ENHANCING THE UNDERGRADUATE MIDWIFERY CURRICULUM: A QUALITATIVE INQUIRY OF DRUG AND ALCOHOL BABY SIMULATORS AS A CREATIVE PEDAGOGICAL TOOL

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Ethical approval: Ethical approval was obtained from the University Research Ethics Committee No: 22036. An e-mail with a participant information leaflet and a participation agreement form was sent out to all Level 4 midwifery students. At the start of the session both verbal and written consent was obtained. Students were reminded that they could withdraw at any point and non-participation would not impact on their studies. In addition, if the students found the content distressing there were services based at the University they could be directed to if need be. In addition, student contributions were anonymised to ensure they were not identifiable.

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Abstract:

Background: Simulation in midwifery education in the UK is mostly related to developing clinical skills such as obstetric emergencies. However, there is minimal use of neonate simulators in educating student midwives about the impact of teratogens on fetal development and very limited research using neonatal simulators as a creative pedagogical tool in undergraduate midwifery education.

Objectives: The two main objectives were 1) to ascertain whether students could recognise the physical impact of teratogens in the early postnatal period whilst interacting with the simulators and 2) to explore whether midwifery students understood their role as future midwives when working with pregnant women who may be misusing substances.

Design: This research was qualitative in nature using thematic analysis to generate themes.

Study setting and participants: Level 4 student midwives from a UK University in the South of England participated in the study.

Methods: A taught session on protecting the unborn environment was provided and students were tasked to interact with Low fidelity Foetal Alcohol Syndrome Simulators and Medium Fidelity Drug Affected Simulators. Data collation included student responses to group activities such as interacting with the simulators and considering their role as future midwives in educating pregnant women about the impact of teratogens on a foetus and newborn baby.

Results: The results indicated that the use of the simulators was a useful pedagogical tool for enhancing student knowledge around teratogenesis and fetal impact.

Conclusions: Neonatal simulators can be used to engage undergraduate midwifery students and enhance their learning and knowledge.

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INTRODUCTION

Pregnancy offers women an opportunity to change their patterns of alcohol and substance use (Stone 2015; Forray 2016) and it likely that the advice and support of midwives will have an impact on women's understanding in avoiding risk (Fleisher 2011; Schölin et al. 2019). Advice should be up to date, consistent, factual and non-judgemental to encourage successful engagement of substance-misusing women with maternity services (Radcliffe 2011). Midwives have reported wanting more support and education on the impact of teratogens on fetal development (Winstone and Verity 2015) and a more recent study discovered that 69% of midwives had received fewer than four hours of alcohol training prequalification, 19% had received none and only two thirds of the midwives provided information about the effects of alcohol consumption in pregnancy to pregnant women (Schölin et al. 2019). A similar picture emerges for illicit drug use during pregnancy (Doleman et al. 2019).

First year undergraduate (UG) midwifery students are likely to have little experience, knowledge, confidence and skills in caring for pregnant women including those who may misuse substances like drugs and alcohol. Midwifery students may also have preconceived stigmas about these pregnant women that need addressing (Geraghty et al.2018; Doleman et al.2019). In addition, research has indicated that pregnant women who misuse substances find engaging with antenatal services difficult as they fear negativity, hostile interactions from healthcare professionals including midwives (Kerker et al. 2004) and report staff's negative attitudes towards them as more significant than the medical care they receive (Hall and van Teijlingen 2006). These studies highlight the importance for midwives to feel confident in providing judgement free evidence- based advice on substance misuse during pregnancy and the need to consolidate the knowledge on its impact during

pregnancy at undergraduate level midwifery education (Schölin et al. 2019). It is important to manage and support women who are misusing substances by developing ongoing respectful partnerships (Miles et al. 2013; Schölin et al. 2019).

In recognition of real-world impacts to mother and baby from substance misuse during pregnancy, researchers have recommended that undergraduate midwifery curricula should address midwifery students' knowledge with the aim of improving the quality of antenatal advice and support which will help lead to better prevention, intervention and recognition of the signs and symptoms of fetal alcohol syndrome and that of drug misuse (Winstone and Verity 2015; Howlett et al. 2019; Schölin et al. 2019). The literature therefore highlights a gap in midwifery knowledge, including understanding the impact of teratogens on fetal development as well as the impact on the newborn baby exposed to substance misuse during pregnancy which could be addressed at undergraduate level.

Within the undergraduate midwifery curricula various teaching strategies including simulation are used to enable students to gain the relevant knowledge and skills around safe woman-centred care (Durham and Alden 2012). Simulation based education (SBE) as a learning strategy is well established (Vermeulen 2016; Nursing and Midwifery Council [NMC] 2019) and is seen as a vital pedagogical resource within midwifery education (Chitongo and Suthers 2019). Students value the opportunity to use simulators in acquiring knowledge and confidence, increasing self-efficacy, developing critical thinking skills within a safe environment and proficiency prior to entering into practice, as a means to improve maternity care (Cant and Cooper 2016; Doolen et al. 2016; Yuill 2017; Chitongo and Suthers 2019). The SBE approach is based on experiential learning theories such as Kolb (1984) and Blooms Taxonomy (1956). Students gain concrete experience from interacting with the simulator rather than simply listening or reading about a topic. Students can then reflect upon their observations and experiences with the simulator as well as actively experimenting with

simulated practice (Zigmont et al. 2011). As a result, students become immersed in a constructionist pedagogy relating theory to practice and consideration of future actions (Kolb 1984).

Simulation based education cannot replace 'real-life hands-on' clinical practice but can 'bridge the gaps' between simulation and life practice (Lendahls and Oscarsson 2017). Simulation can help improve knowledge and clinical performance, for example around obstetric emergencies (Gundry et al. 2010; Yuill 2017). In this situation it enables students to be immersed into a semi-realistic safe, classroom based facilitated environment they can assimilate clinical knowledge and gain skills mastery through kinaesthetic awareness and reflexive observation (Dow 2012; Chitongo and Suthers 2019). Through carefully planned, structured and constructive simulator sessions students can learn from practising scenarios within a positive pedagogical dialogue with the lecturers (Brady et al. 2015; Council of Deans Department of Health [CoDH] 2017). More importantly, reflective debriefing sessions post simulation experience enables students to embrace the use of simulators as new technology and question how they relate to practice (Dreifuerst 2012).

There are different typologies of simulators ranging from static, or low fidelity simulators (LFS) to medium fidelity simulators (MFS) to fully interactive high-fidelity simulators (HFS)(Meller 1997). LFS are not interactive and are non-computerised mannequins or body parts such as a task trainer to help student midwives undertake vaginal examinations(Brady et al. 2014) or using a birthing simulator (MamaNatalie®) to train students about the third stage of labour (Joho et al. 2021). Medium fidelity simulator (MFS) facilitate greater student interaction and demonstrate more physiological characteristics (such as heartbeat and breathing sounds) but according to the National League for Nursing Simulation LFS are not as realistic as HFS (NLN-SIRC 2013). MFS examples include the lower torso of a pregnant woman to facilitate learning around breech birth (Brady et al. 2014) and the post-partum haemorrhage simulator (PPS) (Ntlokonkulu et al. 2018). Finally, the most realistic high-fidelity simulators (HFS) are fully interactive such as the full body birthing simulator which mimics a woman during labour and birth (Cooper et al.2012). This paper therefore considers

the question: *Does the use of low and medium fidelity drug and alcohol neonate simulators enhance undergraduate midwifery student's knowledge about the impact of teratogens on pregnancies?* The overall objective of the study was to explore the use of drug and alcohol neonate simulators as a pedagogical tool to enhance knowledge of teratogens during pregnancy and the early postnatal period. The aims were 1) to ascertain whether students could recognise the physical impact of teratogens on the neonate whilst interacting with the simulators and 2) to explore whether midwifery students understood their role as future midwives when working with pregnant women who may be misusing substances.

METHODS

Study design and settings

Intervention

This study used two neonatal simulators (Image 1). The low-fidelity (non-interactive) Fetal Alcohol Syndrome (FAS) simulator illustrates the effects of gestational alcohol consumption on the neonate including the physical facial phenotype malformations (thin upper lip, smooth philtrum and small palpebral fissures) (Image 2). The medium-fidelity (interactive) Drug Affected Simulator (DAS) demonstrates a painful facial expression, smaller size for gestational age and emits cries and tremors of a baby experiencing Neonatal Abstinence Syndrome (NAS) withdrawal symptoms from an on off switch located on the simulator's back (Image 3).

Image 1: The Fetal Alcohol Simulator (FAS) static low fidelity simulator on the left and the Drug Affected Simulator (DAS) medium fidelity simulator on the right.

Image 2: A guide for the three diagnostic facial features of FAS. Copyright 2019, Susan Astley PhD, University of Washington.

Image 3: Reverse view of the DAS simulator with the medium fidelity on-off switch

Sampling and Recruitment

Fifty midwifery students from a university in the Southwest of England were recruited to the study. The students were a third of the way through their first year of an undergraduate midwifery programme and were being taught the topic 'Protecting the Unborn Environment' which focused on teratogens and the impact to foetal development. Recruitment to the study was based around students who were willing to partake with the taught session activities and share their experiences.

Design

A powerpoint presentation outlining the effects of teratogens on the developing fetus and newborn baby was provided to facilitate knowledge. At intervals during the session, students were encouraged to interact with the FAS and DAS simulators individually and within small groups.

Data collection

During the taught sessions when students interacted with the drug and alcohol simulators, they were asked questions relating to the physical attributes of each simulator including observation and listening. Students then answered the questions (tables 1 and 2) as a group on worksheets which were collected by author one at the end of the session.

Fetal Alcohol Simulator Student Questions	
1.What do you notice about the physical features that are different from the features of a typical baby? 2. What are the non-visible effects of antenatal exposure?	3.What would life be like for a child with these physical abnormalities, and for the parents/guardians of a child with FAS?

Table 1: Questions for students' post-interaction with the FAS neonate simulator

Drug Affected Simulator Student Questions	
1.What do you notice about the physical features? Are different from the the features of a typical baby? 2.What are the physical effects of antenatal exposure to drugs on the newborn baby?	3.How is the cry different from the cry of a healthy infant? 4.What would life be like to care for an infant showing the effects of antenatal drug exposure?

Table 2: Questions for students' post-interaction with the DAS neonate simulator

Further data collection consisted of a 'thought shower' where students were asked to explore how the simulators could be used to teach others in a beneficial and effective way and how they might educate pregnant women on the teratogenic effects of alcohol and drugs through using the simulators. This data was collected on post-it notes.The final activity involved the use of a padlet where students logged onto a URL and responded to questions through that forum (table 3).

Padlet Questions	
Question 1	Question 2

What additional knowledge have you gained from interacting with the simulators that you might have missed from the lecture provided?	How did interaction with the simulators enhance your understanding of the teratogenic effects on the fetus?
Question 3 What advice would you give a pregnant woman who is taking drugs?	Question 4 How do you see your role as a student midwife if a baby displays features/symptoms of FAS or DAS?

Table 3: Padlet questions for students

Analysis

The six-stage framework offered by Braun and Clarke (2013) was used to thematically analyse the feedback obtained from the group activities, the individual post-it notes and the Padlet responses. Both researchers initially and separately familiarised themselves with the data from the sources described above (Stage 1). Preliminary codes were then independently analysed by both researchers including searching for patterns or recurring themes within the data (Stage 2). The authors then met to discuss the preliminary findings and to explore the emergence of the initial codes. The codes were then organised into themes by examining in-depth, patterns, differences, and similarities within the data (Stage 3). Relevant verbatim quotes were then sorted and linked to each of the identified themes so there were identifiable distinctions between the themes which were then reduced (Stage 4) and given appropriate names (Stage 5) (Braun and Clarke 2013).

Ethical considerations

Ethical approval was obtained from the University Research Ethics Committee No: 22036. An e-mail with a participant information leaflet and a participation agreement form was sent out to all students. At the start of the session both verbal and written consent was obtained. Students were reminded that they could withdraw at any point and non-participation would not impact on their studies. In addition, if the students found the content distressing there were services based at the University they could be directed to if need be. No student was identifiable from the feedback obtained from the group activities, the thought shower or the Padlet.

Findings

The findings are presented within three main themes: Kinaesthetic Learning, “In their shoes” and Midwifery Role in Educating Others, with the final theme encompassing three sub-themes: Visual Aid to enhance knowledge, Specialised services, and Practical Suggestions.

Kinaesthetic learning

Many of students indicated that they valued interacting with both neonatal simulators and the simulators appeared to enhance their knowledge:

> *To see the physical effects boosted my understanding of the effects as I am a visual learner and was then able to discuss with my peers*
>
> *I felt the doll interactions shocked me yet has added depth to the information I give to women*

More specifically, students found interacting with the static FAS simulator was visually impactful:

> *Visually seeing the effects on a baby helps to realise the real damage teratogens can have and the sad reality*

Students appeared to easily identify the features of the simulator affected by FAS by distinguishing some of the following features on the simulator:

> *Thin upper lip / protruding lips/mouth*
>
> *Prominent forehead/flat nose*
>
> *Lack of philtrum*
>
> *Small skinny*

Furthermore, switching the DAS simulator button enabled students to hear the shrill cry and feel the tremors.

> *Hearing the doll crying had an impact on learning and made me think more about the importance of educating women*

"In their shoes"

Within this theme students appeared to assimilate how the teratogens would impact on the child in the long term such as when going to school and on the family:

Bullying at school
Continuous medical care
Challenging behaviour and learning difficulties
Long term non-visible effects (behavioural difficulties when older etc)
Guilt

Students were also aware of their role and responsibilities when considering the impact that teratogens may have on the woman herself and the foetus:

Be sensitive do not judge them or make them feel bad

Deliver info so it doesn't sound like a telling off; To support women emotionally and practically with my knowledge"

To be aware of the signs and symptoms to be able to identify a baby suffering withdrawal, perhaps for a mother who hasn't disclosed substance abuse

Support for parents as damage has been done and psychological effect on them would be harsh

Midwifery Role in educating others

This overall theme encompasses several sub themes which are all related to using the simulators to educate a wider audience around the impact of substance misuse during pregnancy.

Visual Aid to enhance knowledge

Many of the students identified that knowledge around the impact of teratogens on the fetus needed to be known before pregnancy, even whilst at school

When women are pregnant it's too late. Give talks in schools/colleges

Women aren't fully aware of teratogenic effects. Need to educate every woman as mandatory education starting from school particularly as FAS NAS effects aren't always visible

Set up youth groups where all teenagers attend including vulnerable ones who already drink/take drugs/smoke

In addition to providing education to young children and teenagers, students also felt that the simulators could be used to educate women at the pregnancy booking visit:

> *Use FAS/DAS dolls in maternity classes and provide verbal information at booking*
>
> *Dolls could be very useful at booking appointment time especially if the woman discloses drug/alcohol addiction and wants to know effects on her baby*
>
> *Talk to women with visual aids/video showing on screens in waiting rooms*
>
> *At booking appointment discuss with them the effects of drugs and alcohol and provide them with relevant leaflets and information so they are aware NO ALCOHOL*

However, one student stated that the simulators could be used as a visual aid to alert pregnant women to abruptly reduce their substance misuse:

> *Use shock tactics with women who think a small amount of alcohol is ok during pregnancy. Seeing the effects of that on the doll*

Specialised services

Student responses also suggested that specific antenatal classes could be offered for women who identified at the booking visit as having problems with substance misuse and the simulators could be shown to add context:

> *Make it mandatory to ask this at booking appointment recorded on notes with advice to attend classes*
>
> *Practical antenatal classes, where women can measure out 1 unit of alcohol between different beverages to compare/teach them about teratogens effecting fetus.*
>
> *Run parentcraft sessions for pregnant women who drink/take drugs and set up classes after booking rather than post 20 weeks.*

Practical Advice:

Finally, the students were able to state what recommendations they might offer to women following interaction with both simulators:

> *Explaining what the effects are and at each stage, backing up with long term and short-term effects to the baby*

That there is help available and to go for it to give your baby the best start in life

To advise her of all the different outcomes that could happen if she continues to take drugs. She may be more inclined to stop if she was aware of the damage

DISCUSSION

Literature exploring the use of neonatal simulators within the undergraduate midwifery curriculum is limited and typically confined to neonatal resuscitation (Cooper et al.2012). This study is therefore reporting on the use of low-fidelity Fetal Alcohol Simulator (FAS) illustrating the effects of alcohol consumption and the medium-fidelity interactive Drug Affected Simulator demonstrating the effects of Neonate Abstinence Syndrome (NAS) on the neonate. Research by Scholin et al. (2019) has revealed that midwives have identified a lack of knowledge within the undergraduate midwifery programme in relation to the impacts of substance misuse. An earlier finding was similarly reported by Winstone et al. (2015).

Overall, the findings indicated that the use of the simulators was a useful pedagogic tool in engaging students and to facilitate knowledge around the teratogenic effects of substance misuse during pregnancy and in the postnatal period and their role as future midwives in educating 'others'. The simulators appeared to be effective in improving understanding from a single interaction as the students engaged better during the taught session due to the kinaesthetic effects of being able to hold, touch, feel and listen to the simulator, particularly the medium fidelity DAS simulator which could be turned on via a switch on its back. In addition, the FAS simulator showed the physical impact of the effects of alcohol on the neonate (dysmorphic facial features, and a smaller and skinnier stature) which students easily recognised and were also able to appreciate the immediate and possible long-term impacts of gestational alcohol exposure.

This study's findings may help to bridge the known 'theory-practice' gap (Power and Cole 2017) as neonatal simulators can be used to prepare students to confront situations that they may only face when qualified (Yuill 2017). Pregnancy being a 'teachable moment' or 'golden period' in women's lives (RCM 2017: 8) provides an opportunity for midwives to explore issues around drug and alcohol

use, however it might be a difficult subject for students to broach. Therefore, the use of neonatal simulators could be utilised in the form of role play at undergraduate level which would help students to practice and enhance their communication skills with potentially difficult public health messages (McNeill et al. 2012). The use of neonatal simulators at undergraduate level does enable students to engage with realistic public health situations but further research around this approach is required (RCM 2017).

A further finding from the study was that although many students were able to put themselves into the shoes of these women and empathise with their situation, one student felt that the simulators could be used during antenatal classes as a visual aid to 'shock pregnant women' into understanding the impact of teratogens during pregnancy. This 'tactic' suggests that simply explaining the impact of substance misuse would not be as effective as using the simulators to reinforce the visual and physical impact of drugs and alcohol on the neonate. According to Scholin et al. (2019) the more experienced qualified midwives become, the notion of using shock tactics is overridden by building more trusting relationships as a way to tackle these issues. Therefore, first year student midwives are still in the early stages of learning how to communicate in a person-centred manner within a humanised framework of care with pregnant women (Way and Scammel 2016) who misuse substances and midwife/woman relationships are important when having to communicate public health messages (McLellan et al. 2019).

A study undertaken by Winstone and Verity (2015) highlighted that just 20% of midwives provided information about antenatal alcohol use if there was a known risk factor, which indicated to the authors that there was unwillingness by the midwives to discuss alcohol. Therefore, the concept of 'knowing what to expect' as reported by Kelly et al. (2014) has identified that when student can anticipate what happens in the workplace, this can lead to contextual experiential learning where students are able to recall simulation experiences. This in turn, enables students to use their knowledge when providing antenatal care. In this study, student midwives could think

reflectively about their role in the future to help educate pregnant women earlier as prevention is key, although many recognised that if features of FAS or NAS were present then the damage had already been done and all they could do is to be supportive and compassionate.

Research by the RCM (2017) demonstrated that in order to address important public health messages such as avoidance of using drugs and alcohol during pregnancy, midwives need to be confident in their knowledge. Their research highlighted a need for further training and greater understanding around certain teratogens such as alcohol and drugs. It is recognised that students learn theoretical knowledge during the UG programme around public health and protecting the fetus. However, this knowledge is likely to fade overtime (James et al. 2019) unless learning is consolidated with experiential understanding gained from direct experience with drug and alcohol issues during pregnancy. To address this gap, neonate simulators can be used to maintain ongoing knowledge post-qualification through mandatory update training sessions. However, this needs further research as this area is not considered within the mandatory training as provided to midwives by maternity services within NHS hospitals (RCM 2017).

Limitations

Despite the positive impact of the neonate simulators as creative pedagogy there were several limitations to the study. Firstly, only one cohort of student midwives participated in this research meaning the findings are not generalisable but may be useful to other Higher Education institutions who are considering the use of neonatal simulators within their undergraduate programme (Carminatti 2018).. Although the taught session was only 90 minutes in length and more time would have been beneficial to enable an in-depth exploration of the issues being covered, a large amount of rich data was evident during the analysis.

Nevertheless, this study's findings support previous research on simulation-based education in terms of improving knowledge, enhancing confidence, and developing clinical skills (Dow 2012; Deegan and Terry, 2013; Kelly et al.2014; Lendahls and Oscarsson 2017). This reflects the view of

the Department of Health (2011) which has stated that simulation-based learning should be used to increase students' learning to benefit and improve 'patient' care. Additionally, our findings support the use of question-and-answer debriefing sessions post simulation interaction (Guhde 2011; Chitongo and Suthers, 2019) to enhance positive pedagogical dialogue between the students and the lecturers around the issue of substance use during pregnancy.

Conclusion

The immediate impact from interacting with the FAS/DAS simulators was evident as the midwifery students showed increased awareness of the influence of drugs and alcohol on the newborn during the teaching session. Students had a stronger appreciation aware of their roles as future midwives in educating pregnant women about the impact of substance misuse during pregnancy. The authors suggest that the use of the FAS and DAS simulators could be a useful integrative educational strategy that other HEIs could incorporate within their undergraduate curricula for health sciences students.

Key Words: Creative pedagogy; neonate simulators; midwifery education; Fetal Alcohol Syndrome; Neonate Abstinence Syndrome

Key points

- Neonate simulators are useful pedagogical tools for the UG curriculum.
- Simulators can bridge the gap between theory and practice.
- Students were able to show empathy towards women with babies' showing Fetal Alcohol Syndrome Disorders and Neonate Abstinence Syndrome.
- There is a need for ongoing education for post-qualified midwives on the impact of drug and alcohol use during pregnancy.

Reflective questions

1. How will qualified midwives keep their knowledge up to date on these issues affecting pregnant women that use drugs and alcohol during pregnancy?

2. How should neonate simulators be used as part of mandatory training for post-qualified midwives?
3. How can neonate simulators be incorporated as standard in the UG midwifery curriculum?

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