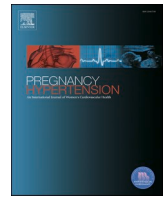


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Informational needs related to aspirin prophylactic therapy amongst pregnant women at risk of preeclampsia – A qualitative study

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ABSTRACT

Objective: Despite being key to reducing the occurrence of pre-eclampsia in high-risk women, adherence to aspirin prophylaxis is low, reflecting multifactorial challenges faced by pregnant women. It is therefore important to understand the barriers and facilitators of aspirin adherence in pregnancy. This sub-analysis of a qualitative study conducted to better understand barriers and facilitators of aspirin adherence was set to describe informational needs related to aspirin use in pregnancy.

Study design: A qualitative study was conducted with 14 postnatal women from North-East of England, who declared various levels of non-adherence to aspirin (0–5/7 prescribed). A thematic framework analysis of semi-structured interviews was used.

Outcome measures: Emerging themes associated with informational needs about aspirin use in pregnancy.

Results: Main themes identified a) Informational needs, b) Nature of the information seeking behaviour (active vs passive), c) Sources of information, d) Preferred format of information, e) Partners seeking knowledge. Not all women actively seek information; some choose not to pursue it as they find thinking of hypothetical risks disturbing. When information is accessed, women use a wide range of informational resources from scientific articles and National Health Services website to social media sources and word-of-mouth. Women admit that reading leaflets can be difficult, preferring to receive information in interactive ways. Although partners seek information about risks and risk reduction strategies, they are often not included in conversations with health care professionals.

Conclusion: New interactive and accessible informational resources are needed to engage pregnant women and their partners in aspirin prophylactic therapy.

1. Introduction

Pre-eclampsia is a hypertensive disease of pregnancy affecting 2–8% of all pregnancies [1] and one of the leading causes of maternal and fetal morbidity and mortality [2,3]. Although, a number of predictive models were developed to identify women at risk of pre-eclampsia [4], women are commonly screened using a combination of medical and obstetric history [5,6]. Women at high-risk of pre-eclampsia are offered a low-dose (75–150 mg) aspirin [5,6]. Aspirin has been shown to be effective in high-risk pregnancies when started before 16 weeks of pregnancy [7] and used with a high-level of adherence [8]. Low-dose aspirin is safe and is recommended by several clinical guidelines in UK [5,9–11] and

world-wide [6,12]. Some studies suggest that non-adherence to aspirin prophylaxis in pregnancy may be as high as 75% [13]. Therefore, it is important to understand barriers to medication adherence.

Non-adherence to long-term therapies is a complex and a widespread issue. It has been recognised by the WHO as a challenge and a burden to the health-care systems [14]. Adherence to medication in pregnancy is further complicated by the limited safety data on many medications [15] and common personal beliefs amongst pregnant women against use of medicines in pregnancy [16,17]. However, common beliefs about medication may overestimate risks of taking medication in pregnancy and are subject to social influence from partner, family and friends [18]. Moreover, considering prophylactic aspirin is recommended from

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approximately 12 weeks of gestation in the UK, women have a very limited time for a decision-making. Therefore, it is imperative that reliable information on the importance and impact of aspirin adherence in pregnancy is available to women in pre-conception period [19] or as early in pregnancy as possible to allow sufficient time to process and act on the information. Educational/informational components are frequently used in interventions aimed at supporting adherence to medication [20]. Although meeting informational needs alone may not be sufficient to improve adherence, knowledge forms a cornerstone of decision-making process. Hence, within wider barriers to adherence (submitted to the Health Psychology and Behavioural Medicine Journal) [21], women's informational needs deserve specific attention and need to be addressed separately.

The aim of this secondary analysis of a barriers and facilitators of adherence was understanding aspirin related informational needs amongst women with suboptimal levels of adherence.

2. Materials and methods

A qualitative study was conducted using semi-structured interviews based on the Theoretical Domains Framework V2 (TDF). This integrative framework was chosen to underpin the interview guide as it aggregates behavioural enhancement and change theories under a number of domains [22,23], allows for accumulation of evidence and alignment of emerging results to future intervention components. Several public engagement sessions were conducted with an independent group of women to initially support the design of the study and then to refine interview guide by improving relevance and clarity of the questions.

Pregnant women who have been identified at higher risk of pre-eclampsia [5], and disclosed adherence levels of ≤ 5 aspirin tablets (out of 7 prescribed) per week at the time of the 20-week scan were approached during the postnatal period. Participants were recruited from an on-going study (WAVE study trial registration number ISRCTN41944844). Women who experienced intrauterine death or stillbirth were not approached. The study had been reviewed and given a favourable opinion by NHS Research Ethics Committee (ref 19/NI/0139). All women gave informed written consent to participate in the study.

Women were offered an option to be interviewed in person, by phone or using Skype.

Questions were structured to address all 14 TDF domains (1. knowledge, 2. skills, 3. social/professional role and identity, 4. beliefs about capabilities, 5. optimism, 6. beliefs about consequences, 7. reinforcement, 8. intentions, 9. goals, 10. memory, attention and decision processes, 11. environmental context and resources, 12. social influence, 13. emotion, 14. behavioural regulation). All these questions were related to the disease (pre-eclampsia), medication (aspirin) concerning both mother and baby. Additional themes that emerged during the interviews were followed and further developed by the interviewer at subsequent discussions with the study participants.

Interviews were audio recorded, transcribed verbatim, underwent participant checks and were anonymised. Data was managed using NVIVO 12.

Interviews were conducted by a trained researcher (RV [BA, MClInRes]). RV is a female research sonographer and lead both 'WAVE' and the present study in a research capacity, hence rapport has been established with the participants and they were aware of RV's research role. The remainder of the research team had no contact with the participants and had only access to the anonymised transcripts for the purposes of data analysis and quality assurance.

Secondary thematic framework analysis was conducted using 5 analytical stages [24] and aimed to summarise information related to information seeking behaviours [24] related to any of the TDF domains. Inductive data coding has been conducted followed by a deductive approach aimed to summarise emerging themes into the framework. Consensus meetings were held regularly amongst the members of the

research team to review coding, the framework, to resolve disagreements and to agree on a data saturation.

3. Results

Out of 52 women participating in WAVE who met non-adherence criteria, 20 women agreed to participate (Fig. 1). Women with the lowest levels of reported adherence were purposefully selected to identify barriers to adherence. We also endeavoured to include participants from different social backgrounds, with diverse risk factors, parental experience, and age (Table 1). Interviews were conducted 4 to 18 months following the delivery (average 9.4 months). All participants were from the North East of England.

Data collection was stopped following the analysis of 14 interviews, as a shared decision was reached amongst the researchers regarding data saturation i.e. no further themes were emerging [25].

During the inductive phase of the analysis (open coding), five themes were identified related to information seeking behaviours: 1) Informational needs, 2) Nature of the information seeking behaviour, 3) Sources of information used, 4) Preferred format of information, and 5) Partners seeking information. The coding tree and additional quotes are shown in Table 2. Once refitted into the thematic framework (deductive approach), clear links to a number of domains emerged as illustrated in Table 3.

1) Informational needs

Women expressed clear informational needs throughout their narratives. Inadequate knowledge about pre-eclampsia, aspirin and consequences of the disease prevailed amongst study participants, with some women knowing little about pre-eclampsia or confusing it with other conditions.

"I never really got told much" ANA 10

"A lot of stuff you only get a bare minimum." ANA 13

"It is not where the placenta blocks the birth passage or something like that..." ANA 2

They did not understand preventative nature of aspirin use in pregnancy, some participants believed that aspirin is used to control their blood pressure, or to prevent a 'heart attack' and as a result didn't see a reason for taking medication because they had no symptoms of the disease. Moreover, women did not consider pre-eclampsia to be a serious disease. This led to a sense of optimism and reduced their sense of necessity in medication as there were no visible consequences of not taking the medication.

"I know it's painkiller, pain relief, it gets rid of headache, it thins your blood. And I know if you are going to have a heart attack then stick one under your tongue. But when they prescribe these things, they don't tell what they exactly for." ANA 2

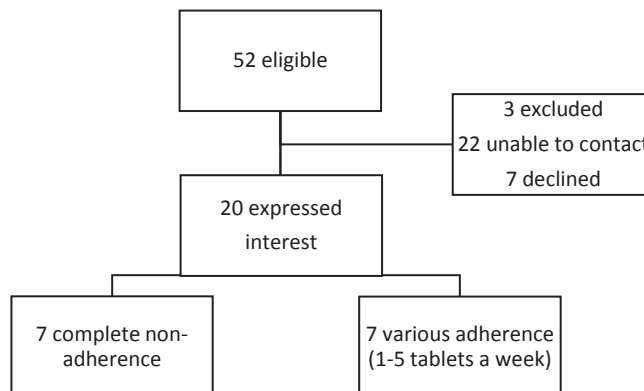


Fig. 1. Recruitment diagram.

Table 1
Participant characteristics.

Participant	Adherence level	Ethnicity	Age	Edu	Parity	Child's age	Risk factor
ANA 1	0/7	WB	31	10	3	14 m	BMI + Fh
ANA 2	0/7	WB	40	13	2	18 m	BMI, CHPT, PIH, SGA, Interval
ANA 5	0/7	Mixed	41	25	0	13 m	BMI, P0
ANA 7	0/7	WB	23	11	1	4 m	PE
ANA 10	0/7	WB	24	9	1	8 m	BMI, PE
ANA 11	0/7	WB	36	13	1	4 m	BMI, Interval
ANA 14	0/7	WB	33	18	1	7 m	PIH ?PE
ANA 4	1/7	WB	40	13	0	6 m	P0, Fh
ANA 6	3/7	WB	29	11	1	12 m	PE, Fh
ANA 8	4/7	WB	31	14	2	7 m	T2DM
ANA3	5/7	WB	33	18	1	11 m	PE, SGA
ANA 9	5/7	WB	36	22	1	15 m	PIH, Fh
ANA 12	5/7	WB	24	16	0	8 m	T2DM, P0
ANA 13	5/7	WB	24	15	0	4 m	BMI, P0
Values (min and max)			31.8 (24–41)	14.7 (9–25)	1 (0–3)	9.4 (4–18)	

Adherence expressed in number of pills taken over 7 days preceding 20 weeks visit

Ethnicity: WB- White British

Education expressed as number of years in full time education

Parity number of livebirths at the time of the index pregnancy

Child age expressed in month and reflect the time lag since the end of the index pregnancy

Risk factors: PE- pre-eclampsia in previous pregnancy, BMI – Body Mass Index > 35 kg²/cm, Fh – family history of PE, CHPT – Chronic hypertension, PIH – pregnancy induces hypertension, SGA – small for gestational age infant, Interval – Pregnancy interval > 10 years, P0 – no previous livebirths over 24 weeks gestation, PIH-pregnancy induces hypertension in previous pregnancy, T2DM -Type 2 Diabetes Mellitus.

“I wasn't worried. Look at me, I don't have any symptoms [...] I didn't have any symptoms of high blood pressure. I think it would have probably been more reassuring for somebody who has it...” ANA 5
“I kind of thought: If I'll get that – I'll get that. It wasn't a big deal.” ANA 12

One participant felt that her knowledge was assumed due to her professional status and as a result she didn't receive the same level of information as other high-risk women, thereby reducing her access to available resources.

“I found you don't get a lot of stuff explained to you because they automatically think you know. You don't get the same explanation as other people. You don't generally get information leaflets.” ANA 14

Large amounts of new information delivered within a short time period made it difficult for women to understand and process information in time to be able to ask questions. A vicious cycle has emerged from a context of high informational needs when women experienced informational overload, that in turn affected women's ability to process the information provided.

“You don't have time to process that information because there's just so much being told to you” ANA 5

2) Nature of the information seeking behaviour

Women exhibited different behavioural patterns with some avoiding further information while others were actively searching for it (coded as active or passive informational seeking behaviours).

Passive approaches to seeking additional information were driven by reduced reading skills, lack of identity with someone who searches, avoidance of negative emotions and desire to adhere to initial decision (intentions).

Some women lack essential skills to actively search for information or could not read the information provided.

“A lot of people aren't fantastic readers either. To some people it's just a lot of scribble on paper.” ANA 2

Another, reason for a passive information seeking behaviour is related to personal identity and habits. Some women had not searched for information even when it would have been welcomed, simply because this is not what they would normally do.

“I'm not one that researches” ANA 7

Many women were explicit about their passive approach to seeking additional information because of desire to enjoy the pregnancy rather than worry about possible negative outcomes. This behaviour also corresponded with a coping strategy employed by several women in this study such as denial and external locus of control i.e., women could not do anything to change the course of events. Moreover, there was an overwhelming need to normalise the high-risk pregnancy and distance themselves from unwelcome medicalisation of a pregnancy, which they perceived to be a happy and normal/natural event.

“No, I didn't read about pre-eclampsia or aspirin because I didn't want to be freaked out.” ANA 4

“I am just scared of answers to be honest.” ANA 8

Others, who disclosed that they had the ability, skills and resources to access the information, decided not to search for further information to avoid possible guilt related to the initial decision to not take aspirin.

“No, cos I wanted to stick to my decision and whether my reasons, whether the reason are good or not.” ANA 14 (adherence level 0/7, WB, 33 yo, P1)

Active searching behaviours amongst this cohort were facilitated by social support or were initiated at the time of salient events and critical incidents such as antenatal bleeding or hospitalisation not necessarily related to pre-eclampsia.

“We both went home and looked at what aspirin was for and what it did in pregnancy.” ANA 3

“This was actually a time [when I bled], I did read a forum cos I'd Googled aspirin during pregnancy.” ANA 11

3) Sources of information used

When women searched for information, multiple sources were used including some with a strong social influence (e.g., grand-parent advice), television series and social media forums, Google searches, NHS official website, books and scientific journals. Women recognised the credibility of NHS official advice. The choice of informational resources was dictated by personal skills, identity, environmental context, and social influence.

Table 2
Themes emerging from inductive analysis.

Theme	Sub-theme	Example
Informational needs	Related to PE	"I've heard of it. It is not where the placenta blocks the birth passage or something like that. ..." ANA 2 (adherence level 0/7, WB, P2)
	Related to prophylactic use of aspirin	"I didn't have any symptoms of high blood pressure I think it (taking aspirin) would have probably been more reassuring for somebody who has it because you can see a distinct difference between pre-aspirin, post-aspirin." ANA 5 (adherence level 0/5, Mixed Ethnicity, 41y, P0)
	Related to consequences	"I kind of thought: if I get that - I get that. It wasn't a big deal". ANA 12 (adherence level 5/7, WB, 24 yo, P0)
	Information provision abs additional needs Informational discrimination	"I don't know. I never really got told much" ANA 10 (adherence level 0/7, WB, prev PE) "A lot of stuff you only get a bare minimum. I was googling everything" ANA 13 (adherence level 5/7, WB, 24 yo, P0) "So, I found you don't get a lot of stuff explained to you because they automatically think you know. Even though I don't because I am not a specialist in that particular area and it's a long time since I studied that particular thing. You don't get the same explanation as other people. you don't generally get information leaflets, you don't you know..." ANA 14 (adherence level 0/7, WB, 33 yo, P1)
Nature of informational seeking behaviour	Active	"We searched online, we both went home and looked at what aspirin was for and what it did in pregnancy." ANA 3 (adherence level 5/7, WB, 33 yo, P1)
	Passive	"No, I didn't read about pre-eclampsia or aspirin, because I didn't want to be freak out. I wanted to have my own experience of pregnancy without other people having to say it." ANA 4 (adherence level 1/7, WB, 40 yo, P0)
	Lack of identity	"I'm not one that researches" ANA 7 (adherence level 0/7, WB, 23 yo, P1)
	Avoidance	"No, cos I wanted to stick to my decision and whether my reasons were justified, whether the reason are good or not and people might not agree with what I thought. I didn't want to go against it. I had made the decisions." ANA 14 (adherence level 0/7, WB, 33 yo, P1)
Partners informational needs		"He was asking more questions than I was. Think he just wanted to know what's going on and if everything is going to alright." ANA 10 (adherence level 0/7, WB, 24yo, P1) "Because even the babies dads are interested but they don't know who to ask." ANA 2 (adherence level 0/7, WB, P2)
Sources of information used	Google	"It was actually a time I did read a forum, cos I'd Googled aspirin during pregnancy and there was a lot of mixed people." ANA 11 (adherence level 0/7, WB 36 yo, P1)
	Word-of-mouth	"My mum has told us, she told me that she has to take aspirin because my mum was overweight on her pregnancy. She had 2 pregnancies after that, and she took aspirin with all three." ANA 12 (adherence level 5/7, WB, 24 yo, P0)
	NHS website	"I usually read stuff like that on the NHS website. That's where I usually get any health information I need." ANA 3 (adherence level 5/7, WB, 33 yo, P1)
	Book	"And having my book that had all the information to read at different points was really helpful. Google came in really helpful because I had google at my finger at all point. They say not good to goggle things, but I found out much more information googling stuff than I have asking a question." ANA 13 (adherence level 5/7, WB, 24 yo, P0)
	Mass media	"My mum and my nana were quite supportive, and they told me what to expect. I was watching "One born every minute". ANA 10 (adherence level 0/7, WB, 24 yo, P1)
	Scientific journals	"I went for medical journals and checked articles, but you see that's because I know about them ". ANA 5 (adherence level 0/5, Mixed Ethnicity, 41y, P0)
	Credibility	"More so the NHS website than anything else, I wasn't a massive fan of taking things from (x-forum) anyways cos its more opinions than experiences." ANA 13 (adherence level 5/7, WB, 24 yo, P0)
	Too much information	"You don't have time to process that information because there's just so much being told to you and they don't tell you that you know." ANA 5 (adherence level 0/5, Mixed Ethnicity, 41y, P0)
	Navigating contradictory advice	"Some people were like oh yeah it's gonna help your pregnancy you know if you're high risk then other people were saying well actually I don't really feel that good and I feel quite uncomfortable taking it when they say you shouldn't be taking stuff like during your pregnancy." ANA 11 (adherence level 0/7, WB 36 yo, P1) "I could take it both ways the internet does one field which is usually the case for anything medical you'll find loads of journals for you'll find loads of journals against both contradicting exactly what the other one is saying." ANA 5 (adherence level 0/5, Mixed Ethnicity, 41y, P0)
Desirable format of information	Face-to-face	"Always prefer face to face ideally as a concept. It's easier to get to know people face-to-face and really feel supported by each other." ANA 3 (adherence level 5/7, WB, 33 yo, P1)
	Classes	"Maybe classes more classes, room of 7 or 8 pregnant mothers to like to talk about that sort of thing and everyone questions and answers by professional who knows what they are talking about. Who we can throw these questions to, we can ask them what is this, what is this means, what is pre-eclampsia, how does it affect you?" ANA 2 (adherence level 0/7, WB, P2)
	Virtual groups using social media platforms	More of a Facebook group possibly...I think that's really helped because they don't know me, and I don't have to answer but at the same time if I need help, I can ask, and I know I am going to get replies. Just because I am not a fantastically sociable person and not very good at social situations." ANA 13 (adherence level 5/7, WB, 24 yo, P0)
	Alternative formats Aversion to printed material	"People like the internet, people watch YouTube, maybes a DVD or something" ANA 2 (adherence level 0/7, WB, P2) "There was lots and lots of waste of paper. Just what a waste of paper. I mean there is easier and better ways to give people information than piles and piles of reading. A lot people aren't fantastic readers either. There is still people who can't read very well. To some people it's just a lot of scribble on paper." ANA 2 (adherence level 0/7, WB, P2) "There is no point giving me something to read, yes I will read it, but you can guarantee I won't take it in as much as I should do." ANA 4 (adherence level 1/7, WB, 40 yo, P0) "As a scientific person I thought I'd read it line by line, but I read the first page or so and the minute it started talking about Downs Syndrome. I was like, no, this is just going to depress me I don't want to read it, do you see what I mean. So, I just, there's just too many leaflets, you know, there's just too much you get". ANA 5 (adherence level 0/5, Mixed Ethnicity, 41y, P0)
Sub-theme	Example	
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Table 2 (continued)

Sub-theme	Example
Partners informational needs	"So, I found you don't get a lot of stuff explained to you because they automatically think you know. Even though I don't because I am not a specialist in that particular area and it's a long time since I studied that particular thing. You don't get the same explanation as other people. you don't generally get information leaflets, you don't you know..." ANA 14 (adherence level 0/7, WB, 33 yo, P1) "He was asking more questions than I was. Think he just wanted to know what's going on and if everything is going to alright." ANA 10 (adherence level 0/7, WB, 24yo, P1)
Active	"Because even the babies dads are interested but they don't know who to ask." ANA 2 (adherence level 0/7, WB, P2) "We searched online, we both went home and looked at what aspirin was for and what it did in pregnancy." ANA 3 (adherence level 5/7, WB, 33 yo, P1)
Passive	"No, I didn't read about pre-eclampsia or aspirin, because I didn't want to be freak out. I wanted to have my own experience of pregnancy without other people having to say it." ANA 4 (adherence level 1/7, WB, 40 yo, P0)
Lack of identity	"I'm not one that researches" ANA 7 (adherence level 0/7, WB, 23 yo, P1)
Avoidance	"No, cos I wanted to stick to my decision and whether my reasons were justified, whether the reason are good or not and people might not agree with what I thought. I didn't want to go against it. I had made the decisions." ANA 14 (adherence level 0/7, WB, 33 yo, P1)
Google	"It was actually a time I did read a forum, cos I'd Googled aspirin during pregnancy and there was a lot of mixed people." ANA 11 (adherence level 0/7, WB 36 yo, P1)
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Navigating contradictory advice	"Some people were like oh yeah it's gonna help your pregnancy you know if you're high risk then other people were saying well actually I don't really feel that good and I feel quite uncomfortable taking it when they say you shouldn't be taking stuff like during your pregnancy." ANA 11 (adherence level 0/7, WB 36 yo, P1) "I could take it both ways the internet does one field which is usually the case for anything medical you'll find loads of journals for you'll find loads of journals against both contradicting exactly what the other one is saying." ANA 5 (adherence level 0/5, Mixed Ethnicity, 41y, P0)
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Classes	"Maybe classes more classes, room of 7 or 8 pregnant mothers to like to talk about that sort of thing and everyone questions and answers by professional who knows what they are talking about. Who we can throw these questions to, we can ask them what is this, what is this means, what is pre-eclampsia, how does it affect you?" ANA 2 (adherence level 0/7, WB, P2)
Virtual groups using social media platforms	More of a Facebook group possibly...I think that's really helped because they don't know me, and I don't have to answer but at the same time if I need help, I can ask, and I know I am going to get replies. Just because I am not a fantastically sociable person and not very good at social situations." ANA 13 (adherence level 5/7, WB, 24 yo, P0)
Alternative formats	"People like the internet, people watch YouTube, maybe a DVD or something" ANA 2 (adherence level 0/7, WB, P2)
Aversion to printed material	"There was lots and lots of waste of paper. Just what a waste of paper. I mean there is easier and better ways to give people information than piles and piles of reading. A lot people aren't fantastic readers either. There is still people who can't read very well. To some people it's just a lot of scribble on paper." ANA 2 (adherence level 0/7, WB, P2) "There is no point giving me something to read, yes I will read it, but you can guarantee I won't take it in as much as I should do." ANA 4 (adherence level 1/7, WB, 40 yo, P0) "As a scientific person I thought I'd read it line by line, but I read the first page or so and the minute it started talking about Downs Syndrome. I was like, no, this is just going to depress me I don't want to read it, do you see what I mean. So, I just, there's just too many leaflets, you know, there's just too much you get". ANA 5 (adherence level 0/5, Mixed Ethnicity, 41y, P0)

"I found out much more information googling stuff than I have asking a question." ANA 13

"I went for medical journals and checked articles, but you see that's because I know about them ". ANA 5

"I usually read stuff like that on the NHS website. That's where I usually get any health information I need." ANA 3

"My mum has told us..." ANA 12

Women had difficulties in navigating the information, as there were numerous sources that provided contradictory advice:

"Some people were like: oh yeah it's gonna help your pregnancy, if you're high risk; then other people were saying: I feel quite uncomfortable taking it when they say you shouldn't be taking stuff like this during your pregnancy." ANA 11

4) Preferred format of information

Women felt that information should be delivered in an easy to understand and accessible way. When women were asked to describe how would they prefer information to be delivered, some valued face-to-face

discussions and others suggested on-line groups with professionals that could enhance knowledge and provide support.

While some women mentioned that a leaflet with aspirin-related information would be helpful, others felt they had too many leaflets and too much written information, suggesting that even women with skills and capabilities may not read available literature.

"It doesn't strike me in my memory that I had much written information about it (aspirin) which I think for me that would be helpful." ANA 3 (adherence level 5/7, WB, 33 yo, P1)

"There was lots and lots of waste of paper. I mean there is easier and better ways to give people information than piles and piles of reading." ANA 2

"There is no point giving me something to read, yes I will read it, but you can guarantee I won't take it in as much as I should do." ANA 4

Informative videos and web-links were mentioned as an alternative to written information.

5) Partners seeking information

Table 3
Relation of the emerged themes to the TDF domains.

	Informational needs	Info seeking behaviours	Partners	Sources	Preferred format
Knowledge	"I don't know. I never really got told much" ANA 10		"He was asking more questions than I was." ANA 10	"A lot of stuff you only get a bare minimum. I was googling everything" ANA 13	
Skills		"A lot of people aren't fantastic readers either. To some people it's just a lot of scribble on paper." ANA 2		"I found out much more information googling stuff than I have asking a question." ANA 13	
Identity		"I'm not one that researches" ANA 7		"I went for medical journals and checked articles, but you see that's because I know about them". ANA 5	More of a Facebook group possibly [...] Just because I am not a fantastically sociable person and not very good at social situations." ANA 13
Believes about capabilities					"There is no point giving me something to read, yes I will read it, but you can guarantee I won't take it in as much as I should do." ANA 4
Optimism	"I kind of thought: if I get that - I get that. It wasn't a big deal". ANA 12				
Believes about consequences	"I didn't have any symptoms of high blood pressure I think it (taking aspirin) would have probably been more reassuring for somebody who has it because you can see a distinct difference between pre-aspirin, post-aspirin." ANA 5			"It was actually a time I did read a forum, cos I'd Googled aspirin during pregnancy and there was a lot of mixed people [opinions]." ANA 11	
Intentions		"I wanted to stick to my decision whether the reason are good or not and people might not agree with what I thought." ANA 14			
Memory, attention and decision making	"You don't have time to process that information because there's just so much being told to you and they don't tell you that you know." ANA 5			"Some people were like: oh yeah it's gonna help your pregnancy if you're high risk; then other people were saying you shouldn't be taking stuff [aspirin] during your pregnancy." ANA 11	
Environmental context and recourses	"So, I found you don't get a lot of stuff explained to you because they automatically think you know [...] You don't get the same explanation as other people. you don't generally get information leaflets.." ANA 14	"I didn't discuss it with my midwife. But when I read, like obviously this was actually a time [when I bled], I did read a forum cos I'd Googled aspirin during pregnancy." ANA 11	"Because even the babies dads are interested but they don't know who to ask." ANA 2		"There was lots and lots of waste of paper. I mean there is easier and better ways to give people information than piles and piles of reading. ANA 2
Social influence		"We both [me and my partner] went home and looked at what aspirin was for and what it did in pregnancy." ANA 3		"My mum has told us, she told me that she has to take aspirin because my mum was overweight on her pregnancy. She had 2 pregnancies after that, and she took aspirin with all three." ANA 12	"Always prefer face to face ideally as a concept. It's easier to get to know people face-to-face and really feel supported by each other." ANA 3
Emotions		"No, I didn't read about pre-eclampsia or aspirin because I didn't want to be freaked out." ANA 4			

Women perceived partners to be in need of more information and felt that they were excluded from important conversations, as partners were not always invited to attend appointments with community midwives. When asked by partners, women struggled to convey medical information to their companions, and partners left with reduced opportunity to access the health professional expertise. Inadequate information provision to partners reduces opportunities for social support related to medication adherence leaving women on their own in a complicated decision-making process or creating a negative social reinforcement

"He was asking more questions than I was." ANA 10

"Because even the babies dads are interested but they don't know who to ask." ANA 2

"It's not something that I would think that you would tell a pregnant woman to take." ANA 8

4. Discussion

4.1. Informational needs

Appropriate knowledge is an important pillar supporting adherence to medication [26,27], which was shown to be weak amongst women who exhibit suboptimal adherence to aspirin in their pregnancies.

Low levels of knowledge amongst women about use of aspirin as prophylaxis of PE is not unique to the UK. A recent publication of "Patients' perspective on aspirin during pregnancy" shows that approximately 50% of women, at risk of developing hypertensive disease in pregnancy, had no awareness of prophylactic properties of aspirin [28].

4.2. Nature of information seeking behaviours

Despite increased informational needs in pregnancy, some women employed a passive approach to search for medicine related information in an attempt to avoid negative feelings. Avoidance behaviour in pregnancy has been shown to be associated with high state anxiety and pregnancy-specific distress and seems more common in the early stages of pregnancy [29]. It is important to note that the first trimester is a critical time for making an informed decision about aspirin treatment, as aspirin prophylaxis is most effective when started before 16 weeks of pregnancy. Therefore, provision of information and discussions about risk and risk reduction strategies should happen as early as feasible. This approach could reduce pregnancy related anxieties and reverse maladaptive (ineffective) coping strategy to an adaptive (effective) approach aimed at preparation and planning.

Special consideration must be given to additional demands on women's attention, memory and emotional resources during pregnancy [30]; women are often given a lot of information and have to make some difficult decisions within a very short time frame. This inevitably leads to information overload and impacts on the ability of women to retain the information and subsequently make an informed decision. Therefore, information should be simple and concise to avoid cognitive overload.

4.3. Sources of information

Amongst women who have searched for additional information, multiple sources of information were used. Interestingly health professionals (obstetricians, general practitioners, midwives, and pharmacists) were not mentioned in the context of obtaining additional information. This corresponds with reported finding from a study of beliefs about medicines and informational needs among pregnant women visiting a tertiary hospital in Belgium, where less than a third of women discussed information retrieved from the internet with their health care practitioners [31]. This was also reported by a study of the use of internet by women seeking pregnancy related information with only 30% of women bringing up information found on internet in discussion with their health care professionals [32]. Another survey indicates that physicians are the most common source of information regarding medicine use in pregnancy with the internet being the second most frequent source with 60% responders turning to web-searches [33]. This clearly demonstrates a need for active provision of opportunities to discuss concerns related to aspirin use in pregnancy with an expert health care professional and is especially important in the presence of conflicting information regarding safety of medicines use in pregnancy [34]. Health care professionals should be aware that women are very likely to encounter a large amount of information that would contradict their clinical advice [17] and be prepared to discuss women's concerns.

4.4. Preferred format of information

We were able to demonstrate that women would appreciate visual information with reduced reading burden. Visual information is known to be easier to process and remember. Several intervention studies have used active visualisation techniques, the techniques facilitate visualisation of an illness or treatment process in a dynamic way and may be effective in cases of asymptomatic diseases [35] and therefore could be of a good fit to support the use of preventative medication. Studies of active visualisation techniques have shown improvement in understanding of the disease and adherence to medication, reduction in disease related anxiety and recovery time [36,37]. The development of technology available to provide information to women in a visual and interactive way could be a possible solution to overcome information burden in pregnancy, and to improve understanding of the disease and its prophylaxis and help women to adhere to treatment more effectively.

4.5. Partners seeking information

Our study provide indirect evidence (via women's perspective) of an intense need for information amongst partners. Practical social support and cohesion within the family are strongly associated with adherence [38], therefore inclusion of partners in conversations related to prophylactic therapy is crucial.

To conclude, a clear narrative that is rooted on knowledge is needed to reduce perceived concerns regarding medicine use in pregnancy. Understanding the nuances around the use of Aspirin during pregnancy, i.e., that most pregnant women should not take it but those at risk of pre-eclampsia should, will reduce confusion induced by conflicting information available from various sources and will increase women's levels of trust in the advice they are given to take the medication. This will improve the relationship between the pregnant women and HCPs and as a result it might support increased levels of adherence. Although we are not claiming that knowledge provision will suffice to alter behaviour, we are stating that knowledge will be fundamental in leading to a better understanding of the necessity to take the aspirin, whilst also reducing concerns on taking it. Therefore we would like to emphasise that purely educational interventions aimed to improve adherence to medication have shown little if any effect on adherence (39). Provision of accessible information about aspirin prophylactic treatment in pregnancy to women and their partners should match their informational needs, improve understanding of the disease, treatment, and potential consequences of a failed prophylaxis. Provision of information should, however, be supplemented by the inclusion of behavioural change techniques (i.e., goal setting [behaviour], prompts/clues) as they link to the wider picture of the identified mechanism responsible for adherence in this group.

4.6. Limitations

In this study only women who have been explicit about their non-adherence to aspirin treatment during pregnancy were interviewed. It is possible that we are lacking other aspects relating to information provision in pregnancy that are helpful in supporting adherence. However, with the limitation of the scope of this study we have gathered very valuable information from a cohort of women who would benefit from future support the most.

Interviews were conducted in a postnatal period, therefore we cannot exclude a degree of recall bias. Moreover, participants were from predominantly White British background and all had a good command of the English language. We would like to acknowledge that informational needs amongst women with reduced ability to understand, communicate and read in English will be completely different to those we have interviewed in this study.

One interview was conducted via phone as requested by the study participant. Although interviews via telephone lack visual and behavioural queues that make understanding easier, a meaningful and full-length interview was conducted.

5. Conclusion

This study has shown that women as well as their partners experience unmet informational needs about aspirin prophylactic therapy during pregnancy. Health care professionals need to be aware that some women may not employ active strategies to support information seeking behaviour irrespective of their assumed ability and knowledge, therefore universal information provision is required. Women who employ active search strategies may struggle to navigate the available knowledge as different sources may contain conflicting information and advice. Although women access different informational resources, the preferred way to assess information and support is through communication with others either face-to-face or on-line. An alternative to written information is the use of active visualisation strategies that could be

employed to support adherence with aspirin prophylactic treatment in high-risk pregnancies. Data gathered during this study will support an intervention development process to target adherence to aspirin during pregnancy, for women at increased risk of preeclampsia.

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