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EVIDENCE
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Reflections on bullying in midwifery and the potential role of EMDR in processing past memories and reducing the impact of trauma

Key words: Bullying, EMDR, trauma and evidence-based midwifery

I have been propelled into thinking about my contribution to midwifery research and I confess, it has been a big challenge. The request has had a mixed impact on me and I would summarise it by stating it was cathartic but painful. It made me go to places in my head I did not want to go, but it also made me aware of the fact there are dark spots that cannot be seen in the spotlight until a person is ready to process them. For me, memory lane at the start of my post-doctoral journey was dark and full of deliberate pot holes and fences. These materialised into the faces of well-know midwifery leaders who tried to blot my journey with innumerable obstacles and falsifications and even physical threats. The raw memories of exchanges between the bullies I met in my research journey flooded back and I was sick to the core. However, at this point in my life I have found a new way to deal with these memories: my recent training in Eye Movement Desensitising Reprocessing (EMDR) therapy. Using this evidence-based technique, I have healed my body response and no longer experience the rapid pulse, chest tightness and leg weakness that accompanied the flashbacks. I have now reprocessed the raw and vivid images into past memories.

I was being asked to review my contribution to midwifery research and for the first time in my life I was able to describe without fear one thread running through my research history that was wrapped around my heart and embedded in my soul: bullying! I decided to share this one, of 24 in exercise and obesity, PhD threads and track it from origin to present day. However, I could easily have selected one of many threads including but not restricted to: breastfeeding, medications in pregnancy, alcohol, still birth, caesarean birth, disabled women's experiences of childbirth, appropriate use of technology, depression, use of social media, etc. On reflection, I consider bullying to be one of the most important and under-estimated doctoral-midwifery-studies in which I have been privileged to be chief investigator.

With EMDR therapy, I was able to get past the sensory aspects and see how I had taken this experience to a place where it could be researched more objectively and be more fully understood. This became a PhD opportunity to research bullying in midwifery, through the work of one of my doctoral students who produced a novel PhD research contribution that included the first conceptual analysis of the phenomenon and a subsequent, theory-based survey to explore the manifestations of bullying in our student population (Gillen et al, 2008). This research had support from the RCM as we launched a summary at the Doctoral Midwifery Research Society (DMRS) (Gillen et al, 2009). Finding further funding for the research was a dead-end. However, the academic framework was evolving with new knowledge contributions coming from mixed-method research and with national and international surveys (Gillen et al, 2008). I could see for the first time the thread that connected the human experience across cultures and across the professions and it was profoundly visible when we published the Cochrane review looking for interventions to deal with bullying in the workplace (Gillen et al, 2017). However, this was still not helpful in terms

of long-term impact. Even after a Cochrane review, there was no robust intervention or a healing pathway that could be endorsed or tested in the profession and so the trauma was set to continue unless we could find a way to intervene (Gillen et al, 2017). Today, I share with you my thoughts as a survivor of bullying and as a researcher in this field about a possible next step in developing our understanding of the implications of bullying on midwives. More importantly I want to propose a modifiable and organic intervention for us to test as the RCM is a large midwifery organisation. Theoretically speaking, I am proposing to all of you who are listening, that EMDR therapy has a vital role to play in the next stage of our midwifery research and ought to be further tested and explored as a suitable and acceptable intervention for reducing the effects of trauma from bullying within midwifery. As part of any research in this specific subject, I think we need to maximise the social media platforms for exposing bullying in practice, education and research, and for promoting evidence-based interventions to ensure a rapid response to trauma management.

A note of caution, being suspicious and questioning the evidence is essential, as one person's testimonial is insufficient for making change or for any recommendations. We must seek and conduct robust research to obtain the appropriate quality of evidence to support any proposition or belief we propose.

As a researcher in the field for almost 25 years, I must remind you of the need to question every research study and to seek the raw data where possible. The work of the committed folks in Retraction Watch demonstrates how important this is. We need to be sure the data exists and we need to be sure it has been analysed robustly and there is an appropriate evidence trail for scrutiny. I see a valuable endpoint and a good outcome that cries out for us to take forward a clinical intervention using EMDR therapy as one method that may have a positive impact: reducing the trail of trauma we inflict on each other. My role as a researcher is to ask questions, propose theories, seek answers and ask more questions. I do this for my midwifery profession.

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Can physical activity and dietary interventions improve maternal and fetal outcomes in women with gestational diabetes mellitus? A systematic review and meta-analysis

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A table summarising all the papers in this study can be found at rcm.org.uk/access-evidence-based-midwifery-journal

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Abstract

Objective. To assess the effect of increasing physical activity (PA) or modifying diet on maternal and fetal outcomes for women with gestational diabetes mellitus.

Methods. Five electronic databases and Google Scholar were searched to identify randomised controlled trials (RCTs) of PA or diet interventions, published before August 2017. Interventions were included if participants had gestational diabetes, there was a control/comparison group and at least one outcome of interest was reported: insulin use, caesarean section or birthweight.

Findings. Twenty-one studies (1613 participants) were included in the systematic review, 14 were diet and seven were physical activity interventions. Diet types included low glycaemic, energy restricted and dietary approaches to stop hypertension (DASH). PA included brisk walking, resistance training and home-based cycling. Meta-analysis of 17/21 RCTs suggested PA reduced insulin use by 47% (OR 0.53, 95% CI 0.29, 0.97, $P=0.04$) and the DASH diet reduced insulin use by 89% (OR 0.11, 95% CI 0.04, 0.29, $P<0.00001$). Neither PA or combined diet interventions reduced the number of caesarean sections and only the diet interventions reduced birthweight -289.80g (95% CI $-526.87, -52.72$, $I^2=98\%$). The DASH intervention produced statistically significant results across all three outcomes. In the meta-analysis, 15/17 studies scored a high risk of bias on at least one domain.

Conclusions. PA interventions can reduce insulin use and diet interventions can reduce birthweight in women with gestational diabetes. Further intervention studies are needed that are theoretically underpinned and provide social support as these elements were lacking in the included studies.

Key words: Gestational diabetes, systematic review, meta-analysis, physical activity, diet, interventions, evidence-based midwifery

Background

Gestational diabetes mellitus (GDM) is glucose intolerance, which begins or is first diagnosed during pregnancy (Metzger and Coustan, 1998). Although worldwide prevalence is difficult to predict accurately due to differing diagnostic criteria (Meek, 2017), it is estimated to be between 1.7% and 11.6% (Schneider et al, 2012). Increasing prevalence is thought to be due to higher maternal age (Dietl et al, 2015), changes in diagnostic criteria (Laafira et al, 2015) and increasing levels of overweight and obesity (NCD Risk Factor Collaboration, 2016).

The burden of GDM, economically and for mothers' and babies' health, is considerable (Chiefari et al, 2017). Women diagnosed with GDM are at greater risk of preeclampsia (Nerenberg et al, 2013), having a macrosomic baby and instrumental deliveries (Ovesen et al, 2015), and up to 10 times more likely to develop type 2 diabetes (Herath et al, 2017). Babies born to mothers with GDM are more likely to be obese adults due to intrauterine programming (RCOG, 2011). Risk factors for GDM include a BMI of 25kg/m² or over (Pons et al, 2015); high maternal age (Dietl et al, 2015); a first-degree relative with type 2 diabetes; previous pregnancy with GDM (Teh et al, 2011); South Asian origin (Bhopal, 2012); having a previous baby weighing over 4.5kg (NICE, 2015); and being

sedentary or inactive (Tobias et al, 2011).

The management and treatment of GDM varies between hospitals and countries (Chiefari et al, 2017). Women diagnosed with GDM are often advised in the first instance to try to control their glucose levels through diet and physical activity (PA) (RCOG, 2011). However, there is a lack of consensus around the type of diet and PA that has the greatest impact. If blood glucose levels cannot be controlled through lifestyle modification it may be necessary for women with GDM to take medication, such as insulin (Saleh et al, 2016).

Pregnancy has been described as a 'teachable moment' where a woman is more likely to make lifestyle changes due to concerns over her health and that of her baby's (Phelan, 2010) and, therefore, an important time to intervene. However, the evidence on the duration, type and timing of PA, for improving outcomes for women with GDM has been equivocal. Findings from dietary interventions have also been mixed.

The purpose of this systematic literature review and meta-analysis is to assess the effect of increasing PA or modifying diet on maternal and fetal outcomes for women with GDM.

Objective

To assess the effect of increasing PA or modifying diet on maternal and fetal outcomes for women with GDM.

Review questions

- Do PA or diet interventions impact on maternal and fetal outcomes for women with GDM?
- Can PA or diet interventions reduce insulin use in women with GDM?

Methods

The Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) guidelines were used for the review, along with the *Cochrane Handbook for Systematic Reviews of Interventions* (The Cochrane Collaboration, 2011) to guide the assessment of risk of bias.

Search strategy

The research question was structured around the PICOS framework, interventions were included if: participants had GDM, intervention types were PA or diet, there was a control/comparison group, at least one outcome of interest was reported (insulin use, caesarean section or birthweight), and studies were RCTs or pilot RCTs. Five databases and Google Scholar were searched: CINAHL Plus (1937-2015), Embase (1980-2015), Medline (1948-2015), PsycINFO (1806-2015) and Cochrane CENTRAL library. All databases were searched from inception to 16 November 2015. The following search terms were used in various combinations: gestational diabetes, GDM, pregnancy diabetes, motor activity, PA, exercise, resistance training, plyometric exercise, muscle stretching exercises, yoga, diet, nutrition, maternal nutrition. Hand searches of journals and conference proceedings were also undertaken. The searches were rerun to include 2015-17 to search for any new papers up until 10 August 2017.

Outcomes of interest

Outcomes of interest were: insulin use, birthweight and caesarean section.

Inclusion criteria

- Published RCTs or pilot RCTs
- Pregnant women with GDM
- Interventions that involved PA or diet or both
- Control/comparison groups where the participants received only 'usual care' or a 'conventional diet' and no intervention
- Reported at least one outcome of interest (need for insulin, birthweight, caesarean section).

Exclusion criteria

- RCTs not published in English
- Interventions without a 'true' control group
- Full text not available
- Intervention focused on preventing the occurrence of GDM
- Intervention with women who had type 1 or 2 diabetes
- Did not report any outcomes of interest.

Study selection and data extraction

All citations retrieved from electronic databases were imported into RefWorks, a bibliography and database manager, and duplicates removed. The titles and abstracts of papers retrieved from the search were reviewed to identify studies for possible

inclusion. Papers were screened independently by two reviewers (MH and MM). After the initial screen of titles and abstracts, 90 papers remained for full text screening. Any disagreements were resolved by a third and fourth reviewer (KC and MS). Full texts were excluded for a number of reasons, including: no maternal or fetal outcomes given, paper not in English, not an RCT and no control/comparison group.

Data from included papers were extracted into a standardised data extraction form based on recommendations from the University of York Centre for Reviews and Dissemination (2009). Extracted data included the following: author, title, year, number of participants, age (mean), BMI (pre-pregnancy), aims and objectives, study design (intervention type, inclusion/exclusion criteria, recruitment, randomisation, GDM diagnostic criteria), PA and/or diet characteristics, maternal and fetal outcomes (need for insulin, birthweight and caesarean sections).

Risk of bias

Risk of bias was assessed using the *Cochrane Handbook for Systematic Reviews of Interventions* (The Cochrane Collaboration, 2011). The tool tests the internal validity of each study included in the systematic review under seven domains: random sequence generation, allocation of concealment, blinding of participants and personnel, blinding of outcome assessment, incomplete outcome data, selective reporting and other bias. A priori, it was decided the other bias category assessed was whether or not the study was adequately powered. Studies were rated as low, high or unclear in the seven domains. This assessment was carried out independently by two members of the research team (MH and MM) and results were compared and consensus reached for each study. Where agreement could not be reached the other two members of the research team were consulted (KC and MS).

Meta-analysis

Where two or more studies reported the required data, meta-analytic techniques were used to combine the results. Revman version 5.3 was used to create odds ratios with 95% confidence intervals for the dichotomous variables (need for insulin and caesarean section) and for the continuous variable (birthweight) the mean difference (MD) with 95% confidence intervals were calculated. Separate subgroup analyses were run for each intervention type (PA, low GI diet, dietary approaches to stop hypertension (DASH) and energy-restricted diet) where data were available. Data were assessed for heterogeneity. If the I² value was above 50% it was considered a moderate to high level of heterogeneity and a random effects model was used. If I² was lower than 50% a fixed effect model was used. Where there was more than one intervention group, data for PA (intervention) were used and no PA (control) (Bo et al. 2014). Sensitivity analysis was performed to assess the effect on the result: due to 15/17 studies scoring a high risk of bias it was inappropriate to omit studies based on risk of bias, therefore, each study was omitted one at a time and a summarised odds ratio (insulin use and caesarean section) or mean difference (birthweight) was calculated for the remaining studies. Due to the small number of studies included in the meta-analysis it was not appropriate to create funnel plots to assess publication bias.

Findings

Study selection

From 5786 records screened, 21 studies were eventually included in the systematic review with 17 of these included in the meta-analysis.

General study characteristics

Studies published between 1989 and 2017 were conducted across eight countries: US (n=5), Australia (n=4), Canada (n=3), China (n=3), Italy (n=2), Iran (n=2), Brazil (n=1) and Spain (n=1). The sample size ranged from 12 (Hernandez et al, 2016) to 300 (Garner et al, 1997). There were 1613 participants across the 21 studies. Out of the 21 studies, 14 involved a diet intervention and seven involved a PA intervention. The interventions ranged in duration from four to 16 weeks depending on when women gave birth.

GDM diagnostic criteria

Various criteria for GDM were used, including: American Diabetes Association (2004), Canadian Diabetes Association (Meltzer et al, 2008) and Metzger and Coustan (1998).

Types of interventions

Interventions included a range of diets: low GI, DASH and calorie/energy restricted diets. PA interventions included elements such as home-based cycling, walking and resistance training.

Participant characteristics

Participants' mean age was reported in 20 of the 21 studies and ranged from 28 to 36 years. The mean pre-pregnancy BMI was reported in 17 studies and ranged from 21.15kg/m² to 34.3kg/m². The majority of the studies excluded smokers from taking part and limited inclusion criteria to only include singleton pregnancies.

Intervention settings

The majority of studies were conducted in high-income countries (n=15), with the remainder of studies taking place in upper middle-income countries (n=6). Recruitment and assessments took place mainly in hospitals with only one study reporting baseline assessments being conducted at the research facility (Symons Downs et al, 2017). Five of the seven PA studies reported location of the PA intervention: all took place at home or away from the hospital.

Physical activity (PA)

Seven studies included a PA intervention (Symons Downs et al, 2017; Halse et al, 2015; Bo et al, 2014; de Barros et al, 2010; Brankston et al, 2003; Avery et al, 1997; Jovanovic-Paterson et al, 1989). Activities varied between the studies and included an arm ergometer (Jovanovic-Peterson et al, 1989), aerobic exercise (Avery et al, 1997), resistance training (Brankston et al, 2003; de Barros et al, 2010), brisk walking (Bo et al, 2014), home-based cycling (Halse et al, 2015) home-based exercise instruction and face-to-face exercise instruction (Symons Downs et al, 2017). Four interventions lasted from diagnosis until birth (Symons

Downs et al, 2017; de Barros et al, 2010; Brankston et al, 2003; Avery et al, 1997), two lasted six weeks (Halse et al, 2015; Jovanovic-Peterson et al, 1989) and one lasted from diagnosis at approximately 24-26 weeks until 38 weeks (Bo et al, 2014).

All studies reported target exercise intensity, four aimed for 12-14 on the Borg rating of Perceived Exertion Scale, which relates to 'somewhat hard' (Halse et al, 2015; Bo et al, 2014; de Barros et al, 2010; Brankston et al, 2003), two aimed for 70% of age calculated maximum heart rate, with heart rate no higher than 140 beats per minute (Avery et al, 1997; Jovanovic-Paterson et al, 1989) and one reported the exercise as moderate intensity (Symons Downs et al, 2017).

The most common exercise frequency was three times per week (de Barros et al, 2010; Brankston et al, 2003; Avery et al, 1997; Jovanovic-Paterson et al, 1989), one study reported two sessions per week and sessions were 70 minutes (Symons Downs et al, 2017), with one reporting five sessions per week, three of these were supervised and two unsupervised (Halse et al, 2015), and one reported 20 minutes of brisk walking per day (Bo et al, 2014).

Compliance across studies was high, ranging from 100% to 64% (Symons Downs et al, 2017; Bo et al, 2014; Jovanovic-Paterson et al, 1989). Completed sessions per week were 2±0.9 out of 3 (Brankston et al, 2003), 2.26±0.4 out of 3 (de Barros et al, 2010) and 3.0±0.6 out of 4 (Avery et al, 1997).

Diet

There were 14 diet interventions. Four used a low GI diet (Grant et al, 2011; Louie et al, 2011; Ma et al, 2014; Moses et al, 2009), three employed the DASH diet (Yao et al, 2015; Asemi et al, 2014; Asemi et al, 2013), two used calorie/energy restricted diets (Rae et al, 2000; Garner et al, 1997), one used a low carbohydrate diet (Moreno-Castilla et al, 2013), one used a high fibre diet (Reece et al, 1995), one used a high carbohydrate diet (Hernandez et al, 2016), one used an ethnic meal plan (Valentini et al, 2012) and one used an oil-rich diet (Wang et al, 2015).

Low glycemic index

Four studies assigned a low GI diet to the intervention group (Ma et al, 2014; Grant et al, 2011; Louie et al, 2011; Moses et al, 2009). The mean GI of the four studies ranged from 53-58 in the control groups and 47-50 in the intervention groups. All studies used a 0-100 GI rating scale to rank foods. All interventions lasted from diagnosis (between 20 and 32 weeks) until birth. The sample size across the studies ranged from 47 to 99. The diagnosis of GDM was based on different guidelines for each study: Canadian Diabetes Association (2008) (Grant et al, 2011; Meltzer et al, 2008), National Health and Medical Research Council Australia (2006) (Moses et al, 2009), Chinese Medical Association and American Diabetes Association (2004) (Ma et al, 2014) and a modified version of the Australasian Diabetes in Pregnancy Society (2002) (Louie et al, 2011).

Dietary approaches to stop hypertension (DASH)

The DASH diet was followed in three studies (Yao et al,

2015; Asemi et al, 2014; Asemi et al, 2013). DASH was high in fruit, vegetables, whole grains and low fat dairy products and low in saturated fat, cholesterol, refined grains and sweets. All three studies used the American Diabetes Association criteria for diagnoses of GDM. All studies lasted for four weeks and finished before birth, two studies reported insulin use post intervention (Yao et al, 2015; Asemi et al, 2014) and one study reported insulin use post-birth (Asemi et al, 2013). In all three studies the calorie content and protein composition was similar to the control diet, 2000kcal and 15% to 20% protein.

Calorie/energy-restricted diets

Two studies tested the effects of low calorie/energy restricted diets (Rae et al, 2000; Garner et al, 1997) – with one recommending 35kcal/kg of ideal body weight per day and advising good spacing of meals and snacks to avoid glucose fluctuations (Garner et al, 1997) and the other implementing a moderate energy restriction of 1590 to 1776kcal/day, 70% of the recommended dietary intake for pregnant women (National Health and Medical Research Council for Australia) (Rae et al, 2000). In one control group participants were instructed in a diabetic diet that was not energy restricted (Rae et al, 2000), with the second control group being recommended an unrestricted diet, based on the standards of the Canada Food Guide (Garner et al, 1997).

Other diets

Five studies employed a range of diets, one low carbohydrate diet (Moreno-Castilla et al, 2013), one high fibre diet (Reece et al, 1995), one ethnic meal plan (Valentini et al, 2012), one oil rich diet (Wang et al, 2015), and one high carbohydrate diet (Hernandez et al, 2016).

Risk of bias of included studies

The majority (19 out of 21) of studies scored a high risk of bias on at least one domain. Due to the nature of PA and diet interventions and the resulting difficulties in blinding participants all but three studies scored a high risk of bias under the domain performance bias (Asemi et al, 2013; Louie et al, 2011; Rae et al, 2000). These three studies all reported that study personnel and participants were blinded to dietary assignment. The risk of detection bias was varied throughout the studies, the main reason studies were judged to have an unclear risk was because there was insufficient information to determine whether outcome assessors had been blinded.

The domain ‘other bias’ was used to assess whether or not studies had undertaken a power calculation and if the required sample size had been reached. Thirteen studies scored a high risk of bias due to either not carrying out a power calculation or not reaching the required sample size. Eight studies (Asemi et al, 2014; Asemi et al, 2013; Moreno-Castilla et al, 2013; de Barros et al, 2010; Bo et al, 2004; Brankston et al, 2003; Rae et al, 2000; Reece et al, 1995) scored a low risk of bias as they had carried out a power calculation and achieved the required sample size. The power calculations were based on various outcomes; birth weight (Asemi et al, 2014), need for

insulin (Moreno-Castilla et al, 2013; de Barros et al, 2010; Brankston et al, 2003; Rae et al, 2000), fasting glucose (Bo et al, 2004), glucose control (Reece et al, 1995) and serum HDL-cholesterol (Asemi et al, 2013).

Forest plots of some of the meta-analysis can be seen in Figures 1 and 2 on page 80. Five PA interventions (de Barros et al, 2010; Bo et al, 2004; Brankston et al, 2003; Avery et al, 1997; Jovanovic-Peterson et al, 1989) with 344 women provided data on insulin use. One of the six studies (Jovanovic-Peterson et al, 1989) could not be used in the meta-analysis as there were no reported cases of insulin use. There was moderate heterogeneity ($I^2=41\%$ $P=0.17$). PA reduced insulin use by 47% (OR 0.53, 95% CI 0.29,0.97, $P=0.04$). Post sensitivity analysis removing de Barros et al, (2010) showed a smaller reduction in insulin use and the difference between those physically active and those not physically active was not statistically significant (OR 0.83 95% CI 0.39, 1.80, $I^2=0\%$).

Eight diet interventions (Wang et al, 2015; Yao et al, 2015; Asemi et al, 2014; Moreno-Castilla et al, 2013; Valentini et al, 2012; Louie et al, 2011; Rae et al, 2000; Reece et al, 1995) were suitable to include in the analysis of insulin use. There was high heterogeneity ($I^2=70\%$ $P=0.006$). The results suggested that insulin use was lower in intervention than control groups but were not statistically significant (OR 0.50, 95% CI 0.22, 1.14), $P=0.10$). The sensitivity analysis produced similar results.

In the separate analysis of the various diet types, all three of the interventions testing DASH (Yao et al, 2015; Asemi et al, 2014; Asemi et al, 2013) provided data on insulin use. However, Asemi et al (2013) was excluded as it reported insulin use post-delivery. There was no evidence of heterogeneity between the two studies ($I^2=0\%$ $P=0.94$). Results indicated that women consuming the DASH diet were 89% less likely to require insulin compared to women in the control group (OR 0.11, 95% CI 0.04, 0.29, $P<0.00001$). It was not possible to carry out sub-analyses on the PA interventions due to a smaller number of interventions and large heterogeneity between intervention types.

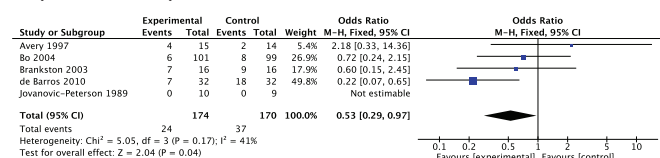
Three of the seven PA interventions (Halse et al, 2015; Bo et al, 2004; Avery et al, 1997) reported rates of caesarean section and therefore were included in the analysis of caesarean section ($n=268$). There was a non-statistically significant difference between the number of caesarean section in the intervention and control groups (OR 0.73, 95% CI 0.40,1.32, $P=0.30$). Heterogeneity was low ($I^2=0\%$, $P=0.89$). After conducting the sensitivity analysis all results remained non-statistically significant. However, due to the large sample size of Bo et al, (2004), the effect was smaller (OR 0.93, 95% CI 0.30,2.85, $I^2=0\%$) when this study was removed from the analysis.

Eight of the diet interventions (Hernandez et al, 2016; Yao et al, 2015; Asemi et al, 2014; Asemi et al, 2013; Moreno-Castilla et al, 2013; Valentini et al, 2012; Rae et al, 2000; Garner et al, 1997) were included in the analysis of caesarean section. There was high heterogeneity ($I^2=65\%$, $P=0.006$). The difference between the intervention and control groups was not statistically significant (OR 0.62, 95% CI 0.32, 1.21). The sensitivity analysis produced similar results.

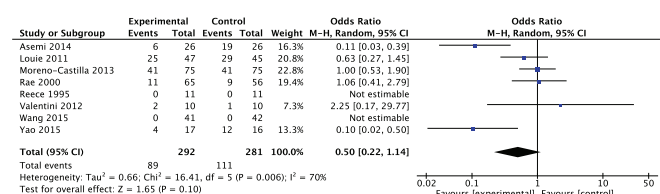
All three DASH diets were included in the analysis for

Figure 1. Odds ratio (95% CI) for insulin requirement intervention versus control group

Physical activity interventions



Diet interventions



DASH diet interventions

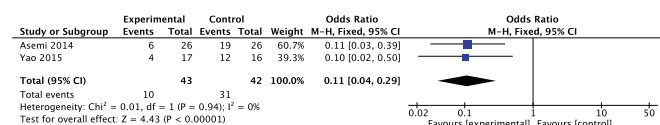
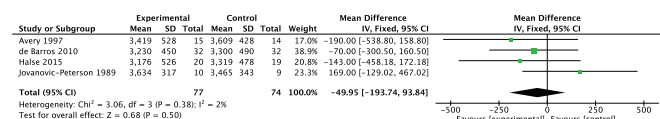
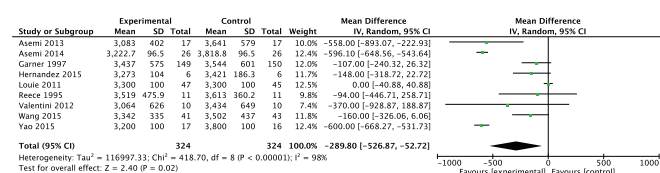


Figure 2. Mean difference (95% CI) in birthweight intervention versus control group

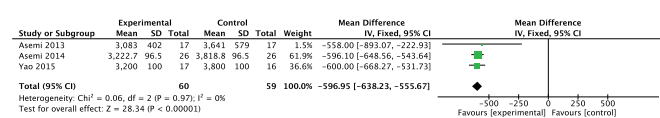
Physical activity interventions



Diet interventions



DASH diet interventions



number of caesarean sections (119 women in total) (Yao et al, 2015; Asemi et al, 2014; Asemi et al, 2013). Women who consumed the DASH diet were 83% less likely to require a caesarean section compared to women on the control diet (OR 0.17, CI 0.07,0.39, P<0.0001, I²=0%). Sensitivity analysis resulted in little change to the results.

Two energy-restricted diet interventions that reported the rate of caesarean section (420 women in total) (Rae et al, 2000; Garner et al, 1997) showed no statistically significant difference (OR 1.27, 95% CI 0.78, 2.08, P=0.34, I²=0%).

The birthweight was statistically significantly lower in the

intervention groups when the diets were analysed together, with a mean reduction of -289.80g (95% CI -526.87, -52.72, I²=98%). The difference between the two groups was larger again when the DASH diets were analysed in isolation: mean reduction -596.95g (95% CI -638.23,-555.67, I²=0%). The sensitivity analysis did not change the results significantly. The PA interventions showed birth weights to be lower in the intervention group but the result was not statistically significant (-49.95g 95% CI -193.74, 93.84, I²=2%). The sensitivity analysis for the PA interventions did not change the statistical significance of the result.

Studies that did not have the required data to be used in the meta-analysis were reviewed descriptively. None of these studies found a statistically significant difference between the control and intervention groups with regards to insulin use, birthweight or rate of caesarean section.

Discussion

This systematic review and meta-analysis found that women with GDM who took part in a PA or DASH diet intervention were less likely to require insulin during their pregnancy than women in the control groups. Women in the intervention groups of the PA studies were 47% less likely to need insulin, and those on the DASH diet were 89% less likely to require insulin than the respective control groups. Due to the risk of bias issues caution should be taken when interpreting these results. Despite this, it is positive that the PA interventions and the DASH diet both appear to reduce insulin use during pregnancy for women with GDM.

The reduction in insulin use in the PA and DASH diet interventions is positive, as a retrospective analysis of medical files of women with GDM (n=601) found women who required insulin had higher rates of large for gestational age (LGA) infants (28.5% vs 13.1%, p<0.001) and a higher proportion of caesarean section (44.1% vs 27.0%, p=0.001) (Benhalima et al, 2015). The differences remained significant when adjusted for age, BMI, excess weight gain, ethnicity, multi-parity and centre.

With regard to other outcomes, caesarean section and birthweight, the DASH diet was the only intervention type to significantly reduce the occurrence of caesarean section. PA and diets in general did not seem to reduce the occurrence of caesarean section. The reduction in caesarean sections is important as it has been found that women who gave birth by caesarean section and/or used epidural anaesthesia during labour had a higher risk of not breastfeeding for a minimum of two months (AOR 2.63, 95% CI 1.34,5.17) (Cato et al, 2017). Importantly, breastfeeding has been found to improve glucose metabolism and there is an association between longer duration of breastfeeding and lower incidence of type 2 diabetes two years after a pregnancy with GDM (Gunderson et al, 2015). A systematic review and meta-analysis found that longer lactation reduced the risk of women who had had GDM developing type 2 diabetes over five years or more (OR 0.22 95% CI 0.13,0.36) (Tanase-Nakao et al, 2017).

In addition, the reduction in the rate of caesarean section has financial implications. In the UK the cost for a planned vaginal birth has been estimated at around £1665 compared to £2369

for a planned caesarean section (NICE, 2011). Caesarean sections are major surgery and as a result are associated with risks such as postpartum sepsis (Field and Haloob, 2016). Vaginal births are also associated with shorter postnatal hospital stays than caesarean sections (NICE, 2012).

There was a statistically significant reduction in birthweight of babies born to mothers in the intervention groups in the combined diet analysis and the DASH diet studies, with a mean difference of -290g when the diet interventions were combined and -597g in the DASH diets. In a study by Choukem and colleagues (2016) they found a statistically significant association between high birthweight and shoulder dystocia ($p < 0.01$), prolonged labour ($p = 0.01$) and postpartum hemorrhage ($p < 0.01$). Furthermore, it has been found that for each 500g increase in birthweight there is an increase in shoulder dystocia, with a tenfold increase at 4500g (Stotland et al, 2004). Therefore, the greater than 500g difference in birth weight found by adopting the DASH diet could potentially reduce some of these complications.

The results of this review imply that diet interventions can reduce birthweight for women with GDM, and that PA interventions can reduce insulin use but did not affect the other outcomes. The DASH diet was the only intervention type to improve all three outcomes. This review suggests the strongest intervention design to reduce the requirement for insulin for women with GDM would be one that incorporates PA and DASH.

It should be noted that only one study (Symons Downs et al, 2017) reported any theoretical background which is suggested by the Medical Research Council (MRC) guidelines for complex interventions (MRC, 2006). A theoretical underpinning is important as it provides a rationale for the intervention and aids understanding with regards to how the interventions cause change (MRC, 2006).

None of the interventions provided social support. Research has shown that women who are diagnosed with GDM reported distress when they lacked social support (Kopeck et al, 2015). None of the trials used group exercise sessions which can provide social support and motivation to participants and may be worth exploring further. Furthermore, none of the PA interventions assessed sedentary behaviour. Sedentary behaviour has been identified as being a risk factor for a range of conditions, independent of an individual's PA levels (Lahjibi et al, 2013). Increased time spent sedentary has been found to be associated with abnormal glucose tolerance in non-pregnant women (Gollenberg et al, 2010). In a recent systematic literature review pregnant women were found to

spend between 57.1% and 78% of their day in sedentary activities (Fazzi et al, 2017). One study found that pregnant women spent at least 70% of their awake time sedentary regardless of meeting PA guidelines (Di Fabio et al, 2015). This research highlights the need to look at both promoting PA and reducing sedentary behaviour when trying to improve maternal and fetal outcomes.

Strengths and limitations

This systematic review and meta-analysis followed the PRISMA guidelines. A further strength is that a risk of bias assessment was carried out on all of the included studies. In addition, sensitivity analysis showed little change in the results, indicating the robustness of the findings. This review included diet and PA interventions: modifying diet and increasing PA are the first recommendations in the NICE guidelines for women diagnosed with GDM to try and help control their blood glucose levels (NICE, 2015).

However, this review has limitations. High levels of heterogeneity across the interventions made comparisons difficult. The interventions varied in many respects including length, components and sample size. In addition a wide range of diagnostic criteria were used for GDM. The control groups across the studies varied in their approach, with some receiving no information or guidance on PA or diet and being left to follow their own plans, while others were given information or prescribed set diets. This may have underestimated the reported differences between the two groups. What is considered 'usual care' is likely to vary from hospital to hospital and country to country, making comparisons difficult.

Conclusion

This review provides new knowledge regarding physical activity and diet interventions for improving maternal and fetal outcomes for women with GDM. Our findings suggest the DASH diet could be a promising way to reduce insulin use, birthweight and caesarean section among women with GDM. PA was also shown to reduce insulin use. However, the results should be interpreted with caution as 19 out of the 21 studies had a high risk of bias in a least one domain. Further intervention studies are required that address the methodological flaws identified in this review, including blinding of personnel and use of a theoretical underpinning for the behaviour change interventions. A more effective intervention design may be one that focuses on both PA and diet.

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A systematic review for exploring the effectiveness of healthy eating education programmes for improving midwives' levels of knowledge and confidence in promoting healthy eating in pregnant women

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Abstract

Background. Maternal nutritional knowledge and education play a significant role in influencing dietary and eating behaviour, and have been shown to have a positive impact on maternal health outcomes. Although, several studies have focused on the midwives' role in providing healthy nutritional eating education for pregnant women, there are no systematic reviews assessing the effectiveness of healthy nutrition/diet education programmes provided for midwives who support pregnant women.

Aim. To examine the effectiveness of healthy eating education programmes for improving midwives' levels of knowledge and confidence in promoting healthy eating in pregnant women.

Review methods. A three-stage comprehensive search of seven electronic databases as well as grey literature was conducted. Two independent reviewers assessed each paper before inclusion using the standardised critical appraisal instruments for evidence of effectiveness developed by the Joanna Briggs Institute (JBI). All authors assessed full-text copies of the papers eligible for inclusion.

Results. The search of the selected databases generated 1575 citations. Manual searching of the published articles and references of the final included studies identified three additional studies. After removing 549 duplicates, 1029 articles were screened by title and abstract against the inclusion criteria. A total of 774 studies were excluded after the title and abstract screening; 255 studies were assessed for full-text eligibility, of these 243 were excluded for irrelevant population, interventions, study design, and non-English publications. Finally, 12 articles met the inclusion criteria, reporting on 11 studies. Of these, four studies involved pretest-posttest interventions, and seven were descriptive cross-sectional studies; none were randomised controlled trial studies. A total of 7362 midwives, 562 midwifery students and 337 healthcare professionals were involved. All pretest-posttest studies reported a significant improvement in participating midwives' knowledge and levels of confidence after receiving the education programme.

Conclusion. This systematic review reports and summarises the findings of 11 studies that evaluated any diet and nutritional education programmes or training, using pre-defined educational and maternal outcomes, for midwives/student midwives. The evidence from the studies included in this review demonstrated a significant improvement in midwives' nutritional knowledge and levels of confidence following participation in diet/nutritional education and training.

Implications. There was some evidence that supported improvement in midwives' levels of knowledge and confidence after participating in a structured healthy eating education and training programme. However, there is a lack of strong evidence as no randomised controlled trials were identified.

Key words: Healthy eating, diet and nutrition, education programme, pregnancy, midwives, systematic review, evidence-based midwifery

Introduction

Healthy eating during pregnancy is essential for the health of both the mother and her developing baby, extending into later life (Serci, 2006). A healthy pregnancy is influenced by diet and nutrients consumed pre-pregnancy and during pregnancy (Royal College of Obstetricians and Gynaecologists, 2010; Widen and Siega-Riz, 2010). Therefore, nutrition and dietary education of pregnant women is vitally important, and midwives require knowledge and confidence to advise and support women (Barger, 2010). Midwives significantly contribute

through communicating clearly, being knowledgeable, monitoring weight gain during pregnancy, and providing support and resources for women to have a healthy pregnancy (Pan et al, 2014; Widen and Siega-Riz, 2010; Nicholls and Webb, 2006). Previous studies have explored the importance of midwives' knowledge and confidence to support pregnant women during pregnancy regarding nutrition-related topics (Arrish et al, 2016a; Wennberg et al, 2015).

A review undertaken in Australia, exploring nutritional knowledge, education and attitudes of midwives during

pregnancy, found midwives lacked appropriate knowledge and education and therefore recommended the provision of undergraduate and post qualification education and training (Arrish et al, 2014). The review's findings were supported by a mixed methods study that investigated Australian midwives' nutritional knowledge, attitudes and confidence in providing nutritional education during pregnancy (Arrish et al, 2016b). This study recommended that midwives should be encouraged to undertake continuing professional development (CPD) in nutritional education and training which can be provided through professional organisations such as the Australian College of Midwives (ACM) (Arrish et al, 2017; Arrish et al, 2016a; Arrish et al, 2016b). Similarly, it has been suggested the role of midwives as health educators be explored (Baron et al, 2017) with the researchers recommending the need to develop nutritional health education programmes for midwives.

A recently published systematic review reported an improvement in nurses' nutritional knowledge and clinical practice after receiving continuing education and interactive learning strategies were positively associated with improvements in nutritional knowledge (Mitchell et al, 2018).

In addition, it has been highlighted by Arrish et al (2016b) that there is a lack of sufficient evidence-based guidelines for nutritional education during pregnancy to assist midwives. There is also no systematic review assessing the effectiveness of nutrition/diet education and training programmes for midwives in promoting healthy eating to pregnant women. To address this deficit in the literature a systematic review protocol was developed utilising the JBI methodology (Othman et al, 2018). This systematic review utilised WHO's definition of a healthy diet during pregnancy:

“Healthy diet during pregnancy contains adequate energy, protein, vitamins and minerals, obtained through the consumption of a variety of foods, including green and orange vegetables, meat, fish, beans, nuts, pasteurized dairy products and fruit.” (WHO, 2017).

Review method

Aim

This systematic review aimed to examine the effectiveness of healthy eating education programmes for improving midwives' levels of knowledge and confidence in promoting healthy eating in pregnant women.

Objectives

- To assess midwives' level of knowledge in promoting healthy eating by pregnant women after undertaking structured education programmes, reported by studies included in this review
- To assess midwives' level of confidence in promoting healthy eating by pregnant women, reported by studies included in this review.

Review question

How effective are healthy eating education programmes for improving midwives' levels of knowledge and confidence in promoting healthy eating by pregnant women?

Inclusion criteria

Participants

This review considered studies that included student midwives and midwives (hospital or community-based), obstetric nurses, birth attendants, doulas, midwives alone or with other health professionals.

Intervention

This review considered studies that evaluated any diet and nutritional education programmes or training targeted at midwives and student midwives. The education and training programme had to be a structured formal programme with a defined period, facilitated as a workshop or seminar by any healthcare professionals such as dietitians, nutritionists, midwife health educators or any other accredited personnel.

Outcomes

This review considered the following primary and secondary outcome measures:

Primary outcomes

- Levels of knowledge acquired by midwives and student midwives regarding diet and nutritional requirements in pregnancy measured by any scale or questionnaire
- Levels of confidence acquired by midwives and student midwives regarding diet and nutritional requirements in pregnancy measured by any scale or questionnaire.

Secondary outcomes

- Levels of knowledge and confidence acquired by midwives and student midwives regarding diet and nutritional requirements for post-natal breastfeeding measured by any scale or questionnaire.

Type of studies

It was planned to include randomised controlled trials (RCTs) including cluster, parallel and cross-over trials. However, this review found no RCTs assessing the effectiveness of diet and nutrition education programmes for midwives in promoting healthy eating in pregnancy when compared to standard care or routine care, other intervention and no intervention. Therefore, this review considered other quantitative studies such as quasi-experimental, cohort, case-controlled, pretest-posttest, mixed methods studies.

Exclusion criteria

This review excluded studies that focused on the following;

1. Nutritional education programmes provided for health professionals other than midwives and student midwives
2. Nutritional education programmes for pregnant women
3. Nutritional education programmes specifically focused on obesity management in pregnancy or other obstetric complications during pregnancy.

Search strategy

The search strategy aimed to find both published and ongoing studies. A three-step search strategy was used for this review, as recommended by JBI (2014). See systematic review protocol for detailed search strategy (Othman et al, 2018).

Study selection

Review authors downloaded all titles and abstracts retrieved by the electronic database search to Endnote and removed duplicates. The data were then uploaded into Covidence (Systematic Review Software, Veritas Health Innovation). Two review authors independently screened all titles and abstracts identified through the search strategies to assess which papers met the inclusion criteria. The abstract for any study that met the inclusion criteria was identified and the details imported into Covidence software. The review authors retrieved and then all authors assessed full-text copies of papers that were eligible for inclusion. Full-text studies that did not meet the inclusion criteria were excluded. There was no disagreement between reviewers/authors on the selection of the studies.

Assessment of methodological quality and critical appraisal

Selected studies were critically appraised by two independent reviewers for methodological quality prior to inclusion in the review using standardised critical appraisal instruments from the Joanna Briggs Institute Meta-Analysis of Statistics Assessment and Review Instrument (JBI-MAStARI) for pretest-posttest and cross-sectional quantitative studies (Moola et al, 2017; Tufanaru et al, 2017). All disagreements that arose between the reviewers were resolved through discussion and the involvement of two other reviewers. The majority of the included studies reported sampling, clear inclusion criteria and reliable outcomes. All studies achieved "YES" to at least 60% of applicable questions. Following critical appraisal, studies were categorised according to JBI level of evidence (Joanna Briggs Institute, 2014).

Data extraction and management

The review authors extracted data regarding specific details about the participants, interventions, study designs and outcomes using an adapted version of the standardised data extraction tool form JBI-MAStARI template (JBI 2014).

Data synthesis

Due to clinical heterogeneity of quantitative data in the intervention, study population, and lack of sufficient data to calculate the effect sizes, a meta-analysis could not be conducted. The findings are therefore presented as a narrative.

Results

Description of studies

The search of the selected databases generated 1575 citations. Manual searching of the published articles and references of final included studies retrieved three additional studies. After removing 549 duplicates, 1029 articles were screened against title and abstract for eligibility for

inclusion criteria. Studies excluded after the title and abstract screening were 774. Therefore, 255 studies were assessed for full-text eligibility. Of these 243 were excluded for irrelevant population, interventions, study design, and non-English publications. Finally, 12 articles met the inclusion criteria, reporting on 11 studies. Four studies involved pretest-posttest interventions, and seven were descriptive cross-sectional studies. No RCTs were identified.

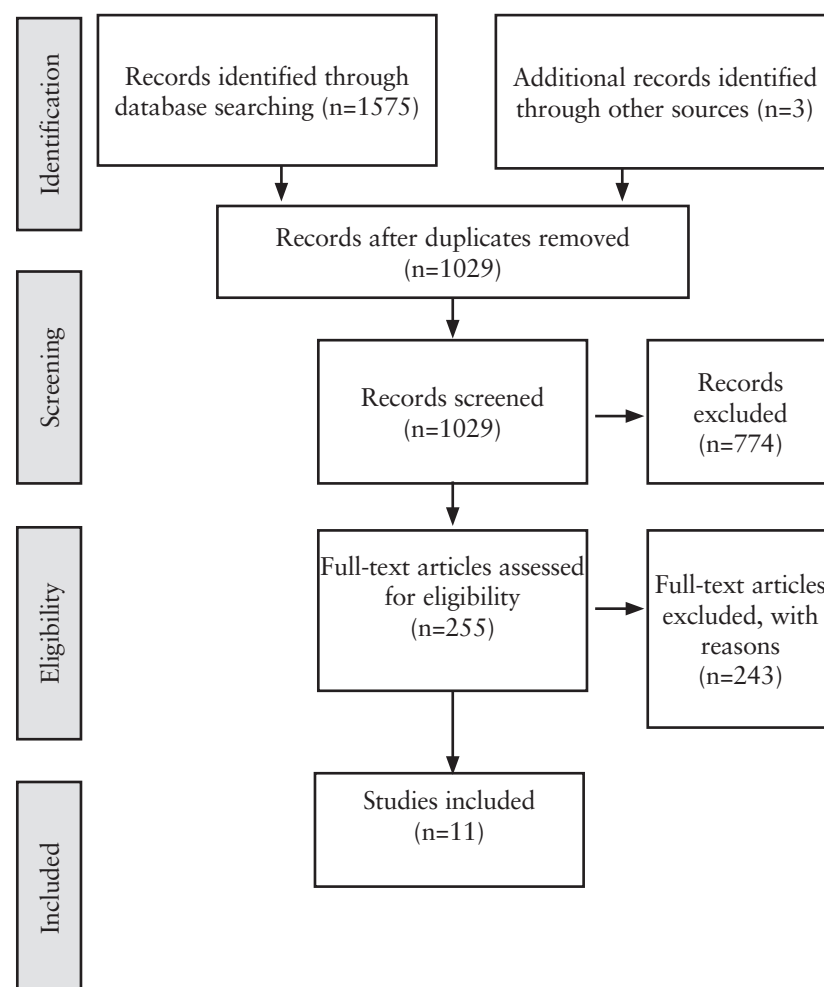
The details of the selection process are presented in the PRISMA flow diagram, below.

Characteristics of the included studies

Study design

This review included four pretest-posttest studies over a period of 32 years undertaken in the UK: Basu et al, 2014; Attala and Henderson, 2003; Barrowclough and Ford, 2001; Edwards and Wyles, 1999. In addition, seven cross-sectional studies that had been undertaken in different countries were considered for inclusion due to the limited number of nutritional education intervention studies identified – Arrish et al, 2017; Asamoah and Ampofo, 2017; Arrish et al, 2016a; Pan et al, 2014; Farrar et al, 2013; Elias and Green, 2007; Touger-Decker et al, 2001; Mulliner et al, 1995 (see Tables 1 and 2).

Figure 1. PRISMA (2009) Flow diagram



Participants

Four pretest-posttest studies included a total of 168 midwives and 232 other healthcare professionals (Basu et al, 2014; Attala and Henderson, 2003; Barrowclough and Ford, 2001; Edwards and Wyles, 1999). Seven cross-sectional studies included a total of 8261 potential respondents; 7362 midwives, 562 midwifery students and 337 healthcare professionals, with an overall response rate of 26% (Arrish et al, 2017; Asamoah and Ampofo, 2017; Arrish et al, 2016a; Pan et al, 2014; Farrar et al, 2013; Elias and Green, 2007; Touger-Decker et al, 2001; Mulliner et al, 1995).

Interventions

Only four pretest-posttest studies included an intervention comprising a health education programme for midwives on healthy eating education (Basu et al, 2014; Attala and Henderson, 2003; Barrowclough and Ford, 2001; Edwards and Wyles, 1999). The programme's package contained a mix of teaching activities and learning methods that included group discussion, brainstorming, short lectures, and interactive activities using food models, nutrition game, printed materials, worksheets and handouts. Programmes varied between one-hour sessions extending to six hours. All four education intervention studies were undertaken in the UK and three of these clearly reported that the intervention education programme was facilitated by a registered dietician and one study was unclear.

Outcomes measures

Consistency was noted among pretest-posttest studies relating to nutritional health education training, delivery methods, and participants' expected outcomes. All pretest-posttest studies reported a significant improvement in participating midwives' knowledge and levels of confidence (Basu et al, 2014; Attala and Henderson, 2003; Barrowclough and Ford, 2001; Edwards and Wyles, 1999).

Cross-sectional studies assessed midwives' nutritional knowledge and level of confidence during their interaction with pregnant women through a survey questionnaire (Arrish et al, 2017; Asamoah and Ampofo, 2017; Arrish et al, 2016a; Pan et al, 2014; Farrar et al, 2013; Elias and Green, 2007; Touger-Decker et al, 2001; Mulliner et al, 1995). Results from the included studies aimed to detect primary and secondary outcomes for participating midwives (see Tables 1 and 2).

Primary outcomes

Outcomes measures from included pretest-posttest studies

1. Midwives' levels of knowledge and effect of nutritional education training programme

Among the 11 included studies, only four pretest-posttest interventions studies (Basu et al, 2014; Attala and Henderson, 2003; Barrowclough and Ford, 2001; Edwards and Wyles, 1999) reported statistically significant improvement in midwives' nutritional knowledge as one of the primary measured outcomes.

One hundred and sixty-eight (168) midwives from a total of 400 participants received a nutrition learning programme that ranged from one-hour to six-hours for minimum completion of

the training. The education was delivered through a compact training model (offered through the pre-reading list then using a mix of teaching and learning methods, i.e. group discussions, short lectures and using food models activities) for a half-day (Basu et al, 2014). Another training programme contained two courses, a basic nutrition course and an updated one (Attala and Henderson, 2003).

A further programme utilised an open-learning pack of nutrition education resources for midwives comprising an audiocassette and printed material that included a variety of interactive exercises lasting six-hours (Barrowclough and Ford, 2001). Another pretest-posttest study consisted of theoretical information, a brainstorming one-hour session about what pregnant women can eat and a nutrition game that involved calculating a daily intake of folic acid (Edwards and Wyles, 1999).

A significant improvement was reported in midwives' nutritional knowledge from pre-training to post-training using a self-administered semi-structured questionnaire: 97% indicated their knowledge of pregnancy-specific food and nutrition messages as 'better' (95% CI 85 to 100, $P < 0.005$); 3% stated 'stayed the same'; 60% stated 'much better' (Basu et al, 2014).

Findings of the training programme of two courses assessed by a semi-structured questionnaire, indicated a mean percentage pre-training scores for midwives' knowledge of 65% out of a total of 24 midwives, the mean percentage post-training scores for midwives knowledge was 87% out of a total of 24 midwives.

The lowest mean difference in knowledge score was 22%, which indicates that midwives had basic nutritional knowledge (Attala and Henderson, 2003).

A developed structured questionnaire assessing midwives' knowledge for the open-learning pack indicated a statistically significant improvement in nutrition knowledge, shown by an increase in the mean nutrition scores (46.81 ± 14.59 v. 71.29 ± 13.04 ; $P < 0.001$), and a significant decrease in the mean number of wrong answers for nutrition knowledge (16.04 ± 3.98 v. 12.20 ± 5.73 ; $P < 0.005$) (Barrowclough and Ford, 2001).

A study to evaluate the effectiveness of training sessions for midwives related to folic acid in pregnancy, assessed by a structured questionnaire, reported an improvement in midwifery participants' knowledge after the training sessions (Edwards and Wyles, 1999).

2. Midwives' level of confidence and effect of nutritional education training programme

A pretest-posttest study with a sample of 32 respondents out of 43 community midwives, reported a statistically significant improvement in confidence following the programme: 83% of participants said their confidence in explaining the risk of raised BMI in pregnancy was either 'much' or 'somewhat better' (95% CI 66 to 93, $P < 0.005$); 17% said it 'stayed the same'. A high percentage of midwives (89%) indicated confidence to discuss eating habits, and physical activity was 'much' or 'somewhat better' (95% CI 73-97, $P < 0.005$); 11% stated 'stayed the same' (Basu et al, 2014).

Table 1. Summary of included intervention studies (Pretest-Posttest studies)

Author, year and country	Study design and level of evidence	Participants' information	Intervention
Basu et al, 2014 United Kingdom	Pretest-Posttest study using self-administered/semi-structured interviews Level 2. D	n=43 community midwives employed by the Health Board. Registered for training session. n=32 (74%) attended training session.	The compact training model and learning materials developed from an extensive scoping review and consultations. Utilised motivational interviewing and behavioural change theories. A half-day (3.5 hours) / 4 compact training sessions were offered (10 participants per session). A pre-course reading list was provided. A mix of teaching and learning methods was used including group discussions, short lectures, activities using food models and worksheets. Brief conversational scripts were developed and filmed as video clips to facilitate discussions. Facilitator: dietitian who was principal researcher
Attala and Henderson, 2003 United Kingdom	Pretest-Posttest study using semi-structured questionnaire Level 2. D	A total of n=133 health professionals and community workers registered. n=119 completed all training. n=24 were midwives. n=22 attended the update sessions In North Tyneside, UK	The training package included two courses: 1) a basic nutrition course/food safety/research issues and 2) an update course - vegan and vegetarian diets/guidelines for referral to a dietitian/local resources available for women/how to use them. Basic nutrition course was offered as either; two separate sessions on different days, one combined session or condensed focussing on specific points from topics. Update course offered as a session. Facilitator: dietitian
Barrowclough and Ford, 2001 United Kingdom	Pretest-Posttest study using developed structured questionnaire Level 2. D	A purposive sample of n=35 practising midwives in three trust hospitals, although only n=27 completed the post-questionnaire.	The open-learning self-directed pack consisted of nutrition education resources for midwives, an audio-cassette and printed material that included a variety of interactive exercises. A minimum of six hours was set as time frame for completion. Researchers were a midwifery lecturer and a dietician.
Edwards and Wyles, 1999 United Kingdom	Pretest-Posttest using structured questionnaire Level 2. D	n=189 participants – from 10 community health professions n=66 midwives/ midwifery students	24 information sessions were run for one-hour duration. Each session consisted of interactive activities such as brainstorming about what pregnant women eat and a nutrition game involving calculating a day's intake of folic acid. Sessions led by principal researcher. Researchers from a dietetic department.

Table 2. Summary of included descriptive cross-sectional studies

Author, year and country	Study design and level of evidence	Participants and response rate
Asamoah and Ampofo, 2017 Ghana	Descriptive cross sectional study using multiple choice questionnaire Level 4. B	Third-year midwifery students from six Midwifery Institutions. 571, consented to participate n=562 completed questionnaire.

Results/Outcomes	Conclusions	Limitations
<p>Pre-training: n=19 (59%) reported limited previous knowledge of the topic area. Some participants selected ratings low as 1 indicating poor knowledge and/or confident to some of the questions. Others rated themselves at 10, highly knowledgeable and/or highly confident for some questions.</p> <p>Post training knowledge: Improvements in self-reported knowledge. 97% indicated knowledge of pregnancy specific food and nutrition messages as 'better' (95% CI 85 to 100), - 3% stating 'stayed the same' 60% stated 'much better'.</p> <p>Post training confidence: Improvements in confidence, 83% indicated confidence to explain the risks of raised BMI in pregnancy was either 'much' or 'somewhat better' (95% CI 66 to 93) – 17% stating 'stayed the same'. 89% indicated confidence to discuss eating habits and physical activity was 'much' or 'somewhat better' (95% CI 73 to 97) as opposed to 11% stating 'stayed the same'.</p> <p>Significant difference in confidence between statements Friedman's two-way ANOVA P <0.005.</p>	<p>Statistically significant improvement in knowledge and confidence related to nutrition, physical activity and weight management during pregnancy, for midwives who participated in the training.</p>	<p>Small sample size of midwives. Questionnaires administered by facilitator, risk of social desirability may have biased findings. The authors reported findings as a percentage and not number of participants.</p>
<p>Mean percentage pre-training scores for midwives knowledge was 65% total midwives (n=24).</p> <p>Mean percentage post-training scores for midwives knowledge was 87% total midwives (n=24).</p> <p>Lowest mean percentage difference in knowledge was 22% – midwives (n=24) had basic nutritional knowledge.</p>	<p>Midwives have the basic nutritional knowledge for folic acid. Training was successful to update basic nutritional knowledge for the targeted participants.</p> <p>Limited exploration.</p>	<p>The questionnaires were not validated – had been piloted. The update sessions poorly attended. Timing for training should be selected according to participants work. Authors poorly reported raw data. Risk of findings being falsely raised participants had access info.</p>
<p>Paired t-test determined a statistically significant improvement in nutrition knowledge shown by an increase in the mean nutrition scores (46.81 ± 14.59 v. 71.29 ±13.04; P<0.001), and significant decrease in the mean number of wrong answers for nutrition knowledge (16.04 ± 3.98 v. 12.20 ± 5.73; P<0.005).</p>	<p>Midwives have basic nutritional knowledge, which required an update.</p>	<p>Small sample size, so cannot be generalised. Unclear who co-ordinated the open learning education.</p>
<p>An improvement in knowledge in all areas after the training. The practical group work and the amount of information given were the most enjoyable parts of the session.</p>	<p>One-hour training was effective to measure participants' knowledge.</p>	<p>Specific focus on folic acid. Unclear how many participants were midwives student midwives. Not validated questionnaire but used previously in a pilot study. No consulting statistician. No statistical data findings for midwives only.</p>

Results and outcomes	Conclusions	Limitations
<p>Mean score for correctly answered questions – 9.8/20 (49%). Out of 20 questions on maternal nutritional issues, 11 questions answered correctly by <50%. 91.4% did not know average iron intake per day, for pregnancy.</p>	<p>Majority of third-year midwifery students had limited basic knowledge of nutrition requirements for pregnant women.</p>	<p>Validity and reliability of questionnaire was not reported. Authors poorly report the raw numbers data when reporting findings.</p>

Arrish et al, 2017; 2016a Australia	A mixed methods study (survey followed by interview). Cross-sectional study using web-based survey followed by two reminders. Using a developed semi-structured questionnaire. Level 4. B	Members of the Australian College of Midwives were surveyed (=4770). The response rate was n=329/4770 (6.9%).
Pan et al, 2014 New Zealand	Nationwide cohort web survey. Followed up over a five-month period. Level 4 B	Self-employed members of the NZCOM surveyed (=996). Response rate 428/996 (42.9%).
Farrar et al, 2013 United Kingdom	Survey questionnaire. Designed, developed and self-administered questionnaire. Level 4. B	Total n=174 participants, of those n=137 were midwives. n=19 obstetricians and n=18 Health Support Workers (HSWs). Bradford, North of England.
Elias and Green, 2007 New Zealand.	Postal survey. Level 4. B	Members of the New Zealand College of Midwives were surveyed (=1340). The response rate was 370/1340 (27.6%).
Touger-Decker et al, 2001 United States	National survey. Reminders and second survey sent to non-respondents 2 and 7 weeks, respectively, after the initial mailing. Level 4. B	n= 342 health workers. n=42 reported being on certified nurse/midwifery programs. Overall response rate n=276, (80.7%). Midwifery response rate n=37.
Mulliner et al, 1995 United Kingdom	Descriptive study, survey using interview schedule and postal questionnaire. Level 4. B	Randomly selected sample of 77 registered midwives. Response rate n=58/77 (78%).

Outcomes measures from other included cross-sectional (survey questionnaire) studies

Midwives' nutrition knowledge

Three descriptive cross-sectional studies that assessed midwives' nutrition knowledge using a survey questionnaire reported it was inadequate (Arrish et al, 2016a; Arrish et al, 2017; Asamoah and Ampofo, 2017; Mulliner et al, 1995). Lack of knowledge was highlighted in several areas including weight gain, dairy servings and iodine requirements (73.3%, 73.2% and 79.9% incorrect responses) from n=329 participants by Arrish et al (2017) and Arrish et al (2016a). One cross-sectional study reported nearly half (46%) of midwives scored

poorly in nutrition knowledge (Mulliner et al, 1995). Another cross-sectional study reported the mean score for correctly answered questions related to nutrition knowledge for all study participants was 9.8 out of 20 questions (approximately, 49%) (Asamoah and Ampofo, 2017). See Table 2.

Midwives' level of confidence

Three descriptive cross-sectional studies using survey questionnaires give an insight into midwives' levels of confidence while discussing nutrition education. These studies reported the level of confidence to discuss general topics such as the role of vitamins and minerals, general food safety and

<p>n=285 (86.6%) highly rated importance of nutrition for pregnancy, and significance of their role in nutrition education n=249 (75.7%). Nutrition knowledge inadequate re: weight gain n=241 (73.3%), dairy serves n=241 (73.3) and iodine requirements n=263 (79.9%). Midwives' level of confidence to discuss specific nutrition issues ranged - moderate to low. Majority of midwives n=306 (93%) provided nutrition advice to pregnant women. n=168 (51.1%) received nutrition education during midwifery training and n=178 (54.1 %) post-registration. Majority of midwives reported: the role of folate, iodine, or calcium n=206/ 261 (78.9%) and alcohol n=201/261 (77.0%). Least covered topic reported was different cultural groups -nutrition n=54/261 (20.7%).</p>	<p>Australian midwives may not be well prepared to provide up-to-date evidence based nutrition advice to pregnant women due to low levels of knowledge and confidence.</p>	<p>Low response rate and sample size makes it difficult to interpret the findings and therefore, findings cannot be generalised.</p>
<p>n=409/419 (97.6%) discussed nutrition with women during pregnancy, i.e. protein and carbohydrate intake n=295 (70%), eating 5 serves of fruits/vegetables daily n=306 (73%). n=193 (46%) discussed portion sizes, physical activity n=395 (94.3%).</p>	<p>Midwives in this survey were knowledgeable and provided advice on nutrition and physical activity during pregnancy.</p>	<p>Low response rate and sample size makes it difficult to interpret the findings and, therefore, cannot be generalised.</p>
<p>n=110 (80%), midwives n=17 (89%) obstetricians, n=14 (78 %) HSWs discussed nutrition with women during pregnancy. n=2 (11%) obstetricians/ HSWs reported they provided nutrition education after birth, compared to n=107 (78%) MWs. n=73 (54%), MWs most HSWs and all obstetricians <15 minutes with pregnant woman discussing nutrition. n=110 (80%) MWs, n=13 (68 %) obstetricians obtained knowledge professional guidance. HSWs gained knowledge from training sessions n=15 (83%). MWs suggested service improvements re: training and use of information leaflets.</p>	<p>All health care professional require ongoing training and nutrition education.</p>	<p>Superficial knowledge provided and limited change in women's behaviour due to limited time spent on health education. Low response rate and sample size makes it difficult to interpret the findings and, therefore, cannot be generalised.</p>
<p>n=136 (37%) MWs reported some formal nutrition education pre, post qualifying. n=268 (72%) of respondents had received nutrition information via midwifery education. High majority of midwives reported nutrition was important/very important - pregnancy n=364 (98.4%). n=351 (94.9%) reported significant/ very significant role in educating pregnant women. Confidence to provide nutrition information varied: n=162 (43.8%) very confident for breastfeeding, n=59 (15.9%) not confident veg diet.</p>	<p>Many midwives did not receive any formal nutrition education but were very aware of how important nutrition is during pregnancy. Midwives confidence varied and reported to be more confident giving advice for nutrition when a woman was breastfeeding but not very confident if the woman was a vegetarian.</p>	<p>Low response rate. No permission to send reminders to non-respondents.</p>
<p>n=107/111 (97%), nurse practitioners, n=35/97 (97%) midwifery programs confirmed importance for graduates to perform nutrition screening.</p>	<p>Cohort sample of professional health workers confirmed that undergraduates require appropriate level of competence in nutrition. Web-based learning approaches maybe helpful as a time saving strategy.</p>	<p>Time limitation. National survey not specific to midwifery.</p>
<p>n=50 (86%) of MWs had received no education in nutrition after qualification. n=27 (46%) of MWs achieved a poor score in nutrition knowledge. n=21 (36%) MWs felt unprepared to offer dietary advice to women from ethnic minority groups and n=38 (66%) for women eating vegetarian diet.</p>	<p>Midwives require more nutritional education in general and would benefit from the inclusion of different cultural and vegetarian diets. Identified need to develop guidelines for midwives.</p>	<p>Small sample size, therefore, findings not presented according to length of post registration experience.</p>

specific nutrition issues, for example, teenage pregnancy and different cultural groups, ranged mostly from moderate to low (Arrish et al, 2017; Arrish et al, 2016a). Elias and Green (2007) explored a sample of 370 out of a possible 1340 midwives, reported midwives' confidence to provide nutrition information varied from 43.8% (n=162) very confident in nutrition for breastfeeding to 15.9% (n=59) not confident in vegetarian diets. An earlier study undertaken by Mulliner et al (1995) reported over a third of midwives 36% (n=21) felt unprepared to offer dietary advice for pregnant women from ethnic minority groups and two-thirds for women eating a vegetarian diet 66% (n=38). See Table 2.

Secondary outcomes

This review considered the level of knowledge and confidence acquired by midwives and student midwives regarding diet and nutritional requirements for immediate or post-natal breastfeeding as a secondary outcome measure. However, the included studies did not highlight the immediate or post-natal breastfeeding findings.

Discussion

The purpose of undertaking this systematic review was to examine the effectiveness of healthy eating education programmes for improving midwives' levels of knowledge and

confidence in promoting healthy eating to pregnant women. Due to different study designs, methodologies and outcomes, a narrative/descriptive analysis of 11 included studies was undertaken.

This review included four pretest-posttest studies involving 168 midwives, and seven cross-sectional studies involving 7362 midwives, 562 midwifery students and 337 healthcare professionals. Various types of educational programmes for midwives, midwifery students and other healthcare professionals were provided and the overall response rate was 26%. The outcomes for the pretest-posttest studies were measured using a various range of validated or structured questionnaires. Overall, healthy eating education programmes for midwives and other healthcare professionals participating in the included studies revealed a significant improvement in their knowledge and confidence (Basu et al, 2014; Attala and Henderson, 2003; Barrowclough and Ford, 2001; Edwards and Wyles, 1999). Basu et al (2014) observed the desired impact of the education and training as midwives' knowledge was improved and their advice and guidance for pregnant women seen to lead to positive behavioural changes for healthy eating.

Only one study explored midwives' levels of confidence pre and post the education programme (Basu et al, 2014). The findings from this showed a significant improvement in midwives' levels of confidence after the training programme, as the majority of midwives had the confidence to discuss eating habits and physical activity.

Based on Hettrema et al (2005) motivational interviewing theory, the learning activities of the compact training model provided midwives with recommendations and strategies to advise pregnant women to eat healthily and practice physical activity. This programme aimed to facilitate non-judgmental discussion on nutrition during pregnancy to encourage positive behavioural changes (Barrowclough and Ford, 2001).

The programme used a mixture of various types of learning and teaching materials to reinforce the information delivered and enhance creativity and a feeling of pleasure with the training (Barrowclough and Ford, 2001). The cross-sectional studies also explored the midwives' levels of confidence and nutritional knowledge.

A significant increase in midwives' nutritional knowledge in all four pretest-posttest studies highlighted that midwives have the initial basic nutritional knowledge, as assessed by a pretest questionnaire. However, it appears this knowledge requires regular updates. All participants showed a significant improvement in nutritional knowledge after receiving a nutritional education programme. However, any post-training follow-up to reassess midwives' knowledge and retention of information was missed.

Therefore, ways to follow-up midwives at different periods following an educational programme to ensure they maintain their knowledge needs to be included in future nutritional education programmes. These findings indicate that healthy eating education programmes could improve midwives' levels of knowledge and confidence. However, small sample sizes, low response rates and lack of validated questionnaires limits

the generalisability of findings.

No RCTs were identified for inclusion in this systematic review. However, two RCTs assessing the effectiveness of nutritional programmes for pregnant women identified the significant role of midwives providing healthy eating education (Takimoto et al, 2013; Huang et al, 2011). This supports the justification to develop a healthy eating education programme for midwives.

This systematic review has some limitations. Despite a comprehensive search across all databases, some eligible studies may have been missed. The review only included studies published in English, so additional studies written in other languages have been excluded, which may lead to an underestimation or exaggeration of the effect of nutrition health education during pregnancy provided for midwives.

In addition, most studies included in this review had a small sample sizes, therefore the generalisability of results and conclusions have to be undertaken with caution. One identified disadvantage of all cross-sectional studies is the low response rate of survey questionnaires. The included studies had a heterogeneity in research designs and measuring outcomes, so it was not possible to pool studies for meta-analysis, meaning that the effect estimate of the nutrition health education training programme could not be evaluated.

Conclusion

All included pretest-posttest studies showed a positive impact of healthy eating education programmes provided for midwives and also other healthcare professionals. Nevertheless evidence suggests to improve levels of knowledge and confidence, midwives would benefit from attending a healthy eating education programme with further follow up assessment and evaluation of their needs periodically.

Implications for practice

Evidence from this systematic review supports the need to provide healthy eating education and training for midwives to improve their levels of knowledge and confidence to support and advise pregnant women.

The suggested recommendations for clinical practice are:

- Increase awareness of the need to provide up-to-date healthy eating education programmes for midwives as CPD
- Plan and implement regular in-service healthy eating education for midwives
- Continually assess midwives' levels of knowledge and confidence by providing healthy eating education programmes with follow-ups after the programme
- It is vital that healthy eating education programmes are included as a part of undergraduate midwifery education and training.

Implications for research

This review suggests a need for further investigation and exploration of midwives' levels of knowledge and confidence after attending a healthy eating education programme to take place. The small sample sizes reported in the included studies and lack of RCTs indicates that a research gap exists.

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Mothers' and healthcare stakeholders' views and experiences of birthing positions and perineal injuries during childbirth in a low-resource setting in Nigeria

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Abstract

Background. Cumulative evidence supports the use of upright positions during labour and childbirth, which has benefits for both mothers and babies. Despite strong evidence supporting upright birthing positions, semi-recumbent or lithotomy positions for birth continue to be the most commonly used in some part of Nigeria. Also, it has been reported that episiotomy is commonly practised in some regions. The high rate of episiotomies performed in Nigeria, and the lack of adoption of guidelines in respect to the restrictive use of episiotomy, has contributed to a continued rise in surgically induced perineal trauma. The aim of this study was to explore the views and experiences of mothers, midwives and obstetricians in Nigeria regarding the use of upright position during birth and the perineal outcomes.

Methods. The study utilised a mixed-methods approach and was conducted in two phases. Phase 1 utilised a questionnaire survey and descriptive statistics. The questionnaire was administered to 110 mothers and 110 midwives in two tertiary hospitals in Nigeria to explore the prevalence rate of different birthing positions and the views of mothers and midwives regarding birthing position and perineal injuries during childbirth. The questionnaires were pilot-tested with 10 postnatal women and 10 midwives. Minor amendments were made to some word descriptors on both mothers' and midwives' questionnaires based on the feedback received. Data analysis was supported with SPSS Version 21. Frequency and percentage distributions were used. Phase 2 involved 12 mothers, 12 midwives and eight obstetricians who participated in qualitative interviews to explore their views and experiences in more depth. Their experiences were collected as text and analysed using Braun and Clarke's (2006) thematic analysis framework.

Findings. Phase 1 found that both mothers (n=94: 85%) and midwives (n=108: 98%) reported a semi-recumbent birthing position was predominantly used and was chosen by the midwives, not the mothers, during childbirth. Many mothers (n=63: 57%) did not find the position helpful but some midwives did (n=65: 59%). However, a large majority of both mothers (n=106: 96%) and midwives (n=97: 88%) reported a willingness to try different birthing positions. Episiotomy was found to be predominantly used (n=80: 73%); most mothers (n=76: 69%) reported that it was performed without their consent, and many (n=59: 54%) were not given any painkiller before its performance. A number of midwives confirmed that they performed an episiotomy without local anaesthesia (n=30: 27%). Phase 2 found that mothers were powerless and passive during their birth and at risk of an episiotomy being performed. Midwives and obstetricians accepted embedded birthing practices at the two study hospitals without questioning these practices or considering contemporary evidence. However, a willingness to change, adapt and incorporate clinical practices based on contemporary evidence that benefit women emerged close to the completion of the study.

Conclusion. Findings provided some insight as to why the adoption of a semi-recumbent birthing position and the common use of episiotomy are standard practices, even though they are not supported by evidence. The collective findings gathered from mothers, midwives and obstetricians demonstrated a positive outcome in as much as, at the outset of this study, the use of a semi-recumbent position for birth and episiotomy were entrenched clinical practices. However, participation in the study generated an awareness of birthing practices that were not based on evidence, which were then reflected upon and are now being challenged. A change process that involved critical thinking and recognition that clinical practice should be based on evidence is found to be occurring.

Key words: Birthing position, episiotomy, mothers, midwives, obstetricians, evidence-based midwifery

Background

Over many years, the supine position has been commonly used as standard medical practice by birth attendants in Nigeria. This position seems to have been adopted without consideration of the physiological consequences for either the woman or her baby (Racinet, 2007). The literature indicates that there are different and more efficient positions women can adopt for labour and birth. Horizontal and vertical positions are mostly used. Horizontal positions are

recumbent and semi-recumbent or the full supine-lithotomy position (Steen, 2012; Racinet, 2007) while vertical birthing positions are classified as upright positions such as squatting, sitting, standing, kneeling and being on hands and knees (Steen, 2012).

Upright positions enable gravity to assist a mother's efforts during labour and birth, and encourage the baby to descend through the birth canal (Steen, 2012). A squatting position produces an increase in the anterior-posterior and transverse

pelvic outlet, thus helping the descent of the presenting part (Gupta et al, 2012). There is evidence to support that women feel comfortable when adopting a hands and knees position and can cope better with labour pains, feeling more in control of their birth; it also helps to reduce the risk of perineal injury (Elvander et al, 2015; Maheux-Lacroix et al, 2013; Steen, 2012). Other benefits reported by a number of studies include enhanced fetal oxygenation, improved strength and frequency of uterine contractions, shorter second stage of labour, and decreased risk of needing an assisted birth (Gupta et al, 2012; Meyvis et al, 2012; RCM, 2012; Gupta and Hofmeyr, 2006). Importantly, studies have indicated that the supine-lithotomy position is associated with a number of negative consequences. This position promotes loss of control, narrows the pelvis and makes it difficult for the baby to descend (Hodnett et al, 2012; Hastings-Tolsma, 2007). In this position, the angle of the sacrum tilts forward and the pelvic outlet is reduced (Steen, 2012); this can also result in damage to lower extremity nerves (Litwiller et al, 2004).

Furthermore, the weight of the fetus compresses the vena cava, thus lowering maternal blood pressure and reducing placental blood flow, resulting in a lowered fetal pH (Souza et al, 2006). Thilagavathy (2012) conducted a randomised experimental study that involved 200 low-risk primigravidae, and compared an upright position (sitting) and the supine-lithotomy position. The results showed reduced pain, shorter second and third stages of labour, average Apgar scores of 8.7 and 9.9 in one and five minutes respectively, and maintained baseline blood pressure, in favour of the upright position (sitting). These study findings are similar to other studies (Gupta et al, 2012; De Jonge et al, 2004). Nonetheless, the supine-lithotomy position continues to be the most common position used in labour and birth in some African countries (Diorgu et al, 2016; Okonta, 2012).

Perineal trauma includes a range of injuries, from minor mucosal grazes, to third and fourth degree tears involving the vaginal wall, perineal muscles and anal sphincter and rectal muscle (Dahlen et al, 2015). Perineal injuries affect a high proportion of the obstetric population. Eighty five per cent of women having a normal vaginal birth experience some degree of injury during childbirth, with 10% experiencing severe perineal injuries (Dahlen et al, 2015; Smith et al, 2013). The injury could be either from episiotomy, spontaneous tear or both (Halperin et al, 2010).

Maternal morbidity associated with perineal injuries following childbirth include weakened pelvic muscles affecting urinary and bowel control, and sexual disorders. Other adverse effects of perineal injuries are low self-esteem and depression (Dahlen et al, 2013; RCM, 2012). Studies have noted birthing position to have a potential influence on perineal outcomes (Elvander et al, 2015; da Silva et al, 2012; Gupta and Hofmeyr, 2006). The use of upright positions for birth could bring about a reduction in the risk of perineal injuries from either spontaneous tears or the use of episiotomy. A study compared maternal semi-sitting position with lateral, squatting, standing, and hands-and-knees positions during the expulsive phase of second stage

of labour, and found that semi-sitting represented a greater risk for second-degree tears and the performance of an episiotomy (da Silva et al, 2012). This finding suggests that the effect of position on perineal outcome is significant. The aim of this study was to explore the views and experiences of mothers, midwives and obstetricians in Nigeria regarding the use of an upright position during birth and the perineal outcomes.

Method

A sequential, explanatory mixed-methods approach was employed: in phase 1 a survey was utilised to gather quantitative data, and this was followed up in phase 2 with in-depth interviews recording qualitative data. Both data sets were used to triangulate and integrate the findings (Cole and Stewart, 2012).

Sample and setting.

This mixed-methods study was conducted in two tertiary hospitals in a low-income country between April 2015 and January 2016. These hospitals support the majority of births that occur in the metropolis. Approximately 1,099 perineal injuries (spontaneous tear and episiotomy) were recorded for 2014 and 2015 in the study hospitals' birth registers (UPTH and BMSH Birth Registers, 2014-2015). As an exploratory study, a purposive sample of 110 postnatal mothers, who were more than 18 years old, had a spontaneous vaginal delivery of a live birth, and sustained perineal injury during childbirth, and were six weeks postpartum; and 110 midwives who were attending births during the period of the study were recruited for phase 1 of the study. Mothers who sustained perineal injuries during childbirth and who were attending the postnatal clinic for their six weeks postpartum check-up were approached and asked to consider participating in the study. All participants reached agreed to take part in this research. The midwives who met the inclusion criteria for the study were approached at their workplaces. Only four of the potential participants that were asked declined. All questionnaires were completed and a 100% response rate was achieved. Mothers' and midwives' recall of events were checked and verified against medical records.

For phase 2 of the study, 12 mothers and 12 midwives were randomly drawn from the surveyed population; in addition, eight obstetricians were recruited to participate. Mothers who gave permission and shared their contact details were followed up in one-to-one interviews; the 12 midwives and eight obstetricians attended one of four profession-specific focus group interviews, two groups for each profession, to talk about their views and experiences of birthing positions and perineal injuries arising from childbirth. Data saturation was reached with the facilitation of the second focus group interview of each profession as no more new emerging themes were identified.

Ethical consideration

All aspects of recruitment and participation were guided by ethical principles. From the outset, participants were clearly informed that they had a right to withdraw at any

time. The participants were given pseudonyms, no personal identification. Written consent was obtained prior to commencement of the data collection. To avoid the risk of discomfort that could be generated by being overheard by others, eight of the mothers' interviews were conducted in a quiet hospital room, while other mothers' interviews were conducted in their homes, with ample time for data collection and to guarantee privacy and confidentiality. The research study was approved by the Ethics and Review Board of both hospitals. The study was part of a self-funded doctorate degree thesis.

Data collection and analysis

The quantitative component investigated the prevalence rates of birthing positions and the views of mothers and midwives regarding birthing positions and perineal injuries during childbirth. The two questionnaires were limited to questions relevant to respondents' views and experiences and their demography details. The questionnaires were pilot-tested with 10 postnatal women and 10 midwives. Minor amendments were made to some word descriptors on both mothers' and midwives' questionnaires based on the feedback received.

Questionnaires placed in an envelope were distributed to the mothers during their first postnatal check-up visit, while the midwives received the questionnaire through their ward managers. All completed questionnaires placed in a sealed envelope were dropped into collection boxes provided on labour wards and postnatal clinics in both hospitals. For the analysis, the data were grouped into categories and a number attributed to each category. Statistical calculation was supported with SPSS version 21. Prevalence rates of the views of mothers and midwives regarding different birthing positions on such questions as the birthing position used and willingness to try other birthing positions, were analysed using frequency and percentage distribution. In addition, the mothers' and midwives' responses as to whether or not the perineal injury was by deliberate cut or spontaneous tear, and if their consent and local anaesthesia were received prior to the performance of an episiotomy, were measured.

The qualitative component explored further the participants' experiences of birthing positions and perineal injuries arising during the childbirth. The process started from the collection of qualitative data using one-to-one interviews for mothers, and a focus-group interview approach for midwives and doctors separately. All interviews were recorded via a digital tape recorder, then transcribed by the interviewer; the data were interrogated with the development of codes and themes; and finally interpretation of the themes from the perspectives of the participants took place based on the thematic analysis framework of Braun and Clarke (2006).

To achieve rigour, the project supervisor assisted with the analysis. She randomly selected some extracts to check for accuracy and ensure findings and interpretations were supported by data. Participants were asked questions relating to the answers they had given in the questionnaire

concerning the use of alternative birthing positions, their views and experiences of a supine-lithotomy birthing position and the challenges of perineal injuries. This enabled comparisons and associations of the two sets of answers by clarifying the nature of their concerns about the birthing positions and their experiences of perineal injuries.

Results

Demographic data of the mothers and midwives in phase 1 of the study is presented in Table 1, with a frequencies and percentages distribution of the mother's age, number of births, level of education and number of antenatal attended. For the midwives, professional qualifications, present status and years of experience are detailed.

For phase 2, out of the 12 mothers aged 18-36 years, eight (67%) were first-time mothers and four (33%) were multiparous. The majority had an episiotomy ($n=7$:58%), while five (42%) had experienced spontaneous tears. A high proportion had used the lithotomy birth position ($n=8$: 66%), while four (34%) had used an alternative birth position. Out of the 12 midwives, five (42%) had double professional qualifications, they were registered nurses/midwives, and one (8%) of the midwives had in addition a Bachelor of Science degree. Three of the midwives (25%) had more than 23 years of service, six (50%) had between 17 and 22 years, while a further three had between five and 16 years of experience. Among the eight obstetricians, six (75%) were male, and two (25%) were female; six (75%) were resident doctors undergoing specialist training in obstetrics/gynaecology, while two (25%) were obstetric consultants. Two (25%) of the participants had 10 years' obstetrics/gynaecology clinical experience, four (50%) had more than five years and two (25%) less than 5 years.

The quantitative findings showed that the majority of mothers were guided by the midwives to adopt the supine-lithotomy birthing position even though the majority were aware of other birthing positions and would be willing to use these if given the opportunity. Both the mothers ($n=94$: 85.5%) and the midwives ($n=108$: 98%) reported high rates of the use of the supine-lithotomy position during childbirth, although some of the mothers and the midwives asserted that using the supine-lithotomy position was not comfortable and helpful during birth. The vast majority of respondents ($n=106$: 96% of mothers and $n=98$: 89% of midwives) declared a willingness to adopt other birthing positions if given the opportunity. It is important to note that most mothers who had an episiotomy $n=80$ (73%) while giving birth gave birth in the lithotomy position and many of them were first-time mothers.

In qualitative phase, the analysis of the transcripts from the mothers, midwives and doctors relating to birthing positions and perineal outcomes resulted in the following final themes and sub-themes presented in Table 2.

The findings revealed that the mothers' birthing positions were decided and chosen by the midwives who attended their births. These mothers talked about how they were not given an opportunity to make a choice. Women were forced into a position of 'obedience and conformity' to

Table 1. Demographic data of mothers n=110, midwives n=110

Variables	Frequency	Percentages
Mothers' data		
Age	N=110	%
18-25	14	13%
26-35	77	70%
36 and above	19	17%
Number of births		
0-1	64	58%
2-4	40	36.5%
5 and above	6	5.5%
Level of education		
Secondary	30	27%
Post-secondary	80	73%
Number of antenatal attended		
Less than 8 times	29	26%
More than 8 times	81	74%
Midwives' data		
Professional qualification		
RN	4	3.6%
RN & RM	73	66.4%
BSc Nursing	33	30%
Present status		
Nursing Officer 1	2	1.8%
Nursing Officer 2	8	7.2%
Senior Nursing Officer	11	10%
Principal Nursing Officer	11	10%
Chief Nursing Officer (Clinical Midwife)	78	71%
Years of service		
5-10	20	18%
11-16	17	15.5%
17-22	17	15.5%
23-28	25	23%
29 and above	31	28%

the hospital protocol regarding birthing position and episiotomy interventions

"I wanted to stand" (Peace).

"I tried to squat, I was not allowed...the midwife said I must lie down" (Mother Bliss).

Although the mothers' narratives contained limited

Table 2. Showing the final themes and sub-themes in phase 2

Participants	Final themes	Sub-themes
Mothers	<ol style="list-style-type: none"> 1. Control/power 2. Unaware of position options 3. Vulnerability to perineal injury 4. Insightfulness/ understanding 	Obedience/ conformity Limited information Model of care Willingness/ Acceptability to change
Midwives	<ol style="list-style-type: none"> 1. Embedded practice/ routine 2. Professional recognition 3. Acceptance of assumption-based practices 	Hospital norms 'Patchwork' policy on who repairs. Amenable to change.
Doctors	<ol style="list-style-type: none"> 1. Entrenched practice 2. Professional dominance 3. Lack of insight for evidence 4. Considering women-centred care 	Routine practices Circle of control Traditional focus practices Willingness to change

information about this imposition, information given by the midwives and doctors indicated it was often framed in such a way as to maintain organisational and cultural norms. When asked about their views concerning the use of lithotomy position for birth, the majority of the midwives and doctors stated that lying on the back was the only birthing position used in their facilities and had become widely accepted:

"...They asked us to lie down during antenatal, antenatal story, that was the position they were teaching us" (Sarah).

"All women in this hospital deliver in lithotomy position..." (Midwife Blue).

"Dorsal position is our standard practice here, more so in this environment – lying down position is like what we are used to..." (Dr Kele).

Insightfulness and understanding emerged as mothers and midwives began to show appreciation of the significance of adopting upright birthing positions and a willingness to use different birthing positions. This increased awareness came from their participation in the study and their reflection on old folk practices:

"...It has expanded my mind and now I know and think better..." (Mother Mercy).

"So I feel if we can take up this upright practice, it is good and it will help...I remember the good old days..." (Midwife Red).

"Our participation in the study has really enabled us to gain insight and know that women can take different labour positions and birthing positions..." (Dr Win).

Prior to participating in this study, none of the participants promoted the use of upright birthing positions during labour and birth, despite good evidence of the benefits to women. Placing women in supine-lithotomy position for birth displays a lack of recognition of the normal physiology of birth that is well supported by evidence.

However, the later part of the study revealed evidence of insightfulness as both midwives and doctors showed willingness and were amenable to change practice despite the entrenched/routine practice.

Some women were then supported in adopting an upright position demonstrating good outcomes towards evidence-based practice:

"I choose to squat on the birthing bed. I was allowed and supported..." (Mother Hope).

"...but now some of our women want to birth in different positions and we are allowing them..." (Midwife Orange).

"Also last night shift a woman wanted an upright position for birthing, she was allowed, and she had a successful spontaneous vaginal birth" (Midwife Grey).

"The different birthing positions...Why not, after due counselling of the patients, when they opt for it we obliged them" (Dr Best).

"...Before now, we use one position which is allowing them to lie in the dorsal position but now there are other positions, as the women so choose those positions we allowed them" (Dr Kii).

Also, from the transcripts, it was noted that most women were more at risk of perineal injuries during childbirth as indicated in the model of care being practised, supported by the birth attendant's lack of insight for evidence-based practice:

"I was cut in two different places..." (Mother Mercy).

"...As it was the routine of the hospital... after the cut I had my baby and the stitching process began..." Mother Sarah).

An overarching theme identified related to professional recognition, particularly in relation to the patchwork of policy on who repairs. Both professions appeared to struggle for recognition in the area of perineal care. This was demonstrated with the theme professional dominance and professional recognition. Doctors' transcripts suggested evidence of a circle of control over maternity care:

"...this policy is loosely followed...doctor's suture, but sometimes the midwife's suture..." (Midwife Red).

"...generally, nurses/midwives do not usually repair episiotomy in our facility, they don't repair, yes. They can perform the episiotomy" (Dr Chi).

"We [doctors] can perform and can repair episiotomy as well...midwives give, we repair" (Dr Win).

In spite of these findings, a change that some women were adopting an alternative position for birth, which may have resulted in the reduction of the use of episiotomy, was observed. That may have been influenced by participation in the ongoing research study on birthing position and perineal

injuries. Though the study lasted for less than 12 months, it demonstrated a relatively quick transition in the mindset of the participants. The findings clearly revealed a willingness of most participants to embrace and adapt practice based on evidence and a consideration for women's wishes.

Discussion

As noted in Phase 1 results, intrapartum care provision was not under the women's control or choice. The second phase of the study contributes further evidence that intrapartum care and support were not woman-focussed. The majority of the mothers were guided by the midwives to adopt the supine-lithotomy birthing position for birth, even though some mothers and midwives had some awareness of the use of other birthing positions. It has been suggested that the birthing position options women adopt are influenced by their midwife's preferences for intrapartum care (Chadwick and Foster, 2013). Okonta (2012) reported that the high preference and use of supine-lithotomy may be owing to women being unsure if they would be allowed to adopt the upright position of their choice and unsure of the support they would receive from the attending midwives.

The position women were forced to use for birth may have contributed to the high rate of perineal injuries found in this study. The rate of episiotomy when compared with other countries where upright birthing positions are offered, such as Australia – 2.0% and 2.9% (Ampt et al, 2013; Dahlen et al, 2013); US – 25% (Trinh et al, 2013); and UK – 1.58% (Eskandar and Shet, 2009) was much higher and also exceeded the WHO recommendation that only 10% of women or less should have episiotomy during birth (WHO, 2011). This result is in line with the results of other studies carried out in different regions of Nigeria: for example, Portharcourt – 39.1% (Enyindah et al, 2007); Abia – 45% (Chigbu et al, 2008); and Lagos – 54.9% (Ola et al, 2002). These results suggest that episiotomy is predominantly practised during childbirth in Nigeria and could be associated with the supine-lithotomy position used by the majority of the mothers.

Mothers being guided into a position for birth, with no recognition of their preference or choice, is regarded as being insensitive to women's comfort and autonomy (Gizzo et al, 2014). This is a reflection of control and power being displayed, in particular expert and positional powers.

The mothers' narratives revealed that they experienced passive participation in the childbirth process, especially relating to the use of birthing position. The mothers were overly compliant and not self-confident as they lacked an awareness of care options. They were not meaningfully involved in their birth-care process; this was due to the midwives and obstetricians having placed themselves in a position of authority and control. This may have been due to a social power disparity, as women see their care providers as medically trained and knowledgeable, which confers on them power to overrule (Stiggelbout et al, 2012). Submission may have been promoted by withholding information from the women and by doing little to orientate them to the progress and process of care.

In that sense, 'information power' was used to maintain control in the prevailing hospital norms and culture. This kind of suppression is directly related to the wider construction of 'expert power structures', recognising that women have their experiences within an organisational dominated construct. Obstetricians are acknowledged to have expertise, special skills and abilities, thus are credited with an 'expert power' that they use to overrule both mothers and the midwives alike (Nelson and Quick 2012), in particular in the undertaking of perineal care as highlighted in the theme 'professional dominance'.

However, in contemporary Nigerian society, the social power construction of mothers' and midwives' experiences supports the notion to confront the power structures and self-made practice guidelines that prevail in the hospital birth settings which, over time, have become embedded and entrenched. In relation to the birthing position and perineal injuries, the study focusing on mothers' and midwives' experiences provided opportunities to elicit their views regarding the experiences of birthing, which may not have previously been voiced.

It is believed that power is effective only when the target of powerful actions agrees to the relevant power dynamic (Lunenburg, 2012). Mothers and midwives, through participation in the research, gained some insight and understanding regarding the benefits of upright birthing position during childbirth. Nevertheless, the knowledge of the benefits was not based on evidence but was through an awareness that came from the poster advertising the study and subsequent reflection of old practices: as one midwife mused: "I remember in those good old days women chose the way...they never choose to lie down to deliver..." This awareness may have stimulated the mothers' confidence to request a birthing position of their choice and given the midwives confidence to support mothers who chose alternative birthing positions.

An outcome of this study indicated that social power was being reclaimed by the mothers and midwives as they felt allowed to support mothers' choices to adopt birthing positions they found suitable/comfortable. This finding demonstrates a form of maternity care that promotes the

normality of childbirth while being largely woman-driven. Consequently, some women's accounts suggest a growing confidence around birth, indicating that alternative birthing positions were becoming accepted as some women got in the 'driving seat' and broke free of previous restricted supine-lithotomy position (Deery and Kirkham, 2007).

The study also revealed that midwives and obstetricians were willing to change their practices and support the use of upright birthing positions during labour and birth, as indicated on the theme 'considering woman-centred care and willingness to change'. This study demonstrated that midwives and obstetricians were beginning to have a fresh examination of birthing position and perineal injuries, and started demanding a new direction of thinking that considers women's preferences, for instance supporting women to adopt upright positions during labour and birth.

If this trend continues, it may result in fewer episiotomies being performed. This synchronization of willingness to change, as suggested in their excerpts, highlights that a change has begun in the two study hospitals. Thus participation in this study became a changing experience for those mothers, midwives and obstetricians.

Conclusion

This study identified that in Nigeria most women are instructed to give birth on their back, which may have influenced the high use of episiotomy. The findings also identified entrenched practice, hospital norm and power/control as being reasons why the adoption of a semi-recumbent birthing position and the common use of episiotomy are standard practices in Nigeria, even when they are not based on evidence. However, the collective findings gathered from mothers, midwives and obstetricians demonstrate a positive outcome of synchronised willingness to adapt practices. Birthing practices not based on evidence were being reflected upon and are being challenged. A change process that involved critical thinking and some adaptation to practice is occurring, such as allowing and supporting some women to adopt different upright positions during labour and birth. This may result in fewer episiotomies being performed.

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Evaluation of an online antenatal course 'Understanding pregnancy, labour, birth and your baby' by the Solihull Approach

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Abstract

Introduction. Digital antenatal education classes can offer increased accessibility and flexibility to expectant parents. However, this method of course delivery is new, with no previous evidence to date. This study examined the impact of the Solihull Approach online antenatal course on participants' attitudes towards pregnancy, labour and birth, and their feelings towards their babies.

Method. A repeated measures design was used. In all, 139 participants completed self-report measures, designed for the purposes of the study, before and after completing all nine modules of the Solihull Approach online antenatal course 'Understanding pregnancy, labour, birth and your baby'. Statistical analyses were conducted using paired samples, t-tests, and Cohen's d to determine effect sizes. Ethical approval was not required, as this was a service evaluation with no conditions and anonymous participants.

Results. Participants showed a reduction in anxiety towards pregnancy and birth ($p < .0001$), felt closer to the baby ($p < .0001$), and showed increased intention to breastfeed ($p < .001$) after completing the online course.

Conclusion. The online antenatal course reduced parental anxiety, increased intention to breastfeed and improved the relationship with the unborn baby. Methodological limitations are discussed. This study indicated that online antenatal education shows promise, with the potential to reach a wider population than traditional classes. Furthermore, with the addition of a focus on the parent-infant relationship, as well as traditional content, such courses may contribute to the emotional health and wellbeing of parents and babies after the birth. It is suggested that this could help reduce the need for parenting interventions in future for problems in childhood.

Key words. Solihull Approach, antenatal course, online course, pregnancy, birth, breastfeeding, wellbeing, evidence-based midwifery

Introduction

Face-to-face antenatal courses/classes have been delivered for decades (Spinelli et al, 2003; Hillier and Slade, 1989) and commonly aim to achieve similar outcomes: preparing people for pregnancy, labour and birth. Being educated about the baby's existence in the womb gives parents a chance to understand what effect the physical/emotional quality of the fetus's life has on the baby's subsequent development (Glover, 2015). Furthermore, some antenatal classes aim to reduce parental anxiety and stress. This is important not just for the parent's experience but also for long-term outcomes for the baby. Talge et al (2007), for example, have shown that anxiety, depression, and stress during pregnancy can have adverse long-term effects on the child's neurodevelopment, increasing the risk of emotional problems, attention deficit hyperactivity disorder, and cognitive impairment. In fact, it has been estimated that anxiety and depression during pregnancy can contribute to 10% to 15% of emotional and behavioural problems for the child (Glover, 2015).

Milgrom et al (2011) evaluated the effectiveness of an antenatal intervention that aimed to reduce maternal postnatal symptoms of depression and anxiety. Results showed a significant reduction in cases of mild/severe depression and anxiety symptoms in the postnatal period when such an antenatal intervention was integrated into antenatal education compared to routine care.

Antenatal education is not only important for the emotional wellbeing of the mother and baby, but also familiarises the mother with breastfeeding and encourages her to breastfeed when her baby is born. Studies have found that antenatal classes increased the likelihood of a new mother breastfeeding. For example, a study of 614 women in northern Spain who had given birth to their first child compared breastfeeding rates among those who received antenatal education with those who had not (Artieta-Pinedo et al, 2013). Findings showed that 90% of the mother's breastfed initially and there were no differences between the groups. However, mothers who did not receive any antenatal education were three times more likely to stop breastfeeding in the first month compared to mothers who received more than five classes. This seems to indicate that the antenatal education had a positive impact on the likelihood of participants choosing to continue breastfeeding.

The Solihull Approach aims to promote positive emotional health and wellbeing in children, adults and families. With a robust, integrative psychodynamic, child development and behavioural theoretical framework underpinning its training and resources, the Solihull Approach provides face-to-face groups for parents, online courses for parents, and training for practitioners working with children/families across a range of agencies, including early years, health, education, prisons, social care, police and fire departments.

The Solihull Approach's online antenatal course, 'Understanding pregnancy, labour, birth and your baby' (UPLBYB-OL), is based on its face-to-face group of the same name (UPLBYB). The online course covers the same information as the face-to-face group. The aims are to provide parents and other members of the 'birth team' (e.g. grandparents, birthing partners) with information about pregnancy and birth, and to help them become attuned to their unique baby and engage in their relationship with the baby. It is designed to appeal to men and women alike, and be inclusive of same-sex parents. The content is written by registered midwives, and health professionals including health visitors, child psychotherapists and clinical psychologists, and covers: getting to know the baby in the womb and establishing a relationship with the baby; the signs of labour and what the mother and baby will be experiencing; help for labour and birth with reference to birthing positions, pain relief and support at home; breastfeeding, including how to develop a feeding relationship with the baby.

UPLBYB, on which the online course is based, has been evaluated (Douglas and Bateson, 2017). Results from 26 fathers and 34 mothers showed that time spent thinking about the baby and the quality of attachment feelings towards the baby statistically significantly increased for men and women, as measured by the maternal/paternal attachment scale (MAAS/PAAS) (Condon, 1993). General anxiety and depression did not change for mothers or fathers. However, pregnancy-specific anxiety, as measured by the pregnancy-related anxiety questionnaire – revised (PRAQ-R) (Rini et al, 1999), decreased. A statistically significant increase was found for intent to breastfeed, as measured by a Likert scale questionnaire developed for the study. Intention to stop smoking did not change for mothers or fathers.

In view of these findings, and given the known links between smoking during pregnancy and harmful effects on the baby, such as fetal growth, problematic births and behavioural problems in childhood (Zacharasiewicz, 2016; Cnattingius, 2004), amendments were subsequently made to the face-to-face antenatal group facilitator manual. These included increased reflections about what the baby experiences in the womb to encourage parents to consider what affect their smoking may have on their unborn child.

Digital education is a relatively recent phenomenon and as such the online delivery of courses in healthcare is a newly emerging field. An estimated 95% of women and men have used the internet at some point during pregnancy as a source of information related to pregnancy (Lima-Pereira et al, 2012). Therefore, antenatal education provision, developed by professionals, via an online format is a natural progression that is likely to fit well with parents' current attempts to self-educate. Currently there has been no published research investigating antenatal online education, making this study the first of its kind. As such, the authors argue, the present research is highly valuable to this developing area of service delivery and research.

Evidence for maintaining positive outcomes when translating face-to-face interventions to an online format is offered by Johnson (2018) who described results from

115 parents and carers who completed the parent-child relationship scale (PCRS) (Pianta, 1992) before and after finishing an online course aimed at parents and carers of children and young people aged 0-18 years. This online course was based on the Solihull Approach's successful 10 week, two hours per week, face-to-face group for parents, 'Understanding your child's behaviour'. Results showed the online course resulted in a highly statistically significant increase in 'closeness' within the parent-child relationship and a highly statistically significant decrease in 'conflict', suggesting that the online course was effective at improving the parent-child relationship.

The advantages of using an online platform to deliver educational classes are many. For example, ease of access, especially for those who are unable to attend face-to-face classes, or who feel uncomfortable or lack the necessary confidence. Online courses also offer convenience and flexibility, with users being able to access the course at any time of the day or night from the comfort of their home. Furthermore, online antenatal support can be relatively easily integrated within a public health approach, enabling free access to a wide range of people, including those in disadvantaged circumstances. It can also be extended to an international population.

The purpose of the present study was to examine whether taking part in the online antenatal course affected levels of anxiety about the pregnancy, birth and baby in participants. The hypothesis was that knowledge and awareness of the physical and emotional aspects of parents and babies would result in a decrease in anxiety, feeling closer to the baby, stronger intention to breastfeed, and a decrease in intention to continue smoking.

Method

Participants

The course was marketed across the UK via existing Solihull Approach networks, GP surgeries, children's centres, health visitors and midwives, and word-of-mouth. Participants were taken from the 738 registered users of the course during the data-collection period. All had accessed the course for self-educative purposes either by buying access or being given pre-paid access, for example by a service provider. In all, 139 (18.8%) of these users had completed all nine modules and both pre- and post-course questionnaires and were therefore included in the study. No demographic data were collected in order to minimise disengagement by participants. Access is ongoing for participants, therefore it is not possible to define the remaining 599 (81.2%) users as non-completers. As an online course open to all there were effectively no inclusion or exclusion criteria. Ethical approval was not required, as this was a service evaluation with no conditions and anonymous participants.

Design

A quasi-experimental, repeated measures design was used to gauge pre- and post-intervention outcomes with participants completing the questionnaire before taking the course (baseline) and after taking the course.

Table 1. Online antenatal course module titles

Module number	Title
1	Welcome
2	Helping you and your baby through pregnancy and birth
3	Getting to know your baby in the womb
4	You, your baby and the stages of labour
5	Helping you and your baby through labour and birth
6	Feeding your baby
7	Who’s the Daddy now? I’m the Daddy!
8	After your baby is born
9	Congratulations

Materials/research protocol

The online antenatal course, UPLBYB-OL, comprises nine modules (see Table 1).

The course offers a learning experience where the material is provided in a course management system (Wordpress) that must be accessed via the internet. The course is self-paced and there is no interaction with an instructor or other learners.

Learners create an account using an email and password of their choice. Their account ‘remembers’ that they have access to the course and resumes the course where they last left it. Learner account details were confidential to the research team and responses were anonymised for the purposes of the analysis. The Solihull Approach is part of the University Hospitals Birmingham NHS Foundation Trust (formally Heart of England NHS Foundation Trust), and the website and course have been subject to a privacy impact assessment, a technical assurance check, risk assessment, are held on a secure server, and have received information governance approval from the trust.

Measure

The measure was based on that used by Douglas and Bateson (2017) and was designed for the purposes of the study. More extensive measures were considered but not included in the study in order to minimise demand on the course participants to encourage completion of the measure. See Table 2 for pre and post questions. The measure uses a five-point Likert scale, as shown in Table 2. Reliability and validity is yet to be established.

Procedure

Learners either purchased the course for £19, or were given pre-purchased access, for example by a service such as a children’s centre, at their request. They accessed the web-based course on a device of their choice (laptop or desktop computer, tablet or smartphone).

The initial pages of the course include a welcome, instructions and an optional pre-course research measure.

Table 2. Pre and post questionnaire

Pre and post course questions	Possible responses	Weighting
1 How do you feel about this pregnancy and birth?	Very relaxed	1
	Relaxed	2
	Neither worried nor relaxed	3
	Worried	4
	Very worried	5
	Don’t want to answer	0
2 How close to this baby do you feel now?	Not at all close	5
	Slightly close	4
	Close	3
	Very close	2
	Extremely close	1
	Don’t want to answer	0
3 Do you intend to breastfeed?	Definitely yes	1
	Probably yes	2
	Haven’t decided	3
	Probably not	4
	Definitely not	5
	Don’t want to answer	0
4 If you smoke, how strong is your intention to quit before the baby is born?	I definitely won’t quit	5
	I probably won’t quit	4
	I haven’t decided	3
	I hope to quit	2
	I will definitely quit	1
	I don’t smoke	0
Don’t want to answer	0	
Additional post course questions:		
5 Did you find this course helpful?		Yes/No
6 Did you find this course enjoyable?		Yes/No
7 Would you recommend this course to others?		Yes/No

Access to the course is not affected by whether or not the research measure is completed. Participants in the research were those learners who opted to complete the course and both pre and post measures. Course content is presented in ‘units’, organised into nine ‘modules’, with ideas introduced in earlier modules being developed and expanded in later modules. Participants are encouraged to take a few days between modules to allow time for home activities and to reflect on what they have learnt in the course.

Individual accounts tracked progress through the course and resumed from the point of last access. Once they have completed the course, participants have ongoing access to

Figure 1. Participants responses to whether they found the course helpful

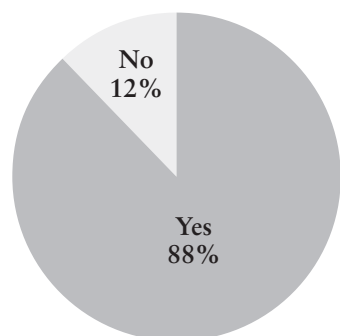


Figure 2. Participants responses to whether they enjoyed the course

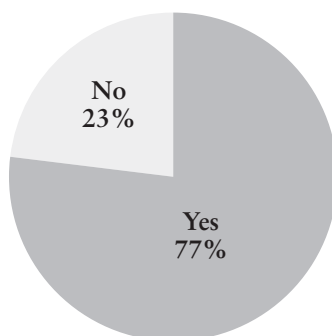
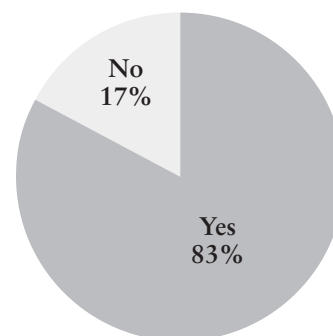


Figure 3. Participants responses to whether they would recommend the course to others



allow them to revisit and consolidate their learning. The optional post-course measure is presented to them in the final module.

The modules include voiceovers, interactive activities, quizzes, videos, hand-outs and home activities.

Results

A paired-samples t-test was conducted to compare the pre-course scores of the first four questions with the post-course scores. Pre-course scores were paired with post-course scores automatically by the software storing the secure learner accounts. Scores were exported by a member of the research team with administrator rights from the software into a spreadsheet document and anonymised.

There were highly statistically significant differences in the pre and post scores for questions 1, 2 and 3.

Mean scores for question 1, measuring anxiety about the pregnancy and birth (response choices: very relaxed, relaxed, neither relaxed nor worried, worried, very worried, don't want to answer), before taking the antenatal online course ($M=2.93$, $SD=.95$) were higher than after taking the antenatal online course ($M=2.36$, $SD=.99$); $t(138)=7.24$, $p<.0001$, indicating a reduction in levels of anxiety after taking the course. Cohen's d values showed the effect size for question one ($d=0.61$) to be medium-large.

Scores for question 2, 'How close to this baby do you feel now?', were lower at the start of the intervention ($M=3.5$, $SD=1.07$) increasing afterwards ($M=3.82$, $SD=1.04$); $t(136)=-3.96$, $p<.0001$, suggesting increased closeness between participants and their baby or babies. The effect size was small to medium ($d=0.34$).

Responses to question 3, 'Do you intend to breastfeed?', decreased from pre course ($M=1.8$, $SD=1.22$) to post course ($M=1.63$, $SD=1.17$). Higher scores indicate lower intention to breastfeed: $t(135)=3.34$, $p<.001$. This indicates a statistically significant increase in the intention to breastfeed after completing the online course. The effect size for question three ($d=0.28$) was small.

There was no significant difference in the scores for question 4, 'If you smoke, how strong is your intention to quit before the baby is born?', before taking the antenatal online course ($M=1.19$, $SD=.88$) and after ($M=1.2$, $SD=.94$); $t(136)=-.27$, $p=.787$. The Cohen's d value ($d=0.02$) showed almost no effect size indicating that conclusions cannot

be drawn from this result. The majority of the sample, 130 people, did not smoke (94%). Of the remaining nine participants, three definitely intended to quit before taking part in the course, one hoped to quit, two had not decided whether they wanted to quit or not, one said they definitely will not quit, and two indicated that they did not wish to answer.

The results of the additional three questions in the post-course questionnaire were course evaluation questions and as such were not included in statistical analyses. Figure 1 shows participants' responses to the question 'Did you find this course helpful?', Figure 2 shows responses to the question 'Did you find this course enjoyable?', and Figure 3 shows responses to the question 'Would you recommend this course to others?'. These results show that the majority of the participants had favourable attitudes towards the course.

Discussion

The present study investigated a newly emergent field and provides promising evidence about the usefulness of an online antenatal education course. The results showed statistically significant improvements in: anxiety about the pregnancy and birth; feelings of closeness to the baby; and intention to breastfeed, among an anonymous, undefined population of completers of an online course designed to appeal to parents-to-be and their families and supporters.

The proportion of smokers within the whole sample and their responses to a question about intention to stop smoking were insufficient to achieve a meaningful effect size. Therefore, conclusions about the impact of the course on smoking cessation cannot be drawn. However, this question is important because it is well established that smoking during pregnancy and after birth can have a negative impact on the fetus and the baby (Zacharasiewicz, 2016; Cnattingius, 2004).

It was hypothesised that although the course focused more on emotional components and connection with the baby rather than physical health elements (e.g. physical effects of smoking), increased attunement with the baby may lead to a reduction in behaviour known to be harmful to the baby, and this remains an interesting question.

Future research could in theory focus on a specific sample of smokers and then conduct analyses to determine whether participating in the course produced a change in

their attitudes towards smoking. This may help to identify specific elements within the course that can be updated to increase the likelihood of participants intending to quit smoking.

There is a paucity of research in this field (antenatal online courses). In fact, it is not possible to compare the findings of the present study with any other directly relevant studies because there are none. However, the findings replicate those found with the Solihull Approach Antenatal face-to-face course on which the online version is based (Douglas and Bateson, 2017), notably: increased feelings of attachment to the baby in mothers and fathers, decreased anxieties related to pregnancy, labour and birth for mothers, and increased intention to breastfeed.

Furthermore, the present results are consistent with the finding that a face-to-face course for parents ('Understanding your child's behaviour') can be translated successfully into a static online delivery format (Johnson, 2018).

There are a number of limitations of the present study, which reflect the challenges inherent in evaluating efficacy in online programs. In order to keep demands on participants to a minimum, a short, self-report measure was used, which was untested for reliability and validity. It is not possible to identify non-completer rates because users have ongoing access to the course and may be intending to complete later. Demographic variables are unknown. There are no control groups, therefore it is not possible to say whether changes would have occurred anyway.

The benefits of online courses, particularly those with sensitive content, such as anonymity, privacy, flexibility, and accessibility, are arguably not compatible with a traditional research paradigm. A focus group investigating attitudes to online learning, conducted by the Solihull Approach for market research purposes, indicated that users were suspicious of giving any personal details at all online, especially prior to knowing whether the course would be of value to them. Therefore, the need for demographic profiling must be balanced against the need to minimise early disengagement by users. Without demographic data, the acceptability of this approach to women from all backgrounds can not be determined. The online course in question was developed from clinical rather than academic or research drivers, with the aim of conveying established, evidence-based theoretical principles at scale in service of a preventative mental health agenda.

Although not available free of charge unless funded by a sponsor, the antenatal online course shares characteristics with massive open online courses (MOOCs), which are known for having high enrolment rates but also high drop-out rates (de Freitas et al, 2015). As such the present course shares the research challenges, described as a 'magnitude of complexity', associated with MOOCs (Gašević et al, 2014).

In recognition of the challenges around evaluating online courses, there have been attempts to identify sound principles for designing effective online courses, which can then be evaluated, such as encouraging student-faculty and student-to-student contact, or presentation of learning by students (Graham et al, 2001).

However, these assume that online courses are undertaken in the context of educational establishments by registered students, and are therefore not applicable to courses designed for a general population.

DeBoer et al (2014) argued for a reconceptualisation of research variables, suggesting that conventional interpretations of variables used in quantitative analysis, such as enrolment, participation and achievement, are inadequate or insufficient for evaluating MOOCs. It is clear that research measures must be kept to a minimum, and the selection of representative participants cannot be achieved through traditional recruitment methods.

Other attempts have been made to explore barriers (e.g. lack of social interaction) and motivators (e.g. persistence) in distance and online education (Hart, 2012; Rovai, 2002; Muilenburg and Berge, 2001). What is clear is that the field of scholarly literature on MOOCs is essentially in its infancy and is fragmented in its approach to overcoming the issues it faces (Raffaghelli et al, 2015). Therefore, this paper, while flawed from a traditional perspective, makes a vital contribution to our early understanding of the usefulness of online courses in the field of antenatal education.

The implications of having an antenatal course that is accessible to a much wider population than face-to-face classes are many. Providing digital education that reduces an expectant mother's anxiety could help promote better emotional wellbeing and mental health for the pregnant mother that will have a positive impact on her baby's health (Glover, 2015; Talge et al, 2007).

In addition, taking part in an antenatal course that increases understanding about the benefits of breastfeeding may encourage the likelihood and/or duration of a mother breastfeeding her baby after birth.

Alongside the education about the physical aspects of pregnancy and birth, the Solihull Approach's focus on enhancing understanding of the baby as a sentient, emotionally connected, and socially capable being from the antenatal period onwards, provides a foundation from which to build capacities within parents and carers. These are known to be associated with positive emotional development, secure attachment patterns, emotional self-regulatory skills, and the future health and wellbeing of the baby.

Therefore, it can be argued that the course has a preventative role and may lead to reductions in the demand for child and baby parenting interventions to help with issues within the family. There are also benefits to the baby of other family members taking the course, as they can then support the parents' and their own relationships with the baby.

A further limitation of the study is that one of the authors (Johnson) has a declared interest in the Solihull Approach, which limits its claim as an independent piece of research.

However, it is not possible to compare these findings with other studies, as to date there is no published research about online antenatal courses. Other providers of online antenatal courses can be found on the internet, however, the focus tends to be on labour and birth, and practical aspects of caring for a baby, rather than on the relationship

and the infants' emotional development and long-term mental health. Given the dearth of knowledge about the importance of the first two years of brain development, the authors argue that this study should be seen as offering preliminary evidence that UYPLBB-OL is effective and therefore should be considered for integration into a public health approach to antenatal education and preventative mental health and wellbeing strategies.

Conclusion

As preliminary evidence these data are highly promising in terms of a population-based health intervention. The online

antenatal course (UYPLBYB-OL) resulted in statistically significant improvements in antenatal anxiety, improved feelings of closeness to the baby and increased intention to breastfeed. It is not possible to draw conclusions about the impact of the course on smoking cessation intentions.

The results must be treated cautiously in view of the limitations of the study (use of a non-standardised self-report measure, unknown demographic characteristics of participants, lack of a control group), but they represent highly significant preliminary evidence in a newly emerging field, which is recognised as having, as yet, inadequately resolved research challenges.

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Information for authors

Evidence Based Midwifery is published quarterly and aims to promote the dissemination, implementation and evaluation of midwifery evidence at local, national and international levels. Papers on qualitative research, quantitative research, philosophical research, action research, systematic reviews and meta-analyses of qualitative or quantitative data are welcome. Papers of no longer than 5000 words in length, including references, should be sent to: rob@midwives.co.uk in MS Word, and receipt will be acknowledged. Suitable papers are subject to double-blind peer review of academic rigour, quality and relevance. Subject area and/or methodology experts provide structured critical reviews that are forwarded to authors with editorial comments. Expert opinion on matters such as statistical accuracy, professional relevance or legal ramifications may also be sought. Major changes are agreed with authors, but editors reserve the right to make modifications in accordance with house style and demands for space and layout. Authors should refer to further guidance (RCM, 2007; Sinclair and Ratnaik, 2007). Authorship must be attributed fully and fairly, along with funding sources, commercial affiliations and due acknowledgements. Papers that are not original or that have been submitted elsewhere cannot be considered. Authors transfer copyright of their paper to the RCM, effective on acceptance for publication and covering exclusive and unlimited rights to reproduce and distribute it in any form. Papers should be preceded by a structured abstract and key words. Figures and tables must be cited in the text, and authors must obtain approval for and credit reproduction or modification of others' material. Artwork on paper is submitted at the owner's risk and the publisher accepts no liability for loss or damage while in possession of the material. All work referred to in the manuscript should be fully cited using the Harvard system of referencing. All sources must be published or publicly accessible.

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News and resources

RCM conference abstract programme

Dozens of speakers have been confirmed for the abstract programme at the RCM Annual Conference 2018. They will be presenting their research on a range of clinical and professional topics, based around the themes of safety, leadership and partnership. These cover key issues within contemporary maternity care and relate to: who we deliver the service for; the importance of good leadership of the profession and vision for what we can achieve; the need to care for staff; the fundamentals of what counts as a 'safe' service and the need to hear women's voices. The abstracts can be read online. The two-day event is free to attend and is being held in Manchester on 31 October and 1 November. For more information, visit rcmconference.org.uk

Iolanthe awards to open

The Iolanthe Midwifery Trust will be accepting applications for next year's awards from November. They include the Midwives Award, to support for training, research and improving local services; the Jean Davies Award, for challenging maternal inequalities in maternal health in the UK; and the Elizabeth Duff Award, for projects supporting the midwife-mother relationship. The trust aims to promote and improve the care of mothers, babies and families through awarding grants and fellowships. For more information, visit iolanthe.org

Funded PhD opportunity

Ulster University has announced a new funded PhD opportunity. It is on developing and testing an EMDR early intervention to improve mothers' cognitive processing of trauma-associated memories embedded during an unexpected caesarean birth. The study will look at prevention of the longer term effects associated with a traumatic birth. Applicants must have a minimum of a 2:1 degree from a UK institution (or equivalent) and experience using research methods, or other approaches relevant to the subject domain. The deadline for submissions is 26 October. For more information, visit ulster.ac.uk/doctorscollege

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