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ORIGINAL ARTICLE

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Knowledge and attitudes of pregnant women about Coronavirus vaccines in Turkiye

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ABSTRACT

The aim of this cross-sectional study was to determine pregnant women's knowledge and attitudes regarding coronavirus vaccines in Turkiye. The research population consisted of 400 pregnant women who applied to a public hospital in this city. The data of the study was collected with the 'Personal Information Form' and 'Attitudes Towards COVID-19 Vaccine Scale'. Only 2% of the pregnant women stated that they wanted to receive coronavirus vaccines in their current pregnancy and 9.5% wanted it during the postpartum period. It has been concluded that the vast majority of pregnant women have insufficient knowledge and negative thoughts about coronavirus vaccines and the place where they live and their thoughts on the safety of coronavirus vaccines affect their positive attitudes about coronavirus vaccines.

IMPACT STATEMENT

- **What is already known on this subject?** Many epidemics in history have been controlled or eliminated with vaccines. However, there is still insufficient evidence about the effects of coronavirus infection and vaccines on pregnant women.
- **What do the results of this study add?** As a result, it was found that the vast majority of pregnant women had insufficient knowledge and negative thoughts about coronavirus vaccines and very few of them wanted to receive the coronavirus vaccine during pregnancy and the postpartum period.
- **What are the implications of these findings for clinical practice and/or further research?** In the light of these findings, it is recommended that increase the vaccination rates in pregnant women by turning existing negative attitudes towards coronavirus vaccines in pregnant women into positive ones, providing accurate and effective information by health professionals and the media to eliminate negative attitudes caused by lack of information in pregnant women, conducting more studies on obstacles to increasing vaccine acceptance during pregnancy, and conducting studies on the subject with wider audiences and regions.

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Vaccine; pregnant; coronavirus; pandemic; attitude

Introduction

The coronavirus infection, which emerged in Wuhan city of Hubei province of China in December 2019, affected the whole world and was declared a pandemic by the World Health Organisation (WHO) (WHO 2020a). In addition to emphasising that social distance, using face-covering masks and personal hygiene rules are the most effective methods in the fight against this pandemic, various vaccines have been developed and these vaccines are ready for use at the end of 2020. Vaccines are the best defense against many infectious diseases, and vaccination against coronavirus continues all over the world (Anderson *et al.* 2020, Krammer 2020, Mello *et al.* 2020). According to current data, it is known that 62.3% of the world population has at least two doses of the coronavirus vaccine (Our World in Data 2022). The Ministry of Health in Turkey carries out vaccination studies in three stages. The health workers, elderly, disabled, people staying in places such as protection houses, employees, and individuals over 65 years old are in the first stage. Priority sectors and individuals aged 50–64 are in the second stage, while those with chronic diseases and those aged 18–49 are in the third stage. Inactivated and mRNA vaccines are used in the fight against COVID-19 infection in Turkey, and 63% of the country has been vaccinated with at least two doses of vaccine and the vaccination process has been completed (Ministry of Health 2022a; Our World in Data 2022). It's not possible to say what proportion this is of all pregnant women, as Turkiye doesn't collect data linking vaccinations, pregnancies, and births.

It has been reported that the admission rate, oxygen, ventilation need, and mortality rates of pregnant women

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infected with coronavirus are higher than non-pregnant women, and they experience adverse pregnancy events such as premature birth, foetal vascular malperfusion, and premature rupture of membranes more frequently, and pregnant women have been classified as a high-risk population during the pandemic by the World Health Organisation (WHO) (Dubey *et al.* 2020, Pirjani *et al.* 2020, WHO, 2020b). Regarding coronavirus vaccines during pregnancy, no adverse events were reported in pregnancy and neonatal outcomes in studies conducted with pregnant women who received the Pfizer-BioNTech vaccine or Moderna vaccine in the United States (Rasmussen *et al.* 2021, Shimabukuro 2021, Lipkind *et al.* 2022). Evidence continues to build showing that coronavirus vaccination before and during pregnancy is safe, effective, and beneficial to both mother and baby. The benefits of receiving a coronavirus vaccine outweigh any potential risks of vaccination during pregnancy (Centers for Disease Control and Prevention [CDC] 2022, Fell *et al.* 2022, Lipkind *et al.* 2022, Ruderman *et al.* 2022). Current guidance from the CDC and the American College of Obstetricians and Gynaecologists (ACOG) recommends that all individuals, including pregnant and recently pregnant people up to six weeks postpartum, receive a booster dose following the completion of their initial coronavirus vaccine. Both organisations advise that initial and booster vaccination may occur in any trimester, and they recommend vaccine receipt as soon as possible to maximise maternal and foetal health (ACOG 2022, CDC 2022). In our country, Turkiye, it is also recommended that pregnant women be vaccinated against coronavirus (Ministry of Health 2022b).

In addition to all these, vaccine hesitations and rejections have started to occur against coronavirus vaccines developed within the scope of combating today's pandemic, and negative attitudes and various concerns against coronavirus vaccines in pregnant women could not be prevented. In a study conducted with 713 participants to evaluate coronavirus vaccine hesitancy and vaccine refusal in the United States, it was reported that 33% of the participants were hesitant to be vaccinated and 18.4% refused the coronavirus vaccine (Shih *et al.* 2021). In another study conducted in Japan, it was reported that 46 of 113 pregnant women were hesitant about getting the coronavirus vaccine (Saitoh *et al.* 2022). In a study conducted with parents with at least one child in Italy, it was reported that 12.4% of 394 parents experienced coronavirus vaccine hesitancy. Oladejo *et al.* (2016) emphasised that vaccine hesitancy is a global threat to the fight against vaccine-preventable diseases (Oladejo *et al.* 2016, Bianco *et al.* 2022). Therefore, it is of great importance to inform the public about the importance of vaccination health professionals, to identify negative attitudes about coronavirus vaccines, and correct them with counselling (WHO 2020b; Dula *et al.* 2021, Rasmussen *et al.* 2021). In addition, determining the knowledge levels and attitudes of pregnant women about coronavirus vaccines will help plan effective counselling by health professionals and conduct studies on the subject in the literature. This study aims to determine the knowledge and attitudes of pregnant women regarding coronavirus vaccines.

Materials and methods

Ethical issues

This study was approved by The Ethics Committee of the Aydın Adnan Menderes University Faculty of Health Sciences Non-Invasive Clinical Research Ethics Committee (Protokol No:2021-020) and Institutional permission was obtained from Tekirdag Provincial Health Directorate (Number: E-12641312-044). Pregnant women included in the study were informed about the study and their written and verbal consent was obtained. Participants were informed about the criteria for choosing the study, the aims of the study, and the consequences if they chose not to participate. Anonymity and confidentiality were taken as the basis for information sharing and report writing, and the participants were informed about this issue. No name or identity information was mentioned in this report. Paper forms were securely stored by one of the research team members. To use the Attitudes Towards COVID-19 Vaccine Scale in the study, permission was obtained from the authors of the scale via e-mail. The study was carried out by the ethical standards specified in the 1964 Declaration of Helsinki and its subsequent amendments.

Study design and participants

The cross-sectional study was conducted in a public hospital in Tekirdag, Turkiye, between September 2021 and January 2022. Tekirdag is located northwest of Turkiye, on the northern shore of the Sea of Marmara. Tekirdag has a population of 204,001. There is one public hospital in the city centre and it serves a large population. In addition to Tekirdag Fehmi Cumalioglu City Hospital, there are two private and one university hospital in this province. The fact that this public hospital serves a large population and is free of charge enables pregnant women of different socioeconomic levels to receive service from this hospital. For this reason, it was found appropriate to conduct the study in this hospital, which serves people from different socio-economic levels and different settlements (urban and rural settlements). The research population consisted of pregnant women who applied to this hospital for routine control. The calculation of the sample size in the study was made based on the data in the study of Goncu Ayhan *et al.* (2021). According to the data of this study, the effect size = 0.19 was found in the calculation made by taking power: 0.95, $\alpha = 0.05$, $n = 300$ with the G*Power 3.1.9.2 program. The minimum number of individuals to be included in the sample of this study was calculated with G*Power 3.1.9.2, effect size = 0.19, $\alpha = 0.05$, power = 0.95, and found to be $n = 362$, increasing the sample size by 10%, and the study has completed a total of 400 people ($n = 400$).

The criteria for inclusion in the study were determined as being between the ages of 18 and 49, being able to read and understand Turkish, volunteering to participate in the study, and being pregnant. Pregnant women who had any health problems during pregnancy (such as preeclampsia, gestational diabetes, Rh incompatibility), who used drugs, who had complications related to vaccination at any time in

their life, and who had coronavirus vaccine before their current pregnancy were excluded from the study. A total of 525 people were reached and 88 (16.7%) of these people were not included in the study. Reasons for not being included in the study of participants were as follows: 23 women experienced pregnancy complications, 21 women could not speak Turkish, 15 women had time problems, 18 women were anxious because of the pandemic, and 11 women did not state any reason. No attempt was made to measure response bias in non-responders. However, those who did not respond refused to participate in the study, not because the subject of the study was 'vaccine', but because they did not know about the research subject.

Pilot application

A pilot application was performed with 10 women to determine the applicability of the Personal Information Form. As a result of the preliminary application, improvements were made to the Personal Information Form and these data were not included in the study.

Data collection

The collection of data started after the approval of the ethics committee and the permission of the institution and was collected in the obstetrics outpatient clinics of the hospital during working hours. During the examination in the outpatient clinic, the researcher was stood by the physician, and after the examination was over, the pregnant woman was talked to and informed about the study. The pregnant women who met the study criteria and agreed to participate in the study were taken to a separate room and the questions in the Personal Information Form were asked by the researcher through face-to-face interviews. Afterward, pregnant women were provided to fill in the Attitudes Towards COVID-19 Vaccine Scale themselves. Data collection took an average of 15 minutes. During the data collection process, after filling out all the forms, the researcher checked whether there were any deficiencies in the forms, and in case of deficiencies, the participant was asked to answer the missing questions in the form and complete the form completely. No payment or gift was given to the pregnant women who participated in the study.

Data collection tools

The Personal Information Form, prepared in line with the current literature, consisted of a total of 30 questions. This form included 10 questions including age, education level, income level, family type, etc. sociodemographic characteristics, 6 obstetric questions questioning the gestational week, number of pregnancies, number of living children, planned pregnancy, and receiving antenatal care, and 14 questions about having coronavirus disease, being vaccinated during pregnancy, getting information about coronavirus and vaccines and information from which sources, attitudes, and thoughts about coronavirus vaccines (Ceulemans *et al.* 2021, Chen *et al.* 2021, Dula *et al.* 2021, Rasmussen *et al.* 2021, Shimabukuro 2021).

The Attitudes Towards COVID-19 Vaccine Scale: The Attitudes Towards COVID-19 Vaccine Scale developed by Geniş *et al.* (2020) has nine items and has two sub-dimensions (positive and negative attitudes). The statements in the scale are evaluated as 'Strongly disagree (1)', 'Disagree (2)', 'Undecided (3)', 'Agree (4)', and 'Strongly agree (5)'. Items in the negative attitude sub-dimensions are scored inversely. A value between 1 and 5 is obtained by dividing the total score obtained by summing the item scores in the scale sub-dimension by the number of items in that sub-dimension. High scores obtained from the positive attitude sub-dimension indicate that the attitude towards the vaccine is positive. The items in the negative attitude sub-dimension are calculated after they are reversed, and the high scores in this sub-dimension indicate that the negative attitude towards the vaccine is less. Inverse items were coded as 1→5; 2→4; 3→3; 4→2; 5→1. In the study of Geniş *et al.* (2020), the Cronbach's Alpha value of the scale was reported as 0.80 (Geniş *et al.* 2020).

Data analysis

The data of the study were analysed using the Statistical Package for the Social Sciences (SPSS) package program v.22. Descriptive data were expressed as a number, percentage, arithmetic median/mean, standard deviation, and minimum-maximum. Before starting the analysis, the Kolmogorov Smirnov test was performed in terms of whether the data had extreme values and normality assumptions. Student *t*-test was used to compare the mean scores of the Attitudes Towards COVID-19 Vaccine Scale between two groups for variables suitable for the parametric test conditions, and the Single Factor Analysis of Variance test was used to compare more than two groups. For the variables that did not meet the parametric conditions, the Mann-Whitney U test was used in the comparison of two groups, and the Kruskal Wallis test was used in the comparison of more than two groups. Linear Regression Analysis Enter method was used to determine the relationship between the variables that were significant in these analyzes and the total scores of the positive and negative subscales of the Attitudes Towards COVID-19 Vaccine Scale. Before the Linear Regression Analysis was performed, the categorical data were coded by making the dummy variable. The beta coefficient (β) for each variable in the multivariate linear regression model is presented. In the two-sided linear regression models, odds ratios (ORs) and their 95% confidence intervals (CIs) were used in the measurement of independent associations between the different variables and the outcomes of interest. All tests were two-tailed, and a p-value of < 0.050 was considered statistically significant for all analyses.

Results

A total of 400 pregnant women were included in this study (Table 1). The mean age of the pregnant women participating in the study was 26.33 ± 4.96 (min: 18, max: 39) years and

Table 1. Socio-demographic and obstetric characteristics of pregnant women (*n*: 400).

Characteristics	*n*	%
Educational status		
Primary-Secondary School	164	41.1
High school/equivalent	187	46.8
University/College	49	12.3
Work status		
Working	73	18.2
Not working	327	81.8
Income status perception		
Poor	199	49.8
Middle	172	43.0
Good	29	7.2
Family type		
Nuclear family	360	85.0
Extended family	40	15.0
Living place		
Village/Town	36	9.0
City centre	364	81.0
Number of Pregnancy		
Primiparous	118	29.5
Multiparous	282	70.5
Existence of living children		
Yes	258	64.5
No	142	35.5
The planned state of pregnancy		
Planned	286	71.5
Unplanned	114	28.5
Regular antenatal care status		
Yes	166	41.5
No	234	58.5
Age, years, mean ± SD* 26.33 ± 4.96	Min-max (18–39)	
Week of pregnany, mean ± SD* 26.05 ± 8.32	Min-max (10–40)	
Number of pregnancies, mean ± SD* 2.21 ± 1.06	Min-max (1–5)	
Number of living children, mean ± SD* 1.79 ± 0.90	Min-max (0–5)	

*Standard deviation.

70.5% were multiparous and 41.5% had regular health check-ups during pregnancy (Table 1).

It was determined that 13.3% of the pregnant women participating in the study had coronavirus infection, 84% had any vaccine during pregnancy and all of these vaccines were tetanus vaccines. It was determined that only 2% ($n = 8$) of the pregnant women wanted to have coronavirus vaccines in their current pregnancy, and 85% did not want to be vaccinated. It was determined that 9.5% ($n = 38$) of the pregnant women thought to have coronavirus vaccines in the postpartum period, 42.8% did not think, and 47.7% were undecided (Table 2).

To determine the factors affecting the positive and negative attitude sub-dimension scores of the pregnant women in the 'Scale of Attitudes Towards the COVID-19 Vaccine', an analysis was made between the socio-demographic and obstetric characteristics of the pregnant women, their knowledge of coronavirus infection, and vaccines, and the scale mean scores. In the Mann Whitney U, Kruskal Wallis, t-test and analysis of variance, it was determined that there was a relationship between the living place of the pregnant women, the thought about the safety of the coronavirus vaccine, and the mean scores of positive attitudes sub-dimension, while there was a relationship between planned pregnancy status, wanting to be vaccinated against coronavirus during pregnancy and the mean scores of negative attitudes sub-dimension ($p < 0.05$). Linear regression analysis was performed on these factors which related to the positive and negative attitude sub-dimension score averages. When these factors were analysed with the enter method in the linear regression analysis, it was determined that there was a significant relationship between the living place, the thoughts about the safety of coronavirus vaccines, and the positive sub-dimension score averages of the pregnant women in the Attitudes Towards COVID-19 Vaccine Scale ($p = 0.001$). It was determined that the positive attitude sub-dimension score averages of the pregnant women were higher than those living in the urban area (0.200 points) and those who were undecided about the safety of the coronavirus vaccine (0.123 points) compared to those who thought it was unsafe (0.123 points), and this difference was statistically significant ($p = 0.017$ and $p = 0.022$, respectively). In the model created with the parameters of the planned pregnancy status and the state of wanting to be vaccinated against coronavirus during pregnancy, which found a significant relationship with the negative attitude sub-dimension, no significant factor was found (Table 3).

Discussion

It is known that the lack of information about the transmission and prevention methods of epidemics increases the spread of epidemics, so it is important to inform society about the prevention methods in a timely and accurate manner (Wong *et al.* 2014). In our study, it was determined that the rate of getting information about coronavirus vaccines in pregnant women was quite low, the media was the first source of information about coronavirus vaccines, healthcare professionals as sources were in the second place, and almost all the pregnant women found the information they receive as insufficient. Unfortunately, it is clear that the knowledge level of pregnant women about coronavirus vaccines is low and the source of information is not reliable. The fact that the coronavirus pandemic is a situation encountered for the first time has led to the emergence of much unrealistic news on social media. When the studies examining the relationship between the attitude towards being vaccinated against coronavirus and fake news in the media were evaluated, it was reported that false news about coronavirus vaccines negatively affects the decision of individuals to be vaccinated and reduces the desire to be vaccinated (Lockyer *et al.* 2021, Loomba *et al.* 2021, Kricorian *et al.* 2022). In addition, current studies report that health care providers and information sources such as scientific journals containing studies on the subject have a positive effect on individuals' vaccination attitudes (Wang *et al.* 2021, Di Giuseppe *et al.* 2021a). In addition, although state policies seem to be effective in the positive attitude of pregnant women towards vaccines, the influence of people and groups that can affect the masses in terms of religion, health, and magazines is also very important. For this reason, it should be considered that the negative messages of the media about vaccines have a significant impact on pregnant women and it should be ensured that positive publications about vaccines are presented in plain and understandable language. Evidence-based and personalised information about vaccines is needed to increase the knowledge level of pregnant women about

Table 2. Information and thoughts of pregnant women about getting coronavirus infection and coronavirus vaccines ($n = 400$).

Parameters	n	%
The state of being infected with coronavirus		
Infected	53	13.3
Time of coronavirus infection ($n = 53$)		
During pregnancy	17	32.0
Receiving any vaccination during pregnancy		
Yes*	336	84.0
Status of getting information about coronavirus vaccines		
Yes	29	7.3
Source of information about coronavirus vaccines ($n = 29$)		
Healthcare professional	12	41.3
Media (such as TV, social media)	17	58.7
The situation of finding the information about coronavirus vaccines sufficient ($n = 29$)		
Insufficient	26	89.6
Thoughts on the effectiveness of coronavirus vaccines		
Effective	241	60.3
Not effective	58	14.5
Don't know	101	25.2
Thoughts on the safety of coronavirus vaccines		
Safe	37	9.2
Not safe	117	29.3
Don't know/undecided	246	61.5
Thoughts on the administration of coronavirus vaccines to pregnant women		
Should be applied	19	4.8
Should not be applied	189	47.2
No idea/Undecided	192	48.0
Status of wanting to be vaccinated against coronavirus during pregnancy		
Yes	8	2.0
No	340	85.0
Undecided	52	13.0
Reasons for not wanting to be vaccinated during pregnancy ** **($n = 415$)**		
I think this vaccine is not safe during pregnancy	130	31.4
There will be a side effect/harm to my baby	93	22.5
I think that the side effects of the vaccine are not well/sufficiently studied.	85	20.4
I think the vaccine is more harmful than the infection	44	10.6
There will be a side effect/harm to myself	37	8.9
I think the vaccine is not effective in preventing infection	26	6.2
Status of wanting to be vaccinated after pregnancy		
Yes	38	9.5
No	171	42.8
Undecided	191	47.7
Reasons for not wanting to be vaccinated in the postpartum period ($n = 38$)		
There will be a side effect/harm to my baby	13	34.2
I think that the side effects of the vaccine are not well/sufficiently studied.	13	34.2
I think the vaccine is not effective in preventing infection	5	13.2
There will be a side effect/harm to myself	3	7.8
I think this vaccine is not safe during breastfeeding	2	5.3
I think the vaccine is more harmful than the infection	2	5.3

*All of them had tetanus vaccine; **More than one answer has been given.

Table 3. Linear regression analysis of the factors affecting the mean scores of the positive and negative attitude sub-dimensions of the 'Pregnants Attitudes Towards COVID-19 Vaccine' Scale.

Parameters	*B* (%95 CI)	Beta	*t*	*p*
Positive Sub-dimension*				
(Constant)	–	–	–	**0.000**
Living place (Urban)	0.20 (0.04–0.36)	0.12	2.40	**0.017**
Thoughts on the safety of the coronavirus vaccine (not safe)				
Safe	0.14 (0.04–0.34)	–0.08	–1.54	0.125
Don't know/Undecided	0.12 (0.02–0.23)	0.12	2.29	**0.022**
Negative Sub-dimension**				
(Constant)	–	–	–	**0.00**
Status of pregnancy (planned)	0.06 (–0.12 to 0.16)	0.06	1.44	0.148
Status of wanting to be vaccinated against coronavirus during pregnancy (not wanting)				
Wanting	0.03 (–0.26 to 0.33)	0.02	0.22	0.825
Undecided/No idea	–0.01 (–0.04 to 0.02)	–0.09	–0.76	0.451

B: Non-standardised coefficient;, CI: Confidence interval; Beta: Standardised coefficient.
*$F = 5.92$, $p = 0.001$, Adj. $R^2 = 0.04$ Standard Error = 0.47.
**$F = 2.96$, $p = 0.032$, Adj. $R^2 = 0.02$ Standard Error = 0.42.

vaccines, to access safe sources, and to support their decision-making, and this information should be provided by health professionals (Chen *et al.* 2021, Munoz 2021, Riley and Jamieson 2021, Skjefte *et al.* 2021, Tao *et al.* 2021).

It is stated that pregnant women generally have a lower desire to be vaccinated against vaccine-preventable diseases than the general population (Offeddu *et al.* 2019, Wang *et al.* 2019). In our study, it was found that the vast majority of

pregnant women stated that they should not be given coronavirus vaccines or that they had no idea/indecisiveness about this issue, and they did not find coronavirus vaccines safe. Similarly, it is seen that very few pregnant women think that coronavirus vaccines can be administered to pregnant women, while the majority of them state that coronavirus vaccines should not be administered to pregnant women or that they have no idea/decided about this issue. Studies show that there was no increase in miscarriage, congenital anomaly, foetal growth retardation, preterm birth, or stillbirth in women who have been vaccinated against coronavirus during pregnancy compared to the general obstetric population and that there is no safety concern in short-term obstetric and neonatal outcomes (Bookstein Peretz 2021, CDC 2022, Fell *et al.* 2022, Lipkind *et al.* 2022, Ruderman *et al.* 2022). In addition, this result of our study shows similar characteristics when compared with the results of current studies conducted in other geographical regions in the world. Accordingly, fear of the side effects of the vaccine and the belief that the vaccine is not safe and effective seem to be important factors in vaccine hesitancy (Chen *et al.* 2021, Dula *et al.* 2021, Di Giuseppe *et al.* 2021b). These findings of our study show that information and education about coronavirus vaccines should be presented to society with more accurate and reliable sources.

Vaccines and their effects, which have come to the fore again with the global coronavirus pandemic today, have led to the emergence of negative thoughts, especially in pregnant women about their own and their baby's health, and the emergence of an anti-vaccine situation (Flannery *et al.* 2021). Our study determined that only 2% ($n = 8$) of pregnant women want to receive coronavirus vaccines. The rate of pregnant women who were thought to be vaccinated during the postpartum period was also very low (9.5%). In studies, it was reported that the vaccine acceptance rate of pregnant women for coronavirus infection was 61% in six European countries, 37% in Turkiye, and 20.8% in Israel (Wainstock *et al.* 2021, Goncu Ayhan *et al.* 2021). In a study conducted with 939 pregnant women in the United States, it was reported that only 41% of the participants would be vaccinated for coronavirus, and 82% were hesitant because they were worried about vaccine safety for their pregnancy (Battarbee *et al.* 2022). International organisations support the administration of coronavirus vaccines to all pregnant and lactating women (WHO 2021, ACOG, 2022, Society for Maternal-Foetal Medicine 2020). In our study, the vaccination rate during pregnancy was considerably lower than in Turkiye and other countries' data. The reasons why pregnant women do not want to be vaccinated during pregnancy and postpartum period were the thought that vaccines will cause side effects/harm to their babies, the vaccine has not been adequately studied and the vaccine is not effective, respectively. In a study, the reasons why pregnant women do not want to be vaccinated were reported as 'not seeing the current disease as an important health problem, difficulties in accessing the vaccine, insufficient training of health personnel on the subject, concerns about the content and side effects of the vaccines, negative thoughts from word of mouth, religious beliefs, and exemplary anti-vaccine people who have an impact on the society' (Dula *et al.* 2021, Riley and Jamieson 2021). Although the order of our findings varies, they were similar to the findings of this study. Investigation of the reasons why pregnant women do not want to have coronavirus vaccines and informing them about the reason, that the possibility of side effects of coronavirus vaccines for the baby and himself is very low, and that they may be more affected if they are infected as unvaccinated, should be explained to the pregnant women (Flannery *et al.* 2021, Munoz 2021).

In our study, it was found that pregnant women living in urban areas had better attitudes towards coronavirus vaccines than those living in rural areas, and those who were undecided about the safety of coronavirus vaccine compared to those who thought it was unsafe. The following results were reported in a multicenter study conducted by Ceulemans *et al.* (2021) involving a total of 16,063 women (including 6,661 pregnant and 9,402 breastfeeding women) and jointly conducted in Belgium, Norway, Netherlands, Switzerland, Ireland, and the United Kingdom: Despite the differences between countries, COVID-19 vaccine hesitancy was detected in approximately half of the pregnant women, education level and employment status were associated with vaccine hesitancy, and as a result of the study, it was emphasised that health professionals should increase positive attitudes towards vaccines and eliminate insecurity (Ceulemans *et al.* 2021). The findings of the study conducted in parallel with our study findings also show that some sociodemographic factors of women, such as living in an urban area, high education level, and access to health institutions, affect women's attitudes towards coronavirus vaccines (Ceulemans *et al.* 2021, Chen *et al.* 2021). We believe that these findings may be because the education level of the people living in the cities is higher, their access to health institutions is easier and their health literacy level is higher. In addition, it is important to develop evidence-based strategies for health professionals to provide individual training and counselling about vaccines, increase positive attitudes towards vaccines, eliminate insecurity, and even turn the decisions of those who are undecided into positive ones.

As a result, many pregnant women did not want to get vaccinated against coronavirus, the rate of those who receive information about coronavirus vaccines was very low, the majority of them did not receive information from reliable sources, and the vast majority of pregnant women did not find the vaccines safe or were undecided about them, and they believed that coronavirus vaccine should not be administered during pregnancy. In addition, the factors affecting the positive attitudes of pregnant women towards coronavirus vaccines were that pregnant women live in the city centre and 'don't know/are indecisive' about the safety of the coronavirus vaccine (according to those who think the vaccine is not safe). In the light of these findings, it is recommended that increase the vaccination rates in pregnant women by turning existing negative attitudes towards coronavirus vaccines in pregnant women into positive ones, providing accurate and effective information by health professionals and the media to eliminate negative attitudes caused by lack of information in pregnant women,

conducting more studies on obstacles to increasing vaccine acceptance during pregnancy, and conducting studies on the subject with wider audiences and regions.

Limitations of the study

This study has several limitations. First, our study was conducted only in a city centre and a public hospital. Therefore, the findings cannot be generalised to the whole country. Since the pregnant women who came to the hospital to receive health services (health-consciousness/good economic status) were included in the study, the pregnant women who did not receive health care services/who received limited health services (who could not reach health services due to pandemic or economic reasons or had low health literacy) could not be evaluated. In addition, participation in the survey was voluntary, the survey information might have drawn more attention from those who were concerned about the COVID-19 pandemic and vaccine. Therefore, there might have been some level of self-selection bias. Second, the survey was a cross-sectional study that collected responses from the participants during a specific period. Therefore, the responses only reflect the information available at that time. Finally, another limitation of the study was that the pregnant women answered the questions according to their reports.

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