Vaccine 39 (2021) 5673–5679

Contents lists available at ScienceDirect

Vaccine

journal homepage: www.elsevier.com/locate/vaccine

‘My primary purpose is to protect the unborn child’: Understanding pregnant women’s perceptions of maternal vaccination and vaccine trials in Europe

E. Karafillakis [a,*], P. Paterson [a], H.J. Larson [a,b,c]

[a] Department of Infectious Diseases Epidemiology, London School of Hygiene & Topical Medicine, London, United Kingdom
[b] Department of Health Metrics Sciences, University of Washington, Seattle, WA, USA
[c] Centre for the Evaluation of Vaccination, Vaccine and Infectious Disease Institute, University of Antwerp, Antwerp, Belgium

ARTICLE INFO

Article history:
Received 24 March 2021
Received in revised form 29 July 2021
Accepted 31 July 2021
Available online 18 August 2021

Keywords:
Maternal vaccination
Vaccine trial
Vaccine confidence
Trust
Decision-making
Risk perception

ABSTRACT

Despite the important benefits of maternal vaccination for pregnant women and newborns, vaccination uptake is low in many European countries. Differences in vaccination policies and recommendations, as well as concerns about vaccine safety can partly explain inadequate coverage rates and women’s hesitancy to get vaccinated during pregnancy. This study aims to explore pregnant women’s experiences, decision-making processes and perceptions towards maternal vaccination and maternal vaccine trials in France, Germany, Italy, Spain and the United Kingdom. Qualitative interviews and focus groups were conducted with 258 pregnant women identified through local research panels and snowballing. Topic guides translated in local languages were designed to explore women’s awareness and perceptions of maternal vaccination, and willingness to participate in vaccine trials during pregnancy. A thematic analysis was conducted. Pregnant women were found to have low awareness about maternal vaccination, with many reporting not having received a recommendation to vaccinate from their doctors. Strong trust in health professionals indicate that strengthened recommendations could improve vaccination uptake. Vaccination decision-making in pregnancy was described in the context of a highly emotional period, generating anxiety and fears around the safety of vaccines. Pregnancy was also discussed as a period during which women develop nurturing and protective identities. However, depending on the information they received as well as influences from experts, families and peers, women either perceived vaccination as a threat to their babies’ safety or as a means to protect them. Attitudes towards maternal vaccine trials were less ambiguous, with most pregnant women strongly rejecting the notion of taking part in trials. While strategies to improve pregnant women’s awareness and perceptions of maternal vaccination are needed, it is equally important to understand why healthcare professionals may not be recommending vaccination. More coordinated strategies across Europe could help strengthen communication and trust in maternal vaccination.

1. Introduction

Maternal vaccination has the potential of reducing maternal and newborn mortality and morbidity around the world by protecting pregnant women as well as providing passive immunity to newborns [1–3]. The World Health Organization (WHO) recommends vaccinating pregnant women against a number of diseases, including seasonal influenza, as well as pertussis and tetanus in certain high-risk areas [4–6]. However, recommendations and policies vary widely from one country to another, partly affected by differences in disease burden [7]. Most countries in Europe recommend inactivated seasonal influenza vaccination to pregnant women [8]. However, while pertussis or Tdap (tetanus, diphtheria, pertussis) vaccination is recommended during pregnancy in some countries such as the United Kingdom (UK), Spain, Germany or Italy, it is only recommended before or after birth as part of a cocooning strategy in other countries such as France [9–13]. Other vaccines such as those against tetanus or Hepatitis B are generally only recommended for pregnant women in high-risk groups, including in these five European countries [9–12,14].

Despite the benefits of maternal vaccination for both mothers and babies, uptake remains inadequate in many European countries. Data on vaccine coverage is also sparse: a 2018 report found

* Corresponding author.
E-mail address: emilie.karafillakis@lshtm.ac.uk (E. Karafillakis).

https://doi.org/10.1016/j.vaccine.2021.07.099
0264-410X/

that only nine European Union member states monitored seasonal influenza vaccine uptake among pregnant women [8]. Vaccine coverage was found to range from 0.5% to 58.6% for the 2016–2017 season [8]. National data shows that influenza vaccination coverage among pregnant women was 43.7% in England [15] and 40.6% in Spain [16]. In both countries, vaccine coverage for pertussis was higher, reaching 72.1% of pregnant women in England [17] and 80.1% in Spain (Tdap) [18]. Maternal vaccination coverage was lower in other countries, with studies reporting 10.9% of pregnant women vaccinated against influenza in Germany [19], 6.5% in Italy [20] and 7.4% in France [21] and 4.8% of pregnant women vaccinated against pertussis in Italy [20].

While the reasons behind low maternal vaccination uptake rates in Europe are often country-specific, literature reviews have found that the most important factors influencing uptake were healthcare professional recommendations and vaccine safety perceptions [22,23]. One study found that women who had received a recommendation from a doctor were 10–12 times more likely to receive a pertussis or influenza vaccine during pregnancy [22]. Low uptake among healthcare professionals themselves and lack of recommendations from specific categories of healthcare professionals such as midwives is also a highly influential factor [24,25]. Furthermore, women who believed vaccines were unsafe for themselves or their unborn children were five times less likely to receive a maternal vaccine [22]. Other factors that influence maternal vaccine uptake in Europe include but are not limited to low awareness and lack of information [19,26–32], concerns that vaccines do not work or are not useful [27,32–35], low perceived severity of vaccine-preventable diseases [27,35], and the belief that the risks of vaccination outweigh their benefits [19,28].

Despite the severe risks of certain infectious diseases for pregnant women and their babies, pregnant women have historically been excluded from vaccine trials [36,37]. Recent disease outbreaks such as H1N1 influenza or Zika have contributed to calls from experts to include pregnant women in vaccine trials and to design more vaccines with pregnant women in mind [36]. Pregnant women's decision-making processes and perceptions of vaccine trials remain limited, with some studies reporting the influence of factors such as perceptions around available evidence, risks and trust [37,38].

This study aims to explore pregnant women's experiences, decision-making processes and perceptions towards maternal vaccination and maternal vaccine trials in Europe.

2. Methods

The study described in this paper is part of a larger mixed-method research project investigating global attitudes towards maternal vaccination among pregnant women. This paper presents findings from qualitative research conducted in five European countries: France, Germany, Italy, Spain and the UK.

2.1. Data collection

We collaborated with WIN/Gallup International Association (WIN/GIA) to conduct semi-structured interviews and focus group discussions with pregnant women over the age of 18 years. Participants were recruited from research panels accessible from WIN/GIA's local partners. An additional snowballing method was used to identify participants in Germany, Spain and the UK. In the UK, some participants were also recruited through advertising posters displayed in places such as antenatal clinics. In order to include different urban environments, participants were recruited from two cities in France (Paris and Toulouse), Italy (Rome and Milan), Spain (Madrid and Barcelona) and the UK (London and Birmingham). While focus groups in Germany were conducted in Munich and Berlin, in-depth interviews participants were recruited from across the country due to logistical challenges.

Pregnant women in their first, second or third trimester with either positive or negative attitudes towards maternal vaccination were purposively selected from each country. Between February and May 2019, 20 semi-structured interviews and four focus groups were conducted in each country by local experienced professionals, briefed on the study objectives and under the supervision of the researchers. Two focus groups with women pregnant for the first time and two with women pregnant for the second time or more were conducted in each country, with 7 to 9 women per focus group. Participants were compensated for travel and participation in the research.

Topic guides were designed to obtain participants' awareness, experiences, perceptions, attitudes and decision-making factors influencing vaccination and participation in vaccine trials in pregnancy, while encouraging them to share their views freely. Before interviews or focus groups, participants were informed that their participation in the study was voluntary and that they could refuse to answer any questions. Verbal or written informed consent was obtained from all participants. All study materials were developed in English and translated by local translators.

2.2. Data analysis

With participants' consent, interviews and focus groups were audio-recorded. Anonymised transcripts were translated into English and imported into NVivo® for analysis. One researcher coded and analysed the transcripts by deductively drawing codes from the topic guides, research objectives and analytical memos. An initial coding framework was developed by coding two transcripts per country, using an inductive process to derive additional codes. The final coding framework was then agreed for all countries of the study (including countries not included in this paper) and the remaining transcripts were coded by the researcher. Themes were derived from the data by conducting a thematic analysis of different aspects of maternal vaccination.

2.3. Data management and ethical approval

Data was collected by WIN/GIA according to strict industry standards, such as those from the World Association for Public Opinion Research (WAPOR). Ethical approval for secondary data analysis was received by the London School of Hygiene & Tropical Medicine (LSHTM) Ethics Committee in May 2019 (LSHTM ethics ref: 17100).

All transcripts and analytical memos were anonymised to ensure confidentiality, removing personal identifiers and using numerical and country codes to refer to participants (i.e. FR1…24 for France, DE1…24 for Germany, IT1…24 for Italy, ES1…24 for Spain, and UK1…24 for the UK). In-depth interviews were given the codes 1 to 20 and focus groups 21 to 24. All files are stored on an LSHTM secure server and password-protected computers. Data are stored according to LSHTM's Records Retention and Disposal Schedule guidance.

3. Results

The qualitative research included 258 pregnant women aged between 18 and 46 years, 100 of which took part in interviews and 158 in focus groups. The thematic analysis identified eight key themes: 1) pregnant women's awareness about maternal vaccination and healthcare professionals' recommendations; 2) changes in decision-making around vaccination associated with

pregnancy; 3) information received about maternal vaccination, 4) trust in healthcare professionals and health authorities; 5) influences on decision-making; 6) the importance of protection against diseases; 7) fear and anxiety around vaccine safety; and 8) emotions and perceptions around vaccine trials.

3.1. Awareness about maternal vaccination and healthcare professionals' recommendations

Awareness about maternal vaccination was particularly low among pregnant women in France, Germany and Italy. Women's knowledge about maternal vaccines depended on the official recommendations in their country, with women in France mostly discussing influenza vaccination and women in Germany, Italy, Spain and the UK referring to both influenza and pertussis vaccination.

Some women blamed their low awareness on a lack of information from healthcare professionals, with only a small number of women reporting having received a recommendation in Italy: *"I have never read anything about it anywhere, and it was never offered to me, not even during my previous pregnancies*" (IT9). Furthermore, even women who received a recommendation to vaccinate still felt uninformed, blaming doctors for not spending enough time to explain and discuss maternal vaccination: "*The consultation lasts 5 min, I asked him the question if he thought it was ok to get vaccinated now, he said 'yes, yes it would be very good, have a good day, bye'*" (FR10). Women in the UK and Germany also expressed feeling pressured to vaccinate, with what was described by one woman as a bullish approach: "*Their approach can be a bit like bullish (. . .) how they chase you down for vaccinations is like another level. . . Especially if you say you're not getting it then you'll have hundreds of phone calls*" (UK23). A few women also reported receiving conflicting advice or recommendations not to vaccinate from their doctor, particularly in France: "*Once I had the confirmation of the gynaecologist, she told me 'don't do it, it's not worth it', well then I decided not to do it*" (FR8).

Women who received recommendations for maternal vaccination felt more confident in vaccination, with many then deciding to get vaccinated: "*I have a relation of trust with my doctor. So, if she said you have to do, I do it.*" (FR22). Receiving positive advice from multiple doctors reinforced this confidence. Satisfaction with information received from doctors was particularly high in the UK, with women valuing doctors who spend more time discussing and listening to their concerns: "*She said 'I understand, you know, your reservations because it's not you anymore, it involves a little baby, like you're making a decision on behalf of someone else' (. . .) the way she handled it was very reassuring for me*" (UK6).

3.2. Decision-making around vaccination: The effect of pregnancy

Pregnancy was discussed as a period of change, with the development of women's nurturing and protective identities. Women in the UK and Spain described a strong will to protect their babies and described the importance of vaccination in this context. However, the thought of receiving a vaccine during pregnancy also raised discomfort and unease for pregnant women: "*I get the impression that I'm scared more now because I'm pregnant*" (FR21). Anxiety and doubt was associated with the injection of a foreign substance into their bodies while carrying their unborn child: "*When you know you've got another human being that's inside you, you're just double-thinking, you're double-guessing: "Is it right? Is it wrong?*" (UK4). Some women explained these differences as a change in perceptions about their own bodies, taking on a new responsibility for their babies, while at the same trying to offer a safe pregnancy: "*You're not only responsible for yourself, you're also responsible for the life, which is growing in you*" (UK7). These doubts led many women to refuse maternal vaccines, sometimes using highly emotive language in their responses.

3.3. Information about maternal vaccination

Access to information was an important factor in decision-making around maternal vaccination, with women reporting receiving positive and negative information around vaccination, including misinformation. Yet, women across all countries described not having received any or sufficient information: "*Unfortunately we are not informed enough about vaccines and I think that's why a lot of people don't get vaccinated, or don't dare to do it*" (FR8). Information about risks and benefits of vaccination, including evidence of testing, was often requested, with women calling for more unbiased and transparent information. Most women agreed that information should come from their doctors, with one woman stressing the importance of personal interactions: "*Pregnancy is very personal and asking someone to put something in their body, that's not something you give them a leaflet about or just information on a piece of paper or something. You need to speak directly to someone*" (UK8).

Despite the trustworthiness of online information being questioned, some women stated using the internet or social media to look for information, particularly in France and the UK. Reassurance was sought by consulting official and reliable websites, such as those written by doctors or health authorities: "*I know which ones are reliable, because I search for them. I look for the updated ones, that they are reliable, that the information looks checked and validated. I don't go to websites where you don't know who's written them*" (ES9).

3.4. Trust in healthcare professionals and health authorities

Doctors were described as the most important influence in decision-making around maternal vaccination: *"I have no medical notions so I trust them, and until now it has always been working for me. Maybe that's why I don't have those fears that other mothers can have, because I have all those doctors and I trust them*" (FR14). The strong trust expressed in doctors was either explained in relation to personal and long-lasting relationships with doctors or scientific expertise: "*That person has studied and has a certain amount of medical knowledge, that's why it's hard for me not to trust a doctor*" (DE23).

Strong trust was also expressed towards health authorities, particularly in Italy. The knowledge that a vaccine has to go through a process to be accepted and recommended in their country was reassuring for women in Germany, Spain and the UK: "*If you bring a vaccination for pregnant women onto the German market, sufficient studies must have been done in order to be allowed to put it on the German market*" (DE23).

However, a small number of women in France, the UK and Germany expressed mistrust of health professionals and health authorities. Some women believed doctors could be dishonest and recommend vaccines because of their medical background or financial incentives, including from health authorities or pharmaceutical companies, instead of scientific evidence: "*When I found out that GPs get paid per vaccination that they give to each child, that then started making me think (. . .) this is just a business*" (UK23). Mistrust of pharmaceutical companies due to financial motives was raised in all countries.

3.5. Influences on decision-making

In addition to doctors, influences in decision-making were reported from other pregnant or previously pregnant women, whether mothers, sisters or friends: *"I always ask people who have*

had healthy children and (. . .) they reassure me on what they had [which vaccinations] (. . .), so I tend to go on that because I can see the baby, it's healthy" (UK22). While family was also seen a source of influence in women's decisions, the partner's role in decision-making was more ambiguous, with some women describing them having an active role in the decision (e.g. "*You still need to talk about it with our partner and I believe that the partner has his word to say*" (FR15)) and others explaining that their partners are not involved in such decisions (e.g. "*My husband does that think like 'do whatever you think' and sometimes that's not really very helpful*" (UK24)). External influences were either positive or negative, with women in France reporting having received recommendations from friends not to get vaccinated. Finally, vaccination decision-making was also discussed as a personal decision that pregnant women should make autonomously, particularly in France: "*When I ask a question, I already have the answer, I already know what I must do*" (FR2)

3.6. The importance of protection against diseases

The importance of protection against diseases offered by vaccination was more often discussed in relation to women's babies rather than themselves: *"I wasn't afraid for me but more for the foetus*" (FR3). This was an important motivator for women to get vaccinated, particularly in Spain and the UK: "*I feel that my primary purpose is to protect the unborn child, so if that's [vaccinating] what I need to do then I'll do that*." (UK2). Vaccination decision-making was dependent on the types of diseases prevented by vaccines, with a priority given to vaccines against diseases perceived as life-threatening. More concerns were raised about the dangers of pertussis and tetanus than influenza. Emotions associated with the risk of these diseases also played a role in decision-making: *"We live in a culture of fear and that's how we work. If (. . .) it [disease] doesn't feel very alarming, then I will surely pass [on vaccination]*" (ES20). Women who did not perceive the benefits of vaccines or the severity of vaccine-preventable diseases were less confident in getting vaccinated: "*As long as it was only about the flu and not about a deadly disease, I didn't see why I should take the risk*" (DE10). Community protection was discussed by some women in France and the UK, who stated they would consider getting vaccinated to protect those around them: "*It's not for you essentially. If a lot of people get [the vaccine] in this area then no-one has the disease*" (UK23).

The risk of contracting diseases was also discussed as a factor influencing decision-making, with women in France mostly discussing the risk of influenza and women in Italy, Spain and the UK expressing concerns about recent epidemics of pertussis. Women who did not feel at risk of contracting vaccine-preventable diseases, for example because they remained at home, were less willing to accept maternal vaccines. Questions around the effectiveness of vaccines, particularly influenza, were also raised: "*I heard a lot of things around me and on the internet about people who have been vaccinated and who still had the flu. So I mean, why do it if it's to have the flu after?*" (FR8). Two women in Italy questioned whether immunity is passed on to babies when pregnant women are vaccinated.

3.7. Fear and anxiety around vaccine safety

Concerns about the safety of maternal vaccination were common across all countries and constituted an important deterrent for accepting vaccination. Women discussed concerns about vaccine ingredients and adjuvants as well as a variety of side effects, including miscarriage, autism, or development disorders. The belief that influenza vaccination could cause the flu was also common across all countries. Strong emotional reactions, including fear and anxiety were observed in relation to the perceived risks of vaccination for unborn babies: "*You think: will it affect the baby? You suffer. Suffering. I got it [vaccine] and I was scared*" (ES21). Anticipated guilt and responsibility for babies were commonly discussed: "*You don't know how to proceed afterwards. What do you do if it goes wrong for the baby?*" (FR2). Anxiety was often associated with women unable to see their foetus and detect problems: "*If something goes wrong in my womb, it's going to be my fault and I won't see it.*" (FR21).

Vaccination was described as risk-taking by women in France, Germany, Italy and the UK, with some women comparing vaccination to smoking or drinking alcohol during pregnancy: "*Some women don't stop smoking and I imagine that these women would be also less concerned about vaccinations*" (DE23). Taking risks during pregnancy was perceived as unacceptable by some women, with some referring to the fact that women are not supposed to take any medicine during pregnancy: "*They tell us that small medicines are forbidden, even cough syrup is forbidden, so I don't really understand why [vaccination] would be authorised*" (FR2).

For some pregnant women in France, Italy and the UK, staying healthy was associated with avoiding vaccination and using natural alternatives: "*I want my body to stay healthy. I prefer to treat myself with natural products*" (FR4). Alternatives included homeopathy as well as limiting exposure to diseases by washing their hands or staying at home: "*Then I'll make sure not to catch it. There is something where? All around Spain? Where? All Spain? Maybe then I don't leave my home*" (ES11).

3.8. Emotions and perceptions around vaccine trials

Awareness about vaccine trials in pregnancy was low in all countries. Most women were unwilling to take part in a vaccine trial, expressing strong emotional and shocked responses, particularly in France and Italy: "*Are you saying that some pregnant women volunteer to be guinea pigs?!?!? Oh my god!!! I would never do it*" (IT10). Some women in Italy were judgmental of pregnant women willing to take part in trials, referring to them as '*irresponsible*' and '*crazy*'. Fear was a common reaction among women, who described taking part in trials as a sacrifice.

Concerns about side effects and possible risks for babies were the most common reasons provided for refusing to take part in vaccine trials: "*It's a study where you try to find out the effects of a certain product on pregnant women and their babies. You don't know the risks yet, you will see the effects during the trial and I am not willing to put the health of my baby in danger*" (DE9). The fear of facing uncertainty with an 'experimental' product was also important, with many women using the word '*guinea pig*' to characterise how they would feel if they took part in a trial. Some expressed disgust in relation to the role of the pharmaceutical industry: "*I think there is a lot of vested interests behind all this, the pharmaceutical business, an economic benefit, and I don't want to take part in any of that. In fact, it's disgusting*" (ES20).

In all countries except France, some women remained opened to the idea of participating in trials during pregnancy, conditional on certain factors such as receiving more information or recommendations from their doctors. Most of these women explained they would only accept to take part if they were told the vaccine was safe: "*I probably wouldn't consider it like I say, unless there's some compelling research or a previous study that has shown it was safe*" (UK17). However, a couple of women in Germany trusted that trials would never be conducted with pregnant women if they were unsafe: "*I think I would be chilled about it because I would assume that they wouldn't give anything to pregnant women that could actually be harmful*" (DE7). Women were also more likely to take part in trials for life-threatening or dangerous diseases: "*It would have to be a huge pay-off in the sense of (. . .) establishing a*

cure, or finding out a deformity or a defect in the child or something, in the embryo" (UK2). Financial compensation was only discussed as a convincing argument by a couple of women in France and Spain.

A few women in Germany, Spain and the UK also responded they would consider taking part in trials to help other pregnant women and to improve healthcare and science: "W*e need trials and research to continue and go forward so that it makes it safer for everyone. (. . .) I've always been interested in scientific studies, so I think those kinds of things may well be very interesting*" (UK6). Some women in these countries also referred to pregnant women who take part in trials as '*brave*', respecting and thanking them for their '*impressive*' choices.

4. Discussion

Maternal vaccination is an essential component of strategies aimed at protecting mothers and newborns from potentially severe infections [1]. Given that maternal vaccination uptake remains low in most European countries, understanding factors influencing pregnant women's willingness to receive a vaccine is important [8]. This qualitative study provided an overview of pregnant women's experiences, decision-making processes and perceptions towards maternal vaccination and maternal vaccine trials in France, Germany, Italy, Spain and the UK. Some differences in the themes identified through the qualitative analysis were noted between countries, with women in Spain and the UK for example more often discussing the protective benefits of vaccination and women in France and Italy expressing stronger emotional reactions against vaccine trials. Furthermore, while women across all countries expressed strong trust in HCPs, they experienced different recommendations and advice from HCPs in relation to maternal vaccination, with women in Italy reporting less recommendations and therefore awareness about maternal vaccination, women in France reporting recommendations not to vaccinate and women in Germany and the UK particularly satisfied with the information they had received. Future quantitative studies should confirm such differences and possible associations, as they constitute important insights for the development of targeted and context-specific interventions to improve maternal vaccination uptake.

Despite national recommendations, pregnant women's awareness about maternal vaccination was low, with women reporting a lack of information and recommendations from doctors. While this confirms findings from previous studies, it also highlights the need for stronger communication and information campaigns to raise awareness about the benefits of maternal vaccination [22,26–28]. Further research should also be conducted in countries where maternal vaccination is not part of routine antenatal services, as this could further impact women's awareness about vaccination. As women also reported strong influences from their peer networks, communication campaigns could also focus on engaging communities and peers, for example by involving them in discussions around vaccination or by using them as peer educators [39].

However, increasing access to information may not be sufficient to rebuild confidence in and uptake of maternal vaccination. A study in Spain found that pregnant women with higher health literacy were more likely to decline immunisation, with the authors suggesting this could be due to women seeking information online [29]. Our study found that despite women reporting that the internet and social media are not trustworthy, they would still use it to research information around vaccination. Pregnant women who used social media to look for information about maternal vaccination were found to be less likely to receive pertussis vaccination during pregnancy in a study in the UK [40]. While ensuring pregnant women have access to clear and factual information about maternal vaccination is important, strategies should also include structural changes such as the removal of misinformation from social media platforms to prevent exposure of pregnant women to misinformation, as well as interventions to empower and train women to assess and evaluate health information [41].

Pregnant women expressed strong trust in their doctors, explaining maternal vaccine recommendations from midwives, general practitioners, or gynaecologists were a decisive factor for vaccine acceptance. This confirms findings from previous studies that have found associations between women's vaccine uptake and receiving a recommendations from healthcare providers [26,28,30,31]. However, this trust can constitute a barrier to maternal vaccination if doctors do not recommend vaccination or if they recommend against it, as was seen in this study. A European report states that while 96% of general practitioners in the UK and 93% in Spain would recommend influenza vaccination to pregnant women, only 83% of general practitioners would do so in France [42]. Understanding the reasons behind doctors' recommendation practices is therefore essential. Studies from various European countries identified similar issues than the ones raised by pregnant women, such as a perceived lack of official recommendations for maternal vaccination as well as concerns about vaccine safety and effectiveness [24,31,43,44]. Furthermore, healthcare professionals' recommendations for maternal vaccination were found to be associated with their own vaccination status, pointing to possible vaccine hesitancy issues [25,43]. Vaccine perceptions are also known to vary among different types of healthcare professionals, with midwives and nurses, who are generally more trusted by pregnant women, showing less confidence in vaccination and willingness to recommend vaccines to pregnant women than other doctors [25].

Pregnant women's trust in their doctors was found to be based on the perceived scientific expertise of doctors as well as reassuring, personal and long-term relationships with them. This shows that vaccine recommendations by themselves might not be sufficient, and the manner in which doctors recommend vaccination could be equally as important [39]. Many women were disappointed at the lack of explanations they received and the feeling their doctors did not have time to talk about vaccination. The perceptions that doctors were forcing vaccines, sometimes even being judgmental or dishonest, have the potential of eroding women's trust in their doctors and in vaccination overall.

One study in the UK found that 25% of healthcare professionals were not confident in discussing vaccination with pregnant women [45]. These findings highlight the need for stronger communication training for healthcare professionals to improve their confidence in addressing pregnant women's concerns as well as explaining the need for maternal vaccination [46,47]. Insufficient evidence exists on effective communication strategies to improve vaccine uptake and confidence in pregnancy, but studies seem to show the importance of personal interactions and emotional responses from healthcare professionals, such as empathy [39,48].

Vaccination decision-making during pregnancy was described in the context of a highly emotional time, with women reporting a range of strong emotions, from fear to anxiety and guilt. These were in part explained by a growing sense of responsibility and desire to protect their children. For some women, pregnancy was the first time they were required to make a decision about vaccination, which could create uncertainty and anxiety. Furthermore, it was shown that pregnant women's experiences with vaccination in pregnancy can impact their future attitudes towards childhood vaccination [49,50]. Future research should be conducted to explore the possible association between women's perceptions and whether this is a first time pregnancy or whether they have other children.

Emotions were found to play an important role in pregnant women's decisions to accept or refuse vaccination. While some women expressed fears about the risk of diseases and the desire to protect their babies – and even communities – against possible threats through vaccination, others identified vaccination as the threat. Exploring how women perceive different maternal vaccines (e.g. influenza vs pertussis or COVID-19) is therefore crucial. Women reported anxiety, fear and anticipated guilt as reasons for refusing vaccines, mostly in relation to vaccines' safety and concerns about side effects for their babies. While pregnant women's concerns about vaccine safety is known to contribute to vaccine hesitancy and refusal [22,23], this study found that women placed vaccination in the context of the long tradition of avoiding any type of risk during pregnancy. As women have repeatedly been told to avoid risks such as smoking, drinking alcohol or even taking certain medications, the notion of receiving a vaccine while they are pregnant is unconceivable for some. Communication strategies focusing on vaccination in the context of other antenatal care interventions and possible risks will therefore be required to change women's perceptions and establish maternal vaccination as a safe intervention. Insufficient evidence exists on the effectiveness of such strategies with pregnant women, which warrants further research.

Contexts of high uncertainty have been shown to heighten anxieties and emotional reactions to vaccination [51,52]. While this was visible in this study, with pregnant women expressing concerns about being unable to see their unborn babies' reactions to vaccines, it was even more important in women's discussions around vaccine trials. Emotions such as anxiety, fears and even disgust were heightened in relation to safety concerns around vaccine trials. Taking part in vaccine trials was seen as an unnecessary risk in the context of pregnancy, with no or little perceived individual benefits. Only a few women discussed taking part in trials as a means to contribute to the progress of science or to benefit pregnant women in the future. It would be important to understand how such perceptions may evolve in the context of vaccine trials during global pandemics, such as COVID-19. While many have stressed the need to increase the participation of pregnant women in clinical trials to obtain more data on the safety and effectiveness of important public health interventions such as vaccination, it raises important ethical issues [53,54]. In addition to addressing the concerns pregnant women may have about participating in such trials, it is therefore important to develop stronger guidance on issues such as informed consent, and risk benefits analyses [55,56].

Our study has several limitations. Our sample was relatively homogenous, with participants mostly coming from urban areas. It is possible different themes would be identified in a more diverse or rural sample. While no associations between socio-economic variables such as education, age, or ethnicity and vaccine confidence can be made based on qualitative data, it is possible that these factors influenced some of the results. Furthermore, while one of the strengths of this study was the analysis of international data from five European countries, more local research in each of the countries would allow more contextual insights. Although the impact of interviewers on participants' responses in qualitative studies is non-negligible, it was limited by using trained local researchers and good fieldwork and analysis practices as well as comprehensive analysis of the entire data set.

This study explored pregnant women's perceptions and decision-making practices around maternal vaccination in Europe, highlighting the important role of trust and emotions as well as healthcare professionals' recommendations in women's decisions. Some differences across countries were also identified, showing the need for targeted responses. However, the range of different policies for maternal vaccination across Europe may be contributing to the inadequate recommendation practices by healthcare professionals and women's hesitancy to get vaccinated. While this warrants further research, more coordinated strategies across the region could strengthen communication and overall trust in maternal vaccination.

Declaration of Competing Interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: The Vaccine Confidence Project has collaborative grant with GlaxoSmithKline (HJL, EK, PP), Merck (HJL, EK), and Johnson and Johnson (HJL, EK, PP). HJL and EK have also received other support for participating in Merck meetings and GlaxoSmithKline advisory roundtables. HJL is a member of the Merck Vaccine Confidence Advisory Board.

Acknowledgements

The Vaccine Confidence Project would like to acknowledge our long-term partnership with WIN/Gallup International Association (WIN/GIA). HJL and PP are affiliated to the National Institute for Health Research (NIHR) Health Protection Research Unit in Immunisation at the London School of Hygiene & Tropical Medicine in partnership with Public Health England. The views expressed are those of the author(s) and not necessarily those of the National Health Service, the NIHR, the Department of Health, or Public Health England.

Funding

This work was supported by GlaxoSmithKline(GSK). The funder reviewed the study protocol but had no role in data collection, analysis, interpretation, or writing of this manuscript.

References

[1] Bergin N, Murtagh J, Philip RK. Maternal vaccination as an essential component of life-course immunization and its contribution to preventive neonatology. Int J Environ Res Public Health 2018;15:847.
[2] Mak TK, Mangtani P, Leese J, Watson JM, Pfeifer D. Influenza vaccination in pregnancy: current evidence and selected national policies. The Lancet Infect Dis 2008;8:44-52.
[3] Rasmussen SA, Jamieson DJ, Uyeki TM. Effects of influenza on pregnant women and infants. Am J Obstetrics Gynecology. 2012;207:S3-S8.
[4] World Health Organization. Vaccines against influenza WHO position paper – November 2012. Weekly epidemiological record: WHO; 2012.
[5] World Health Organization. Pertussis vaccines: WHO position paper – August 2015. Weekly epidemiological record: WHO; 2015.
[6] World Health Organization. Tetanus vaccines: WHO position paper – February 2017. Weekly epidemiological record: WHO; 2017.
[7] Munoz FM. Current challenges and achievements in maternal immunization research. Front Immunol 2018;9:436.
[8] European Centre for Disease Prevention and Control. Seasonal influenza vaccination and antiviral use in EU/EEA Member States – Overview of vaccine recommendations for 2017–2018 and vaccination coverage rates for 2015–2016 and 2016–2017 influenza seasons. ECDC Technical Report. Stockholm: ECDC; 2018.
[9] National Health Service. Can I have vaccinations if I'm pregnant? https://www.nhs.uk/common-health-questions/pregnancy/can-i-have-vaccinations-if-i-am-pregnant/ 2018.
[10] Asociacion Espanola de Pediatria. Manual de vacunas en linea de la AEP. https://vacunasaep.org/documentos/manual/manual-de-vacunas 2019.
[11] Ministero della Salute Direzione Generale Della Prevenzione Sanitaria. Vaccinazioni raccomandate per le donne in età fertile e in gravidanza Aggiornamento novembre 2019. https://www.trovanorme.salute.gov.it/norme/renderNormsanPdf?anno=2019&codLeg=71540&parte=1%20&serie=null2019.
[12] Santé Publique France. Recommendation vaccinales spécifiques, personnes exposées à des risques spécifiques, femmes enceintes. https://professionnels.vaccination-info-service.fr/Recommendation-vaccinales-specifiques/Personnes-exposees-a-des-risques-specifiques/Femmes-enceintes 2020.

[13] Bundeszentrale für gesundheitliche Aufklärung. Impfempfehlungen für Schwangere. https://www.impfen-info.de/impfempfehlungen/schwangere.html#:~:text=Die%20Impfungen%20gegen%20Grippe%20und,werden%2C%20k%C3%B6nnen%20Schwangere%20geimpft%20werden.
[14] Frauenärzte im Netz. WELCHE IMPFUNGEN KÖNNEN IN DER SCHWANGERSCHAFT STATTFINDEN UND WELCHE NICHT? https://www.frauenaerzte-im-netz.de/frauengesundheit/impfschutz-impfungen/impfungen-in-der-schwangerschaft/ 2018.
[15] Public Health England. Seasonal influenza vaccine uptake in GP patients: winter season 2019 to 2020. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/912099/Annual-Report_SeasonalFlu-Vaccine_GPs_2019-20_FINAL_amended.pdf 2020.
[16] Secretaria General de Sanidad. Coberturas de vacunación frente a gripe en ≥65 años, personas de 60-64 años, embarazadas y personal sanitario. https://www.mscbs.gob.es/profesionales/saludPublica/prevPromocion/vacunaciones/calendario-y-coberturas/coberturas/docs/Tabla13.pdf: Ministerio de Sanidad Gobierno de Espana,; 2018-2019.
[17] Public Health England. Pertussis vaccination programme for pregnant women update: vaccine coverage in England, October to December 2019. Health Protection Report https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/867575/hpr0420_prtsss-vc2.pdf: PHE; 2020.
[18] Secretaria General de Sanidad. Coberturas de vacunación con dTpa en embarazadas. https://www.mscbs.gob.es/profesionales/saludPublica/prevPromocion/vacunaciones/calendario-y-coberturas/coberturas/docs/Tabla12.pdf: Ministerio de Sanidad Gobierno de Espana; 2018.
[19] Bödeker B, Betsch C, Wichmann O. Skewed risk perceptions in pregnant women: the case of influenza vaccination. BMC Public Health 2015;15:1308.
[20] Vilca LM, Cesari E, Tura AM, Di Stefano A, Vidiri A, Cavaliere AF, et al. Barriers and facilitators regarding influenza and pertussis maternal vaccination uptake: A multi-center survey of pregnant women in Italy. Eur J Obstetrics & Gynecology Reproductive Biol 2020;247:10–5.
[21] Descamps A, Launay O, Bonnet C, Blondel B. Seasonal influenza vaccine uptake and vaccine refusal among pregnant women in France: results from a national survey. Human Vaccines & Immunotherapeutics 2020;16(5):1093–100.
[22] Kilich E, Dada S, Francis MR, Tazare J, Chico RM, Paterson P, et al. Factors that influence vaccination decision-making among pregnant women: A systematic review and meta-analysis. PLOS One. 2020;15:e0234827.
[23] Wilson RJ, Paterson P, Jarrett C, Larson HJ. Understanding factors influencing vaccination acceptance during pregnancy globally: a literature review. Vaccine 2015;33(47):6420–9.
[24] Vilca LM, Martínez C, Burballa M, Campins M. Maternal care providers' barriers regarding influenza and pertussis vaccination during pregnancy in Catalonia, Spain. Maternal Child Health J 2018;22(7):1016–24.
[25] Vishram B, Letley L, Jan Van Hoek A, Silverton L, Donovan H, Adams C, et al. Vaccination in pregnancy: Attitudes of nurses, midwives and health visitors in England. Hum Vaccines Immunotherapeutics 2018;14(1):179–88.
[26] Maurici M, Dugo V, Zaratti L, Paulon L, Pellegrini MG, Baiocco E, et al. Knowledge and attitude of pregnant women toward flu vaccination: a cross-sectional survey. J Maternal-Fetal & Neonatal Med 2016;29(19):3147–50.
[27] Vila-Candel R, Navarro-Illana P, Navarro-Illana E, Castro-Sánchez E, Duke K, Soriano-Vidal FJ, et al. Determinants of seasonal influenza vaccination in pregnant women in Valencia, Spain. BMC Public Health. 2016;16:1173.
[28] Donaldson B, Jain P, Holder BS, Lindsey B, Regan L, Kampmann B. What determines uptake of pertussis vaccine in pregnancy? A cross sectional survey in an ethnically diverse population of pregnant women in London. Vaccine 2015;33(43):5822–8.
[29] Castro-Sánchez E, Vila-Candel R, Soriano-Vidal FJ, Navarro-Illana E, Díez-Domingo J. Influence of health literacy on acceptance of influenza and pertussis vaccinations: a cross-sectional study among Spanish pregnant women. BMJ Open. 2018;8:e022132.
[30] Gaudelus J, Martinot A, Denis F, Stahl J-P, Chevaillier O, Lery T, et al. Vaccination of pregnant women in France. Medecine et maladies infectieuses 2016;46(8):424–8.
[31] Loubet P, Guerrisi C, Turbelin C, Blondel B, Launay O, Bardou M, et al. Influenza during pregnancy: Incidence, vaccination coverage and attitudes toward vaccination in the French web-based cohort G-GrippeNet. Vaccine 2016;34(20):2390–6.
[32] Tuells J, Rodríguez-Blanco N, Duro Torrijos JL, Vila-Candel R, Nolasco BA. Vaccination of pregnant women in the Valencian Community during the 2014–15 influenza season: a multicentre study. Rev Esp Quimioter 2018;31:344–52.
[33] Napolitano F, Napolitano P, Angelillo IF. Seasonal influenza vaccination in pregnant women: knowledge, attitudes, and behaviors in Italy. BMC Infect Dis 2017;17:48.
[34] Bödeker B, Walter D, Reiter S, Wichmann O. Cross-sectional study on factors associated with influenza vaccine uptake and pertussis vaccination status among pregnant women in Germany. Vaccine 2014;32(33):4131–9.
[35] Campbell H, Van Hoek AJ, Bedford H, Craig L, Yeowell A-L, Green D, et al. Attitudes to immunisation in pregnancy among women in the UK targeted by such programmes. Br J Midwifery 2015;23(8):566–73.
[36] Krubiner CB, Faden RR, Karron RA, Little MO, Lyerly AD, Abramson JS, et al. Pregnant women & vaccines against emerging epidemic threats: Ethics guidance for preparedness, research, and response. Vaccine 2019.
[37] Jaffe E, Lyerly AD, Goldfarb IT. Pregnant women's perceptions of risks and benefits when considering participation in vaccine trials. Vaccine 2020;38(44):6922–9.
[38] McQuaid F, Pask S, Locock L, Davis E, Stevens Z, Plumb J, et al. Attitudes towards antenatal vaccination, Group B streptococcus and participation in clinical trials: Insights from focus groups and interviews of parents and healthcare professionals. Vaccine 2016;34(34):4056–61.
[39] Wilson R, Paterson P, Larson H. Strategies to improve maternal vaccination acceptance. BMC Public Health 2019;19:342.
[40] Ford AJ, Alwan NA. Use of social networking sites and women's decision to receive vaccinations during pregnancy: A cross-sectional study in the UK. Vaccine 2018;36(35):5294–303.
[41] Lazer DMJ, Baum MA, Benkler Y, Berinsky AJ, Greenhill KM, Menczer F, et al. The science of fake news. Science 2018;359(6380):1094–6.
[42] Larson H, de Figueiredo A, Karafillakis E, Rawal M. State of vaccine confidence in the EU 2018. Luxembourg: European Union; 2018.
[43] Böhm S, Röbl-Mathieu M, Scheele B, Wojcinski M, Wichmann O, Hellenbrand W. Influenza and pertussis vaccination during pregnancy – attitudes, practices and barriers in gynaecological practices in Germany. BMC Health Services Res 2019;19:616.
[44] Wilcox CR, Little P, Jones CE. Current practice and attitudes towards vaccination during pregnancy: a survey of GPs across England. Br J Gen Pract 2020;70(692):e179–85.
[45] Wilcox CR, Calvert A, Metz J, Kilich E, MacLeod R, Beadon K, et al. Determinants of influenza and pertussis vaccination uptake in pregnancy: a multicenter questionnaire study of pregnant women and healthcare professionals. The Pediatric Infect Dis J 2019;38.
[46] Barrett T, McEntee E, Drew R, O'Reilly F, O'Carroll A, O'Shea A, et al. Influenza vaccination in pregnancy: vaccine uptake, maternal and healthcare providers' knowledge and attitudes. A quantitative study. BJGP Open. 2018;2:bjgpopen18X101599.
[47] Frawley JE, McKenzie K, Cummins A, Sinclair L, Wardle J, Hall H. Midwives' role in the provision of maternal and childhood immunisation information. Women and Birth 2020;33(2):145–52.
[48] Frew PM, Randall LA, Malik F, Limaye RJ, Wilson A, O'Leary ST, et al. Clinician perspectives on strategies to improve patient maternal immunization acceptability in obstetrics and gynecology practice settings. Hum Vaccines Immunotherapeutics 2018;14(7):1548–57.
[49] Glanz JM, Wagner NM, Narwaney KJ, Shoup JA, McClure DL, McCormick EV, et al. A mixed methods study of parental vaccine decision making and parent-provider trust. Academic Pediatrics 2013;13(5):481–8.
[50] Danchin MH, Costa-Pinto J, Attwell K, Willaby H, Wiley K, Hoq M, et al. Vaccine decision-making begins in pregnancy: Correlation between vaccine concerns, intentions and maternal vaccination with subsequent childhood vaccine uptake. Vaccine 2018;36(44):6473–9.
[51] Chou W-Y, Budenz A. Considering emotion in COVID-19 vaccine communication: addressing vaccine hesitancy and fostering vaccine confidence. Health Communication 2020;35(14):1718–22.
[52] Stuck LHJ. How vaccine rumors start–and why they don't go away. USA: Oxford University Press; 2020.
[53] Baylis F, Kaposy C. Wanted: inclusive guidelines for research involving pregnant women. J Obstetrics Gynaecology Canada 2010;32(5):473–6.
[54] Bianchi DW, Kaeser L, Cernich AN. Involving pregnant individuals in clinical research on COVID-19 vaccines. JAMA. 2021;325:1041-2.
[55] The American College of Obstetricians and Gynecologists. Committee Opinion. Ethical Considerations for Including Women as Research Participants. 2015. p. e100-7.
[56] Beeler JA, Lambach P, Fulton TR, Narayanan D, Ortiz JR, Omer SB. A systematic review of ethical issues in vaccine studies involving pregnant women. Hum Vaccines & Immunotherapeutics 2016;12(8):1952–9.