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Intention and hesitancy to receive a booster dose of COVID–19 vaccine among pregnant women using a health belief model: A cross–sectional study

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ABSTRACT

Objective: To examine the pattern of COVID-19 infection and vaccination, and to explore pregnant women's willingness and reluctance to accept a booster dose of the COVID-19 vaccine.

Methods: This was a cross-sectional, descriptive study with a convenient sample size using a structured questionnaire among pregnant women attending the gynecology and obstetrics department at Acıbadem Mehmet Ali Aydınlar Hospital, Istanbul, Türkiye. The Health Belief Model scale was used to assess the intention and reluctance to accept a booster dose of the COVID-19 vaccine.

Results: A total of 145 participants, with a mean age of (33.5±4.8) years, and a gestational age of (30.9±7.3) weeks, were enrolled in this study. 88.8% Received full doses of the Pfizer-BioNTech vaccination. 47.8% Participants suffered from vaccine adverse effects. Health Belief Model demonstrated a significant finding of perceived susceptibility ($P<0.001$), perceived severity of COVID-19 complications ($P<0.001$), and perceived benefits regarding a booster COVID-19 vaccination ($P<0.001$).

Conclusions: Most pregnant women who received the COVID-19 immunization express a significant intention to receive a booster dose, regardless of the adverse effects experienced from the previous doses. However, a small percentage of the study sample express hesitancy about receiving the booster dose.

KEYWORDS: Booster dose; Hesitancy; Pregnancy; COVID-19; SARS-CoV-2; Vaccine

1. Introduction

Despite global public health precautions, the coronavirus disease 2019 (COVID-19) pandemic has created unprecedented difficulties for public health, resulting in poor health outcomes and deaths[1,2]. Pregnant women infected with COVID-19 experience a significantly more severe clinical course, with higher rates of adverse outcomes and complications in comparison to non-pregnant women. COVID-19 has been linked to higher morbidity and mortality,

Significance

Acceptance and willingness to accept a booster dose of COVID-19 vaccine is a major concern among pregnant women. Use of Health Belief Model revealed a useful information to accept a booster dose of COVID-19 vaccine among pregnant women. Most pregnant women who received the full COVID-19 vaccine reported a significant intention to receive a booster dose.

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including higher hospitalization and intensive care unit admission rates, an elevated risk of cardiomyopathy, preterm birth, low birth weight infants, stillbirth, pre-eclampsia, and maternal death. Furthermore, pregnant women who have preexisting cardiovascular or endocrine disorders such as hypertension or diabetes mellitus are more likely to contract COVID-19[3-5].

Several COVID-19 vaccines have been licensed by the World Health Organization, which cannot control the epidemic without community acceptance to reach an immunity level of at least 75%[6]. Therefore, immunization is one of the most important approaches that can protect against serious COVID-19 complications. Meanwhile, it looks like the COVID-19 outbreak is far from finished, as waves of SARS-CoV2 transmission are still being recognized with the emergence of different Omicron variants. The protection from the two-dose regimen of several COVID-19 vaccines is waning slowly against severe infection, hospitalization, and mortality[7]. Previous research found that people who received a third or booster dose of any mRNA-based vaccine had a significantly lower risk of COVID-19 reinfection or even mild disease symptoms even if infected compared to individuals who were not immunized or received only two doses[8-10].

While pregnant women did not take part in the research and clinical evaluation of COVID-19 vaccines, the critical necessity for pregnant women's vaccinations cannot be overstated[11]. According to the World Health Organization, pregnant women who have been exposed to SARS-CoV-2 can be vaccinated after consulting with their specialist[12]. Therefore, ongoing data on vaccine safety is crucial to rule out potential adverse effects among pregnant women. Additionally, COVID-19 immunization during pregnancy is supported by accumulating evidence from enormous epidemiological studies and guidelines, since there are no substantial safety concerns or significantly elevated risks of undesirable outcomes, such as spontaneous abortion or premature birth, related to the COVID-19 vaccine[13-17]. However, concerns regarding vaccine safety, both short-term testing and long-term consequences, as well as the need for recently developed vaccines, continue to be important barriers to adopting a booster COVID-19 vaccination[18,19]. Vaccine hesitancy is regarded as one of the world's most serious health issues, described as a set of beliefs, attitudes, or behaviors, or a combination of these, manifested as a delay in accepting or refusing vaccines[20,21]. Therefore, an assessment of vaccine reluctance may help decision-makers set guidelines to address the hesitation towards a booster COVID-19 immunization, particularly among pregnant women. Recognizing the importance of vaccination during pregnancy, the purpose of this study is to examine the pattern of COVID-19 infection and vaccination, as well as pregnant women's willingness and reluctance to obtain a booster dose of the COVID-19 vaccine in Istanbul, Türkiye.

2. Patients and methods

2.1. Study design and setting

The study was designed as a descriptive, cross-sectional study that enrolled a convenient sample size of pregnant women and was conducted from March to August 2022 at the gynecological and obstetric department at Acıbadem Mehmet Ali Aydınlar Hospital, Istanbul, Türkiye.

2.2. Study participants

The inclusion criteria included pregnant women, expressing willingness to take part in this study were included in study while attending the gynecological and obstetric department of Acıbadem Mehmet Ali Aydınlar Hospital. Those who declined to participate or provided incomplete responses to the questionnaire items were excluded.

2.3. Data sources and collection

The questionnaire was developed following a comprehensive literature review and was organized to meet the objectives of the current study. To ensure accuracy, the questionnaires underwent a process of translation from English to Turkish and vice versa, and two pharmacists and medical professionals validated the content. Participants who expressed an interest in participating were given detailed verbal information about the study's objectives as well as written informed consent. Additionally, all participants were reminded that their participation was entirely voluntary, and their anonymity and response confidentiality were ensured. It was distributed to participants and filled out through direct face-to-face interviews, taking approximately 10 minutes to complete.

2.4. Study tools and measurements

The questionnaire consisted of four sections. The first section collected information on demographic characteristics. The second section evaluated patients' patterns and experiences of COVID-19 infection. The third section evaluated patients' patterns and perceptions regarding COVID-19 vaccinations, and the respondents were given the option to answer "yes" or "no". The fourth section assessed vaccine hesitancy following a booster dose of the COVID-19 vaccine using the Health Belief Model (HBM) [22], which is a theoretical framework representing five domains and consisting of 14 items regarding existing beliefs that can predict future behaviors, such as receiving a booster dose of a vaccine. By applying the HBM to disease prevention, it is possible to explore the motivations of individuals willing to receive vaccination

and understand the reasons behind vaccine refusal. The HBM domains include perceived susceptibility (2 items), which refers to an individual's belief regarding the likelihood of acquiring a disease; perceived severity (3 items), which reflects the individual's perception of the seriousness of the illness; perceived benefits (3 items), which assess the individual's perception of the usefulness of particular health behavior; perceived barriers (3 items), which evaluate the obstacles that could hinder the performance of specific health behavior; and cues to action (2 items), which pertain to the cues that stimulate a specific behavior.

2.5. Ethical considerations

The ethical committee of human researchers at the Faculty of Pharmacy, Istinye University, Istanbul, Türkiye (date: 08.04.2022; ref. number: 2022-22-44) approved the study. All methods involving human subjects in the study were carried out in compliance with the ethical standards of the research institution board and the 1964 Helsinki Declaration.

2.6. Statistical analysis

Assuming a value of 95%, at the 5% significance level with an effect size of 0.920, the sample size was estimated at 70 participants. The Statistical Program for Social Science Research, edition 23.0, and Microsoft Office Excel 2013 were used for analyzing the data. The characteristics of the study population were explained *via* descriptive analysis, with results presented as numbers, percentages, means, and standard deviations. The Chi-square test was applied to assess study participants' willingness and reluctance to get COVID-19 vaccinations. The significance level was set at $\alpha < 0.05$.

3. Results

During the study period, a total of 265 participants were enrolled. However, 145 of them completed the entire questionnaire (Figure 1).

3.1. Demographic characteristics

Table 1 presents the demographic characteristics of the participants, with a mean age of (33.5±4.8) years and a gestational age of (30.9±7.3) weeks. Most of the respondents were in the gestational age range of the third trimester (81.3%). Most of the participants had a university degree (53.8%), were non-smokers (92.4%), and had no comorbidities (93.8%). Of the enrolled participants, 55.9% reported being infected with COVID-19. Among them, 8.6% reported hospital admissions from the infection.

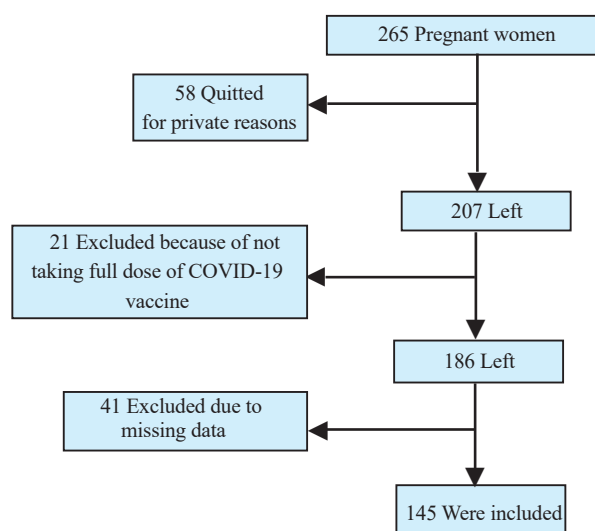


Figure 1. The study flowchart.

Table 1. Demographic characteristics (n=145).

Variables	n	%
Gestational trimesters		
First trimester (0-13 weeks)	4	2.8
Second trimester (14-26 weeks)	23	15.9
Third trimester (27-40 weeks)	118	81.3
Educational level		
Primary	9	6.2
Secondary	14	9.7
University	78	53.8
Postgraduate	44	30.3
Cigarette smoking*		
Yes	11	7.6
No	134	92.4
Co-morbid disease conditions		
Yes	9	6.2
No	136	93.8

*Average number/times of smoking: 2.6 cigarettes/3.4 per month.

3.2. Patterns related to COVID-19 vaccination

Table 2 presents the patterns related to COVID-19 vaccination among the participants, with 92.4% (n=134) receiving the COVID-19 vaccine. Of these, 88.8% (n=119) received the Pfizer-BioNTech vaccine. Less than half of the participants (46.2%) were concerned about the adverse effects of the vaccine they had received, while 43.4% of the participants received education and counseling to manage the symptoms of vaccine adverse effects. Meanwhile, 47.8% (n=64) of the participants suffered from adverse effects of the vaccine they received. Of these, 50% (n=32) reported mild symptoms of the COVID-19 vaccine, followed by moderate symptoms (43.8%, n=28). Half of the participants reported that the symptoms lasted for 1-3 days. Meanwhile, 46.9% reported taking medication to relieve symptoms of a vaccine adverse effect. Regarding perceptions of receiving a booster dose of the COVID-19 vaccine, 73.8% reported an intention to receive a booster dose of the

COVID-19 vaccine. Of these, 8.4% reported an intention to receive a booster dose from a different vaccine brand. Less than half of respondents (37.2%) reported receiving information about a booster dose of the COVID-19 vaccine, and a physician was the primary source of information for this group (74%).

3.3. Participants' intention and readiness to booster COVID-19 immunization based on the HBM

Table 3 shows the participants' intention and readiness to get a booster COVID-19 immunization based on the HBM. There were significant findings regarding the perceived susceptibility ($P<0.001$), as nearly half of the participants were worried about the likelihood of getting COVID-19 (48.3%), and that it was currently possible that they would get COVID-19 (50.3%). Participants also reported a significant perceived severity of COVID-19 complications (56.5%) and a fear of getting COVID-19 (55.9%) ($P<0.001$). Nonetheless, the study participants reported significant perceived benefits regarding a booster COVID-19 vaccination ($P<0.001$), the reported agreement being less worried about catching COVID-19 after obtaining the booster COVID-19 vaccine (66.2%), as well as minimizing the risk of infection and related complications (73.8%). On the other hand, many participants stated significant disagreement ($P<0.001$) that they would obtain the booster COVID-19 vaccine if enough information was offered (53.8%) and that they were only going to get a booster vaccine if a majority of the public did (68.9%), as shown in Table 3.

Table 2. Patterns regarding the COVID-19 vaccination among the participants.

Variables	n	%
Receiving the COVID-19 vaccine (n=145)		
Yes	134	92.4
No	11	7.6
Vaccine type (n=134) †		
Pfizer-BioNTech	119	88.8
Sinopharm	15	11.2
Worrying about adverse effects of the vaccine (n=145)		
Yes	67	46.2
No	78	53.8
Providing education and counseling to control the symptoms of vaccine adverse effects (n=145)		
Yes	63	43.4
No	82	56.6
Suffering from adverse effects from the vaccine (n=134)		
Yes	64	47.8
No	70	52.2
Severity of symptoms from the vaccine (n=64)		
Mild	32	50.0
Moderate	28	43.8
Severe	4	6.2
Duration of symptoms (n=64)		
< 24 h	28	43.8
1-3 days	32	50.0
4-7 days	4	6.2
Hospital admission for the vaccine side effects (n=64)		
Yes	0	0.0
No	64	100.0
Intake of medicine (s) for the control or relief of symptoms of vaccine side effects (n=64)		
Yes	30	46.9
No	34	53.1

†: Two variants of COVID-19 vaccine were launched by the Ministry of Health in Türkiye.

Table 3. Perception, intention, and willingness to receive a booster COVID-19 vaccine based on the Health Belief Model (n=145, n, %).

Variables	Agree	Not sure	Disagree	χ^2	P
Perceived susceptibility					
Chance of getting COVID-19 in the next few months is great	37 (25.5)	58 (40.0)	50 (34.5)	14.27	<0.001
Worry about the likelihood of getting COVID-19	70 (48.3)	27 (18.6)	48 (33.1)		
Getting COVID-19 is currently a possibility for me	73 (50.3)	34 (23.5)	38 (26.2)		
Perceived severity					
Complications from COVID-19 are serious	82 (56.5)	34 (23.5)	29 (20.0)	28.53	<0.001
I will be very sick if I get COVID-19	30 (20.7)	68 (46.9)	47 (32.4)		
I am afraid of getting COVID-19	81 (55.9)	25 (17.2)	39 (26.9)		
Perceived benefits					
Booster vaccination is a good idea because it makes me feel less worried about catching COVID-19	96 (66.2)	27 (18.6)	22 (15.2)	89.04	<0.001
Booster vaccination decreases my chance of getting COVID-19 or its complications	107 (73.8)	22 (15.2)	16 (11.0)		
Perceived barriers					
Worry the possible side-effects of COVID-19 vaccination would interfere with my usual activities	51 (35.2)	27 (18.6)	67 (46.2)	43.03	0.35
Concern about the efficacy of the COVID-19 booster vaccination	29 (20.0)	37 (25.5)	79 (54.5)		
Concern about the safety of the COVID-19 booster vaccination	51 (35.2)	43 (29.6)	51 (35.2)		
Concern of my affordability (high cost) of getting the COVID-19 booster vaccination	9 (6.2)	25 (17.2)	111 (76.6)		
Cues to action					
I will only take the COVID-19 booster vaccine if I was given adequate information about it	35 (24.1)	32 (22.1)	78 (53.8)	55.41	0.01
I will only take the COVID-19 booster vaccine if the vaccine is taken by many in the public	19 (13.1)	26 (17.9)	100 (68.9)		

4. Discussion

Achieving high vaccine coverage is a crucial strategy to effectively control the pandemic, particularly among pregnant women who face a higher risk of severe illness. However, the dearth of information on the acceptance rate of a booster dose of the COVID-19 vaccine among pregnant women is a major concern. In this study, the utilization of the HBM provided valuable insights into the impact of different domains on booster vaccine acceptability among pregnant women. Most participants expressed a positive acceptance rate and perceived benefits associated with receiving a booster vaccine, believing it would effectively protect against infection and subsequent complications. Additionally, the study identified the participants' perceived susceptibility to infection and the severity of COVID-19, which play crucial roles in shaping their attitudes and confidence toward receiving a booster vaccine. These findings agree with previous studies that assessed booster vaccine acceptability among pregnant women. A multinational study conducted through an online study of 16 nations found that vaccination acceptance was higher in India, the Philippines, and Latin American countries, while it was lower in Russia, the United States, and Australia[23].

Confidence in the vaccination's safety and effectiveness are the strongest determinants of a high acceptance rate for the booster COVID-19 vaccine. Healthcare providers may deal with these worries by highlighting the benefits of COVID-19 control and the potential advantages of vaccination in comparison to the possible risks to the fetus[24]. In our study, most participants reported minor to moderate adverse effects, whether they received Pfizer-BioNTech or Sinopharm vaccines. However, the majority of those surveyed believed that the probability of harmful effects was unlikely and would deter them from receiving a booster dose of the COVID-19 vaccine. The higher acceptance rate observed in our sample suggests that the burden of other infectious diseases may contribute to both a heightened perception of the risk of COVID-19 and more positive attitudes towards vaccination[25]. Additionally, the approval of multiple COVID-19 vaccines with high efficacy rates and the implementation of large-scale vaccination campaigns worldwide are likely to promote public acceptance and confidence in the booster COVID-19 vaccination. These results are consistent with previous studies conducted among different populations[26-30] but contrast with findings reported by Skjefte *et al.*[23], who found that pregnant women in the USA and Russia exhibited lower perceived importance of COVID-19 vaccination, resulting in a lower acceptance rate and less confidence in the beneficial outcomes of vaccine safety and effectiveness for COVID-19.

In this study, most participants received the Pfizer-BioNTech vaccine. They preferred a COVID-19 booster dosage from the same brand, likely due to safety considerations. The rate of significant adverse events after the initial doses typically correlates with the

preference for the same vaccine brand, emphasizing the influence of prior experiences on vaccine perception and trust. Our findings are consistent with a previous study carried out in the Polish population, which observed that individuals previously vaccinated with mRNA vaccines expressed a preference for receiving the same type of vaccination[29]. This is also in line with a systematic review and meta-analysis conducted by Prasad *et al.*[31], which assessed the safety of mRNA COVID-19 vaccines during pregnancy. The review observed that COVID-19 immunization appeared to be safe, with a significantly lower risk of stillbirth and no indication of an increased risk of miscarriage, maternal death, or hospital admission. Similarly, in Canada, a study by Fell *et al.*[32] found no significant association between mRNA COVID-19 vaccination during both the second and third trimesters of gestation and an increased likelihood of peripartum complications. In our study, most participants received the mRNA COVID-19 vaccination and were in their third trimester of gestation, which may explain why a booster dose of the COVID-19 vaccine was highly accepted in our sample.

Less than half of the participants reported having received information about a COVID-19 booster dosage, and physicians were identified as the primary source of information. Our findings indicate that sources, such as social media, which are not always associated with official health authorities, disseminate exaggerated and inaccurate information, leading to misconceptions that can negatively impact public health. The misinformation can create fear and anxiety, ultimately affecting the willingness of individuals to receive an effective and safe COVID-19 vaccine that could contribute to ending the pandemic. Therefore, it is recommended that individuals consult and rely on local health authorities for the most accurate and important information[33]. As more safety data becomes available, the recommendations and guidance provided by healthcare providers will play a crucial role in increasing acceptance among this population. Interventions tailored specifically to address vaccine concerns and the specific needs of these patients are of the utmost importance. These efforts can contribute to the development of informed intervention measures aimed at improving vaccine acceptance, particularly considering the growing evidence supporting the necessity of COVID-19 booster immunization to combat the pandemic[34]. Consequently, there is an urgent need to restore trust in vaccines through transparent communication and effective community engagement.

To our knowledge, there is a scarcity of studies utilizing the HBM to explore pregnant women's willingness and reluctance to get a booster dose of the COVID-19 vaccine in Türkiye. Our findings underscore the urgent need to engage pregnant women and adequately prepare for future pandemics, providing them with sufficient motivation to accept booster vaccinations and improve the health outcomes of this population. However, it is crucial to acknowledge certain limitations of the present study. Firstly, the

study was conducted only in Istanbul province and may not be representative of other regions in Türkiye, limiting generalizability. Secondly, the survey relied on self-reported data, which may have resulted in inconsistent interpretations of questions among certain participants, potentially introducing recall bias. Lastly, the participants exhibited a higher overall education level, and their responses may vary depending on personal attitudes, emotions, and inherent biases.

Taken together with our findings, this study reveals that most pregnant women who received the COVID-19 immunization expressed a significant intention to receive a booster dose, regardless of the adverse effects experienced. However, a small percentage of the study sample exhibited hesitancy towards receiving the booster dose. Therefore, to effectively control the spread of SARS-CoV-2, communication with the public about health methods should be developed, and efforts to establish general trust in vaccines may ultimately be necessary. Prenatal vaccination has the potential to protect babies during their early months of life, emphasizing the importance of influencing trust in the rigorous approval of future vaccines for these vulnerable groups and the wider public.

Conflict of interest statement

The authors report no conflict of interest.

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Data availability statement

The data supporting the findings of this study are available from the corresponding authors upon request.

Authors' contributions

AA conceived of the study. AA and ZY reviewed the literature, conducted the quality assessment, and extracted the data. AA developed the methods, supported the data interpretation, and drafted the manuscript. AYÇ, GC, and SB reviewed and collected the data. AA was the project manager and advisor on the project. All authors read and approved the final manuscript.

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