ten groups classification, based on parity and previous CSs, number of foetuses, gestational age, foetal presentation and lie, and onset of labour (chapter 1, Table 1.3).

The contribution of each Robson group to overall CS rates were analysed and identified. Cross-tabulation of mode of childbirth and Robson classification showed significant association between them (P<0.00). Table 4.6 below shows that size of Robson group one was the highest (33.1%) followed by group three (20%), five (13.9%) and two (13.8%). These four groups contained 80.8% of the total sample population. Similarly, CS rate was found to be high in group two (63.7%), followed by groups four (42.9%) and one (40.6%). CS rate was 100% in Robson group five, six, seven, eight and nine. Table 4.6 below also shows that Robson group five (13.9%) was the highest contributor to overall CS rate followed by group one (13.4%), two (8.8%), three (4.4%), six (2.9%) and four (2.3%). In contrast, group nine (0.1%) was the lowest contributor to overall CS rate followed by group eight (0.6%).

Table 4.6: Robson ten group classification contribution to overall CS rate

Robson Group	Number women in each group	Total number vaginal births	Total number of CS	Group Size (%)	CS rate in each group (%)	Absolute group contribution to overall CS rate (%)	Relative group contribution to total CS rate (%)
1. Nulliparous, single cephalic, =>37 weeks in spontaneous labour	219	130	89	33.1	40.6	13.4	26.8
2. Nulliparous, single cephalic, =>37 weeks in induced labour or CS before labour	91	33	58	13.8	63.7	8.8	17.5
3. Multiparous, excluding previous CS, single cephalic, =>37 weeks in spontaneous labour	132	103	29	20	22.0	4.4	8.7
4. Multiparous, single cephalic, =>37 weeks in induced labour or prelabour CS	35	20	15	5.3	42.9	2.3	4.5
5. Previous CS, single cephalic, =>37 weeks) (13.9%)	92	0	92	13.9	100.0	13.9	27.7
6. All nulliparous breeches)	19	0	19	2.9	100.0	2.9	5.7
7. All multiparous breeches (including previous CS)	10	0	10	1.5	100.0	1.5	3.1
8. All multiple pregnancies (including previous CS)	4	0	4	0.6	100.0	0.6	1.2
9. All abnormal lies (including previous CS)	1	0	1	0.1	100.0	0.1	0.3
10. All single, cephalic, =<36 weeks (including previous CS)	58	43	15	8.8	25.9	2.3	4.5
Total	661	329	332	100.0	-	50.2	100.0

*p<0.00

Cross-tabulations of current mode of childbirth, types of hospital and Robson classification were conducted to examine the association between them. CS rates in Robson group were variable in these two hospitals. Table 4.7 below shows that Robson classification was significantly associated with contribution to overall CS rates in the two hospitals ($p<0.001$). Furthermore, group one and group two were also found to be significantly associated with a contribution to overall CS rates in both hospitals ($p<0.001$). However, other Robson groups were not associated significantly with types of hospitals.

In PMWH, Robson group one (11.9%) is found to be significantly the highest contributor to overall CS rate followed by group five (7.5%), two (4.7%), three (3.4%), six (3.4%), ten (2.1%), seven (1.6%) and four (1.5%). The lowest contributor to overall CS rate in this hospital was Robson group nine (0.2%) followed by eight (0.8%). CS rates were high in Robson groups one to three and six (Table 4.7).

However, in KMH, Robson group five (22.8%) was the biggest contributor to overall CS rate followed by groups one (15.6%), two (14.5%), three (5.8%), four (3.3%), ten (2.5%), six (2.2%) and seven (1.4%). The lowest contributor to overall CS rate in this hospital was Robson group nine (0.0%) followed by eight (0.5%). CS rates were high in Robson groups one to four and six. All women in Robson group five to nine ended up with a CS in both hospitals (Table 4.7).

Table 4.7: Contribution of Robson groups to overall CS rate in two hospitals

Robson Groups	PMWH						KMH						P value
	Total no. in each group	Total no. of CS	Group Size (%)	Group CS rate (%)	Absolute group contribution to overall CS rate (%)	Relative group contribution overall CS (%)	Total no. in each group	Total no. of CS	Group size (%)	Group CS rate (%)	Absolute group contribution to overall CS rate (%)	Relative group contribution to overall CS (%)	
1. Nulliparous, single cephalic, =>37 weeks in spontaneous labour	146	46	37.9	31.5	11.9	32.2	73	43	26.4	58.9	15.6	22.7	0.001*
2. Nulliparous, single cephalic, =>37 weeks in induced labour or CS before labour	47	18	12.2	38.3	4.7	12.6	44	40	15.9	90.9	14.5	21.2	0.001*
3. Multiparous, excluding previous CS, single cephalic, =>37 weeks in spontaneous labour	81	13	21.0	16	3.4	9.1	51	16	18.5	31.4	5.8	8.5	0.052
4.Multiparous, single cephalic, =>37 weeks in induced labour or prelabour CS	17	6	4.4	35.3	1.5	4.2	18	9	6.5	50	3.3	4.8	0.500
5.Previous CS, single cephalic, =>37 weeks)	29	29	7.5	100	7.5	20.3	63	63	22.8	100	22.8	33.3	-
6.All nulliparous breeches)	13	13	3.4	100	3.4	9.1	6	6	2.2	100	2.2	3.2	-
7. All multiparous breeches (including previous CS)	6	6	1.6	100	1.6	4.2	4	4	1.5	100	1.4	2.1	-
8. All multiple pregnancies (including previous CS)	3	3	0.8	100	0.8	2	1	1	0.4	100	0.4	0.5	-
9. All abnormal lies (including previous CS)	1	1	0.3	100	0.2	0.7	0	0	0.0	0	0.0	0.0	-
10.All single, cephalic, =<36 weeks (including previous CS)	42	8	10.9	19	2.1	5.6	16	7	5.8	43.7	2.5	3.7	0.091
Total	385	143	100.0		37.1	100	276	189	100		68.5	100	0.001*

*p<0.00

Further crosstabulation of indications and Robson groups was carried out to highlight key indications for CS rates in each Robson group. However, all indications for CS could not be accommodated in the Table 4.8 due to lack of space. Therefore, the following Table 4.8 displays only 11 key indications for CS in each Robson group.

The majority women in Robson group one had CS for foetal distress (10.4%) followed by CPD (4.2%), not specific reasons (2.4%), oligohydramnios (0.9%), PROM (1.5%), meconium-stained liquor (1.2%). Similarly, in Robson group two, main indication for CS was CPD (5.2%) followed by oligohydramnios (2.7%), not specific reasons (1.2%), maternal request(1.8%) meconium-stained liquor (0.3%) and PROM (0.2%). In group three, foetal distress (2.7%) was main indications for CS followed by PROM (0.6%), not specified reason (0.6%), maternal request (0.9%), CPD (0.3%), oligohydramnios (0.3%) and meconium-stained liquor (0.3%). In group four, indications for CS were not specified reasons (1.2%), CPD (0.9%), oligohydramnios (0.6%), meconium-stained liquor (0.6%), and foetal distress (0.3%) (Table 4.8).

Women in Robson group five had CS for previous CS (27.4%). Similarly, women in Robson group six (5.7%) and seven (2.1%) had CS for breech presentation. Likewise. Women in Robson group eight had CS for multiple pregnancy (1.2%). In Robson group nine a woman had CS for abnormal foetal lie (0.3%). Women in Robson group ten, indications for CS were oligohydramnios (1.2%), PROM (1.2%), CPD (0.3%), meconium-stained liquor (0.3%), and not specified reasons (0.3%) (Table 4.8).

Table 4.8: Robson groups and key indications for CS

Robson Groups	Key Indications										
	Previous CS	Foetal distress	CPD	Breech	Not Specified reasons	Oligohydramnios	PROM	Meconium Stained Liquor	Maternal request	Twin	Abnormal lie
1. Nulliparous, single cephalic, =>37 weeks in spontaneous labour	-	35 (10.4%)	14 (4.2)	-	8 (2.4)	3 (0.9)	5 (1.5)	4 (1.2)	-	-	-
2. Nulliparous, single cephalic, =>37 weeks in induced labour or CS before labour	-	2 (0.6%)	17 (5.2)		4 (1.2)	9 (2.7)	1 (0.3)	1 (0.3)	6 (1.8)	-	-
3. Multiparous, excluding previous CS, single cephalic, =>37 weeks in spontaneous labour	-	9 (2.7)	1 (0.3)	-	2 (0.6)	1 (0.3)	2 (0.6)	1 (0.3)	3 (0.9)	-	-
4. Multiparous, single cephalic, =>37 weeks in induced labour or prelabour CS	-	1 (0.3)	3 (0.9)	-	4 (1.2)	2 (0.6)		2 (0.6)	-	-	-
5. Previous CS, single cephalic, =>37 weeks) (13.9%)	91 (27.4%)	-	-	-	-	-	-	-	-	-	-
6. All nulliparous breeches)	-	-	-	19 (5.7)	-	-	-	-	-	-	-
7. All multiparous breeches (including previous CS)	-	-	-	7 (2.1)	-	-	-	-	-	-	-
8. All multiple pregnancies (including previous CS)	-	-	-	-	-	-	-	-	-	4 (1.2)	-
9. All abnormal lies (including previous CS)	-	-	-	-	-	-	-	-	-	-	1 (0.3)
10. All single, cephalic, =<36 weeks (including previous CS)	-	-	1 (0.3)	-	1 (0.3)	4 (1.2)	4 (1.2)	1 (0.3)	-	-	-
Total	91 (27.4)	48 (14.5)	36 (10.8)	26 (7.8)	19 (5.7)	15 (4.5)	12 (3.6)	9 (2.7)	9 (2.7)	4 (1.2)	1 (0.3)

4.2.8 Risk of CS in Robson groups

Table 4.9 indicates the risk ratios for CS of each Robson category. Risk ratio (RR) with 95% confidence interval in each Robson group was calculated to estimate the risk of undergoing CS for childbirth or incidence of CS in each Robson group (group one to ten). The risk of undergoing CS was the highest in Robson group five. Group five had 2.37 times the risk (RR: 2.37; 95% CI: 2.15 - 2.61) of CS. Similarly, Robson group six was 2.05 times (RR: 2.05; 95% CI: 1.89 - 2.22), seven was 2.02 times (RR: 2.02; 95% CI: 1.87 - 2.18), nine was 1.99 times (RR:1.99; 95% CI: 1.85 - 2.15) and two was 1.33 times (RR:1.33; CI: 1.11 - 1.58) risk of CS. However, group one was 0.74 times (RR: 0.74); 95% CI: 0.62 - 0.89), three was 0.38 times (RR: 0.38; 95% CI: 0.28 - 0.53) and ten was 0.49 times (RR: 0.49; 95% CI: 0.32 - 0.77) risk of CS. Robson groups four and eight were not significant risk groups for CS (Table 11).

Table 4.9: Robson ten group classification and risk ratio in study sample

Robson Group	Total number women in each group	Total number vaginal births	Total number CS	Size of each group (%)	CS rate in each group	CS Risk Ratio each group	95% CI	P-value
1.Nulliparous, single cephalic,≥37 weeks in spontaneous labour	219	130	89	33.1	40.6	0.74	0.62 - 0.89	0.0005*
2.Nulliparous, single cephalic, ≥37 weeks induced labour or CS before labour	91	33	58	13.8	63.7	1.33	1.11 - 1.58	0.0056*
3.Multiparous, excluding previous CS, single cephalic, ≥37 wks spontaneous labour	132	103	29	20.0	22.0	0.38	0.28 - 0.53	0.0000*
4.Multiparous, single cephalic, ≥37 wks induced labour or prelabour CS	35	20	15	5.3	42.9	0.85	0.57 - 1.25	0.3780
5.Previous CS, single cephalic,≥37 wks) (13.9%)	92	0	92	13.9	100.0	2.37	2.15-2.61	0.0000*
6.All nulliparous breeches)	19	0	19	2.9	100.0	2.05	1.89-2.22	0.0000*
7. All multiparous breeches (including previous CS)	10	0	10	1.5	100.0	2.02	1.87 - 2.18	0.0018*
8.All multiple pregnancies (including previous CS)	4	0	4	0.6	100.0	2.00	1.86 - 2.16	0.0631
9. All abnormal lies (including previous CS)	1	0	1	0.1	100.0	1.99	1.85 - 2.15	0.0000*
10.All single, cephalic, =<36 weeks (incl. previous CS)	58	43	15	8.8	25.9	0.49	0.32 - 0.77	0.0000*
Total	661	329	332	100	-	-	-	-

*p<0.00

Table 4.10 below represents the risk of CS in Robson groups in two hospitals. Robson group ten had significantly higher risk of undergoing CS in PMWH (RR:1.100; 95% CI 1.03-1.17), but the risk of CS in group three was 0.38 times (RR: 0.38; 95% CI 0.22-0.63). However, the risk of CS was significantly higher in Robson group one and two in KMH. The risk of CS was 1.18 times (RR: 1.18; 95% CI 0.99-1.40) in Robson group one and 1.21 times (RR: 1.21; 95% CI 1.10-1.32) in Robson group two. The risk of CS in Robson group three in KMH was also 0.54 times (RR: 0.54; 95% CI 0.35-0.83) (Table 4.10).

Table 4.10: Risk of CS in Robson groups in two hospitals

	PHWH					KMH				
Robson Group	Vaginal birth (%)	CS (%)	RR	95% CI	P-value	Vaginal birth (%)	CS (%)	RR	95% CI	P-value
1. Nulliparous, single cephalic, =>37 weeks in spontaneous labour	100(68.5)	46 (31.5)	0.78	0.58-1.03	0.0555	30(41.1)	43 (58.9)	1.18	0.99-1.40	0.0443*
2. Nulliparous, single cephalic, =>37 weeks in induced labour or CS before labour	29(61.7)	18 (38.3)	1.04	0.70-1.53	0.8553	4(9.1)	40 (90.9)	1.21	1.10-1.32	0.0002*
3. Multiparous, excluding previous CS, single cephalic, =>37 weeks in spontaneous labour	68(84)	13 (16)	0.38	0.22-0.63	0.0000*	35(68.6)	16 (31.4)	0.54	0.35-0.83	0.0000*
4. Multiparous, single cephalic, =>37 weeks in induced labour or prelabour CS	11(64.7)	6 (35.3)	0.95	0.49-1.83	0.8908	9(50)	9 (50)	1.06	0.89-1.15	0.0978
5. Previous CS, single cephalic, =>37 weeks) (13.9%)	0(0)	29 (100)	-	-	-	-	63 (100)	-	-	-
6. All nulliparous breeches)	0(0)	13 (100)	-	-	-	-	6 (100)	-	-	-
7. All multiparous breeches (including previous CS)	0(0)	6 (100)	-	-	-	-	4 (100	-	-	-
8. All multiple pregnancies (including previous CS)	0(0)	3 (100)	-	-	-	-	1 (100)	-	-	-
9. All abnormal lies (including previous CS)	0(0.0)	1 (100.0)	-	-	-	-	-	-	-	-
10. All single, cephalic, =<36 weeks (including previous CS)	34(81.0)	8 (19.0)	1.100	1.03-1.17	0.0086*	9(56.3)	7 (43.8)	1.070	0.99-1.16	0.0586

*p<0.00

4.3 Chapter summary

A total of 661 birth cases were selected from the medical records of two hospitals for the year 16/07/2018 to 15/07/ 2019 using a systematic random sampling. CS rate was very high (50.2%, 332 out of 661) in the sampled records. The rate of CS was almost twice as high in KMH than PMWH. The most common indication for performing CS is found to be previous CS, followed by foetal distress, CPD and breech presentation. Performing a CS on women who had a previous CS was more than double in KMH compared to PMWH. Moreover, previous CS was the most common indication of CS in elective CS and multipara women. Similarly, CS for foetal distress was found to be another common indication of CS. Foetal distress was found to be the most frequent indication for conducting CS in PMWH than in KMH. Moreover, foetal distress was the key indication for performing CS in primipara. Maternal request was found to be a non-medical indication of CS. Similarly, considerable numbers of CS were performed for unspecified reasons.

A significant association was found between mode of birth and type of hospital, age of mother, gestational age of pregnancy, foetal presentation, onset of labour, number of ANC visits, Apgar score at five minutes, ethnicity and place of residency. Bivariate and multivariate logistic regression showed that odds of CS was significantly higher in KMH, women aged 35 years or older, breech presentation, spontaneous labour and women having no labour during childbirth (all of women, had CS) and four or more ANC visits. The rates of CS were found to be high in low-risk Robson groups (one - four). The highest contributor Robson group for overall CS rate was found to be group five followed by groups one, two, and three. On the other hand, group nine was the lowest contributor to overall CS rate. The risk of undergoing CS was the highest in Robson group five followed by six, seven, nine and two. Risk of CS was found to be significantly higher in groups five, six, nine, and two. Robson group one and two were low risk pregnancy, but these groups were found to be significantly higher contributors to total CS rate in both hospitals. Moreover, the risk of CS was also higher in group one and two in KMH. Similarly, Robson group ten had significantly higher risk to undergo CS in PMWH. However, the risk of undergoing CS was found to be significant lower in Robson group three in both hospitals.

Chapter 5 QUALITATIVE RESULTS

5.1 Introduction

This chapter presents the analysis of qualitative data: 14 interviews with various level health professionals, five interviews with key informants and four FGDs with pregnant women. A summary of results is provided at the end of the chapter.

5.2 Results

5.2.1 Interviewees

A total of 22 pregnant women who were attending ANCs in PMWH (10 in two groups) and KMH (12 in two groups) participated in four FGDs. Four to eight pregnant women were involved in each group. More details on socio-demographic information of all pregnant women participating in FGDs is listed in Appendix 13.

A total of 14 interviews with doctors, nurses and midwives were conducted in two hospitals in Kathmandu. Table 5.1 shows identifiers for interviewees: three senior consultants, two consultants, one senior registrar, one resident doctor, three nurses in charge, one staff nurse, two midwives, one auxiliary nurse midwife (more details in Appendix 14). There were five additional key informant interviews with: two hospital directors, one representative from NESOG, one representative from MIDSON and one representative from Ministry of Health and Population (more details in Appendix 15).

Table 5.1: Identification of interviewees

Interviewees	Identification
Midwife 1, PMWH	P1
Midwife 2, PMWH	P2
Nurse in charge, PMWH	P3
OT in charge, PMWH	P4
Senior consultant, PMWH	P5
Senior registrar, PMWH	P6
Senior consultant, PMWH	P7
Consultant, KMH	P8
Senior consultant, KMH	P9
Consultant, KMH	P10
Resident doctor, KMH	P11
Auxiliary nurse midwife, KMH	P12
Staff nurse, KMH	P13

OT in charge in, KMH	P14
Medical director, KMH	K1
Deputy director, PMWH	K2
Representative of Midwifery Association, Nepal	K3
Representative from Ministry of Health/Nepal	K4
Representative from NESOG	K5
FGDs Participants	FGD/P1-P22

5.2.2 Key results

5.2.2.1 CS rate in two hospitals in urban Nepal.

All interviewees highlighted that the CS rate is high in both hospitals. All interviewees from KMH indicated that the CS rate is very high in KMH and higher than public hospitals, but lower than other private hospitals:

"Our hospital has a CS rate of 60%, although this rate is higher than a public hospital. It is lower than any other private, corporate hospital. But even this 60% is considered very high and it is a matter of concern." (P9)

Similarly, all interviewees in PMWH agreed that its CS rate is high, but lower than in private hospitals:

"Recently, the caesarean section rate of this hospital is 33%. Compared to some other public hospitals this rate is very high but if you see other private hospitals then the caesarean section rate is even higher and goes up to 90 to 99%." (P2)

5.2.3 Indications for CS

Many interviewees highlighted that CS is performed mainly for medical indications, such as previous CS, foetal distress, CPD, breech presentation, short maternal height, problem with cervix dilatation and labour progression, placenta previa, IUGR, APH, meconium-stained liquor and false or non-reassuring CTG. Mainly, CS is conducted for medical indications in both hospitals:

"The main indications for caesarean section are medical indications...sometimes there is low maternal height, CPD, sometimes low progression of labour, sometimes placenta previa, even if there is previous CS then caesarean section is done here…" (K3)

Complications in pregnancy and during birth are found to be the reasons for conducting CS:

"...sometime complications like foetal distress, meconium-stained liquor, placenta previa, sometime patient blood flows a lot, patient blood pressure become high, and eclampsia is seen at that case we have to do CS." (P5)

"…There are also many reasons where the caesarean sections have to be done like if the women come with bleeding, baby's breech presentation, if there is a previous caesarean section." (K2)

"…Regarding medical reasons the CS rate is high due to foetal distress. In the case of IUGR, high risk pregnancy we cannot allow spontaneous labour. Another main reason is previous CS..." (P11)

False positive or non-reassuring CTG is also found to be a reason for performing CS:

"…Another important reason behind increase CS rate is sometime false positive of CTG. We need to do CTG, but sometimes it shows false positive." (P7)

5.2.4 Decision making on CS

All interviewees said that decisions on CS are made by senior doctors, based on indications of CS. A senior consultant is the responsible person to make decision on any types of CS:

"Senior Consultant obstetrician makes the decision regarding CS…" (P9)

"The decision regarding the CS is taken by a consultant, any types of decision for CS are taken by a consultant." (K1)

All interviewees said that decision making on elective CS is usually pre-planned, before admission into the labour ward, but decision making on emergency CS is made in emergency conditions if complications arose during labour, such as foetal distress or APH:

"Elective CS are usually planned at OPD, and the patient are counselled for the CS informing their indication. Decision for emergency CS is made in the following condition: like if there is

foetal distress...danger for both mother and baby, less foetal movement, or any complications arise during delivery like excessive blood loss, antepartum haemorrhage." (p9)

All agreed that women and their families are informed, and consent is taken before conducting the CS:

"Pregnant women and families are included in the decision before doing CS. Because without their consent, the decision cannot be made by the doctor alone. At the time of elective, the patient and her family already know that they have already planned for CS. In the emergency case, due to the urgent need to do CS, the patient or family decides to sign the consent form after explaining everything to the people who have come with patient." (p5)

5.3 Key factors affecting the rise of CS rate in urban hospitals in Nepal.

Five key themes including several sub-themes are identified behind the rising CS rates in urban hospitals in Nepal: (1) medical factors; (2) sociodemographic factors; (3) financial factors; (4) non-medical factors; and (5) health service-related factors (Figure 5.1). Medical factors affecting rising CS rate are found to be repeated CS and lack of VBAC, complicated referral cases and CS for breech presentation. Sociodemographic factors are found to be changing sociodemographic characteristics of women (advanced maternal age, career-oriented women, educated, rich and urban women), precious baby and lack of security of service providers, legal issues and defensive CS. Financial factors are found to be income source for private hospitals and incentive for public hospitals. Non-medical factors are found to be maternal request (including reasons for requesting CS) and service providers' attitude on CS. Health service-related factors are found to be lack of awareness around mode of childbirth, lack of adequate resources, centralisation of health facilities in urban Nepal and lack of appropriate policies and protocols on CS. The details of data sources for these themes and sub-themes (Figure 5.1) are in Appendix 16.

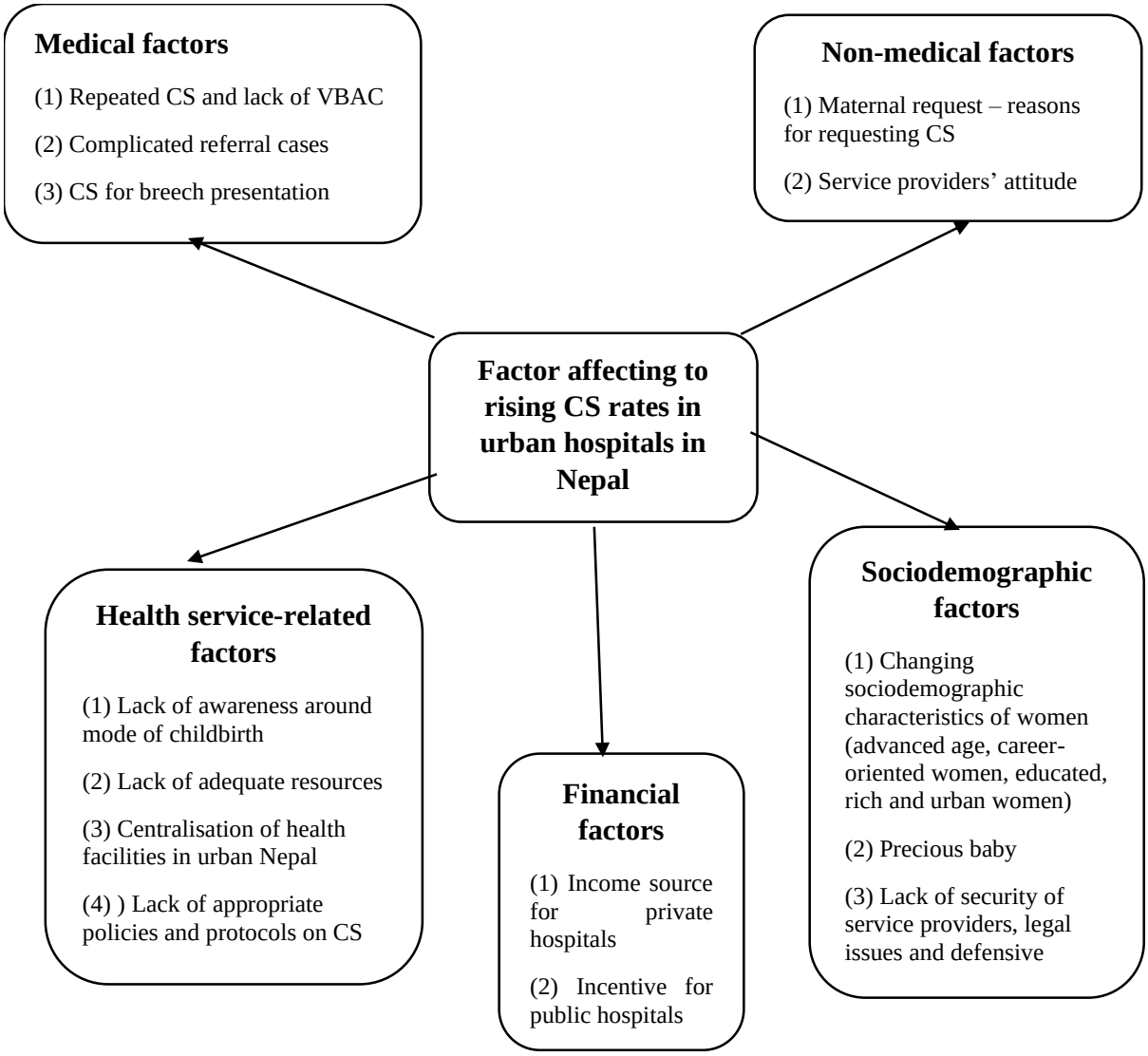

Figure 5.1: Factors contributing to rising CS rates in urban hospitals in Nepal

5.3.1 Medical factors

This theme has three sub-themes for the rising CS: (1) repeated CS and lack of VBAC; (2) complicated referral cases; and (3) CS for breech presentation.

Repeated CS and lack of VBAC in case of previous CS

Most interviewees said that previous CS is the major factor for rising CS rates, since it is the first choice of mode of childbirth for women who have a history of CS. CS rate high because of high cases of previous CS:

"...main factor is previous CS cases are high ...that's why CS rate is higher." (P9)

Trial of labour for previous CS is unlikely in Nepal due to lack of experience and resources. It is not part of many hospitals policies. Hospitals do about 10-20% repeated CS:

"According to the hospital policy, if first delivery is from CS then we will not give a normal delivery for the second delivery which is called VBAC. We don't have this facility and we have our own limitation and challenges. We have repeated CS which is about 10-20%." (P10)

Hospitals do not want to take the risk conducting VBAC, but it seems neither do the women and their families. Previous CS is taken as an indication of CS:

"We do not provide the opportunity of VBAC because it needs intensive monitoring of patient as well as hospital do not want to take risk. Previous CS falls under indication plus patient also demand it. So, we do repeat CS for previous CS." (P9)

In both hospitals, most highlighted that VBAC is usually not offered due to the lack of resources, including a lack of staff for intensive monitoring of labour. Difficulty in labour monitoring due to lack of SBAs or midwives is highlighted for not offering VBAC:

"Patients should be monitored by SBA trained nurses. In our context, 10 patients are overseen by one nurse. In such a condition, it is very difficult to perform VBAC as monitoring is difficult in our context." (K2)

Repeated CS is conducted in case of previous CS due to lack of human resources:

"…there are very few human resources. Therefore, due to this reason we usually do repeated CS..." (K5)

However, some noted that VBAC is offered only if the woman arrived in normal active labour, but in complicated cases both hospitals do CS to avoid uterine rupture:

"If the client already has a caesarean section and if 8–9-centimetre cervix dilation is there, then we do not take them for caesarean section, but do normal delivery instead. However, if the condition is complicated and if the previous scar is quite dangerous. Then, there is a chance of the uterine rupture. So, we do not provide them VBAC after assessing the condition." (P3)

Similarly, VBAC is offered if both doctor and the patient want to take risk:

"… both parties (doctor and pregnant woman) had to take the risk. If the patient wants to take the risk and try it, then we allow it otherwise a caesarean section is performed." (P2)

An interviewee also highlighted that VBAC is less common now because of the risk of uterine rupture and lack of security of service providers/doctors in case of bad outcomes, such as uterine rupture. In that case, hospital reputation is damaged. It is not uncommon for a hospital-based health workers to be mistreated and beaten up by family members if something goes wrong with a woman and baby:

"Opportunity for VBAC is given, but that practice is getting less and less nowadays... We know that there is only one chance of uterus rupture in 1000...However, if only one has uterus rupture, then it is not possible to run the hospital. This process of misbehaving, encircling the doctor, demanding compensation is still going on. So, vaginal delivery to the previous CS cannot be done unless the society is well-disciplined." (K4)

Complicated of referral cases

Another main medical factor for rising CS rate is found to be the complexity of cases referred from smaller maternity units elsewhere. Many interviewees highlighted that both hospitals were referral centres, where complicated cases came from other parts of Nepal. Sometimes complicated cases arrived at urban hospitals from remote area by air as stated by interviewees:

"I think that the reason for the high caesarean section rate in this hospital is because this is a referral centre also and complications that arise in other places are referred to here through helicopter or nearby places." (P2)

One interviewee suggested these referrals account for five to ten percent of the CS rate:

"…our hospital gets complicated referred cases from different places which consist of 5-10%. Referred cases are mostly complicated, so we perform CS... So, because of this also CS rate is slightly high." (P10)

Breech Presentation

Most interviewees said that elective CS is planned for primigravida breech presentation unless patient comes in active phase of labour and everything normal for vaginal birth. Mainly, planned CS is performed for primigravida breech presentation:

"For the primigravida breech we usually plan for elective CS unless and until that patient comes with an active phase of labour. If a patient comes with an active phase of labour, then we go for trial of labour." (P11)

Trial of labour is not planned for primigravida with breech presentation unless the woman is admitted in active labour with fully dilated cervix and baby's buttock is visible:

"Labour trial is not given for primigravida breech for first time mom, but when they come from home if the dilation is over 10 centimetre and if the buttock of the baby is seen then we do not tell them to perform a caesarean section, but rest of the time on first-time mother receive a caesarean section. But if it is multigravida, and if they have normal condition, then we try to perform normal delivery." (P2)

Trial of labour in cases of breech presentation can be offered in both hospitals to multigravida, if everything is normal:

"If there is multigravida patient then we give trial of labour in such case, but if the patient is a young primigravida, those who are going to be a mother for the first time. Then, in that case we give a choice for the patient for both caesarean section and normal delivery. But if a patient is matured with good progress in labour. Then, in that case, we give a trial of labour. Otherwise, we usually do CS in breech presentation." (P5)

"...If there is second gravida and the indications are normal then we also give trial of labour. In this hospital, delivery is also done giving trial of labour." (P14)

External cephalic version in case of breech presentation is not practice in hospital in Nepal:
"...there is system to do external cephalic version, but we don't do that." (K5)

5.3.2 Sociodemographic factors

Three sub-themes are identified: (1) changing sociodemographic characteristics of women (advanced age of mother, career-oriented women, educated, rich and urban women); (2) precious baby; and (3) lack of security of service providers, legal issues and defensive CS.

Changing sociodemographic characteristics of obstetric population

The sociodemographic characteristics of the obstetric population is changing in urban Nepal. Women focus on their education, work and career. Therefore, they get married later, plan for fewer children and become pregnant later in life.

Advanced age of pregnant women

Most interviewees indicated that late marriage and pregnancy in advanced age is also a reason for the increasing rate of CS. Problems of infertility, diabetes and hypertension also increase due to advanced age. Pregnancy in advanced age potentially needs CS. Usually, CS is performed for pregnant women in advanced age:

"…the women who come to us are slightly older. We need to perform CS on elderly women and with many complications. So, because of this also CS rate is slightly high." (P10)

First pregnancy in older age and those who have late marriage need CS due to complications:

"…some are pregnant at elderly age; some have late marriage and that type of patient need CS due to complications." (P6)

"…primigravida those who became pregnant in elder age they need caesarean section." (K1)

Furthermore, late marriage and pregnancy in advanced age can have problems such as infertility, diabetes, hypertension that needs CS:

"Nowadays women do late marriage due to which there is problem in conceiving the child. Problem of infertility is also high. Problem of diabetes and hypertension is also there. Because of all this reasons caesarean section is high." (K4)

Career-oriented women

Some interviewees highlighted that increasing orientation around career for women is another factor behind the increasing the CS rates. Women focus on their work, get married later, and they can have infertility problem especially when trying to get pregnant later in life:

"...women are focusing only on work, get married late and because of late marriage. It is difficult to conceive for many women. Various kinds of egg ripening medicines should be given to conceive baby, but many fail." (P6)

Likewise, women are giving priority to their education and career, rather than planning a family and late marriage can lead to complications in pregnancy and need CS:

"…main reason for the increase in CS is nowadays women are more concerned about their education and career. So, they do late marriage and plan baby late, there are also subfertility cases. All these factors lead to the complications, for which CS is needed." (P12)

Additionally, working women may see a CS as a way of getting back to work sooner after childbirth:

" ...women think that if they do CS then they can go to work quickly." (K1)

Rich, educated and urban women

Some interviewees further highlighted that rich, educated and urban woman do not want labour pain and do not want to take the risk of vaginal birth:

"Socio-demographic reason the women from the middle class, grassroot level their main priority is normal delivery. However, the women from rich families do not want to go for normal delivery to avoid labour pain. They demand CS ...maternal request." (P11)

Similarly, many interviewees stated that educated and urban women choose CS:
"Mostly educated women , those who are from urban areas, demand CS. Women from remote areas do not understand about on-demand CS. They want to do normal delivery. There are group of women who said they can't bear pain…" (P9)

Precious baby

Precious baby is also found to be a reason for CS. Women have fewer babies, which may make each more precious:
"…nowadays women prefer fewer babies, and those babies are very precious to them, so they do not want to take risk on vaginal delivery." (P10)
Pregnancy after infertility treatment, pregnancy after many years of marriage and pregnancy after having a poor obstetric history may be viewed as particularly precious. Many interviewees emphasised that such babies are more likely to be borne by CS to avoid risk:

"Precious babies are also more likely to be born by caesarean section. If they have had a baby by IUI, IVF, have had a baby after years, have had a miscarriage, or have had a previous pregnancy loss, have had a bad experience such as stillbirth, IUFD, they mostly demand CS." (P7)

After fertility treatment or pregnancy at advanced age, babies are usually borne by CS to avoid risk. This might be due to views of women, their families, but also some doctors:

"Those who have a baby from IVF, IUI precious baby, those who have late pregnancy. In this case, doctors also do not want to take risk and give priority to such for CS. I think to avoid pain, because of having precious baby, patient demands for CS." (P14)

Women with precious babies due to infertility do not allow themselves or doctor to go for vaginal birth:

"There is also the problem of infertility. In that case, women with precious babies are not allowed to go for normal delivery. They prefer caesarean section." (K2)

Women with precious babies are mentally prepared for CS:

"...Sometimes, it happens that there is often a precious baby, so the mother requests for CS. They are already mentally prepared for the CS..." (P14)

Lack of security of service providers, legal issues and defensive CS

In Nepal, there is a lack of security due to undisciplined society and protective law for doctors/service provider in case of unfortunate incidents. Doctors, nurses and hospitals are attacked and penalised if something goes wrong with the mother or baby due to vaginal birth rather than CS. Many interviewees highlighted that doctor perform defensive CS for self-protection to avoid verbal and physical assault and litigation:

"...If one baby dies because of conducting vaginal delivery rather than CS, Then, hospital is vandalised, and doctor is charged and court orders to both hospital and doctor. That is why doctors do not want to take risk..." (K4)

Some interviewees highlighted that defensive CS was performed due to a lack of protection law for service providers. If a baby dies during a vaginal birth rather than CS, then, the hospital might be vandalised, and doctors are penalised with huge amounts of money:

"...If one baby dies because of vaginal delivery rather than CS. Then, hospital is vandalised, and doctor is charged, and court order is given to both hospital and doctor. That is why doctors do not want to take risk. Judge should know all these things. In such incident in past, this hospital paid Rs.600,000 and doctor paid Rs.600,000 (total 1 year salary). So, how can a doctor pay such a high fine..." (K4)

Social issues such as verbal and physical attacks on service providers reduce the doctors' morale and doctors do not take risk conducting vaginal birth due to uncertainty of foetal outcome :

"...doctors are blamed, attacked, vandalising the hospital which has reduced the morale of the doctors. So, doctors do not want to take the risk in conducting normal delivery as its cannot be said anything about baby until the baby is born in normal delivery…" (P7)

Doctors do defensive CS to protect themselves due to fear of litigation and undisciplined society due to the lack of social security and protective law:

"…Asking fine to the doctor, shouting at the doctors if anything happens to the patient, and the police also put pressure on the doctors. That's why the doctor looks after his own security and does caesarean section…We do 1000 CS to avoid one uterine rupture due to lack of security of doctor, fear of litigation and undisciplined society…" (K4)

5.3.3 Financial factors

Two sub-themes are identified: Income source for private hospitals and incentive for public hospitals.

Income source of private hospital

Many highlighted that CS is a major operation which means it can be a good income source for private hospitals. CS is performed to increase income:

"It comes with the financial aspects of a private hospital. Because of these things, I think, it is a challenge to conduct normal delivery." (P8)

Private hospital doctors counsel for CS and conduct CS to generate money:

"…It is also found that doctors do counselling for caesarean section at the 1st -2nd trimester especially in private hospital…majority service providers are promoting for caesarean section. The intention is to earn money in a private hospital. If you do normal delivery, the money will not come. Intentionally, they want to cut women to generate the income…Private hospital charge approximately 100,000-200,000 rupees for a caesarean section." (K3)

Some interviewees emphasised additional financial benefits from CS such as increased patient load, bed occupancy and income from operation charges:

"The benefit of CS to the hospital is in terms of money. After caesarean section, hospital receives income from bed/room, from medicine, from OT charge, many benefits from CS... whatever income sources to the hospital, staff also get salary in time." (P10)

However, most justified that CSs are undertaken for the benefit of the patients rather than the hospital and staff:

"Doing CS is more beneficial for the patients than the hospital. We do not do CS without any indications; we do it for the sake of mother and foetus. For the hospital the advantage is the good outcome of patient and baby." (P11)

Incentive for CS in public hospital

Although public hospitals perform CS mainly for the benefit of women and baby, they also receive some government incentives. However, the amount of incentive for CS is higher than vaginal birth.

Few interviewees highlighted that the government of Nepal provides some amount of incentive to public hospitals for providing free CS:

"…it is beneficial to the patient to perform an operation in most cases. Ministry of Health provides the service free of cost from the Safe Motherhood programme and the patient do not have to pay money for it. We keep the statistics of how many surgeries we performed and send it to the Ministry of Health (which) provides 8000 rupees per caesarean section." (P4)

However, the incentive for doing CS is higher than vaginal birth:

"Upon doing caesarean section the Government of Nepal provides incentive, which is even more than that provided to normal delivery…" (P2)

5.3.4 Non-medical factors

Two sub-themes are emerged under the theme 'non-medical factors': Maternal request and service providers' attitude.

Maternal request

Although all women in FGDs said that the preferred mode for their forthcoming birth is a vaginal birth due to the benefits for both mother and baby:

"If normal delivery, it is good for both mother and baby because in caesarean section incision is done in abdomen which creates difficulty in sitting, walking. Normal delivery is natural, and caesarean section is difficult and it is different. So, normal delivery is good for both mother and baby. Natural birth is better than incision in abdomen." (FDG/p22)

However, CS on demand/maternal request is also one of the main non-medical factors for the rising CS rates in urban hospitals in Nepal:

"On-demand CS has become the worldwide matter of discussion nowadays. We do not do on-demand CS, frequently happen with patient while going through labour pain they themselves request CS thinking that if something wrong with their baby. We called it as maternal distress due to which doctor distress also happened, which is also one of the reasons for caesarean section." (K2)

CS on maternal request is increasing in urban hospitals in Nepal:

"Nowadays, one of the main reasons is caesarean delivery on maternal request (CDMR) which was earlier less than 1%, but now at least 3-4% of women demand CS." (P11).

Some interviewees agreed that in some situations they perform CS at maternal request. Some pregnant women demand CS and do not want to give birth vaginally in any condition:

"…Some of the CS are done on demand of the pregnant women as they do not want to give normal delivery in any condition. So, because of this also CS rate is slightly high." (P10)

Pregnant women and her family request CS to avoid risk. However, CS is not performed on request unless they put pressure to doctors:

"…women and her family do not want to take risk. They ask/demand for caesarean section, but we do not do it according to their demand. If they put little pressure, then we have to do it. "(K4)

However, many interviewees stated that they would not do CS simply on maternal request, but do CS on medical indications:

"We look at the indication rather than the demand of the patient, here we do not do CS according to the demand of the patient…" (P7)

Cord around the foetal neck is sometimes evident on ultrasound scan. It is not a standard indication for CS as it does not usually pose a threat to the foetus. If a pregnant woman learned that her baby has the cord around the neck and then herself request a CS to avoid perceived risks to baby. Doctors may respect the autonomy of pregnant women and respect their request.

Therefore, doctors may feel compelled to do a CS if women request CS after knowing the cord is round the of a foetus :

"…major reason is patient request. Even if there is no indication for example cord round neck is not indication for CS. But while we explain patient about this, they themselves demand CS. I think caesarean delivery on maternal request is one of the major unnecessary CS. In that case, we should also respect patient request, so we have to do it." (P11)

Some interviewees highlighted that CS is requested in cases of the cord being wrapped round the baby's neck. Pregnant women do not want to take risk giving vaginal birth in case of cord round neck. Women request CS in the case of cord round neck to avoid complications:

"The patient is also conscious, patient themselves demand CS if they notice cord round neck, even if doctor suggest for trial of labour, they demand CS. They do not want to take risk…." (P13)

"Nowadays if there is cord round neck patient demand CS thinking that there might occur some complications…" (P5)

Many interviewees highlighted that urban, educated, older and rich women are more likely to request CS:

"Educated women, elderly women, the women from socially high-class families mostly demand CS." (P11)

".. it seems that women in urban areas are highly educated and demand a caesarean section." (K1)

Many interviewees highlighted that better-off women do not want to go for vaginal birth and request CS. Women from rich families have access to all the care and support they need, so that, they prefer CS:

"…I think mostly rich families prefer caesarean section as their family can help in all the aspects. They get all the care, support and can afford for all the nutritious food from the beginning unlike us from the middle-class family. So , rather to go through all those labour pain they might prefer C-section." (FGD/P1)

One interviewee added that women request CS due to growing urbanisation and modernity:

"… I think the reason behind it is growing urbanisation, modernisation. The trend of demanding CS is there in so-called affluent families' women." (K5)

Many interviewees pointed out that CS is requested by women without valid indications to avoid risks or complications, if they only plan one or two babies:

"Now there are many women who want one child, so they do not want to take the risk and demand CS. (P6)

"They do not want to take risk by doing vaginal delivery thought that they are going to make 1 or 2 babies. So, even if there is no indication… they themselves demand CS." (P11)

Reasons for requesting a CS

Seven sub-themes are explored on reasons for requesting CS: Labour pain, maintaining their pre-birth vagina and sexual life, poor obstetric history, following the fashion, birth at auspicious times and dates**,** avoidance of emergency CS and complications, and bad experience in previous birth. There are many reasons for maternal request of CS without medical indication. The data sources of these sub-themes are illustrated in Appendix 17.

Many interviewees underscored that labour pain is the main reason for women to request a CS. Women asked for CS either avoid pain or not coping with pain. Some interviewees said that women asked for CS to avoid painful labour pain:

"Women do caesarean section to avoid labour pain as it is painful and long …" (FGD/P6)

Some interviewees said that women asked for CS to avoid pain due to fear of labour pain:

"…to avoid the pain of natural birth there is word pathological fear. There is fear, which is called tokophobia, unnecessary fear of labour pain. The wrong rumours about labour - pain is unbearable, you will see mustard flower (experiencing unbearable pain) heard by the pregnant women. So, to avoid labour pain, they demand CS." (K3)

Some interviewees highlighted that woman request CS due to fear of pain after hearing horror stories from others:

"…women have heard of many horror stories while being pregnant from the experience of other woman while giving birth to babies. They hear horror stories such as women must fight between her life and death to give birth of their child. Therefore, they are in very much stress.

And they think that it is better to go for surgery than to bear such intense pain. With this preoccupied mind they come, and they demand caesarean section." (P2)

Likewise, some interviewees highlighted that women request a CS because of not coping pain during labour:

"...No one says they do normal delivery when they are in labour pain. So, there is a high chance of wrong decision, because they do not know the medical condition." (K4)

Some interviewees pointed out that women fear of prolonged labour, so that, request CS:

"...Mother used to tell us how they delivered their baby after 3-4 days labour. So, many may fear about the pain and think that they will give birth through caesarean section…" (FGD/P22)

Some interviewees highlighted that some women want just one child or 2 and do not want to take risk giving vaginal birth, so that, request CS:

"Now there are many women who want one child, so they do not want to take the risk and demand CS. (P6)

"….nowadays patients are making 1or 2 baby, so they demand CS to avoid risk." (P7)

Some women request CS thinking CS is free of complications:

"Main reason of patient demand CS is to avoid labour pain. Some of the patient think that if they have long term labour pain then there will be complications in their baby and think that in CS there are not any complications for their baby. But doctors clear their doubt. I think the main reason is to skip pain." (P11)

Some interviewees said that some women request CS because they think long labour can harm their baby and they could end up in CS after a prolonged labour:

"There are group of women who said they cannot bear pain, they want mother and child both safe, they think that being in long term labour pain harms their child, and the baby may be disabled. Another reason is that some women come after hearing the experience of others, just like my friends have gone for long term labour pain but at last they did CS. That kind of woman also demands CS." (P9)

One interviewee added that performing CS could be a painless shortcut and easy way of childbirth:

"Some women might feel easy to operate rather than normal delivery as for normal delivery, labour takes time and painful. So, to avoid pain they might prefer caesarean section..." (FGD/P3)

Some interviewees highlighted that women want CS without a medical reason to maintain their pre-birth vagina and sexual life.

"... People think after normal delivery, changes occur in vagina, and you would not feel the same as before during sexual intercourse which is totally wrong. Most of the women who do not know about all these things prefer caesarean section. So that, their sexual life will be same..." (FGD/12)

Some request CS to avoid various consequences of vaginal birth such as genitals tear, late return to job and sexual reasons:

"...normal delivery can sometimes have various consequences such as tear in the genitals; the other is that women think that it may not be able to continue the profession for a long time due to it. Someone wants it for sexual reason ... there is a misconception that it affects later if it is normal delivery. There is no scientific reason for that but there is such an understanding in people." (K1)

Some request CS for maintaining sexual desire:

"...some of the women do because their husband has said the vaginal orifice, the vagina should be kept narrow but after normal delivery it would not be the same. I hear from women that it is amazing that their sexual desire will decrease as soon as it happens." (K3)

Bad obstetric history or poor obstetric history means having history of miscarriage, stillbirth and IUFD. Women who have a bad obstetric history such as foetal loss, stillbirth or miscarriage are more likely to request CS:

"... if they have previously had stillbirth, then they are in fear that it might happen again, and they ask for Caesarean section." (P4)

"...babies are also more likely to be caesarean if...have had a miscarriage, or have had a previous pregnancy loss, have had a bad experience such as stillbirth, IUFD. they mostly demand CS." (P5)

Some also pointed out that occasionally women just demand CS to follow the fashion under

the influence of friends and relatives:

"... they might have seen their friends who had previously performed a caesarean section. During the initial stages the caesarean section is not complicated and seeing the simplicity of this they might have been inspired by their friends. They talk about their friends who performed caesarean section previously and have had no problem till date. I think that is the reason why women demand a caesarean section." (P2)

Similarly, some highlighted that some women request CS to give birth at auspicious times and dates**:**

"There are lots of people who comes seeing auspicious day, requesting for CS as its good and auspicious today. Some come saying it is good to deliver today seeing auspicious date." (P8)

Furthermore, some interviewees indicated that women request CS to avoid emergency CS and complications or if they have had bad experiences during a previous normal birth:

"... reason is that some women come after hearing the experience of others, just like my friends have gone for long term labour pain, but at last they did CS. That kind of woman also demands CS." (P9)

"... even if patient go for a trial of labour because of complications seen during the course of labour, they have to go for emergency CS." (P13)

Bad experience on previous vaginal birth can be also a reason of requesting CS:

"...if someone has faced a lot of difficulty during the first normal delivery then they want to perform a caesarean section in second time." (P3)

Service providers' attitude

Service providers' attitude on CS also found a non-medical reasons for rising rates in urban hospitals in Nepal. Some interviewees indicated that service providers/doctors also perceive CS as the safe option to avoid risk. Normal birth is not promoted as it used to be, and CS is performed to avoid risk to baby and even doctors:

"...normal delivery is not encouraged as much as it used to be, in case of CS, baby is safe mother is also safe which reduces the headache of the doctors." (p7)

Some interviewees added that the challenge is also the positive attitude of service providers

towards CS. Both pregnant women and service providers would not like to take risks conducting vaginal birth rather than CS:

"Main challenge is attitude change of both providers and client. Clients and provider both also could not take risks and this kind of attitude of both providers and clients are main challenge." (P9)

However, many interviewees said that they do not offer CS simply on maternal request either to avoid risk or to avoid labour pain but do CS only for medical indications:

"We look at the indication rather than the demand of the patient, here we do not do CS according to the demand of the patient. Even if the demand of the patient is under the indication, we do not do so…" (P7)

One interviewee further said that doctors do not do decision on CS either maternal request or family pressure:

"Patients demand CS to avoid risk and to avoid pain. Patient's family also give pressure, but we do not make decisions based on pressure. If the doctor decides to do a caesarean section based on the demand of patient, then there will be 100% caesarean section..." (K4)

5.3.5 Health services related factors

Four main sub-themes on health services related factors are identified: (1) lack of awareness around mode of childbirth; (2) lack of adequate resources; (3) the centralisation of health facilities in urban Nepal; and (4) lack of appropriate policies and protocols on CS.

Lack of awareness on mode of childbirth

Most of interviewees highlighted that women's lack of awareness around mode of childbirth is one of the main factors for the rising CS rate in urban hospitals. Interviewees described how most pregnant women are not well informed about the risks and benefits of CS in ANC:

"…one is there is lack of awareness among the client themselves on the risk and complications of caesarean section. So, they want to do it. Whether the caesarean section is required, or not. This type of awareness is lacking among the women as they are not well informed about it. In the hospital settings also, there is not any system to provide information on this while the women come for ANC visit. There is communication gap between the service providers and client. This is one of the main barriers to reduce CS." (K3)

Some highlighted that health workers are not able to provide complete information about complications of CS:

"… reason could be because we health workers do not provide full information to them from our side and do not make them aware about the complication of caesarean section and we do not tell them much about the techniques of pain relief such as laughing gas. This is not quite practiced in Nepal and therefore caesarean section is mostly done." (P2)

Although most interviewees said that the hospital has health education activities in antenatal clinics, most of these sessions concentrate on pregnancy care and well-being rather than the risks and benefits of CS and vaginal birth:

"When pregnant women come to ANC visits, we tell them everything from tetanus vaccine to diet they should eat during the pregnancy. We counsel the patient according to their condition, even after the delivery we tell them about the breastfeeding, wound care, personal hygiene, and nutrition needs. The other thing is we provide them with all the health education …" (P13)

However, some interviewees said that the Government of Nepal has a birth preparedness programme and that student nurses counsel pregnant women around mode of birth if they come to hospital at a late stage of pregnancy:

"…We have a government programme called birth preparedness. There are a lot of patients, so we cannot counsel everyone, but we also have nursing students who are counselling about birth preparedness... when the patient visit hospital in her 37/38 weeks, we counsel them to try vaginal delivery if everything is normal. We recommend them for CS only in indicated cases like previous CS, breech presentation." (P5)

Some interviewees pointed out that a lack of appropriate health education is due to the lack of midwives. Thus, pregnant women were not empowered or motivated for vaginal birth:

"Lack of women empowerment due to lack of midwife… The midwives who would advocate for the rights of the woman are lacking. Women think that they must go to the doctor after they are pregnant. What they think is if they go to the governmental hospital, then the doctor would perform normal delivery and if they go to a private one, then they would perform caesarean section…" (P2)

Some highlighted that pregnant women are afraid of labour pain and due to lack of health education:

"I think the main reason behind it is lack of health education, fear with pain of normal delivery. But if we provide counselling regarding the advantage and disadvantage of CS, then, CS rate will be reduced." (P14)

One interviewee added the lack of motivation for normal birth:

"I think we do not motivate patient for the normal delivery, usually educated people nowadays do not want to go for normal delivery because of fear of labour pain so we health worker should counsel them properly for the normal delivery." (P13)

Some interviewees highlighted that urban, educated and rich women are not aware of mode of childbirth:

"Urban educated women are not aware and informed about the physiological birth. I think, that is why they think that birth is pathological condition. So that, they choose artificial way to bring their baby in this world ... Even, women rights activist should be aware because those women who call themselves feminist or empowered women, they themselves mostly do CS while giving birth to baby…" (K3)

Furthermore, one interviewee mentioned that women are not aware of respectful maternity care, so they simply obey the advice of doctor without participating in the decision-making process, accepting a subordinate role in decision making:

"…Clients are not aware of respectful maternity, which is promoted by worldwide alliances. We are moving forward with traditional mindset. We accept traditional practices. There is hierarchy between doctor client relationship we have the mindset that doctors are God, doctors are boss. We are the receiver, and we must be submissive. What doctors tell, we must accept that this also one of the huge barriers. There is lacking respectful maternity care." (K3)

Lack of adequate resources

Most interviewees emphasised that lack of adequate resources (midwives or SBAs) is another main factor for the rising CS rates. Lack of resources has always been a problem for health services in countries such as Nepal. Many interviewees highlighted the lack of midwives who are expert for handling physiological births:

"…We do not have experts (midwives) in handling natural births in Nepal. Recently, our country has produced 28 midwives. It takes a minimum of 10 years for them to adopt a system-adjusted society because it is challenging for you to change the established practice to change

the system. For that, women themselves are not aware and informed. I think, it would be a little difficult." (K3)

Some interviewees highlighted of lack of doctor or nurses in comparison to pregnant women who need maternity care. The main problem is lack of skilled workforce (SBAs and midwives) for optimal use of CS:

"The main obstacle is lack of skilled workforce. Because looking at Kathmandu only we cannot generalise whole Nepal. A remote place where there is no skilled workforce, even normal delivery is difficult to conduct. The second thing is that for the caesarean section, manpower is needed…." (K1)

"Main challenge is proportion of doctor/nurses with proportion of patients, so if trained midwife, SBA trained personnel are mobilised in every remote as well as urban then this may help to reduce unnecessary CS rate." (P7)

Some interviewees indicated that a lack of medical skill in vaginal birth for breech and instrumental birth is also adding to increasing CS rates in Nepal:

"…we called instrumental delivery like forceps, vacuum delivery nowadays their use is very low like when I was MD student about 25 years ago. At that time there was vacuum delivery 6% and forceps delivery 3% - total 9% of instrumental delivery. Now this 9% is also added in caesarean section because nowadays doctors are lacking the skills of instrumental delivery (vacuum, forceps) and normal delivery of breech presentation. That is why the trend of caesarean section is increasing." (K4)

One interviewee highlighted that the CS rate is higher in those hospitals where doctors are trained to MD level:

"Those hospitals where the MD students are trained caesarean section rate is high. So, another important reason for increase in CS rate is because the hospital is a training site for gynaecology and obstetrics related condition of MD students' doctors." (K3)

Centralisation of health facilities in urban Nepal

The centralisation of comprehensive maternity health facilities in tertiary centres in the cities of Nepal is another reason for rising CS rates in urban Nepal. This was highlighted by some interviewees:

"The main reasons behind the increase of CS rate in urban Nepal is tertiary care centres and many big hospitals are situated in urban cites of Nepal where most of the patients are referred." (K2)

Some interviewees suggested that increase trend of CS rate is exacerbated by the number of private hospitals in the cities:

"The trend of caesarean section in Nepal is increasing now especially in urban areas, in big hospitals of cites, corporate hospitals in comparison to rural and remote areas…" (K1)

All health professional interviewees from the relevant hospitals said that the hospital provides a comprehensive obstetric care service**.** PMWH has been providing range of maternity and women's health services:

"This is Paropakar hospital, here range of services available such as preconception care, IVF, ante-natal care, postnatal care, caesarean section, normal delivery. These facilities have been continuously provided since many years. All kinds of health facilities including gynaecology, maternity, obstetrics is being provided from here." (P2)

Similarly, KMH has been providing all kinds of maternity services:

"We provide all kinds of maternity related services from here like delivery service, antenatal care, postnatal care as well as morbidity care services like ectopic pregnancy..." (P9)

Lack of appropriate policies and protocols

Lack of policies and protocols on maternity care and CS is found to be a health-services-related factor. The main issues were lack of written protocols and policies on CS, lack of models of maternity care and respectful maternity care, lack of policy on awards for low CS or monitoring and supervision regarding high rate of CS, lack of political commitment on implementation of international recommendations (Robson classification) and lack of auditing CS.

Lack of written protocols and policies on CS

Most of interviewees said there are no written policies and protocols on CS, they do CS based on indications as in MD level textbook:

"We do not have a written protocol here. We are finalising it soon. We know about the indication of CS and based on that we do CS in our hospital." (P6)

"There is no such a separate strategy/policy for CS in Nepal, we follow MD level book and according to the indication we do CS." (K1)

However, some interviewees agreed that the Safe Motherhood policy is useful and applicable**:**

"Nepal Government has Safe Motherhood policy; I think that is applicable for all." (P6)

Lack of models of maternity care

Some interviewees importantly stressed that the lack of a midwifery model of maternity care and current practice of an obstetric model of maternity care is a cause of increasing rate of CS:

"…doctors are trained to handle pathological conditions while being professionally trained...where there is a midwife, the midwifery is called the social model of maternity care. Similarly, the midwifery model of maternity care, women are trained to be empowered…if professional midwives are very empowered in the country, the rate of caesarean section is relatively low in that country." (K3)

Hospitals in Nepal mostly follow an obstetric model of maternity care:

"In our hospital also, deliveries are done from obstetric model..." (P1)

Lack of respectful maternity care

Similarly, one participant indicated that the lack of respectful maternity care was also a reason for unnecessary CSs in Nepal. Performing unnecessary CS is obstetric violence. However, there is no complaints system for such incidences in Nepal:

"...There is lacking respectful maternity care…There is not any mechanism to handle consumer rights although there is legal right. There should be a system to complain, but even clients are very fearful even to raise their voice. Unnecessarily CS is obstetrics violence, which is what is happening in Nepal, first it was in Brazil. I am blaming the system for the mindset of the society which is the big drawback of the system that brought women up." (K3)

Lack of policy on awards for low CS or monitoring and supervision for high CS

Some interviewees raised the issue about lack of policy and protocol for awards to hospitals for low CS rates and monitoring of CS rate in hospitals. The Government of Nepal has no policy to award those hospitals who have lower CS rates or a system for monitoring and supervision to reduce the high CS rate:

"…Government has no policy to award the hospitals having caesarean section rate less than 15%. And another thing is there should be the monitoring and supervision of the hospitals in order to prevent the higher rate of caesarean section..." (P2)

Lack of political commitment on implementation of international recommendations (Robson classification)

Some interviewees stressed that a lack of political commitment on implementation of international recommendations such as Robson classification to reduce CS rate is also a policy/protocol related factor for rising CS rate in Nepal:

"…national leaders must be committed to implementing the standards set by the WHO… For example, WHO says use the Robson classification, but if the director of the maternity hospital cannot get support from the Government than he/she could not implement it alone. That is what the system is all about we need system to support our work… NESOG does not seem like to have taken any initiative to control... (K3)

Lack of appropriate auditing of CS

Lack of appropriate monitoring and auditing systems of CS can be a reason for rising CS rates. Although most interviewees reported that they have a system for recording and reporting CS:

"In our hospital, there is a monthly audit …for example, how many of the deliveries during the month are normal delivery, how many forceps, vacuum deliveries and how many caesarean sections are done, how many are done annually. We also provide this data to the Government of Nepal." (K1)

However, some added that the Government of Nepal is trying to develop the auditing system of using Robson in all hospitals:

"The Nepal Government is trying to develop the system of using Robson criteria in all the sites. There are indications for CS in Nepal Government guideline." (K5)

Furthermore, few interviewees mentioned that CS auditing is carried out using Robson classification in line with the recommendations of the Government of Nepal:

"…there is a system for audit of CS. We do CS audit according to the Robson criteria." (K2)

"...we have been doing audit for CS. We have been conducting annual audits. We have a system and in between we have been reviewing following the Robson criteria…" (K4)

However, one interview said that they do not audit CS using Robson classification:

"We do not have practice of audit of CS. If we move forward using Robson criteria, then it will be better." (K3)

5.4 Strategies for optimal use of CS in urban hospitals in Nepal

Four main themes including several sub-themes are identified regarding the strategy for the rational use of CS as shown in Figure 5.2 below: (1) adequate resources; (2) increasing awareness around mode of childbirth; (3) reforming policy and developing protocols for CS; and (4) the promotion of physiological birth.

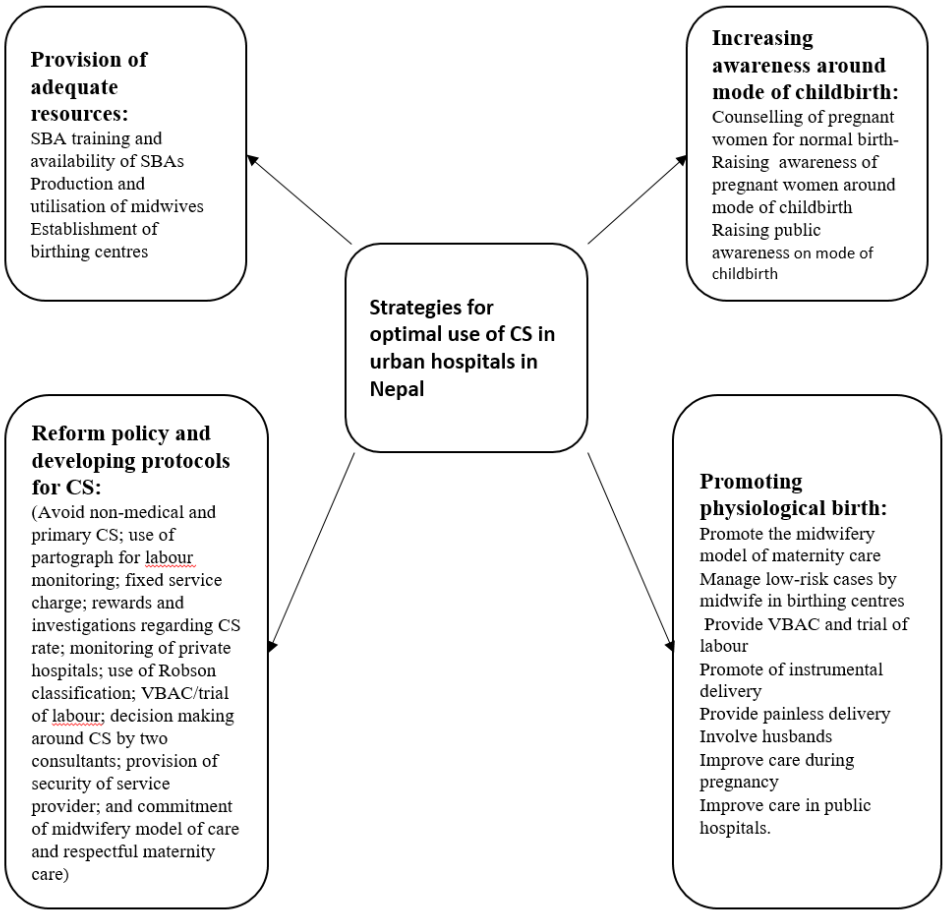

Figure 5.2: Strategies for optimal use of CS in urban hospitals in Nepal

The data sources of above themes and sub-themes are presented in detail in Appendix 18.

5.4.1 Provision of adequate resources

Three sub-themes are identified: SBA training and availability of SBA trained staff, production and utilisation of midwives and the establishment of birthing centres (Figure 5.2).

SBA training and availability of trained staff

Most interviewees emphasised that training of SBA to doctors and nurses and availability of adequately trained staff to perform vaginal birth would be a strategy for reduction of the CS rate and promotion of normal birth:

"... Along with doctors, SBAs also should have a hand in normal delivery. So, the government should focus on training and mobilising SBA. In the same way there should be SBA at labour room, delivery room to perform the normal delivery. At the hospital level we need to influence the patients for the normal delivery as well as staff themselves should be skilful." (P13)

Some interviewees indicated that maternity services including CS should be available all over the country to reduce referral and manage complications at community level:

"…If you have SBA trained and ASBA trained manpower in every remote area, then people do not have to come here, because many problems arise in between. If trained manpower is placed everywhere then mothers do not have to die with complications, they do not need to do CS." (P5)

Some emphasised the importance of increasing the number of nurses according to number of pregnant women (who need maternity care) and geographically feasible of health facility:

"Patient nurse ratio should be increased. Health facility should be in feasible places and should be geographically well distributed." (K2)

Production and utilisation of midwives

Most interviewees highlighted that education and appropriate utilisation of midwives must be the strategy for reasonable use of CS and for promotion of physiological birth. Midwives should be posted in antenatal clinics, birthing centres, PNC clinics, as well as in the community:

"First of all, midwives should be produced, and they must be mobilised from ANC, birthing to PNC. Because of the lack of midwives, normal physiological birth is not promoted. If we can produce more midwives and utilise them from community level to higher level than the rate of caesarean section can be decreased." (P2)

Some interviewees emphasised the training and appropriate placement of midwives:

"…if we can increase the production of midwives and provide them a good place and to utilize them. Then, we can be able to reduce the rate of caesarean section... midwife can see the patient in the OPD when they come for the ANC visit. And following them up to the delivery… if we are able to produce midwives and utilise them, then caesarean section rate can be controlled and brought down." (P4)

Similarly, some interviewees emphasised the need of midwives to promote physiological birth:

"…if there is a midwife then they can promote women for the normal physiological birth until and unless there is an emergency otherwise you can have a normal birth…physiology type of counselling should be done among the pregnant women...Until and unless we do not have a midwife who can assist the physiological birth, it would not happen. Human resources who can handle physiological birth need to be produced in large numbers. The Government of Nepal has already estimated that 9000 midwives should be produced and utilised..." (K3)

The establishment of birthing centres

Many interviewees stressed the importance of establishing birthing centres in each hospital which are run by midwives and where normal birth is promoted:

"Birthing centres should be established which is run by midwives…" (K4)

In order to promote physiological birth, birthing centres with adequate numbers of SBAs/midwives should be established in each hospital:

"In order to promote normal physiological birth, birthing centres should be established, well trained nurses should be utilised in every health facility." (K2)

A midwifery approach should be applied to promote physiological birth:

"For this in everything just like in birthing centres physiological births should be promoted, midwife approach should be applied, the amount of oxytocin should be removed for induction." (P1)

5.4.2 Raising awareness around mode of childbirth

Three sub-themes are recognised: (1) counselling of pregnant women for normal birth; (2) increasing awareness of pregnant women around mode of childbirth; and (3) increasing public awareness around mode of childbirth.

Counselling of pregnant women for normal birth

Most interviewees stressed that counselling pregnant women about normal birth from the beginning of pregnancy during the antenatal period can play vital role in reducing CS rates. Proper counselling can motivate women to aim for normal birth and reduce the fear of labour pain:

"…Counselling plays an important role. If counselling is done properly, then, we can reduce unnecessary CS." (P7)

Some emphasised the importance of counselling women from the beginning and teaching yoga and exercise:

"…pregnant women should be counselled for the normal delivery from the very beginning. There are lots of yoga, exercise for the pregnant women, which should be taught to them. I think, it would be beneficial if the health education related to pregnancy should be given from the very beginning." (P12)

Some stressed to counsel on the process and advantages of normal delivery to reduce fear of normal birth:

"…women should be counselled from their preconceptions. About how one can deliver normally then only we might be able to reduce their fear of the normal delivery by explaining to them about the benefits of normal birth. This way we might be able to reduce the rate of caesarean section." (P1)

ANC counselling by a doctor is important for mental preparation for normal birth:

"…counselling during antenatal period is main importance. If we have counselled properly during antenatal period, the client will be prepared mentally to give normal birth…Doctors should counsel that you have come to safe place, and you have to give normal delivery. Counselling also convinces many patients, so, I think as a doctor he/she should also be a counsellor." (P8)

Some interviewees highlighted that doctors should not suggest CS, should suggest normal birth:

"Counselling is important. Doctors also should suggest normal delivery is better than caesarean section. I have seen many doctors suggesting caesarean section even in small problem, so they do not have to take risk. Same as the others." (FGD/P10)

"Counselling from health workers from time to time… Doctors also should recommend normal delivery rather than caesarean section in normal condition. I think some doctors do not like to take risk, so they perform caesarean section. This should not be done ..." (FGD/P18)

Some interviewees suggested that pregnant women should be clearly informed about the risks and benefits of CS and normal birth and be provided with free health checks as a motivation for normal birth:

"…if we provide counselling regarding the advantage and disadvantage of CS, then CS rate will be reduced…Mainly we should provide counselling, health education on the benefit of normal delivery and risk of doing CS to the patient clearly…to provide health education and counselling to mother then we should create such type of program that promote mother for normal delivery. For example, if mother do normal delivery, then they will be benefited with free health check-up for their child up to some visits." (P14)

Some interviewees pointed out that doctors could motivate and encourage pregnant women to plan normal births by telling benefits of normal birth.

"…doctor also have to tell the patient about the advantages of normal delivery." (K4)

"Women should be mentally focused to give normal birth from the beginning. Doctors should also encourage women to give normal birth and aware patients about normal delivery. In case of critical case only then should they go for caesarean section otherwise they should prefer normal delivery." (FGD/P17)

Increase awareness of pregnant women around mode of childbirth

Many participants emphasised on health education to pregnant women on mode of childbirth. Health workers should provide health education and encourage pregnant women giving birth by normal birth:

"Health education should be given to pregnant women by health workers and encourage for normal delivery." (FGD/p1)

Childbirth education should be given during ANC visits:

"Education on mode of childbirth should be given to women since they visit antenatal check-up. And their mental and physical aspect should be taken care of to prepare them. If you can do that then the caesarean section will decrease. Woman must be prepared for a normal delivery rather than caesarean section…." (P2)

Some added that during ANC visits women should make aware of the benefits of vaginal birth:

"…we should make pregnant women aware about the benefits of vaginal delivery during ANC visit. Monetary cost is also cheap, physical recovery is also quick, CS recovery takes time so normal delivery recovers quickly, all these things should be made aware during ANC visit to pregnant women." (P10)

Many interviewees stressed that empowerment of pregnant women should be done by providing maternity care from midwives to maximise the chance of the woman making decisions around the mode of their childbirth:

"The first thing is that the women must be empowered themselves, there is not much human resource to empower the right of the woman and that is lacking for example the midwives… the main thing that can be done is the empowerment of the woman to reduce the rate of caesarean section. And the number of women performing elective caesarean section in the urban sector is increasing. Women need to be aware; they must be empowered so that they can make decisions for themselves." (P2)

Some interviewees highlighted that educated urban women should make aware on the mode of childbirth. They should be aware about risk and benefit of CS as well as benefits of physiological birth:

"... All we need to do is to make aware and informed urban settings women about the consequences of CS…Likewise, women should be made aware and informed about the benefits of normal physiological birth." (K3)

Some interviewees emphasised that richer and educated women prefer CS because they afford it. However, CS can cause health problem and they should know about importance of their health:

"...I see more educated people prefer caesarean section then uneducated people. I am also from medical field. So, I have seen mostly women from rich family prefer caesarean section as poor family they do not have money and cannot afford for the treatment. So, they prefer normal delivery. But women from rich family have concept to keep nanny to take care for them as they have enough money for diet and for everything. So, educated women should understand it is not just about money only, but also about health and body of the mother..." (FGD/P7)

Increase public awareness around mode of childbirth

Many interviewees emphasised that public awareness around mode of childbirth should be increased using mass media such as displaying posters and pamphlets to reduce the rising CS rates. Such mass communication methods of health education can promote normal birth:

"Normal delivery has to be promoted via ANC - displaying posters, pamphlets in it our counselling patients in the OPD about the benefits of normal delivery by providing information in understandable form in television." (P3)

Some emphasised the importance of educating family and community on mode of childbirth:

"...family, community people should understand that CS should only be done in indicated cases... One is that we must make the client aware from the very beginning to promote normal delivery." (P9)

Awareness of mode of childbirth can lead to the right choice:

"...to create awareness, we need to educate every family about CS. If every patient thinks consciously about the advantages and disadvantages of a caesarean section, then the choice is different..." (K1)

Some interviewees recommended increasing public awareness on CS, and how health education around childbirth could occur in higher education:

"...Childbirth education is lacking in our country. We should promote it from higher education or school level so that girls and boys both know that 85% of births are normal physiological birth, they will be well informed from their early phase..." (K3)

Some interviewees suggested incorporating health education about mode of childbirth into college (Plus two) courses or medical courses:

"Changes should be done only from education system. Health education should be provided in courses of +2 or medical course but basic general knowledge needs to be included from the beginning. Male and female both should know that this is the natural process, and it should be included in health education from school level." (FDG/p12)

5.4.3 Reform policies and protocols for CS

Ten sub-themes are identified: (1) policies for avoiding CS for non-medical reasons and primigravidae/primary CS; (2) appropriate use of partograph for labour monitoring; (3) fixed service charge for CS; (4) rewards for, and investigations into hospitals in relation to CS rate; (5) monitoring of private hospitals; (6) use of Robson classification to enable proper comparison; (7) VBAC/trial of labour; (8) decision making around CS to be made by two consultants; (9) provision of security of service providers and (10) commitment to implementation of international recommendations (including midwifery model of care and respectful maternity care).

Policy for avoiding CS for non-medical reasons and primigravidae/primary CS

Caesarean section should be done only for medically indicated reasons. Most interviewees stressed that policy should be reformed to avoid conducting CS on non-medical grounds. CS is lifesaving surgical procedure. Therefore, it must be done for saving life:

"… a lifesaving procedure absolutely performed for life saving. If caesarean section is avoided to be done routinely then the rate of caesarean section can be lowered." (P1)

There should be protocol regarding performing CS only in indicated reasons and the protocol to be followed strictly:

"…there should be strict protocol regarding the CS that it should be done in indicated cases only. Hospital wise protocol for the CS…Institution wise by strictly following the rules and regulation of government on CS can be used appropriately." (P14)

Some interviewees highlighted that strict monitoring and follow up of the implementation of policy is also necessary:

"The first step to reducing unwanted CS is to make strict protocol… Secondly, strict monitoring whether the protocol has been strictly followed or not. The main thing is to reduce the unwanted CS, one had to make a protocol and strict monitoring of it…The current policy has everything,

but we do not have a system of strict monitoring. If the Government alone cant monitor, it is better to have a separate body…In addition, there is policy which need to be strictly implemented, there is system to provide allowances to the mother who give birth through normal delivery." (K1)

Some interviewees also highlighted that primary CS should be avoided wherever possible to avoid repeated CS:

"…you should not perform the operation during the first delivery, because if the CS was performed at the primigravida, if VBAC was not performed, then again, the caesarean section will be performed at second time." (K4)

"... If the first baby delivers vaginally then it would be better. If the first baby has CS, then there is a good chance of getting CS later. In my experience, if women are motivated to try their vaginal delivery first, they will agree." (P7)

Some interviewees said that CS should only be carried out for benefit of mother and baby rather than for profit for hospitals:

"…the hospital should be more concerned about the patient rather than profit. So, hospital should do caesarean section only in sever condition. Caesarean section should be done only required. Policy to be implemented properly to do caesarean section for only required ones." (FGD/P20)

Some interviewees emphasised that doctors should encourage normal birth and do CS only when necessary:

"Doctors should also encourage to give normal delivery and make them aware about normal delivery. In case of critical case only they should go for caesarean section otherwise should favour normal delivery." (FGD/P5)

Furthermore, many interviewees stressed that private hospitals should avoid doing CS for maternal request.

"In private institutions we should reduce maternal requests…" (P11)

Similarly, CS on-demand/request must not be promoted:

"…we should not promote on-demand CS…" (P9)

Appropriate use of partograph for labour monitoring

Partograph should be used to monitor labour. Some interviewees stressed that labour in hospital (including private hospitals) should be monitored using the partograph, there was a notion that other (private) hospitals did not use them:

"Our hospital has its own protocol. We filled partograph but I don't think private hospital filled partograph, at least partograph should be filled." (P6)

Partographs help staff consider what is within the normal range and what is not:

"I think the partograph should carefully be remembered for this because the partograph can tell whether a normal delivery can be performed or not looking at the condition of both the mother and the foetus. If the partograph is carefully used when the condition of the foetus is known, the progress of the labour is known. Partograph is monitored from the active phase of labour. Then, it will be easier to decide whether to perform a normal delivery or a caesarean section..." (P3)

Rewards for, and investigations of, auditing hospitals in relation to CS rate

Some interviewees recommended that the Government should create policy to reward hospitals with high normal birth, to investigate reasons for high CS rates, to run programmes to increase moral of doctors and to auditing of CS to reduce unnecessary CS. Such policy reform could encourage to conduct more normal birth and reduce CS in the hospitals:

"...create protocol/guideline to be followed to reduce unwanted CS... programs to increase morale of the physicians, encouraging strategy. The hospital that has more normal delivery had to be awarded. If it is encouraging, there will be competition among the hospitals, so more vaginal delivery can be done. Similarly, in a hospital where most of the CS are done, the government should investigate the cause of more CS. Auditing can also reduce CS because when there is inquiry, then people become aware that unnecessary CS..." (P10)

Monitoring of private hospitals

Some interviewees stressed that the Government of Nepal should advocate for medically indicated CS. The Government of Nepal should supervise and monitor private hospitals regarding high CS rates. CS should be conducted only for indicated reasons in private hospitals:

"Government should advocate that CS should be done only in indicated cases…Government should also monitor the private sector and need to strengthen for doing CS in indicated cases only." (K5)

"We should sit and talk to the hospital management of the private sector because most of the caesarean section are conducted in private sector..." (P8)

However, the Government of Nepal should monitor private hospitals rather than blaming them, because they are profit making hospitals and CS is the best option to generate income for private hospitals:

"Private hospitals are there for making money unless and until government sector they do not themselves question and monitor them, nothing is going to happen. That is why it is useless to blame private hospital, because we are pretty much sure they are for profit making and they don't get any money from government to run hospital and to run hospital they must generate fund, and to generate the fund CS is best option…" (K3)

Fixed service charge for CS

Some interviewees emphasised the need for a policy of fixed fee charge for CS, particularly in private hospitals. The government of Nepal must decide the price of the caesarean:

"In the private hospitals the charge for caesarean section is very high and it is also the focus of there. So, the government must decide the price of the caesarean section first and the charges of normal delivery." (P1)

Some interviewees further emphasised that fees for CS must be fixed in private hospitals. Although CS is free in public hospitals the fee for CS in the private hospitals is very expensive but variable according to hospitals. Poor women who need CS cannot afford CS in private hospitals. Therefore, the Government of Nepal should make fixed rate of CS at a reasonable price and should monitor it:

"… financial aspects like in government sector CS is free. Likewise, if there are certain rules like only CS fee can be charged up to that amount, this will help patient to get service easily. The fee in a private hospital is very expensive for CS. It is around Rs. 1 lakh. It is cheaper in some places. Doing CS for some of our poor family or lower/middle-class family is expensive. So, even if they need to do CS, they try for normal delivery. At the same time, the lives of both

mother and baby may be at risk, so if the government of Nepal makes fixed rate available to the public at a very reasonable price along with strict monitoring it... those who must deliver from CS will get CS." (K1)

Use of Robson classification to enable proper comparison

A few interviewees suggested that the Robson criteria must be applied to assess and monitor CS in all hospitals, including private hospitals. This enables better identification of the reasons for CS. Robson classification should be applied in both public and private hospitals to assess and monitor CS:

"By taking the Robson protocol and analysing all the hospitals indication for CS. This should be applied in private as well. Going private is the private choice of the patient but Robson criteria which is universally accepted and approved by WHO. Now, there is also a necessary to know why the CS rate is high. The root cause also comes from the criteria and if the main cause of CS is found then we can reduce the unwanted CS." (P9)

Provision of VBAC and trial of labour for breech presentation

Many interviewees discussed the provision of protocols for VBAC in each hospital and trial of labour for breech presentation. It would not only reduce CS rates, but also reduce the cost.

"...we should give a chance of trial of labour to previous CS, and this must be kept in every hospital protocol. Usually, doctors are distressed while the baby takes long time to deliver in order to be on the safe side, we want to do CS. So, it would be better if doctors try to keep calm and manage their distress and not perform unnecessary CS." (P11)

Some interviewees highlighted the need for intensive monitoring of labour for trial of labour in breech presentation:

"...it would be better if hospital could provide intensive monitoring for the trial of labour in the case of breech and previous CS. If we do all this, then normal physiological birth can be promoted." (P9)

Some interviewees highlighted that the Government of Nepal should think about the cost of doing repeat CS to prevent uterine rupture:

"…The state also had to be interested in this because in a country like ours how much does it cost to re-CS the previous CS of 1000 people to prevent one uterus rupture by VBAC. Everything from sewing yarn must be imported from abroad..." (K4)

Provision of security of service providers

Many interviewees highlighted the provision of a safe working environment by protecting staff's safety and morale for reduction of defensive CS.

"…Providers also should have confidence and safety. In case of any problem during delivery, safety of the provider should be ensured. The society should also be aware if anything happens blaming doctors, attacking them should not be done. Government should provide guarantee of security and conduct different workshops to increase the morale… This is the responsibility of the hospital as well as of government to provide safe environment for health worker to work." (P10)

Staff should be aware as well as health system should address the security and safety issues:

"Staff should be aware; providers should not get afraid and distress. Health systems should address this and support service providers to ensure safety of them." (P9)

Some also emphasised the need for the law to be supportive of the doctors or service providers:

"There should be a provision for safety of the doctors. If the system has followed well there, the judge does not have to make a hasty decision. If you have not followed the system, you must be punished if you have made a mistake… national protocol/law and order should be strong and should strictly follow them. There should be strict law for the sake of doctors in what condition do they get exemption and punishment if any complications arise even if precaution is taken as protocol." (K4)

Decision making around CS by two consultants

One interviewee highlighted that there should be a policy of decision making for CS to be made by two consultant doctors.

"… important thing, I have to say is that the caesarean section must be decided by two consultants…" (K4)

Commitment to implementation of international recommendations (midwifery model of care, respectful maternity care and Robson classification).

Some interviewees emphasised that government policy should be committed to the reduction of CS by following WHO protocol on the provision of Respectful Maternity Care with the midwifery model of care:

"The maternity department head is obstetrician, he/she should be committed first to reduce unnecessary CS... Department of Health Services, Family Welfare Division Head all should be committed collaboratively to reduce unnecessary CS… from national level WHO criteria should be strictly followed. Similarly, local level government should also commit for respectful maternity care... Local body should be informed about which model of maternity care we are adopting in the country like social model or medical model...The Ministry of Health should be conceptually clear which model exists for maternity care in the country…" (K3)

However, many interviewees pointed out that current policy of government of Nepal is good, but problem is in implementation. These current policies must be implemented**:**

"I think it is enough if we could implement already formed policies like ROBSON criteria, RCOG/ACOG, WHO policies. Nepal government also has its own policy if it is implemented properly then that will be enough." (P9)

"The Government written documents are very wonderful, fantastic, but they are not in practice. There is lack of proper implementation..." (K3)

Some highlighted the need of monitoring current policies:

"The current policy has everything, but we do not have system of strict monitoring. If the Government alone cannot monitor, it is better to have a separate body." (K1)

5.4.4 Promotion of physiological birth

Eight sub-themes were explored by interviewees: (1) promote the midwifery model of maternity care; (2) manage low-risk cases by midwives in birthing centres; (3) provide VBAC and trial of labour; (4) promote of instrumental delivery; (5) provide painless delivery; (6) involve husbands; (7) improve care during pregnancy; and (8) improve care in public hospitals.

Promote the midwifery model of maternity care

Midwives practising the midwifery model of care will encourage natural birth. Most interviewees emphasised that physiological birth should be promoted by utilising midwives in this way. Physiological birth can be promoted by promoting the midwifery model of maternity care and avoiding use of unnecessary intervention such as using oxytocin unnecessarily:

"…the approach to delivery should be that of midwifery model by promoting physiological birth then the rate of caesarean section might be lowered... Because midwives have more knowledge about physiological birth and how to perform normal delivery. And the way in which the oxytocin is being used randomly and the misoprostol an induction is increasing and therefore, after the induction fails the next option is caesarean section. So, we have to promote physiological birth giving process by producing more midwives and utilising them..." (P1)

An interviewee further stressed that women who ask for elective CS should be taught about pain relief methods and water birth should be adopted:

"…women who ask for elective caesarean section should be taught about pain relief methods. And laughing gas can be used and included as a pain relief method and techniques such as water birth should also be adopted to promote normal birth." (P2)

Manage low-risk cases by midwife in birthing centres

Some interviewees emphasised that low-risk cases should be looked after by midwives and trained nurses in birthing centres to promote physiological birth in all hospitals. A birthing centre should be established in all hospitals. PMWH has a birthing centre where low-risk cases are managed by SBA nurses and midwives. The rate of CS is comparatively lower in PMWH than other public hospitals in Kathmandu. Therefore, similar birthing centres should be established in all urban hospitals:

"…like in our maternity hospital (PMWH), low risk cases are there in birthing centre where nurses and midwives manage delivery. The caesarean section rate over there (birthing centre) is less than 10%... There should be a birthing centre having obstetric unit where nurses, midwives can do normal physiological delivery. If you see at CS rate of other public hospitals in Kathmandu, CS rate is over 50%. The only reason the maternity hospital (PMWH) has less CS rate is we have a birthing centre where midwife perform normal delivery…" (K4)

Provide VBAC and trial of labour

Provision for VBAC and trial of labour for breech presentation can help to promote physiological birth. This was described by some interviewees:

"...VBAC should be given priority in case of previous CS. Breech should be delivered normally based on criteria…" (P6)

Moreover, intensive monitoring of labour for VBAC and trial of labour to breech presentation can promote physiological birth:

"…it would be better if hospital could provide intensive monitoring for the trial of labour in the case of previous CS and breech presentation. If we do all this, then normal physiological birth can be promoted." (P9)

Promote instrumental birth

Some interviewees suggested that instrumental birth should be performed to promote vaginal birth. Continues to offer instrumental birth:

"We also do vacuum, forceps, instrument delivery we need to keep both mother and baby healthy…instrumental/vacuum delivery should be performed like previously if these things are done then we can reduce CS rate." (P6)

Provide painless birth (epidural anaesthesia)

Some interviewees indicated that provision of painless birth can be an option for reducing CS on maternal request due to the labour pain. Painless birth/labour analgesic should be offered:

"…if epidural anaesthesia is provided to relieve the labour of pain. Then normal delivery can be increased. Many patients are demanding painless delivery but to get painless delivery there should be good backup of anaesthetic doctors because pain management is not the scope of work of the obstetrician. However, there is a shortage of anaesthesia doctors in Nepal. Therefore, if the doctor of anaesthesia can produce and utilise it well, and then, painless delivery can be done in Nepal." (K4)

"…if we start painless delivery then, on-demand CS rate will be decreased…" (P5)

Involve husband/Partner

Some interviewees highlighted that involvement of the husband during pregnancy and childbirth can promote physiological birth. Some interviewees emphasised that the husband should be involved during pregnancy:

"…in foreign countries both the husband and wife are explained clearly about the nutrition exercises and what happens if normal delivery or caesarean section is performed and this way the husband also understands everything about when to go to the hospital. So, this must be practiced in Nepal also." (P3)

Similarly, husband should be involved not only during pregnancy, but also during childbirth:

"All I want to say is husbands should equally participate in this 9-month pregnancy journey along with wife. During childbirth husband should be there, so that, they can feel how hard it is to give birth. It's not only woman's job to give birth baby. It is equal for men also, it's like partnership." (FGD/p12)

Improve care during pregnancy

Pregnancy is a critical period of life. Quality care during pregnancy can have a big influence on the pregnant woman. Most of interviewees emphasised the importance of the care during pregnancy, such as regular exercise, mental preparation and family support in promoting physiological birth:

"Women should be mentally focused to give normal birth from the beginning. Exercise regularly. Women should be mentally strong to give normal birth from the starting of pregnancy. Mentality to give normal delivery." (FGD/P16)

Many interviewees also emphasised doing regular exercise and avoiding bed resting during pregnancy to promote physiological birth:

"…Women should be mentally strong enough to give normal delivery. Normal exercise should be done regularly from the beginning. Nowadays, there is lack of exercise among pregnant women. They start bed resting from 2-3 months of pregnancy. Resting in bed only will make body stiff and weak. So, regular exercise is important." (FGD/P22)

Similarly, emotional and mental support from family was also suggested to be important:

"…Family support for normal delivery. Pregnant mother should be mentally prepared. … Emotional and mental support from family members as well. Positive thoughts in mother." (FGD/P18)

Likewise, adaptation of evidence-based approaches such as using laughing gas and water birth can promote physiological birth:

"…the number of women who come for elective caesarean section should be taught about pain relief methods… laughing gas can be used and included as a pain relief method … techniques such as water birth should also be adopted to promote normal birth." (P2)

Improve care in public hospitals

Some interviewees described aspects of the quality of care in public hospitals as important. Some highlighted the behaviour and skill of health workers/nurses:

"Hospital should be more concerned about the patient. Behaviour of the nurses in the public hospital should be good. Stiches should be done properly in the public hospitals in case of normal delivery. Before giving baby to the mother baby should be examined thoroughly and should be given to the parents." (FGD/P21)

Similarly, some emphasised the good communication skills of health workers:

"…Health workers should speak calmly and softly without harsh words…" (FGD/P6

5.5 Summary of the chapter

It was agreed that CS rates are very high in KMH compared to public hospitals. The CS rate in PMWH was also high, but lower than the private hospitals. CS was performed mainly for medical indications, such as previous CS or foetal distress. However, CS conducted for non-medical indications (maternal request and not specified reasons) also became apparent. The main decision making for CS was found to be made by a senior doctor on duty. Women and family members were informed, and consent was obtained before conducting a CS in emergency situations.

Mainly, five factors affecting the rising CS rates were identified in this study. Firstly, medical factors for rising CS rate were found to be performing repeat CS, complicated referral cases which required CS and CS for breech presentation. Secondly, sociodemographic factors were

found to be changing the obstetric population (advanced age of mothers, career-oriented women, educated, rich and urban women), precious baby and lack of service provider security, Thirdly, financial factors were found to be income source for private hospital and incentives in public hospital. Fourthly, non-medical factors affect the rise of CS rates, including maternal request and service providers positive attitude towards CS. Finally, health service-related factors were identified to be a lack of awareness on mode of childbirth, lack of appropriate human resources (midwife and SBA), lack of appropriate policy and protocol to control unnecessary CS and centralised health facilities in urban areas in Nepal.

Similarly, four main strategies were recommended for reasonable use of CS in urban hospitals. Details of these four strategies are given in the following Table 5.2.

Table 5.2: Strategies for rational use of CS in urban Nepal

Key themes	Sub-themes
Provision of resources for maternity care	• SBA training and availability of SBAs • Production and utilisation of midwives • The establishment of birthing centre in each urban hospital
Raise Awareness	• Counselling of pregnant women for normal birth • Raising awareness of pregnant women around mode of childbirth • Raising public awareness on mode of childbirth
Reform Protocol and policies	• Policy for avoiding CS for non-medical reasons and primigravidae/primary CS • Appropriate use of partograph for labour monitoring • Rewards for, and investigations of, auditing hospitals in relation to CS rate • Monitoring of private hospitals • Fixed service charge for CS • Use of Robson classification to enable proper comparison, assessment and monitoring CS • Provision of VBAC and trial of labour for breech presentation • Provision of security of service providers • Decision making around CS by two consultants • Commitment to implementation of international recommendations (midwifery model of care and respectful maternity care).
Promotion of physiological birth	• Promote the midwifery model of maternity care • Manage low-risk cases by midwife in birthing centres • Provide VBAC and trial of labour • Promote instrumental delivery • Provide painless birth • Involve husbands • Improve care during pregnancy • Improve care in public hospitals

Chapter 6 DISCUSSION

6.1 Introduction

This chapter discusses the key results from both the qualitative and quantitative results in light of other related research. In this chapter, integration of the qualitative and quantitative results occurred through connecting, comparing and joint display the main results from the quantitative study with key results from the qualitative study (Fetters et al. 2013). The discussion is focussed on the following points: (1) the rates of CS; (2) key indications for CS; (3) use of Robson classification; (4) decision making around CS; (5) key factors impacting the rising CS rate in urban hospitals in Nepal; and (6) key strategies to promote the optimal use of CS.

6.1.1 The rates of CS

Overall, the CS rate is found to be very high in this study (50.2%). This is comparable with studies conducted in the Manipal Teaching hospital in Nepal (Shrestha et al. 2021a; Subedi et al. 2023) and in India (Ahmad et al. 2022) (55.3%). Furthermore, the rate of CS was almost twice as high in KMH (private hospital) (68.5%) as in PMWH (public hospital) (37.1%). None of the interviewees in KMH were surprised by this finding, whilst interviewees in PMWH acknowledged that the rate of CS was high in PMWH, but lower than in private hospitals. In this study the rate of CS in KMH was slightly higher than a previous study conducted in this hospital (Poudel et al. 2019) and in other private hospitals in Kathmandu (Prasad et al. 2017; Maskey et al. 2019; Shrestha et al. 2021a). Similarly, the CS rate in PMWH was also higher than in other previous studies conducted in this hospital (Darnal and Dangal 2020; Shrestha and Shrestha 2020; Baral et al. 2021). However, the CS rate in PMWH was notably lower than other public hospitals in Kathmandu (Pradhan et al. 2015; Rawal et al. 2020). Many hospital-based studies in South Asia (Rai et al. 2019) and Nepal have also reported high CS rates in urban hospitals (Dhakal Rai et al. 2019).

The elective CS rate is found to be higher (55.7%) than the emergency CS rate (44.3%) in this study. The balance between elective and emergency CS was opposite in the two settings. In KMH, the elective CS was rate (61.9%) higher than the emergency CS rate (38.1%). However, in PMWH, it was the other way round, the emergency CS rate was higher (52.4%) and the elective CS rate was lower (47.6%). Previous studies conducted in both hospitals showed that the emergency CS rate was higher than the elective rate (Poudel et al. 2019; Darnal and Dangal

2020; Shrestha and Shrestha 2020). Many other studies have also reported a higher emergency than elective CS rate (Dhakal et al. 2018; Shamima et al. 2018; Litorp et al. 2020). The reasons for rising elective CS rates can be both medical and non-medical. Medical reasons include previous CS, breech presentation and non-medical reasons, including maternal request.

6.1.2 Key indications for CS

Previous CS

Previous CS (27.4%) was overall the most common indication for performing CS in this study. Data from the interviews support this finding, as do several other studies (Shenoy et al. 2019; Dorji et al. 2020; Shrestha and Shrestha 2020; Singh et al. 2020; Shrestha et al. 2021a; Zhang et al. 2022). Previous CS was also the main indication for elective CS and CS for multiparous women in this study. In the systematic review, previous CS was the second most common indication for overall CS and the most leading indication for elective CS and repeated CS, as well as a significant factor for the rising CS rate in South Asia (Dhakal-Rai et al. 2022). The upgraded position of previous CS as the most common indication for overall CS in this current study could be due to the rising number of women with a history of previous CS. This is an important reason for emphasising the need to avoid unnecessary primary CS. Both quantitative and qualitative results highlighted that previous CS is the leading indication for CS. Previous CS is kept as an indication of CS.

Foetal distress

Both the quantitative and qualitative results showed foetal distress as a key indication for performing CS in this study. It was an important indication for emergency CS. This is also borne out in many other studies (Begum et al. 2019b; Maskey et al. 2019; Shrestha and Shrestha 2020; Singh et al. 2020; Shrestha et al. 2021a). In a systematic review conducted in South Asia (Dhakal-Rai et al. 2022), foetal distress was found to be the most common indication overall for performing CS, primary CS, emergency CS and CS in primigravidae and multigravida. Similarly, the rate of CS for foetal distress was higher in PMWH than KMH. Foetal distress is commonly diagnosed by cardiotocograph (CTG). False-positive CTG or non-reactive CTG often results in unnecessary CS (Khanum and Chowdhury 2020). This result was replicated in both the qualitative and quantitative data in this study. Lack of adequate human resources (midwives or SBA) impacts on appropriate labour monitoring and may result in inaccurate and late diagnosis of foetal distress. Although foetal distress is found to be the most common

indication for CS, there is a big question about appropriate monitoring for foetal distress. A large-scale study conducted in Nepal revealed that only one third (36%) of CS performed due to foetal distress were monitored appropriately in terms of foetal heart rate and foetal heart rate was not monitored in 15% of CSs (Litorp et al. 2020).

There were two other common indications for CS in the qualitative and quantitative data for this study - cephalopelvic disproportion (CPD) and breech presentation**.** Several studies conducted in Nepal also reported CPD as a common indication for CS (Dhakal et al. 2018; Maskey et al. 2019; Pageni et al. 2020; Shrestha and Shrestha 2020; Baral et al. 2021; Shrestha et al. 2021b). Similarly, many other studies have reported breech presentation as one of the common indications of CS (Begum et al. 2019a; Pageni et al. 2020; Sebastian et al. 2020; Shrestha and Shrestha 2020). A systematic review also revealed that CPD and breech presentation were key indications for conducting CS in South Asian countries (Dhakal-Rai et al. 2022). Non-medical indications were maternal request and CS for non-specified reason which are discussed on section 6.4.4 below.

6.2 Robson Classification of CS

Robson classification of CS is an effective tool to assess, monitor and compare CS rates within and between health facilities and this classification is recommended by WHO (World Health Organization 2015). Furthermore, this classification helps to identify the groups which contribute most and least to the overall CS rate (Vogel et al. 2015) as stated in chapter 1, section 1.10.

In this study, CS rates are found to be high in low-risk groups (Robson group one to four) as reported by many other studies (Yadav and Maitra 2016; Mall et al, 2018; Ghimire et al. 2020; Das et al. 2020; Thakur 2021; Baral et al.2021). All women in Robson groups five (Previous CS, single cephalic, =>37 weeks), six (All nulliparous breeches), seven (All multiparous breeches (including previous CS)), eight (All multiple pregnancies (including previous CS)) and nine (All abnormal lies (including previous CS)) underwent CS. These groups were high-risk for CS (Yadav and Maitra 2016). The reason for conducting 100% CS could be to reduce the risk to both mother and baby.

Robson group five (Previous CS, single cephalic, =>37 weeks) is found to be the major contributor to the overall CS rates in this study. This result reflects that repeated CS is performed in case of previous CS and there is a lack of provision for VBAC in these two hospitals in Nepal. The scoping review also revealed that Robson group five was the main

contributor to overall CS rates (Rai et al. 2021). Many other hospital-based studies conducted in Nepal (Malla et al. 2018; Baral et al. 2021), Bangladesh (Begum et al. 2019b), India (Jamwal et al. 2021; Chauhan et al. 2022), Pakistan (Gilani et al. 2020; Afridi et al. 2022), Maldives (Goonewardene et al. 2012) and Bhutan (Tamang et al. 2020) supported the finding. Similarly, several studies conducted in Europe (Zeitlin et al. 2021), Brazil (D'Agostini Marin et al. 2022), and Turkey (Tontus and Nebioglu 2020) also reported that group five is the main contributor to increase overall CS rates. Moreover, the risk of CS was found to be the highest in Robson group five in this study. A study conducted in India also showed that risk of CS in this group is higher in this group (Yadav and Maitra 2016).

Although group one (Nulliparous, single cephalic, =>37 weeks in spontaneous labour) is assumed to be a low-risk pregnancy, the second highest contributor to overall CS rates was found to be Robson group one in this study. The scoping review of Robson classifications also reported that group one was a key contributor to overall CS rates (Rai et al. 2021). Many other studies also reported that group one was the leading contributor to total CS rates (Yadav and Maitra 2016; Saxena and Balan 2019; Ghimire et al. 2020; Baral et al. 2021; Chauhan et al. 2022). Some other studies also reported that Robson group one was the second key contributor to overall CS rates (Das et al. 2020; Sharma et al. 2020a). However, the risk ratio of CS was significantly lower in this group. A study conducted in India also showed that there were no significant risks for CS in this group (Yadav and Maitra 2016).

The third contributor to overall CS rates was found to be Robson group two (Nulliparous, single cephalic, =>37 weeks in induced labour or CS before labour). The scoping review of Robson classifications also reported that group two was a main contributor to overall CS rate (Rai et al. 2021). Some other studies also reported that this group was the main contributor (Das et al. 2020; Vila-Candel et al. 2020; Thakur 2021), while many other studies showed that Robson group two was one of the key contributors to overall rates of CS (Goonewardene et al. 2012; Malla et al. 2018; Begum et al. 2019b). Moreover, the risk of CS is also found to be significantly higher in group two in this study. A study conducted in India also showed that there is significantly higher risk of CS in this group (Yadav and Maitra 2016).

The fourth contributor to overall CS rates was Robson group three (Multiparous, excluding previous CS, single cephalic, =>37 weeks in spontaneous labour). This is very surprising. This group would normally be the lowest risk group among the ten groups of Robson classification. The scoping review of Robson classification also reported that group three is a key contributor

to overall CS rates (Rai et al. 2021). Several other studies also reported that Robson group three was a major contributor to overall CS rates (Dogra et al. 2019; Das et al. 2020; Vila-Candel et al. 2020; Baral et al. 2021; Thakur 2021). However, the risk ratio of CS is found to be significantly lower in this group in overall sample and in both hospitals. Similar findings were reported in another study conducted in India (Yadav and Maitra 2016).

The fifth contributor was Robson group six (All nulliparous breeches) in this study. Qualitative results also revealed that all nulliparous breeches usually undergo for CS unless in the active phase of labour and everything is normal. Many other studies also reported that Robson group six was a major contributor to overall CS rates (Yadav and Maitra 2016; Begum et al. 2019b; Vila-Candel et al. 2020; Saharan et al. 2021). Moreover, the risk of undergoing CS was significantly higher in this group. A study conducted in India also showed that risk of CS in this group is higher (Yadav and Maitra 2016).

Robson groups one (Nulliparous, single cephalic, =>37 weeks in spontaneous labour) and two (Nulliparous, single cephalic, =>37 weeks in induced labour or CS before labour) were significantly associated with contribution to overall CS rates in both hospitals ($p<0.001$). In KMH, Robson group five is found to be the major contributor to overall CS rates followed by groups one (Nulliparous, single cephalic, =>37 weeks in spontaneous labour), two (Nulliparous, single cephalic, =>37 weeks in induced labour or CS before labour), three (Multiparous, excluding previous CS, single cephalic, =>37 weeks in spontaneous labour) and four (Multiparous, single cephalic, =>37 weeks in induced labour or prelabour CS). Several studies also reported that group four is also a key contributor to overall CS rates (Yadav and Maitra 2016; Das et al. 2020; Gilani et al. 2020; Afridi et al. 2022). Furthermore, Robson group one and two had significantly higher risk of CS in KMH. This showed that CS is conducted in these low-risk groups in KMH. However, Robson group three (Multiparous, excluding previous CS, single cephalic, =>37 weeks in spontaneous labour) had significantly lower risk for undergoing CS in both hospitals. In PMWH, Robson group one (Nulliparous, single cephalic, =>37 weeks in spontaneous labour) is found to be the largest contributor to overall CS rates, followed by groups five (Previous CS, single cephalic, =>37 weeks), two (Nulliparous, single cephalic, =>37 weeks in induced labour or CS before labour), three (Multiparous, excluding previous CS, single cephalic, =>37 weeks in spontaneous labour) and six (All nulliparous breeches). However, the risk of CS is found to be significantly high only in Robson group ten (All single, cephalic, =<36 weeks (including previous CS)) in PMWH.

In this study, the major contribution of the Robson groups was group five (Previous CS, single cephalic, =>37 weeks). However, Robson groups one (Nulliparous, single cephalic, =>37 weeks in spontaneous labour) to four and six (All nulliparous breeches) are also found to be key contributors to overall CS rates. Performing primary CS in groups one (Nulliparous, single cephalic, =>37 weeks in spontaneous labour) to four can result in an enlarged group five in subsequent pregnancies (Tontus and Nebioglu 2020). Lack of adequate labour management due to lack of resources, such as insufficient SBAs or midwives for constant labour monitoring could be a reason for performing CS in these groups. Therefore, an appropriate evidence-based approach for labour and childbirth assistance, in groups one to four, can reduce the rate of CSs. For example, the Project Appropriate Birth (PPA), an innovative project which was implemented in maternity hospitals in 2017 in Brazil, aiming to promote activities (several activities including ANC visit schedules, health education on normal birth to the public, health education to pregnant women focusing on physiological childbirth and encouraging having a trusted companion during childbirth, establishing multidisciplinary team inputs in childbirth care, provision of analgesia) for the improvement of childbirth care and promotion of vaginal birth. A total of 6238 pregnant women admitted to the hospital for delivery were included in this PPA and classified into one of the Robson 10-group classification. Using the PPA, the overall CS rate decreased from 62.4% to 55.6% (10.9%) and from 49.1% to 38.6% (21.4%) in Robson group one to four (D'Agostini Marin et al. 2022).

6.3 Decision making around CS

It is important to consider the decision-making process around CS in order to think about optimal use of CS and reducing unnecessary CS. In this study, the doctor was usually the primary decision maker around CS. Similar findings were reported in one study in Bangladesh (Begum et al. 2018). The decision for an elective CS takes place before admission in labour (hospital) in both hospitals. In the antenatal clinic or outpatient department both the doctor and the pregnant woman, or her family, agree to do CS based on indications of CS. Decision making around emergency CS is an urgent decision made in the labour ward in hospitals by the senior doctor on duty and is based on complications which arise during labour. A qualitative study conducted in Bangladesh also reported similar findings around decision making on CS (Sultana et al. 2022). The role of women or their family in decision making in emergency CS is limited to obtaining of consent and does not reflect informed decision making at times due to lack of communication (Sultana et al. 2022). Informed consent is a key part of the shared decision-making process, but poor communication between physician and women in the decision-

making process around CS can affect to process of informed consent. Furthermore, patients usually rely on the expertise of doctors and their final decision on CS (Doraiswamy et al. 2021). Shared decision making on CS could be the right option not only to make informed decision making on CS but also to make rational use of CS. If adequate information is provided to pregnant women in the decision-making process about the risks and benefits of CS and vaginal birth and if patient is involved actively in decision making process on CS, then the pregnant women can make an informed choice about the mode of birth (Coates 2019).

Communication is a crucial part of acquiring informed consent for caesarean section. In the context of urban hospital in Nepal, communication regarding informed consent should be improved informing all risks and benefits of both vaginal birth and CS to a pregnant woman and her family. Effective communication skills (such as listening to women about their choice of childbirth mode) should be applied and more information should be offered by providing pamphlets and leaflets on mode of childbirth including indications, risks and benefits of CS and vaginal birth. Information should be clear and simple, medical jargon must be avoided. Moreover, regarding the right to refuse or withdraw consent also be informed. Hospital staff should offer individual counselling to pregnant women and actively involving pregnant women in decision making process surrounding CS considering their preferences, circumstances, belief and knowledge. Pressure should not be put to obtain consent. Any concerns or questions raised by pregnant woman, or her family should be addressed appropriately.

6.4 Factors affecting rise of CS in urban hospitals in Nepal

Five factors affecting to rising CS rates in urban hospitals in Nepal are discussed in this section.

Medical factors in the rising CS rate

Repeated CS/lack of VBAC

In this study, in these two urban hospitals in Nepal, it is demonstrated that repeated CS for previous CS is the key factor influencing the rising CS rate. All women with a history of previous CS underwent CS. Repeated CS is not mandatory for women with a history of previous CS. However, vaginal birth after CS (VBAC) is rarely practiced because of a shortage of resources such as trained staff for the required intensive monitoring of labour. Quantitative results showed that all women who had history of previous CS undergone CS. The incidence of repeated CS was high (28.9%) in this study, which was similar to a study (29.96%) conducted in Kathmandu Medical Collage (Sharma et al. 2020b), but more than double than

another study (13.9%) conducted in another hospital in Kathmandu (Regmi et al. 2022). Previous CS was found to be the most common indication for conducting a CS in this study, as discussed above (section 6.1.2). Similarly, a hospital-based study conducted in Kathmandu reported that 95.19% women who had a previous child by CS had a repeated CS (Sharma et al. 2020b). A systematic review also showed that previous CS is significantly associated with rising CS rates in South Asia (Dhakal-Rai et al. 2022). Although the concept of 'Once a caesarean section, always a caesarean section' by Cragin in 1916 (Foster 2017) it was reviewed countries and VBAC was recommended as a safe and effective strategy to reduce the CS rate worldwide (Rosen and Dickinson 1990; Rageth et al. 1999; Mozurkewich and Hutton 2000). The increasing trend of repeated CS and decreasing practice of VBAC in Nepal reflects the possibility of going back to 'Once a caesarean section, always a caesarean section' similar to other countries (Christmann-Schmid et al. 2016).

The availability of intensive monitoring of labour is necessary for the provision of successful VBAC. A lack of appropriate resources (facilities and trained staff/SBAs: obstetrician and midwife/nurse) can be a big challenge for offering VBAC in hospitals in Nepal. Although VBAC is the recommended standard of care in modern obstetric care, there are several factors associated with successful VBAC (Parveen et al. 2022). Considering the safety of the patient, offering VBAC may not be the best alternative in a low-resource country like Nepal, where these facilities are not always available (Wanyonyi and Muriithi 2015). Pregnant women with a history of previous CS may not be willing to give birth vaginally due to safety concerns for themselves and their baby. Therefore, they may decline VBAC and request a repeated CS. The study results reflect that repeated CS is found to be the most common and preferred mode of childbirth for women who have a history of previous CS in Nepal which is leading to the rising CS rate in urban hospitals in Nepal. The systematic review showed that refusal of VBAC by women who have a history of previous CS is an indication of CS in South Asia (Dhakal-Rai et al. 2022). Similarly, refusal of VBAC is one of the indications for CS that is also reported by studies conducted in Nepal (Darnal and Dangal 2020) and India (Shenoy et al. 2019). Although the chance of uterine rupture is low (Holmgren 2012), services providers and woman may both perceive that repeat CS is the best option. The qualitative results highlighted that repeated CS is requested and conducted rather than VBAC for those women who had history of CS.

Several reasons might be influencing the choice for a repeated CS. These include a lack of resources, maternal request, consequences of failed VBAC (maternal and neonatal morbidities), attitude of doctors, defensive practice, provider security and willingness of

women. The main concern around VBAC would be the risk of uterine rupture and perinatal morbidity and mortality (Rossi and D'Addario 2008; Fitzpatrick et al. 2012). A case control study conducted in the UK reported that the estimate rate of uterus rupture is higher for women with VBAC (2.1 per 1000) than women with elective repeat CS (0.3 per 1000). The risk of uterine rupture increases as the number of repeated CS goes up. The odds of uterine rupture were increased in women who had more than two previous caesarean deliveries (Fitzpatrick et al. 2012). A systematic review and meta-analysis also revealed that women with failed VBAC have a three-fold increased chance of having uterine rupture or dehiscence (4.4%) than women with elective repeat CS (0.4%) (Rossi and D'Addario 2008). Similarly, maternal morbidity was much higher in women who had a failed VBAC (17%) compared to women with a successful vaginal birth (3.1%) (Rossi and D'Addario 2008). A prospective study conducted on VBAC among women who had a previous CS in a hospital in Dhaka showed higher maternal and foetal complications such as uterine rupture (6.2%), hysterectomy (6.2%) and haemorrhage needing transfusion (14.6%), respiratory distress syndrome (17.7%), perinatal death (10.4%), hypoxic ischemic encephalopathy (4.2%) and sepsis (8.3%) (Hoque et al. 2021). In order to reduce repeat CS, primary CS should be avoided where possible. However, quantitative results showed that primary CS was high (71.1%) in this study. A study conducted in Bangladesh also showed that primary CS are growing (Shamima et al. 2018). Increasing primary CS will expand the number of previous CS that may need repeated CS in subsequent pregnancy.

CS for breech presentation

Breech presentation is found to be another factor contributing to the rising CS rates in these two urban hospitals in Nepal. Qualitative results revealed that CS is planned for breech presentation especially in primigravida. Quantitative results also showed that all women with a breech presentation underwent CS. Bivariate logistic regressions showed that a breech presentation is 1.69 times more likely to undergo CS compared to cephalic presentation. Similarly, Robson group six (primigravida breech) was a key contributor to overall CS rate as discussed above (section 6.2). Both Robson groups six (primigravida breech) and seven (multigravida breech) had 100% CS in this study. Many studies reported that foetal presentation was significantly associated with an increasing CS rate (Yadav and Maitra 2016; Begum et al. 2019b). A systematic review also revealed that breech presentation is one of the indications for CS in South Asia (Dhakal-Rai et al. 2022). Trial of labour is not permitted in the case of primigravida unless they are admitted to hospital during active phase of labour within normal conditions. Management of breech presentation is still debateable. Using

external cephalic version at around 36 weeks' gestation or more increased the chance of vaginal birth and reduced the risk of having a CS (Hofmeyr et al. 2015b). External cephalic version for breech presentation is not common practice in Nepal, which revealed in qualitative results in this study. The National Institute for Health and Care Excellence (NICE) in England and Wales has recommended CS for women with a singleton breech pregnancy at term for whom external cephalic version is contraindicated or has been unsuccessful, to reduce perinatal mortality and neonatal morbidity (Gholitabar et al. 2011; National Institute for Health and Care Excellence 2021). A Cochrane review also showed that prelabour CS can minimise adverse perinatal outcome in breech presentation (Hofmeyr et al. 2015a). A meta-analysis revealed that Apgar scores at one and five minutes in breech presentation was significantly associated with mode of birth. Outcomes were better for CS than vaginal birth (Fajar et al. 2017). Therefore, doctors may prefer to do CS for breech presentation in these two hospitals which adds to rise CS rates. CS is performed for most breech presentations and thus vaginal breech skills are reducing, as is the quality of education in this area (Shirzad et al. 2021).

Other medical factors

It is important to note that the qualitative data in this study revealed that high referral rates of complicated cases were also a factor contributing to rising CS rates in these hospitals in Nepal. Both hospitals are tertiary care hospitals and many complicated high-risk pregnancy cases are referred from other parts of the country. These women may need medical intervention such as CS for medical indications. This finding is reflected in other studies such as in India where Ahmad et al. report that high-risk pregnancy is a reason for high rates of CS (Ahmad et al. 2022). Karim et al. report from a study conducted in Bangladesh that complications during pregnancy increased the risk of CS by 3.6 (Karim et al. 2020).

Pregnancy gestation is also found to be associated with mode of childbirth in this study. Bivariate logistic regression showed that gestational age of 30-36 weeks was 0.78 times less likely to have a CS compared to full-term (37-40 weeks). Similar results have been reported in other studies (Yadav and Maitra 2016; Begum et al. 2019b). Planned elective CS (for breech presentation, previous CS, pregnancy after IVF) was usually reserved for term pregnancies which may explain why CS rates at term are higher. Also, preterm labours may be much shorter, with less time to decide about mode of birth.

Another factor relevant to the CS rate is mode of onset of labour. Quantitative results showed that the odds of CS are higher among women in spontaneous labour (OR: 1.18 (95% CI: 1.07-

1.30); AOR: 1.16 (95% CI: 1.06-1.27) and women in no labour in full term (OR: 2.26 (95% CI: 2.03-2.52); AOR: 1.96 (95% CI: 1.76-2.18) than in induced women. The study revealed that induction of labour in low-risk pregnancy can reduce the rate of unnecessary CS. A study conducted in Bangladesh also reported that the incidence of CS can decrease up to 85% by induction or augmentation of labour (Begum et al. 2019b). Similarly, a systematic review and meta-analysis showed that induction of labour can reduce the risk of CS in women with intact membranes (Wood et al. 2014). However, induction of labour was low in our study sample (11.5%), so that, it could contribute to the rise of CS. Shortage of SBAs in hospitals in Nepal can limit the use of induction of labour because constant monitoring of labour is a vital task for induction of labour, as recommended by WHO (World Health Organization 2014b). In contrast, a study conducted in USA reported that the CS rate was significantly higher among women who had induced labour than those with spontaneous onset of labour (Levine et al. 2021).

The Apgar score is a rapid method for assessing the general well-being of a neonate after birth at one minute and at five minutes and in response to resuscitation by using the five elements of Appearance, Pulse, Grimace, Activity, and Respiration. The score is recorded at one minute and five minutes. Apgar scores of 7-10 are considered good (Simon et al. 2017). The Apgar score at five minutes is found to be significantly associated with mode of childbirth. The odds of CS for an Apgar score 7-10 at five minutes (OR: 1.33; 95% CI 1.06-1.69) is found to be higher than 0-3 in this study. A study conducted in Australia also reported that low and intermediate Apgar score at five minutes is significantly associated with mode of birth as emergency CS is associated with low and intermediate Apgar scores (Thavarajah et al. 2018). Emergency CSs are usually conducted due to complications arising during labour, such as foetal distress, that may be associated with the Apgar score. As discussed above, better Apgar score for CS than vaginal birth was reported at one and five minutes in case of breech presentation (Fajar et al. 2017). However, the Apgar score has nothing to do with the choice of mode of birth and this does not look like a potential causative association with CS but rather complications of childbirth or health of new-born baby.

Sociodemographic factors for rising CS rates

Advanced age of mother at the time of giving birth

The qualitative results revealed that advanced age of the mother at the time of birth is a major sociodemographic factor for the rising CS rate in urban Nepal. Most of the interviewees

described how modern Nepalese women, residing in urban areas, are giving priority to their education, career or job and not to marriage and family. They get married at a later age and give birth at an advanced age, often to only one or two children. The quantitative data showed that the age of the mother is significantly associated with CS. The odds of CS were significantly higher among mother aged 25-29 and more in bivariate logistic regression. The odds of CS were significantly higher among mother aged 25-29 and 35+ years old in multivariate logistic regression. This is endorsed in the systematic review of CS rates in South Asia (Dhakal-Rai et al. 2022) and in other studies, in Nepal (K C and Neupane 2014; Verma et al. 2020), Bangladesh (Begum et al. 2019b; Ahmad et al. 2022), Pakistan (Murtaza et al. 2021), India (Yadav and Maitra 2016; Narzary et al. 2017) and Indonesia (Islam et al. 2022). In addition, advanced maternal age was associated not only with an increased rate of CS but also with reduced success of VBAC (Megli and Caughey 2017). Pregnancy at advanced age may have many complications and can increase the risk of CS. A population-based cohort study in the UK revealed that pregnancy at a very advanced age has a higher risk of gestational hypertensive disorder, gestational diabetes, postpartum haemorrhage (PPH), iatrogenic and spontaneous preterm birth and caesarean section (Fitzpatrick et al. 2017).

Career-oriented educated and wealthy urban women

The qualitative results revealed that career-oriented, rich and educated urban women who give priority for their career and want a smaller number of children were more likely choose CS. Educated and wealthy urban women are more likely to give birth by CS than uneducated and unemployed rural women in Nepal (Mainali 2019). CS is viewed as a prestigious method of birth for educated and wealthy urban women (Shirzad et al. 2021). The quantitative results also showed that urban residency was associated with mode of childbirth. Bivariate logistic regression showed that the odd (OR:1.09; 95% CI 1.01-1.17) of CS in urban women is higher than for rural women. This is reflected in the systematic review looking at rising CS rate in South Asia (Dhakal-Rai et al. 2022) and is supported in many other studies (K C and Neupane 2014; Bhandari et al. 2020; Verma et al. 2020). Similarly, higher educated women are more likely to undergo CS (Verma et al. 2020). Rich and educated women residing in urban areas can easily access CS if they wish because they can afford the cost of CS (Hasan et al. 2019; Ahmad et al. 2022). Additionally, availability of modern maternity care facilities especially in private hospitals in urban Nepal may encourage women to choose CS. All these reasons would help to increase CS rates in urban hospitals in Nepal.

Ethnicity/Caste

The quantitative results showed that ethnicity was associated with mode of childbirth. Women from higher caste had significantly higher odds (OR: 1.14; 95% CI 1.05-1.23) of CS in this study. In Nepal, the social hierarchy of the caste system is well established. There is caste-based inequality in the utilisation of health services in South Asia including Nepal (Thapa et al. 2021). High ethnicity is assumed to imply higher socioeconomical status. Women from high ethnicity could have better access to CS because of being more highly educated, having higher socioeconomical status and residing in urban areas. This could increase the rate of CS. A study conducted in India also showed that ethnicity/caste is associated with utilisation of CS. Women from higher caste (general) are more likely to undergo CS compared to tribal women (Narzary et al. 2017).

Precious baby

Qualitative results revealed that another factor for rising CS rates is 'precious baby'. A baby could be viewed as being very precious for many reasons. The baby can be precious if the woman conceived after long-term subfertility, pregnancy after infertility treatment such as IUI, IVF, having pregnancy at an advanced age, having just one or two children and pregnancy after having a poor obstetric history, such as stillbirth or miscarriage. In this case, vaginal birth may be avoided to avoid risk. Both pregnant women and doctor do not want take risk doing vaginal birth. This will increase the CS rates as demonstrated in the systematic review in South Asia (Dhakal-Rai et al. 2022) and in a study conducted in Pakistan (Kanji et al. 2019).

Lack of security of service providers, legal issues and defensive CS

The lack of security for doctors and nurses/midwives from service users (verbal threatening or physical assaults) in the case of a bad outcome of vaginal birth rather than CS and lack of legal protection for the service provider in cases of poor outcomes in childbirth is a social factor leading to rising CS rates in urban hospitals in Nepal. Similar legal issues are reported in Iran (Shirzad et al. 2021). This results in doctors conducting defensive CS to protect themselves from such unfortunate incidents. Nepali civil society has been more aware of individual civil rights after the political movement 2005/06, but physical violence against doctors and health workers (verbal threatening or physical assaults) is rising. In the case of a poor outcome from vaginal birth (neonatal mortality) the women's family may engage in violent activities (public gathering, vandalising the hospital, threatening the doctors verbally and physical assault), and

make demands for compensation (Magar 2013). In this case, doctors are not protected by employers appropriately. This may cause reputational damage and make it is very difficult to run the hospital again. This situation has resulted in doctors carrying out defensive CS due to fear of physical assaults and litigation (Dhakal-Rai et al. 2021b). A legislation on violence against the healthcare providers was passed in 2022 to provide a safe working environment for all health care workers in Nepal, because the incidence of violence in healthcare settings is growing (Kharel 2022; Parajuli and Koirala 2022). Such types of workplace violence against health workers are reported in many health care settings around the world (Somani et al. 2021). This can cause anxiety and distress and decrease the morale of health professionals. The lack of protection for staff may therefore increase the CS rate through defensive practice.

Financial factors for rising CS rates

Qualitative results revealed that conducting CS is a lucrative income-stream for non-governmental or private hospitals in urban Nepal, which contributes to the rising rate of CS in those hospitals. CS is a major operation. So, a high price can be charged, not only for the operation but also for the hospital bed, medications and other service charges. Therefore, the total cost for a CS is very high. However, the service charge has different rates in different hospitals (around £700-1300 per CS, as stated by interviewees). In Nepal, the quality of maternity care in public hospitals can be low sometimes, due to lack of resources (Neupane and Devkota 2017). The poor quality or poor performance of public hospitals in Nepal provides ample opportunity for private hospitals to fulfil the demands of patients for CS and make big profits (Neupane and Devkota 2017). Educated, rich and urban women who can afford the cost and are willing to give birth by CS would go to a private hospital (Adhikari et al. 2021). The scoping review also reported that financial motivation may lead to private hospitals carrying out more CS (Dhakal-Rai et al. 2021b). Increasing the CS rate increases bed occupancy which leads to higher income and improved business. It also fulfils demand of women (Peel et al. 2018). Private health services in South Asia, including Nepal, appear to be a profitable business. In Bangladesh, private hospitals are using agents to refer women from public hospitals to private hospitals for CS (Aminu et al. 2014). Further evidence shows that CS is performed to earn money in middle and low-income countries, particularly in private health facilities (Shirzad et al. 2021; Ahmad et al. 2022). Therefore, private hospitals must consider pregnant women and their foetus wellbeing rather than financial profit.

In order to promote safe maternity care, under the Safe Motherhood Programme, "Aama Surakshya Karyakram", public hospitals in Nepal are receiving financial incentives from the Government of Nepal for conducting free CS (Witter et al. 2011). Although the real cost is higher for CS than vaginal birth and the incentive is higher for CS than vaginal birth. However, a higher rate of incentive for conducting CS partially may encourage doctors to conduct more CS in public hospitals. Therefore, incentives should be based on real cost.

Non-medical Factors for rising CS rates

Maternal request

The qualitative study showed that maternal request is the main non-medical factor affecting the rise of CS in urban hospitals in Nepal. Educated, wealthy women who are residing in urban areas usually request CS. The quantitative results also showed that 2.7% of overall CS were conducted for maternal request. However, CS for maternal request (4.8%) only occurred in KMH. The reason behind it would be that KMH is a private hospital, where educated, rich and urban women who can afford the cost of CS, would go to this hospital. Doctors in KMH would accept the maternal request for financial reasons. By contrast, all interviewees from PWMH explained that they would not do a CS for maternal request, even though, at times, women do request CS. The proportion of CS conducted at maternal request was slightly lower (4.8%) in this study than reported by an earlier study (6%) in KMH (Poudel et al. 2019). Then again, higher than another study (2.12%) in Patan hospital (Gurung et al. 2022). However, it is lower than other studies conducted in Kathmandu Medical Collage teaching hospital (18.65%) in Nepal (Shrestha et al. 2021b), India (Sebastian et al. 2020) and Bangladesh (Shamima et al. 2018). Globally, CS on maternal request varies between 0.2 and 42.0% (Begum et al. 2021). The systematic review (Dhakal-Rai et al. 2022) and scoping review (Dhakal-Rai et al. 2021b) also identified maternal request as the main non-medical indication for conducting CS.

This is interesting because all the pregnant women in the FGDs said that they would like to give birth normally because of benefits to both mother and baby. The women seem to understand the benefits of normal birth, but poor ANC health education and lack of respectful maternity care due to lack of staff possibly encourages CS. Perceiving CS safer option can be another possible reason for opting CS. Regular consultations with doctors during antenatal and trusting in their advice on complications of pregnancy, may lead to women changing their choice of mode of childbirth. Furthermore, mistreatment or bad experience in previous

childbirth, lack of information or misinformation, fear of labour pain and not coping with labour pain could be reasons for changing choice of mode of birth (Shirzad et al. 2021).

The main reason for requesting CS was labour pain. Similar result reported by another study conducted in Nepal (Shrestha et al. 2021b). Similarly, many other studies also reported that labour pain is the main reason for requesting CS (Dhakal-Rai et al. 2021b; Shirzad et al. 2021; Shrestha et al. 2021b; Ahmad et al. 2022). Pregnant women hear horror stories about natural labour pain from other female family members, relatives and friends. Women who are going to give birth for the first time are then frightened of labour pain, so they may want to avoid labour pain by requesting a CS. Women may also request CS during labour due to not coping with the pain (Schantz et al. 2019). There is no practice of pain relief methods in hospitals in Nepal such as using laughing gas and other pain relief techniques (as revealed in interview). Although, labour analgesia for labour pain (giving an epidural injection for pain relief during labour) can be the effective option for painless birth. However, the provision of painless birth is not common in Nepal in many hospitals due to a lack of resources such as anaesthetists, facilities and awareness (Maharjan and Karki 2003; Sharma et al. 2018b). Moreover, an epidural seldom makes birth painless. In fact, labour analgesia for labour pain (painless birth) is not widely offered by hospitals in urban Nepal. Currently, there is facility for labour analgesia service for women who are willing to have painless birth in PMWH, but this facility offers this service only to two women at a time (MNSC Department 2023). Pregnant women are also not well informed about painless birth (Maharjan and Karki 2003; Sharma et al. 2018b). Other reasons for requesting a CS identified in this study were included avoiding the risk of cord round neck, complications or emergency CS, maintaining structure of the vagina, maintaining sex life, giving birth at an auspicious time, having a bad or poor obstetric history and following the fashion. The scoping review on non-medical reasons for CS also revealed similar reasons for requesting CS (Dhakal-Rai et al. 2021b).

In this study, cord round neck is found to be classified as an indication of CS. Quantitative results showed that 1.2% CS was conducted for cord round neck only in private hospital and emergency CS. In primigravida 0.9% and in multigravida 0.3% CS was conducted for cord round neck. The percentage of CS for cord round neck is lower in this study than another study conducted in Kathmandu Medical Collage Teaching hospital, which revealed that 5.5% CS is conducted for the umbilical cord round neck (Shrestha et al. 2021b). Likewise, qualitative results also revealed that women request a CS to avoid risk if cord round neck is identified. Only few studies reported that cord round neck could cause bad effect in birth outcome, but

many studies revealed that there is no association between cord round neck (or nuchal cord) with perinatal morbidity and mortality including long term health consequences. In case of tight cord round neck, same as strangulation can cause foetal asphyxia and birth asphyxia (Peesay 2017). However, cord round neck is diagnosed easily by ultrasonography (Peesay 2017). In this study, CS for cord round neck was conducted only for emergency CS in private hospital. It means cord round neck was discovered during birth. At that time, vaginal birth by competent SBAs/midwives could be more appropriate for prompt assistance for safe birth rather than waiting for CS as it could be too late to arrange CS for cord round neck after noticing it during labour. Availability of adequate number of competent SBAs/midwives who can handled cord round neck safely at birth also can reduce chance of CS.

CS for not specified reasons

In 5.7% of birth cases in this study the reason for CS was not specified. This occurred in both hospitals - PMWH (2.7%) and KMH (3.9%). The systematic review also revealed that CS was conducted without indications in South Asian countries (Dhakal-Rai et al. 2022) and this was also found in a study conducted China (Chu et al. 2010). Doctors may conduct CS believing that CS is a safer option for birth than vaginal birth (Shirzad et al. 2021) and perform CS without indications due to pressure from women and their families (Aminu et al. 2014). They may be reluctant to formalise maternal request or there may be poor paper-based medical recording systems in hospitals in urban Nepal. Nonetheless, performing CS without clear medical indications is not only ethically questionable, but also a serious matter due to health risks to mother and baby. It also has financial implications (Wagner 2000; D'Souza and Arulkumaran 2013).

Service providers' attitude on CS

Qualitative study highlighted that doctors/service providers also perceived CS to be safer than vaginal birth to avoid risks. So that, they would not take the risk of doing vaginal birth and rather do a CS to avoid risk (Shirzad et al. 2021). The positive attitude of service providers on CS is adding to the rise of CS. Several factors may influence the attitude of service providers on CS. For example, doctors may be compelled to do CS to avoid risks if it is requested due to the cord being round the neck, previous CS and breech presentation. Furthermore, the attitude of service providers or doctors on CS may depend not only due to fear of litigation or physical assaults (Dhakal-Rai et al. 2021b) or family pressure (Aminu et al. 2014) but also depends on financial motives (Wagner 2000; Peel et al. 2018). However, it may not depend on medical

knowledge and skills (Begum et al. 2018). Doctors may depend on technology to treat the pathological potential of pregnancy and childbirth. Technological developments in CS procedures may influence doctors' attitudes on CS being a safer procedure (Wagner 2000). As discussed above, precious baby due to giving birth at advanced age and preference of only one or two children can persuade service providers to conduct CS, because of safety of the baby during birth is utmost in that case. Similarly, there would be several reasons to perceive CS to be safe such as vaginal birth takes longer time, needs more SBAs to monitor labour and there may be uncertainty in perinatal outcome (Peel et al. 2018). So that, doctors may have positive attitudes on CS as younger obstetricians seems to have negative attitudes towards natural birth (D'Souza and Arulkumaran 2013). However, there are many short-term and long term health consequences of CS to mother and baby (Sandall et al. 2018). Therefore, service provider should acknowledge these health effects of CS and CS should be performed only when needed for medical reasons.

Health service-related factors for rising CS rates

Lack of antenatal education/counselling about mode of childbirth

The quantitative results showed that ANC visits are significantly associated with mode of childbirth. The chance of undergoing CS was significantly higher among women who had four or more ANC visits than women who attended 1-3 visits. Many other studies also reported that ANC visits are associated with CS (Narzary et al. 2017; Amjad et al. 2018; Ahmad et al. 2022). On the one hand, more ANC consultations may be needed due to pregnancy complications that need a CS. On the other hand, poor counselling and health education during ANC visits do not play a motivational role to encourage women to give birth naturally, due to lack of information on risks and benefits of mode of childbirth, as stated above. Similarly, educated and wealthy urban women would be more aware about their health and would attend private clinic more frequently for consultation and build good rapport with their doctors (Adhikari et al. 2021). They may be highly influenced by doctors' advice to undergo CS. Additionally, the power relationship between service providers or doctors and pregnant women is not equal in Nepal, like in other south Asian countries. The subordinate role of women to service providers also can influence decision making on CS (Akhter and Schech 2018) or doctors may accept maternal request perceiving CS is safer than vaginal birth (Shirzad et al. 2021). Moreover, some interviewees highlighted that pregnant woman are not aware of respectful maternity care. This is a very new approach in the context of Nepal. It does not mean doctors do not provide

respectful maternity care. The lack of awareness of women about respectful maternity care in addition to their subordinate position in decision making may influence them to accept doctors' advice on CS.

Shortage of human resources (midwives or SBAs)

The qualitative results highlighted that the lack of midwives or SBAs is another factor in the rising CS rate. Lack of human and capital resources is a chronic problem in developing countries (Naicker et al. 2009). In Nepal, the shortage of skilled professionals, especially midwives, is a major problem (Rath et al. 2007; Bogren et al. 2013b). The Government of Nepal has already initiated increased education provision to train midwives. However, most of the interviewees emphasised that this lack of adequate skilled human resources is another main factor behind the rising CS rate. The lack of midwives or SBAs means that it is impossible to monitor labour closely and this is particularly relevant for VBAC. In urban hospitals, vaginal birth may not be promoted because of the hospitals find this mode of birth is time consuming, particularly in the situation of insufficient staff (Peel et al. 2018). In these ways, the shortage of skilled staff can increase use of CS (Aminu et al. 2014; Sikder et al. 2015). Midwives who could advocate for the rights of the woman, counsel and motivate for normal birth are scarce in Nepal. Similarly, inadequate human and capital resources is reported to be a barrier to the utilisation of childbirth services in rural Nepal (Khatri et al. 2021). Lack of human resources and infrastructure challenges in providing quality emergency obstetric care can drive both doctors and pregnant women towards CS (Doraiswamy et al. 2021). In addition, lack of medical skill in instrumental/assisted and vaginal breech birth also add to increasing rates of CS. Instrumental birth/assisted birth is not common practice, although it may reduce maternal and neonatal complications in comparison to CS in the second stage of labour (Rawal et al. 2020). Instrumental birth is declining in many countries as CS increases (Bailey 2005).

It was interesting to note that the qualitative results highlighted the link between hospitals designated for Postgraduate MD training in gynaecology and obstetrics and having rising CS rates. Both hospitals (PMWH and KMH) are designated MD training centres. CS rates in both hospitals are found to be high. Similar findings are reported in Bangladesh (Rukhsana 2016).

City centralised health facility and hospital types

The qualitative results highlighted that one reason for high CS rates in urban hospitals is health facilities, particularly private hospitals, being centralised in the city. Well-equipped health

facilities (both private and public) are centralised in the city. Similarly, tertiary care hospitals and private hospitals where high quality comprehensive obstetric care is available are mostly centralised in Kathmandu city (Neupane and Devkota 2017). All interviewees from both hospitals said that both selected hospitals are providing comprehensive obstetric services. The availability of comprehensive quality obstetric care in both hospitals may increase the access of wealthy educated urban pregnant women to CS and encourage them to use CS. Women may self-refer to better private hospitals in the city (Karkee et al. 2015). Moreover, women who prefer CS may go to the private hospital to request CS and have their request fulfilled.

In the quantitative study, the type of hospital is found to be significantly associated with mode of childbirth, with the rate of CS being much higher in the private hospital, KMH, compared to the public hospital, PMWH. Qualitative study also revealed that more CS is performed in private hospital. The odds of CS are found to be higher in KMH (OR: 1.37; 95% CI 1.27-1.47 and AOR:1.32; 95% CI 1.22-1.44) compared to PMWH. A study conducted in Nepal also showed that CS rate is increased excessively in private hospitals, but not in public hospitals, over two decades in Nepal (Bhandari et al. 2020). Similarly, unnecessary CS in Nepal is profoundly raised by private health hospitals (Mainali 2019). The probability of CS is found to be higher in private and charitable health facilities than in public facilities in Nepal (Neuman et al., 2014). The systematic review also reported a similar finding (Dhakal et al, 2022). Similarly, the CS rate is found to be higher in private hospitals than public hospitals in Rwanda (Kibe et al. 2022) and in India (Singh et al. 2018; Lee et al. 2021). Other studies conducted in India (Narzary et al. 2017; Verma et al. 2020) and Bangladesh (Ahmad et al. 2022) showed that CS utilisation is higher among women who gave birth in private hospitals than in public hospitals. Quality of care and satisfaction of the patient with the care received is found to be high in private hospitals in Nepal (Neupane and Devkota 2017). Women who can afford to pay for services may go to the private hospitals for CS to be on the safe side and avoiding childbirth complications or labour pain. In fact, private hospitals are intended to encourage women to give birth by CS.

Lack of policy and protocol on CS

The qualitative results revealed the following issues around policy and protocol: No written protocol and policy on CS, lack of a model of maternity care, lack of respectful maternity care and lack of policy for award & motivation, lack of policy on supervision and monitoring in private hospitals and lack of auditing CS rates.

Lack of written protocol on CS

The qualitative results revealed that neither hospital has a written policy or protocol on CS, but each follows evidence-based guidelines as much as possible and conducts CS based on specific medical indications. Written protocols aim to achieve similar understanding and uniformity in practice among practitioners. A written protocol for CS, based on evidence-based international guidelines, would be beneficial to encourage evidence-based good practice in each hospital (Aminu et al. 2014).

Medical versus midwifery model of maternity care

The qualitative results highlighted a lack of commitment to the midwifery model of maternity care and emphasised how the current practice of the medical, or obstetric, model of care is promoting CS. In Nepal, the maternity care model is not well-known, as the Government of Nepal has no clear policy and protocol for which model of care should be implemented. In the hospital setting, maternity care in Nepal is mostly influenced by the medical model. Political commitment with evidence-based international guidelines on the midwifery model of maternity care would be a vital strategy not only for the development of the midwifery profession in Nepal (Bogren and Erlandsson 2018), but also, for the reduction of unnecessary CS and promotion of physiological birth (Sandall et al. 2016). Although midwifery-led maternity care is cost-effective and person-centred, as stated in chapter 1.6, the current practice of the obstetric model of care in hospital settings and lack of policy and protocol on model of maternity care is adding to the rise of unnecessary CS.

Respectful Maternity Care (RMC)

Pregnancy and childbirth are a critically vulnerable period of a woman's life. Therefore, respectful maternity care is recommended by WHO and all women of childbearing age have right to receive respectful maternity care (World Health Organization 2018b). However, qualitative results highlighted that lack of respectful maternity care in hospitals (as stated in chapter 1, section 1.7) is also a reason for unnecessary CS in Nepal. Disrespectful maternity care is witnessed in hospitals in Nepal (Dhakal et al. 2022). A study revealed that women have experienced disrespectful care in various forms: being shouted at (30.0%), being slapped (18.7%), delayed service provision (22.7%), and not talking positively about pain and pain relief during childbirth (28.0%) (Pathak and Ghimire 2020). Similarly, another study reported that all women who gave birth in health facilities have experienced at least one type of disrespect and or abuse during childbirth. The most common forms of disrespect and abuse

were non-consented care (100%), non-dignified care (72%), non-confidential care (66.6%), discriminatory care (32.33%) and physical abuse (13.23%) (Ghimire et al. 2021). However, a recent study showed that only 15.7% of women are dissatisfied with privacy and 13.0% of women reported their birth experience did not meet their religious and cultural needs, but nobody reported physical, sexual, or verbal abuse (Gurung et al. 2021). A qualitative study also reported that 44% women in Bangladesh, 36% in Ghana and 64% in Tanzania have no privacy during labour due to structural challenges; and 7% women in Ghana, 6% in Bangladesh and 5% in Tanzania are verbally abused (Manu et al. 2021). Another study reported that disrespect, poor communication between women, their families and doctors or nurses, poor physical conditions of birth facilities and mistreatment during labour and childbirth could result in women opting for CS (Shirzad et al. 2021).

Although all pregnant women in FGDs expressed that their preference and choice of mode of birth is vaginal birth to give birth of their baby, but the quantitative study showed that more than half pregnant women have had CS. Traditionally, in Nepali society, the mother-in-law would be the responsible person in family to look after the daughter-in-law during pregnancy, childbirth and postnatal period. The husband and mother-in-law of the pregnant women often expect to take over decision making around mode of childbirth. On the other hand, the preferences and choices of pregnant women during pregnancy and childbirth may be ignored by health professionals (Kaphle et al. 2022). This situation may create fear, uncertainty and disrespectful maternity care (Kaphle et al. 2022). There is no system to deal with disrespectful maternity care in Nepal. Doctors are assumed to be expert as a God/superior in the Nepali context. This unequal position between pregnant women and obstetricians is a barrier in women-centred care provision in maternity care. Moreover, lack of midwives/SBAs and lack of awareness about respectful maternity care among both service providers and service users could create difficulties in the provision and delivery of respectful maternity care. This may encourage/pressurise women to either request CS or accept advice from a doctor and opt for CS despite them preferring vaginal birth.

Policy on award for low CS rate/monitoring system

Lack of policy from the Government of Nepal to encourage and supervise the rational use of CS is also found to be a factor for rising CS rates in urban hospitals in Nepal. The qualitative results showed that the Government of Nepal has no policy to reward those hospitals who have CS rates less than 15% and elevate the morale of doctors who promote vaginal birth. Similarly,

there is no policy to investigate those hospitals where the CS rate is high. This situation does not motivate or encourage service providers to reduce their CS use. In addition, there is no monitoring system of the CS rate from the relevant hospital authorities, which may encourage the use of unnecessary CS. This is particularly important in the private hospital setting as well as the ability of the government to investigate or penalise those private hospitals where CS rates are very high. Private hospitals run almost autonomously. There is lack of policy/system of Government of Nepal for monitoring private hospitals. This situation creates a lack of accountability for private hospitals on their use of CS (Mainali 2019).

Auditing CS

Most of interviewees said that there is a system of reporting CS in their hospital, but only a few mentioned that the Government of Nepal is trying to develop a system of auditing CS using the Robson classification system. However, a system for auditing particularly CS is lacking in hospitals in Nepal. There is no auditing system of CS in the national health policy in Nepal. This is in spite of it being known that audit and feedback were identified as interventions that have potential to reduce CS rates (Chapman et al. 2019). The Robson classification (also known as ten group classification) is recommended by WHO to assess, monitor and compare CS within and between health facilities (World Health Organization 2015, 2017) as stated in chapter 1, section1.10. A systematic review revealed that audit and feedback using the Robson classification can reduce CS rates (Boatin et al. 2018). The scoping review also showed that Robson classification was a useful tool for assessing, monitoring and comparing CS within and between health facilities, and use of this tool is increasing in South Asia, including in Nepal (Rai et al. 2021). However, it seems to be far behind on auditing CS by using Robson classification in hospitals in Nepal. Only few studies have reported that the Robson classification has been used to classify CS in Nepal (Poudel et al. 2019; Baral et al. 2021; Gautam et al. 2021).

6.5 Strategies to reduce high CS rate in urban hospitals in Nepal

Four main strategies to reduce the high rate of CS are discussed in this section.

Provision of adequate resources

The qualitative results emphasised that adequate resources (SBA or midwife, birthing centre) for maternity care should be provided for reasonable use of CS. First, the provision of adequate numbers of SBAs or midwives should be a vital strategy to reduce CS rates across Nepal. The

Government of Nepal has been providing SBA training to doctors, nurses and ANM (Goyet et al. 2017). This training should be mandatory to all new doctors and nurses. Refresher training should be provided to update knowledge regularly, as part of continuous professional development (CPD) training. An adequate number of trained SBAs should be available for providing maternity care in hospitals so that they can provide counselling and health education in ANC, monitor labour and assist with birth. This can reduce the CS rate and promote normal birth (Mahato et al. 2018b). Secondly, adequate numbers of midwives should be produced, and they should then be utilised appropriately from community to the labour room. Most interviewees highlighted that the education and utilisation of midwives should be the strategy for reasonable use of CS and promotion of physiological birth. Midwives should be posted in ANC clinics, labour room, birthing centres, PNC clinics, as well as in the community. The midwife is the right person to provide professional assistance to women during pregnancy, childbirth and the postpartum period. Midwifery education has already been introduced in Nepal (Bogren et al. 2013a; Goyet et al. 2017). However, there are many challenges in building an autonomous midwifery profession in Nepal (Bogren and Erlandsson 2018), as mentioned in chapter 1, section 1.6. Therefore, midwifery education and professional development should be given priority in Nepal. Similarly, the qualitative results also emphasised the establishment of birthing centres in all hospitals, run by midwives, that are places where normal birth is promoted and thus reduce unnecessary CS in the hospital setting. The Government of Nepal has been providing maternity care through the birthing centres at the community/village level. These birthing centres are trying to provide midwifery-led maternity care for low-risk pregnancies by SBAs (Mahato et al. 2016; Mahato et al. 2020). In PMWH, a birthing centre or MNSC is trying to provide midwifery-led maternity care for low-risk pregnancies (MNSC Department 2023). It would be the reason, CS rate in this hospital is found to be comparatively lower than other public hospitals in Kathmandu (Rawal et al. 2020; Gurung et al. 2022). However, only three midwives out of 10 SBAs are working in birthing centre PMWH (MNSC Department 2023). There is no midwife working in KMH. All private hospitals and almost public hospital do not have a birthing centre hospital level. Therefore, all hospitals, including private hospitals in the city, should also be obliged to establish a birthing centre within the maternity care department where SBAs and midwives can provide the midwifery model of maternity care to reduce CS rates.

Increase awareness around risks and benefits of mode of childbirth

Antenatal education and counselling around mode of childbirth

Responses in the interviews and focus groups indicated that antenatal health education and counselling for pregnant women around childbirth from the beginning of pregnancy can play a vital role in reducing the CS rate. The WHO states that antenatal health education for pregnant women is vital in reducing unnecessary CS (World Health Organization 2018a). All women, including educated, rich and urban women, should be targeted in the antenatal education programme. WHO recommends psychoeducation for women with fear of labour pain (information about fear, anxiety, fear of childbirth, stages of labour, birth process, and pain relief techniques) (World Health Organization 2018a). Evidence showed that psychoeducation is effective in reducing fear of childbirth of pregnant women and in increasing natural birth (Fenwick et al. 2010; Rouhe et al. 2013; Masoumi et al. 2016; Kordi et al. 2017; Akgün et al. 2020). Similarly, relaxation classes could reduce the anxiety and stress of pregnant women (Bastani et al. 2005). Likewise, it is suggested that nurse-led relaxation classes and birth preparedness classes could reduce CS rate (Khunpradit et al. 2011). Husband should be involved in antenatal education together with a pregnant woman. A study conducted in Iran showed that antenatal education of husbands of pregnant women around mode of childbirth can increase support to those women and reduce the rate of elective CS (Sharifirad et al. 2013). Moreover, a randomised control trial revealed that educational intervention on mode of childbirth for husbands and wives together can significantly reduce CS and encourage natural birth (Valiani et al. 2014).

In urban hospitals in Nepal, pregnant women usually receive antenatal check-ups from an expert doctor. Interviewees in this study suggested that the doctor should be a good counsellor and show support for pregnant women to aim for normal birth by providing adequate counselling. Doctors would, therefore, be in a good position to counsel and motivate women to opt for a physiological birth. Pregnant women should be informed clearly about the risks, benefits, indications and contraindications for CS and the benefits and risks of normal birth during counselling. Most importantly, health education and counselling must be offered to all women including urban, rich and educated pregnant women.

Some interviewees stressed that empowerment of pregnant women should be done by providing antenatal care from a midwife. The individualized and motivating approach of midwives promotes the inner strength of pregnant women and belief in their own capability to handle the birth (Dahlberg et al. 2016). The midwifery approach is a holistic approach that includes person-centred counselling, prenatal care and education; continuous, direct help during labour, birth and the postnatal period, monitoring the physical, psychological and social

well-being of the pregnant woman throughout the pregnancy cycle and identifying and referring women who require obstetric attention and minimising medical interventions (Rooks 1999; Moghasemi et al. 2018; Choudhary et al. 2020). Pregnant women should be well informed about mode of childbirth to overcome from misinformation about childbirth among women (Doraiswamy et al. 2021) and to be empowered to make the right choice of birth plan (Moghasemi et al. 2018). This approach can empower individual pregnant women with knowledge about childbirth, which can help them make good decisions around birth. Lack of midwives in Nepal is the main problem with the promotion of this approach.

Raising public awareness

Public awareness around risks and benefits of the various modes of childbirth could help reduce the rising CS rate, as suggested by interviewees. Evidence showed that mass media (television, radio, and newspaper) is positively associated with maternal healthcare utilisation in South Asia (Fatema and Lariscy 2020). Therefore, mass communications methods such as posters, pamphlets, radio, newspapers and television programmes could be used to disseminate information on risks and benefits of both modes of childbirth to the public. This could also include schools and institutions of higher education. Furthermore, interviewees indicated that childbirth education should be a component of the health education programme of the Government of Nepal, schools and colleges. Additionally, public education could enhance collaboration with local organisations (Corry and Rooks 1999) such as women's groups, FCHVs. All these efforts can enhance the rational use of CS.

Reform policy and protocol for CS

The qualitative findings emphasised that policy and protocol for CS should be reformed, addressing issues such as the following: avoiding CS for non-medical reasons and primigravida, use of partograph for labour monitoring, fixed service charge for CS, reward and investigation of hospitals regarding high CS rate, use of Robson classification, provision of VBAC and trial of labour, monitoring of private hospitals, decision making around CS to be made by two consultants, provision of security for service providers, stopping workplace violence from service users and commitment from the Government to implement evidence-based international guidelines on CS (midwifery model of care, respectful maternity care and Robson classification).

The WHO recommends that CS must be performed only for medically indicated reasons (World Health Organization 2015). Interviewees emphasised that the Government of Nepal

must reform policies and protocols to avoid CS for non-medical reasons as well as for reduction of primary CS. If hospitals implement these policies, then CS rates can be reduced.

The partograph is recommended by the WHO for appropriate monitoring of labour process and progress (World Health Organization 2014b). The partograph is used widely for labour monitoring and for timely recognition of the need for intervention. However, evidence showed that partographs are not used adequately for labour monitoring in hospitals in Nepal. A study conducted in Nepal reported that only 8.6% CSs for prolonged labour had a completed partograph (Litorp et al. 2020). A comprehensive realist synthesis showed that the partograph provides a picture of potential issues and solutions related to successful labour recording and management (Bedwell et al. 2017). Therefore, interviewees emphasised that compulsory use of the partograph should be included in the policy and protocol of each hospital for reduction of CS rates.

The Government of Nepal should fix the service charge for CS for all hospitals including private hospitals in order to optimise the use of CS, as suggested by interviewees. The fees are very high in private hospitals, and the high cost is not affordable for poor women. Furthermore, the fee rate is varied between individual hospitals. Therefore, policy and protocol must be formulated addressing equal fixed amount of service charges for CS. The rate of fee must be the equal and affordable to the public in all hospitals. Additionally, public hospitals in Nepal are incentivised for both CS and normal birth from "Aama Surakshya Karyakram". However, the amount of incentive is higher for CS (Khanal 2019). The higher incentive for CS may encourage to conduct CS. Therefore, the financial incentive should be equivalent to the real cost of the types of childbirth, that removes wrong financial incentives altogether and that may improve optimal use of CS.

Interviewees highlighted that the policy of rewarding hospitals where normal birth is high, or CS rate is low (less than 15%) and investigation where the CS rate is high could help the rational use CS. In fact, it is very important to consider that the WHO recommendation of CS rate of 15% (World Health Organization 2015) is based on all women in the population, not based on childbirths in hospital only. Therefore, hospitals particularly urban ones could not be expected to keep CS rates under 15% because of looking after referred women with complications. This is especially relevant in a referral hospital which, by nature of the referral system would expect to have a higher CS rate due to such complications. However, appropriate policy can help discourage CS for non-medical indications. The Government of Nepal should

formulate policy to reward those hospitals where the normal birth rate is high, CS rate is reasonably low and encourage doctors who perform CS only for medical reasons and promote vaginal birth. Similarly, the Government of Nepal should make policy provision to investigate the reasons for high CS rates and penalise those hospitals where the CS rate is very high. If the policy is implemented well, hospitals may be encouraged by role modelling to reduce the CS rate.

The Robson classification of CS is recommended by WHO (World Health Organization 2015). It is an internationally used tool for assessing, monitoring and comparing CS rates within and between health facilities. Interviewees recommended that the Robson classification be used in both public and private hospitals. Therefore, the Government of Nepal should make a strong commitment to adopt and implement the Robson classification. Individual hospitals must produce written protocols for how to implement and monitor it.

The qualitative results emphasised that provision of VBAC in case of previous CS should be in the protocol of each hospital to reduce CS rate. All necessary criteria including adequate resources (human resources and other facility) must be addressed in the hospital protocol. Similarly, trial of labour for breech presentation should also be included in hospital protocols along with sufficient human and practical resources for safe vaginal breech birth to reduce unnecessary CS. External cephalic version could be beneficial in case of breech presentation.

Monitoring of private hospitals is one of the crucial responsibilities of the Government of Nepal. Most of interviewees emphasised that the Government of Nepal must formulate and implement rules and regulations for private hospital to control overuse of CS and to make them accountable for their CS use. Constant supervision and monitoring of private hospitals by the Government of Nepal could reduce unnecessary CS (Mainali 2019). Although this is a complex issue as private hospitals are largely independently managed, a system should be developed by the Government of Nepal to monitor and supervise private hospitals closely. Likewise, decision making for CS to be made by two consultant doctors was suggested to reduce unnecessary CS. If a decision for elective and emergency CS is made by two expert doctors, it would be more likely to be a rational decision. Evidence suggested that implementing mandatory second opinion policy with evidence-based guidelines can reduce rates of CS (Althabe et al. 2004; Khunpradit et al. 2011). However, decision-making on CS by two consultants may not be practical in all hospitals and situations due to the shortage of human resources.

The qualitative results highlighted that robust policies and protocols should be reformed to maintain security, create safe working environments and prevent workplace violence from service users towards staff. A law on violence against the healthcare providers was passed in 2022 will hopefully help some extent to offer a safe working environment and prevent violence against health workers in Nepal (Kharel 2022; Parajuli and Koirala 2022). If service providers feel secure, the working environment is safe, and society is well disciplined, then the doctor would do less defensive CS. The risk of threatening behaviours and physical assault can be avoided or minimised by the hospital authorities taking appropriate precautions. Employers must think seriously about how to avoid such kinds of workplace violence against doctors and nurses. A zero-tolerance policy toward workplace violence from service users can be the best protective intervention in hospitals in Nepal (Cheung et al. 2017). A written policy and procedure should be produced regarding how to avoid and handle such kinds of incidences. Hospitals should provide training to all staff on this issue. Additionally, hospitals should secure the workplace by installing video surveillance, extra lighting, and alarm systems and minimising access by outsiders through identification badges, electronic keys and guards (Wurim 2012).

Most of the interviewees emphasised that the Government of Nepal must commit to reducing CS by implementing internationally evidence-based protocols and guidelines such as the maternity model of care, respectful maternity care, and Robson classification as stated in chapter 5, section 5.4.3.10. A robust national policy and protocol on CS must be formulated incorporating international evidence-based guidelines as recommended by WHO such as Robson classification (World Health Organization 2015; Betrán et al. 2016a) and respectful maternity care (World Health Organization 2018b). Evidence showed that the midwifery model of maternity care can reduce the unnecessary CS rate (Sandall et al. 2016). National policy and protocol must give priority to the midwifery model of maternity care for low-risk pregnancies. Similarly, respectful maternity care should be implemented, but implementation of RMC may require a huge cultural shift, and this is not straightforward. In PMWH, birthing centre is trying to provide Respectful Maternity Care including the rights of childbearing woman and new-born recently (MNSC Department 2023). It is greatly appreciated initiation that should be common initiation in all hospitals for reducing CS rate. In addition, issues about weakness regarding policy implementation was highlighted in the interviews and this is an area that needs attention and action.

Promotion of physiological birth

The qualitative findings highlighted that physiological birth should be promoted to make rational use of CS. This can be done by shifting from the medical model of maternity care to the midwifery model, providing opportunity for VBAC for previous CS and trial of labour for breech, promoting instrumental delivery, offering painless birth, involving the husband throughout the journey of pregnancy and childbirth, improving care during pregnancy (regular exercise, mental preparation and family support) and improving the quality of care in hospitals (particularly in public hospitals).

The qualitative results emphasised that a midwifery model of maternity care should be adopted to promote physiological birth in hospitals in Nepal for the reduction of CS rates. The midwifery, or social, model of maternity care is a women-centred holistic approach to enhance natural physiological processes, which optimise the health of mother and baby and results in individual mothers' satisfaction (van Teijlingen 2005). Pregnancy is a natural process, and it is not an illness. Midwives play a key role in helping to promote a natural birth and positive birth experience. A qualitative study conducted among first-time Norwegian mothers (Dahlberg et al. 2016) revealed that women felt an inner strength after receiving guidance, coaching and support through the birth process by a midwife. This gave those women a strong motivation and encouragement to continue the natural birth process up to the most intense labour (Dahlberg et al. 2016). All pregnant women require help from a midwife but only a few women need further medical help from a doctor (Sandall 2012). Only a few pregnancies need obstetric intervention due to complications. Low-risk pregnancy should be looked after and managed by midwives and SBA trained nurses in birthing centres to promote physiological birth. Urban hospitals of Nepal could reduce CS rate by adopting midwife-led models (Chapman et al. 2019). Similarly, evidence-based alternative approaches such as the provision of water birth should be offered to low-risk pregnant women in hospitals in Nepal (Carpenter et al. 2022). At present, water birth is completely new, and no such facility exists in Nepal. Water birth is common in many developed countries, and it is found to be helpful to increase normal physiological birth and to reduce medical and surgical interventions (Menakaya et al. 2013; Carpenter et al. 2022). Moreover, normal physiological birth among low-risk women is found to(Carpenter et al. 2022).

Similarly, most of interviewees suggested that the opportunity of VBAC for women who have a history of previous CS must be provided in all hospitals. Provision of VBAC would a

reasonable and safe strategy to increase physiological birth and to decrease the morbidity associated with repeated CS after having a lower-segment CS. Success rates of VBAC have been reported to be high - 60-80% (Birara and Gebrehiwot 2013; Abdelazim et al. 2014; Hoque et al. 2021; Parveen et al. 2022). However, several factors are associated with successful VBAC. It is only a safe option and successful if individual risk assessment is carried out for carefully selected VBAC cases (Abdelazim et al. 2014; Hoque et al. 2021; Parveen et al. 2022). Additionally, it has huge economic, training and professional culture implications. Some interviewees highlighted that the opportunity of trial of labour must be provided for breech presentation according to protocol. Instrumental (vacuum and forceps) birth should be promoted by provision of continuous professional development for doctors, as suggested by interviewees. It also has training and skills issues. All urban hospitals should offer VBAC, trial of labour of breech presentation or external cephalic version and instrumental birth to reduce CS and promote vaginal birth.

Labour anaesthesia (Painless birth) is not offering commonly by hospitals in Nepal and women's awareness of painless labour is also low (Sharma et al. 2018b) as discussed earlier. Moreover, the shortage of expertise such as anaesthetists to give epidural analgesia, lack of equipment for monitoring the process and lack of staff for constant monitoring of labour may hinder the provision of painless childbirth in Nepal as discussed earlier. However, provision of painless birth would be an option for reducing CS at maternal request due to the labour pain. PMWH has already initiated offering this service (MNSC Department 2023) in a small scale. All urban hospitals of Nepal should offer painless childbirth to promote vaginal birth and to avoid CS on maternal request due to labour pain.

The qualitative results suggested that the involvement of husbands throughout the pregnancy and childbirth journey can be a good strategy to promote physiological birth. Despite having positive desire and potential benefits, involvement of the husbands in wives' maternity care (pregnancy and childbirth) is not recognised in Nepal due to many factors such as their availability, cultural beliefs, and traditions (Lewis et al. 2015). A hospital-based study conducted in Kathmandu reported that there are service users' barriers (lack of knowledge, social stigma, shyness and professional obligations of husband) and health service providers' barriers (lack of hospital policy, human resources and space) to involve husband in maternal (Mullany 2006). Therefore, these are not easy things to change. However, as discussed above couple-based antenatal education intervention is effective in increasing spousal support and decreasing elective CS rates (Sharifirad et al. 2013). Therefore, the health system in Nepal

should focus on the inclusion of husbands in maternity care. Pregnancy is a critical period of life. Quality care during pregnancy can influence the well-being of the pregnant woman and baby. For the improvement of quality in maternity care WHO recommends women have a companion of choice during labour and childbirth to support them (World Health Organization 2018b, 2020). This approach is found to be effective in reducing CS rates, improving Apgar scores as well as enhancing women's satisfaction with childbirth (World Health Organization 2020). In birthing centre in PMWH, companionship of husband is encouraging during labour and childbirth (MNSC Department 2023). All hospitals should allow husband as a companion during labour and childbirth in the same way.

Care during pregnancy such as regular exercise and mental preparation for normal birth and family support for normal birth could develop pregnant women's confidence to undergo vaginal birth. Antenatal care in hospitals can offer more services such as yoga, exercise and motivational classes. Furthermore, qualitative results also pointed out that the quality of maternity care particularly in public hospitals should be improved in terms of respectful, dignified and person-centre maternity care (skill and attitude of staff, effective communication).

6.6 Limitations and strength of the study

The study is not free from limitations. The researcher could not directly involve for data collection in Nepal due to the COVID pandemic travel restrictions. However, local data collector was trained online to develop expertise on data collection. Although the study was conducted in only two hospitals, the study found similar results as reported by the systematic review (Dhakal et al 2022).

Limitations

This study has some limitations, especially coverage and selection of sites for study, as well as the huge impact of the COVID-19 pandemic as discussed below:

- Only two hospitals were selected in Kathmandu for conducting the study due to limitation of resources. More hospitals in other cities could be not included but would have increased coverage of urban Nepal. However, these two hospitals were chosen because they represent both public and non-public sectors. Therefore, generalisation of the study findings may be made to all urban hospitals in the country.

- Another limitation is that data collection could not occur as planned, due to the travel restrictions of the COVID-19 pandemic. Delay in data collection created several uncertainties around how to collect data. In the end a local data collector was hired, and data were collected after providing online training. If data collection could have been done by the researcher herself, it would have saved time and resources. Validity and reliability were maintained by providing training, feedback and re-checking data.
- Another limitation was the paper-based medical recording system in hospitals in Nepal. It was very time consuming to collect and verify data using different paper-based record such as case files, admission and discharge records, records of operating theatres as well as records in the medical records section. Furthermore, retrospective data did not provide information such as education or the occupation of the woman and her husband.
- There was a challenge in qualitative data collection due to many reasons such as the busy work schedules of interviewees, not enough room for conducting interview and FGDs.
- This study did not consider other philosophical approaches such as critical realism (see Section 3.2.1).
- Case study was not able to consider in methods due to many reasons (more details see chapter 3, section).

Strengths

Although the study encountered some limitations as discussed above, there are several strengths of the study as discussed below:

- Ethical approval obtained from the university, relevant hospitals and NHRC before data collection. A pilot study was conducted in Karnali Province Hospital to test validity and reliability of data collection tools prior to the study.
- Although data were collected by local data collector rather than the researcher, but training was provided to local data collector regarding data collection prior to data collection. Likewise, continues supervision, guidance and feedback was provided by the researcher from online. Additionally, face to face feedback and support provided by local supervisor. Hence, data collector was constantly guided and supervised by the local supervisor and researcher. Use of local data collector for data collection helped to minimize researcher bias.

- Using different methods for qualitative data collection provided benefits such as a clearer picture of the research problem of this research topic including factors behind rising CS rates and answering the research questions. Pre-tested open-ended questions or guidelines were used, and irrelevant discussion was minimised by using multiple probing questions. The local data collector, who had experience of conducting interviews and FGDs, was involved face to face and took enough time with interviewees for building rapport and trust.
- Appropriate methods were used to collected quantitative data such as interview and FGD. The interview and FGD enabled a wider range of perspectives to be sought from both service providers and service users. These included semi-structured interviews with various level health personnel. Various level doctors, from junior doctors to senior consultants and ANM to ward sisters were interviewed. Similarly, hospital directors, representatives from NESOG, MIDSON and the Ministry of Health of Nepal were interviewed as key informants. Furthermore, FGDs were conducted with pregnant women who were attending ANC visits in both hospitals. The qualitative data were checked by individual supervisor for quality control. The trustworthiness of qualitative data was maintained (see chapter 3, section 3.8.2.1).
- Suitable sampling strategy was applied in this study. The sample for the quantitative study was collected using systematic random sampling to reduce the selection bias. Systematic random sampling technique was used to ensure representativeness and generalizability of study results. Pre-tested record format was used to record extracted data. Sample size was calculated separately for the two selected hospitals to avoid over and under sampling. This was done in consultation with a statistician. An extra 10% sample was added to the actual sample to overcome missing data. Reliability and validity of study tools including quantitative data was maintained (see chapter 3, section 3.3.3). Purposive sampling was applied for qualitative data collection.
- Using a mixed-methods approach provides rigour and triangulation of methods to overcome the weaknesses of both qualitative and quantitative methods. This is a cross-sectional mixed-methods study which has provided comprehensive insights into factors contributing to rising CS rates in urban hospitals in Nepal. For the quantitative study, retrospective data were extracted randomly from the hospital records of one fiscal year using record format. The quantitative method provided data on the significant factors associated with rising rates of CS in two hospitals in Nepal. Similarly, the qualitative

approach explored why CS rates are high in urban hospitals in Nepal. Integration of both qualitative and quantitative findings increases insights into the research problem, strengthens the study and validates the results.

- Appropriate research design (mixed methods) and research philosophy (pragmatic philosophy) was chosen according to research questions and objectives. The advantage of applying mixed methods in this study is flexibility in selecting and using more than one method to address research questions, which is not possible using a singular method. Similarly, qualitative and quantitative data were collected at the same time to use resources efficiently. Using mixed methods enables clear understanding of complex issues around rising CS rates in urban hospitals in Nepal from different perspectives. This cannot be achieved by using only one research method. Likewise, this mixed method can increase the validity of the study and reduce the bias to provide the best and most robust results by triangulating, corroborating and comparing the results.
- Appropriate statistical test or analysis methods were used for data analysis and draw conclusion. Chi-square test, logistic regression and risk ratio to analyse quantitative data. Similarly, NVivo 12 and thematic analysis was used for qualitative data analysis. Data are recorded and stored accurately and securely. The study results are reported transparently.

6.7 Achieving the aim and objectives of the study

This thesis has one aim and three objectives which were answered and addressed in the methods and results chapters, the details of which are shown in Table 6.1 below:

Table 6.1: Achieving the aim and objectives of the study

Aim and objectives	How was it addressed in each chapter
Aim: Explore the factors associated with the high rate of CS in two urban hospitals in Nepal.	Chapter 3 explained how to fulfil the aim through both quantitative and qualitative methods. Detailed explanations and the guidelines were mentioned regarding sampling methods, sample size, development of questionnaires and how to collect quantitative and qualitative data.
	Chapter 4 presented quantitative results that highlighted many factors associated with rising rates of CS in two hospitals in Nepal. Retrospective data were analysed using SPSS. Significant associated factors were

	identified by using Chi-square test and logistic regression, risk ratio. Tables and figures were used to present the data.
	Chapter 5 presented qualitative results that revealed many factors affecting the rise of CS rates in urban hospitals in Nepal, such as medical, non-medical, financial, sociodemographic and health service-related factors.
Objective 1. Estimate the proportion of CS deliveries in the study population and each Robson category.	Chapter 3 explained how to fulfil the objective through quantitative methods. Detailed explanations and the guidelines were mentioned regarding sampling methods, sample size, and how to collect and analyse quantitative data.
	Chapter 4 demonstrated CS rates. Retrospective data from two hospitals were analysed using SPSS. The contribution of each Robson group to overall CS rate, hospital-wise CS rate, rate of CS in each Robson group was identified. Risk of CS in each Robson group was identified using risk ratio. Tables were used to present the data.
Objective 2. To identify key factors contributing to a higher rate of CS.	Chapter 3 explained how to fulfil the objective through both quantitative and qualitative methods. Detailed explanations and the guidelines were mentioned regarding sampling methods, sample size, development of questionnaires and how to collect quantitative data and qualitative data.
	Chapter 4 identified significantly associated factors with CS using Chi-square test, logistic regression and risk ratio. Chapter 5 presented qualitative results that revealed five main factors affecting the rise of CS rates in urban hospitals in Nepal - medical, non-medical, financial, sociodemographic and health service-related factors. Within these five main factors were many other factors. Thematic analysis and NVivo were used to analyse the data.
Objective3: To seek strategies/recommendations to improve a reasonable use of CS.	Chapter 3 explained how to fulfil the objective. Detailed explanations and the guidelines were mentioned regarding sampling methods, sample size, development of questionnaires and how to collect quantitative data.
	Chapter 5 presented qualitative results that revealed four main strategies to make rational use of CS in Nepal such as increased awareness around mode of childbirth, provision of resources, reform of policy and protocol and the promotion of physiological birth.

6.8 Chapter summary

This chapter has discussed key findings from the qualitative and quantitative studies in light of the research questions outlined in this section. These key findings were discussed and brought together in light of the relevant literature. This discussion was organised under various topics. The strengths and weaknesses of the study were also discussed. The significance of the findings of the study both for urban Nepal or similar middle and low-income contexts has been discussed. In this way the aim and objectives of the study have been fulfilled (Table 6.1).

Chapter 7 CONCLUSION

7.1 Introduction

This chapter presents conclusions drawn from the mixed method study. Firstly, the overall conclusion is drawn from both the mixed method study and the literature reviews. Then, the key conclusions were drawn from the findings of both the quantitative and qualitative studies on CS rates, key indications, factors affecting with rising rates of CS in urban hospitals in Nepal and possible strategies for rational use of CS in urban hospitals in Nepal. Brief conclusions from the scoping and systematic review are also included.

The rate of CS is rising unexpectedly in urban hospitals in Nepal, although the CS rate is still low in rural hospitals. The rising rate of CS in urban Nepal is a worrying public health issue in a poor country like Nepal. However, the reasons for rising CS rate are still not clearly understood due to the lack of study in this subject. Therefore, this thesis has tried to find out the possible factors of rising CS rates as well as the possible strategies to stem the rise and rational use of CS in two urban hospitals (one public and one private) in Kathmandu, Nepal. The mixed methods study has highlighted many reasons for rising CS rates in urban hospitals of Nepal, and offers detailed knowledge on factors fuelling the rise of CS. At the same time, the thesis has also sought and recommended possible strategies to reduce the CS rates. The findings would be the important evidence not only for researchers but also for policy makers to reform policies regarding rational use of CS in Nepal. This thesis can provide baseline information to plan and implement effective interventions or modified clinical strategies or practice to reduce unnecessary CSs and to optimise CSs realistically in health facilities in Nepal. The study findings would be a steppingstone for further research.

7.2 Overall conclusion from the thesis

The rate of CS is extremely high compared to WHO recommended rate, particularly in the private hospital (KMH). The unrealistic high rates of CS reflect the medicalisation of childbirth in urban private hospitals in Nepal. The emergency life-saving procedure CS is used as a preferred mode for childbirth. The rising rates of CS in urban hospitals in Nepal is an alarming public health problem and it must be addressed urgently. Scoping literature reviews also showed that rising CS rates are a public health problem globally and in South Asian countries including Nepal.

Previous CS was the leading indication for performing CS, followed by foetal distress, CPD and breech presentation. Previous CS was the principal indication for elective and repeat CS.

In this study, previous CS is found to be the leading indication for performing overall CS, elective CS, CS in multipara and a private hospital (KMH). The elective CS rate was higher than emergency CS rates in KMH. Foetal distress is found to be the second most common medical indication for overall CS, but the most common indication for emergency CS, for CS conducted for primipara women and for CS conducted in a public hospital (PMWH). The systematic review also concluded that foetal distress and previous CS were the key indications for performing CS in South Asian countries. Furthermore, foetal distress was a key indication for all types of CS except elective CS. It was identified that CS was also performed for non-medical indications such as maternal request and not specified reasons in urban hospitals in Nepal. However, evidence of CS performed for maternal request was found only in private hospital (KMH). Scoping reviews and systematic reviews also showed that CS was performed for non-medical indications, such as maternal request and without indications. Changing attitudes of doctors and service providers towards CS and maternal preference of CS are non-medical reasons for rising CS rates in urban Nepal.

The Robson classification, which is a recommended tool by WHO for assessing and monitoring CS rate, was successfully used to calculate CS rates for each Robson group. CS rates are found to be high in low-risk Robson groups (1-4). Robson group five (Previous CS, single cephalic, =>37 weeks) is found to be the highest contributor to overall CS. Robson groups one (Nulliparous, single cephalic, =>37 weeks in spontaneous labour) and three (Multiparous, excluding previous CS, single cephalic, =>37 weeks in spontaneous labour) are assumed to be low-risk pregnancy. Robson groups two (Nulliparous, single cephalic, =>37 weeks in induced labour or CS before labour) and four (Multiparous, single cephalic, =>37 weeks in induced labour or prelabour CS) are also not assumed to be a very high-risk group. However, groups one (Nulliparous, single cephalic, =>37 weeks in spontaneous labour) to four (Multiparous, single cephalic, =>37 weeks in induced labour or prelabour CS) are found to be higher contributors to overall CS rates. The risk of undergoing a CS was significantly higher in high-risk groups such as Robson group five (Previous CS, single cephalic, =>37 weeks), six (All nulliparous breeches), seven (All multiparous breeches (including previous CS)), nine (All abnormal lie (including previous CS)). However, the risk of undergoing CS was significantly higher in low-risk group in private hospital (KMH) such as Robson groups one (Nulliparous, single cephalic, =>37 weeks in spontaneous labour) and two (Nulliparous, single cephalic, =>37 weeks in induced labour or CS before labour).

Many associated factors with rising CS rate in urban hospitals in Nepal were identified by the quantitative study. Types of hospital (private), higher age of mother at time of birth (25-29 and ≥35), breech presentation of foetus, four or more ANC visits during pregnancy and having spontaneous and no labour during childbirth were key significant factors associated with rising CS rates in these two urban hospitals in Nepal. The systematic review also concluded that higher maternal age, higher maternal education, urban residency, higher economic status, higher numbers of ANC visits, previous CS, complications of pregnancy/childbirth, and lower parity were key factors associated with rising CS rates in South Asia, including Nepal,

The qualitative study concluded that multiple factors influence rising CS rates in urban hospitals in Nepal. Therefore, joint strategies are required to stem the rising CS rates. The qualitative study tried to capture and represent both service providers' and service users' perspectives on factors affecting rising CS rates as well as tried to provide possible strategies for the optimal use of CS. The primary decision maker on CS is found to be a senior doctor and patients and family were mainly involved for obtaining consent for emergency CS (chapter 5, section 5.2.4). Five key factors influencing the rising CS rates are identified in this study. (1) Medical factors (2) Sociodemographic factors (3) Financial factors **(**4) Non-medical factor (5) Health services related factors (chapter 5, section 5.3). Similarly, four key strategies are sought to stem the rise of CS. (1) Provision of adequate resources (2) Increasing awareness on mode of childbirth such as antenatal education and counselling on mode of childbirth. (3) Reform of policies and protocols to avoid CS for non-medical reasons and primary CS. (4) Promoting physiological birth (chapter 5, section 5.4).

7.3 Key conclusion from quantitative results

The quantitative study concludes that the CS rate is exceptionally high in urban hospitals in Nepal, but more alarmingly higher in KMH than in PMWH. Elective CS is higher than emergency CS, particularly in KMH. Previous CS is the most common medical indication and maternal request is the most common non-medical indication, which is reported only in KMH. CS are performed for not specified reasons in both hospitals. Several factors are associated with rising CS in urban hospitals. However, risk of having a CS was significantly higher in KMH, among women aged 35 or more years old, breech presentation of the foetus, women who had spontaneous labour and no labour and four or more ANC visits. Similarly, Robson group five is the highest risk group and highest contributor to overall CS rates. The results of the quantitative study could provide significant evidence and could add important insights.

Rate of CS

The rate of CS is found to be worrying high particularly in KMH. The rate is very high in both hospitals in Nepal compared with recommended CS rates by WHO, which reflects the global trend of over medicalisation of pregnancy and childbirth. Furthermore, the rate of CS in KMH (private hospital) is extremely high and it is almost twice as high compared to PMWH (public hospital). Similarly, a higher proportion of elective CS, particularly in KMH, mirrors the great favour to CS and use of the emergency procedure routinely as an alternative mode of childbirth, in many private hospitals. More than two thirds of births are by CS in KMH compared to less than one third in PMWH. Another upsetting issue is the high incidence of both primary and repeated CS in this study. Additionally, the rate of CS is rising in both hospitals, as shown by hospital data from three consecutive years. Therefore, there is an urgent need to address the problem immediately.

Key indications for CS

The study concluded that CS is performed for both medical and non- medical indications.

Medical indications: Previous CS is found to be the most common medical indication for overall CS and elective CS. Similarly, previous CS was the major indication for performing CS among multipara women. Likewise, previous CS was the most common indication for CS in KMH. Foetal distress is found to be the second most common medical indication for overall CS but the most common indication for emergency CS, for CS conducted for primipara women and for CS conducted in PMWH. Other common indications for CS were CPD and breech presentation (chapter 4, Table 4.1).

Non-medical indications: Maternal request is found to be the main non-medical indication for CS. However, CS is conducted for maternal request only in KMH (private hospital). A notable proportion of CS conducted without any specific reason is also found in both hospitals in this study (chapter 4, Table 4.1).

Factors significantly associated with CS

This study concluded that there are many associated factors with mode of childbirth such as types of hospital, age of mother, gestational age of pregnancy, Apgar score of the new-born baby at five minutes, utilisation of ANC visits, ethnicity, place of residency, foetal presentation, onset of labour (chapter 4, Table 4.4). In bivariate logistic regression, the risk of having a CS is found to be higher in KMH, among women aged 25 years or older, breech presentation of foetus, women who had spontaneous labour and no labour, new-born babies having an Apgar

score of 7-10 at five minutes, women having four or more ANC visits, women from high ethnicity and residing in urban. However, multivariate logistic regression showed that the risk of having a CS is higher only in KMH, among women aged 25-29 and ≥35years old, breech presentation of foetus, women who had spontaneous labour and no labour and four or more ANC visits (chapter 4, Table 4.5).

CS rates in Robson groups

The Robson classification, which is recommended tool by WHO, was successfully used to classify quantitative data into ten groups of Robson classification and then the CS rate was calculated for each Robson group (chapter 4, Table 4.6). Robson groups one (Nulliparous, single cephalic, =>37 weeks in spontaneous labour), Robson groups two (Nulliparous, single cephalic, =>37 weeks in induced labour or CS before labour), three (Multiparous, excluding previous CS, single cephalic, =>37 weeks in spontaneous labour) and four (Multiparous, single cephalic, =>37 weeks in induced labour or prelabour CS) are assumed to be low-risk groups for performing CS. However, CS rates are found to be high in these low-risk Robson groups (1 - 4) in this study.

In this study, Robson group five (Previous CS, single cephalic, =>37 weeks) is found to be the highest contributor to overall CS as well as the highest risk group to undergo a CS, followed by groups one (Nulliparous, single cephalic, =>37 weeks in spontaneous labour), two (Nulliparous, single cephalic, =>37 weeks in induced labour or CS before labour), three (Multiparous, excluding previous CS, single cephalic, =>37 weeks in spontaneous labour) and six (All nulliparous breeches) (chapter 4, Table 4.6).

In PMWH, Robson group one (Nulliparous, single cephalic, =>37 weeks in spontaneous labour) is found to be the highest contributor to overall CS rates followed by groups five (Previous CS, single cephalic, =>37 weeks), two (Nulliparous, single cephalic, =>37 weeks in induced labour or CS before labour), three (Multiparous, excluding previous CS, single cephalic, =>37 weeks in spontaneous labour) and six (All nulliparous breeches). Similarly, in KMH, Robson group five (Previous CS, single cephalic, =>37 weeks) is found to be the biggest contributor to overall CS rates followed by groups one (Nulliparous, single cephalic, =>37 weeks in spontaneous labour), two (Nulliparous, single cephalic, =>37 weeks in induced labour or CS before labour), three (Multiparous, excluding previous CS, single cephalic, =>37 weeks in spontaneous labour) and four (Multiparous, single cephalic, =>37 weeks in induced labour or prelabour CS) (chapter 4, Table 4.7). Robson groups one (Nulliparous, single cephalic, =>37

weeks in spontaneous labour) and two (Nulliparous, single cephalic, =>37 weeks in induced labour or CS before labour) are significantly associated with a contribution to overall CS rates in both hospitals (chapter 4, Table 4.7). The risk of undergoing CS is found to be the highest in Robson group five (Previous CS, single cephalic, =>37 weeks) followed by groups six (All nulliparous breeches), seven (All multiparous breeches (including previous CS)), nine (All abnormal lie (including previous CS)) and two (Nulliparous, single cephalic, =>37 weeks in induced labour or CS before labour) (chapter 4, Table 4.8). The risk of CS was significantly higher in Robson groups one (Nulliparous, single cephalic, =>37 weeks in spontaneous labour) and two (Nulliparous, single cephalic, =>37 weeks in induced labour or CS before labour) in KMH. Similarly, Robson group ten (All single, cephalic, =<36 weeks (including previous CS)) had significantly higher risk of undergoing CS in PMWH. However, Robson group three is found to be significantly lower risk group for undergoing CS in both hospitals (chapter 4, Table 4.9).

7.4 Key conclusion from qualitative study

The qualitative study concludes that the CS rate is rising in urban hospitals in Nepal, especially in private hospital (KMH). Decision making on CS is usually made by the senior doctor and women and family are involved in decision making for obtaining consent for emergency CS. Multiple factors are contributing to rising CS rates in urban hospitals in Nepal. CS is conducted mainly for medical indications such as previous CS, foetal distress, breech presentation. Therefore, joint strategies are required to stem the rising CS rates. The findings of the qualitative study are valuable because this study tried to capture and represent both service providers' and service users' perspectives on factors affecting rising CS and possible strategies for optimal use of CS.

Key factors affecting to rising CS rate

The qualitative findings concludes that five key factors are affecting rising CS rate in two urban hospitals in Nepal (chapter 5, section 5.3).

(1) Medical factors for rising CS rates in these two hospitals are found to be repeated CS for previous CS, lack of practice of VBAC, breech presentation, complicated referral cases that need CS.

(2) Sociodemographic factors for rising CS rates in these two hospitals are found to be advancing age of mother at time of birth, career-oriented, educated, wealthy and urban women, precious baby due to infertility or bad obstetric history or other many reasons and social issues

such as insecurity of service providers from service users' violence which results in defensive CS.

(3) Financial factors for rising CS are found to be an income source for private hospital to run the business and incentives from the government of Nepal for conducting free CS in public hospitals.

(4) Non-medical factors are found to be maternal request (with many reasons for requesting CS) and service providers' positive attitude. The main reason for maternal request was labour pain.

(5) Health service-related factors are found to be, lack of awareness on mode of childbirth, lack of adequate resources, lack of appropriate policy and protocol on CS and centralised health facilities in urban areas in Nepal.

Strategies for optimal use of CS in urban hospital in Nepal

The thesis has sought four main strategies for rational use of CS urban hospitals in Nepal (chapter 5, section 5.4) and concludes that they could reduce the rise of CS and promote the rational use of CS. These strategies would be the best strategies at local and national level if they could be implemented.

(1) Provision of adequate resources such as provision of SBA training continuously and availability of trained staff; production and utilisation of midwives and the establishment of birthing centres could reduce the high rate of CS and increase the rational use of CS.

(2) Increased awareness on mode of childbirth through interventions such as ANC education and counselling of pregnant women for normal birth, awareness and empowerment of pregnant women to choose the right mode of childbirth and increased public awareness on mode of childbirth could reduce the high rate of CS and increase the rational use of CS.

(3) Many policies and protocols for CS should be reformed. Policy should be reformed to avoid CS for non-medical reasons and primary CS; adequate use of partograph for labour monitoring; making fixed service charges for CS; reward for low rates of CS and high rates of vaginal birth and investigation of hospitals regarding high CS rate; use of the Robson classification for routine auditing of CS; provision of VBAC for previous CS and trial of labour for breech presentation; monitoring the policy of private hospitals regarding CS use; decision making on CS by two consultants; provision of security of service providers to reduce defensive CS and

commitment to the implementation of international recommendations such as the Robson classification, midwifery model of care and respectful maternity care.

(4) Rising CS rates in urban hospitals could be reduced by promoting physiological birth. Physiological birth could be promoted by promoting the midwifery model of maternity care (managing low-risk cases by midwives in midwife-led birthing centres); provision of VBAC for previous CS and trial of labour for breech presentation; promotion of instrumental delivery; provision of painless birth; involvement of husbands; family support, exercise and mental preparation for normal birth during pregnancy and improving quality care particularly in public hospitals.

7.5 Key conclusion from systematic review

The systematic review concluded that foetal distress and previous CS are the most common key medical indications followed by APH/placenta previa/abruptio, CPD, HDP, failed induction, NPOL, and oligohydramnios. Foetal distress was a key indication for all types of CS except for elective CS. Previous CS was the principal indication for elective and repeat CS. Maternal request was the main non-medical indication for CS. Use of inaccurate terminology for indications of CS and carrying out CS without an indication was also reported. Similarly, the key factors significantly associated with rising CS rates in South Asia were higher maternal age, higher maternal education, urban residency, higher economic status, higher numbers of ANC visits, previous CS, complications of pregnancy/childbirth, and lower parity. Maternal preference for CS and rising numbers of private hospitals were the most important non-medical factors significantly associated factors for rising CS rates in South Asia. These key indicators and significant factors mirror global trends of CS and recommend that a global strategy is required to stem the rise of unnecessary CS. Therefore, multiple strategies are required to make help make a more rational use of CS, for example improving precision in the diagnosis of foetal distress; reducing primary CS; improving antenatal education of pregnant women/family on indications, risks and benefits of CS; avoiding CS for non-medical indications; and increased adherence to evidence-based guidelines for CS.

7.6 Key conclusion from scoping review

The scoping review on CS concludes that the CS rates are growing at an alarming rate in urban settings in South Asian countries, including Nepal, which requires immediate attention. The evidence from this review demonstrates that there is a genuine need to explore why the CS rate is higher in urban areas and how to make rational use of CS in order to benefit women and their

infants. Further research needs to be conducted to explore the factors or reasons associated with rising CS rates in urban settings, from the perspectives of both the patients and the health system. This can help to develop appropriately tailored interventions. Improving the quality of intrapartum care through midwifery care in health facilities is an important focus in the pursuit to reducing unnecessary CS and to end preventable mortality and morbidity among mothers and new-borns.

The positive attitude of obstetricians and women on CS could be a reason for favouring CS for non-medical indications like maternal requests. Maternal request is the most frequent non-medical indication. Performing CS without medical indications is a rising public health issue which is creating medical, financial and ethical dilemmas in maternity care. Provision of quality obstetric care can reduce unnecessary CS and it must include social support during labour, appropriate labour monitoring, analgesic medication during labour and counselling or education of pregnant women on mode of childbirth, including indications, risks and benefits of CS during antenatal visits. Similarly, evidence-based practice and guidelines must be followed. More research studies should be conducted on CS for non-medical indications. The use of the Robson classification of CS is increasing in South Asia, including Nepal. The main contributor to overall CS rate is found to be Robson group five followed by groups one and two. The need for modified clinical strategies and practice is emphasised to optimise CSs in health facilities in Nepal.

7.7 Chapter summary

This chapter concludes the key findings from both the quantitative and qualitative studies. Additionally, a brief conclusion is also included from the systematic review and scoping review. It is concluded that the extremely high CS rates in urban hospitals (mainly private hospital) of Nepal reflects the medicalisation of pregnancy and childbirth. It is a serious public health problem that needs to be addressed immediately. Multiple factors affecting rising CS rates were identified in urban hospitals. Therefore, a combination of multiple strategies is required to stem the rise of CS rates and to make rational use of CS. The thesis could provide baseline insights on factors affecting the rising rates of CS in urban hospitals in Nepal as well as strategies to mate rational use of CS.

Chapter 8 RECOMMENDATIONS

8.1 Introduction

This chapter recommends possible strategies to reduce the CS rate in Nepal, some might perhaps be relevant for other low- and middle-income countries too. Combined strategies require to tackle multiple factors of rising Cs rates and to make rational use of CS. The recommendations are presented under five different headings, namely those aimed at: policy makers, public hospitals, private hospitals, practitioners, and fellow researchers.

8.2 Recommendations to policy makers

A midwife can motivate and empower pregnant women as well as promote their own capability to handle the birth themselves (Dahlberg et al. 2016). The Government of Nepal must focus on the training of midwives and support the expansion of midwifery education across Nepal, both in public and private education colleges. Midwives should be employed in birthing centres, OPD, ANC clinics, labour rooms, maternity wards and other places where woman seek maternity services. At the time being , SBA training should be provided to doctors, nurses and ANMs continuously. Refresher training should be provided regularly. This training should be included in CPD for doctor and nurses.

The Government of Nepal must focus on raising awareness on mode of childbirth, disseminating the right information, such as risks and benefits of CS and vaginal birth through mass media. Provision of counselling on the appropriate mode of childbirth must be secured for individual pregnant woman from the conception phase of pregnancy. Similarly, health education on mode of childbirth should be part of a public health education programme targeting schools and colleges and the public, through mass communication methods to increase public awareness.

Psychoeducation is found to be effective not only in reducing fear of childbirth of pregnant women, but also effective in increasing natural birth (Fenwick et al. 2010; Rouhe et al. 2013; Masoumi et al. 2016; Kordi et al. 2017; Akgün et al. 2020). Therefore, WHO recommends psychoeducation for women with fear of labour pain including information about fear, anxiety, fear of childbirth, stages of labour, birth process, and pain relief techniques (World Health Organization 2018a). Moreover evidence suggests that educational intervention on mode of childbirth for both husband and pregnant woman together could substantially reduce CS and promote physiological birth (Valiani et al. 2014). Therefore, pregnant women and husbands should be involved together in antenatal education as well as in maternity care.

Most importantly, adequate resources (enough midwives or SBAs for intensive monitoring of labour using partographs and suitable infrastructure for conducting VBAC) must be secured to encourage VBAC for previous CS and trials of labour for breech presentation based on individual risk assessment criteria.

The Government must show commitment on the implementation of evidence-based international guidelines or approaches on CS and maternity care, as recommended by WHO. For example, the Robson classifications, midwifery approach for maternity care and respectful maternity care. The midwifery model of maternity care can promote physiological birth and reduce the unnecessary CS rate (Sandall et al. 2016). A written protocol or policy should be made, including all these international guidelines to maintain uniformity understanding and feasibility. All health facilities including private hospitals should follow these written protocols and policies of the government. Protocol must be adhered to, to avoid CS for non-medical reasons and nullipara/primary CS. The dialogue "how to make reasonable use of CS?" should be opened among all service providers.

A robust policy and monitoring system must be reformed to monitor and supervise closely private hospitals regarding conducting CS. Similarly, the Government should stipulate robust monitoring and support a good supervision system and closely monitor those hospitals where the CS rate is high. An audit system should be implemented to all hospitals to supervise and monitor CS rates. Strategies should be applied to reduce the CS rate in high-risk Robson groups and to avoid CS in low-risk groups.

The Government must develop policy to award or appreciate hospitals or practitioners who promote normal birth, conduct CS only for medical reasons and avoid unnecessary CS. Motivational training and workshops should be conducted as required. A policy must be formulated for establishing a birthing centre in each urban hospital, where midwives or SBAs can manage low-risk cases and promote physiological birth.

National health education programme should include the topic of mode of childbirth in health education activities using mass media such as radio and television programmes to promote physiological birth (Fatema and Lariscy 2020).

Mandatory second opinion policy with evidence-based guidelines can reduce the rates of CS (Althabe et al. 2004; Khunpradit et al. 2011). Policy must formulate around decision making on CS to do by two consultants in all tertiary/referral hospitals in urban adopting mandatory second option policy as possible.

The Government must regulate or limit the service charge for CS especially for private or non-governmental hospitals, to make CS less commercially attractive for these hospitals. The incentive in public hospital for both types of mode of birth must match the real cost of the type of birth to reduce unnecessary CS or to avoid 'Too Much Too Soon'.

8.3 Recommendations to both public and private hospitals

Counselling and health education on mode of childbirth should be provided to all pregnant women since the beginning of pregnancy in ANC. Each hospital must counsel pregnant women on mode of birth from the first ANC visit providing correct information about risks and benefits of CS and vaginal birth. Husband should be involved in counselling and health education during ANC visits together with pregnant woman. Health education in ANC clinics should incorporate mode of childbirth and its advantages and disadvantages. Not only the pregnant women, but also her husband and mother-in law (family), should be aware of the mode of childbirth. All hospitals must participate in a public awareness program on mode of childbirth, by distributing pamphlets, displaying posters and television programmes.

A written protocol should be produced in all hospital for the development of uniformity and common understanding. All hospitals should implement evidence-based guidelines in practice as committed to by the Government of Nepal, such as performing CS only in medically indicated cases, using Robson classification, applying midwifery model of maternity care and initiating respectful maternity care. Robson classifications must be applied in all hospitals prospectively to assess, compare and monitor CS rates as well as to implement appropriate strategies to reduce CS rates in high-risk groups and avoid CS in low-risk Robson groups (1-4). All hospitals should follow evidence-based practice such as pain relief method, labour analgesia, water birth, and the provision of a trusted companion at labour and involvement of husbands to promote physiological birth.

All hospitals must secure sufficient trained staff (SBAs, midwives, doctors) for provision of quality maternity care. SBAs or midwives must be available for proper counselling and health education of pregnant women in ANC clinics, constant labour monitoring in labour room using partographs correctly, promotion of vaginal birth and conduct CS only for medical reasons.

A birthing centre led-by midwives or SBAs for low-risk pregnancy must be established in all urban hospitals to promote physiological birth. They must adopt evidence-based new approaches such as pain relief method, yoga, water. Although a birthing centre is established

in PMWH (Paropakar Maternity and Women's Hospital 2023b). The established birthing centre continues to strengthen, expanded and improve for quality maternity care.

All hospitals should make provision of trusted companions for women during labour. Companion of choice during labour and childbirth can be valuable to reduce CS rate and enhance satisfaction of women (World Health Organization 2020). Husbands should be allowed in the labour room. All hospitals should make provision for VBAC for previous CS and trial of labour for breech presentation as possible based on individual risk assessment criteria by securing adequate resources (adequate SBAs/Midwives, doctors and infrastructure). This should be included in hospital's written protocol.

Primary CS and CS on maternal request must be avoided. All hospitals must promote well-being and health of the mother and offer psycho-social support as well as painless birth for women and their families who fear childbirth. All hospitals in urban settings need to adopt mandatory second opinion on decision making on CS. All hospital authorities must secure a safe working environment and staff security, endorsing a zero-tolerance policy. A zero-tolerance policy toward workplace violence from service users would be the best protective policy for service providers in hospitals in Nepal (Cheung et al. 2017). The dialogue "how to make reasonable use of CS?" should be considered. By all hospitals.

8.4 Recommendations to public hospitals

In addition to above recommendation, public hospitals must improve the quality of maternity care by promoting respectful maternity care, maintaining a safe physical environment and making available adequate competent staff (midwives, SBAs) for provision of quality maternity care. Public hospitals are receiving incentive allowance for each CS and vaginal birth. unequally. The incentive must be based on real cost for both CS and vaginal birth to reduce CS. CS must be conducted only for medical reasons.

8.5 Recommendations to private hospitals

In addition to above recommendation, the service charge of CS in all private or non-governmental hospitals must be make CS less commercially attractive for these hospitals. For example, equality in amount of charge for CS, which must be affordable for all women not only for rich women.

Pregnant women must be counselled for vaginal birth in normal conditions and must avoid CS for non-medical indications such as maternal request. CS must be performed only for medical

reasons. Physiological birth must be promoted by hiring midwives and establishing a birthing centre.

8.6 Recommendations to practitioners

All practitioners must be well-informed and adhere to evidence-based guidelines and protocols recommended by WHO. They must follow these guidelines. The organisations of practitioners, such as NESOG, must act as counterpart to implement them and to pressurise the Government of Nepal for implementation of these guidelines. They must conduct CS keeping medical ethics in their mind. According to medical ethics, CS must promote professionalism and must avoid CS on non-medical reasons and do CS only for medically indicated cases.

All practitioners should play the role of good counsellor, educator, motivator and lifesaver. All practitioners including nurses and midwives must develop their skills on instrumental birth and vaginal birth as part of their continuous professional development (CPD) and develop and maintain positive attitudes towards physiological birth.

8.7 Recommendations to researchers

There is ample scope for researchers to conduct research on CS in Nepal. This PhD study recommends more research on CS including in the following areas:

- More mixed methods research including prospective quantitative data on factors associated with CS, with wider coverage regarding study areas/sites and wider target populations including policy makers, women who had CS, husband and mother in low.
- Antenatal education and counselling and its effectiveness in the reduction of CS
- Reasons for changing preferred/choice mode of birth of pregnant women during giving birth
- Robson classification for auditing CS and its strength and weakness
- Obstetric approach vs midwifery approach to reduce CS
- Labour companion and CS
- How to reduce primary CS
- VBAC and trial of labour in breech presentation
- Urban women's perspective on choosing CS
- Impact of non-medical CS
- Challenges and opportunity for implementation of WHO guidelines in Nepal
- Respectful maternity care and CS

- Interventional studies such as studies to evaluate the impact and outcomes from waterbirth.

8.8 Dissemination of study results

The study findings were presented in NESOGCON 2023 (31 March to 1 April 2023) in Kathmandu and a copy of the presentation was handed over to a member of parliament on her request. A poster on the systematic review was presented in GLOW conference in 2020 (see certificate of attendance in Appendix 19). Similarly, a poster on the pilot study was presented in GLOW conference in 2022 (see Appendix 20). A summary of the results of the study will be provided in future to the Government of Nepal, MIDSON and NESOG. There is process of submitting article on this study to Plos one and other relevant international journals. The results of the study will be presented in local, national or international conferences, seminars and workshops in future. A copy of thesis will be provided to those two hospitals where the study was conducted. A copy of the study will be provided to Ministry of and Population and Health Nepal.

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LIST of APPENDICES

Appendix 1: Article search strategy for the review 'A brief history and indications for Caesarean Section'

Descriptions	Filter	Search Terms	Result
MIDLINE	English language Date: 1961 – 2020	TI (Caesarean* OR Cesarean* OR C-Section*) OR AB (Caesarean* OR Cesarean* OR C-Section*) TI (history* ancient* or renaissance * or medieval* or middle age* or modern age*) OR AB (history* ancient* or renaissance * or medieval* or middle age* or modern age*)	550
PubMed	English language Date: 1961 – 2020	("caesarean section" or "caesarean section" or "c-section" or history) ("caesarean section" and "caesarean section" and "c-section" and history)	600
CINAHL	English language Date: 1961 – 2020	(cesarean section* or caesarean section* or c-section*) AND (history* ancient* or renaissance * or medieval* or middle age* or modern age*)	530
SCOPUS	English language Date: 1961 – 2020	(TITLE-ABS-KEY (caesarean OR cesarean OR c-section) AND TITLE-ABSKEY (history* ancient* or renaissance * or medieval* or middle age* or modern age*)	150
Web of Science	English language Date: 1961 – 2020	(TI = (Caesarean or Cesarean or C-section o) OR AB = (Caesarean or Cesarean or C-section) (TI = (history* ancient* or renaissance * or medieval* or middle age* or modern age*) OR AB= (history* ancient* or renaissance * or medieval* or middle age* or modern age*)	150
EMBASE	English language Date: 1961 – 2020	("caesarean section" or "cesarean section" or "c-section" or "history") ("caesarean section" and "caesarean section" and "c-section" and "history")	150
NepJOL	English language Date: 1961 – 2020	caesarean section or cesarean section or c-section or history	265
BanglaJOL	English language Date: 1961 – 2020	caesarean section or cesarean section or c-section or history	181
Hand Search	English language Date: 1961 – 2020	Additional records from other resources	3
Total			2,579

Appendix 2: Article search strategy for 'Caesarean Section rates in South Asian cities: Can midwifery help stem the rise'

Descriptions	Filter	Search Terms	Result
MEDLINE	English language Date: Jan 2011 – Dec 2018	TI (Caesarean* OR Cesarean* OR C-Section*) OR AB (Caesarean* OR Cesarean* OR "C-Section"*) TI (Nepal* OR India* OR Pakistan* OR Bangladesh*) OR AB (Nepal* OR India* OR Pakistan* OR Bangladesh*)	350
EMBASE	English language Date: Jan 2011 – Dec 2018	("caesarean section" or "caesarean section" OR "c-section") ("caesarean section" and "caesarean section" and "c-section")	141
CINAHL	English language Date: Jan 2011 – Dec 2018	(cesarean section* or caesarean section* or c-section*) AND (Bangladesh* or India* or Nepal* or Pakistan*) (cesarean section* or caesarean section* or c-section*) OR (Bangladesh* or India* or Nepal* or Pakistan*)	350
Web of Science	English language Date: Jan 2011 – Dec 2018	(TI = (Caesarean or Cesarean or C-section) or AB = (Caesarean or Cesarean or C-section) (TI = (Nepal or India or Bangladesh or Pakistan or) or AB= (Nepal or India or Bangladesh or Pakistan)	140
NepJOL	English language Date: Jan 2011 – Dec 2018	caesarean section or cesarean section or c-section	167
BanglaJOL	English language Date: Jan 2011 – Dec 2018	caesarean section or cesarean section or c-section	75
PubMed	English language Date: Jan 2011 – Dec 2018	(("Caesarean" OR "caesarean" OR "C-section") ("Caesarean" AND "caesarean" AND "C-section"))	260
SCOPUS	English language Date: Jan 2011 – Dec 2018	(TITLE-ABS-KEY (caesarean OR cesarean OR c-section) AND TITLE-ABSKEY (Nepal* OR india* OR Pakistan* OR Bhutan* OR Bangladesh* OR Afghanistan* OR "SRI LANKA" * OR Sri Lanka* OR Maldives*)	30
Hand search	English language Date: Jan 2011 – Dec 2018	Additional records from other resources	5
Total			1518

Appendix 3: Article search strategy for 'Caesarean Section on Non-medical reasons: A rising Public Health Issue'

Descriptions	Filter	Search Terms	Result
MEDLINE	English language Date: 2000 – 2020	TI (Caesarean* OR Cesarean* OR C-Section*) OR AB (Caesarean* OR Cesarean* OR "C-Section"*) TI (non-medical* or request* or demand or preference or choice* or wish* or litigation* or convenience* or incentives* or ethics*) OR AB (non-medical* or request* or demand or preference or choice* or wish* or litigation* or convenience* or incentives* or ethics*)	159
PubMed	English language Date: 2000 – 2020	("caesarean section" or "caesarean section" OR "c-section") ("non-medical" or request" or demand or preference or choice or wish" or litigation" or convenience" or incentives" or ethics")	7,954
CINAHL	English language Date: 2000 – 2020	(cesarean section* or caesarean section* or c-section*) AND (non-medical* or request* or demand or preference or choice* or wish* or litigation* or convenience* or incentives* or ethics*) AND (nepal* or india* or Bangladesh* or Pakistan*)	1,884
NepJOL	English language Date: 2000 – 2020	caesarean section or cesarean section or c-section	252
BanglaJOL	English language Date: until 2020	caesarean section or cesarean section or c-section	129
Hand Search	English language Date: until 2020	Additional records from other resources: WHO/reference	5
Total			10,383

Appendix 4: Article search strategy for 'Classification of Caesarean Section: A scoping review of Robson Classification'

Descriptions	Filter	Search Terms	Result
MIDLINE	English language Date: 2010 – 2020	TI (Caesarean* OR Cesarean* OR C-Section* OR "Robson classification"*) OR AB (Caesarean* OR Cesarean* OR "C-Section"* Robson classification"*) TI (Nepal* or India* or Bangladesh* or Pakistan* or Bhutan* OR Bangladesh* OR Afghanistan* OR "SRI LANKA" * OR Sri Lanka* OR Maldives*) OR AB (Nepal* or India* or Bangladesh* or Pakistan* or Bhutan* OR Bangladesh* OR Afghanistan* OR "SRI LANKA" * OR Sri Lanka* OR Maldives*)	450
CINAHL	English language Date: 2010 – 2020	(cesarean section* or caesarean section* or c-section* or Robson classification*) AND (Robson classification*) AND (Nepal* or India* or Bangladesh* or Pakistan* or Bhutan* OR Bangladesh* OR Afghanistan* OR "SRI LANKA" * OR Sri Lanka* OR Maldives*)	380
SCOPUS	English language Date: 2010 – 2020	(TITLE-ABS-KEY (caesarean OR cesarean OR c-section OR Robson classification) AND TITLE-ABSKEY (Nepal* OR India* OR Pakistan* OR Bhutan* OR Bangladesh* OR Afghanistan* OR "SRI LANKA" * OR Sri Lanka* OR Maldives*)	55
Web of Science	English language Date: 2010 – 2020	(TI = (Caesarean or Cesarean or C-section or Robson classification) or AB = (Caesarean or Cesarean or C-section or Robson classification) (TI = (Nepal or India or Bangladesh or Pakistan or) or AB= (Nepal or India or Bangladesh or Pakistan)	80
EMBASE	English language Date: 2010 – 2020	("caesarean section" or "cesarean section" OR "c-section" or "Robson classification") ("caesarean section" and "caesarean section" and "c-section" and "Robson classification")	170
NepJOL	English language Date: 2010 – 2020	caesarean section or cesarean section or c-section or Robson classification	13
BanglaJOL	English language Date: 2010 – 2020	caesarean section or cesarean section or c-section or Robson classification	12
Hand Search	English language Date: until 2020	Additional records from other resources	10
Total			1,170

Appendix 5: PROSPERO article

NIHR | National Institute for Health Research

PROSPERO
International prospective register of systematic reviews

Factors contributing to rising cesarean section rate in South Asian Countries: a systematic review

Citation

Sulochana Dhaka-Rai, Edwin van Teijlingen, Pramod Regmi, Juliet Wood, Ganesh Dangal, Keshar Bahadur Dhakal. Factors contributing to rising cesarean section rate in South Asian Countries: a systematic review. PROSPERO 2019 CRD42019131237 Available from: https://www.crd.york.ac.uk/prospero/display_record.php?ID=CRD42019131237

Review question

What are the contributing factors to rising cesarean section (CS) rates in South Asian countries?

- Social & demographic factors
- Medical/obstetric factors
- Non-medical factors.

Searches [1 change]

A systematic review will be undertaken using the following electronic databases:

MEDLINE

EMBASE

Scopus

PubMed

Web of Science

CINAHL

ScienceDirect

NepJOL,

BanglaJOL.

Databases will be searched from January 2010 to until December 2018 for articles reporting factors, reasons, causes, determinants and indications of CS developing countries.

MeSH terms and Key words for 'caesarean'; 'cesarean';' C-section', will be combined with the developing countries (Nepal, India, Pakistan, Bangladesh, Afghanistan, Sri Lanka and Bhutan) using Boolean operators. Titles and abstracts of the articles will be scanned for the reasons/factors/indications/reasons/factors/indications/determinant.

The search strategy also included hand search of journals and references listed in included articles. Key articles cited by multiple authors will also be checked on Google Scholar, and the authors of relevant published protocols contacted if necessary.

Types of study to be included [2 changes]

Inclusion criteria:

The following studies will be included:

1. Quantitative, qualitative & mixed method studies conducted on caesarean section in South Asian countries.

2. Written in English language only.

3. Studies conducted from 1st January 2010 to 31st December 2018. All studies accessible online/data base until 30th of May 2019.

4. Only primary and peer reviewed studies.

5. Only cross-sectional studies and cohort studies.

Exclusion criteria:

The following studies will be excluded:

1. Studies which are on caesarean, but without examining the causes/indications/factors/determinants of caesarean section.

2. Editorials, theoretical papers, case study, review papers, essays, letters, opinion pieces and newspaper articles.

3. All case control studies and interventional studies on caesarean section.

4. All studies conducted secondary analysis on primary studies.

5. The study which received the critical appraisal skill programme (CASP) scoring less than 20.

Condition or domain being studied [1 change]

Caesarean section (CS) is a surgical procedure which is performed to reduce the risk of mortality or morbidity in the mother and foetus. The World Health Organization (WHO) recommends a CS rate of 10-15% (WHO, 1995). Recent Lancet series (Boerma et al., 2018) warns about the global rising CS rate, from 12.1% in 2000 to 21.1% in 2015. A massive rise in CS use, often for non-medical reasons, is harmful for both mother and child. CS should be carried out when medically necessary (Lumbiganon et al., 2010). CS can cause complications, disability or even death, mainly in setting where the infra-structure is not well-developed and material resources are lacking (WHO, 2015). The review will explore the contributing factors to rising CS rate in developing countries.

Participants/population

All reproductive age group women who undergone through CS in South Asian countries.

Intervention(s), exposure(s)

Not applicable.

Comparator(s)/control

None.

Context [1 change]

The use of CS is steadily rising in the South Asian countries such as Bangladesh, India, Nepal, and Pakistan (especially in urban settings). However, there is a huge inequality in access to CS use between rich and poor women which is a public health concern. CS use is higher among highly educated urban women in private hospitals in South Asian Countries. It is important to understand the factors underlying this rising CS rates in order to be able to do something about it in South Asia.

Main outcome(s) [2 changes]

Discover range of factors associated with CS in South Asian countries. The factors will be categorised in categories, for example:

1. Medical factors: Previous CS, foetal distress, abnormal feta lie, cephalon-pelvic disproportion, fail induction, prolong labour, cord prolapse etc.

2. Socio-demographic factors: Age, education, occupation and wealth of women, urban resident,

3. Supply of care: Geography, accessibility of private hospital, cost etc.

4. Personal factors: Demand/ preference of women/family, precious pregnancy, fear of pelvic floor damage etc.

5. Attitudes and perceptions on CS use of doctors/nurse/midwife such as perception of safe option etc.

Measures of effect

Not applicable.

Additional outcome(s) [1 change]

None.

Measures of effect

Not applicable.

Data extraction (selection and coding) [1 change]

All extracted articles will be independently assessed inclusion eligibility by PhD researcher (SD). Initial inclusion will be based on screening of title of articles. Duplication will be removed with the help of Endnote. Then, included titles will be screened on abstract. Those abstract, which will be included factors/causes/indications/reasons of CS will be included. After that, potentially articles satisfying the inclusion criteria will be screened in full text. Extracted data will be checked for accuracy and completeness by other reviewers. Any discrepancies/ disagreement over eligibility of studies will be discussed with reviewers (Supervisors in this case) and resolved by consensus. The PRISMA flow diagram will be used to demonstrate the initial number of records, records after removing duplicates, records excluded at title and/ or abstract screening stage, records excluded after screening full- text and finally the total numbers of excluded and included studies. Data extraction will include: Study title, Author, Published Year, Type of article, Study design, Study aims, Data collection methods, Types of participants, Context(urban/rural), sample size, country of study, Setting (public, private),

Method of analysis, Major findings. Summary tables of main findings include: Reference (authors & date), study location, study design, study population/sample size, main findings.

Risk of bias (quality) assessment

All selected eligible articles will be reviewed independently by two reviewers (EvT and SD) to assess the risk of bias for each included study. Critical Appraisal Skill Programme (CASP) qualitative checklist will be used for qualitative study and quality assessment tool will be used for quantitative study. Any disagreements between reviewers in regards with the risk of bias in particular studies will be discussed with third reviewer where necessary and resolved

Strategy for data synthesis [1 change]

We will provide a descriptive and narrative synthesis of associated factors with caesarean section in South Asian countries from the findings of the included studies. The contributing factors of CS will be divided into distinct categories mentioned above using content analysis.

Overview summary tables will be used to present summary of findings. Graphs and charts will be used to display quantitative data on associated factors with caesarean section in each category.

Qualitative data will be synthesised using thematic narrative synthesis. Two researchers will conduct data synthesis. The selected studies will be appraised for strengths and weakness. The quality of evidence will be assessed for each study and then the whole study.

Analysis of subgroups or subsets

No subset analyses are planned.

Contact details for further information

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Type and method of review [1 change]

Narrative synthesis, Systematic review

Anticipated or actual start date [1 change]

20 May 2019

Anticipated completion date [3 changes]

30 September 2020

Funding sources/sponsors [1 change]

None.

Conflicts of interest

Language

English

Country

England

Stage of review [1 change]

Review Completed published

Details of final report/publication(s) or preprints if available [1 change]

This systematic review is published online journal.

Subject index terms status

Subject indexing assigned by CRD

Subject index terms

Cesarean Section; Female; Humans; Pregnancy

Date of registration in PROSPERO

29 May 2019

Date of first submission

05 April 2019

Details of any existing review of the same topic by the same authors

Stage of review at time of this submission [3 changes]

Stage	Started	Completed
Preliminary searches	Yes	Yes
Piloting of the study selection process	Yes	Yes
Formal screening of search results against eligibility criteria	Yes	Yes
Data extraction	Yes	Yes
Risk of bias (quality) assessment	Yes	Yes
Data analysis	Yes	Yes

Revision note

This systematic review is published online journal.

The record owner confirms that the information they have supplied for this submission is accurate and complete and they understand that deliberate provision of inaccurate information or omission of data may be construed as scientific misconduct.

The record owner confirms that they will update the status of the review when it is completed and will add publication details in due course.

Versions

29 May 2019

28 July 2020

12 November 2020

01 February 2022

Appendix 6: Data collection tools

i. RECORD FORMATE

1. Hospital Name	

2. Total Hospital Beds		**3. Total Hospital Beds (Maternity Ward)**	

4. What is the annual number of the following cases in maternity ward?

SN	Indicators	Fiscal Year 2074/75	Fiscal Year 2075/76	Fiscal Year 2076/77
1	**Total Deliveries**			
2	**Normal Deliveries**			
3	**Instrumental Deliveries**			
4	**Caesarean Section**			
5	**Live Births**			
6	**Still Births**			

	ate
	Patient ID
	Types of hospital
	Age
	Gestational age
û Nulliparous û Multiparous	*Parity*
û Single û Multiple	*No. of Pregnancy*
û Longitudinal û Transverse û Oblique	*Foetal Lie*
û Cephalic û Breech û Other	*Foetal Presentation*
û Spontaneous û Induced	*Labour Induction*
û Normal/Instrumental û CS	*Previous delivery type*
û Normal/Instrumental û CS	*Current delivery types*
	Birth order
û Morning (6am –12 md) û Afternoon (12m - 6 pm)	*Time of delivery*
Û Elective û Emergency	*Types of CS*
	APGAR: 5 minutes
	Birth weight (Kg)
Û Yes……. …… *Û None*	*medical conditions*
û Yes…….. *û None*	*BOH*
Û Male *û Female*	*Sex of Baby*
	No. of ANCs
	Indications
û Hindu û Muslim û Christian û Buddhist	*Religion*
û High û Middle û Dalit	*Ethnicity*
Û Urban û Rural	*Place of residency*
	Robson' s Groups

ii. Interview guidelines for key informants

Date of interview: …….

Interviewer:

Name of organization	
Education	
Position/Role	
Number of years in position	

Guidelines:

Introduce interviewer

Explain the purpose of the study and interview.

Stress confidentiality.

Put them at their ease and encourage them to ask questions.

Questions and probes:

Themes	Lead question	Probe
Reasons of CS In urban Nepal	What is the trend of CS rate in Nepal? (how common is it) नेपालमा सिजरियन सेक्सनको ट्रेन्ड कस्तो छ ? कतिको प्रयोग गरिन्छ? What are the main reasons behind it in your knowledge? सिजरियन सेक्सन गर्नको कारणहरु के के होलन ? What are the main causes of excessive use of CS and why? तपाईंको विचारमा के के मुख्य कारणहरुले गर्दा शहरी नेपालमा सिजरियन सेक्सन प्रयोग धेरै बढधैछ होला?	• How is it related to client factors or medical conditions? यो कसरी महिला वा उनिहरुको medical conditions सँग सम्बन्धित छ? • How is it related to facility and systems factors? यो कसरी Hospital र System Factors सँग सम्बन्धित छ? • How is it related to the staff and leadership? यो कसरी Staff वा Leadership सँग सम्बन्धित छ?

Themes	Lead question	Probe
	What are the main reasons for women demanding CS? महिलाहरुले सिजरियन सेक्सनको माग गर्ने कारणहरु के के होलन?	• Fear of labour? Fear of pain; auspicious time of birth • Demographic factors: age, education, ANC….
Decision making on CS delivery	How is the decision to perform CS made? सिजरियन सेक्सन गर्नको लागि कसरी निर्णय गरिन्छ?	• Difference for emergency/elective CS Probe: के निर्णय गर्ने तरिका ईमर्जेन्सी र ईलेक्टिभमा फरक्-फरक हुन्छ? कसरी?
	Who are the most important persons in making decision regarding CS birth? सिजरियन सेक्सन गर्ने निर्णयको लागि मुख्य बक्ती को हुन्छ?	• Who is usually consulted before surgery? • Probe: को को सँग परामर्श लिइन्छ वा सोधिन्छ?
	What role do pregnant mothers or family play in decision regarding CS? सिजरियन सेक्सन गर्ने निणय गर्नमा महिला वा फमिल्री ले के कस्तो भूमिका खेल्छन?	• Who are the most important persons in decision –making? Probe: निर्णय गर्नमा कस्ले महत्वपूर्ण भूमिका खेल्छ?
	What are the national strategies or guidance for performing CS in Nepal? सिजरियन सेक्सन गर्ने बिषय मा नेपालमा के कस्ता Strategies/Polices/Protocals छन?	• Request to share a copy of that guideline/strategy. Probe: के म यक कपि लिन सक्छु? यसलाई कसरी लगु गरियको छ?
	Is there a universal policy of C/S for breech presentation in hospitals in Nepal? Breech Presentation को लागि (नेपालमा) के कस्तो universal पोलिसी छ?	What kinds of circumstances, would a trial of labour be used? Probe: के कस्तो circumstances मा Trial of Labour को मौका दिइन्छ?

Themes	Lead question	Probe
Barriers, strategies/protocol to reduce CS	What are the criteria for management of delivery for mothers with previous CS? पहिले नि सिजरियन सेक्सन गरेको महिलाहरुको delivery को लागि (नेपालमा) के कस्तो ब्यबस्था गरिन्छ?	Is vaginal delivery offered/tried [VBAC]? Probe: के VBAC को मौका दिइन्छ?
	Is there any system for auditing CS? के सिजरियन सेक्सनको अडिट गर्ने सिस्टम छ?	• Explore around the system. Probe: छ भने के कसरी गरिन्छ?
	In your view, what policies, guidelines and tools from the national level have contributed towards better CS service provision? तपाईंको विचारमा नेपालमा कुन्-कुन Policies/Protocals ले सिजरियन सेक्सनको राम्रो सेवा दिनको लागि योगदन गरेको जस्तो लाग्छ?	• How have these made a difference? • Probe: यसले के कसरी फरक बनायको छ?
	What are the most important barriers to quality CS service provision? यो अस्पतालमा साथै देशब्यापीरुपमा CS को उचित प्रयोग गर्नको लागि गर्नकोलागि मुख्य बाधाहरु के के छन र किन ?	How can we reduce unnecessary CS? तपाईंको विचारमा यो अस्पतालमा साथै देशब्यापीरुपमा नचाहिने CS लाई कम कसरी गर्न सकिन्छ होला? Probes: Health system/hospital/health personals को तर्फबाट; Community/women/family को तर्फबाट?

Themes	Lead question	Probe
	What kinds of policies/strategies to be reformed to use CS appropriately?	• From the health system/hospital/health personals • From the community/women/family • How? At local level, at national level
	How can Nepal promote or improve normal physiological birth?	

- Is there anything else you would like to add? अरु केहि कुरा छलफल गर्न चाहनुहुन्छ?

Thank to participant for their participation and wrap up.

iii. Interview guidelines for Health professionals (Doctor, nurse and midwife):

Date of interview: ……

Interviewer:……

Name of hospital	
Position	
Qualification	
Number of years in position	

Guidelines:

- Introduce yourself
- Explain the purpose of the interview
- Stress confidentiality. Ensure their consent for their participation, note taking and voice recording. Also record the consent voice before the interview.
- Put them at their ease and encourage them to ask questions**.**

Hospital services

1) What major maternity services do you provide to pregnant women at this hospital? यो अस्पतालबाट के-कस्तो किसिमको मेटेर्निटी सन्बन्धित सेवाहरु दिइन्छ?

   Probe: Antenatal care, Normal and complicated deliveries/ CS

2) What kinds of health education do you provide to pregnant mother?
   गर्भवती महिलाहरुलाई के कस्तो Health Education दिने गरियको छ?

   Probe: Risks and benefits of CS/advantages of normal delivery

3) What are the advantages and disadvantages of doing CS in this hospital? तपाईंको विचारमा CS गर्दा अस्पताल लाई के के Advantages र disadvantages हुन्छ?

   Probe: For hospital, for staff

4) If someone cannot afford CS, how does the hospital handle? यदी कोही महिलासँग CS गर्ने पैसा छैन भने कसरी ह्यान्डल गर्नु हुन्छ?

   Probe: Poor fund/referral

Reasons of CS

1) What is current rate of CS in this hospital? How does his CS rate compare with other hospitals? तपाईको अस्पतालमा CS Rate कती छ? अरु हस्पितलहरुको दाजोमा यो रेट कस्तो छ?

2) What are the main reasons for the high rate of CS in this hospital? यो अस्पतालमा CS रेट बढी हुनु को मुख्य करण हरु के के होलन? Probe: Medical reasons, socio-demographic reasons, non-medical reasons?

3) What proportion of pregnant women or family asking for CS delivery? कती प्रतिशत महिला वा परिवारहरुले CS गर्न खोज्छन? कुन महिला समुहले CS गर्ने माग गर्छन? Are any particular groups demanding CS? कुन महिला समुहले CS गर्ने माग गर्छन?

4). What are the main reasons for your patients demanding CS? CS माग गर्नु को मुख्य करणहरु के के होलन?

Probe: Process related factors

- Fear of labour pain;
- Pelvic floor damage
- Desire to choose an auspicious time of birth;
- Convenience of birth time for the patients
- Convenience of time for doctors.

Probe: socio-demographic factors

- Age of mothers

- Educational level
- Employment status,
- Wealth status
- Attendance in antenatal service

Decision making on CS delivery

1) Who are the most important persons in making decision regarding CS service at this hospital? यो अस्पतालमा CS गर्ने निर्णय गर्न्न को लागि मुख्य बक्तीहरु को हुन? Probe: who are usually consulted before surgery? को को सँग परामर्श लिइन्छ वा सोधिन्छ

2) How is the decision to perform CS made? CS गर्नको लागि कसरी निर्णय गरिन्छ? Probe: For emergency/elective CS? के निर्णय गर्ने तरिका ईमर्जेन्सी र ईलेक्टिभमा फरक्-फरक हुन्छ? कसरी?

3) How do you involve pregnant mothers /family in decision making on CS कसरी गर्भवती महिला र उनको परिवारलाई CS गर्ने निर्णयमा समाबेश गरिन्छ ? What role do mothers Could you cite some examples?

4) Have you come across instances when patient demands CS? तपाईं ले माग गरेको उदाहणहरु भेट्नु भयको छ ? यदी छ भने केहि उधहरण हरु भन्न सक्नुहुन्छ ?

5) What information do you provide to the women who are undergoing CS? CS गर्न लागेको गर्भवती महिलाहरुलाई के कस्तो कुराहरु बताउनु हुन्छ? Probe: risks & benefits of CS?CS को Advantages र disadvantages?

Adherence to guideline or protocol

1) Is there are protocol for performing CS that is followed at this hospital? के तपाईं को अस्पतालमा CS गर्नको लागि कुनै Evidenced-based Protocol फलो गरिन्छ? Can I please have a copy of the protocol? के म यक कपि लिन सक्छु?
2) What is the policy on breech? Breech Presentation को लागि यो अस्पतालमा के कस्तो universal पोलिसी छ? Probe: Is trial of labor given? के कस्तो circumstances मा Trial of Labour को मौका दिइन्छ?

3) What is the policy for mothers with previous CS? पहिले नि CS गरेको महिलाहरुको delivery को लागि यो अस्पतालमा के कस्तो ब्यबस्था गरिन्छ? Probe: Is vaginal delivery offered/tried [VBAC]? के VBAC को मौका दिइन्छ?
4) Is there any system for audit of CS? के यो अस्पतालमा CS को अडिट गर्ने सिस्टम छ? Probe: छ भने के कसरी गरिन्छ?
5) What polices, guidelines and tools have contributed towards better CS service provision? तपाईंको विचारमा नेपालमा कुन्-कुन Policies/Protocals ले CS को राम्रो सेवा दिनको लागि योगदन गरेको जस्तो लाग्छ? Why and how have these made a difference? Probe: यसले के कसरी फरक बनायको छ?

Barrier and strategies to reduce CS rates

1). What are the main challenges to reduce CS rate? Why? यो अस्पतालमा साथै देशब्यापीरुपमा CS Rate कम गर्नकोलागि मुख्य बाधाहरु के के छन र किन ?

2). How can we reduce unnecessary CS in this hospital/Nepal? Probe: From the health system/hospital/health personals, From the community/women/family तपाईंको विचारमा यो अस्पतालमा साथै देशब्यापीरुपमा नचाहिने CS लाई कम कसरी गर्न सकिन्छ होला? Probes: Health system/hospital/health personals को तर्फबाट; Community/women/family को तर्फबाट

3). What kinds of policies/strategies to be made or reformed to use CS appropriately in this hospital/Nepal? What would you like to do for rational uptake of CS at this hospital? यो अस्पतालमा साथै देशब्यापीरुपमा CS को उचित प्रयोग गर्नको लागि कुन प्रकारको Strategies/Polices/Protocals बनाउनु/ सुधार गर्नु पर्छ होला? Probe: यो अस्पतालमा CS को उचित प्रयोग होस भन्न को लागि तपाईं को बिचार मा के के गर्नु पर्ला?

4). How could you improve normal physiological birth in low risk mother and baby? तपाईंको विचारमा यो अस्पतालमा कसरी नोर्मल बर्थ लाई बढावा दिन सकिन्छ होला?

5. Is there anything else you would like to add? अरु केहि कुरा छलफल गर्न चाहनुहुन्छ?

Thank to participant for participation and wrap up.

iv. Guidelines for Focus Group Discussion with Pregnant women

(गर्भवती महिलाहरुसंग फोकस समुहगत चर्चाको लागि दिशानिर्देश)

Introduction

1. Thank the participants for agreeing to take part in the focus group.
2. Introduction of researcher and purpose of the focus group.
3. Provide information on duration of the focus group (30 -60 minutes).
4. Remind participants that the conversation will be recorded.
5. Let the participant know that they can stop the focus group at any time.
6. Let participants know that they are free to not answer any question
7. Let participants know that there are no right or wrong answers as they can express freely their opinion on subject matter.

Questions, probing for FGD with pregnant women

(गर्भवती महिलाहरुसँग समुहगत छलफलकोलागि प्रश्नहरु)

1. What is your expectation about delivering your baby? तपाईंको बच्चालाई डेलिभर गर्ने बारेमा तपाईंको अपेक्षा के छ?
2. What is your choice about mode of birth in this time? Could you please explain why? यस्पाली तपाईंले बच्चालाई कुन तरिकाले जन्म दिने बिचार छ? कृपया बताउन सक्नुहुछ किन?
3. What do you know about Caesarean section? Explore sources of knowledge. सिजरियन सेक्सन को बिसयमा तपाईंलाई के थाहा छ? कसरी थाहा पाउनु भयो?
4. In your opinion, why do you think women choose caesarean section? तपाईको विचारमा किन महिलाहरु सिजरियन सेक्सनबाट बच्चालाई जन्म दिन चाहन्छन होला?
5. What are the reasons for performing CS? Reasons related to women/baby/ family or other reasons? सिजरियन सेक्सन गर्नुको कारणहरु के के होलान?

    - महिला सम्बन्धित, कारणहरु
    - बच्चा सम्बन्धित, कारणहरु
    - परिवार सम्बन्धित कारणहरु
    - अन्य कारणहरु

6. What are the advantages and disadvantages of performing CS? सिजरियन सेक्सन गर्नुको फाइदाहरु र बेफाइदाहरु के के होलान?

7. How do we minimise using unnecessary CS delivery? नचाहिने सिजरियन सेक्सन को कसरी प्रयोग हामीले कसरी रोक्न सकिन्छ होला?
8. Is anything else would you like to say? अरु केहि कुरा छलफल गर्न चाहनुहुन्छ?

Sociodemographic Characteristics of Participants: Separate sheet will be used to collect socio-demographic data of all participants.

सहभागीहरुको सामाजिक जनसांख्यिकीय लक्षण

1. Age (आयु) :
2. Education (शिक्षा) :
3. Occupation (व्यवसाय)
4. Place of residency (बस्ने ठाउँ):
5. Number of children (बच्चा को सङ्ख्या):
6. History of CS (पहिले सिजरियन सेक्सन गरेको हो कि होईन?)
7. Husband's education (श्रीमान्को (शिक्षा):
8. Husband's occupation (श्रीमान्को व्यवसाय):

Appendix 7: Participant information sheets

i. Participant information sheet for FGD

Participant information sheet

Title of the research: Factors associated with Caesarean Sections in urban Nepal

Invitation paragraph

My name is Sulochana Dhakal-Rai. I am a Nepalese student and studying PhD in Bournemouth University (BU). I am conducting a research study around caesarean section (CS). I would like to invite to take part in my study. Before you decide, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Please, take time to decide whether you wish to take part and ask me if there is anything that is not clear or if you would like more information.

What is the purpose of the project?

Many studies in urban hospitals in Nepal have reported that use of CS is very common The main purpose of the study is to explore the reasons of CS and to find ideas how to make CS reasonable use.

Why have I been chosen?

You have been chosen for a focus group discussion to take account your voice regarding CS delivery. We will also discuss about your choice of birth plan. You may also have suggestions for better use of CS or for improving physiological birth in the future.

Do I have to take part in this study?

It is up to you to decide whether or not to take part. If you do decide to take part, you will be given this information sheet to keep and be asked to sign a participant agreement form. You can withdraw from participation during the interview at any time and without giving a reason. If you decide to withdraw, we will usually remove any data collected about you from the study. Once the interview session has finished you may still be able to withdraw your data up to the point where the data is analysed and incorporated into the research findings or outputs. At this

point your data will usually become anonymous, so your identity cannot be determined, and it may not be possible to identify your data within the anonymous dataset. Withdrawing your data at this point may also adversely affect the validity and integrity of the research.

What would taking part involve?

You are expected to involve in a group discussion focusing some question which I will ask regarding your choice of birth plan such as CS. This will be in private and will take about one hour, depending on how much information you wish to share. There will be six to eight other participants in the group discussion. You will need to give informed consent to participate in this study.

What are the advantages and possible disadvantages or risk of taking part?

Whilst there are no immediate benefits for those people participating in the project, it is hoped that this work will allow your voice to be heard in the research community. Findings from this discussion will assist in understanding why CS is high in urban hospitals. Minimal risk is anticipated in this study for both participants and researcher following results of health and safety assessment. You are free to decline answering any questions that makes you feel uncomfortable.

What type of information will be sought from me?

I am seeking your knowledge and experiences on why women are choosing CS. I would also value your suggestions on how to make better use of CS in future. Please express your idea/experience honestly. The information provided by you will help us understand why many women are using caesarean section in Nepal.

Will I be recorded, and how will the recorded media be used?

The focus group session with you will be audio recorded. The recordings made during this discussion will be used only for the transcription. I will translate into English for illustration in my PhD thesis and findings will be presented at conferences, seminars and in academic journals. No other use will be made of them without your written permission, and no one outside the project will be allowed access to the original recordings.

How will my information be kept?

All the information we collect about you during the course of the research will be kept strictly in accordance with UK current data protection legislation. Research is a task that we perform in the public interest, as part of our core function as a university. Bournemouth University (BU) is a Data Controller of your information which means that we are responsible for looking after your information and using it appropriately. BU's Research Participant Privacy Notice

sets out more information about how we fulfil our responsibilities as a data controller and about your rights as an individual under the data protection legislation. We ask you to read this Notice so that you can fully understand the basis on which we will process your information.

Publication

Your information will only be included in an anonymous form, i.e. you will not be identifiable. Research results will be illustrated in PhD thesis and published in national and international academic journals,

Security and access controls

BU will hold the information we collect about you in hard copy in a secure location and on a BU password protected secure network where held electronically. Only the study researcher will be allowed to have access to the audio recordings before and after transcription. The audio recordings will be deleted once they have been converted into Word documents with no individual identifying elements.

Sharing and further use of your personal information

The information collected about you may be used in an anonymous form to support other research projects in the future and access to it in this form will not be restricted. It will not be possible for you to be identified from this data.

Retention of your data

The data collected from you will be kept for five years after this study and deleted after the period in accordance with the BU Research Ethics Code of Practice.

Contact for further information

For further information/ details about this research, please contact:

Sulochana Dhakal-Rai, Faculty of Health and Social sciences, Bournemouth University.
Tel.: 977-83-520709; Email: sdhakalrai@bournemouth.ac.uk

Prof. Ganesh Dangal, Senior consultant Gynaecology & Obstetrics, Kathmandu Model Hospital, Nepal. Tel: 977-1-4240805, Email: ganesh.dangal@gmail.com

Complaints

If you have any concerns or complaints about any aspect of this research, please contact:

Professor Vanora Hundley, Deputy Dean for Research and Professional Practice, Faculty of Health & Social Sciences, Email: researchgovernance@bournemouth.ac.uk

Finally

If you decide to take part, you will be given a copy of the information sheet and a signed participant agreement form to keep.

Thank you for taking your time to read through this information sheet.

Participant information sheet in Nepali language for focus group discussion

Bournemouth University

फोकस समुहगत छलफलको सहभागिताका लागि सहभागी सूचना पत्र

अनुसन्धानको शीर्षक: शहरी नेपालमा सिजरियन सेक्सनसँग सम्बन्धित कारणहरु

निमन्त्रणा अनुच्छेद

मेरो नाम सुलोचना ढकाल-राईं हो, म बोर्नमाउथ विश्वविद्यालय, यु. के को पीएचडी विद्यार्थी हो । म शहरी नेपालमा सिजरियन सेक्सन गर्नुको कारणहरुबारे अनुसन्धान अध्ययन गर्दैछु। म तपाईंलाई मेरो अध्ययनमा भाग लिन आमन्त्रित गर्न चाहन्छु। तपाईंले निर्णय गर्नु अघि, यो बुझ्न महत्त्वपूर्ण छ कि अनुसन्धान किन गरिरहेको छ र यसले के समावेश गर्दछ। कृपया निम्न जानकारी सावधानीपूर्वक पढ्नु होला र यदि चाहानुहुन्छ भने अरूसँग यो छलफल गर्न समय लिनुहोस्। यदि तपाईं भाग लिन चाहानुहुन्छ भने कृपया निर्णय लिनको लागि समय लिनुहोस्। यदि कुनै कुरा स्पष्ट छैन वा यदि तपाइँ अधिक जानकारी चाहानुहुन्छ भने मलाई सोध्नुहोस्।

अनुसन्धानको उद्देश्य के हो?

शहरी नेपालमा धेरै अध्ययनहरूको रिपोर्टले देखायको छ कि सिजरियन सेक्सनको प्रयोग धेरै गरिएको छ। सिजरियन सेक्सनको अनावश्यक प्रयोगले आमा र बच्चाको स्वास्थ्यलाई हानि गर्न सक्छ। सिजरियन सेक्सनले आमा र बच्चाको स्वास्थ्यमा धेरै समस्याहरू ल्याउन सक्छ, जस्तै : यसले गम्भीर रक्तस्राब (Severe Bleeding) र संक्रमण (Infection) हुन सक्छ। यसको अतिरिक्त, अर्को गर्भावस्थामा समस्याहरू उत्पन्न हुन सक्छ। त्यसैगरी, सिजरियन सेक्सन द्वारा जन्मेका बच्चाहरु धेरै रोगहरुको उच्च जोखिममा पर्दछन्। यस अध्ययनको मुख्य उद्देश्य सिजरियन सेक्सन गर्नुका कारणहरू पत्ता लगाउन र यसको भविष्यमा उचित प्रयोग कसरी गर्ने भन्ने बारे पत्ता लगाउन हो।

मैले तपाईंलाई किन चुनेको छु?

तपाईंलाई सिजरियन सेक्सनको सन्दर्भमा फोकस समुहगत छलफलको लागि छनौट गरिएको छ। तपाईंसँग सिजरियन सेक्सन गर्नुको कारणहरु बारेमा छलफल गर्नेछौ । त्यस्तै गरी सिजरियन सेक्सनको भविष्यमा उचित प्रयोग गर्नको लागि तपाईंको सुझावको बारे छलफल गर्नेछौं। यसबारेमा तपाईंको ज्ञान र अनुभब बाटनु होला । यदी चाहनुहुन्छ भने हामी तपाईंको डेलिभर योजनाको बारेमा पनि चर्चा गर्नेछौं।

के यस अध्ययनमा भाग लिनु पर्छ?

तपाईं यसमा भाग लिने वा नलिने भन्ने कुरा तपाईं को आफ्नो निर्णय हो । तपाईंको सहभागिता स्वैच्छिक हो। यदि तपाईंले भाग लिन निर्णय गर्नुहुन्छ भने, तपाईंलाई यो जानकारी पाना दिइनेछ र एक सहभागी सम्झौता फारममा हस्ताक्षर गर्न लगाइनेछ । तपाईंले कुनै पनि कारण बिना कुनै पनि समयमा अनुसन्धान गतिविधिहरुमा भाग लिन रोक्न सक्नुहुनेछ । तपाईं कुनै विशेष प्रश्न (हरु) को जवाफ दिन अस्वीकार गर्न सक्नुहुनेछ । यदि तपाईं आफ्नो सहभागिता हटाउन निर्णय गर्नुहुन्छ भने, हामी सामान्यतया तपाईले छलफलबाट एकत्रित कुनै पनि तपाईंले भनेको कुराहरु हटाउनेछौं। तपाईंको डेटा पहिचान भयसम्म हटाउनेछौं। यदी तपाईंको डेटा गुमनाम भयको अवस्थामा छ भने, तपाईंको पहिचान निश्चित गर्न सकिँदैन, र यो अज्ञात डेटासेट भित्र तपाईंको डेटा पहिचान गर्न सम्भव नहुन सक्छ। यो बिन्दुमा तपाईंको डेटा निकाल्न पनि प्रतिकूल रूपमा अनुसन्धानको वैधता र पूर्णतालाई असर गर्न सक्छ।

भाग लिदा के के गर्नु पर्छ?

तपाईं यस समुहगत छलफलमा केहि प्रश्नहरुमा केन्द्रत गरेर छलफलमा भाग लिनुपर्ने हुन्छ । सबै जानाले पालोसित आ-आफ्नो बिचार र अनुभब अनुसार प्रश्नहरुको ईमानदारीपूर्वक उतर दिनु पर्ने हुन्छ । प्रश्नहरु बिशेस गरेर सिजरियन सेक्सनको बिषयमा हुनेछ । यो छलफल निजीमा हुनेछ र लगभग एक घण्टा लाग्ने छ। कुन जानकारी तपाईं छलफल गर्न चाहानुहुन्छ त्यस्मा निर्भर गर्दछ। यस समुहगत छलफलमा ६ देखि ८ अन्य सहभागिहरु हुने छन । तपाईले यस अध्ययनमा भाग लिनकोलागि लिखित सहमति दिन आवश्यक छ।

भाग लिनको लाभहरू र सम्भावित हानिहरू वा जोखिम के हो?

यद्यपि यस अध्ययनमा भाग लिनेको लागि कुनै तत्काल लाभ छैन ।आशा छ कि तपाईंको आवाज शोध समुदायमा सुनिने छ। ।तपाईंले दियको जानकारिहरुबाट किन सिजरियन सेक्सन शहरी अस्पतालहरूमा धेरै प्रयोग गरिन्दै छ भन्ने कुरा बुझ्न मद्दत गर्नेछ । स्वास्थ्य र सुरक्षा निर्धारणको परिणाम अनुसार यस अध्ययनमा सहभागी र शोधकर्ताको लागि न्यूनतम जोखिम अनुमान गरिएको छ। तपाईं कुनै पनि प्रश्नहरूको जवाफ दिन अस्वीकार गर्न स्वतन्त्र हुनुहुन्छ जुन तपाईंले असहज महसुस गर्नुहुन्छ।

मबाट कुन प्रकारको जानकारी खोज्नु हुनेछ?

म तपाईंबाट धेरै महिलाहरु किन सिजरियन सेक्सन गर्दैछन् भन्ने कुरामा तपाईंको ज्ञान, बिचार र अनुभव खोज्दै छु । त्यस्तै गरी भविष्यमा सिजरियन सेक्सन को उचित प्रयोग कसरी गर्ने भनेर म तपाईंका सुझावहरू पनि माग्दै छु । कृपया आफ्नो विचार ईमानदारीपूर्वक व्यक्त गर्नुहोस्। तपाईले प्रदान गर्नुभएको जानकारीले हामीलाई किन धेरै महिलाहरु नेपालमा सिजरियन सेक्सन प्रयोग गर्दैछन् र यसको भविष्यमा उचित प्रयोग कसरी गर्ने भन्ने कुरा बुझ्न मद्दत गर्नेछ ।

के मेरो जानकारी रेकर्ड गरिनेछ र रेकर्ड मिडिया कसरी प्रयोग गरिनेछ?

तपाईंसँगको फोकस समुहगत छलफल सत्र अडियो रेकर्ड गरिनेछ। यस छलफलको क्रममा बनेको रेकर्डिङ केवल ट्रान्सक्रिप्टको लागि मात्र प्रयोग गरिनेछ। त्यसपछी म आफ्नो पीएचडी थीसिसमा दृष्टान्तको लागि अंग्रेजीमा अनुवाद गर्नेछु । त्यस्तै गरी तपाईंले भनेको कुराहरु सम्मेलनहरू, सेमिनार र पत्रिकाहरूमा प्रस्तुत गरिनेछ। तपाईंको लिखित अनुमति बिना कुनै अन्य प्रयोग गरिनेछैन र यो परियोजना बाहिर कुनै पनि वास्तविक रेकर्डिङमा पहुँच अनुमति दिइनेछैन।

मेरो जानकारी कसरी राखिने छ?

अनुसन्धानको बेला तपाईंको बारेमा एकत्रित सबै जानकारी वर्तमान डेटा सुरक्षा कानून अनुसार राखीनेछ। अनुसन्धान एक कार्य हो जुन हामी सार्वजनिक रुचिमा गर्छौं। बर्नमाउथ युनिवर्सिटी तपाईंको जानकारीको डेटा नियन्त्रक हो। यसको अर्थ हामी तपाईंको जानकारी हेर्ने सुरक्षित गर्ने र यसलाई उचित प्रयोग गर्ने कुरामा जिम्मेवार छौं।

प्रकाशन

तपाईंको जानकारी केवल अज्ञात रूपमा समावेश गरिनेछ, उदाहरणका लागि तपाईंको पहिचान हुने छैन। अनुसन्धान परिणाम पीएचडी थीसिसमा चित्रित गरिनेछ र राष्ट्रिय र अन्तर्राष्ट्रिय पत्रिकाहरूमा प्रकाशित गरिनेछ।

सुरक्षा र पहुँच नियन्त्रण

बर्नमाउथ युनिवर्सिटीले तपाई को जानकारी सुरक्षित राख्नेछ। केवल अध्ययन शोधकर्तालाई मात्र अडियो रेकर्डिङमा पहुँच हुनेछ। अडियो रेकर्डिङहरू ट्रान्सक्रिप्ट भएपछि मेटिने छ र कागजातहरूमा कुनै व्यक्ति पहिचान हुने छैन।

तपाईंको व्यक्तिगत जानकारी साझेदारी र थप प्रयोग

तपाईंको बारेमा एकत्रित जानकारी भविष्यमा अन्य अनुसन्धान परियोजनाहरूको समर्थन गर्न अज्ञात रूपमा प्रयोग गर्न सकिन्छ र यस फारममा यसलाई पहुँच गर्न प्रतिबन्धित हुनेछैन। यस डेटाबाट तपाईंको पहिचान गर्न यो सम्भव छैन। तपाईंबाट एकत्रित डेटा यो अध्ययन पछि पाँच वर्ष सम्मको लागि राखिने छ।

थप जानकारीको लागि सम्पर्क गर्नुहोस्:

सुलोचना ढकाल-राईं, स्वास्थ्य र सामाजिक विज्ञान, बर्नमाउथ विश्वविद्यालयका संकाय, यु. के । इमेल: sdhakalrai@bournemouth.ac.uk

प्रोफेसर गणेश दङगाल, वरिष्ठ सल्लाहकार, Gynaecology & Obstetrics, काठमाडौं मोडेल मोडेल अस्पताल, नेपाल। टेलिफोन: 977-1-4240805, इमेल: ganesh.dangal@gmail.com

उजुरी

यदि तपाइँसँग यो अनुसन्धानको कुनै पनि पक्षको बारेमा कुनै चिन्ता वा उजुरी छ भने, कृपया सम्पर्क गर्नुहोस् । सम्पर्क ब्यक्ती:

प्रोफेसर Vanora Hundley, Deputy Dean for Research and Professional Practice,, हेल्थ एण्ड सोशल साइंसेज संकाय, बर्नमाउथ विश्वविद्यालय, यु. के, टेलिफोन: +44 (0) 1202965206, इमेल: researchgovernance@bournemouth.ac.uk

अन्तमा

यदि तपाइँ भाग लिन निर्णय गर्नुहुन्छ भने, तपाईंलाई सूचना पानाको प्रतिलिपि र एक हस्ताक्षरित सहभागी सम्झौता फारमलाई राख्नको लागि दिइनेछ।

यो जानकारी पाना पढ्नको लागि तपाईंको समयको लागि धन्यबाद।

ii. Participant information sheet for interviews

Bournemouth University

Participant information sheet

The title of the research project Factors associated with Caesarean Sections in urban Nepal

Invitation to take part

My name is Sulochana Dhakal-Rai. I am a Nepalese student and studying in Bournemouth University (BU), UK. I am conducting a research study on factors associated with high caesarean section (CS) rates in urban hospitals in Nepal. You are invited to take part in this research. Before you decide, it is important for you to understand why the research is being done and what it will involve. Please, take time to read the following information carefully and discuss it with others if you wish. Please take time to decide whether or not you wish to take

part. You are welcome to ask me if there is anything that is not clear or if you would like more information.

What is the purpose of the project?

Several recent small-scale epidemiological studies in urban Nepal have reported high CS rates; three -fold higher than the World Health Organisation (WHO) recommendation of 10-15%. Therefore, through this study, we wish to explore the range factors which contribute to the rising rates of CS in urban hospitals in Nepal and to seek strategies/recommendations for reasonable use of CS.

Why have I been chosen?

You have been invited to take part in this study as you are working in this field of healthcare. I would like to learn from your expertise, valuable knowledge, and experiences regarding factors associated with rising CS use and any strategies/suggestions to make reasonable use of CS in future.

Do I have to take part in this study?

It is up to you to decide whether or not to take part. If you do decide to take part, you will be given this information sheet to keep and be asked to sign a participant agreement form. You can withdraw from participation during the interview at any time and without giving a reason. If you decide to withdraw, we will usually remove any data collected about you from the study. Once the interview session has finished you may still be able to withdraw your data up to the point where the data is analysed and incorporated into the research findings or outputs. At this point your data will usually become anonymous, so your identity cannot be determined, and it may not be possible to identify your data within the anonymous dataset. Withdrawing your data at this point may also adversely affect the validity and integrity of the research.

What would taking part involve?

If you take part, you will have one individual interview session. This will take about 1 hour. An interview guides will be used to facilitate the interviews. However, most questions are concerning your experience on providing obstetric care/CS. You will be asked to give informed consent to take part in this study.

What are the advantages and possible disadvantages or risk of taking part?

Whilst there are no immediate benefits for those people participating in the project, it is hoped that this research will allow your experiences/voice to be heard in the research community.

This study is envisaged to add to the knowledge of factors contributing to high CS rate in urban hospitals and how to reform local and national strategies to use CS appropriately. Minimal risk is anticipated in this study for both participants and researcher following results of health and safety assessment. However, you are free to decline answering questions that makes you feel uncomfortable.

What type of information will be sought from me and why is the collection of this information relevant for achieving the research project's objectives?

I am seeking your knowledge and experiences on reasons related to rising rates CS in urban hospital. I am also expecting your recommendations to make CS use reasonable at local and national level. The individual interview sessions will be conducted in private, so that you will be comfortable to share information freely. The information provided by you will be used to help better understand the factors contributing to the rising CS rate, to help improve the quality of services, and to strengthen the health system in future.

Will I be recorded, and how will the recorded media be used?

The interview session with you will be audio recorded. The audio recordings of your activities made during this research will be used only for analysis and the transcription of the recording(s) for illustration in my PhD thesis and conference/seminars presentations. No other use will be made of them without your written permission, and no one outside the project will be allowed access to the original recordings.

How will my information be kept?

All the information we collect about you during the course of the research will be kept strictly in accordance with UK current data protection legislation. Research is a task that we perform in the public interest, as part of our core function as a university. Bournemouth University (BU) is a Data Controller of your information which means that we are responsible for looking after your information and using it appropriately. BU's Research Participant Privacy Notice sets out more information about how we fulfil our responsibilities as a data controller and about your rights as an individual under the data protection legislation. We ask you to read this Notice so that you can fully understand the basis on which we will process your information.

Publication

Your information will only be included in an anonymous form, i.e. you will not be identifiable. Research results will be illustrated in PhD thesis and published in national and international academic journals,

Security and access controls

BU will hold the information we collect about you in hard copy in a secure location and on a BU password protected secure network were held electronically. Only the study researcher will be allowed to have access to the audio recordings before and after transcription. The audio recordings will be deleted once they have been converted into Word documents with no individual identifying elements.

Sharing and further use of your personal information

The information collected about you may be used in an anonymous form to support other research projects in the future and access to it in this form will not be restricted. It will not be possible for you to be identified from this data.

Retention of your data

The data collected from you will be kept for five years after this study and deleted after the period in accordance with the BU Research Ethics Code of Practice.

Contact for further information

For further information/ details about this research, please call:

Sulochana Dhakal-Rai, Faculty of Health and Social sciences, Bournemouth University, Tel.: 977-83-520709; Email: sdhakalraj@bournemouth.ac.uk

Prof. Ganesh Dangal, Senior consultant Gynaecology & Obstetrics, Kathmandu Model Hospital, Nepal. Tel: 977-1-4240805, Email: ganesh.dangal@gmail.com

Name, position and contact details of supervisor: **Professor Edwin van Teijlingen,** Faculty of Health & Social Sciences, Bournemouth University, Tel. +44 (0)1202-961564; Email: evteijlingen@bournemouth.ac.uk

Complaints

If you have any concerns or complain about any aspect of this research, please contact:

Professor Vanora Hundley, Deputy Dean for Research and Professional Practice, Faculty of Health & Social Sciences, Email: researchgovernance@bournemouth.ac.uk.

Finally

If you decide to take part, you will be given a copy of the information sheet and a signed participant agreement form to keep.

Thank you for taking your time to read through this information sheet.

Appendix 8: Participant agreement form

i. Participant agreement form for FGDs in Nepali

महिला सहभागिहरुका लागि सहभागी सम्झौता फारम

अनुसन्धानको शीर्षक: शहरी नेपालमा सिजरियन सेक्सनसँग सम्बन्धित कारणहरु

शोधकर्ता को नाम, स्थिति र सम्पर्क विवरण:

सुलोचना ढकाल-राईं, पीएचडी विद्यार्थी, स्वास्थ्य र सामाजिक विज्ञान संकाय, बर्नमाउथ विश्वविद्यालय,

टेलिफोन: 977-83-520709, इमेल: sdhakalraj@bournemouth.ac.uk,

सुपर्भाइजरको नाम र ठेगाना:

प्रोफेसर गणेश दङगाल, वरिष्ठ सल्लाहकार, Gynaecology & Obstetrics, काठमाडौं मोडेल मोडेल अस्पताल, नेपाल।

टेलिफोन: 977-1-4240805, इमेल:ganesh.dangal@gmail.com

सेक्शन ए: अध्ययनमा भाग लिन सम्झौता

मैले सहभागी सूचना पत्र (संस्करण 2) पढेको र बुझेको छु।
मैले प्रश्न सोध्न मौका पाएको छु।
मैले बुझें कि मेरो सहभागिता स्वैच्छिक छ। म कुनै पनि कारण बिना कुनै पनि समयमा अनुसन्धान गतिविधिहरुमा भाग लिन रोक्न सक्छु र म कुनै विशेष प्रश्न (हरु) को जवाफ दिन अस्वीकार गर्न सक्छु। म बुझ्छु कि मेरो डाटा रेकर्ड गरिनेछ ।
म यो बुझ्छु, यदि म अध्ययनबाट हटाउँछु भने, म अध्ययनमा थप प्रयोगबाट पनि मेरो डेटा फिर्ता गर्न सक्दिनँ, जहाँ मेरो डेटा गुमनाम गरिएको छ (जस्तै मलाई पहिचान गर्न सकिँदैन) वा यो परियोजनाको लागि हानिकारक हुनेछ मेरो डेटा हटाइयो भने । म बुझ्छु कि मैले बोलेको कुराहरु रेकर्ड गरिनेछ । मलाई नचिनिने गरेर प्रकासन गरिने छ ।
म बुझ्छु कि मेरो डाटा बर्नमाउथ विश्वविद्यालयको अनलाइन अनुसन्धान डाटा भण्डारमा एक अज्ञात फारममा संग्रहित हुन सक्छ।
मैले बुझें कि मेरो डेटा भविष्य मा अन्य अनुसन्धान परियोजनाहरु लाई समर्थन गर्न को लागि शोध टीम द्वारा रिपोर्ट या प्रस्तुति सहित अज्ञात रूप मा प्रयोग गरिन सक्छ।

	सहमत बक्स
म माथि सेट आउट आधारमा परियोजनामा भाग लिन सहमत छु (सेक्शन ए)	

सहभागीको नाम…….

(ब्लक कैपिटल)

मिति……..

शोधकर्ताको नाम……

(ब्लक कैपिटल)

मिति……..

ii. Participant Agreement Form interviews (health professionals and key informants)

Participant Agreement Form

Full title of project: **Factors associated with caesarean sections in urban Nepal**

Name, position and contact details of researcher: **Sulochana Dhakal-Rai**, PhD student, Faculty of Health and Social sciences, Bournemouth University, UK; Tel.: 977-83-520709; Email: sdhakalraj@bournemouth.ac.uk

Prof. Ganesh Dangal, Senior consultant Gynaecology & Obstetrics, Kathmandu Model Hospital, Nepal. Tel: 977-1-4240805, Email: ganesh.dangal@gmail.com

Name, position and contact details of supervisor: **Professor Edwin van Teijlingen,** Faculty of Health & Social Sciences, Bournemouth University, Tel. +44 (0)1202-961564; Email: evteijlingen@bournemouth.ac.uk

Completed prior to data collection activity

Section A: Agreement to participate in the study

You should only agree to participate in the study if you agree with all of the statements in this table and accept that participating will involve the listed activities.

I have read and understood the Participant Information Sheet (version 2) and have been given access to the BU Research Participant Privacy Notice which sets out how we collect and use personal

information (https://www1.bournemouth.ac.uk/about/governance/access-information/data-protection-privacy).
I have had an opportunity to ask questions.
I understand that my participation is voluntary. I can stop participating in research activities at any time without giving a reason and I am free to decline to answer any particular question(s).
I understand that taking part in the research will include the following activity/activities as part of the research:
• being audio recorded during the project
• my words will be quoted in publications, reports, web pages and other research outputs [without using my real name].
I understand that, if I withdraw from the study, I will also be able to withdraw my data from further use in the study **except** where my data has been anonymised (as I cannot be identified) or it will be harmful to the project to have my data removed.
I understand that my data may be included in an anonymised form within a dataset to be archived at BU's Online Research Data Repository.
I understand that my data may be used in an anonymised form by the research team to support other research projects in the future, including future publications, reports or presentations.

	Initial box to agree
I consent to take part in the project on the basis set out above (Section A)	

I confirm my agreement to take part in the project on the basis set out above.

Name of participant	Date	Signature
(BLOCK CAPITALS)	(dd/mm/yyyy)	

Name of researcher	Date	Signature
(BLOCK CAPITALS)	(dd/mm/yyyy)	

Once a Participant has signed, **please sign 1 copy** and take 2 photocopies:

Original kept in the local investigator's file

1 copy to be kept by the participant (including a copy of PI Sheet)

Appendix 9: Ethical approval

i. Ethical approval from Bournemouth university

Bournemouth University

Research Ethics Checklist

About Your Checklist	
Ethics ID	26403
Date Created	02/04/2019 17:32:07
Status	Approved
Date Approved	22/07/2019 09:20:00
Date Submitted	08/07/2019 21:35:46
Risk	High

Researcher Details	
Name	Sulochana Dhakal-Rai
Faculty	Faculty of Health & Social Sciences
Status	Postgraduate Research (MRes, MPhil, PhD, DProf, EngD, EdD)
Course	Postgraduate Research - HSS
Have you received external funding to support this research project?	No

Project Details	
Title	Assessing factors associated with high rate of Caesarean section in urban Nepal and possible strategies to overcome this trend: Hospital-based study
Start Date of Project	17/09/2017
End Date of Project	31/12/2022
Proposed Start Date of Data Collection	01/09/2019
Original Supervisor	Pramod Regmi
Approver	Research Ethics Panel

Summary - no more than 500 words (including detail on background methodology, sample, outcomes, etc.)

Caesarean section (CS) is a life-saving surgical procedure for delivering a baby when complications arise in childbirth. The World Health Organization recommends a CS rate of 10 – 15%. The Nepal Demographic Health Survey (2016) reported an overall CS rate of 9.0% in Nepal. This is lower than the recommended rate by World Health Organization. However, the disparity in CS rates has been observed across urban and rural population. Similarly, Nepal Multiple Indicator Cluster Survey (2014) reported that CS rate is higher in urban areas (19%) than rural areas (7.1%) and CS rate is the highest in Kathmandu valley (24%). Some hospital-based studies have reported a very high CS rates (41–51%) in Kathmandu. Easily available private facilities and education of women have been suggested as factors for rise in rates of CS in urban settings. The worrying rising of CS rate in urban Nepal needs to be addressed urgently.

Many hospital- based studies plus hospital data collected through the regular health management information systems (HMIS) indicate rising CS rates along with a wide variation in the CS rates across facilities as well as between public and private facilities. Against this backdrop, this PhD aims to (a) explore range of contributing factors to rising CS in urban hospitals in Nepal; (b) to seek strategies/recommendations to make reasonable use of CS; and (c) to assess the CS rate among study population and each Robson's

category.

This is a cross- sectional comparative study. A mixed-methods approach (quantitative - patients' records and qualitative - interview, focus group discussion, case study) will be utilised as this approach makes use of the pragmatic method and system of philosophy. Moreover, mixed-methods research provides a better understanding of the research problem and increases the strength of research design.

This study will be conducted in two hospitals (one public and one private) in Kathmandu, the capital city of Nepal. Paropakar Maternity and Women's Hospital is a public hospital where current CS rate is 34% and Kathmandu Model Hospital is a private hospital where current CS rate is 50% according to hospital annual data.

For quantitative component, a total 566 delivery cases (235 in Kathmandu Model Hospital and 331 in Paropakar Maternity and Women's Hospital) will be selected retrospectively by applying systematic random sampling from the latest fiscal year. Similarly, up to 15 interviews with various levels of health care professionals (obstetricians/doctors and nurses/midwife various levels) and about five few key informants (stakeholders from governmental and non-governmental organisations related to maternal health) will be conducted using semi-structured questions. About four focus groups discussions (FGDs) will be conducted with 16 - 32 pregnant women with or without history of previous CS who are attending antenatal clinics in relevant hospitals. Four to eight women will be in one FGD. The participants for interviews, FGDs and case study will be selected purposively. All interviews and FGDs will be audio recorded. Then, transcribed and translated in to English. All questions will be translated in Nepali language as necessary. Two to four case studies on CS will be carried out focusing the reasons of performing CS, if possible.

Qualitative data will be organized through NVivo version 12 and will be analysed applying thematic analysis. Quantitative data will be analysed using SPSS version 25. Descriptive analysis such as frequencies, percentages and proportions will be calculated and appropriately presented. Statistical significance will be set at $p<0.05$. For each Robson group, risk ratios (RR) with 95% confidence interval for delivery by CS will be calculated. Chi-square test will be applied to assess the contributions of each Ronson's group to the overall CS rates with differences. Association between variables and CS delivery/outcome variables will be assessed by applying Chi-square test. Multiple liner regression will be applied to assess independent association of significance variables with outcome.

The study will help to add new knowledge about contributing factors to rising rates of CS in urban hospitals of Nepal. Furthermore, it will help to identify strategies that can help the use of CS appropriately in Nepal. The findings will be the important evidence for Government of Nepal and policy maker to reform policies regarding rational use of CS in Nepal. The study findings will be illustrated in PhD thesis and will be disseminated via high impact local and international journals.

Human Participants

Participants	
Describe the number of participants and specify any inclusion/exclusion criteria to used	
About 15 obstetricians and nurses from various levels and 5 key informants from governmental (Obstetrics Society, Midwifery Society etc,) and non-governmental organisations (Safe Motherhood Projects). About 32 pregnant women with second or third trimester of pregnancy will be selected for focus group discussions (FGDs). Six to eight participants will be one FGD. Two FGDs will be with women without previous CS and other two with previous CS. Two case study will be carried out.	
Do your participants include minors (under 16)?	No
Are your participants considered vulnerable?	No
Is a Disclosure and Barring Service (DBS) check Required?	No

Recruitment	
Please provide details on intended recruitment methods, include copies of any advertisements.	
Health personnel will be identified with the help of hospital organisation chart. The key informants will be identified by consulting the Ministry of Health of Nepal and relevant organisations. FGDs participants will be selected from antenatal clinic (ANC) in relevant hospitals. Cases for case study will be selected from current CS cases in the Maternity ward of relevant hospitals. The participants for interview, FGDs and case study will be selected purposively.	
Do you need a Gatekeeper to access your participants?	Yes
Please provide details, including their roles and any relationship between Gatekeepers and participant(s) (e.g. nursing home	

Participant Withdrawal	
At what point and how will it be possible for participants to exercise their rights to withdraw from the study?	All participants will be told that they can withdraw from participation during the process of study at any time without giving a reason. If someone participant decides to withdraw, any data collected about him/her will be removed from the study. Once the participation in the study has finished, they may still be able to withdraw their data up to the point where the data is analysed and incorporated anonymously into the research findings or outputs.
If a participant withdraws from the study, what will be done with their data?	Data will be excluded if participant withdrawn. In FGDs, information may be not able to remove. In that case, information will be kept anonymously.

Participant Compensation	
Will participants receive Financial compensation (or course credits) for their participation?	No
Will financial or other inducements (other than reasonable expenses) be offered to participants?	No

Research Data	
Will identifiable personal information be collected, i.e. at an individualised level in a form that identifies or could enable identification of the participant?	Yes
Please give details of the types of information to be collected, e.g. personal characteristics, education, work role, opinions or experiences	
Personal information such as age, education, occupation, history of previous caesarean section, personal opinions on subject matters etc. will be collected from pregnant women. Similarly, personal information such as education, personal opinions on subject matters, work position/role and numbers of year working in the position etc, will be collected from health professional and key informants. For quantitative study, personal data will be extracted such as age, education, occupations etc.	
Will the personal data collected include any special category data, or any information about actual or alleged criminal activity or criminal convictions which are not already in the public domain?	Yes
If Yes, please give details of the information you will be collecting	
Will the information be anonymised/de-identified at any stage during the study?	No
Will research outputs include any identifiable personal information i.e. data at an individualised level in a form which identifies or could enable identification of the individual?	No
Have you considered and addressed the need for 'data minimisation' in your use of personal data for the study?	No
Please give brief details of how you will address the need for data minimisation	

Storage, Access and Disposal of Research Data	
During the study, what data relating to the participants will be stored and where?	All the personal data such as age, education, occupation, personal opinions on subject matter etc. collected during the study will be store strictly according to current data protection legislation. The audio recordings will be deleted after converted into word documents anonymously. The word documents will be stored in a BU password secure computer network. All paper-based documents related to personal data will be stored in secured place (locked cabinet) of Bournemouth University.
How long will the data relating to participants be stored?	The audio recordings will be deleted once audio recordings have been converted into word documents with no individual identifying elements. All data will be converted in word document form with no individual identifying elements. The word documents will be stored in a BU password protected computer during the study. The paper-based documents will be stored in secured place (locked cabinet) in Bournemouth university during the study.

manager and residents)
Institutional Review Committee (IRC) is the responsible authority of the hospital regarding research related any activities. Approval from IRC is sought before conducting the research. Approval letter for the study is received from IRCs of both selected hospitals (Kathmandu Model Hospital and Paropakar Maternal & Women's Hospital). At the beginning of data collection process, I will contact hospital authority, maternity ward and medical record section of selected hospitals.

Data Collection Activity	
Will the research involve questionnaire/online survey? If yes, don't forget to attach a copy of the questionnaire/survey or sample of questions.	No
Will the research involve interviews and/or focus groups? If yes, don't forget to attach a copy of the interview/focus group questions or sample of questions.	Yes
Will the research involve the collection of audio materials?	Yes
Will your research involve the collection of photographic materials which will identify a participant?	No
Will your research involve the collection of video materials?	No
Will any photographs, video recordings or film identify an individual?	No
Please provide details	
Will the study involve discussions of sensitive topics (e.g. sexual activity, drug use, criminal activity)?	No
Will any drugs, placebos or other substances (e.g. food substances, vitamins) be administered to the participants?	No
Will the study involve invasive, intrusive or potential harmful procedures of any kind?	No
Could your research induce psychological stress or anxiety, cause harm or have negative consequences for the participants or researchers (beyond the risks encountered in normal life)?	Yes
Please provide details and measures taken to minimise risks	
Interview and FGDs sessions will be conducted in private. Confidentiality will be maintained. Personal feelings will not be asked. FGDs will be facilitated by female researcher with birth experience.	
Will your research involve prolonged or repetitive testing?	No

Consent	
Describe the process that you will be using to obtain valid consent for participation in the research activities. If consent is not to be obtained explain why.	
Each potential participant will be provided an information sheet. The participant information sheet will be written in understandable language stating that his/her decision to accept or decline this invitation is voluntary and any decision him/her take concerning taking part or not will be respected and no questions will be asked. Any question of participant will be clarified. Informed choice will be provided to Individual participant.	
If participants are minors, describe the process for obtaining consent/assent.	
Not applicable	
Do your participants include adults who lack/may lack capacity to give consent (at any point in the study)?	No
Will it be necessary for participants to take part in your study without their knowledge and consent?	No

During the study, who will have access to the data relating to participants?	Only the study researcher of this study will be allowed to have access to all data including the audio recordings before transcription and after transcription during the study.
After the study has finished, what data relating to participants will be stored and where? Please indicate whether data will be retained in identifiable form.	All personal data will be stored anonymously in a BU password protected secure network where held electronically. A hard copy will be stored in a secure location (locked cabinet) of Bournemouth University.
After the study has finished, how long will data relating to participants be stored?	The data collected during the study will be kept for five years after finishing the study.
After the study has finished, who will have access to the data relating to participants?	The information collected during the study may be used in an anonymous form to support other research projects in the future and access to it in this form will not be restricted. The information will only be included in an anonymous form, i.e. participant will not be identifiable. Research findings will be illustrated in PhD thesis and will be published in national and international academic journals.
Will any identifiable participant data be transferred outside of the European Economic Area (EEA)?	No
How and when will the data relating to participants be deleted/destroyed?	After five year completion of the study, the data will be deleted in accordance with the BU Research Ethics Code of Practice.
Once your project completes, will any anonymised research data be stored on the BU's Online Research Data Repository "BORDaR"?	Yes

Final Review	
Are there any other ethical considerations relating to your project which have not been covered above?	No

Risk Assessment	
Have you undertaken an appropriate Risk Assessment?	Yes

Research Outside the UK

Additional Details	
What country will your research take place in? Please include details and measures taken to minimise risks.	The study will be conducted in Nepal. Nepal is a low income country of South Asia. Two hospitals in Kathmandu city are chosen for the study. 1 Paropakar Meternity and Women's Hospital - Public hospital, 2. Kathmandu Model Hospital - Private hospital
Does the country in which you are conducting research require that you obtain internal ethical approval (other than BU ethical approval)?	Yes
Please state the approving authority	Approval from Institutional Review Committee (IRC) of relevant hospitals will be obtained at first. Then, ethical approval will be sought from Nepal Health Research Council (NHRC).

External Ethics Review

Additional Details	
Please identify the approving authority	Nepal Health Research Council (NHRC) is the National approval authority for ethical approval in Nepal. Institutional Review Committee (IRC) of relevant hospitals is local

	ethical approval authority in relevant hospitals.
Do you also require Bournemouth University ethical approval?	Yes

Attached documents
Question for health personnel ver1.docx - attached on 26/04/2019 11:45:31
recordformate ver1.docx - attached on 26/04/2019 11:48:52
questions for key informants.doc ver 1.docx - attached on 29/04/2019 12:47:56
Focus Group Discussion with women ver2.docx - attached on 01/07/2019 08:26:50
Agreement form for health professional2.docx - attached on 04/07/2019 21:41:30
Agreement form for key informants-2.docx - attached on 04/07/2019 21:41:36
Agreement form for women-2.docx - attached on 04/07/2019 21:41:42
participant information sheet for health personnals ver 2corrected.docx - attached on 04/07/2019 22:35:06
participant information sheet for key informant ver2corrected2.docx - attached on 04/07/2019 22:35:25
participant information sheet for women ver2corrected2.docx - attached on 04/07/2019 22:35:42
IRC approval from KMH.pdf - attached on 05/07/2019 12:59:05
IRC PMWH Approval letter.doc - attached on 05/07/2019 12:59:16

ii. **Ethical approval from NHRC**

Government of Nepal

Nepal Health Research Council (NHRC)

Estd. 1991

Ref. No.: 3503

9 July 2019

Ms. Sulochana Dhakal Rai
Principal Investigator
Bournemouth University
United Kingdom

Ref: **Approval of thesis proposal** entitled **Factors associated with Caesarean section in two urban hospitals in Nepal**

Dear Ms. Rai,

It is my pleasure to inform you that the above-mentioned proposal submitted on **22 May 2019 (Reg. no. 327/2019)** please use this Reg. No. during further correspondence) has been approved by Nepal Health Research Council (NHRC) Ethical Review Board on **3 July 2019**.

As per NHRC rules and regulations, the investigator has to strictly follow the protocol stipulated in the proposal. Any change in objective(s), problem statement, research question or hypothesis, methodology, implementation procedure, data management and budget that may be necessary in course of the implementation of the research proposal can only be made so and implemented after prior approval from this council. Thus, it is compulsory to submit the detail of such changes intended or desired with justification prior to actual change in the protocol. Expiration date of this proposal is **December 2022.**

If the researcher requires transfer of the bio samples to other countries, the investigator should apply to the NHRC for the permission. The researchers will not be allowed to ship any raw/crude human biomaterial outside the country; only extracted and amplified samples can be taken to labs outside of Nepal for further study, as per the protocol submitted and approved by the NHRC. The remaining samples of the lab should be destroyed as per standard operating procedure, the process documented, and the NHRC informed.

Further, the researchers are directed to strictly abide by the National Ethical Guidelines published by NHRC during the implementation of their project proposal and **submit progress report in between and full or summary report upon completion.**

As per your thesis proposal, the total research amount is **Rs 2,45,000** and accordingly the processing fee amounts to **Rs 10,000.** It is acknowledged that the above-mentioned processing fee has been received at NHRC.

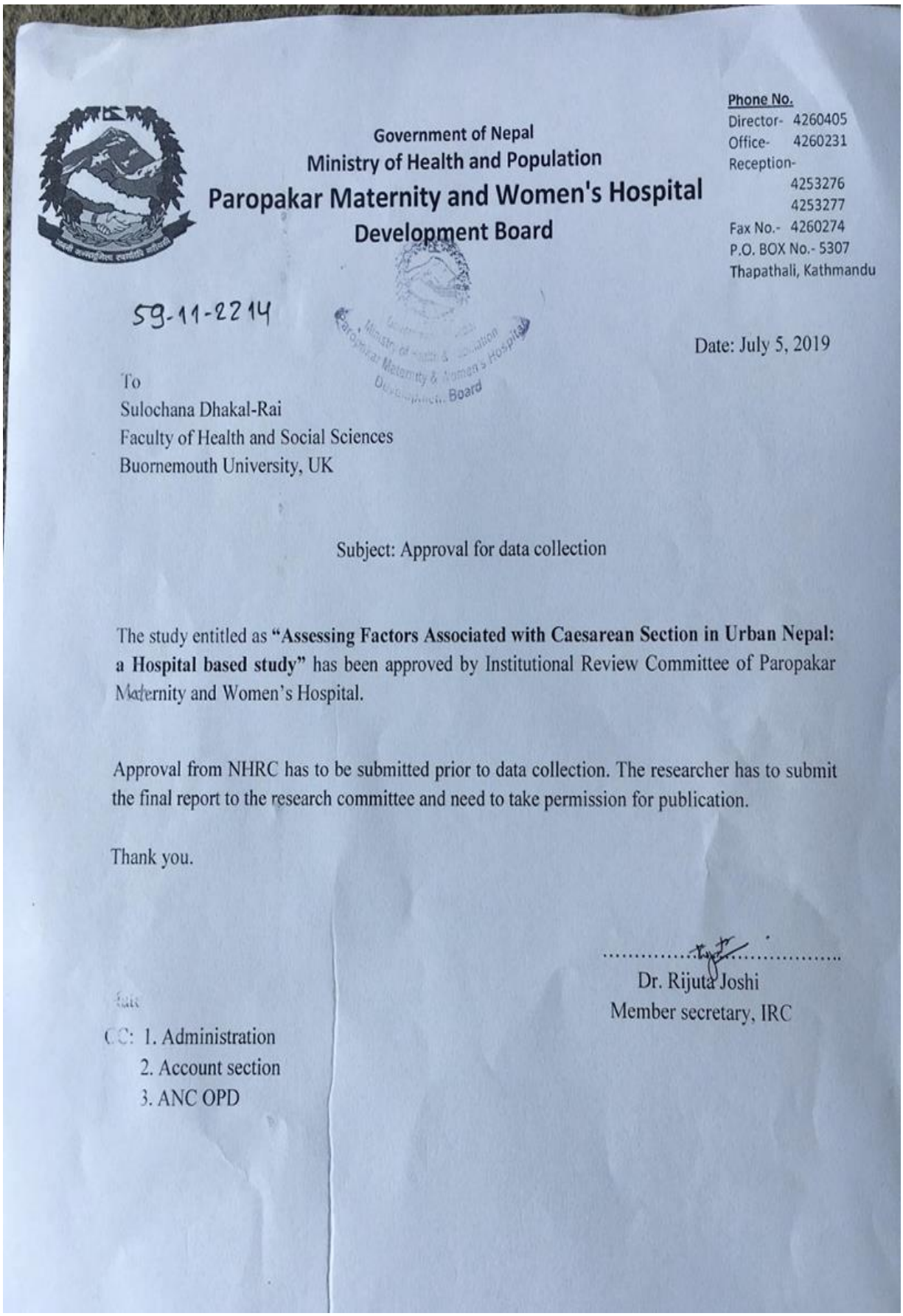
If you have any questions, please contact the Ethical Review M & E Section at NHRC.

Thanking you,

Prof. Dr. Anjani Kumar Jha
Executive Chairperson

Tel: +977 1 4254220, Fax: +977 1 4262469, Ramshah Path, PO Box: 7626, Kathmandu, Nepal
Website: http://www.nhrc.gov.np, E-mail: nhrc@nhrc.gov.np

iii. Ethical approval from PMWH



Government of Nepal
Ministry of Health and Population
Paropakar Maternity and Women's Hospital Development Board

Phone No.
Director- 4260405
Office- 4260231
Reception- 4253276
4253277
Fax No.- 4260274
P.O. BOX No.- 5307
Thapathali, Kathmandu

59-11-2214

Date: July 5, 2019

To
Sulochana Dhakal-Rai
Faculty of Health and Social Sciences
Buornemouth University, UK

Subject: Approval for data collection

The study entitled as **"Assessing Factors Associated with Caesarean Section in Urban Nepal: a Hospital based study"** has been approved by Institutional Review Committee of Paropakar Maternity and Women's Hospital.

Approval from NHRC has to be submitted prior to data collection. The researcher has to submit the final report to the research committee and need to take permission for publication.

Thank you.

Dr. Rijuta Joshi
Member secretary, IRC

CC: 1. Administration
2. Account section
3. ANC OPD

iv. Ethical approval from KMH

phect NEPAL

जन स्वास्थ्य सरोकार ट्रष्ट
Public Health Concern Trust

Ref. No.: 189-075/076

Date: April 24, 2019

To,

Ms. Sulochana Dhakal Rai
PG Student Researcher,
Faculty of Health and Social Sciences, Bournemouth University

Dear Ms. Dhakal Rai,

As per the recommendation of Institutional Review Committee of phect, I am pleased to inform you that Public Health Concern Trust, Nepal (phect-NEPAL) will permit you to collect relevant information in Kathmandu Model Hospital of phect-NEPAL for the research as approved by phect-NEPAL IRC which is stated below. This No Objection Certificate will be in action if Nepal Health Research Council offers ethical approval for the same.

Project title: 'Factors associated with rate of caesarean section in urban Nepal and possible strategies to overcome this trend: Hospital-based study'

Principal researcher:
Prof. Edwin van Teijlingen, Bournemouth University (Supervisor)

Student researcher:
Ms. Sulochana Dhakal-Rai (PG Student Researcher, Bournemouth University)

Other researchers:
Prof. Ganesh Dangal (phect-NEPAL), Dr. Pramod Regmi, Dr. Juliet Wood

Approval is limited to the research as described in the submitted application to the IRC phect.

.....
Mr. Sagar Lal Shrestha
Chief Administrator

पो. ब. नं. ६०६४ प्रदर्शनी मार्ग, काठमाडौं, नेपाल फोन : ४२२२४५०, ४२४०८०५, ४२४०८०६
Head Office : P. O. Box No.: 6064, Pradarshani Marg, Kathmandu, Nepal. SWC Reg. No.: 982 DAO Reg. No.: 451-047/048

v. Ethical approval from KPH

Karnali Province Government
Ministry of Social Development
PROVINCE HOSPITAL
Birendranagar, Surkhet, Nepal
083 523200
083 520266

Province Government Ministry of Social Development Province Hospital Karnali Province, Surkhet

Ref:

Date: 10/09/2019

To

Sulochana Dhakal-Rai

PhD student

Faculty of Health and Social Sciences

Bournemouth university,

UK

Subject: Ethical approval for conducting pilot study

Dear Mrs Dhakal-Rai,

We have reviewed your application of conducting a pilot study on caesarean section in our hospital. We have found that your pilot study is scientifically and ethically sound. Therefore, we have provided an ethical approval to conduct your pilot study in our hospital.

Regards,

Dr. Damber Khadka

Hospital Director

Website: https://provincehospital.karnali.gov.np
e-Mail: provincehospitalskt@gmail.com
phospitalskt@gmail.com

Appendix 10: Submitted article to NJOG on pilot study

Caesarean section in Karnali Province Hospital: A pilot study

Authors: Sulochana Dhakal-Rai[1*], Edwin van Teijlingen[1], Pramod R. Regmi[1], Juliet Wood[1], Ganesh Dangal[1,2], Keshar Bahadur Dhakal[3]

[1] Bournemouth University, Bournemouth, UK

[2] Kathmandu Model Hospital, Kathmandu, Nepal

[3]Karnali Province Hospital, Nepal

***Correspondence**: Sulochana Dhakal-Rai, Mobile: +44 7592 791358, Bournemouth University, Bournemouth Gateway Building, St. Paul's Lane, Bournemouth, BH8 8GP, UK. Email: sdhakalrai@bournemouth.ac.uk, ORCID: 0000-0001-6933-7689

ABSTRACT

Background

Caesarean section (CS) rate is high in Karnali Province Hospital (KPH), Nepal, but the factors driving this rise are unclear. This feasibility study was conducted to test the qualitative tools to explore questions around the increase in CS rate and possible measures for rational use of CS.

Methods

This cross-sectional study was conducted in autumn 2019 in KPH. Focus group discussions (FGDs) with pregnant women attending antenatal clinics (ANCs) and interviews with doctors and nurses were conducted. Data were thematically analysed using NVivo 12.

Findings

Four main themes and several sub-themes are identified in this study. (1) Reasons for high rate of CS (Availability of maternity care; Complicated referral cases; Medical indications; Lack of written protocol; CS for breech presentation; Repeat CS; Lack of auding CS; Advanced age; and Maternal request), (2) Reasons for requesting CS (Labour pain; Socio-cultural reasons; Sexual reasons; & Bad experience in a previous delivery), (3) Decision making process: a senior doctor is primary decision maker on CS. (4) Challenges to optimal use of CS (Resources: shortage of staff and other resources; Lack of adequate monitoring of labour; Lack of awareness on mode of childbirth; and Lack of companion support to women in labour), (5)

Strategies for optimal use of CS (Adequate resources: Skilled birth attendants & special maternity unit; Written protocol; Increase awareness about mode of childbirth; Companion support during labour; Quality labour monitoring; and Minimise primary CS & avoid CS on request/demand).

Conclusion

Counselling for all pregnant women on mode of birth and raising public awareness of the risks and benefits of CS and normal birth can play a vital role in reduction of CS and fear of labour pain. Availability of adequate SBAs and quality labour monitoring and provision of companion support during labour can minimise CS and maximise normal birth.

Keywords: Caesarean section, Normal delivery, Optimal use

INTRODUCTION

Caesarean section (CS) is a life-saving surgical operation for delivering babies in case of complications or high-risk pregnancy.[1] The World Health Organization (WHO) recommends a CS rate of around 15%.[2] Increasing CS rates are a global health concern,[3] because of risks associated with maternal and child health.[4] There are several factors associated with rising CS rates. Foetal distress and previous CS are key indicators of CS.[5] However, performing CS for non-medical reasons such as maternal request is also increasing.[6] The rates of CS are rising especially in urban/private hospitals in South Asia,[6] and in Nepal.[7,8] Many hospital-based studies showed that CS rates are very high.[9-12] A previous study conducted in this hospital disclosed that the rate of CS is high (18.8%).[13] Hence, there is a genuine need to explore the reasons behind increasing CS rate. The study has explored reasons for high CS rate, reasons for requesting CS, decision making processes and strategies for optimal use of CS.

METHODS

This is a pilot study[14] conducted in late 2019 in Karnali Province Hospital (KPH), in Nepal. This qualitative study design comprised focus group discussions (FGDs) [14] and semi-structured interviews.[15] Two FGDs were conducted with 12 pregnant women attending antenatal clinics (ANCs), and five face-to-face interviews were conducted with five maternity ward staff including a hospital director. All FGDs and interviews were transcribed in Nepali and translated into English. Data were organised using NVivo 12 and then data were thematically

analysed.[16] Quotes are identified as FGD or N=nurse or D=doctor with a number. Ethical approval was obtained from the hospital authority before conducting the pilot study.

FINDINGS

Five main themes were identified: (1) Reasons for requesting CS; (2) Reasons for requesting/demanding CS; (3) Decision making process; (4) challenges to optimal use of CS; and (5) strategies for optimal use of CS. Several sub-themes are discovered in above main themes.

1. Reasons for high CS rate in KPH

Eight sub-themes emerged regarding reasons for high CS rate in KPH: Availability of comprehensive maternity care; Complicated referral cases; Medical indications; Lack of written protocol; CS for breech presentation; Repeat CS/less vaginal birth after CS (VBAC); Lack of auding CS; Advanced age; and Maternal request.

Availability of comprehensive maternity care

A comprehensive maternity care is available in KPH including free CS under *Aama Surakshya Karyakram* (Safe Motherhood Programme). All interviewees said that this hospital provided a range of maternity care, including antenatal care (ANC), normal delivery, complicated delivery, CS, postnatal care, safe abortion. For example, an interviewee said. "*All types of maternity services have been providing from this hospital. ANC services are being provided every day to pregnant women from ANC clinic. Similarly, normal delivery has been conducting regularly. CS has been conducted every day as required. Additionally, complicated deliveries have also been conducting as necessary*." (D1)

Furthermore, all interviewees acknowledged that the free *Aama Surakshya Karyakram* (Safe Motherhood Programme) is beneficial for poorer families; An interviewee highlighted, *"…through Safe Motherhood project, poor patients are benefiting as CS is free of cost. This project supplies us logistic things as well, which has made easier for provision of CS service." (N1)*

Complicated referral cases

Since this is the main referral centre in the Karnali Province, offering comprehensive obstetric services, CS rate is high in this hospital but lower than private hospitals. Interviewees defended that the CS rate is high due to this being a referral hospital receiving women with high-risk pregnancies and/or complications. An interviewee stated, "…*the CS rate in this hospital is*

lower than the private hospital but higher than remote district hospitals. Because of this hospital is the main referral centre in Karnali Province, many complicated or high-risk pregnant women are referred to this hospital ..." (D1)

Medical indications

The main reason for CS is found to be medical indications in this hospital. For elective CS, the indications were previous CS, primi breech, cephalopelvic disproportion (CPD), placenta previa, foetal malpresentation, thick meconium, eclampsia and bad obstetric history. For emergency CS, indications were foetal distress and non-progress labour. An interviewee highlighted the following indications for CS, *"The main causes of electives are previous CS, primi breech, CPD, placenta previa, foetal mal presentation but we don't do elective CS on patient's request. For emergency CS, main indications are foetal distress, nonprogress of labour, thick meconium stained in latent stage of labour and eclampsia. In my experience, NPOL cases are high and eclampsia cases are low." (D2)*

Various medical reasons for performing CS also highlighted also in FGDs, *"If the baby is big, sitting upside down and wrong position in the womb, high BP of mother, weak & ill mother and cannot deliver normally then they need to do operation. Operation is required If baby need to deliver earlier than date." (FGD1/p1)*

Lack of written protocol

All interviewees said that there is no written protocol for performing CS in this hospital, but CS is performed based on medical indications. An interviewee highlighted, *"We follow the protocol as we learned in book such as indications of CS. We don't have written policy document in this hospital." (D1)*

CS for breech presentation

All interviewees said that CS is performed for breech in primigravida women and trial of labour is offered to multigravida. An interviewee stated, *"...trial of labour in multigravida breech cases. However, we do CS for primi breech." (D2)*

Repeat CS/less VBAC

All interviewees agreed that repeat CS is more common in this hospital due to shortage of staff, lack of labour monitoring and fear of adverse results. An interviewee said, *"We offer VBAC in this hospital… because of monitoring problem and shortage of staff. Some VBAC cases were*

end up to CS with complications. Therefore, usually we do CS in previous CS for a safe practice." (D1)

Advanced age of women

All interviewees thought that pregnancy in advanced age ended up with a CS, as one interviewee emphasised, *"...Older women above 40 years old undergo CS due to difficulty in giving normal birth..." (D2)*

Lack of auding CS

All interviewees mentioned a daily or yearly system of recording and reporting CS, but nobody mentioned about auditing CS. For example, an interviewee mentioned daily reporting system, *"We do report and discussion at first hour of everyday regarding number of CS within 24 hours, reasons of CS, condition/complications of mother and new-born baby..." (D1).* Similarly. another stated about yearly reporting of health service data, *"We do perinatal review monthly and data presentation yearly." (D3)*

Maternal request

Although all pregnant women in the FDGs said that their preferred mode of childbirth is normal/vaginal birth and there no benefit of CS rather than health problem, but sometime maternal request was also found a reason for performing CS. A participant said, *"I have 40 weeks baby in my womb, and I want to have a normal delivery. My mother-in-law also wants my normal delivery." (FDG 1/ p5)*

Furthermore, all participants thought that there is no benefit to them having a CS but causes many health problems such as backache, wound pain, weakness of mother. A participant emphasised, *"I think, there is no advantage of operation as normal delivery because instruments are used in operation. Operation can cause health problems to mother and child." (FGD 1/p1)*

However, some interviewees highlighted some events involving a CS on demand/request and compelling doctors to conduct CS. An interviewee recalled such event involving a CS on demand/request, *"...a patient from very rich family ... After starting labour pain, she started to ask for CS. We were monitoring her condition and counselling her for normal delivery regularly. Doctors were also looking after her constantly...However, she was continuously asking for CS. At the end, she appeared to be distressed. After that, foetus also appeared to be tachycardiac. Finally, she had a CS as she wished." (N1)*

2. Reasons for requesting/demanding CS

Several reasons for requesting a CS were explored too: Labour pain; Socio-cultural reasons; Sexual reasons; & Bad experience in a previous delivery.

Labour pain

Labour pain was mentioned the common reason of requesting/demanding CS. Although a very small group of women such as educated/health professional request for CS to avoid labour pain. However, most of women especially younger women ask for CS because of not being able to cope with labour pain. An interviewee said, *'I see, a very small number of patients request for CS before labour pain but after starting labour pain most of the patient ask for CS because of pain. I also saw, some educated/health professional who saw the labour pain request CS because of fear of pain. Younger women below 20 years old cannot cope labour pain and request CS..." (D2)*

Socio-cultural reasons

Another reason for requesting a CS is as a safe option to the precious baby due to infertility and cultural preference for a baby boy. One interviewee said, "*One of the reasons is precious baby because of pregnancy after long time treatment for infertility…After identified sex of baby, if foetus is male, they think, normal delivery may put baby at risk and CS is the safest way to delivery baby….*" *(D3)*

Similarly, another cultural reason for requesting CS is auspicious time, as said by another interviewee, "*...Many of them demand of CS on an auspicious time as well...*" (N2)

Sexual reasons

Interviews and FGDs highlighted that a reason od requesting a CS for maintaining pelvic flower and size of vagina as well keeping sexual satisfaction. One interviewee stated, *"They ask for CS thinking that if they give birth vaginal route, then, it will damage the pelvic floor including vagina. In that case, they cannot give sexual satisfaction to their husband and their husband hates them...*" *(N1)*

Bad experience in a previous delivery

Some women have had a bad experience in a previous delivery, so they ask for CS. An interviewee highlighted, "*…they ask for CS because of previous bad experience of instrumental delivery such as vacuum/ forceps delivery, previous CS, mal/breech presentation, history of prolong labour..." (D1)*

Socio-demographic reasons

Educated, employed and rich women, women who received antenatal care from an expert doctor from private clinic, and younger women are found to be socio-demographic reasons for requesting a CS**.** One interviewee highlighted that educated and employed women usually request a CS, "*...Educated and employed women usually demand CS.*" (N2)

Similarly, another interviewee emphasised that rich women and women who had antenatal check-up from private clinic of an expert doctor demand a CS, *"...Some women who have official job and are rich ask for CS... Some women who have had ANC check-up from doctor's private clinic, they think, they are under special doctor's supervision, and they can get CS if they ask. Such type of woman expects more attention and demands CS.*" *(N1)*

Likewise, another interviewee added*, "...Younger women below 20 years old cannot cope labour pain and request CS. Older women above 40 years old undergo CS due to difficulty in giving normal birth..." (D2)*

3. Decision making process on CS in Karnali Province Hospital (KPH)

All interviewees agreed that the obstetrician/consultant on duty is responsible for the final decision for CS in KPH. However, the decision-making process is different for emergency and elective CS. The decision for emergency CS is made on the ward, an interviewee said, *"Labour progression is monitored by nurses on duty in first place. In any abnormal condition in labour... nurses on duty consult with doctors. The duty doctors consult with senior doctor on call such as consultant. Consultant makes final decision based on situation of mother and foetus." (D1)* For elective CS the decision is made prior to admission in hospital, an interviewee stated, *"...In case of elective CS, doctor and patient decide for CS in OPD and patient come to admit for CS in maternity ward." (N1)*

All interviewees said that the woman and their family are informed and obtain consent before performing CS. Information provided to pregnant women and their families include medical reasons of the CS to mother and foetus as well as advice on spacing the next pregnancy. An interviewee explained, *"We tell why to do CS and its risks and benefits to mother and child to all high-risk pregnant women who have indication of CS before operation. We explain about CS. We tell them to keep 3-4 years gap for next pregnancy..." (D2)*

However, some interviewees also mentioned that patients cannot always be fully informed about all aspects of the CS in emergency CS. An interviewee pointed out, *"In emergency cases,*

we won't have time to explain all about advantages and disadvantages of CS. In OPD, what doctor tells elective patient, I am not aware. However, we normally don't say about risks and benefits of CS in details." (N2)

4. Challenges for optimal use of CS

Four sub-themes identified on challenges to the optimal use of CS: 1) Lack of resources (shortage of staff and other resources), 2) Lack of adequate monitoring of labour, 3) Lack of awareness about mode of childbirth, and 4) Lack of companion support to women in labour.

Lack of resources (shortage of SBAs and other resources)

All interviewees agreed the main barrier to minimise the use CS is staff shortage (Skilled Birth Attendants and obstetricians), and some also pointed out of lack of equipment and space. An interviewee emphasised, *"We don't have enough Skilled Birth Attendants (SBA) for monitoring labour progression in labour ward. One obstetrician must cover all areas. Another thing is we don't have enough equipment and space." (D1)*

Lack of adequate monitoring of labour

Inadequate monitoring labour was highlighted by nearly all interviewees, one said, *"We don't have good and constantly monitoring system for labour in this hospital. We have CTG but it is not used monitoring continuously. Therefore, we are in dilemma, whether take risk or not. If anything, happen with baby, it could be dangerous to hospital and staff. Therefore, we do CS and CS rate goes up." (D2)*

Lack of awareness about mode of childbirth

Although all interviewees agreed that health education is provided to all pregnant women attending in ANC on various relevant topics but not counsel on mode of childbirth. Health education is given on warning sign of pregnancy, nutritional intake and immunisation. An interviewee stated, "*Health education to pregnant women is provided from ANC clinic regularly about all things such as warning signs on pregnancy, nutritious food intake, immunisations etc. In maternity ward, health education session is conducting at first hour in the morning every day*." (D1)

However, counselling on mode of birth is lacking. Another interviewee raised the issue inadequate preparation of women about mode of birth in ANC clinics, *"Many people are unaware of health risks of CS. We won't do proper counselling on advantages and disadvantages of normal delivery and CS in ANC in this hospital..." (N1)*

Lack of companion support to women in labour

The study highlighted the lack of companion support to women in labour ward and genuine need for such kind of support. One interviewee emphasised, *"…visitors are not allowed at all in labour ward in this hospital. Nurses cannot sit with them always…(N2)*

5. Strategies for optimal use of CS

Five sub-themes found on strategies for optimal use of CS: 1) Adequate resources and training, written protocol, 2) Raising awareness about mode of childbirth, 3) Companion support during labour, 4) Quality labour monitoring, 5) Minimise primary CS and avoid CS on demand.

Provision of adequate resources and training

Adequate number of trained staff/consultants and training, and well-equipped special maternity unit regular training were recommended for minimising CS rates. One interviewee emphasised on availability of trained staff/consultant for right decision making and training, *"... provision of trained staff, especially availability of consultant doctor to see patients at all times. Lack of competent staff sometime creates dilemma in decision making on CS. Therefore, regular training programme to be run for all staff …enough trained staff in labour ward." (N1)*

Another interviewee highlighted on adequately trained and motivated staff for provision of normal delivery, *"…If we have got trained, competent and dedicated staff we would do normal delivery rather than CS... Hospital should have enough trained/skilled staff. Management should take responsibility and initiation for all above." (D3)*

Most importantly, an emphasis given to necessity of special maternity unit with adequate number of motivated trained staff to promote normal delivery because commitment, interest and attitude of staff also matter in this issue. An interviewee emphasised, *"…establish special maternity unit with well-equipped and skilled …motivated/competent and dedicated staff who can give high priority for normal delivery. Because the general ward does not give priority of normal delivery. Staffs' commitment, interest and attitude also matter in this issue. So, staff in maternity ward should be enough, competent and dedicated to do normal delivery" (D1)*

Increase awareness on mode of childbirth

Both staff and pregnant women recommended for better health education or counselling on mode of birth during ANC visits from the initial stage of pregnancy, couple counselling and raising public awareness on advantages and disadvantages of CS and normal delivery.

One interviewee said, "…education to pregnant mothers from initial stage of ANC visit about mode of delivery, indication of CS, advantages and disadvantages of CS and normal delivery etc. Women, family and community need to be aware about these things. Health education in labour ward is not effective as women in labour pain do not understand well." (D1)

Another emphasised for couple counselling on normal birth, *"Counselling is required to pregnant women, especially couples should be counselled about normal deliver to remove negative concept about it." (FGD 2/p4)*

All interviewees highlighted to raise public awareness on CS and normal birth. One stated *"At first, we should know about difference between normal delivery and operation. All family members need to know the advantages and disadvantages of operation as well as advantages of normal delivery. Operation can affect mother and child health. Public awareness should be increased regarding disadvantages of operation and advantages normal delivery." (FGD 1/p1)*

Quality labour monitoring

All interviewees believed that constant monitoring in labour could help reduce CS. One highlighted of constant monitoring of labour, *"Hospital has to establish continuous labour monitoring system, so that, we can identify any complication on time..." (D2)*

Another emphasised on use of partograph along with availability human resource such as obstetrician/midwife/nurse, *"First of all, partograph should be followed strictly for labour monitoring and management. Competent and dedicated obstetrician and midwives/nurses to be available at all times for monitoring and evaluation of labour correctly…" (D1)*

Companion support during labour

All interviewees thought that provision of companion support from a family member during labour in hospital can promote normal delivery. One interviewee said, *"In my opinion... if we allowed at least one family member with woman in labour pain, who could help to her like back massage during the labour pain. So that, labour won't be long. Patients shouldn't do up and down alone with pain in bed, which can delay the labour." (N1)*

Written protocol

The study revealed the needs of written protocol for CS including minimising elective CS for maternal request and charging CS on maternal request, reducing primary CS, adequate monitoring labour, promotion of normal delivery, raising awareness on CS and antenatal education in ANC clinic, and provision of enough trained staff.

An interviewee emphasised, *"A protocol to be produced covering all the following issues: Elective/CS on demand to be minimised, ... good labour monitoring and management to be performed, normal delivery to be encouraged and CS to be done only when required." (N2)*

One interviewee advocated for charging for CS on demand to reduce CS on demand, *"...*

on demand must be charged as we have made policy in this hospital." (D3)

Similarly, another highlighted of need to avoid primary CS as well, "*First of all, we should try to minimise the primary CS and CS rate will reduce itself..." (N1)*

Likewise, the need of raising public awareness on CS was also highlighted*, "...must make policy to raise public awareness from grass root level on CS regarding when does and doesn't need CS, disadvantages of CS, advantages of normal delivery etc." (N1)*

Furthermore, one interviewee emphasised*, "...Policy must be reformed to sort out shortage of staff as well as discourage performing CS on demand. Hospital should make compulsory health education women regarding advantages/disadvantages of normal delivery and CS in ANC to all." (D2)*

DISCUSSION

The qualitative study revealed several reasons for high rate of CS in KPH. This hospital has been offering comprehensive obstetric care. Therefore, complicated and high-risk pregnancy cases are referred to this hospital. In addition, there was the perception that Safe Motherhood Program helped poorer women to access CS. The reasons for higher CS rate were found to be partly due to being a referral hospital. Medical reasons are regarded as the main reasons for performing CS in this hospital. Although there no written protocol on performing CS, but CS is conducted based on medical indications such as foetal distress, prolong/obstructed labour, antepartum haemorrhage, eclampsia, non-progress of labour, eclampsia, cephalopelvic disproportion, previous CS, placenta previa, foetal malpresentation and bad obstetric history as reported in many studies.[5,10] Similarly, advanced age of mother was also found to be a reason for performing CS. Many other studies also reported that higher age is associated with CS rates in Nepal[17,18] and South Asia.[5] CS is performed in the case of breech presentation in primigravidae.[19] Evidence showed that prelabour CS can minimise adverse perinatal outcome in breech presentation.[20] Similarly, VBAC is less practice in this hospital and repeat CS is commonly performed for women with a previous CS. It could be relatively unsafe in low resource setting.[21] Moreover, lack of auditing system of CS may not to control the rise of CS rate. Although Robson classification system is recommended by WHO to assess, compare and

monitor CS.[1] However, the classification of CS using Robson classification is rising in Nepal.[22] Although doctors are responsible for making the final decision on CS, but pregnant women have little involvement in decision making around an emergency CS.[23] The preferred mode of giving birth for all women is found to be normal delivery. A study conducted elsewhere also reported that 93% of pregnant women preferred vaginal delivery.[24] Similarly. performing a CS on maternal request was considered rare in this hospital. However, various reasons for requesting demanding CS were explored in this study as reported by another study CS.[6] Labour pain is reported to be main reason of demanding/requesting a CS. Women ask for a CS either because of fear of pain or not tolerating labour pain.[6,25] Maternal age - younger or older - was also highlighted as a reason for demanding CS. Evidence showed maternal age is associated with CS at maternal request.[26] Similarly, infertility/precious/male baby, bad experience of previous birth, choosing auspicious time/birthday are indicated the reasons for requesting CS.[6,26] Sexual dissatisfaction/dysfunction, cosmetic reasons or maintaining pelvic floor integrity are other reasons for requesting CS.[6,21]

Many challenges for rational use of CS are highlighted in this study. Shortage of skilled staff/resources is the main challenge for optimal use of CS in this hospital. This finding is similar to a study conducted in Bangladesh which reported that a shortage of staff was the reason of performing most of the emergency CS.[27] Similarly, lack of adequate labour monitoring is another constraint to reduce CS. VBAC would be unsafe due to the lack of resources including skilled human resources for the constant monitoring of labour.[21] It is not possible to do continue labour monitoring without sufficient skilled staff. A study in Nepal revealed that the partograph was filled completely only for 8.6% cases who underwent CS due to prolonged labour.[28] Likewise, lack of awareness on mode of childbirth among pregnant women and public is also found to a challenge for rational use of CS. While health education sessions are run in ANC clinic in this hospital, women are not counselled about mode of childbirth. Pregnant women may not have complete understanding on risks and benefits of CS and normal delivery.[29] Therefore, they would request a CS thinking CS is a pain free safe option.[6,25] Furthermore, lack of companion support to women in labour is also found to be a barrier to make reasonable use of CS. Companion support to women in during labour in hospital is not common in hospitals in Nepal. Women in labour leaving without companion support may not encourage them to go through normal delivery.

Several strategies for rational use of CS are suggested in this study. The study revealed that provision of adequate resources (Motivate SBAs and special maternity unit) would be a

strategy for reasonable use of CS. Availability of enough SBA trained, motivated staff in special maternity unit can promote normal delivery. Evidence showed that establishing midwife-led birthing centre for low-risk pregnancy in hospital setting can reduce CS and promote normal delivery.[30] An adequate number of trained SBAs should be available for providing quality maternity care, so that, they can provide counselling and health education in antenatal clinic, monitor labour and assist with childbirth. Similarly, provision of quality labour monitoring using a partograph would be another strategy to reduce rising rate of CS in this hospital. The partograph presents a figure of potential problems and explanations related to successful labour recording and management.[31] Likewise, raising awareness on mode of birth, risks and benefits of CS and vaginal birth, and indications for CS can be a good strategy to make rational use of CS. Most importantly, counselling of all pregnant women on mode of childbirth can be a good strategy to increase their confidence in normal birth. Adequate counselling on mode of childbirth can motivate women to choose normal birth and to reduce the fear of labour pain.[32] A study reported that couple-based antenatal education found to be is effective to increase spousal support and decrease elective CS rates.[33] Moreover, this study suggested that companion support from family during labour can be a good strategy to reduce CS. WHO also recommends a companion of choice for all women throughout labour and childbirth for positive childbirth experience and for quality improvement of maternity care.[34] WHO recommends conducting CS only for medically indications.[1] Primary CS should be minimised and CS on request/demand should be avoided to reduce CS rate. A written protocol regarding CS can be the best guideline for uniformity and common understanding. The written protocol for CS should be formulated including avoid elective CS for maternal request and charging CS on maternal request, reducing primary CS, adequate monitoring labour, promotion of normal delivery, raising awareness on CS and antenatal education in ANC clinic, and provision of enough trained staff.

CONCLUSION

The pilot study revealed several reasons for the current CS rate in KPH. Shortage of staff and lack of constant labour monitoring were the main challenges to optimal use of CS. Labour pain is the main reason for which women request CS. However, CS performed for maternal request was rare. Development of written protocols based on evidence would be the vital step for reasonable use of CS. Counselling of all pregnant women about normal birth and increasing public awareness around risks and benefits of CS and normal birth can play a vital role in reduction of fear of labour pain and CS. Establishing a birthing centre or special maternity unit

with adequate resources for low-risk pregnancy for promotion of physiological birth can minimise unnecessary CS.

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Appendix 11: CS rates including types of births in three consecutive years in two hospitals

Indicators	**PMWH**			**KMH**		
	Fiscal year 2074/75 (16/07/2017-15/07/ 2018)	Fiscal year 2075/76 (16/07/2018–15/07/ 2019)	Fiscal year 2076/77 (16/07/2019-15/07/2020)	Fiscal year 2074/75 (16/07/2017-5/07/2018)	Fiscal year 2075/76 (16/07/ 2018–15/07/ 2019)	Fiscal year 2076/77 (16/07/2019-15/07/2020)
Total Birth	20680 (100%)	22147(100%)	22461(100%)	770(100%)	702(100%)	699(100%)
Normal Births	12353(56.7%)	12445(56.2%)	12054(56.7%)	278(36.1%)	211(30.0%)	190(27.2%)
Instrumental Birth	8327(40.3%)	9702(43.8%)	2432(10.8%)	0(0.0%)	4(0.7%)	4(0.6%)
Caesarean Section	6082(29.4%)	7318(33.0%)	7975(35.5%)	492(63.9%)	487(69.4%)	505(72.3%)
Live Births	20486(99.1%)	21898(98.9%)	22213(98.9%)	749(97.3%)	682(97.1%)	689(98.6%)
Stillbirths	194(0.9%)	249(1.1%)	248(1.1%)	21(2.7%)	20(2.9%)	10(1.4%)

Appendix 12: Sociodemographic and obstetrics characteristics of the study variables

Socio Demographic Characteristics	Category	Frequency	Percentage
Types of Hospital	Paropakar	385	58.2
	Kathmandu Model Hospital	276	41.8
Age of mother	<20	51	7.7
	20-24	224	33.9
	25-29	206	31.2
	30-34	143	21.6
	35+	37	5.6
Gs Age	<30	9	1.4
	30-36	53	8.0
	37-40	577	87.3
	≥40	22	3.3
Pariety	Nulliparous	380	57.5
	Multiparous	281	42.5
Number of Pregency	Single	657	99.4
	Multiple	4	0.6
Foetal lie	Logitudal	660	99.8
	Transverse	1	0.2
Foetal Presentation	Cephalic	630	95.3
	Breech	30	4.5
	Other	1	0.2
Labour induction	Spontaneous	408	61.7
	Induced	76	11.5
	No labour	177	26.8
Previous Delevary Type	Normal	185	65.8
	CS	96	34.2
Current Delevery type	Normal	329	49.8
	CS	332	50.2
Birth other	1	380	57.5
	2	200	30.3
	3+	81	12.3
Time of delevary	Morning	314	47.5
	Afternoon	277	41.9
	Night	70	10.6
Type of CS	Elective	185	55.7
	Emergency	147	44.3
APGAR Score1	0-3	23	3.5
	4-6	275	41.6
	7-10	363	54.9
APGAR Score5	0-3	18	2.7
	4-6	15	2.3
	7-10	628	95.0

	<2.5	129	19.5
	2.5-3.9	521	78.8
Birth Weight	>=4	11	1.7
	Yes	29	4.4
Medical Condition	No	632	95.6
	Yes	53	8.0
BOH	No	608	92.0
	Male	355	53.7
Sex of Baby	Female	306	46.3
	0	6	0.9
	1-3	233	35.2
Number of ANC Visit	4+	422	63.8
	Hindu	471	71.3
	Buddhist	158	23.9
	Christian	25	3.8
Religion	Muslim	7	1.1
	High	258	39.0
	Middle	376	56.9
Ethnicity	Dalit	27	4.1
	Urban	345	52.2
Place of Residence	Rural	316	47.8

Appendix 13: Socio-demographic information of pregnant women who are attending in FGDs (Tables 1-4)

Table 1: FGD at Kathmandu Model Hospital- Group 1

SN	Socio-demographic information of women	Participant 1	Participant 2	Participant 3	Participant 4
1.	Age	29	32	33	33
2.	Education	Masters	Bachelor	Bachelors	BBS
3.	Occupation	Housewife	Administrative Officer	NGO Worker	Accountant
4.	Place of residency	Nepaltar, Balaju	Ramechap	Machapokhari	Dallu-15
5.	Number of children	0	0	0	1
6.	History of CS	No	No	No	No
7.	Husband's Education	Bachelors	Bachelor	Bachelor	Plus +2

Table 2: FGD at Kathmandu Model Hospital -Group 2

SN	Socio-demographic information of women	Participant 1	Participant 2	Participant 3	Participant 4	Participant 5	Participant 6
1.	Age	33	24	29	24	28	27
2.	Education	Plus 2	10	MSc	Lab tech	2	12
3.	Occupation	Beautician	Housewife	Researcher	Lab tech	Housewife	Housewife
4.	Place of residency	Bhaktapur	Bagbazar	On Bahal	Bagbazar	Swyambhu	Naikap
5.	Number of children	0	1	0	1	3	1
6.	History of CS	No	Yes	No	No	No	Yes
7.	Husband's Education	Masters	12	MBA	Bachelor	8	12
8.	Husband occupation	IT engineer	press	Software Engineer	Barber	Labour worker	IT

Table 3: FGD at Paropakar Maternity and Women's hospital Hospital – Group 3

SN	Socio-demographic information of women	Participant 1	Participant 2	Participant 3	Participant 4	Participant 5	Participant 6
1.	Age	20	22	28	21	20	26
2.	Education	12	12	Class 8	11	9	8
3.	Occupation	Housewife	Housewife	Housewife	Housewife	Housewife	Housewife
4.	Place of residency	Balaju	Chabel	Nepal tar	Kapan	Dhading	Tokha
5.	Number of children	0	0	1	0	1	0
6.	History of CS	No	No	No	No	No	No
7.	Husband's Education	Bachelor 2nd year	10 (SLC)	7	10	8	8
8.	Husband occupation	marketing	Driving	Business (shop)	Driving	Labor worker	Agriculture

Table 4: FGD at Paropakar Maternity and Women's Hospital – Group

SN	Socio-demographic information of women	Participant 1	Participant 2	Participant 4	Participant 5	Participant 6	Participant 7
1.	Age	19	31	22	28	28	27
2.	Education	11	Masters in finance	Plus 2	Plus 2	Bachelor	6
3.	Occupation	Nothing	Banker	Housewife	Housewife	Housewife	Business
4.	Place of residency	Jadibuti	Imadol-03, lalitpur	Kadaghari	Samakhusi	Ramkot	Jamal
5.	Number of children	0	1	1	1	0	1
6.	History of CS	No	yes	NO	No	No	No
7.	Husband's Education	SLC	Masters in finance	Bachelor	Masters' student	Masters	Literature
8.	Husband occupation	Nothing	Nepal electricity authority	Hotel	Teaching	Government officer	Business

Appendix 14: Details of key informants interviewees

S.N.	Name of Hospital/organisation	Position	Qualification	Number of years in position
1.	Ministry of Health and Population, Nepal/Paropakar Maternity and Women's Hospital	Chief consultant obstetrician and gynaecologist	Master of Doctorate (MD) in gynaecology and obstetrics	1/8 years
2.	Kathmandu Model Hospital	Medical director	MD, MS (consultant in gynaecological Surgeon)	1 year
3.	Midwifery Society of Nepal (MIDSON)	President of MIDSON	PhD	3 years
4.	Paropakar Maternity and Women's Hospital/ NESOG)	President of NESOG	Master of Doctorate (MD) in gynaecology and obstetrics	5 years
5.	Paropakar Maternity and Women's Hospital	Deputy director	Master of Doctorate (MD) in gynaecology and obstetrics	2 years

Appendix 15: Details of health professionals interviewees

S.N	Name of Hospital	Position	Qualification	Number of years in position
1.	Paropakar Maternity Hospital	Midwife officer	Bachelors in Midwifery Science	9 months
2.	Paropakar Maternity hospital	Midwife officer	Bachelors in Midwifery Science	9 months
3.	Paropakar Maternity hospital	Nursing in charge	Masters in nursing	36 years
4.	Paropakar Maternity hospital	Nursing officer, operation theatre in charge	Master degree in nursing	32 years
5.	Paropakar maternity hospital	Senior consultant	Master of Doctorate (MD) in gynaecology and obstetrics	2years
6.	Paropakar Maternity hospital	Senior registrar	MD in gynaecology and obstetrics	8 years
7.	Paropakar Maternity hospital	Senior consultant	MD in gynaecology and obstetrics	5 years
8.	Kathmandu Model hospital	Consultant gynaecologist	MD in gynaecology and obstetrics	7 years
9.	Kathmandu Model Hospital	Senior consultant	MD and Fellowship in gynaecology and obstetrics	20 years
10	Kathmandu Model Hospital	Consultant	MD in gynaecology and obstetrics and Fellowship in Gynaecological oncology	8 years
11	Kathmandu Model Hospital	Resident doctor	MD in gynaecology and obstetrics	4years
12	Kathmandu Model Hospital	ANM subfertility nurse	Auxiliary nurse midwife	6 years
13	Kathmandu Model Hospital	Staff nurse	Proficiency certificate level (PCL) nursing	18 years
14	Kathmandu Model Hospital	OT in charge	PCL nursing	18 years

Appendix 16: Data sources of themes and sub-themes on factors affecting the rising rates of CS

Themes	Sub-themes	Sources
Medical factors	○ Repeated CS/lack of VBAC	k1,k2,k3,k4,k5,p1,p2,p3,p4,p5,p6,p7,p8,p9,p10,p11,p12,p13,p14
	○ Complicated referral CS	k1,k2,k4,k5,p1,p2,p4,p5,p6,p7,p9,p10,p12,p13,FGD/p1,FGD/p2,FGD/p9, FGD/p10,FGD/p13.FGD/p15.FGD/p16.FGD/p18,FGD/p19
	○ CS for breech presentation	k1,K2,k3.k4,k5,p1,p2,p3,p4,p5,p6,p7,,p8,p10,p11,p12,p13,FGD/p1,FGD/ p3,FGD/p4,FGD/p4,FGD/p10,FGD/p12,FGD/p15,FGD/p16,FGD/p17,F GD/p18, FGD/p21,FGD/p22
Sociodemographic factors	○ Changing sociodemographic characteristics of obstetric population	k1,k2,k3,k4, k5,p1,p6,p7,p8,p9,p10, p11,p12,p13,p14,FGD/p1,FGD/7
	○ Precious baby	k1,k2,p7, p8,p10,p12,p14
	○ Lack of security of service providers, legal issues and defensive CS	k2k4,,k5,p6,p7,p9,p10
Financial factors	○ Income source of private hospital	K1,k3,P5,p8,p10,p11,p12,p14,p9,p5, FGD/p1
	○ Incentive for CS in public hospital	P2,p4
Non-medical factors	○ Maternal request	k1,k2,k3,k4,k5,p1,p2,p5,p6,p7,p8,p4,p9,p10,p11,p12,P13,FGD/p1,FGD/p 3,FGD/p7, FGD/p13,FGD/p18,FGDp/22
	○ providers' attitude on CS	k1,k2,k3,k4,k5,p6,p7,p9,p11,FGD/p17,FGD/p10,FGD/p18

Health services related factors	1.Lack of awareness on mode of childbirth	k1,k2,k3,k4, p1,p2.p3,p5,p8,p9,p10,p12,p13,p14,FGD/p9, FGD/p12
	2.Lack of adequate resources (midwives or SBAs)	k1,k2,k3,k5,p2,p1,p4,p5,p13, FGD/p12
	3.Centralisation of health facilities in urban Nepal	k1,k2,k4,k5,p2,p9,p13
	4.Lack of appropriate policies and protocols:	k2,k1,k3,k4,p1,p2,p4,p6,p7,p8,p9,p11
	○ lack of written protocols and policies on CS	k3,p1,p2 k3,p1,p2,FGD/p6,FGD/p21
	○ lack of models of maternity care	k1,k2,k3,k4,p2,p10
	○ lack of respectful maternity care	
	○ lack of policy on awards for low CS or monitoring and supervision for high CS,	k3,p9
	○ lack of political commitment on implementation of international recommendations	k1,k2,k3,k4,p1,p7,p9,p10
	○ lack of appropriate auditing of CS	

Appendix 17: Data sources of themes and sub-themes on reasons for requesting CS

Main Themes	Sub-themes	Sources
labour pain	• fear of labour pain/avoid pain • not coping labour pain	K1,k4,p1,p2,p3,p10,p11,p14,FGD/p1-9,FGD/p17-19, FGD/p21,FGD/p22 K3,k4,p1,p2,p4,p6,p7,p8,p9,p11
sexual reasons	• maintain pre-birth vagina • maintain sex life • avoid vaginal damage	K3,k4, FGD/p12 K3, FGD/p12 K1,FGD/p12
Poor obstetric history	• miscarriage • stillbirth/IUFD	P5 P4,p5
Following fashion/ peer pressure	• Perceiving free of complication • Short cut & easy way • Giving birth only one or two children	K3,p2,p5,p9,p11 K3,k5,p2,p4 K4,p8,p2.p5,p6,p7,p10,FGD/p3
Auspicious date and time	• give birth on an auspicious date and time • give birth preferred date and time	P2,P8 P2,FGD/p1,FGD/p20
Avoid risk/complications	• cord round neck • avoid complications • avoid emergency CS • precious baby/IVF	P5,P7,p11,p13,FGD/P16 P6,p7,P9,p11,p13,p14,FGD/p1,FGD/p13,FGD/p15,FGD/p16 P9,p13 K2,P5,p8,p10,p14
Bad experience on previous vaginal birth	• Faced difficulties in previous vaginal birth	P3,P5

Appendix 18: Data sources of themes and sub-themes on strategies rational use of CS of CS

Themes	Sub-themes	Sources
Provision of adequate resources	1. SBA training and availability of trained staff	k1,k2, k3, k4,p7,p5,p13
	2. Production and utilisation of midwives	k2,k3,k4,k5,p1,p2,p4,p5,p7
	3. The establishment of birthing centre in each urban hospital	k2, k3,k4,k5,p1,p2,p5
Raising awareness around mode of childbirth	1. Counselling of pregnant women for normal birth	K1,k3, k4,k5,p1,p2,p3,p4,p5,p6,p7,p8,p9,p11.p12,p13,p14,FGD/p1, FGD/p6, FGD/p7, FGD/p9,FGD/p10 FGD/p12, FGD/p13, FGD/p15, FGD/p17, FGD/p18
	2. Raising awareness of pregnant women around mode of childbirth	k1,k3,K4,p1,p2,p3,p4,p7,p9,p10,p11,p12,p14,FGD/p1,FGD/p7, FGD/p12,FGD/p14,FGD/p15, FGD/p17, FGD/p18, FGD/p19, FGD/p22
	3. Raising awareness public awareness on mode of childbirth	k1,k2,k3,k4,k5,p1,p2,p3,p7,p9,p10,p14,FGD/p7, FGD/p9, FGD/p12, FGD/p20
Reform policies and protocols for CS	1. Policy for avoiding CS for non-medical reasons and primigravidae/primary CS	k1,k4,p1,p2,p3,p5,p6,p7,p9,p11,p12,p14,FGD/p7,FGD/p10, FGD/p17,FGD/p20
	2. Appropriate use of partograph for labour monitoring	k1,k3,p3,p6
	3. Rewards for, and investigations of, auditing/monitoring hospitals in relation to CS rate	k1,k4,k5,p12,p10
	4. Monitoring of private hospitals	k1,k3,k4,k5,p2,p7,p8,p9,p10
	5. Fixed service charge for CS	k1,k3,k4,k5,p1,p2,FGD/p1
	6. Use of Robson classification to enable proper comparison	k2,k3,p7,p9 k3,k4,k5,p7,p9,p10,p11,p13
	7. Provision of VBAC and trial of labour for breech presentation	k2,k4,k5,p6,p9,p10,p11
	8. Provision of security of service providers	k5
	9. Decision making around CS by two consultants	k1,k3,k5,p9,p10
	10. Commitment to implementation of international recommendations (Robson	

	classification, midwifery model of care and respectful maternity care)	
Promotion of physiological birth	1. Promote the midwifery model of maternity care 2. Manage low-risk cases by midwife in birthing centres 3. Provide VBAC and trial of labour 4. Promote instrumental birth 5. Provide painless birth 6. Involve husbands 7. Improve care during pregnancy 8. Improve care in public hospitals	k2,k3,k5,p1,p2 k2,k3,p1,p2 k5,p6,p9,p10.p11 k5,p6 k1,k4,k5,p5,p6,p7,p8,FGD/p14 p2,p3,p9,FGD/p5,FGD/p6,FGD/p9,FGD/p12,FGD/p16,FGD/p18,FGD/p22 p1, p2,p6,FGD/p1, FGD/p15,FGD/p16,FGD/p18,FGD/p21,FGD/p22

Appendix 19: Certificate of attendance in GLOW conference in 2020

Appendix 20: Certificate of attendance in GLOW conference in 2022