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Qualitative study exploring the barriers and facilitators to low-dose aspirin adherence in pregnant women with placental dysfunction risk in the UK

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ABSTRACT

Introduction Placental dysfunction is estimated to affect 10% of pregnancies and is associated with adverse perinatal outcomes. Low-dose aspirin (LDA) reduces placental dysfunction risk. However, adherence to LDA is suboptimal in pregnant women and may reduce its effectiveness.

Objectives We aimed to explore the barriers and facilitators to LDA adherence in pregnant women with placental dysfunction risk.

Design Qualitative semi-structured individual interviews were undertaken, and data were inductively thematically analysed.

Setting A single NHS Trust in South West England, UK.

Participants Pregnant women aged>18, recommended daily LDA for pregnancy indications. We purposively recruited those with a range of adherence patterns (non-adherent, suboptimally adherent, adherent).

Results 15 women participated (93% white British, 73% university educated). Five were adherent (6–7 doses per week), five suboptimally adherent (4–5 doses per week) and five non-adherent (≤3 doses per week). Indications for LDA were pre-eclampsia risk, low PAPP-A and previous intrauterine growth restriction. Four themes and related subthemes were identified addressing motivational and implementation issues. Motivational barriers and facilitators included (1) risk perceptions: participants described limited understanding of their indications for LDA and the maternal and fetal impacts of placental dysfunction, feeling stigmatised by their body mass index being an indicator for LDA and perceiving it to be unlikely they would experience serious consequences of placental dysfunction. Facilitators were direct/indirect experiences of placental dysfunction. (2) Concerns about taking LDA, including bleeding risk. (3) Interactions with healthcare professionals: participants described receiving limited information from healthcare professionals, with limited attention given to LDA compared with other antenatal recommendations. Distrust and trust in healthcare professionals impacted non-adherence/adherence. Implementation barriers were (4) difficulties with establishing habits, tailing off and difficulties swallowing. Established habits and swallowing LDA whole supported taking it.

Conclusions We identified motivational and implementation-related barriers and facilitators to LDA adherence in a clinical sample of women with placental dysfunction risk. Women require more information to enhance understanding and inform their decision, and require support to establish effective habits. Theory-informed behaviour change techniques could address these barriers. Adherence barriers and facilitators should be explored in minority ethnicity and economically deprived women, and healthcare staff providing LDA-related care to inform optimally effective interventions.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ We explored the barriers and facilitators to adherence to low-dose aspirin in pregnant women with placental dysfunction risk who had varying levels of adherence, extending previous research in non-adherent women to understand what helps and hinders taking it.
⇒ We used a consensus-informed theoretical framework for the topic guide, which provides a comprehensive approach to identifying the barriers and facilitators to adherence to low-dose aspirin.
⇒ This research was undertaken in a single NHS Trust; exploring it in other Trusts could highlight the differences in access to information and care relating to low-dose aspirin.
⇒ We achieved limited participation of women who were not university educated and no representation of women from minority ethnicity groups; their experiences should be explored in a future study.

INTRODUCTION

Placental dysfunction during pregnancy is the failure of the placenta to adequately supply oxygen and nutrients to the fetus.[1] It impacts approximately 10% of pregnancies and is associated with adverse perinatal outcomes, including pre-eclampsia, placental abruption, preterm birth, intrauterine growth restriction (IUGR) and stillbirth.[2] Risk factors for placental dysfunction include low pregnancy associated plasma protein A (PAPP-A),[3] previous recurrent pregnancy loss,[4] previous

pre-eclampsia and maternal hypertensive disorders, smoking, maternal age, primiparity and previous IUGR.[2]

Currently, low-dose aspirin (LDA) is the only well-evidenced medication to reduce adverse outcomes associated with placental dysfunction risk.[5–7] The UK National Institute for Health and Care Excellence (NICE) and *Saving Babies' Lives* Care Bundle recommends LDA (75–150 mg daily), commenced before 16 weeks until 36 weeks gestation for women with previous IUGR, low PAPP-A, risk of preterm birth and risk factors for pre-eclampsia to reduce the potential adverse outcomes of placental dysfunction.[8 9]

LDA adherence is important in achieving this; the ASPRE trial found a 75% vs 40% reduction in preterm pre-eclampsia incidence in those taking ≥90% vs <90% of doses.[10] However, survey data indicate widespread suboptimal adherence in women recommended LDA for pre-eclampsia risk, mirroring suboptimal adherence to medications for chronic conditions in pregnant women.[11 12] In an Australian survey, 53% of women self-reported taking fewer than 90% of LDA doses.[13] In a cross-sectional survey in the Netherlands, 46% and 21% of women reported suboptimal adherence using two self-report tools.[14]

Our recent systematic review identified few studies evaluating interventions to increase adherence to prescribed medications in pregnancy, with one small (n=15) pre-post study targeting LDA adherence.[15] Systematic reviews of adherence interventions for the wider population indicate limited available evidence for effective adherence interventions in this group, with studies often excluding pregnant women.[16 17] Pregnancy-specific interventions may be needed due to unique adherence barriers experienced in this group, such as teratogenicity concerns.[18 19]

Reasons for LDA non-adherence have been explored in a small number of previous studies. In a survey of women reporting intentional non-adherence to prescribed LDA in the USA, participants described difficulty remembering, concerns about safety and necessity, information on the aspirin warning label, wanting more information and fetal/neonatal concerns.[20] Qualitative interviews with UK postnatal women in an LDA-related Doppler imaging trial explored both intentional and non-intentional adherence barriers.[21 22] Participants did not perceive LDA to be necessary, had a limited understanding of pre-eclampsia, perceived themselves as 'not being medication takers' and did not identify with clinical factors predisposing them to pre-eclampsia. Not being given LDA at their appointment and difficulties obtaining it due to safety concerns expressed by other healthcare practitioners (HCPs) were also barriers. Limitations of this study are that those participating in a trial may have been well-informed about LDA prophylaxis compared with the wider pregnant population and all participants were suboptimally or non-adherent. Exploration of adherence barriers and facilitators in women recommended LDA with a range of placental dysfunction risk factors can inform targeting of behaviour change techniques (BCTs) in an intervention to improve adherence, and therefore improve pregnancy outcomes.

We aimed to identify the barriers and facilitators to LDA adherence in pregnant women with a risk of placental dysfunction.

METHODS

This study is reported in accordance with the Consolidated criteria for Reporting Qualitative research guidelines (online supplemental file 1).[23]

Design and setting

Qualitative semi-structured individual interviews were undertaken in a single NHS Trust maternity service in South West England between July 2020 and March 2022.

Patient and public involvement

A member of the public with experience of LDA prophylaxis for risk of placental dysfunction gave input to the development of the protocol for this study and reviewed the participant-facing materials (Information Sheet and Topic Guide). They did not support recruitment or conduct of the study. A public-patient involvement group has informed the development of a follow-on study and will also provide input into the dissemination strategy for this study.

Sampling and recruitment

Participants were invited to take part in the study by the clinical team during antenatal appointments in community midwifery and hospital antenatal clinics, who referred them to the research team. Eligible participants were pregnant women of >12 weeks' gestation, aged >18 years, who had been recommended daily LDA per current NICE guidelines.[24]

Women expressing interest were telephoned by the researcher and emailed a study information sheet describing the research aims and what participation involved. During the call, the research team asked potential participants to describe their current adherence pattern as the 'average' number of days per week they were taking/had taken LDA during their pregnancy. The research team purposively recruited women describing varied LDA adherence, categorised as adherent (6–7 doses per week), suboptimally adherent (4–5 doses per week) and non-adherent (≤3 doses per week). After 24 hours, a researcher telephoned to answer questions and arrange an interview. Prior to the interview, participants completed an online consent form hosted in REDCap,[25] which was verbally verified at the start of the interview. Participants received a £15 shopping voucher.

Sample size

The sample size was guided by *Information Power*.[26] This approach provides a pragmatic methodology for assessing sample size in qualitative studies, based on the breadth of the study aims (narrow or broad), specificity of the sample (general vs specific experience of the phenomenon

under investigation), use of theory to inform the study approach/questions, quality of dialogue (knowledge, skill and experience of the interviewer and quality of dialogue with the participant) and analysis strategy (case or cross-case analysis). Within this approach, the more information relevant to the study aims the sample holds, the fewer participants are needed. We had a moderately narrow aim focusing on LDA adherence, with a purposively recruited, specific sample of women who had been recommended LDA, who were further selected on the basis of their adherence to it. An established theoretical framework informed the topic guide (see 'Data collection'). Interviews were conducted by an experienced qualitative/behaviour change researcher (AD) with considerable knowledge of medicines adherence in pregnancy. Cross-case analyses were undertaken by two experienced qualitative researchers with medicines adherence knowledge. We estimated that a sample of approximately 15 women, ensuring representation of differing levels of adherence, would be sufficient to provide rich data about the important barriers and facilitators.

Data collection

Telephone interviews were undertaken due to being unable to interview face-to-face during the COVID-19 pandemic. Demographic data were collected using a structured questionnaire: age, (estimated) delivery date, previously recommended LDA in a pregnancy, parity, gravidity, highest educational qualification and ethnicity (UK Census categories). Each participant took part in a single interview, and no repeat interviews were undertaken.

Topic guide

The researcher began the interview by establishing current and previous LDA adherence by asking about (1) the number of doses missed in the previous week, (2) number of doses missed in the previous month and (3) whether LDA adherence patterns in the preceding week were typical for them. Questions were framed by the interviewer in such a way as to support women to truthfully report their adherence by acknowledging that some women choose to not take it or forget it. Participants' responses were used to inform the framing of questions during the interviews. We did not objectively assess LDA adherence as an accurate objective assessment of it is difficult to obtain due to its short half-life and because there is variable physiological response to aspirin (see online supplemental file 2).[27]

The semistructured topic guide was based on the Theoretical Domains Framework,[28] which provides a list of consensus-derived barriers and facilitators to behaviour. During the course of the interviews, we added a question to the topic guide about whether LDA was recommended or prescribed and the perceived impact of that on behaviour. Interviews were audio recorded on an encrypted device, and the researcher took notes to support the analysis.

Analysis

Interviews were professionally transcribed verbatim, checked for accuracy and uploaded to NVivo. We conducted reflexive inductive thematic analysis (see table 1).[29]

Reflexive accounting

The research team comprised an experienced female qualitative and health psychology postdoctoral mid-career researcher who investigates experiences of maternity healthcare (AD), a senior health psychology researcher with expertise in medication adherence (SC) and a consultant academic obstetrician (CB). Other team

Table 1 Thematic analysis process

Stage	Activities
Familiarisation with the data	Two researchers (AD, SC) read and re-read paper transcripts to familiarise themselves with the data set, making notes about the data. They met to discuss their observations and agreed on and noted down potential initial codes.
Initial codes	The two researchers coded three transcripts in NVivo, looking for data relevant to the research question, and coding using initial codes to identify barriers and facilitators to taking low-dose aspirin. Additional unanticipated codes were noted, and codes were modified during this process. The researchers coded a further three transcripts and met on two further occasions to review the codes, how codes were assigned to the data and to agree on final codes. AD completed coding on the remaining transcripts using the codes.
Generating themes	Two researchers examined the codes to identify which sat together within themes. Themes were patterns of codes identified within the data, and data were organised under initial themes.
Review themes	AD organised all data under the initial themes. SC and AD reviewed the data associated with each theme and considered the theme and codes within it. Themes, subthemes and codes were reviewed and altered where needed. Names were assigned to the themes and subthemes through iterative discussion and review by the wider research team.
Define themes	A thematic map was developed illustrating the theme names, sub-hemes and the relationships between them.

Table 2 Participant characteristics

Demographics (n=15)	
Age	
Range	24–36 years
Median	31 years
Ethnicity	**N (%)**
White British	14 (93.3%)
White other	1 (6.7%)
Highest education	
General Certificate of Secondary Education (GCSE)	1 (6.7%)
A'-levels/National Vocational Qualifications (NVQ)	3 (20.0%)
Bachelor's degree or equivalent	7 (46.7%)
Postgraduate degree	4 (26.7%)
Parity	
Primiparous	7 (46.7%)
Multiparous	8 (53.3%)
Previously recommended and taken low-dose aspirin for pregnancy	
Yes	2 (13.3%)
No/NA (not previously recommended/ primiparous)	13 (86.7%)
Previous pre-eclampsia	
Own history	2 (13.3%)
Family history	2 (13.3%)
No history	11 (73.3%)
Low-dose aspirin adherence	
Adherent (6–7 doses/week)	5 (33.3%)
Suboptimally adherent (4–5 doses/week)	5 (33.3%)
Non-adherent (≤3 doses/week)	5 (33.3%)

members are academic obstetricians (SM, DB, CW), a consultant physician (FN) and an epidemiologist (AF). In their professional roles, the team supported medication use in pregnant women where it is evidence/guideline-informed, which could influence decisions about the topic guide and how themes were identified and described from the data. To mitigate this, the topic guide was based on a theoretical framework, and coding and identification of themes were undertaken by two researchers. The summarised data were also reviewed by all authors to ensure multiple viewpoints were considered.

RESULTS

21 women expressed interest and were eligible to take part, of which 15 participated. Two-thirds of the participants were either suboptimally or non-adherent. The characteristics of the sample are presented in table 2.

Four themes were identified (see figure 1 for the thematic map), with three representing motivational barriers and facilitators and one relating to implementation barriers and facilitators. Themes and their related subthemes are presented with quotations in boxes 1–4. Additional quotations supporting each theme are presented in online supplemental file 3.

Theme 1: am I really at risk?

This theme describes women's understanding of their indicators resulting in the recommendation to take LDA, perceptions of body mass index (BMI) as a risk factor and understanding and perceived likelihood of experiencing severe adverse perinatal outcomes from placental dysfunction.

Why has LDA been recommended?

Adherent and some suboptimally adherent women understood their clinical indications for being recommended LDA. Women with experience of pre-eclampsia, stillbirth or IUGR were aware of their current placental

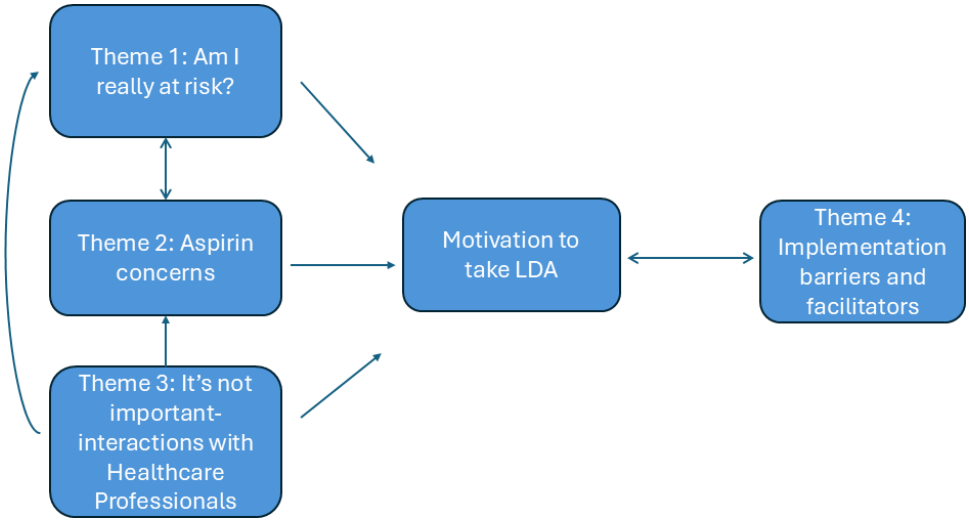

Figure 1 Thematic map. LDA, low-dose aspirin.

Box 1 Theme 1: am I really at risk?

Why has LDA been recommended?

…. and that's been recommended because of my previous pregnancy having a small gestational age baby and problems with the placenta at the end, no fluid around the baby, and a bit of high blood pressure towards the end of my pregnancy as well. (AD08)

I still don't understand now 100% what I was taking it for. I think because they were like, "Right you need to do this, this, and this, because you're this, this, this and this," I am sat there and like okay, and then I'm dropping the prescription off here, I'm having to do this, I think it all just got a bit I don't know what I am taking for what or why I am taking it, does that make sense? (NA06)

No, I feel like I'll change my mind once I know as to why I have been given them. If I can get a better explanation as to why and if they're going to help. (NA13)

Body mass index as a stigmatising and unreliable indicator of placental dysfunction risk

… it's almost like well it's all your fault you're fat ……. and it just makes you feel a bit guilty that it's all your fault. (NA06)

… I do a lot of running and I did London marathon a few years ago, I've just got a lot of muscle weight on me, on my legs in particular and I am just really tall so I'm five foot nine, and quite big boned, because my whole family are, so I have never considered myself extremely overweight, but it borderlined into that obese category, which always confused me slightly. (NA12)

Understanding LDA as prophylaxis

I suppose if my blood pressure was considered quite high then I probably would definitely have taken it to lower the risk to myself and baby. But as it's been consistently normal throughout the whole pregnancy I have not seen the point. (NA12)

I told her I think I want to talk to the doctor, because again my blood pressure was normal, so I still didn't … couldn't find a reason why I have to take that aspirin, nobody give me explanation why I was a high risk to have some eclampsia or something else. I did not have any problem, they test my urine, I have no proteins, have nothing, so why I have to the aspirin? (NA15)

I think it was just a case of I was forgetting to take it, but at my appointments they were like, "Everything is fine, the baby is growing fine, the baby is perfect size," and you're like well okay, I've not taken anything and you're telling me everything is okay anyway. So almost like a confirmation that it didn't really matter that you didn't take it because everything is okay, and maybe it's not as bad … if they'd have maybe said your baby is not growing as big as it should be or it's measured small maybe then I would have been like oh God maybe I should have taken all that, but everything was fine. (NA06)

Perceived seriousness of and susceptibility to placental dysfunction outcomes

May affect the birth and, I don't know actually, I don't know too much about pre-eclampsia. I know that from my point of view I think of headaches, dehydration, feeling like my blood pressure might be high, that sort of thing, but I don't know a huge amount about the effect on the baby. But I know that it would mean going into hospital and potentially delivering early, or there's associated risks with that, and potentially needing to have a C-section maybe, I don't know, all those increased risks. (AD05)

Liver, these parts like that, I don't know, I thought it was more everything. I should know, it's the organs that's going to bleed, I know that it's internal bleeding. (NA15)

Yeah, I just understand that it helps towards having a miscarriage, and I understand from the baby's side, but more my side I am just a bit well who is it really protecting, me or the baby or is it protecting both? (NA13)

… because although I am in a second pregnancy which means that you have got decreased risk of pre-eclampsia, I took aspirin a lot of the time to change that risk. (SOA07)

Yeah, I feel like it is, especially when it comes and the words miscarriage and stillborns and stillbirths come into it, because I feel like those two or three things are very big, because either way I involves you losing your child and it's not a feeling that I would … it's not something I would put on my enemy, I would never wish it on my enemy, so I wouldn't want to wish it on myself. (NA13)

I guess given my last experience and that I don't really have any risk factors of having a small baby, I don't smoke, I don't drink, I am healthy, I am a healthy weight, I don't think that … I don't know, I put it down to the placenta just not working for some reason, whether or not that's because my blood pressure went up and then hopefully the aspirin will prevent that. (AD08)

I think it would be … it has to be significant for them to recommend aspirin as a precaution. So I think it's more likely, but I don't think it's if you don't take it you will definitely get it, I don't think … it's not like that, but I definitely think you are more at risk because otherwise they wouldn't recommend it to be less at risk. So I don't know what those percentages would be, 10% or 20%, I am not sure, but I would see that if you didn't take it a percentage would potentially get it. (AD04)

I think they would be serious. I don't want to get pre-eclampsia, but I also am aware they can be treated if caught early, and I feel quite aware of what's going on with my body so I feel like I would keep an eye on if I was feeling unwell or had a headache I would contact either the midwife or whoever. (SOA10)

AD, adherent; NA, non-adherent; SOA, suboptimally adherent.

dysfunction risk in pregnancy and intended to take LDA to reduce it (see box 1). Participants identified additional indicators for placental dysfunction, including twin pregnancy, high blood pressure and chronic kidney disease (online supplemental file 3). A small number of participants with family history of placental dysfunction

Box 2 Theme 2: aspirin concerns

Why should I put poison in me? Why should I have paracetamol for a pain that I am not having yet, or for a fever that I … I don't know, I don't think I wish you should have medicine that … even risk of course, but it's not the risk for me, like I said am I going to have cranberry juice all my pregnancy, because I might have urine infection one1 day? (NA15)

… because I presume that it would increase your risk of more significant postpartum haemorrhage etc, and speaking to the obstetrician at the 28 week week scan they said yes you don't need to take it after 36 weeks, but actually talked about the fact that it's done its job and it wouldn't really be influencing pre-eclampsia at that stage as opposed to there being a particular risk with haemorrhage. (SOA09)

I think because it's aspirin as well it's something that's quite well-known, it's not a drug that people don't really know about, you can buy it on the shop shelves. (AD05)

AD, adherent; NA, non-adherent; SOA, suboptimally adherent.

understood this as an indicator for being recommended LDA (online supplemental file 3).

Some suboptimally or non-adherent women were unsure why LDA had been recommended, leading some to decide against taking it (box 1). Others felt that the explanation given about their indicators was insufficiently compelling to take LDA. One non-adherent participant said she would be more willing to take LDA if she was given more information about why it was needed (box 1).

BMI as a stigmatising and unreliable indicator of placental dysfunction risk

Some non-adherent women with raised BMI as a risk factor for placental dysfunction found it stigmatising, with one describing feeling blamed for having pre-eclampsia risk (box 1). Another felt that her BMI inaccurately represented her risk, describing that her fitness compared with women with a similar BMI meant she considered herself to have limited placental dysfunction risk (box 1).

Two non-adherent participants with raised BMI described ambiguous communication about BMI as a risk factor; one was told she "*didn't look like she was in the obese category*" (online supplemental file 3), and the other was recommended LDA but told that a woman with a BMI over 35 would be recommended LDA and that she did not fit this criterion because her BMI was lower (online supplemental file 3). This participant perceived that she was being offered healthy lifestyle advice, rather than being strongly advised to take it: "*I think it was more health promotion than telling me that I should take it*" (online supplemental file 3).

Understanding LDA as prophylaxis

Women used information about their and their baby's current health status from antenatal appointments to assess the need for LDA. Two non-adherent women understood that pre-eclampsia was related to blood pressure, with one also relating it to proteinuria. They

Box 3 Theme 3: it's not important—interactions with healthcare professionals

Trust in HCP advice

I just listened to the medical advice, the consultant is far more knowledgeable than I am, so the fact that they recommended me to take aspirin I just didn't even think about not taking it really, because they know more than me, so it was what I assumed. (AD04)

I don't know, to be honest I didn't feel that much confidence with midwife here, they didn't … at the time I told you I had been there twice, they are not aware of this history and everything, they didn't ask for some exam, they didn't check my sugar, they didn't check my levothyroxine level. I know this, everything, is meant for pregnancy. (NA15)

Minimal information and nothing to take home

I think it would have been better if there was an information leaflet available, I am not sure if there is, because it was just a verbal exchange and that's possibly another reason that I don't feel completely confident yet, it's just because it was just mentioned to me rather than advised. (NA16)

Soon after I found out I was having twins as well and the type of twins I'm having, so I think she just went into how aspirin should be recommended for that but didn't really talk much about it. (SOA03)

… I think that's quite important as to whether women will decide or not to take it if they have been recommended to, because you get a lot of information with certain decisions you have to make, but then there didn't seem like any information with this decision. So that would probably be quite useful I think. (AD08)

… I tried to get him to tell me a bit more specific knowledge that he may have, but he didn't pick up on the fact that I was using medical language and wanted something a bit more in-depth. (SOA09)

When I went to my first … when I knew I was pregnant again this time I emailed them and said I am looking to get pregnant again, is everything the same I need to do with my third pregnancy, and I got an email back about ten minutes later to say you need to up your aspirin to 150 milligrams when you find out you're pregnant. (AD11)

… and then you go and buy it and then you're on your own reading the leaflet telling you not to take it in pregnancy, I think that is probably quite a big worry for a woman, like for me the first time round. (AD08)

I think my dose is 75 milligrams, because I know I have to break the aspirin in half, so I think it's 75 I am on. (SOA10)

It wasn't until from what I'd read online I know that I needed to stop it at some point, before full term. But I was never told when, so I called up and said, "Am I supposed to stop taking this?" And they said yeah, but it was my initiative, it was never followed-up, no. (AD17)

Never followed up

… feel like I have made the right decision by not doing it. But I do find it strange how nobody has followed up on it, and nobody has seen that I have continued to request prescriptions for it or anything like that. (NA12)

I think she asked what I was taking, but that was … and I told her I was taking it, I might have said that I forget it sometimes, not something I was particularly dishonest about. (SOA10)

AD, adherent; HCP, healthcare professionals; NA, non-adherent; SOA, suboptimally adherent.

believed that LDA was unnecessary due to having healthy blood pressure and no proteinuria at the start of and during pregnancy. Similarly, some suboptimally and non-adherent women were reassured that their baby growing as expected meant it "*didn't really matter*" that they were not taking it (box 1).

Perceived seriousness of and susceptibility to adverse outcomes

Some adherent and non-adherent participants were unsure about maternal and fetal/infant impacts of placental dysfunction. One perceived that pre-eclampsia was more harmful for her than her baby (online supplemental file 3), and some did not understand whether the risks related to mother or baby.

Some participants, including non-adherent women, understood some placental dysfunction impacts, including maternal symptoms (headaches, high blood pressure), miscarriage, premature birth with impact on infant development, fetal distress, lack of oxygen and fetal and maternal death (box 1 and online supplemental file 3). Adherent and non-adherent participants considered these outcomes to be serious, which motivated some to take LDA.

Adherent participants felt that LDA would reduce the risk of developing placental dysfunction. However, many participants, including adherent women, did not perceive themselves to be particularly susceptible to adverse outcomes from not taking LDA (box 1 and online supplemental file 3). One who understood her risk was high enough for LDA to be recommended did not perceive the risk to be considerable, although she understood that a percentage of women with risk would get pre-eclampsia (box 1).

Not feeling susceptible to adverse outcomes was also linked by suboptimally adherent participants to beliefs about the effectiveness of medical care. Attending regular antenatal appointments where blood pressure was checked and symptom awareness were perceived to mitigate risk. Participants perceived that care to prevent severe outcomes would be effective if symptoms were detected early (box 1, online supplemental file 3).

Theme summary

Many participants were aware of their indications for LDA, but some who were non-adherent did not understand why it was recommended. Some with raised BMI felt stigmatised, believing that it does not accurately represent their health status, and perceive that they are not at risk. A minority misunderstood LDA's role as prophylaxis, which resulted in them feeling they were not at risk. Some were underinformed or unsure about the maternal and infant outcomes of placental dysfunction. While some perceive these outcomes to be very serious, they do not feel susceptible to them due to beliefs that symptoms will be monitored and effectively treated if necessary.

Theme 2: aspirin concerns

Within this theme, LDA-related concerns are described (see box 2 for quotations).

Non-adherent women described concerns about LDA; one non-adherent participant described not wanting to take *'poison'* to prevent what she perceived to be a rare outcome (box 2). Another non-adherent participant wanted further information to inform her deliberations, reporting concerns about bleeding due to previous bleeding during her pregnancy, and concerns about a family history of adverse reaction to aspirin (online supplemental file 3). Several participants described concerns

Box 4 Theme 4: implementation barriers and facilitators

Supportive routines

Yeah, so when I am ready to go to bed I just go into the kitchen, I do my aspirin first to give it chance to disperse and then I do my vitamin D and my blood pressure tablet, and then because I take a bottle of water up to bed with me every night I refill that, and then I have my aspirin. (AD05)

It's the evening bit that I really struggled with, especially because my son doesn't sleep very well, and one of us often has to sit with him while he's going to sleep, and really since I have been pregnant I have been falling asleep with him and then just going into bed afterwards, so it's been really hard to take at night. I guess the other thing is then also that general pregnancy exhaustion, I suffered from that quite a lot this pregnancy, more so than in my first pregnancy, and staying awake at night, I just sometimes fall asleep and then I don't take it. (SOA07)

Tailing off

I probably was when I decided to get it and take it I was more consistent to begin with, but then just not being very organised, and then I think really if I found some really clear evidence that I was like okay this is a definite thing that I completely understand why I need to take this, then I would feel a bit different about taking it. But I've never really felt like it's going to be hugely significant. (SOA09)

Difficulties swallowing

I am just thinking I will try later, and I will try later, and then the next thing I know it's lunchtime and then I don't need my paracetamol because I have got up and about so I've got rid of those, and then just staring at the other two and thinking if I do that I am going to be sick. (SOA14)

Obtaining low-dose aspirin

I said, "I'm supposed to be on aspirin, I thought I would have an aspirin prescription," and they said, "There's nothing here, there is an omeprazole." So I said, "Okay I'll get the omeprazole." They said, "But you can buy aspirin," and I said, "Okay, I'll buy the aspirin," and that was how that went. (AD17)

I had a problem with is when I first went to buy them it was during corona, when corona got quite bad, so they didn't have them in stock in my local Boots or Lloyds Pharmacy, so my husband who was working away so he managed to get some for me. So I think that would have been a problem if I had been on my own or anything, I wouldn't have been able to get them from our local pharmacy, and people weren't travelling. (AD04)

AD, adherent; SOA, suboptimally adherent.

about bruising and severe bleeding during birth, understanding LDA as an anticoagulant (box 2, online supplemental file 3). A small number of participants felt unsure about when to stop LDA to reduce these risks.

For some, initial concerns were resolved through seeking information online or because they perceived them to be minor, or a trade-off for the benefits of LDA. Other concerns about side effects described by both adherent and non-adherent participants included potential adverse impact for her or her baby, stomach ache and LDA safety for breastfeeding an older child (online supplemental file 3). Conversely, many adherent participants described having no concerns, with one saying that they expected any concerns would be mentioned to them (online supplemental file 3). Another felt reassured by aspirin being an established medication (box 2).

Theme summary

Many women had concerns about LDA, even if they were adherent, including potential common side effects and risk of bleeding during birth. For some, seeking information online reassured them, but for others concerns were enough to dissuade them from taking it.

Theme 3: it's not important—interactions with healthcare professionals

Interactions with HCPs impacted perceived importance of the recommendation. Subthemes relate to trust in professional advice, limited information given to women during clinical consultations and a lack of follow-up.

Trust in HCP advice

Many adherent participants trusted HCPs' expertise about LDA (box 3, online supplemental file 3). A clinically trained participant described trusting that unnecessary treatment would not be recommended, but wanted further information to support the recommendation (online supplemental file 3). In contrast, a non-adherent participant described reading conflicting information about LDA online and felt distrustful of the recommendation due to her wider pregnancy care, feeling that HCPs had not attended to the full clinical picture relating to her health (box 3).

Minimal information and nothing to take home

Participants described conversations with HCPs as brief and perceived that little attention was given to LDA, with one participant comparing the limited information given about LDA with information given about other pregnancy-related decisions (box 3). Two medically trained participants felt that information was not tailored to their knowledge level (box 3, online supplemental file 3). Those who had received more information had often discussed LDA due to a previous complicated pregnancy and accessing advice outside of community midwifery appointments (box 3).

Many participants described wanting an information leaflet to help them decide; however, no participants had received written information about LDA or signposting to internet resources, which undermined the recommendation (box 3, online supplemental file 3). Those with questions or concerns sought information online to understand why it was recommended (online supplemental file 3). Two participants described feeling concerned after reading in the drug information leaflet that LDA should not be taken during pregnancy (box 3).

Most participants understood to take 150 mg daily; however, some were unsure about this. One believed she had been recommended 75 mg, and one participant who was confused about the quantity had sought advice from the pharmacy (box 3). One believed she had been recommended to take it in the mornings (online supplemental file 3), and one non-adherent participant recalled being asked to take it "*once or twice a day I think*" (online supplemental file 3). Some reported not knowing when to commence and stop LDA. One described initially believing that she should take it up to 12 weeks' gestation only (online supplemental file 3).

Never followed up

Many participants reported that LDA was never discussed again at subsequent appointments and that no-one checked adherence. One suboptimally adherent participant described feeling that it was "*not imperative that you take it every day*" (online supplemental file 3). One participant noted that this was a missed opportunity to discuss non-adherence. Another described how she had been willing to disclose that she was not taking it as recommended, but the HCP did not pursue further discussion (box 3, online supplemental file 3).

Theme summary

Limited discussion and information offered initially and during follow-up appointments led some to believe that taking LDA was unimportant. HCP recommendation was viewed as trustworthy. Some women accessed online information or read the patient information leaflet in the LDA packaging, which for some increased concerns about taking it. Some were unclear about how much and when to take LDA, and when it should be started and stopped.

Theme 4: implementation barriers and facilitators

This theme explores implementation barriers and facilitators to LDA being taken in women who were motivated to take it. Subthemes relate to supportive routines, tailing off, difficulties swallowing and obtaining LDA (box 4).

Supportive routines

Participants who intended to take LDA reported having routines to help them (box 4, online supplemental file 3). Having LDA visible by their bed or in the kitchen prompted adherence, and several participants linked taking LDA to previous or current self-care behaviours, including taking contraception, pregnancy vitamins or other medications, with one participant taking it in the morning to support adherence (online supplemental file 3.

Suboptimally adherent participants who were busy with other children or working shifts described forgetting to take LDA (online supplemental file 3). The recommendation to take it at night impacted adherence for several participants, who described forgetting to take it due to pregnancy-related tiredness, falling asleep before their usual bedtime and despite having it beside the bed (box 4, online supplemental file 3).

Tailing off

Some suboptimally adherent participants reported that their adherence changed over time, with most tailing off in later pregnancy (box 4, online supplemental file 3). A medically trained participant described increased motivation to take it at the beginning of pregnancy compared with later due to knowledge of its impact on placental implantation (online supplemental file 3). One participant described feeling that poor understanding of why it was needed impacted her motivation to take it regularly (box 4).

Difficulties swallowing

Those prescribed LDA received soluble aspirin. Some participants who experienced pregnancy sickness found it difficult to tolerate the unpleasant taste (box 4), and one participant described it being time-consuming and inconvenient to dissolve it (online supplemental file 3). Decreased motivation to take it was reinforced by difficulties swallowing it for one non-adherent participant (online supplemental file 3). Some reported buying non-soluble LDA to avoid this, and two medically trained participants knew they could swallow soluble aspirin whole if desired (online supplemental file 3).

Obtaining LDA

Some participants were prescribed and some were asked to buy LDA; however, being asked to buy it was not a barrier to taking it, with those asked to buy it, or who had inferred that they needed to buy it, considering it inexpensive and easy to obtain (online supplemental file 3). One participant who expected it to be included on her usual prescription for a long-term condition reported that it was left off. Pharmacy staff asked her to buy it, and she was happy to do so (box 4). Those who were prescribed it typically reported a straightforward process of obtaining it, although one participant reported delays in the prescription, which meant it took a week to obtain the recommended LDA. One participant described being unable to obtain the correct amount and having to cut the tablet in half (online supplemental file 3).

Theme summary

Implementation challenges are experienced by many non-adherent and suboptimally adherent women who are motivated to take LDA. These included difficulties swallowing LDA, although some adjusted how they took it to accommodate this. Routines facilitated taking LDA regularly; however, many women experienced difficulty in establishing or maintaining them due to busy lives and because it was harder to remember to take medication at night than in the morning. Having to purchase LDA rather than being prescribed it does not appear to be an adherence barrier.

DISCUSSION

We aimed to identify barriers and facilitators to LDA adherence in pregnant women with placental dysfunction risk, who exhibited a range of adherence patterns. Motivational barriers to initiating LDA are summarised in figure 2 and included a limited understanding of their indications for it, feeling stigmatised by their BMI being an indicator, limited understanding of the serious

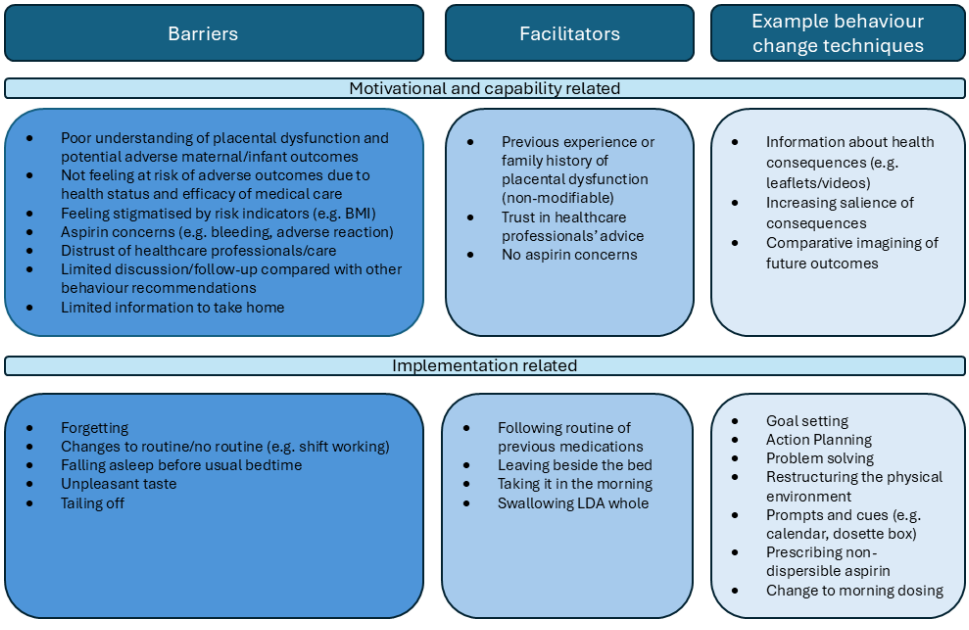

Figure 2 Barriers, facilitators and example behaviour change techniques. BMI, body mass index; LDA, low-dose aspirin.

maternal and infant impacts of placental dysfunction and not perceiving those to be likely, concerns about LDA and receiving limited information and follow-up from health professionals, which resulted in perceptions that taking LDA was not as important as other antenatal recommendations. Key motivational facilitators were direct or indirect experience of placental dysfunction-related adverse pregnancy outcomes, such as preterm birth, and trust in HCP advice. Implementation barriers experienced by those motivated to take LDA included difficulties with establishing supportive habits, tailing off and difficulties swallowing it. Despite variation in how they were given or asked to obtain the LDA, having to purchase it was not a barrier in this group of participants. Routines to help them remember to take it and knowledge about being able to swallow soluble aspirin whole supported taking it.

Strengths and limitations

We used a consensus-informed theoretical framework to explore adherence, ensuring a comprehensive approach, and built on previous research by identifying both barriers and facilitators to LDA adherence in a group of women with a range of risks for placental dysfunction. However, we undertook this research at a single NHS Trust; exploring these questions in other Trusts could highlight the differences in access to information, although it is corroborated by findings from other studies.[20 22] Most participants had been recommended LDA for the risk of pre-eclampsia; therefore, barriers and facilitators in women with other placental dysfunction risk (eg, low PAPP-A) may be under-represented. Additionally, this study has explored individual-level barriers and facilitators to taking LDA, and has not explored wider systemic barriers that could influence adherence.

These findings are further limited by no representation of women from black, Asian and other minority ethnicity groups and limited participation of women who had not attended university. It is essential that their experiences are sought since they are at an increased risk of developing placental dysfunction in pregnancy,[30] and previous studies suggest that minority ethnicity and socioeconomically disadvantaged women are less likely to take LDA compared with white women.[10] Exploration of the experiences of women from these groups is vital to ensure that interventions serve the whole maternity population. For example, these groups may experience structural barriers that result in non-adherence or there may be cultural differences in women's beliefs about LDA that require consideration when developing health service delivery or individual-level interventions to support adherence. There is a need to improve the methods used to achieve engagement of women from these groups, capture their experiences and ensure that care and experience inequities are not widened.

Our findings support those of a previous survey and qualitative study in women exhibiting both intentional and non-intentional (implementation-related) non-adherence; women feel underinformed about why they have been recommended LDA, do not identify with the risk factors that are applied to them and experience a perceived lack of professional support around taking it.[20 22] However, our data did not support their finding that not being given or prescribed LDA impacted adherence; participants were happy to buy it and sometimes elected to do so even where they had a prescription because prescribed soluble LDA was unpalatable. This may relate to the characteristics of our participants who were from higher socio-economic status groups. There is now increasing use of patient group directions (PGDs) that enable community midwives to provide LDA during antenatal appointments.[31] This may reduce this access barrier to LDA; however, providing soluble LDA through the PGD may be an implementation barrier and should be considered when implementing them.

Our data are consistent with the COM-B model,[32] in which an individual's capability (knowledge of why it is recommended, why it is important), motivation (feeling at risk and believing the consequences of non-adherence or placental dysfunction to be serious) and opportunity (having supportive routines and access to palatable medicine) to do so influence behaviour (taking LDA as recommended). A number of potentially effective BCTs can be mapped to these motivational-related and capability-related and implementation barriers, and are presented in figure 2.[33 34]

Women appear to be engaged in an in-depth evaluation of the risks and benefits of taking LDA. They describe a limited understanding of, and distrust in, the validity of the risk assessment undertaken, and limited understanding of the potential adverse outcomes for mother and baby of placental dysfunction. A lack of written information and signposting to online resources means they are not consistently given high-quality information to address these barriers. Notably, some only accessed information in the LDA packaging, which highlights that aspirin is contraindicated during pregnancy. It is therefore vital that high-quality, accessible information is provided to them.

Implications for policy, practice and future research

Consistent use of leaflets and signposting to quality-checked online resources can ensure women access evidence-based information targeting these barriers, although it should be noted that some previous research has highlighted that women may prefer interactive online information rather than paper leaflets.[21] Additionally, our findings highlight that trust in HCPs' advice and interactions with them are important for LDA adherence. A limited discussion at initiation and during follow-up appointments influenced perceptions that taking LDA is less important than other antenatal behavioural recommendations. Additionally, misunderstanding of LDA as prophylaxis, and maternal and fetal health status information received from growth scans, blood pressure and urine testing reinforced beliefs that non-adherence was not impacting their baby. Therefore, the multidisciplinary

team, including sonographers, midwives and obstetricians, has a vital role in assessing and promoting LDA adherence during all antenatal care episodes. We did not explore HCPs' experiences of recommending LDA. A detailed discussion is challenging when promoting multiple health behaviours during busy antenatal appointments.[35] A study exploring HCPs' beliefs about recommending medication for hypertensive disorders of pregnancy has identified the concerns about the appropriateness of recommending LDA and medicalisation of pregnancy, as well as the concerns about a potential negative impact on the HCP-patient relationship and patient autonomy in the context of shared/informed decision-making when discussing non-adherence at follow-up appointments.[36] Further exploration of multidisciplinary HCPs' perspectives about recommending LDA to pregnant women could inform the development of HCP training and support.

CONCLUSIONS

We have identified motivational and implementation barriers and facilitators to LDA adherence in women with placental dysfunction risk. Women report receiving insufficient information, have limited understanding of their indications, do not always identify with those applied to them, have limited knowledge of what placental dysfunction and the consequences of it are, and often do not believe themselves to be susceptible to them. Limited discussion and receiving little information inform their belief that it is not important, and trust in HCPs' recommendations impacts adherence. Where women are motivated to take it, many find it difficult to establish supportive habits. Behaviour change interventions can target these barriers. It is vital that the views of minority ethnicity and economically deprived women and HCPs' experiences of delivering LDA-related care are explored in future research to inform a comprehensive intervention.

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REFERENCES

1 Gagnon R. Placental insufficiency and its consequences. *Eur J Obstet Gynecol Reprod Biol* 2003;110 Suppl 1:S99–107.
2 Wardinger JE, Ambati S. Placental insufficiency. In: *StatPearls [Internet]*. Treasure Island (FL): StatPearls Publishing LLC, 2024.
3 Spencer K, Yu CKH, Cowans NJ, *et al*. Prediction of pregnancy complications by first-trimester maternal serum PAPP-A and free beta-hCG and with second-trimester uterine artery Doppler. *Prenat Diagn* 2005;25:949–53.
4 Rasmark Roepke E, Christiansen OB, Källén K, *et al*. Women with a History of Recurrent Pregnancy Loss Are a High-Risk Population for Adverse Obstetrical Outcome: A Retrospective Cohort Study. *J Clin Med* 2021;10:179.
5 Henderson JT, Vesco KK, Senger CA, *et al*. Aspirin Use to Prevent Preeclampsia and Related Morbidity and Mortality: Updated Evidence Report and Systematic Review for the US Preventive Services Task Force. *JAMA* 2021;326:1192–206.
6 Duley L, Meher S, Hunter KE, *et al*. Antiplatelet agents for preventing pre-eclampsia and its complications. *Cochrane Database Syst Rev* 2019;2019:CD004659.
7 Van Doorn R, Mukhtarova N, Flyke IP, *et al*. Dose of aspirin to prevent preterm preeclampsia in women with moderate or high-risk factors: A systematic review and meta-analysis. *PLoS One* 2021;16:e0247782.
8 National Institute for Health and Care Excellence. *Hypertension in pregnancy quality standard (QS35)*. NICE, 2019. Available: https://www.nice.org.uk/guidance/qs35
9 NHS England. Saving babies' lives care bundle version 2. 2019.
10 Wright D, Poon LC, Rolnik DL, *et al*. Aspirin for Evidence-Based Preeclampsia Prevention trial: influence of compliance on beneficial effect of aspirin in prevention of preterm preeclampsia. *Am J Obstet Gynecol* 2017;217:685.
11 Lupattelli A, Spigset O, Twigg MJ, *et al*. Medication use in pregnancy: a cross-sectional, multinational web-based study. *BMJ Open* 2014;4:e004365.
12 de Korte BAC, Smeets NJL, Colbers A, *et al*. Adherence to prescription medication during pregnancy: Do pregnant women use pharmacological treatment as prescribed? *Br J Clin Pharmacol* 2023;89:1521–31.
13 Shanmugalingam R, Mengesha Z, Notaras S, *et al*. Factors that influence adherence to aspirin therapy in the prevention of preeclampsia amongst high-risk pregnant women: A mixed method analysis. *PLoS One* 2020;15:e0229622.
14 Abheiden CNH, van Reuler AVR, Fuijkschot WW, *et al*. Aspirin adherence during high-risk pregnancies, a questionnaire study. *Pregnancy Hypertens* 2016;6:350–5.
15 Davies A, Mullin S, Chapman S, *et al*. Interventions to enhance medication adherence in pregnancy- a systematic review. *BMC Pregnancy Childbirth* 2023;23:135.
16 Nieuwlaat R, Wilczynski N, Navarro T, *et al*. Interventions for enhancing medication adherence. *Cochrane Database Syst Rev* 2014;2014:CD000011.
17 Wilhelmsen NC, Eriksson T. Medication adherence interventions and outcomes: an overview of systematic reviews. *Eur J Hosp Pharm* 2019;26:187–92.

18 Nordeng H, Ystrøm E, Einarson A. Perception of risk regarding the use of medications and other exposures during pregnancy. *Eur J Clin Pharmacol* 2010;66:207–14.
19 Lynch MM, Squiers LB, Kosa KM, *et al*. Making Decisions About Medication Use During Pregnancy: Implications for Communication Strategies. *Matern Child Health J* 2018;22:92–100.
20 Olson DN, Russell T, Ranzini AC. Assessment of adherence to aspirin for preeclampsia prophylaxis and reasons for nonadherence. *Am J Obstet Gynecol MFM* 2022;4:100663.
21 Vinogradov R, Smith VJ, Robson SC, *et al*. Informational needs related to aspirin prophylactic therapy amongst pregnant women at risk of preeclampsia - A qualitative study. *Pregnancy Hypertens* 2021;25:161–8.
22 Vinogradov R, Smith VJ, Robson SC, *et al*. Aspirin non-adherence in pregnant women at risk of preeclampsia (ANA): a qualitative study. *Health Psychol Behav Med* 2021;9:681–700.
23 Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *Int J Qual Health Care* 2007;19:349–57.
24 National Institute for Health and Care Excellence. Hypertension in pregnancy: diagnosis and management. 2019. Available: https://www.nice.org.uk/guidance/ng133/chapter/recommendations
25 Harris PA, Taylor R, Thielke R, *et al*. Research electronic data capture (REDCap)--a metadata-driven methodology and workflow process for providing translational research informatics support. *J Biomed Inform* 2009;42:377–81.
26 Malterud K, Siersma VD, Guassora AD. Sample Size in Qualitative Interview Studies: Guided by Information Power. *Qual Health Res* 2016;26:1753–60.
27 Vinogradov R, Kavanagh ON, Palmer J, *et al*. A randomized crossover design study comparing the pharmacokinetics and pharmacodynamics of 2 single doses of oral aspirin (75 mg v 150 mg) in pregnant women at risk of preeclampsia: implications on assessing aspirin response and patient adherence to therapy. *Am J Obstet Gynecol* 2024.:S0002-9378(24)01084-6.
28 Michie S, Johnston M, Abraham C, *et al*. Making psychological theory useful for implementing evidence based practice: a consensus approach. *Qual Saf Health Care* 2005;14:26–33.
29 Braun V, Clarke V. Using thematic analysis in psychology. *Qual Res Psychol* 2006;3:77–101.
30 Ghosh G, Grewal J, Männistö T, *et al*. Racial/ethnic differences in pregnancy-related hypertensive disease in nulliparous women. *Ethn Dis* 2014;24:283–9.
31 MBBRACE-UK. Saving lives, improving mothers' care: core report: lessons learned to inform maternity care from the UK and Ireland confidential enquiries into maternal deaths and morbidity 2018-20. 2022.
32 Michie S, van Stralen MM, West R. The behaviour change wheel: a new method for characterising and designing behaviour change interventions. *Implement Sci* 2011;6:42.
33 Michie S, Richardson M, Johnston M, *et al*. The behavior change technique taxonomy (v1) of 93 hierarchically clustered techniques: building an international consensus for the reporting of behavior change interventions. *Ann Behav Med* 2013;46:81–95.
34 Carey RN, Connell LE, Johnston M, *et al*. Behavior Change Techniques and Their Mechanisms of Action: A Synthesis of Links Described in Published Intervention Literature. *Ann Behav Med* 2019;53:693–707.
35 McLellan JM, O'Carroll RE, Cheyne H, *et al*. Investigating midwives' barriers and facilitators to multiple health promotion practice behaviours: a qualitative study using the theoretical domains framework. *Implement Sci* 2019;14:64.
36 Vestering A, Bekker MN, Grobbee DE, *et al*. Views and preferences of medical professionals and pregnant women about a novel primary prevention intervention for hypertensive disorders of pregnancy: a qualitative study. *Reprod Health* 2019;16:46.