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EVIDENCE BASED MIDWIFERY

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Masked identity in COVID-19: seeing the face of midwives and mothers

Keywords: COVID-19, masks, midwives, Evidence Based Midwifery, ocularcentrism

Since the COVID-19 pandemic 'lock down' in March 2020, birth in our maternity wards and at home has changed face ... the taken-for-granted, 'seeing' the face of the midwife caring for a woman in labour has been shattered by fear of infection and replaced by 'masked identity'.

The history we are creating will be written about for years to come and those who have lived through it will never forget these unprecedented times. Therefore, I would strongly encourage you to keep a diary and write about the thoughts, fears, joys and unexpected events that you have experienced. Take pictures, collect the nomenclature used in the literature and map your personal and professional journey through this difficult period in human history. The life stories of midwives and mothers in this pandemic matter now and in the future.

In my last editorial, I shared some of the memories of living through troubled days in Northern Ireland and as I write this editorial today, I remember the faces of many mothers who placed their trust in me (Sinclair 2020a). I feel privileged to have been able to walk away from the life of an artist to that of a midwife. I know being able to help a mother to birth her baby and help a father be part of that wonder, has been one of the most fulfilling aspects of my life.

Recently, I have been listening to my colleagues in clinical practice, hearing about their experience of wearing masks and protective clothing and learning about their personal and professional challenges. My thoughts have been focusing on masks: I have been wondering why they are so evocative and I have been trying to understand why some people are reluctant to wear them. I began to think about different types of masks and considered those worn by clowns, actors, Halloween characters, tribal leaders and religious leaders. I concluded that the reasons for wearing these are mostly to create a deliberate impact of wonder, fear or joy; emotions felt by us when we *see* them. The context in which a mask is worn is a key factor that enables us to accept its use and be comfortable in their presence. Our children quickly accept the masks worn by superheroes and most look forward to taking on a new masked identify at Halloween. Historically, we find many references to the use of masks in the 1800s to protect workers from harmful substances, such as gases or chemical burns (Walton 2020). However, it was close to the end of the eighteenth century before our knowledge of germs and infection improved and some surgical mask wearing was promoted by the medical profession (Moynihan 1906).

Living in Northern Ireland, the very thought of wearing a face mask, or talking about it, brings memories of the 'Troubles', the wearing of balaclavas, closed helmets and the vision of blackened faces: all associated with hiding or protecting one's identity. The armed forces, police and terrorists in Northern Ireland, all used face coverings to protect them from becoming visible or known to the enemy. This was a deliberate act of self-protection driven by fear of the repercussions of being caught on camera or targeted by one group or another. Wearing balaclavas is designed to instil fear. In those days, life was under threat from a human attack not a viral attack! This memory associated with mask-wearing is part of our cultural history and is worth mentioning when we hear about public reticence, or even resistance, to conforming to the recommended guidance and safe practice of mask-wearing (Department of Health (DoH) 2020).

I have focused on a local situation because having lived and worked through it adds a greater awareness of the lasting effects of masked men in our specific community. However, it is important to look nationally and internationally and recognise that concealing one's identity for 'good' or 'bad' reasons is true of every culture/country. It is true of individuals involved in recent riots in the USA, highwaymen in the past and in the behaviour of the Ku Klux Klan (KKK). Surgical masks do hide identity! Maskaphobia

is a recognised psychological condition that causes people to have panic attacks when they see masks. It is important for us to remember this as a woman may become traumatised during birth if we insist on sticking to the protocol and do not weigh up the potential for good and harm, using the evidence and guidance with wisdom. In addition, wearing masks makes it difficult for people to hear properly due to muffling of the voice and is an even bigger problem for those who depend on lip reading to supplement hearing loss.

We need to *see* behind the mask, we need to *see* down the microscope, we need to *see* space. Seeing is part of our being and ocularcentrism is a key factor in our modern technological world (Sinclair 2020b). Modern technology fulfils some of our current need to see but we are not satisfied. Yes, with modern technology, we enjoy seeing people on FaceTime, Skype, Microsoft Teams or Zoom, and we are miffed if we just have voices and no pictures. For most of us, we still need to see the person's face, hear their voice and, if possible, touch them (Sinclair et al 2019).

In the past month, I have had email and Skype chats with mothers, health professionals and researchers to hear directly from them about the impact of COVID-19 and, in particular, to hear what they thought about wearing face masks. I would like to share some of their responses with you as a collection of professional mothers' voices (not collected for research purposes and therefore not subject to any thematic analysis):

'*We are not asking women to wear masks in the postnatal ward. Everyone is now offered swabs for covid when admitted although some decline. I personally don't think wearing masks makes any difference when assisting women with BF other than to be warm and uncomfortable for the midwife. Most women are focused on the baby and understand about the PPE. Women have already had a midwife wearing a mask antenatally and throughout labour by this stage so have become accustomed.*' (Mother and hospital midwife.)

'*I feel that it takes away from being personal and may stop women building a relationship with their midwife.*' (Mother and community pharmacist.)

'*… staff and partners have to wear the masks ... not practical for the women themselves as they need to use the entonox. Mums just accept staff having to wear masks but it might be harder for them to bond with their midwife and it can be hard for them to hear staff talking at times.*' (Mother and hospital midwife.)

'*She had welcomed her baby prematurely at 32 weeks and baby was in the neonatal unit. She hadn't planned to breastfeed but due to the circumstances and COVID she was trying to pump for baby. She felt absolutely traumatised as you can imagine but this was compounded by the fact she had to wear a mask and wasn't allowed to kiss the baby. I can't begin to understand how this must have felt. The potential for it to impact on bonding, breastfeeding and also increasing anxiety is just dreadful. We know the fact a mother's kiss to her newborn's head tells her body so much about the pathogens on baby which then influences the makeup of her breastmilk. In my opinion the impact of wearing masks, although important in reducing the spread of COVID, it will be quite detrimental for the mental health of women and possibly on babies' health.*' (Mother, researcher and psychologist.)

'*… unless you are wearing the see-through visor and even this barrier creates distance, fear and safety and associated memory triggers to times past.*' (Mother and professional.)

These working professionals and mothers were well-informed about all aspects of COVID-19, including the scientific data and the need for public and professional compliance. The threads of their conversations can be woven together and I think we could all agree there is a general acceptance of face masks as part of the status quo (Wikipedia 2020) and it is important to note that 'times past' will never be forgotten in the Northern Ireland context. However, you cannot ignore the potential psychological impact that mask-wearing may have on the midwife, mother and baby relationships and well-being and this is an area for us to be concerned about.

I would strongly encourage you to begin to start mapping, documenting and asking the important research questions. Midwives are natural researchers, observers of bonding at birth and totally committed to facilitating women to birth in the best possible way, regardless of complexities. Midwives will find new ways to communicate and build that essential trust. The need to see behind the mask is a modern-day challenge. Already I have heard about midwives who have put little pictures of themselves on the outside of their surgical masks to help women feel more connected, some have made short videos to introduce themselves and others have showed women their 'midwife selfies'. I hear that some midwives have already raised concerns about remembering the importance of guidance, mandates and personalised care and the need to speak out without fear about challenges experienced. This was evident when some midwives added their voices to mothers to fight against the 'mandatory' wearing of face masks in the NICU when they are breastfeeding.

In conclusion, masks are now part of everyday life in maternity care and have a proven role to play in the reduction of COVID-19. Midwives, like others, must act on best evidence (Brooks et al 2020). However, it is important not to forget that evidence must be used judiciously. There is a time when science dominates and there is a time when human intuition and emotional needs must be recognised and valued

so that masked identity in midwifery is applied with wisdom and discernment in a human spirit of loving kindness. New evidence is published every day and the guidance is updated as fast as possible. However, I think there is important COVID-19-related midwifery research to be undertaken now regarding the opposition to, or adoption of, wearing masks and the identification of criteria for extenuating circumstances. More research will help us to understand the complexity of factors we need to address when we make our evidence-informed contribution to guidance on mask wearing in midwifery practice.

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Evidence Based Midwifery

Experiences of pregnancy and maternity care for women exposed to human trafficking and sexual exploitation: a systematic review and qualitative evidence synthesis

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ABSTRACT

Background: Human trafficking is a form of modern-day slavery which health care providers may encounter at different stages of the trafficking process and recovery. Contact with someone in health care may be the victim's only opportunity to explain their situation. However, the evidence to inform identification, referral and care of trafficked people is extremely limited.

Aims: To identify and synthesise peer-reviewed qualitative evidence of pregnancy journeys in the context of trafficking and exploitation.

Methods: A systematic review was undertaken to critically evaluate studies that had examined women's experiences of pregnancy and maternity services. One thousand six hundred and twenty-two studies were identified across eight databases and 13 studies included (n=883 women). The Critical Appraisal Skills Programme (CASP 2018) assessment tool was used to evaluate quality, and thematic synthesis applied (Thomas & Harden 2008).

Findings: One thousand seven hundred and six records were reviewed and 13 papers met the eligibility criteria. Eight descriptive themes emerged: barriers to health care, late access to maternity care, continuity of care, communication, stigma, physical, sexual and mental health problems, physical, sexual and emotional abuse, and care of baby. These themes were developed into three analytical themes: Access, Person-centred, Poor health, with an underpinning theme of Safeguarding.

Conclusions: This literature review identified trafficked women's experiences in pregnancy which included many barriers to accessing appropriate health care in a timely manner, and physical, sexual and mental health needs which were a result of illness or abuse. Trafficked women face numerous health issues which undermine their capacity to contribute to work, family and community life.

The underpinning theme of Safeguarding relates to protecting and responding to the needs of both a woman and her children together.

'POPPY' represents the three analytical themes - POor health; Person-centred; People who need us to say Yes to access; with the underpinning theme of Safeguarding the mother and baby together. Thus, it captures the essential elements of recognising signs and providing an informed, compassionate response to victims of trafficking and sexual exploitation.

Keywords: human trafficking, sexual exploitation, maternity, systematic review, thematic synthesis, Evidence Based Midwifery

Introduction

Human trafficking is a form of modern-day slavery (International Labour Organization (ILO) 2017) and is described by the United Nations Office on Drugs and Crime (UNODC 2017) as a serious crime and a grave violation of human rights. The UNODC (2017:para 2) defines trafficking of people as:

'the recruitment, transportation, transfer, harbouring or receipt of persons, by means of the threat or use of force or other forms of coercion, of abduction, of fraud, of deception, of the abuse of power or of a position of vulnerability or of the giving or receiving of payments or benefits to achieve the consent of a person having control over another person, for the purpose of exploitation.'

The International Organization for Migration (IOM 2009) highlights that health care providers may encounter trafficking victims at different stages of the trafficking process and recovery, and that contact with someone in health care may be their only opportunity to explain what has happened and ask for help. However, Ottisova et al (2016) found that the evidence to inform the identification, referral and care of trafficked people is extremely limited. This is of serious concern given growing evidence of the harmful impacts of exposure to human trafficking and sexual exploitation on health outcomes (Hossain et al 2010, Oram et al 2012, Kiss et al 2015, Oram et al 2015, Stanley et al 2016).

Human Rights First (2017) stated that 71 per cent of trafficking victims around the world are women and girls. Seventy-five per cent of victims (15.4 million) are aged 18 years and above, with children and young people estimated at 5.5 million. A significant proportion of those who experience trafficking are of child-bearing age. Knight et al (2018) in the MBRRACE-UK report stated that of the women who died in the United Kingdom (UK) and Ireland during pregnancy, or up to a year postnatally, two-thirds had pre-existing physical or mental health problems. Experiences of intimate partner violence and sexual violence are associated with poor maternal outcomes (Gisladottir et al 2016), and these risk factors share characteristics with, or are amplified in, the experiences of women who have been trafficked or sexually exploited.

Studies on human trafficking and sexual exploitation are relatively sparse. Collins & Skarparis (2020) published their scoping review of human trafficking in relation to maternity care which highlighted the need for further research. However it focused more broadly on studies around immigration, asylum seeking and refugee women, and investigated a broad spectrum of publications including commentaries and non-peer-reviewed publications. This synthesis specifically focuses on peer-reviewed qualitative evidence on pregnancy journeys in the context of trafficking and exploitation.

Aim

To identify and synthesise peer-reviewed qualitative evidence of pregnancy journeys in the context of trafficking and exploitation.

Methods

A systematic review was undertaken to critically evaluate studies that had examined women's experiences of pregnancy and maternity services. The following electronic databases were searched up to 31 January 2019: CINAHL Plus, Cochrane Database of Systematic Reviews (CDSR), ClinicalTrials.gov, Embase, MEDLINE, PsycInfo, PubMed and Scopus. We also searched online for official reports from UK government organisations and charities up to 6 March 2019. Studies were included where participants were female and had experienced trafficking or sexual exploitation and all, or a subset, reported pregnancy experiences; they reported primary qualitative data, and were published in English in peer-reviewed journals, or UK charity or government reports.

All titles and abstracts were screened using these inclusion and exclusion criteria. Papers and reports that met the criteria based on title and abstract were retrieved for further examination by two authors.

The searches generated 1622 papers from electronic databases and a further 114 through searching reference lists and research reports. Thirty papers were duplicates and excluded. One thousand seven hundred and thirty-six abstracts were screened by title and abstract. Twenty-nine papers and reports met the initial eligibility criteria. Following full-text review, 15 studies were excluded, see Figure 1 Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) (2015).

The CASP checklist for qualitative research (CASP 2018) was used to identify the quality of individual studies and these findings were considered in their totality to make an assessment of the body of evidence of included studies (see Supplementary Information, Table 1).

Analysis was undertaken using the Thematic Synthesis framework described by Thomas & Harden (2008). Primary data in the form of quotes were taken from the studies and coded according to meaning and context. Every relevant quote had at least one code applied, and some had several codes. This initial stage of coding was carried out by two researchers to ensure agreement. Similarities and differences between the codes and descriptive themes were then identified to group them into a hierarchical tree structure. New codes in the form of analytical themes were then created which captured the meaning from the initial group of codes. These analytical themes layer on top of the descriptive themes in a tree-like structure. The structure of these codes and themes was reviewed with the team to ensure agreement. Any disagreements were discussed amongst the team until consensus achieved.

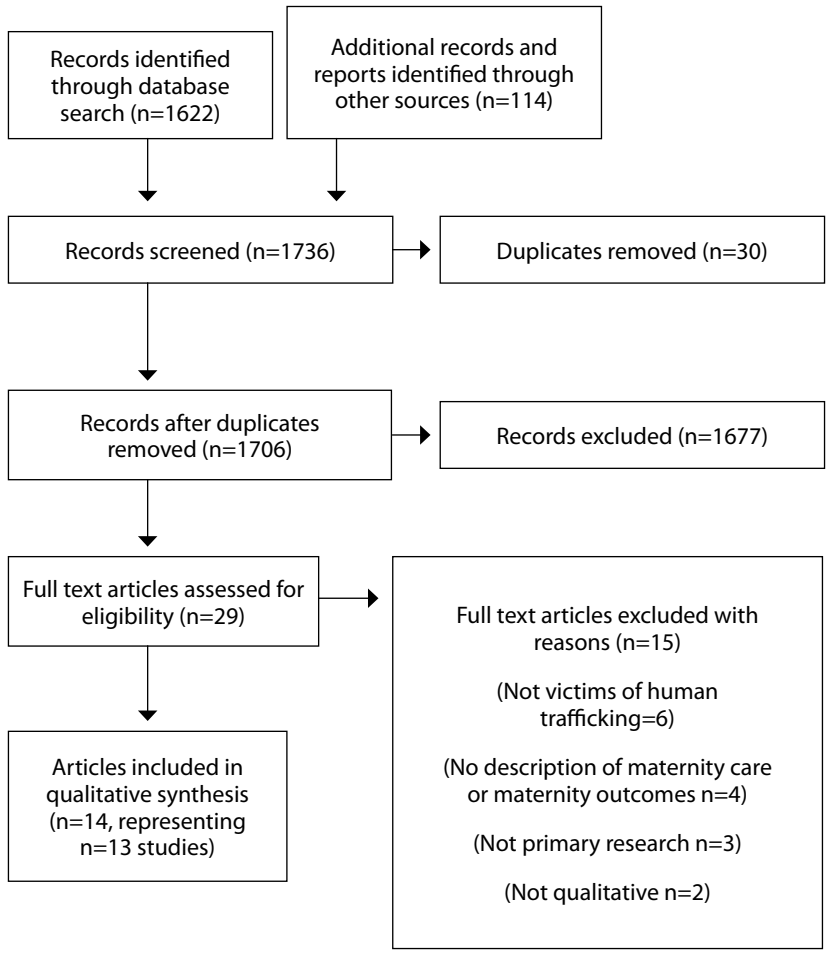

Figure 1. PRISMA flow diagram.

Findings

Thirteen studies reported in 14 articles were selected for inclusion in this review (see Supplementary Information, Table 1) These studies were as follows:

Bick et al 2017

Caretta 2015

Karandikar et al 2016

Karandikar & Próspero 2010

Lederer & Wetzel 2014

Peled & Parker 2013

Ravi et al 2017

Stanley et al 2016

Stöckl et al 2017

Surtees 2017

Westwood et al 2016

Willis et al 2016

Zimmerman et al 2003

Eight descriptive themes emerged: barriers to health care; late access to maternity care; continuity of care; communication; stigma; physical sexual and mental health problems; physical, sexual and emotional abuse; care of baby.

These themes developed into three analytical themes: Access, Person-centred, Poor health, with an underpinning theme of Safeguarding.

Analytical themes

Access

The analytical theme 'Access' comprised 'Barriers to accessing health care', 'Late access to maternity care', and 'Continuity of care', representing scenarios which reduced women's access to health care. Trafficked women are prevented from accessing health care in a timely manner, for physical, sexual and mental health needs which are as a result of illness or abuse: *'I thought I needed to see a doctor … they wouldn't take me'* (Westwood et al 2016:e796).

The traffickers controlled women (Bick et al 2017) often locking them in rooms or houses, physically preventing access to health care (Zimmerman et al 2003, Karandikar et al 2016, Ravi et al 2017) or follow-up appointments (Ravi et al 2017). Women also feared reprisals for themselves or their families if they revealed their experiences and the circumstances in which they were living (Zimmerman et al 2003, Bick et al 2017). Often women who do access health care are accompanied by their traffickers who speak and complete paperwork on their behalf:

'He told staff that I can't speak any English … he will interpret for me and he told them some story … the doctor asked me directly as well … I didn't want to say it was this person because he was there with me' (Westwood et al 2016:e797).

Interpreters are often not available, or independent professional interpreters who can be trusted by victims are not used: *'I had no interpreter and so I couldn't understand what happen to me, what happen to my health'* (Westwood et al 2016:e797).

Often telephone interpreters are used, which does not aid effective communication in these difficult situations (Stanley et al 2016, Bick et al 2017).

Women fear that if they access health care, they will be reported to authorities, such as police and immigration services, and either arrested or deported:

'We don't wanna go to the hospitals because we feel like they're gonna check there. Or we go to the hospital, our names are ran, and the cops come and they take us. And that has happened a lot' (Ravi et al 2017:411).

Women may not understand the health care system of the country they are in, and how to access health care (Zimmerman et al 2003). They may have concerns about how to pay for health care and, if in the UK, may not understand that they are entitled to free health care as victims of trafficking (Stanley et al 2016). Health care staff are not always aware of the entitlements to health care that victims of trafficking have; also women may be erroneously refused access to health care due to lack of identification (Bick et al 2017). Added to this, as victims of trafficking often do not recognise they are trafficked (Ravi et al 2017), they are not able to highlight their entitlement to free health care to health care staff:

'When I was 4-5 months pregnant ... I snuck out of the house and went to the local GP [family doctor] *practice. When I arrived, they told me I needed a passport and proof of address. I explained that I didn't have this documentation and they turned me away'* (Bick et al 2017:5).

Women are known to self-medicate to either avoid health care or because of the poor access to it (Zimmerman et al 2003). Medication is sometimes provided for women by their traffickers without having seen a health care professional themselves:

'The first time I saw a doctor was when I got pregnant. Before that when I used to be sick, I was just given medicine by someone around me' (Karandikar et al 2016:290).

Women often fear pregnancy and the repercussions it may have for them. It may lead to an increased level of violence as women risk losing income for the traffickers:

'It was always something I was worried about. And even if my period was like three days late, I would start freaking out and crying … because the last thing I wanted was to get pregnant, because that would affect my boss, how he would treat me. Like he would probably beat the shit out of me more because I wasn't able to work because I was like a big belly or something like that, and I also wouldn't have the money to get an abortion, or like the little things like that really scared me' (Ravi et al 2017:411).

Women may experience forced termination of pregnancy (TOP), or access TOP services late in pregnancy and therefore need more invasive procedures or be too late in their pregnancy to proceed with the TOP (Zimmerman et al 2003, Ravi et al 2017, Surtees 2017).

Women may also experience illegal TOP procedures with increased risks of haemorrhage, infection and mortality (Zimmerman et al 2003).

Late access to maternity care itself is a risk factor for morbidity and mortality for mother and baby:

'When I had my first visit at the hospital, the doctor she told me when she saw the baby, she told me that the baby seemed bigger than it should be. "You should have come earlier, actually, to see me"' (Bick et al 2017:5/13).

Women may only present in labour for maternity care or in emergency situations: 'I was found unconscious in the street when I was heavily pregnant … I was taken to the hospital by ambulance' (Westwood et al 2016:e796); or have irregular attendance at appointments. Attending scheduled appointments can be extremely problematic for women who have no control over their own lives (Bick et al 2017, Ravi et al 2017). Women may also be subject to dispersal to different areas, due to the traffickers themselves, or due to government authority procedures, where people are moved to different parts of the country when claiming asylum, or when awaiting the outcome of a human trafficking application (Bick et al 2017, Ravi et al 2017).

Person-centred

The descriptive themes of communication, confidentiality and stigma were subsumed within the analytical theme 'Person-centred'.

Communication is an essential skill and ability for health care professionals to ensure effective care (Leonard et al 2004): sometimes terminology is difficult for women to understand, especially for those whose first language is not being spoken (Stanley et al 2016, Westwood et al 2016). It is essential that language is sensitive and appropriate for the individual, as women unable to speak for themselves or fearful of people in authority are extremely unlikely to ask for clarification: *'Put it in pieces for me so I understand'* (Stanley et al 2016:106).

This emphasises the importance of checking understanding, as well as using appropriate language. The presentation to health care may be the one opportunity the victim gets to explain their situation, give clues or arouse suspicion to a professional who listens and observes well (Lederer & Wetzel 2014). Health care professionals are known to have treated victims unknowingly, or sometimes even knowingly (Lederer & Wetzel 2014), but not known where to direct them to the most appropriate help (Stanley et al 2016). This raises the importance of training in how to spot the signs of trafficking, and refer to the correct help and support, safely and appropriately. It is essential that improved communication and integrated care are developed and improved within our system to support women who are victims of human trafficking.

Access to appropriate face-to-face interpreting services is vital for trafficked women who require

them (Westwood et al 2016); where women may have been coerced or sold into trafficking by family or friends there are well-founded reasons for them to be suspicious of others, and telephone interpreting services are unlikely to encourage the trust needed for victims to be open about their experiences (Zimmerman et al 2003, Karandikar & Próspero 2010, Lederer & Wetzel 2014, Caretta 2015, Karandikar et al 2016, Stöckl et al 2017): *'Maybe it would be better if the interpreter came in person'* (Stanley et al 2016:106).

Victims often don't want to talk about their past experiences, they find reliving the past distressing, they may want to keep the abuse in the past and move on:

'I want to forget what happened. I just want to move on. I just want to get my own flat and live and maybe get a job' (Stanley et al 2016:106).

This can lead to missed opportunities to prepare women for care or treatment; this is especially relevant in maternity care, where women may experience flashbacks or psychotic incidents due to mental ill-health following the abuse they have faced. Labour itself, vaginal examinations, or the presence of men in delivery rooms can all add to the suffering of victims and increase the likelihood of worsening mental health problems. Mental ill-health has a strong link to maternal morbidity in pregnancy and the year following the birth of a baby (Knight et al 2018).

Confidentiality is an important issue for victims. Confidentiality experienced by victims increases trust and builds relationships with health care professionals:

'It made me feel comfortable that everything is confidential, I wasn't worried about everything being said, I was happy that if I'm gonna move from this area to another, it is OK for information to go to another doctor' (Bick et al 2017:5/13).

Women are very aware that they may appear different to many other women having babies in hospitals, particularly to those in loving relationships, and do not want their situations to be discussed in areas which can be overheard by other families (Bick et al 2017). Experience of poor confidentiality can destroy relationships with professionals and put women at greater risk of harm (Bick et al 2017). Victims really appreciated kindness and support that was shown to them in ways that were small, but went above and beyond the professional role of the health care providers; for example, providing clothes and equipment for the baby, and ensuring that the health care professional caring for them spoke their language where that was possible (Bick et al 2017). Continuity of care provided by health care professionals was highly valued:

'Once a month she [health practitioner] *sees me. She will sit for at least half an hour talking to me. She encourages me'* (Westwood et al 2016:e798).

Victims are very aware of judgmental attitudes towards them, being considered a sex worker rather than a victim of trafficking (Zimmerman et al 2003, Karandikar et al 2016, Bick et al 2017). Health care professionals may assume women are choosing sex work, rather than being forced, abused and coerced (Lederer & Wetzel 2014). Health care professionals can also be complicit in trafficking, providing 'back door' access to health care, and working in partnership with the traffickers (Lederer & Wetzel 2014). In the circumstances outlined by Lederer & Wetzel (2014), health care professionals abused their professional position, working with traffickers to aid in health care for women so that the women would not be seen, and in circumstances that would not allow other staff to come across women, or records to be kept, so that their trafficking and abuse were perpetuated. Health care professionals were complicit in hiding abuse, rather than undertaking their safeguarding responsibilities for the women.

Women carry the stigma and shame of the sex work they have been forced and coerced into doing, as if it was their fault, which often increases their sense of isolation.

Pregnancy and the children they bear are symbols of their isolation, loss and the injustice perpetrated against them. In some societies women have a name associated with this stigma and shame, and symbols of their abuse are even painted on the doors of their homes to label them as prostituted:

'We have very serious prejudice about prostitution and people don't try to see if [women] were forced or not forced to do sex work … We even have a tradition, when a person working in prostitution has a gate to the house and it is painted black. It's a tradition of our society to ostracize [prostitutes]' (Surtees 2017:91).

The World Health Organization (WHO) (2013) guidelines for responding to women who have experienced sexual violence recommend that first-line responders should provide practical care and support in a way which offers women the choice to make their own decisions, not be coerced, listen without pressurising for further information, offer comfort to help reduce anxiety and offer information and assistance to connect to appropriate agencies. These guidelines are an ideal starting place for health care professionals who come across women who have experienced trafficking and likely sexual exploitation, detailing effective ways to approach and offer support to women.

Poor health

Trafficked women face numerous health issues, directly from the abuse perpetrated against them, but also on account of the substantial health inequalities they experience.

Sexually transmitted infections (STIs) are common among women who are forced to have multiple sexual encounters, often without access to barrier methods of contraception (Karandikar & Próspero 2010):

'If I hadn't had my children when I was young, I wouldn't be able to have them because I have had so many STDs and gynaecological problems — including pelvic inflammatory disease, cervical infections, gonorrhoea, herpes, chlamydia — I can't have children now' (Lederer & Wetzel 2014:71).

Women may be unable to access the treatment they need, or to follow their treatment plans, for example, to refrain from sexual activity while having treatment. Human immunodeficiency virus (HIV) and tuberculosis (TB) are two infections that victims both fear and experience in equal measure:

'When they did the blood test, I was detected HIV positive. Now I live in fear that I will die soon. If I have any disease I will die' (Karandikar et al 2016:288).

The poor living conditions women experience, and the multiple unprotected sexual encounters, mean these diseases are highly likely, and without adequate health care likely to be severely life-limiting. Women fear an increase in abuse by their traffickers if their diagnosis is discovered, as this affects their ability to earn money (Ravi et al 2017). This fear reduces the likelihood of women seeking medical help until their disease is at an advanced state and less likely to be curable.

Physical health problems from skin, neurological, heart and respiratory conditions are not unusual, with untreated chronic conditions frequently experienced (Zimmerman et al 2003, Lederer & Wetzel 2014, Stanley et al 2016, Stöckl et al 2017). Women in the UK are likely to present in emergency departments with these complaints, rather than access regular care through a general practitioner (GP) (Stanley et al 2016).

Mental health problems are frequent in victims and survivors of human trafficking, and likely to be complex with suicidality and post-traumatic stress disorder (PTSD). Victims are unlikely to access mental health care while trafficked:

'The mental health problems are the worst and most long lasting. I was diagnosed with chronic depression, have anxiety, post-traumatic stress syndrome, nightmares, flashbacks, disorientation. I've been suicidal at times. I don't think anyone is out on the street without having these long-lasting effects' (Lederer & Wetzel 2014:69).

Physical, mental and sexual abuse are regularly experienced:

'I had a breakdown. I just wanted to hurt myself. I would cry a lot. I was scared and worried. I was bruised. The back of my neck was bleeding from being hit with the thick gold chain. They beat me and kicked me. They told me "Don't scream or we will kill you" They would.' (Zimmerman et al 2003:41).

Such abuse is experienced from women's traffickers as well as the men they encounter within the context of their exploitation:

'I was frequently afraid of my pimp beating me up, as they all used to do, and sexually abusing me. I was in a continual state of anxiety and worry so that sometimes I couldn't sleep, also causing me headaches' (Zimmerman et al 2003:54).

Multiple physical injuries are not uncommon and frequently not properly treated or treated at all (Zimmerman et al 2003, Karandikar et al 2016).

Drugs and alcohol are often used as a way of coping with the daily abuse and neglect they face: *'Life is hard and there is no money. What can I do? When there is nothing else, I drink to forget the pain'* (Karandikar et al 2016:288), or they are forced to take drugs or alcohol by their traffickers to ensure compliance in their exploitation (Zimmerman et al 2003, Lederer & Wetzel 2014).

Lack of access to, or use of, contraception is common:

'Well, I've always carried condoms with me. But there were men that didn't wanna use condoms. And if I refused, it was – my pimps were gonna find out. Because I would come back, lose a trick, lose a date, and lose money. And then my type of people would beat us' (Ravi et al 2017:412).

In the UK contraception is freely available but women may not be aware of these services.

Victims who face sexual exploitation often experience repeated miscarriages and TOPs:

'I miscarried two times in 5 years and had to be hospitalized both times due to heavy bleeding. All this was very expensive treatment and the gharwalli [brothel-keeper] *charged money for all this'* (Karandikar et al 2016:288).

The TOPs may be forced (Lederer & Wetzel 2014, Caretta 2015) or sought by the woman herself to avoid the birth of a baby through sexual abuse. Women may be denied the needed health care:

' … if I didn't make money, then, sometimes I would have to wait for my prescriptions for days before I could, yeah …. you can take it [emergency contraception] up to 72 hours. So … I would try and go right away. Sometimes, I would take it at the last minute. I've had so many abortions because it was too late to take it' (Ravi et al 2017:411).

Women may also experience life-threatening complications from haemorrhage and infection (Zimmerman et al 2003, Karandikar et al 2016).

Overall, victims of trafficking experience many physical, sexual and emotional health problems as a result of the abuses they experience.

Babies are not unaffected by these situations of abuse. There are strong links with bonding issues for mothers and babies who have been in abusive situations, even when they have then escaped the abuse (Surtees 2017). Bonding starts *in utero*, and the abuse and stress that women face in situations of abuse has the potential for a physiological impact on the neurodevelopment of the fetus leading to delayed mental and motor development (Buss et al 2012). Chronic maternal stress has also been shown to increase cortisol levels (Sandman et al 1997) which negatively impacts uterine perfusion in pregnancy and therefore the transfer of nutrients essential for fetal growth, a known factor associated with intrauterine growth restriction. Cortisol is also associated with an increase in uterine irritability which can lead to preterm births (Hoffman & Hatch 1996, Pico-Alfonso et al 2004). The impacts of *in utero* abuse can therefore have a lifetime impact from neurological development, premature birth, or restricted in utero growth.

Babies born from trafficking situations are affected by low birth weight and prematurity (Stanley et al 2016, Willis et al 2016, Surtees 2017). They are exposed to physical, sexual and emotional abuse as well as witnessing the abuse of their mothers (Willis et al 2016, Surtees 2017). These abuses can result in physical and developmental delays (Surtees 2017), and behavioural and mental health issues (Willis et al 2016). Child deaths are also reported due to neglect, abuse, sudden infant death syndrome, suicides, HIV and murder (Willis et al 2016).

It has been clearly demonstrated that mothers and their babies are exposed to multiple victimisation and different forms of abuse, with increased risks of morbidity and mortality for those experiencing exploitation.

The risks to babies in trafficking situations highlight safeguarding concerns, both for babies and their mothers. Safeguarding support is needed to prevent further abuse and harm; access to such support is vital to enable them to escape abuse, start their road to recovery, and prevent the risk of re-trafficking (Zimmerman et al 2003).

Under the Care Act (2014), in the UK individuals have the right to live in safety, free from abuse and neglect. Modern Slavery is one of the 10 categories of abuse highlighted (Social Care Institute for Excellence 2015). The Children and Social Work Act (2017) lays out the requirements to prevent harm and neglect for all children in the UK. Health care professionals therefore have a duty of care to safeguard mothers and babies in situations of human trafficking. In maternity care especially, health care professionals are very aware of their responsibilities for safeguarding babies (Lazenbatt & Greer 2009); it is essential to emphasise that, in situations of human trafficking, mothers and babies require safeguarding support as a family unit (Peled & Parker 2013).

Well-trained health care professionals are ideally placed to identify trafficked women and know where to signpost victims for help and support (Bick et al 2017). Sexual health services and TOP providers are key areas where sexually exploited women may access services. Health care professionals in emergency departments and maternity services also need to be acutely aware of the signs of vulnerability, be trained in how to respond and know where to access support to ensure each mother and baby can be adequately safeguarded.

Discussion

The key findings are identified in three analytical themes which emerged from the synthesis.

Access

Human trafficking victims experience multiple circumstances which result in barriers to them accessing care. These include the control and intimidation exerted by their traffickers and the lack of freedom women experience generally, their lack of understanding of where and how to access health care, and fear of authorities if they do so, lack of documentation to allow them to register for health care, language differences and the lack of recognition by those in health care that allows women access to health services (Zimmerman et al 2003, Stanley et al 2016, Westwood et al 2016, Bick et al 2017, Ravi et al 2017). Women experienced lack of continuity of care because of an inability to attend repeat appointments or to access or follow prescribed treatment, due to changes in location imposed by traffickers or by the government when support is offered. Continuity of care was also affected by costs and the logistics of following medical instructions. Where continuity was achieved, it allowed ongoing care without the burden of having to re-tell their experiences and so avoided related distress; this was recognised as helpful by the women interviewed (Bick et al 2017, Ravi et al 2017).

Late access to maternity services, a known risk factor for maternal morbidity and mortality (Knight et al 2018), is a common feature among women who experience human trafficking. The lack of assessment and planning for health problems which can impact on pregnancy may negatively affect the outcomes for mother and baby.

Person-centred

Victims appreciated care which was sensitive and appropriately person-centred, and were acutely aware of care which led to them feeling stigmatised (Bick et al 2017). Communication directly with them, rather than with those accompanying them, could be problematic. Appropriate use of independent professional face-to-face interpreters can aid effective communication between health care professionals and women (Westwood et al 2016). Health care professionals need to use understandable language and to check women's understanding of information discussed and advice given.

Where multiple abuses have been experienced and complex mental health issues may be underlying, sensitive care is imperative, particularly during labour, and an understanding of these issues by health care professionals is vital to prevent further trauma (Gottfried et al 2015). The role of the midwife as an advocate for women's wishes and rights in pregnancy and labour is especially vital for women who have experienced multiple and complex abuses and exploitation.

Those who have experienced sexual exploitation are very aware of the stigma and shame they experience, which can be exacerbated by health care professionals, especially if treating women as 'prostituted' rather than trafficked; this can increase their sense of isolation, of being different and becoming fearful (Zimmerman et al 2003, Karandikar et al 2016, Bick et al 2017). Women are aware of the stigma they will face if and when they return home and they also carry shame themselves (Surtees 2017). Women who experienced kindness shown by health care professionals conveyed the value of this (Westwood et al 2016, Bick et al 2017).

Poor health

Much of the available evidence focused on the general health experiences and needs of victims. Lederer & Wetzel (2014) indicated that most of their participants were affected by physical symptoms; two-thirds experienced physical injuries, and almost four-fifths experienced physical violence. Almost 80 per cent of women experienced sexual violence which must also have impacted on overall mental and physical health. Trafficked women experience high levels of violence, abuse and ill-health. It is entirely justifiable to summarise that trafficked women are plagued by physical, mental and sexual health problems.

Victims experienced multiple miscarriages and TOPs, and often forced TOPs in unsanitary conditions, and experienced multiple STIs (Zimmerman et al 2003, Lederer & Wetzel 2014, Karandikar et al 2016, Stanley et al 2016, Ravi et al 2017). The lack of appropriate health care experienced by women put their lives at risk due to haemorrhage or septic complications (Zimmerman et al 2003, Karandikar et al 2016).

Women discussed how they were often not recognised as victims of trafficking in health care settings or, if recognised, not offered appropriate help and support (Lederer & Wetzel 2014, Stanley et al 2016).

Sexual violence was discussed in relation to how many men women were exploited by on a daily basis. This underlined the lack of freedom experienced by women, and the lack of any control women have over their lives. It also speaks to the high levels of violence and abuse faced by victims to ensure their co-operation when faced with such constant and ongoing abuse (Zimmerman et al 2003, Lederer & Wetzel 2014).

Safeguarding

The underpinning theme of safeguarding relates to the safeguarding of mother and baby together, recognising that both are victims and need to be offered appropriate help and support. This theme especially relates to the training that health care professionals need.

Training for appropriate health care responses is vitally important due to the increased risks women may face from their traffickers if they disclose their situations. These increased risks highlight the need for better integrated care, with improved communication, confidentiality and safe referrals to underpin the safeguarding of this vulnerable group of women.

Implications/recommendations

The findings of this systematic review point to essential evidence for health care professionals in maternity and wider clinical situations.

An effective way of narrowing the clinical gap is to take the research to clinicians in a memorable format. This principle has been used to develop an aide memoire and mnemonic representation of the findings.

The themes of POor health, Person-centred, People who need us to say Yes to access, with the underpinning theme of safeguarding the family, mother and baby together, were brought together to form a novel mnemonic 'POPPY' and diagram to support health care professionals to remember to look for the signs of trafficking (see Figure 2). The underpinning theme, safeguarding the family, is represented by the stem of the poppy, the central theme. While this mnemonic and aide memoire is quite simplistic, the idea is for it to be displayed in clinical areas, where staff can be drawn to the message, read and understand the issues, and remember the key details. In a busy clinical environment, it is essential to be able to affect health care professional learning in an effective and memorable way.

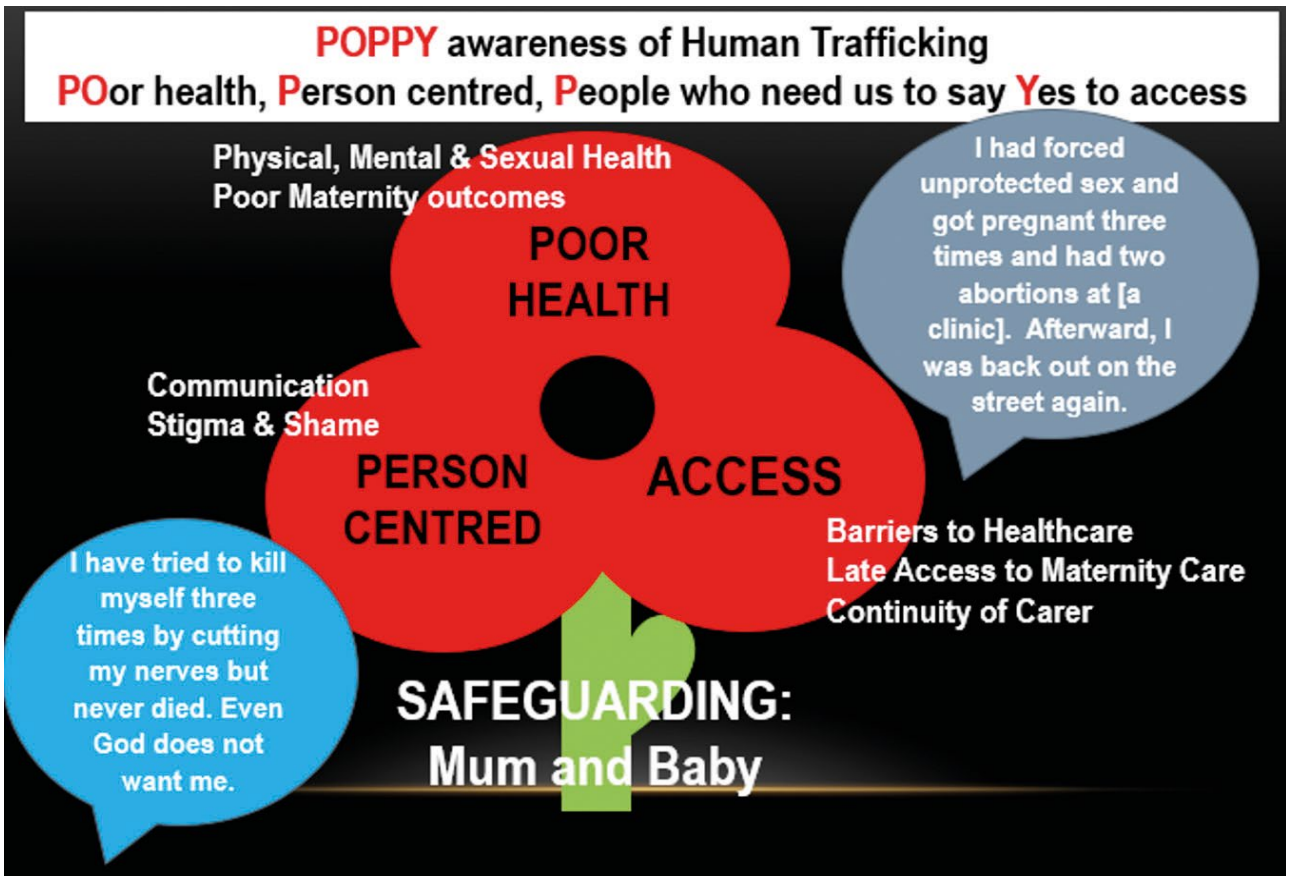

Figure 2. POPPY Mnemonic, Nightingale et al (2018).

Conclusion

The issues raised in this research, and the themes highlighted in the mnemonic, aim to assist health care professionals' awareness of the vulnerabilities and dangers that victims of human trafficking potentially encounter, and increase their ability to identify victims in their day-to-day clinical practice. Some of the potential red flags for concern are women who have multiple unmet health care needs, repeated pregnancies, STIs, mental health issues, are accompanied by controlling people, have no ID, are unable to speak for themselves, are not appropriately clothed or are malnourished. It is essential that health care staff are able to respond appropriately and sensitively, not taking situations at 'face value', but are prepared to gently probe further to uncover the abuse when suspicions are raised.

This systematic review highlights the significant health inequalities and multiple abuses faced by women who are victims of human trafficking; however, it does not answer the research question regarding maternal and neonatal outcomes for women victims. Therefore, it is the recommendation from this study that further primary research needs to be undertaken to better understand the specific maternity experiences, and maternal and neonatal outcomes, that affect victims of human trafficking.

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Supplementary information

Table 1 CASP Appraisal.

	Bick et al (2017)	Caretta (2015)	Karandikar et al 2016	Karandikar & Próspero (2010)	Lederer & Wetzel (2014)	Peled & Parker (2013)	Ravi et al (2017)	Stanley et al (2016)	Stöckl et al (2017)	Surtees (2017)	Westwood et al (2016)	Willis et al (2016)	Zimmerman et al (2003)
Was there a clear statement of the aims of the research?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Is a qualitative methodology appropriate?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Was the research design appropriate to address the aims of the research?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Limited qual evidence	Yes
Was the recruitment strategy appropriate to the aims of the research?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Was the data collected in a way that addressed the research issue?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Limited qual evidence	Yes
Has the relationship between the researcher & participants been adequately considered?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Have ethical issues been taken into consideration?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Was the data analysis sufficiently rigorous?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Limited qual evidence	Yes
Is there a clear statement of findings?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Limited qual evidence	Yes
How valuable is the research?	High	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Minimal	Moderate

Perineal wound assessment and repair education for midwifery students: a multi-methods study

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ABSTRACT

Background: Perineal trauma is a common injury sustained during childbirth that, if not managed appropriately, can lead to significant physical and psychological morbidities. Knowledge and skills gaps for perineal wound trauma assessment and repair exist among health professionals and students. These deficits can be effectively addressed through structured education and training. Currently, there is a lack of research that has evaluated perineal trauma education and training in undergraduate midwifery programs.

Objective: To evaluate the effectiveness of a perineal wound assessment and repair workshop for midwifery students in their final year of study.

Methods: A multi-method study design was used to measure knowledge, self-confidence and skills of a midwifery student cohort, before and after the implementation of an educational workshop on perineal wound assessment and repair. Convenience sampling was used to recruit 65 midwifery students in their final year of a Bachelor of Midwifery program at an Australian university.

Ethical approval: Approval was obtained from the Human Research Ethics Committee (HREC) of the University of South Australia (0000036768).

Results: Post-workshop mean test scores for a multiple-choice questionnaire were statistically significant ($p < .0001$) indicating an overall improvement in students' knowledge in perineal wound assessment and repair. Students' self-assessment on their knowledge, confidence and skills in anatomy and physiology, assessment and recognition of perineal trauma and repair, were statistically significantly higher in all areas ($p < .0001$) after the workshop. Midwifery students' reflective journals were analysed verbatim and five main themes were identified. Twelve sub-themes were determined that gave a deeper insight into students' learning and support the main findings of this study.

Conclusion: This study showed that the inclusion of a perineal wound assessment and repair workshop in an undergraduate midwifery curriculum improved the knowledge and confidence of midwifery students in the management of childbirth-related perineal trauma.

Implications: While this study is limited in scope it demonstrates the clear need to ensure perineal wound education is provided in undergraduate midwifery programs. Further research that focuses on student midwives' knowledge and confidence after attending perineal wound education over a longer period is recommended.

Keywords: perineal trauma, midwifery education, perineal repair, knowledge, confidence, midwifery students, tertiary education, Evidence Based Midwifery

Introduction

Perineal trauma is the most frequently observed complication of childbirth, affecting approximately eight out of 10 women who have a vaginal birth in Australia (Australian Institute of Health and Welfare (AIHW) 2020). The trauma is associated with significant co-morbidities for women (Tucker et al 2013, Priddis et al 2014, Khajehei et al 2015, LaCross et al 2015, Chang et al 2016, Keighley et al 2016, Crookall et al 2018). Severe Perineal Trauma

(SPT) rates reported in Australia for unassisted and instrumental vaginal births are above the average reported by other comparable countries (for example, the United Kingdom and New Zealand) (Australian Commission on Safety and Quality in Health Care (ACSQHC) 2017, Organisation for Economic Co-operation and Development (OECD) 2017). Reasons for higher rates are not completely understood, however, one possible explanation is the lack of structured educational programs in perineal wound assessment and repair for midwives and obstetricians in pre-registration courses and continuing professional development (Morris et al 2013, Abdulwahab et al 2014, Diaz & Steen 2017).

Background

Perineal trauma is defined as any injury to the female genitalia that occurs spontaneously during a vaginal birth or 'deliberately as a result of an episiotomy' (Steen & Diaz 2018:9). Over half of these injuries will require repair and a smaller, but significant, portion of women will require ongoing management well beyond the postnatal period (Tucker et al 2013, Edozien et al 2014, Priddis et al 2014, Khajehei et al 2015, Keighley et al 2016, Kochev & Dikke 2017). The outcomes of perineal repair have been linked to three key factors: the type of suture material used in the repair (Kettle et al 2010, Perumal & Selvaraju 2017), the suturing technique employed (Kettle et al 2012, Selo-Ojeme et al 2016), and the knowledge and skills of the operator (Bick et al 2012, Ismail et al 2013, East et al 2015, Selo-Ojeme et al 2015, Frost et al 2016, Zimmo et al 2017).

A systematic review exploring healthcare professionals' skills in assessment and classification of perineal tears found substantial gaps in midwives' and obstetricians' knowledge in this area (Morris et al 2013). This has considerable implications in clinical practice, as a poor understanding of perineal anatomy, assessment and repair, may lead to the misclassification and the inadequate repair of perineal trauma (Sioutis et al 2017). This can leave women to experience significant short- and long-term morbidities including: faecal and urinary incontinence, delay in healing, perineal pain, dyspareunia, and depression (Tucker et al 2013, Priddis et al 2014, Dunn et al 2015, Fodstad et al 2016, Leeman et al 2016, Kochev & Dikke 2017).

The lack of perineal assessment and repair knowledge has been attributed to the absence of structured and accredited educational training in undergraduate programs and clinical practice (Ismail et al 2013, Morris et al 2013). Studies have demonstrated that the implementation of structured hands-on workshops in perineal wound assessment and repair improved the confidence, knowledge and skills of midwives and obstetricians (Ismail et al 2013, East et al 2015, Selo-Ojeme et al 2015, Zimmo et al 2017). However, most research has focused on assessing the implementation of structured education in clinical settings and limited focus has been on the effectiveness of this type of education in undergraduate programs (Andrews et al 2005, Selo-Ojeme et al 2009, Wilson 2012, Morris et al 2013, Ismail et al 2013, Frost et al 2016, Zimmo et al 2017).

Aim

The aim of this study was to evaluate the effectiveness of a perineal wound assessment and repair workshop for midwifery students in their final year of study at an Australian university. Effectiveness was measured using two outcomes highlighted in previous research (Selo-Ojeme et al 2009, Wilson 2012, Morris et al 2013, Frost et al 2016, Zimmo et al 2017):

1. Knowledge of general perineal anatomy and wound assessment.
2. Self-confidence in perineal wound assessment and repair skills.

The null hypothesis was that there is no difference in the mean test scores for knowledge, confidence and skills in perineal wound assessment and repair, before and after the workshop.

Method

In 2017, a perineal wound assessment and repair skills workshop was introduced for final year students enrolled in the Bachelor of Midwifery at the University of South Australia (UniSA). The aim of the workshop was to provide midwifery students with foundational knowledge and skills to assess perineal trauma and repair. The workshop was designed using the 'Four Rs' of perineal wound management: Risk, Recognition, Repair and Relief (Steen 2012) as a systematic way of presenting the information. The theory content included an interactive perineal anatomy presentation followed by current evidence for perineal care and healing. The skills sessions gave students the opportunity to practise performing an episiotomy and conduct perineal repairs using simulated models.

Pilot study

A pilot study was undertaken six months prior to the inclusion of this workshop in the Bachelor of Midwifery program to confirm the feasibility and acceptability of perineal wound care education, training and data collection tools. Ten midwifery students participated in the pilot study. Students were asked to complete a questionnaire (adapted from a questionnaire already in use in the School of Nursing and Midwifery at UniSA) before and after a two-hour workshop. A Wilcoxon signed rank test of the results demonstrated that attending the workshop increased students' knowledge ($p = 0.011$) and confidence ($p = 0.011$) on perineal wound assessment and repair.

Research design

A multi-method, single group, pre- and post-test study design was utilised to evaluate the outcomes of the workshop.

Rationale

Multi-methods design is 'the combination of two or more theories, data sources, methods or investigators in one study of a single phenomenon to converge on a single construct' (Yeasmin & Rahman 2012:156). This design allows the cross-validation of the results using different perspectives (Brewer & Hunter 2006). Unlike mixed-methods, whereby qualitative and quantitative results are 'mixed together' and compared as a whole, multiple methods allow for two different data sets to be analysed and interpreted separately, then triangulated to confirm or refute the findings (Yeasmin & Rahman 2012, Creswell 2015).

Data collection tools

Knowledge was measured using a multiple-choice questionnaire consisting of 10 questions, each with four possible answers (a-d), covering knowledge in: perineal anatomy, risk assessment, classification of perineal tears, episiotomy and perineal repair, all relating to the information presented in the workshop. The content validity of the multiple-choice questionnaire was examined by an expert panel comprising three midwives and two academics, each with more than five years of clinical and research experience.

Self-confidence was measured by use of a 5-point Likert scale questionnaire, which sought to gather information on students' perceived level of knowledge, confidence and skills in the context of anatomy and physiology, recognition of perineal tears and perineal repair. Lastly, the Student Satisfaction and Self-confidence in Learning (SSSL) questionnaire, developed by the National League for Nursing (NLN) which has a Cronbach's alpha reliability score of 0.94 in satisfaction and 0.87 in self-confidence (Kardong-Edgren et al 2010, Young & Shellenbarger 2012, Adamson et al 2013). The data collection tools were designed to gather data at three points in time: pre-, immediately after and four months post-, the workshop.

A qualitative self-reflective journal (accessed online) was used by participants to record their experiences caring for women with perineal trauma during the eight-week intrapartum clinical placement which took place approximately two weeks after attending the workshop. All data collection tools were completed by the students online, through a password-protected course site.

Participants

Convenience sampling was used as the targeted population was selected based on accessibility and practicality (Etikan et al 2016). It was not possible to randomise participants or allocate a control group as the perineal wound care educational and training workshop was a compulsory component of the final year of the Bachelor Midwifery program, therefore, all final-year midwifery students were required to attend. Participants had to meet the inclusion criteria of being a midwifery student, enrolled in the final year of the Bachelor of Midwifery program at UniSA.

Ethical considerations

Written approval to evaluate the workshop and access to students was sought and granted from the Nursing and Midwifery Head of School and Human Research Ethics Committee (HREC) at the University. Approval was granted in July 2017 (protocol No. 0000036768), two weeks prior to commencement of the study.

Data analysis

All results were de-identified to protect the privacy of the student participants. The results were analysed using IBM Statistical Package for Social Sciences (SPSS) for Windows version 24 (IBM 2018). A statistician was consulted on the best approach for converting the information obtained from the questionnaires into a format recognisable by SPSS. Descriptive statistics, sample size (n) and percentages (%), were used to report the group's characteristics (Arifin et al 2016). The multiple-choice questionnaire was analysed using a paired-samples *t*-test to determine if there was a statistical difference between the pre- and post-test mean scores (Cleophas & Zwinderman 2016, Xu et al 2017).

To assess knowledge, confidence and skills, the Wilcoxon signed-ranks test, a nonparametric test that uses a rankings system to determine the significance (z-value) of the differences between the outcomes, was used (Wilcoxon 1945, Kasuya 2010, Cleophas & Zwinderman 2016). Univariate analysis (distribution, central tendency and dispersion) was used to report the results collected by the SSSL questionnaire (Field 2013, Canova et al 2017). Value of $p < 0.05$ was denoted as significant across all analysis.

Reflective journal content analysis

Reflective journal entries were analysed using Erlingsson & Brysiewicz's (2017) 'hands-on guide' for conducting qualitative content analysis. De-identified data was uploaded to NVivo 12 Plus for Microsoft Windows software for data management and content analysis. Each participant was given a pseudonym. Three investigators analysed the data separately, then discussed the results together and agreed on the final themes. This process, a form of triangulation, allowed the confirmation of the findings thus increasing the credibility of the analysis (Elo et al 2014).

Findings

Demographics

Sixty-five out of a cohort of 81 midwifery students invited to participate in the study consented to participate. The majority of the participants were: in their third year of study (75%); direct entry students (67.2%); studying full time (89%); through the internal mode of study (65.6%) and had no other prior undergraduate qualifications (73.4%).

Prior knowledge

All 65 (100%) participants stated that they had never attended a course/training or completed a self-directed learning package on suturing (including perineal suturing) prior to the workshop. Two (3.1%) participants stated that they had performed some type of suturing and an episiotomy prior to the workshop.

Assessment of knowledge: multiple-choice questionnaire

Sixty-five (100%) participants completed the multiple-choice questionnaire prior to the workshop, however, 20 (31%) and a further 62 (95%) participants, did not complete the multiple-choice questionnaire immediately post- and four months after the workshop, respectively, despite two reminders on the online course site viewed by students. Therefore, only the multiple-choice questionnaire results for pre- and immediately post-workshop were analysed. A total of 45 (69%) valid responses were analysed.

A dependent paired sample t-test (Cleophas & Zwinderman 2016:32) was conducted to test the null hypothesis, that is, that there were no differences between the pre-workshop (M=6.9, SD=1.6) and post-workshop multiple-choice questionnaire means (M=8.8, SD=1.1) tests scores. The assumption of normally distributed difference scores was tested prior to performing the analysis. The skew (-.35) and kurtosis (-.28) levels were less than the maximum allowable values for t-test (skew <|2.0| and kurtosis <|9.0| (Posten 1984)), indicating that the assumption was satisfied. The null hypothesis that there were no differences to test score means was rejected, t (44)=7.710, p < .0001. Therefore, the post-workshop test mean was statistically significantly higher than the pre-workshop test mean. Cohen's d was estimated at 1.127, representing a large effect based on Cohen's (1992) guidelines. A graphical representation of the means and adjusted 95% confidence intervals (CI) (Loftus & Masson 1994) is demonstrated in Figure 1.

Assessment of self-assessment of knowledge, confidence and skill 5-point Likert scale questionnaire.

Sixty-four (98%) participants completed the 5-point Likert scale questionnaire pre-workshop but only 63 (97%) completed the questionnaire post-workshop. Therefore, only the 63 (n = 63) completed pre- and post-workshop questionnaires were analysed. Wilcoxon signed-rank test for self-assessment of knowledge, confidence and skills in anatomy and physiology of the perineum, assessment and recognition of perineal trauma, and repair of perineal trauma, demonstrated that the median post-test scores were statistically significantly higher than the median pre-test scores in all three areas. This result demonstrates that the self-assessment of knowledge, confidence and skills of students in all three areas improved after the workshop (see Table 1).

Student satisfaction and self-confidence in learning (SSSL)

Fifty-seven participants completed the SSSL questionnaire, however, valid responses (that is, no missing values) varied with each question. Results are presented in Table 2.

Theme 1 — Communication is important

The most common theme noted in the analysis was that communication is important. A number of key factors were highlighted by the students as necessary for communication to be effective, including discussing all aspects of care with the woman, empowering the woman to speak up, listening to her concerns and respecting her wishes.

Sub-theme: Information and involvement in decision making was empowering for the woman

Keeping the woman 'informed' throughout her care was regarded positively by a number of students. Communicating the steps undertaken during the assessment of perineal trauma and repair procedure

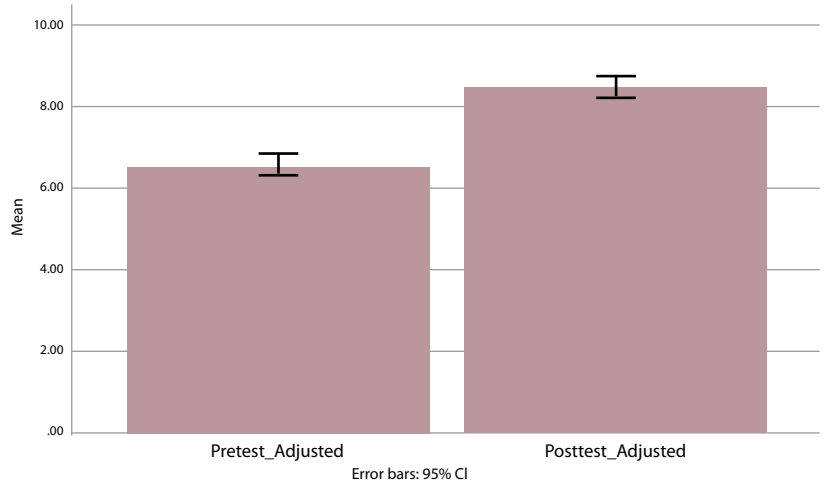

Figure 1. Pretest and posttest total score means and adjusted 95% confidence intervals.

Table 1. Summary of mean test results for students' self-assessment on level of knowledge, confidence and skills before and after the workshop.*

	Pre-workshop (n = 63)		Post-workshop (n = 63)				
Identifying the anatomy and physiology of the perineum	**Mean**	**SD**	**Mean**	**SD**	***Z*[b]**	***p* value[a]**	***r***
Your level of knowledge of the anatomical structures of the perineum and their function	2.41	0.73	3.65	0.65	-5.97	$p < .0001$	-0.047
Your level of confidence on how to appropriately identify the anatomical structures of the perineum and their function	2.05	0.71	3.33	0.67	-6.12	$p < .0001$	-0.049
Your level of skill on how to appropriately identify the anatomical landmarks of the perineum	2.16	0.79	3.46	0.71	-5.84	$p < .0001$	-0.046
Assessment and recognition of perineal trauma	**Mean**	**SD**	**Mean**	**SD**	***Z*[b]**	***p* value[a]**	***r***
Your level of knowledge on how to assess and recognise perineal trauma sustained in childbirth	2.84	0.72	3.67	0.57	-5.35	$p < .0001$	-0.042
Your level of confidence on how to assess and recognise perineal trauma sustained in childbirth	2.43	0.78	3.37	0.58	-5.33	$p < .0001$	-0.042
Your level of skill on how to assess and recognise perineal trauma sustained in childbirth	2.43	0.73	3.27	0.65	-5.15	$p < .0001$	-0.041
Repair of perineal trauma sustained in childbirth	**Mean**	**SD**	**Mean**	**SD**	***Z*[b]**	***p* value[a]**	***r***
Your level of knowledge on how to repair perineal trauma sustained in childbirth	1.62	0.66	3.43	0.8	-6.65	$p < .0001$	-0.053
Your level of confidence on how to repair perineal trauma sustained in childbirth	1.24	0.59	2.83	0.85	-6.49	$p < .0001$	-0.052
Your level of skill on how to repair perineal trauma sustained in childbirth	1.24	0.53	2.7	0.94	-6.19	$p < .001$	-0.049

**(Likert scale: 1=very low, 2=low, 3=moderate, 4=high, 5=very high)*

a Wilcoxon signed-rank test

b Based on negative ranks

with the woman was seen as a strong example of holistic and woman-centred care by some of the students. Listening to the woman and answering her concerns was also noted as an important aspect of good communication, this enabled the woman to make informed decisions regarding care, such as consenting to the repair of her perineal trauma. The opposite was also true, where failure to listen to the needs of the woman impacted on her birth experience:

'She kept stating how uncomfortable she was and that she was experiencing extreme back pain, however the midwife kept on continuing with the suturing. I feel as though the woman should have been offered some pain relief prior to assessing the trauma as she was clearly distressed. I feel as though the midwife ignored the woman's pain and feelings in the situation.' (Zoey)

Sub-theme: Women received inadequate explanations about their perineal trauma or care

Lack of communication was observed when inadequate explanations were provided to women regarding assessment of perineal trauma, obtaining consent for an episiotomy, and what to expect during the wound healing stage in the postpartum period. One student observed a situation where she believed that the perineal repair took precedence over the emotional well-being of the woman:

'This woman was very distressed by the situation and the peri [sic] *repair, due consideration to her emotional well-being seemed to somewhat take a back seat to the necessary medical intervention.'* (Grace)

Theme 2 — Confidence growth

The level of confidence perceived by students when performing perineal assessments and observing a repair appeared to be linked to the amount of information they recalled and their experience practising and observing these skills. In other words, the more knowledge the student had on perineal assessment and repair, the higher their reported confidence was in what they were observing. The same appeared true when they had engaged in more opportunities to perform perineal assessments and observe perineal repair.

Sub-theme: Inexperienced practitioners have a lack of confidence in determining the extent of the injuries

The most common issue students faced during the assessment of perineal trauma was determining the

Table 2. Descriptive statistics of students' satisfaction with current learning and self-confidence in learning (SSSL) results* (*n* = 57).

Satisfaction with current learning							
	Strongly disagreed	**Disagree**	**Undecided**	**Agree**	**Strongly agree**	**Missing values**	**Mean (SD)**
1. The teaching methods used in this simulation were helpful and effective.	0 (0)	1 (1.80%)	2 (3.50%)	26 (45.60%)	26 (45.60%)	2 (3.50%)	4.4 (0.7)
2. The simulation provided me with a variety of learning materials and activities to promote my learning.	0 (0)	0 (0)	3 (5.30%)	21 (36.80%)	32 (56.10%)	1 (1.80%)	4.5 (0.6)
3. I enjoyed how my instructor taught the simulation.	0 (0)	1 (1.80%)	2 (3.50%)	17 (29.80%)	36 (63.20%)	1 (1.80%)	4.6 (0.7)
4. The teaching materials used in this simulation were motivating and helped me to learn.	0 (0)	1 (1.80%)	4 (7.00%)	22 (38.60%)	29 (50.90%)	1 (1.80%)	4.4 (0.7)
5. The way my instructor(s) taught the simulation was suitable to the way I learn.	1 (1.80%)	0 (0)	3 (5.30%)	23 (40.40%)	29 (50.90%)	1 (1.80%)	4.4 (0.8)
Self-confidence in learning							
	Strongly disagreed	**Disagree**	**Undecided**	**Agree**	**Strongly agree**	**Missing values**	**Mean (SD)**
6. I am confident that I am mastering the content of the simulation activity that my instructors presented to me.	1 (1.80%)	3 (5.30%)	18 (31.60%)	28 (49.1%)	7 (12.30%)	0 (0)	3.6 (0.8)
7. I am confident that this simulation covered critical content necessary for the mastery of perineal trauma recognition and repair.	0 (0)	0 (0)	7 (12.30%)	24 (42.10%)	26 (45.60%)	0 (0)	4.3 (0.7)
8. I am confident that I am developing the skills and obtaining the required knowledge from this simulation to perform necessary tasks in a clinical setting.	0 (0)	3 (5.30%)	5 (8.80%)	36 (63.20%)	12 (21.10%)	1 (1.80%)	4 (0.7)
9. My instructors used helpful resources to teach the simulation.	0 (0)	0 (0)	3 (5.30%)	22 (38.60%)	31 (54.40%)	1 (1.80%)	4.5 (0.6)
10. It is my responsibility as the student to learn what I need to know from this simulation activity.	0 (0)	1 (1.80%)	5 (8.80%)	21 (36.80%)	30 (52.60%)	0 (0)	4.4 (0.7)
11. I know how to get help when I do not understand the concepts covered in the simulation.	0 (0)	2 (3.50%)	8 (14%)	20 (35.10%)	27 (47.40%)	0 (0)	4.1 (0.8)
12. I know how to use simulation activities to learn critical aspects of these skills.	0 (0)	0 (0)	6 (10.50%)	26 (45.60%)	24 (42.10%)	1 (1.80%)	4.3 (0.7)
13. It is the instructor's responsibility to tell me what I need to learn of the simulation activity content during class time.	2 (3.50%)	7 (12.30%)	13 (22.80%)	23 (40.40%)	12 (21.1)	0 (0)	3.6 (1.1)

**(Likert scale: 1 = STRONGLY DISAGREE with the statement, 2 = DISAGREE with the statement, 3 = UNDECIDED - you neither agree or disagree with the statement, 4 = AGREE with the statement, 5 = STRONGLY AGREE with the statement)Reflective journal content findings*

degree of damage observed. While some students could identify that damage had occurred, they were uncertain of the classification as they could not identify the anatomical landmarks. Over time, some students developed strategies to determine the degree of trauma by comparing new observations to previous ones:

'I felt confident in checking this that there were no labial tears but I did think it was more of a 2nd degree tear than 1st and I have seen a 1st before that was never sutured so maybe it was borderline to being a 2nd.' (Leah)

Sub-theme: Inexperienced practitioners need more opportunities to feel confident when assessing perineal trauma

Ability to identify the anatomical structures involved in perineal trauma was not the only factor that influenced the confidence of students. Students who had more opportunities to practice these skills felt more confident over time:

'Given this was into my 3rd week of intrapartum I was feeling more confident to assess peri [sic] *trauma.'* (Riley)

Sub-theme: Confidence increases when perineal trauma is correctly recognised

Students reported that they felt most confident when they were able to correctly identify the degree of trauma they were observing, and their findings were supported by experienced clinicians. As one student noted:

'I felt I was able to view quite clearly that there was no internal trauma to the vaginal and the perineum with simply an external 1st-degree surface tear with minimal bleeding. I felt confident in my classification and the midwife agreed and supported me.' (Avery)

Theme 3 — Perineal pain

Perineal pain was recognised as a concern by a number of students. They identified that pain had a significant impact on the assessment and the overall experience for the woman. However, although they questioned the lack of analgesia for the women, they still followed through with the assessment. It was only after the experience that the students were able to reflect on what could have been improved.

Sub-theme: Pain impacts on the assessment

Performing perineal wound assessments on women with minimal or no analgesia proved challenging for some of the students. Not only did it make it difficult to conduct assessments, but also gave rise to uncomfortable feelings for the student:

'The Midwife asked me to assess the perineum to assess if there was any trauma. I felt nervous doing so as the woman had no pain relief and was extremely uncomfortable, however I did it.' (Zoey)

Sub-theme: Pain relief often not offered or not adequate

Women experience high levels of pain and discomfort in the postpartum period following perineal repair. However, they are often not asked about their pain and thus experience some anxiety and unnecessary stress. One student described quite explicitly the words used by a woman during a postnatal visit regarding the pain she was experiencing following a first-degree tear:

'I visited the woman a few days later in postnatal and said that she was quite sore, her phrase was "it feels like I'm sitting on barbed wire". What a shame considering how little perineal trauma she suffered at the birth.' (Audrey)

Theme 4 — Perineal outcomes are associated with practitioner's skills and experience

Students felt that perineal outcomes were associated with the practitioner's skills and experience. In the case of midwives, the practice of hands-on the perineum in the second stage of labour and slowing down the birth of the baby's head was perceived to reduce perineal trauma. Furthermore, a practitioner's decision to perform an episiotomy was observed as 'the right decision' in view of risk factors such as a 'tight' perineum. However, the practice was also questioned by students.

Sub-theme: Midwifery influence on perineal outcomes

Students perceived that, by supporting the woman's perineum during the second stage of labour, perineal trauma was reduced. However, they only tended to do so when they noticed risk factors such as quick progress in second stage of labour, history of previous severe perineal trauma and/or episiotomy and large for gestational age baby:

'During the delivery, I made the decision to brace and support the perineum with the knowledge that the woman had a previous episiotomy, her labour was progressing fast and her baby when palpated abdominally felt quite large.' (Avery)

However, even when the perineum was supported, a number of students noted that trauma could not be prevented:

'I guarded the peri (hands on), as is the practice at the hospital where the birth took place. I had never seen a perineum tear right before my eyes so quickly and obviously and felt terrible afterwards as it seemed to go right down to her bottom. It looked a mess, and I could clearly see that muscle was involved.' (Sadie)

Sub-theme: Practitioner expertise associated with 'good' outcomes

A number of students associated the clinician's expertise with positive outcomes for the woman particularly, when the use of an episiotomy was deemed necessary. However, this was despite the evidence and clinical guidance that did not support some of the techniques and practices used by clinicians, for example performing a 1cm episiotomy (Carroli & Mignini 2009, Steen & Cummins 2016, Naidu et al 2015). As one student explained:

'The Dr was present and as the woman was having a contraction and bearing down, he cut a very small incision of approximately 1cm. This allowed her to birth the baby over the next 2 contractions. When we assessed her perineum the trauma was minimal and the episiotomy incision had not extended at all… there was no muscles involvement and only the skin layer required suturing. For me this was a perfect example of when and how to perform an episiotomy. The head was tightly applied and stretched across the perineum and the incision made at the right time.' (Hannah)

Theme 5 — Reflecting on the experience

Reflecting on the clinical experience helped the students link their knowledge on perineal trauma management gained in the workshop, to their practice. Reflection allowed students to think about their own learning and ways of improving care:

'I found it easy to identify the apex of the episiotomy and could recognise the continuous suturing in the muscle and just under the skin. I feel like I was able to relate what I saw back to the perineal repair workshop and was quite proud of what I remembered and of the knowledge that I attained.' (Avery)

Sub-theme: Linking practice to knowledge gained in workshop

A number of students acknowledged the benefits of the pre-clinical workshop on perineal assessment and repair when caring for a woman with perineal trauma.

'I was able to ascertain that it was a second-degree tear from closely looking at the layers affected and could tell it was more than a first degree as there was more than just skin. I found the slideshow at the pre-clinical was very valuable in making the degrees of tearing clearer for me.' (Hannah)

Sub-theme: Feeling supported

Feeling supported through the assessment and being informed on the process of perineal repair was acknowledged positively by some of the students. One student was grateful when an obstetrician spent time teaching her how to assess the degree of perineal injury and repair:

'The doctor did the examination and talked me through it, although I could obviously see the labial grazes, and could see there was a tear, I struggled to determine what degree. The doctor was brilliant at educating me on recognition of tears and again through the suturing. I really appreciated the time the doctor spent with me, talking me through the suturing process and allowing me to observe all aspects.' (Victoria)

Sub-theme: Continuity of care

Continuity of care was highly regarded by the students as they were able to see various stages of wound healing. As highlighted by one student:

'I had the benefit of seeing this woman again 3 days later and was able to view her perineum. Wow, I couldn't believe how normal it looked! After seeing it swollen and freshly sutured, it looked pretty bad. But it was well on the way to healing really well. It was really good for me to see how quickly it returns to normal, as I have never seen this continuity from the same birth through to healing a few days later.' (Sadie)

Another student reflected that continuity of care could be improved if the practitioner who performed an episiotomy also sutured the repair. This would also reduce the time a woman would have to wait for a qualified practitioner to undertake the repair.

'I think an improvement would have been suturing completed by the consultant who made the episiotomy, or supervision of the RMO to ensure she correctly sutured in the first instance to avoid such a lengthy process for the woman.' (Charlotte)

Discussion

Key findings of this study demonstrate that the introduction of a perineal wound assessment and repair workshop in the final year midwifery program improved students' knowledge, self-confidence and skills. Students self-reported an improvement in their skills when identifying anatomical landmarks of the perineum, assessment and recognition of perineal trauma and repair after participating in the skills section of the workshop. Interestingly, the area that showed the most improvement after the workshop was skills in perineal repair, with a majority (81.3%) of students reporting low levels of skill in this area prior to the workshop compared to (12.7%) after the workshop. However, it is noted that participant bias in the self-reported assessments is a limitation in the design of this study.

Students' knowledge and self-confidence on perineal wound assessment and repair improved significantly after immediately attending the workshop. However, the planned assessment of knowledge and self-confidence at four months was not possible due to a large percentage (95%) of student participants not completing the follow-up questionnaire online. One possible solution to rectify this limitation of the current study would have been to hand-deliver the questionnaire to students. More recently, this method was successfully implemented in a similar study for midwives and obstetricians by Zimmo et al (2017) who achieved 80% response rates 12 weeks after the intervention. However, it is worth noting that the students had another assignment to undertake during this time period and this needs to be taken into consideration. Nevertheless, this study was able to capture useful insights from reflective journal entries on how midwifery students implemented their newly acquired knowledge and confidence in clinical practice. The use of reflective journals has not been explored in previous research.

It was clear from the reflective journal entries that attending a perineal wound education workshop gave students confidence to assess and recognise perineal trauma in clinical practice. Students' confidence improved during their clinical placement and this resonates with previous studies' findings involving clinicians (Cioffi et al 2010, Zimmo et al 2017).

Strengths and limitations

Adopting a multi-methods research design and validated assessment tools were strengths of this study as these enabled the triangulation of findings. Implementation of newly acquired knowledge, confidence and skills was validated by quantitative and qualitative data.

This study used four types of data collection tool to capture both qualitative and quantitative information. This allowed for the triangulation of the findings using different perspectives. For example,

knowledge was tested using a multiple-choice questionnaire to determine students' knowledge prior to and immediately after the workshop, which was supported through the translation of knowledge to practice as reported in the reflective journal entries.

Convenience sampling is a limitation for this study, as participants selected were accessible (that is, the workshop was a compulsory component of the final year Midwifery program at the university) and therefore the findings cannot be generalised. Furthermore, of the 81 midwifery students who were invited to participate, only 65 consented, thus reducing the sample size, however, this also indicates that students had a choice to voluntarily participate in the study.

Despite 65 students consenting to participate in the study many did not complete all the assessments. In some instances, the responses were incomplete and therefore data analysis had to be adjusted. There was also a major limitation in the longitudinal design of the study in that 95% of consenting students had not completed the multiple-choice questionnaire four months after attending the workshop. Possible reasons for this may be that the questionnaires were all provided to students online, therefore allowing for greater autonomy.

Midwifery students were asked to keep a reflective journal for assessment during this time period and completing a follow-up questionnaire may have been too time-consuming. Furthermore, the workshop was offered in the last midwifery practicum and students were finalising their studies, therefore completing the questionnaires may not have been a priority.

This is the first known study conducted in Australia that has reported improvements in knowledge, confidence and skills of midwifery students and how they translated this newly acquired knowledge to clinical practice.

Conclusion

The inclusion of a perineal wound assessment and repair workshop in an undergraduate midwifery curriculum improved the knowledge and confidence of these midwifery students in the management of childbirth related perineal trauma.

Recommendations

The implementation of perineal wound assessment and repair education and training in the Bachelor of Midwifery programs is recommended. This study has highlighted the need to further evaluate the implementation of education at a tertiary level that aligns with continued professional practice for midwives, to investigate if midwives maintain the knowledge, confidence and skills once they complete their foundation training.

Conflict of interest

None.

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Exercise intervention in pregnancy: a feasibility study in Thailand

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ABSTRACT

Background: Exercise during pregnancy can increase physical fitness, decrease the risk of non-communicable diseases (NCDs) and control gestational weight gain (GWG); there is also an association with enhanced psychological well-being. However, pregnant women generally exercise less than before pregnancy or when not pregnant.

Objectives: The objectives were to determine the acceptability of a programme based on the Thai Government guidance for exercise in pregnancy, and to assess the preliminary effects of the exercise programme.

Methods: A total of 61 women, between 12–16 weeks' gestation, were randomly allocated to the 10-week exercise intervention (n=31) or control group (n=30). Baseline measures were collected before the intervention and preliminary effects data after completion of the intervention and two weeks after the expected date of delivery (EDD).

Ethical approval: Approval was obtained from the University of East Anglia, Faculty of Medicine and Health Sciences Research Ethics Committee, United Kingdom (UK) Ref: 2015/2016-46 and the Health Promoting Hospital, 3rd Regional Health Centre, Nakhon Sawan, Thailand Ref: Sor Thor 093.07/2764.

Results: Analysis of Covariance (ANCOVA) showed the exercise group had lower gestational weight gain than the control group after controlling for maternal age, pre-pregnancy body mass index (BMI), gestational age (GA), and baby birth weight ($p<.001$). The study indicated significant increases over time in physical activity (PA) after controlling for maternal age, and pre-pregnancy BMI ($p<.001$).

Conclusion: The study demonstrated the feasibility of conducting a larger RCT with an intervention to improve exercise behaviour in pregnant women.

Keywords: exercise, pregnant women, exercise programme, antenatal, obesity, Evidence Based Midwifery

Introduction

The prevalence of global obesity and overweight is increasing (World Health Organization (WHO) 2015a) including in Thailand (Aekplakorn & Mo-Suwan 2009, Ministry of Public Health (MoPH) Thailand 2010, Teerawattananon & Luz 2017). Obesity has direct and indirect impacts on physical and mental health (Davies et al 2010, Mahmood & Arulkumaran 2013, Özdemir 2015). In pregnant women, obesity and overweight may impact on maternal health and baby outcomes, including both medical and obstetric complications. Moreover, being obese is associated with next generation obesity (Poobalan et al 2009, Keeley et al 2011, Centers for Disease Control and Prevention (CDC) 2012, Marchi et al 2015), thereby compounding this public health issue for future generations.

Evidence strongly supports the benefits of regular exercise during pregnancy beyond mere physical fitness. Several studies show that exercise is associated with a decrease in the risk of non-communicable diseases such as coronary heart disease, hypertension and obstetric complications, the control of GWG, a reduction in antenatal depression symptoms, reduced rates of macrosomia (a birth weight of more than 4000 grams) and the reduced risk of an overweight baby (Prather et al 2012, Siebel et al 2012, Millard et al 2013, Makinde et al 2014, Seneviratne et al 2014, WHO 2015b). Generally, guidelines recommend that low-risk pregnant women without

any contraindications should conduct at least 30 minutes of accumulated moderate exercise a day for a minimum of three days a week (Royal College of Obstetricians and Gynaecologists (RCOG) 2006, American College of Sports Medicine (ACSM) 2014, American College of Obstetricians and Gynecologists (ACOG) 2015). In Thailand, the policy guides all antenatal care units to promote exercise during pregnancy (Department of Health, Thailand 2014).

However, antenatal clinics (ANC) in Thailand do not have routine exercise programmes for pregnant women (MoPH Thailand 2012). Generally, prenatal education classes are led by one nurse who teaches a range of subjects during pregnancy and provides exercise advice (3rd Regional Health Centre Thailand 2011, Parnkasem 2013). Research studies indicate that pregnant women may receive insufficient information and that current practice may be ineffective for motivating them to exercise during pregnancy (Bauer et al 2010, Jones et al 2010, Krans & Chang 2012, Melton et al 2013). The objective of this study was to determine the preliminary effects and acceptability of an exercise programme based on the Thai Government guidance for exercise in pregnancy.

Methods

Study design

The study involved a two-armed feasibility randomised controlled trial (RCT) designed to test three aspects of the intervention: acceptability, feasibility, and preliminary effects. The primary outcome was the GWG. The secondary outcomes were the effects on mother and baby as follows: 1) mother, in terms of physical activity including frequency and duration of exercise behaviour, blood pressure, stress score, and adverse events; and 2) baby, in terms of baby birth weight. Ethical approval for the study was obtained from the Faculty of Medicine and Health Sciences Research Ethics Committee, University of East Anglia (UEA), Norwich, United Kingdom (UK) and the Health Promoting Hospital, 3rd Regional Health Centre, Nakhon Sawan, Thailand, where the study was conducted from December 2016 to September 2017.

Participants

The target sample size for the feasibility RCT was 66 pregnant women (33 for the control group and 33 for the intervention group), allowing for a 10% dropout rate in each arm (Hertzog 2008). This was not based on a formal sample size calculation as this was only a feasibility study. Sample size was computed according to the number of attendees at the antenatal care clinic where recruitment took place. Consideration was given to how many women could feasibly be accommodated within an exercise programme to arrive at a pragmatic decision on recruitment. The sample size justification for a feasibility study varies widely depending on the research objective, question, population and context (Arain et al 2010, Billingham et al 2013). The United Kingdom Clinical Research Network (UKCRN) reported the median sample sizes per arm of feasibility trials were 36, in a range of 10 to 300 participants, and pilot trials were 30, in a range of eight to 114 participants (Billingham et al 2013).

Participants were pregnant women aged 20 years or more who exercised for less than 30 minutes a day and/or three days a week. Those with any contraindications to exercise during pregnancy, as identified by the Physical Activity Readiness Medical Examination for Pregnancy Thai version (PARmed-X), (Davies et al 2003, Suputtitada 2005) and with extremely high stress scores (score > 30 points) were excluded from the study. After completion of the baseline measures, participants were randomised to either the control or the intervention group at GA 16–18 weeks by the blocked randomisation with four and six block sizes.

Exercise intervention

The exercise intervention was co-designed by women and health care professionals, including physiotherapists, based on the Thai Government guidelines for exercise in pregnancy. Intervention group participants were offered 10 prescribed hospital-based group exercise sessions, once a week, between 18–20 weeks' gestation (GA) and 28–30 weeks. All exercise classes were instructed by the researcher in consultation with a physiotherapist who attended the first, fifth, and tenth weeks. Each exercise training session included dynamic exercises: five-minute warm-up of muscle stretching, 10–15 minutes' muscular workout, 10–15 minutes' cardiovascular exercise and five-minute cool down of muscular progressive relaxation. The exercise training session increased progressively from 20 minutes during the first week to 40 minutes by the fifth week. The control group continued with the usual care comprising exercise information and nurse-demonstrated workouts during a 30-minute general prenatal education class at 16–28 weeks of GA.

Data collection

Data were collected through questionnaires at baseline (GA 16–18 weeks), after the intervention (GA 30–32 weeks), and by telephone at two weeks post estimated date of delivery (EDD). The Global Physical Activity Questionnaire (GPAQ) (Thai version) was used to assess the exercise behaviour of women (Division of Physical Activity and Health 2009). Evidence-based safety information was provided (ACOG 2002, 2015, Suputtitada 2005). The individual's stress score was routinely collected at GA 16–20 and 28–32 weeks in the antenatal clinic using a stress self-assessment tool (MoPH Thailand 2012). The acceptability of the exercise programme was determined by a questionnaire developed by the

researcher; this focused on acceptability, satisfaction, reason for adherence or discontinued participation, and suggestions for any changes to the exercise programme. These data were only collected from pregnant women who participated in the exercise intervention group. An exercise checklist was used by the researcher to record the participants' attendance and adherence to the intervention, after each exercise class. In the telephone interview at two weeks following estimated delivery date women supplied the gestation, weight on admission to delivery room and baby birth weight from their personal copy of maternal and child health record.

Statistical analysis

Data were analysed using SPSS for Windows version 24.0. Analysis of covariance (ANCOVA) was conducted to compare any differences identified in the exercise intervention and control groups on GWG and baby birth weight. Baseline values: maternal age, pre-pregnancy BMI, and gestational age, were included as covariates in the model due to the interaction between GWG, baby birth weight, stress score, blood pressure, and physical activity (Nascimento et al 2012, Bazyar et al 2015, Zanardo et al 2016, Yang et al 2017). Repeated measures ANCOVA was used to test group effects between intervention and control groups on total physical activity, blood pressure, and stress score over time at baseline (16–18 weeks of gestation) and 30–32 weeks of gestation (Vickers & Altman 2001, Field 2015). These tests were carried out to inform the future design of a trial.

A two-tailed statistical evaluation of the study was performed with an alpha of 0.05 as the cut-off for significance, although the feasibility study was not powered to measure the effectiveness of the exercise intervention (Eldridge et al 2016a). Descriptive data were presented as means and standard deviations, and numbers and percentages for continuous and categorical variables respectively (Field 2015). Pre-pregnancy BMI values were square root-transformed because of moderate right skewness. Square root-transformed pre-pregnancy BMI was entered as a covariate in the ANCOVA model. Diastolic blood pressure at 30–32 weeks of gestation, stress score at baseline and 30–32 weeks of gestation values were log-transformed due to right skewness (Field 2015).

Results

Recruitment

The feasibility study is summarised in Figure 1 (Eldridge et al 2016b). One hundred and four

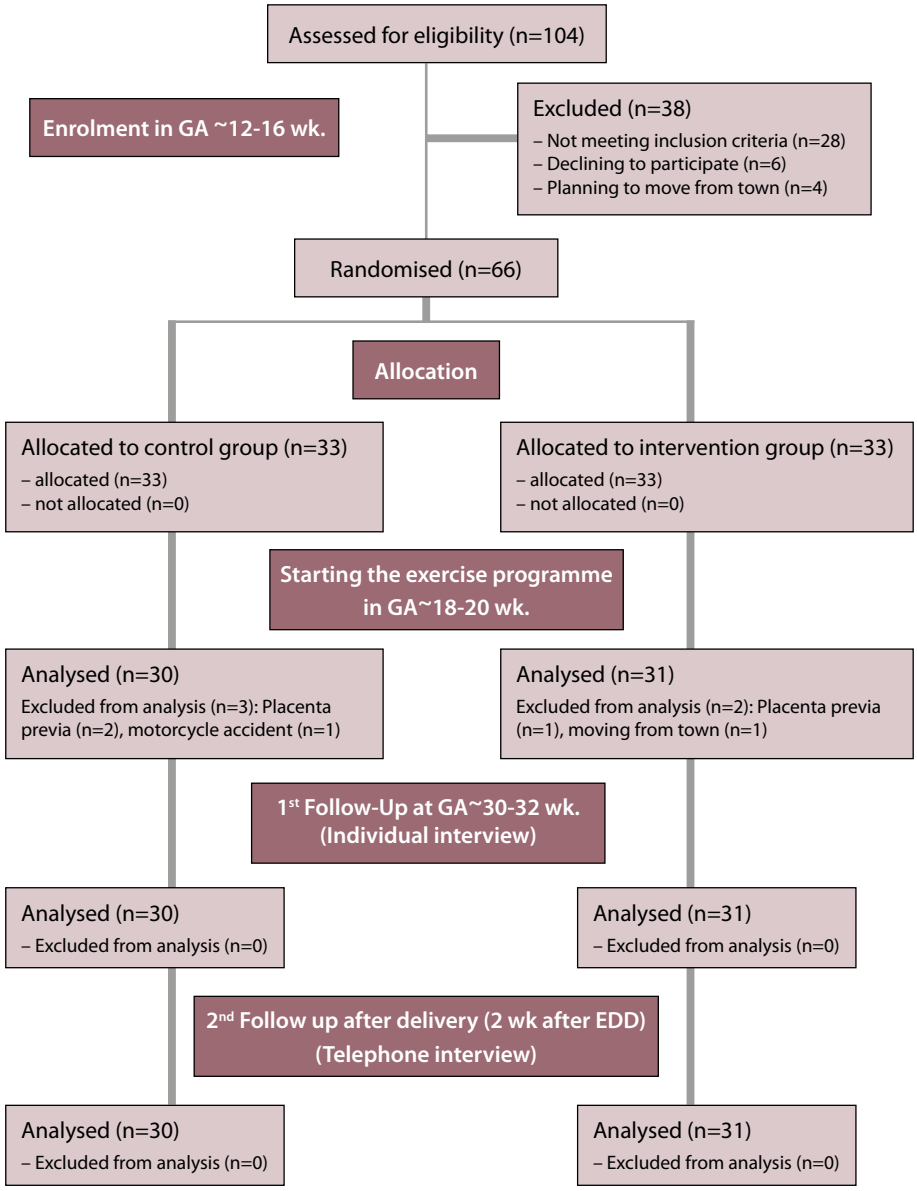

Figure 1: Flow diagram of the feasibility RCT study

women were assessed for eligibility to participate in the exercise intervention. Around one-fifth (20 of 104 women) were excluded as verified by the Physical Activity Readiness Medical Examination for Pregnancy Thai version (PARmed-X) (Davies et al 2003, Suputtitada 2005). Four women already regularly exercised at least 30 minutes a day for three days a week, four were aged under 20 years, and a further four had a history of vaginal bleeding. Three women had severe anaemia (haemoglobin <10 mg%) due to thalassaemia. Another three had a previous premature labour. Two women had a history of mental health problems and stress score >30 points, and eight women had a high risk of medical conditions: hypertension and diabetes. Nearly one-tenth (10 of 104 women) declined to participate in the study for personal reasons and planned to move back to their hometowns.

Initially 66 women who met the inclusion criteria were enrolled (63.46%). They completed a baseline questionnaire and were randomised to either the intervention (n=33) or the control group (n=33). Subsequently five women were excluded from the study: a dropout rate of 7.58% during the exercise intervention, three women were excluded from the control group and two women were excluded from the exercise intervention. Thus the total sample for analysis was 61 pregnant women: the intervention group (n=31) and the control group (n=30). The dropout rate was under 10% in each arm (control and intervention groups).

Demographic characteristics of the sample

In keeping with CONSORT guidelines, the tests of significance were not carried out on baseline characteristics (Eldridge et al 2016a) (see Table 1). The sample was aged between 20 and 40 years. The mean maternal age was 28.23 years with standard deviation (SD) of 5.67 years. The sample's previous pregnancy number was between 1 and 4; most were multigravida (n=40, 65.57%) and their pre-pregnancy BMI was between 17.07 and 31.22 kg/m^2. Nearly half of them had a healthy pre-pregnancy BMI between 18.5 and 22.9 kg/m^2 (n=29, 47.54%).

Preliminary effects of the exercise intervention

Analysis of Covariance (ANCOVA) was used to analyse the difference between intervention and control groups (Vickers & Altman 2001) for total gestational weight gain (TGWG), and baby birth weight. The normality assumption was tested using Kolmogorov-Smirnov and Shapiro-Wilk tests. The assumption of homogeneity of variance for ANCOVA was tested using Levene's test. The assumption of sphericity for repeated measures ANCOVA was tested using Mauchly's test (Field 2015). Pre-pregnancy BMI values were square root-transformed because of a moderate right skewness. Square root-transformed pre-pregnancy BMI was entered as a covariate in the ANCOVA model. Diastolic blood pressure at 30–32 weeks of gestation, stress score at baseline and 30–32 weeks of gestation values were log-transformed due to right skewness.

TGWG was calculated as weight at delivery minus pre-pregnancy weight. TGWG was the dependent variable in the ANCOVA model. Groups of study (intervention and control groups) were used as a fixed factor while maternal age, pre-pregnancy BMI, gestational age at delivery, and baby birth weight were entered as covariates (see Table 2). TGWG differed significantly between the intervention and control groups after adjusting for maternal age,

Table 1. Demographic characteristics at 16–18 weeks of gestation.

Baseline characteristics mean (+SD) or n (%)	Intervention group (n=31)	Control group (n=30)
Maternal age [a]	29.10±6.28	27.33±4.90
Family income [c]	30,258.06±9,332.13	23,933.33±9,303.07
Pre-pregnancy weight [a]	55.48±8.15	59.67±11.72
Pre-pregnancy BMI [a]	21.95±3.11	23.22±4.55
Underweight (BMI < 18.5 kg/m^2)	6 (19.35%)	2 (6.67%)
Healthy (BMI 18.5–22.9 kg/m^2)	15 (48.39%)	14 (46.67%)
Overweight (BMI 23–29.9 kg/m^2)	10 (32.26%)	9 (30%)
Obesity (BMI ≥ 30 kg/m^2)	0	5 (16.67%)
Educational level [b]		
Primary school	1 (3.23%)	0
Secondary school	5 (16.12%)	7 (23.33%)
High school	11 (35.48%)	10 (33.34%)
College degree	2 (6.45%)	1 (3.33%)
Bachelor's degree	12 (38.71%)	11 (36.67%)
≥ Master's degree	0	1 (3.33%)
Gravida [b]		
Primigravida	11 (35.48%)	10 (33.34%)
Multigravida	20 (64.52%)	20 (66.67%)
Occupation [b]		
Government/ employee	10 (32.25%)	12 (40%)
Self-employed	6 (19.35%)	4 (13.33%)
Agriculture	4 (12.90%)	3 (10%)
Housewife	11 (35.50%)	11 (36.67%)
Location of work [b]		
Inside home	7 (22.58%)	5 (16.67%)
Outside home	13 (41.94%)	14 (46.67%)
None	11 (35.48%)	11 (36.67%)
Area of living [b]		
Urban area	15 (48.39%)	15 (50%)
Rural area	16 (51.61%)	15 (50%)

[a] t-test for continuous variables
[b] x^2 test for categorical variables
[c] Non-parametric test: Mann-Whitney U test

pre-pregnancy BMI, gestational age at delivery, and baby birth weight, F (1, 55) = 58.934, p <.001, partial η^2 = .517. More women in the intervention group had appropriate TGWG, according to the recommendation made by the Institute of Medicine (IOM 2009), than the control group with an average weight gain of 12.64 (+2.51) kilograms (kg.) for the intervention group and 17.73 (+ 4.61) kg. for the control group (ACOG 2013).

Baby birth weight (BBW) was the dependent variable in an ANCOVA model with maternal age, pre-pregnancy BMI, gestational age at delivery, and TGWG as covariates (see Table 3). There was no significant effect of the exercise intervention on baby birth weight with an average birth weight of 3,084.84 (±307.63) grams for the intervention group and 3,176 (±485.09) grams for the control group,

Table 2. Total gestational weight gain in the control and intervention groups.

Variable[c] mean (±SD)	Intervention (n=31)	Control (n=30)	Absolute effect size (95%CI)	*p*-value[a]	Adjusted effect size (95%CI)	Adjusted *p*-value[b]
Total weight gain (kilograms)	12.64±2.51	17.73±4.61	-5.09 (-6.98 to -3.2)	<.001	-5.73 (-7.22 to -4.23)	<.001
Appropriate GWG	26 (83.87%)	6 (20%)				
Excessive GWG (>IOM)	3 (9.68%)	24 (80%)				
Inadequate GWG (<IOM)	2 (6.45%)	0				

[a] Unadjusted analysis

[b] Linear or generalised linear mixed model for covariate factor, maternal age, pre-pregnancy BMI, and baby birth weight

[c] Total gestational weight gain was calculated at admission to delivery room. The data was collected at the postnatal telephone interview when women were asked to access the information from their handheld postnatal notes.

Table 3. Baby birth weight in the control and intervention groups.

Variable mean (±SD)	Intervention (n=31)	Control (n=30)	Absolute effect size (95%CI)	*p*-value[a]	Adjusted effect size (95%CI)	Adjusted *p*-value[b]
Baby birth weight (grams)	3084.84±307.63	3,176±485.09	-91.16 (-298.6 to 116.2)	0.383	257.69 (-4.12 to 5.19)	0.054
Low birth weight (BBW < 2,500 grams)	0	3 (10%)				
Appropriate birth weight (BBW 2,500-3,499 grams)	28 (90.32%)	18 (60%)				
Large birth weight (BBW ≥ 3,500 grams)	3 (9.68%)	9 (30%)				

[a] Unadjusted analysis

[b] Linear or generalised linear mixed model for covariate factor, maternal age, pre-pregnancy BMI, gestational age at delivery, and total gestational weight gain (TGWG)

Table 4. Total physical activity in the control and intervention groups.

Variable Mean (±SD)	Intervention (n=31)	Control (n=30)	F	*p*-value[a]	Adjusted effect size (95%CI)	Adjusted *p*-value[b]
Total physical activity (MET-min/wk.)			21.283	<.001		
Baseline (GA 16–18 wks)	1,889.4±493.2	1,852587±.1			31.94 (-256.9 to 320.8)	0.826
Follow-up (GA 30–32 wks)	2,643.6±493.2	1,635.5±288.2			1,010.40 (793.6 to 1,227.2)	<.001

[a] P value differences within groups

[b] P value for effect of intervention between groups (Repeated-measurements ANCOVA for covariate factors: maternal age and pre-pregnancy BMI)

after controlling for maternal age, pre-pregnancy BMI, gestational age at delivery, and TGWG, F (1, 55) = 3.891, p = .054, partial η^2 = .066. Most of the babies in the intervention and control groups had appropriate birth weight (BBW 2,500-3,499 grams) between 90.32% and 60% respectively.

The total physical activity (PA) was calculated from different behavioural domains: work, transport, and recreation. The Metabolic Equivalent of Task (MET) is commonly used to express the intensity of physical activities, and also to analyse PA data in minutes per week (WHO 2004, Singh & Purohit 2011).
A repeated measures ANCOVA was conducted to compare PA in the intervention and control groups over time at baseline (16–18 weeks of gestation and 30–32 weeks of gestation). Maternal age and pre-pregnancy BMI were entered as covariates in the model (see Table 4). There was a significant effect of the exercise intervention on the total PA after controlling for maternal age, and pre-pregnancy BMI, F (1, 57) = 21.283, p <.001, partial η^2 = .272. Pregnant women in the intervention group increased their total PA from the average of 1,601.94 (±530.97) MET-minutes/week at baseline (16-18 weeks of gestation to 2,385.16 (±516.63) MET-minutes/week at the end of the exercise intervention (30-32 weeks of gestation), while women in the control group decreased their total PA from the average of 1,546 (±633.47) MET-minutes/week at baseline to 1,340 (±314.87) MET-minutes/week at the end of the intervention.

The exercise diary was used to assess adherence to the intervention to be completed from the beginning of the intervention (at GA~18-20 weeks) until delivery by the participant. The exercise diary consisted of the type and duration of exercise in a day, including the assessment of exercise intensity by pulse rate and talk test. The researcher phoned participants to gather information from their exercise diaries as part of the data collection process. Data (n = 31) were analysed as a descriptive statistic (see Table 5). Most women who participated in the exercise intervention at 30-32 weeks of gestation did exercise during pregnancy, following ACOG's recommendation (ACOG 2002, 2015, ACSM 2014, Suputtitada 2005), for at least 30 minutes a day, three times a week (24, 77.42%). Most women in the control group indicated they did not perform any exercise at 30-32 weeks of gestation (n = 22, 73.33%). Five women stopped recording their exercise behaviour after the end of the exercise intervention (16.12%) due to their duties, tiredness from work, and a lack of motivation. They thought it was a waste of time to keep the exercise record every day. Most of the women who continued exercise after the end of the exercise intervention until delivery (26, 83.87%) exercised at least three days a week for at least 30 minutes a day (19, 61.29%). Seven women continued exercise less than three days a week for at least 30 minutes a day (7, 22.58%). Most of them gave as their reasons for continuing exercise until delivery that they wanted to reduce discomfort during pregnancy, especially low back pain, leg cramp, muscle strain and insomnia.

Systolic and diastolic blood pressure were taken as the dependent variable in the repeated measurement ANCOVA model over time at baseline and 30-32 weeks of gestation. Groups of study (intervention and control groups) were entered as a fixed factor while maternal age and pre-pregnancy BMI were entered as covariates. After controlling for maternal age and pre-pregnancy BMI, systolic blood pressures differed significantly between the intervention and control groups over time at baseline and 30-32 weeks of gestation, F (1, 57) = 11.126, p = .002, partial η^2 = .163. However, diastolic blood pressure did not differ significantly after controlling for maternal age and pre-pregnancy BMI, F (1, 57) = 1.418, p = .239, partial η^2 = .024.

Stress score was taken as the dependent variable in the repeated measurement ANCOVA model over time at baseline (16-18 weeks of gestation) and 30-32 weeks of gestation. Groups of study were entered as a fixed factor while maternal age and pre-pregnancy BMI were entered as covariates. Stress scores differed significantly between the intervention and control groups over time at baseline and 30-32 weeks of gestation after controlling for maternal age and pre-pregnancy BMI, F (1, 57) = 14.079, p <.001, partial η^2 = .198. Blood pressure and stress score are summarised in Table 6. In this study, there was no report of any adverse events or low birth weight related to pregnant women who participated in the exercise programme.

Adherence to the exercise intervention

Adherence rate was calculated from the number of times each woman attended over the course of the exercise intervention (n=31). Around half of the women who participated in the exercise programme adhered for 80% of the exercise programme, which means that they attended at least eight weeks (17, 54.84%). Nearly one-third of women adhered to the exercise programme between 60–79% (9, 29.03%).

Table 5. Exercise behaviour in the control and intervention groups.

Exercise behaviour, (ACOG's recommendation)	Baseline (GA 16–18 wks.)		Follow-up (GA 30–32 wks.)	
	Intervention (n=31)	Control (n=30)	Intervention (n=31)	Control (n=30)
No exercise	24 (77.42%)	24 (80%)	0	22 (73.34%)
Inadequate exercise	7 (22.58%)	6 (20%)	7 (22.58%)	4 (13.33%)
Regular exercise	0	0	24 (77.42%)	4 (13.33%)

Table 6. Pregnancy outcomes: blood pressure and stress score.

Variable mean (±SD)	Intervention (n=31)	Control (n=30)	F	*p*-value[a]	Adjusted effect size (95%CI)	Adjusted *p*-value[b]
Systolic blood pressure (mmHg.)			11.126	0.002		
Baseline (GA 16–18 wks)	109.03±12.7	112.67±10.52			-3.346 (-9.42 to 2.73)	0.274
Follow-up (GA 30–32 wks)	108.35+6.48	121.2+11.38			-12.187 (-16.90 to -7.48)	<.001
Diastolic blood pressure (mmHg.)			1.418	0.239		
Baseline (GA 16–18 wks)	61.48±9.79	59.8±7.64			2.465 (-1.65 to 6.582)	0.235
Follow-up (GA 30–32 wks)	60.13±7.14	63.1±7.29			-0.017 (-.041 to .008)	0.174
Stress score (point)			14.079	<.001		
Baseline (GA 16–18 wks)	11.94±2.63	11.73±2.73			. 017 (-.036 to .069)	0.523
Follow-up (GA 30–32 wks)	8.77±1.87	13.23±2.27			-0.178 (-.224 to -.131)	<.001

[a] *P* value differences within groups

[b] *P* value for effect of intervention between groups (repeated-measurements ANCOVA for covariate factors: maternal age and pre-pregnancy BMI)

Five women participated less than 60% (16.13%). The total number of absences was 86. Reasons for absence included: being busy with work and duties (43, 50%), transportation (no car) (8, 9.30%), poor weather (6, 6.98%), making merits on Buddhist days (5, 5.81%), and visiting family in another town (4, 4.65%) respectively.

Acceptability of the exercise intervention

All women who participated in the exercise intervention (n=31) agreed that the exercise programme should be part of care at antenatal clinics. Most were satisfied with the overall exercise programme (30, 96.78%). Women were highly satisfied with the duration of each class, saying that it provided sufficient demonstration and training time (28, 90.32%).

The programme encouraged women to gain a better understanding of exercise, change their attitudes to exercise, and increase the frequency and duration of their exercise behaviour. Women indicated that the exercise programme was helpful in maintaining their fitness level (13, 41.94%) and reducing discomfort during pregnancy (20, 64.52%) such as leg cramp, backache, insomnia, and muscle strain, including stress and anxiety, while increasing relaxation. Women also enjoyed the exercise programme partly because there was an exercise group network for sharing their experiences (24, 77.42%) and motivating them to continue to exercise (during pregnancy and after delivery).

Most of the women suggested that an exercise appointment should be made on the same day of their visit at the ANC clinic (18, 58.06%). Women felt it was a waste of time and money when they travelled to hospital for 10 weeks only for the exercise. In their opinion, it would be better to conduct such a class every three or four weeks. It is unnecessary to arrange a weekly class as they have many other duties to fulfil (20, 64.52%). Women also said that HCPs should regularly update their exercise knowledge so that they are able to deliver such knowledge to pregnant women in a proper and effective way (19, 61.29%).

Discussion

This study demonstrated the significant parameters and process feasibility that could inform a larger RCT regarding an exercise programme aimed at improving exercise behaviour in pregnant women. Verbal invitation and direct distribution of the leaflets by the reception nurse were added into the recruitment process after the first week and this resulted in a recruitment rate which was three times higher compared to the first week of the recruitment process. This finding indicated that face-to-face recruitment by healthcare providers is more successful when recruiting pregnant women's participation in a study (Kim & Lennon 2008). This is an important element to build in to future trial recruitment.

The screening process was useful for recruiting pregnant women to the study. In this study, nearly

one-third of women (19 of 61 women) were overweight and five women were obese. However, in a larger trial, it would be better to categorise pregnant women into three groups: healthy (BMI 18.5-22.9 kg/m^2), overweight (BMI 23-29.9 kg/m^2), and obese (BMI > 30 kg/m^2) by adding this criterion into the screening questions. In this way, it will be possible to compare each group's results for the exercise intervention.

Adherence rates to the exercise intervention were greater in the first five weeks of the exercise programme. Around half of the pregnant women (less than 60%) who participated in the exercise programme cited work and duties as reasons for their later absences. Even so, the study data from exercise diaries indicated that pregnant women in the exercise group increased their total physical activity (PA) while women in the control group decreased their total PA by the end of the study. This warrants consideration in designing a trial. The financial implication for women having to attend separate appointments for exercise and for antenatal care may have impacted on their adherence to attending exercise classes. Considering lessons learned during the current public health crisis, when exercise classes online soared in popularity, suggests a potential solution for low attendance.

The data collection process revealed that the questionnaire and telephone interviews were successful in collecting the data at baseline as well as at the end of the exercise programme. The interview data not reported here gave insight into the views of women and the other elements of lifestyle that can be taken into account in designing a trial. The exercise programme encouraged Thai pregnant women to explore the value of exercise in pregnancy. The influence of celebrity and social media in highlighting the benefits of exercise in pregnancy is a new movement in Thailand that, alongside Westernisation, is influencing modern motherhood attitudes.

This exercise programme, drawn from the Thai Government's guidance for exercise in pregnancy, was successful in encouraging pregnant women to increase their physical activity and exercise behaviour. The findings also revealed that pregnant women intended to engage with the exercise programme, and to continue to exercise, because they received guidance from the programme. They also perceived that exercise during pregnancy assisted them in achieving such benefits as increased physical fitness, reduced discomfort during pregnancy, feeling fresh and relaxed, being able to sleep well, and especially achieving a better body shape and sense of well-being during pregnancy and after childbirth.

The physical activity of the pregnant women who participated in the exercise programme was significantly higher at the end of the exercise intervention, compared to that of the control group as well as the baseline. The exercise intervention group possessed significantly lower systolic blood pressure than the control group; it has been recognised that the mechanism of regular exercise during pregnancy decreases arterial stiffness and increases blood circulation (Kawabata et al 2012). It also enhances vagal activity that reduces cortisol and substance P, as well as increases serotonin. This could reduce blood pressure and heart rate in low-risk pregnant women (Horak & Osmam 2012). Blood pressure during pregnancy can also be reduced by exercise (Field 2011, Horak & Osmam 2012). Hence, exercise during pregnancy which reduces systolic blood pressure is an influential factor reducing the risk of gestational hypertensive disorders (Sorensen et al 2003, Scholten et al 2014).

The intervention group had significantly lower stress scores than the control group. Pregnant women felt more relaxed when engaging in the exercise programme. The exercise programme helped pregnant women who participated by reducing discomfort during pregnancy, such as low back pain and fatigue. These findings are in line with other studies that found benefits of exercise during pregnancy include a decrease in stress, anxiety, and insomnia symptoms (Prather et al 2012, Guszkowska et al 2013, Fieril et al 2014).

The present feasibility study illustrated several factors that need to be considered before conducting a larger scale RCT with an exercise programme to improve exercise behaviour in pregnant women. The important parameters gained from this present study can be used to calculate an appropriate sample size and prepare processes in designing a full-scale study in terms of recruitment, exercise intervention, data collection, and outcome measures. Total gestational weight gain and baby birth weight, including total physical activity and maternal outcomes on blood pressure and stress score, would be important outcome measures of the effects of the exercise intervention during pregnancy in a larger trial.

In Thailand, the current Thai national policy has not made clear how to promote exercise behaviour in Thai pregnant women. A larger scale study is required to inform clinical practice.

Strengths and limitations of the study

The randomisation blocking in groups of four and six to either the control or the intervention group was employed to reduce any selection bias and secure an equal sample size (Altman & Bland 1999, Efird 2011).

The study was designed to improve exercise behaviour in Thai pregnant women. The co-design element of the study provided a programme that considered the needs of women's lives. A physiotherapist was a consultant in designing the

exercise programme and the exercise intervention to ensure the safety of the exercise programme for pregnant women.

Most of the participants represented a medium to high level of education and family income. Consideration would need to be given to recruiting a wider more representative sample in a full-scale trial

Conclusion

This study demonstrated feasibility to conduct a larger scale trial with an exercise programme for pregnant women. Recruitment and retention rates demonstrated a good likelihood of implementing such a programme in a larger trial. However, consideration needs to be given to the number of classes and how they can be grouped to reduce the number of visits to the antenatal clinic. Preliminary effects of the exercise intervention were noted and can be used to calculate an appropriate sample size and prepare processes such as collecting and analysing the data in any future trial. The exercise programme was helpful to improve exercise behaviour and health outcomes. Finally, the study suggests that pregnant women showed high fidelity in the intervention.

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