Disaster Medicine and Public Health Preparedness

www.cambridge.org/dmp

COVID-19 Vaccine Acceptance Among Pregnant, Lactating, and Nonpregnant Women of Reproductive Age in Turkey: A Cross-Sectional Analytical Study

Zeynep Daşıkan PhD, RN[1], Ebru Cirban Ekrem MSc, RN[2] and Didem Kıratlı PhD, RN[3]

[1]Ege University Faculty of Nursing, Department of Women's Health and Diseases Nursing Izmir, Izmir, Turkey; [2]Bartin University, Department of Nursing, Faculty of Health Sciences, Bartın, Turkey and [3]University of Health Sciences Dr. Behçet Uz Pediatric Diseases and Surgery Training and Research Hospital, Izmir, Turkey

Original Research

Cite this article: Daşıkan Z, Ekrem EC, Kıratlı D. COVID-19 vaccine acceptance among pregnant, lactating, and nonpregnant women of reproductive age in Turkey: A cross-sectional analytical study. *Disaster Med Public Health Prep*. **17**(e505), 1–11. doi: https://doi.org/10.1017/dmp.2023.142.

Keywords:
breastfeeding; pregnant; vaccine acceptance; vaccine hesitancy; reproductive health

Corresponding author:
Zeynep Daşıkan;
Email: zeynep.dasikan@ege.edu.tr.

Abstract

Objective: This study aims to identify the rates of coronavirus disease 2019 (COVID-19) vaccine acceptance, the reasons for receiving and not receiving the vaccine, and the associated factors among pregnant, lactating, and nonpregnant women of reproductive age.

Methods: This cross-sectional and analytical study was conducted online in Turkey, at the end of the fourth wave of the COVID-19 pandemic, between February and May 2022. A total of 658 women (230; 35% pregnant) (187; 28.4% lactating) (241; 36.6% nonpregnant) women of reproductive age participated in the study.

Results: Vaccine acceptance rates were found to be 91.7% in nonpregnant women of reproductive age, 77% in lactating women, and 59% in pregnant women ($P < 0.05$). The highest rate of vaccine hesitancy was observed in pregnant women (31.3%), and vaccine rejection rate was the highest in lactating women (10.2%). Pregnancy (odds ratio [OR] = 3.98; confidence interval [CI] = 1.13-14.10), and the breastfeeding period (OR = 3.84; CI = 1.15-12.78), increased vaccine hesitancy approximately four times.

Conclusions: Lack of knowledge about and confidence in the COVID-19 vaccine is still one of the barriers to vaccine acceptance today. Health-care providers (HCPs) should provide effective counseling to pregnant, lactating, and nonpregnant reproductive-aged women based on current information and guidelines.

Coronavirus disease 2019 (COVID-19) is a contagious acute respiratory infection and a global public health problem. The September 2022 data of the World Health Organization (WHO) report that 620 million people have been infected with the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) virus so far, and 6.5 million people died.[1] Due to the immunological and cardiopulmonary changes that occur during pregnancy, it is stated that pregnant and lactating women have a higher risk of serious morbidity and mortality from respiratory infections such as influenza or SARS than nonpregnant women.[2–4] Compared with healthy pregnant women, pregnant women infected with COVID-19 have abortus, gestational hypertension, thromboembolism, and premature birth. In terms of fetal and neonatal outcomes, the chances of encountering fetal distress, low birth weight, hospitalization in the intensive care unit, invasive ventilation, and stillbirth risk increase.[2,4–6] In addition, there are studies in the literature stating that the clinical symptoms of COVID-19 in pregnant women are similar to those in nonpregnant women.[7,8] There is no direct evidence of intrauterine vertical transmission of SARS-CoV-2 during pregnancy, and the risk of transmission through breast milk is very low.[4,6] In addition, it was found that the mode of delivery did not cause a difference in COVID-19 transmission to newborns; however, it was revealed that COVID-19 infection increased the cesarean section rates considerably (77-91%) and negatively affected the mode of delivery.[6,9]

There has been no specific treatment for the disease since the onset of the COVID-19 pandemic.[10] Vaccination is a proven method to cope the COVID-19 pandemic and is being implemented globally.[2,3] Vaccination is essential to prevent negative consequences in pregnant, lactating, and reproductive age populations as well as in the whole society. Many vaccines are recommended during pregnancy, as maternal antibodies pass into the fetal circulation by means of the transplacental route and protect the newborn. Thus, the vaccine administered can protect the mother, fetus, and baby.[11] Pregnant and lactating women were not included in the development trials of the COVID-19 vaccine due to concerns about possible adverse consequences of the vaccine to the fetus/newborn or to the breastfeeding process. Therefore, there are limited data on vaccine safety and pregnancy and breastfeeding outcomes compared with the general population.[4,12]

SDMPH
SOCIETY FOR DISASTER MEDICINE & PUBLIC HEALTH

Major organizations such as the Center for Disease Control and Prevention (CDC), American College of Obstetricians and Gynecologists (ACOG), Society for Maternal-Fetal Medicine (SMFM), and the World Health Organization (WHO) have recommended that pregnant and lactating women be vaccinated against COVID-19,[13,14] and many countries have provided vaccine guidance for pregnant and lactating women.[12] It has also been reported that COVID-19 vaccines provide protection for the baby through breastfeeding.[13,14] Controversies regarding the use of vaccines in high-risk pregnant and lactating women still continue.[12]

Women of reproductive age planning pregnancy may have significant concerns about the effects of the COVID-19 vaccine on reproductive health and the infertility process.[2] There is no evidence that COVID-19 vaccines can affect the fertility of women or men. In addition, it is reported that people who have infertility treatment, frozen embryo transfer, egg freezing, ovulation induction, intrauterine insemination, and oocyte or who donate sperm can safely vaccinate against COVID-19.[15]

Vaccine hesitancy in the fight against COVID-19 is considered a public health threat.[16] The success of the vaccines depends not only on their efficacy but also on their acceptance.[12,17] COVID-19 vaccine acceptance should be between approximately 67% and 80% in the general population to reduce the spread of the disease.[18] Studies conducted with the general population in some countries revealed that the COVID-19 vaccine acceptance rates range from 70% to 91%.[16,19–21] The rate of vaccine hesitancy is 28.5% globally,[22] while it is 31% in Turkey.[23]

Pregnant and lactating women are more likely to refuse vaccination than nonpregnant women due to the unknown long-term health effects of the vaccine on the fetus/newborn, concerns about losing the fetus, and lack of research on vaccines.[5,12,17] In addition, many factors such as gender, region of residence, race, ethnicity, education level, employment status, past vaccination experiences of individuals, perceived health risk, recommendation of the vaccine by health professionals, and the efficacy and safety of the vaccine affect vaccine acceptance.[12,16,17] The number of studies investigating COVID-19 vaccine acceptance and the motivating factors, and the causes of vaccine hesitancy among pregnant, lactating and reproductive age women is limited. In addition, it is thought that this study will be an important scientific resource against future pandemics, as it provides evidence about vaccine acceptance and motivations for pregnant, lactating, and reproductive age women. The present study aims to reveal the rates of COVID-19 vaccine acceptance among pregnant, lactating, and nonpregnant women of reproductive age, and to identify the factors motivating this population to receive the vaccine, the barriers to receiving the vaccine, and the associated factors.

Methods

Design

This cross-sectional and analytical study was conducted online in Turkey at the end of the fourth wave of the COVID-19 pandemic, between February and May 2022. The National COVID-19 vaccination program in Turkey started with the Sinovac vaccine on January 13, 2021, and the Pfizer-BioNTech vaccine was included in the program on April 12, 2021. The first stage of the vaccination program included health workers and disadvantaged individuals (disabled, those living in nursing homes, elderly people over 65). In the second stage of the vaccination program, individuals working in the service sector and those between the ages of 50 and 64 were vaccinated. The third stage of the vaccination program included individuals between the ages of 17 and 49. At least 2 doses of vaccination have been completed at the country level in the age group studied.[24]

Sample

The target population of the study consisted of pregnant women, lactating women, and nonpregnant women of reproductive age. The number of women in the 18-49 age group in Turkey is approximately 22 million.[25] No sample selection was performed in the study. A total of 658 pregnant, lactating, and nonpregnant women who were literate in Turkish, who had Internet access, and who agreed to participate in the study on the specified dates were included in the study. The study aimed to reach women admitted to the clinics and polyclinics of 2 public hospitals in İzmir in the west of Turkey and 2 public hospitals in Bartın and Ordu in the north of Turkey. It was aimed to reach the following groups of women: (a) those between the ages of 18 and 49 admitted to Obstetrics and Gynecology clinics or polyclinics; (b) women in the Pediatrics Unit, Newborn Services, and Healthy Child Follow-up Polyclinics for examination or visit; (c) women in the breastfeeding counseling groups; and (d) women who take part in groups on social media (Instagram, Facebook), where information and counseling on mother-baby care issues of the same hospitals are provided.

The data were collected by distributing the leaflet containing the research information and quick response (QR) code and sharing the research link online on social media. Leaflets containing QR codes were hung in the waiting rooms and breastfeeding rooms of the hospital. Women were informed about access by means of QR code on the leaflet. In addition, the QR-coded brochure was shared with the women in the waiting rooms by the researchers. Informed consent was obtained from the participants before moving on to the survey items on the survey platform. An average of 6-8 min is needed to fill out the survey. Data were based on self-report of the participants.

Instruments

Question form

The form developed by the researchers in line with the literature consisted of 3 parts and same questions were posed to all 3 groups (pregnant women, lactating women, and nonpregnant women of reproductive age). The first part included 8 questions regarding the demographic characteristics of the participants (age, marital status, education level, region of residence, employment status, and perception of monthly income, etc.) and 11 questions on obstetric characteristics (number of pregnancies and births, reproductive age period, gestational age, and postpartum period [in months], pregnancy and postpartum problems, and breastfeeding). The second part included 4 questions on the history of COVID-19 infection, the history of influenza vaccination in the past 2 y, and the history of previous vaccination rejection. The third part included 7 questions regarding the COVID-19 vaccine acceptance status (1 = yes; 2 = no), and those who selected "yes" were asked how many doses of the vaccine they received in total; which type of vaccine (Pfizer/BioNTech vaccine, SinoVac) and how many doses they received; vaccine information sources; and reasons for vaccine acceptance, vaccine rejection, and vaccine hesitancy.[2,4,10,12,17,18,26,27] The questionnaire form used in the study was sent to 3 experts in the field to evaluate its validity and reliability. Necessary adjustments were made to the questionnaire form after expert

https://doi.org/10.1017/dmp.2023.142 Published online by Cambridge University Press

opinions. Before starting the research, a pilot study was conducted with 15 women.

The fear of COVID-19 scale

The scale was developed by Ahorsu et al. in 2020 to reveal the level of fear related to COVID-19. The scale was adapted to Turkish culture.[28] The scale consists of "7" items under "1" factor, and the items are rated on a 5-point Likert type scale from "1" (strongly disagree) to "5" (strongly agree). The minimum and maximum scores that can be obtained from the scale are 7 and 35 points, respectively, and no items in the scale are reverse-coded. Higher scores indicate greater levels of fear of COVID-19. The Cronbach's alpha internal consistency coefficient for the Turkish version of the scale is .84. In this study, the Cronbach's alpha was calculated as .85.

Statistical Analysis

The Statistical Package for the Social Sciences version 23.0 package program (IBM Corp.; Armonk, NY) was used to analyze the data. Frequency (percentage) was calculated for categorical variables. Mean (standard deviation), median (interquartile range (IQR), and minimum-maximum values were calculated for continuous variables. The Kolmogorov-Smirnov and Shapiro-Wilk tests were performed to test whether the research data showed normal distribution. In the evaluation of COVID-19 vaccine acceptance, vaccine rejection was coded as "0" dose, vaccine hesitancy was coded as "1" dose, and vaccine acceptance was coded as ≥ "2" doses. The Kruskal-Wallis test, the Mann-Whitney U-test, and the chi-squared test or Fisher's exact test were used in group comparisons and vaccine acceptance analysis. The level of significance was set at $P < 0.05$ in the analysis of the data. The regression model could not be performed as there were no strong predictors affecting vaccine acceptance on a group basis. The multinomial logistic regression analysis was performed to identify the potential predictors of COVID-19 vaccine acceptance or rejection and hesitancy rates for all participants, including the associated variables and baseline demographic data. All inferential tests were performed with an assumed confidence level (CI) of 95% and significance level (Sig.) $P < 0.05$.

Results

Basic Characteristics of the Participants

A total of 658 women (230; 35% pregnant, 187; 28.4% lactating, and 241; 36.6% nonpregnant) of reproductive age participated in the study. The main characteristics of the participants are presented in Table 1 according to the groups. A total of 22.2% of the pregnant women and 24.6% of the lactating women were found to have encountered a problem during pregnancy and lactation, and 89.8% of the lactating women were found to breastfeed. The level of fear of COVID-19 was found to be moderate. It was revealed that 9.1% of the participants had influenza vaccination in the past 2 y, and 5.9% had a history of vaccination rejection. The history of influenza vaccination and vaccination rejection was higher in nonpregnant women of reproductive age compared with pregnant and lactating women ($P < 0.05$). The comparison of the main characteristics of the pregnant women, the lactating women, and the nonpregnant women of reproductive age showed that there was no significant difference only between perceived income level and the COVID-19 fear level scores ($P > 0.05$), and there was a significant difference between other variables ($P < 0.05$) (Table 1).

Vaccine Acceptance, Reasons for Vaccine Acceptance or Rejection, and Hesitancy, Sources of Information

The COVID-19 vaccine acceptance rate in women of reproductive age (18-48 y) was found to be 76.3%. Vaccine acceptance rates among the groups were as follows: nonpregnant women of reproductive age (91.7%), lactating women (77%), and pregnant women (59%; $P < 0.05$). Vaccine hesitancy was the highest in pregnant women (31.3%), and vaccine rejection was the highest in lactating patients (10.2%). The median COVID-19 vaccine acceptance dose was calculated as three in pregnant and lactating women and as four in nonpregnant women of reproductive age, and a highly significant difference was observed between the groups ($p < 0.05$). The median dose of the Sinovac vaccine was "2" in all reproductive age groups, and the median dose of Pfizer/BioNTech vaccine was 1 in pregnant and lactating women, and 2 doses in nonpregnant women of reproductive age ($P < 0.05$). Health personnel were reported as the first source of information about COVID-19 vaccine. However, this rate was found to be significantly higher in pregnant women (80.4%) than in lactating (74.3%) and nonpregnant women of reproductive age (65.1%) ($P < 0.05$). The nonpregnant women of reproductive age preferred statements/websites of the Turkey Ministry of Health and World Health Organization (63.9%) and scientific publications such as books/magazines/articles (24.9%) to receive information about COVID-19, while the pregnant (45.2%) and lactating (40.6%) women were found to obtain information more from family and friends than women of reproductive age (29.0%; $P < 0.05$) (Table 2).

The first reason why pregnant (55.5%) and nonpregnant women of reproductive age (56.4%) were vaccinated was a *lack of no other choice for protection*, while the main reason for vaccination for the lactating women (50.6%) was *to protect the baby* (Figure 1). Among the reasons behind COVID-19 vaccine rejection or hesitancy in pregnant women, the most common cause was *having had COVID-19 infection* (9.7%) and *the thought that the vaccine will harm the pregnancy or the baby* (8.6%). In lactating women, the main reason for vaccine rejection was *not trusting the vaccine* (25.6%), and for the nonpregnant women of reproductive age, the main reason was *lack of enough information about the vaccine* (65%) (Figure 2).

Factors Affecting Vaccine Acceptance

The relationships among the potential predictors of COVID-19 vaccine acceptance by groups are shown in Table 3. COVID-19 vaccine acceptance rates were found to be significantly higher in pregnant women with low (primary education) or high (≥ university) education level, who were ≥30 y old, who were working, who had multigravida, who were multiparous, who perceived their income as medium or good, who were living in the western or central regions of Turkey, and who had a history of flu vaccine in the past 2 y ($P < 0.05$). In lactating women, COVID-19 vaccine acceptance rates were found to be high in mothers with high levels of COVID-19 fear, who had multigravida, who were multiparous and ≥30 y old, and who were not breastfeeding their babies ($P < 0.05$). However, the vaccination acceptance rate (27.3%) was found to be quite low in lactating women with a history of vaccination rejection ($P < 0.05$). Vaccine acceptance rates were higher in nonpregnant and nonlactating women of reproductive age who had a high level of COVID-19 fear and who finished university or a higher level ($P < 0.05$). Considering all the participants, it was found that women with a high level of

https://doi.org/10.1017/dmp.2023.142 Published online by Cambridge University Press

Table 1. Main characteristics of pregnant, lactating, and nonpregnant women of reproductive age

Variables	Total (N = 658) X±Sd	Pregnant (n = 230, 35%) X±Sd	Lactating (n = 187, 28.4%) X±Sd	Reproductive age (n = 241, 36.6%) X±Sd	Analysis p
Gestational age (in weeks)	–	26.21± 8.22	–	–	–
Lactating period (average/in months)	–	–	5.19±4.75	–	–
Fear of COVID-19 Scale score	17.29±6.73	17.20±6.47	17.77±7.46	17.02±6.40	.875*
Age (in years)	30.02±6.39	27.77±4.26	29.96±4.92	32.23±8.11	**<.001***
Gravidity	1.50±1.04	1.64±.81	1.79±.90	1.14±1.21	**<.001***
	***n* (%)**	***n* (%)**	***n* (%)**	***n* (%)**	**X^2**
Marital status					
Married	551 (83.7)	227 (98.7)	180 (96.3)	144 (59.8)	**<.001**
Single	107 (16.3)	3 (1.3)	7 (3.7)	97 (40.2)	
Education					
Primary school (≤8 years)	80 (12.2)	19 (8.3)	25 (13.4)	36 (14.9)	
High school	264 (40.1)	127 (55.2)	69 (36.9)	68 (28.2)	**<.001**
≥ University	314 (47.7)	84 (36.5)	93 (49.7)	137 (56.8)	
Employment Status					
Yes	311 (47.3)	87 (37.8)	86 (46.0)	138 (57.3)	**<.001**
No	347 (52.7)	143 (62.2)	101 (54.0)	103 (42.7)	
Perceived Family Income					
Low	50 (7.6)	19 (8.3)	18 (9.6)	13 (5.4)	.284
Middle	371 (56.4)	129 (56.1)	96 (51.3)	146 (60.6)	
Good/high	237 (36.0)	82 (35.7)	73 (39.0)	82 (34.0)	
Region					
Western	244 (37.1)	43 (18.7)	71 (38.0)	130 (53.9)	**<.001**
Northern	368 (55.9)	180 (78.3)	105 (56.1)	83 (34.4)	
Central	46 (7.0)	7 (3.0)	11 (5.9)	28 (11.6)	
Smoking					
Yes	78 (11.9)	4 (1.7)	22 (11.8)	52 (21.6)	**<.001**
No	580 (88.1)	226 (98.3)	165 (88.2)	189 (78.4)	
History of chronic disease					
No	537 (81.6)	207 (90)	157 (84)	173 (71.8)	**<.001**
Yes	121 (18.4)	23 (10)	30 (16)	68 (28.2)	
Parity					
Nulliparous	227 (34.5)	124 (53,9)	0 (0)	103 (42.7)	**<.001**
Primiparous	235 (35.7)	82 (35,7)	97 (51.9)	56 (23.2)	
Multiparous	196 (29.8)	24 (10,4)	90 (48.1)	82 (34.0	
History of adverse pregnancy/breastfeeding outcomes					
Yes		51 (22.2)	46 (24.6)		
No		179 (77.8)	141 (75.4)		
Breastfeeding					
Yes			168 (89.8)		
No			19 (10.2)		
Infected with COVID-19					
Yes	243 (36.9)	68 (29.6)	61 (32.6)	114 (47.3)	**<.001**
No	415 (63.1)	162 (70.4)	126 (67.4)	127 (52.7)	
Death caused by COVID-19 in family/neighborhood					
Yes	219 (33.3)	59 (25.7)	60 (32.1)	100 (41.5)	**.001**
No	439 (66.7)	171 (74.3)	127 (67.9)	141 (58.5)	
History of flu vaccination in the Past two years					
Yes	60 (9.1)	12 (5.2)	12 (6.4)	36 (14.9)	**.001**
No	598 (90.9)	218 (94.8)	175 (93.6)	205 (85.1)	
History of vaccine rejection in the past					
Yes	39 (5.9)	3 (1.3)	11 (5.9)	25 (10.4)	**<.001**
No	619 (94.1)	227 (98.7)	176 (94.1)	216 (89.6)	

Note: X, mean; SD, standard deviation; *Kruskal-Wallis test; x^2 = chi-squared test; $p < 0.05$, column percentage was taken.

https://doi.org/10.1017/dmp.2023.142 Published online by Cambridge University Press

Table 2. COVID-19 vaccine acceptance of pregnant, lactating, and nonpregnant women of reproductive age, vaccine types, and sources of information

Variables	Total (N = 658) *n* (%)	Pregnant (n = 230, 35%) *n* (%)	Lactating (n = 187, 28.4%) *n* (%)	Reproductive age (n = 241. 36.6%) *n* (%)	X^2 *p*
COVID-19 vaccine acceptance					
0 (declined)	54 (8.2)	21 (9.1)	19 (10.2)	14 (5.8)	**<.001**
1 (hesitant)	102 (15.5)	72 (31.3)	24 (12.8)	6 (2.5)	
2	296 (45.0)	107 (46.5)	101 (54.0)	88 (36.5)	
3	158 (24.0)	25 (10.9)	37 (19.8)	96 (39.8)	
4-5	48 (7.3)	5 (2.2)	6 (3.2)	37 (15.4)	
	M(IOR)/ min-max	**M(IOR)/ min-max**	**M(IOR)/ min-max**	**M(IOR)/ min-max**	***p***
COVID-19 vaccine doses	3(1)/0-5	3(1)/0-4	3(0)/0-5	4(1)/0-5	<.001*
Sinovac doses	2(0)/ 1-4	2(0)/1-3	2(0) /1-4	2(0)/1-4	<.001*
BioNTech doses	1(1) /1-3	1(1)/1-3	1(1) /1-3	2(1)/1-3	<.001*
COVID-19 vaccine information sources (say yes - %)					
HCPs (doctor, nurse, midwife)	481 (73.1)	185 (80.4)	139 (74.3)	157 (65.1)	**.001**
Television/media news	407 (61.9)	148 (64.3)	114 (61.0)	145 (60.2)	.619
Turkey Ministry of Health, WHO	277 (42.1)	44 (19.1)	79 (42.2)	154 (63.9)	**<.001**
Social media (Facebook, Instagram)	258 (39.2)	74 (32.2)	73 (39.0)	111 (46.1)	.009
Family, friends	250 (38)	104 (45.2)	76 (40.6)	70 (29.0)	**.001**
Websites	242 (36.8)	81 (35.2)	63 (33.7)	98 (40.7)	.276
Scholarly publications (books, journals, articles etc.)	112 (17.0)	17 (7.4)	35 (18.7)	60 (24.9)	**<.001**

Note: x^2, chi-squared test; *Kruskal-Wallis test; M, median; IQR, interquartile range.

Figure 1. Reasons of pregnant, lactating, and reproductive aged women for receiving the COVID-19 vaccine.

https://doi.org/10.1017/dmp.2023.142 Published online by Cambridge University Press

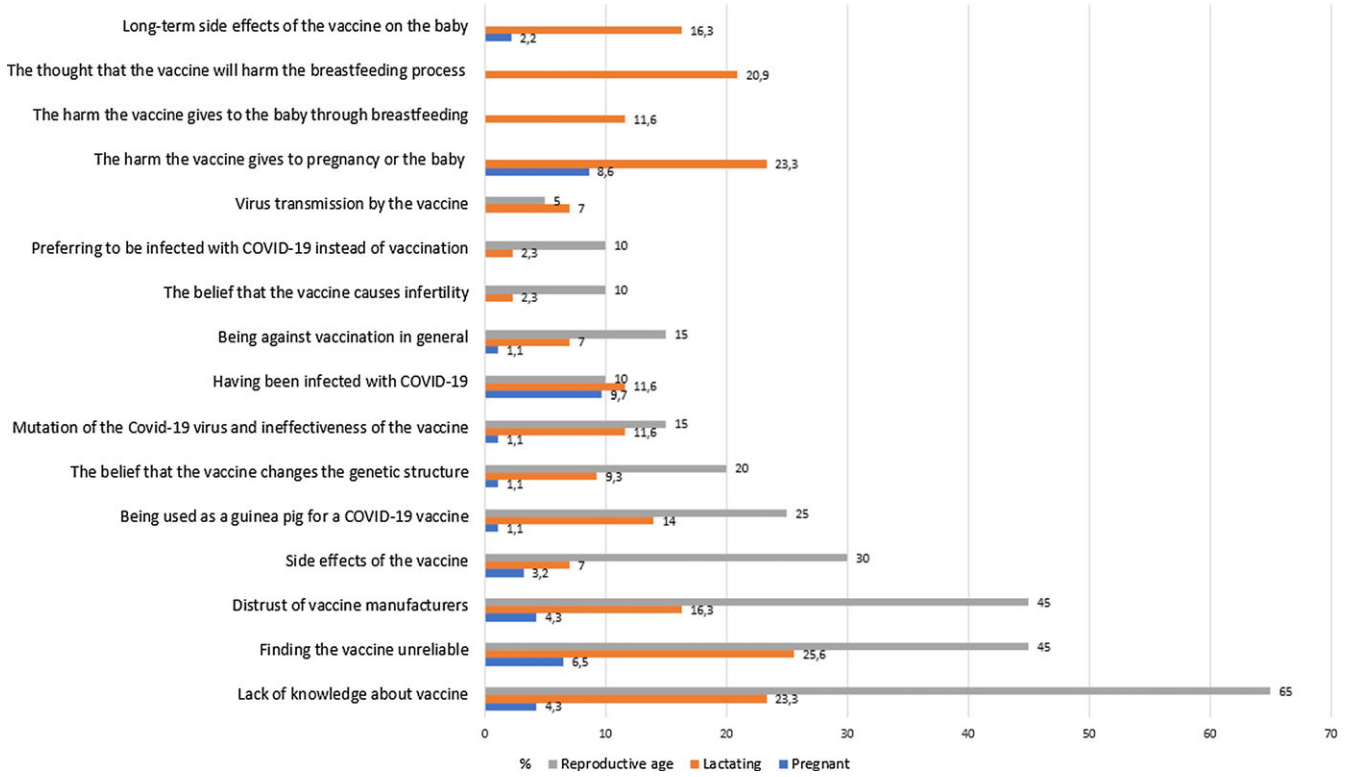

Figure 2. Participants' reasons for COVID-19 vaccine rejection and/or hesitancy.

COVID-19 fear, those ≥30 y of age, those who were single, those with a high level of education (≥ university) or a low level of education (primary education), those who were working and living in the western and central region of the country, and those who were smoking, who were primiparous, and who had a history of influenza vaccination in the past 2 y had significantly higher rates of vaccination acceptance ($P < 0.05$) (Table 3).

The multivariate regression analysis model performed to identify the strong predictors of COVID-19 vaccine acceptance explained 41% of the variables ($p < 0.05$) (Table 4). In the regression analysis model, COVID-19 vaccine acceptance and vaccine rejection were found to be related with low fear of COVID-19 (OR = .909; CI = .860-.960), low/middle perceived family income (OR = 3.424; CI = 1.575-7.441), and a history of vaccine rejection (OR = 8.55; CI = 3.20-22.80). Furthermore, COVID-19 vaccine acceptance and vaccine hesitancy were found to be associated with the pregnancy period (OR = 3.98; CI = 1.13-14.10), breastfeeding period (OR= 3.84; CI = 1.15-12.78), being in the 18-29 age group (OR = 2.51; CI: 1.12-5.62), having primary education (OR = 9.21; CI = 3.27-25.96) or high school education (OR = 4.43; CI = 2.02-9.74), non-working woman (OR = 2.57; CI = 1.25-5.29), and having nulliparity (OR = 7.87; CI = 1.74-35.55) or primiparity (OR = 3.51; CI = 1.27-9.69) (Table 4).

Discussion

This multicenter online study provides significant data on vaccine acceptance and its associated factors in groups of pregnant and lactating women, and nonpregnant women of reproductive age. The vaccine acceptance rate of nonpregnant women of reproductive age was found to be quite high (91.7%); however, the vaccine acceptance rate was low in lactating (77%) and especially in pregnant (59%) women. Pregnancy and the breastfeeding period increased vaccine hesitancy approximately 4 times. In studies conducted before the vaccination program in our country, the willingness to be vaccinated in pregnant women was 37% and 52.6%,[10,26] whereas this rate was found to be 33% in postpartum women.[29] In a study of 17,871 participants including pregnant women and mothers with children under 18 y of age in 16 countries, 52% of the pregnant women and 73.4% of the nonpregnant women stated their intention to be vaccinated.[18] Meta-analysis studies reported that the global prevalence of COVID-19 vaccine acceptance during pregnancy is approximately 49-54%.[30,31] In China, where the pandemic started, the acceptance rate of the COVID-19 vaccine was found to be higher (77.4%) among pregnant women.[17] The study conducted with 1012 participants in Columbia showed that nonpregnant women (76.2%) had the highest vaccine acceptance rate, followed by lactating (55.2%) and pregnant women (44.3%).[5] One study conducted with pregnant and lactating women in Czechia demonstrated that the vaccine acceptance rate was 76.6% in pregnant women, while it was 48.8% in lactating women, indicating a significant difference between the 2 groups. In parallel with the literature, it has been observed that vaccine acceptance is lower during pregnancy and lactation due to the concern of harming the pregnancy, fetus, or newborn.

The main reasons for the nonpregnant women of reproductive age to be vaccinated were to protect themselves against COVID-19 infection and to protect family members. The main reasons for receiving the COVID-19 vaccine for pregnant women were to protect against the COVID-19 infection and to follow the recommendations of the health personnel. The main reason for receiving the COVID-19 vaccine for lactating women was to protect their babies. In the literature, the fear of contracting

https://doi.org/10.1017/dmp.2023.142 Published online by Cambridge University Press

Table 3. Relationship between the main characteristics of pregnant, lactating, and nonpregnant women of reproductive age and COVID-19 vaccine acceptance

	COVID-19 vaccine acceptance				Analysis			
	Pregnancy[a]	Lactating period[b]	Reproductive age[c]		a	b	c	d
Variable	X ± SD	X ± SD	X ± SD	Total[d]	p	p	p	p
Fear of COVID-19 Scale Score	17.74±6.57	18.47±7.52	17.20 ±6.37	17.71±6.78	.126*	**.048***	**.016***	**.003***
Gestational age/month	26.23±8.32	–	–	–	.911*			–
Postpartum month	–	6.17±.72				.345		–
Gravidity	1.74±9.16	1.88±.93	1.50±1.67	1.50 ±1.09	**.040***	**.018***	.165*	.964*
	n (%)	**n (%)**	**n (%)**					
Age group (year)								
18-29	81(50.3)	63(67)	88(91.7)	232(66.1)	<**.001**	**.001**	.987	<**.001**
30-48	56(81.2)	81(87.1)	133(91.7)	270(87.9)				
Marital status								
Married	135(59.5)	137(76.1)	133(92.4)	405(73.5)	.801	.141	.651	<**.001**
Single	2(66.7)	7(100)	88(90.7)	97(90.7)				
Education								
Primary school	14(73.7)	20(80)	28(77.8)	62(77.5)	<**.001**	.329	**.003**	<**.001**
High school	55(43.3)	49 (71)	66(97.1)	170(64.4)				
≥ University	68(81.0)	75(80.6)	127(92.7)	270(86)				
Employment status								
Yes	70(80.5)	71(82.6)	128(92.8)	269(86.5)	<**.001**	.096	493	<**.001**
No	67(46.9)	73(72.3)	93(90.3)	233(67.1)				
Perceived family income								
Poor	7(36.8)	10(55.6)	12(92.3)	29(58)	**.047**	.075	.993	.005
Medium	75(58.1)	76(79.2)	134(91.8)	285(76.8)				
Good/very good	55(67.1)	58(79.5)	75(91.5)	188(79.3)				
Region								
Western and central	40(80.0)	63(76.8)	146(92.4)	249(85.9)	**.001**	.960	.585	<**.001**
Northern	97(53.9)	81(77.1)	75(90.4)	253(68.8)				
Smoking								
Yes	3 (75)	20 (90.9)	49(94.2)	72(92.3)	.649	.099	.455	<**.001**
No	134 (59.3)	124(75.2)	172(91)	430(74.1)				
History of chronic disease								
No	119(86.9)	117(81.3)	160(72.4)	396(73.7)	.054	.065	.481	.001
Yes	18(13.1)	27(18.8)	61(27.6)	106(87.6)				
Parity								
0	70(56.5)	0	94(91.3)	164(72.2)	**.043**	**.007**	.091	<**.001**
1	47(57.3	67(69.1)	55(98.2)	169(86.2)				
≥ 2	20(83.3)	77(85.6)	72(87.8)	502(76.3)				
Problem in pregnancy/lactation period								
Yes	32(62.7)	37(80.4)	–	–	.631	524		
No	105(58.7)	107(75.9)	–	–				
Breastfeeding								
Yes	–	125(74.4)	–	–		**.001**		
No	–	19(100)	–	–				
Infected with COVID-19								
Yes	41(60.3)	45(73.8)	102(89.5)	314(75.7)	.884	.465	.235	.620
No	96(59.3)	99(78.6)	119(93.7)	188(77.4)				
Death caused by covid-19 in family/neighborhood								
Yes	33(55.9)	47(78.3)	92(92)	172(78.5)	.510	.767	887	.338
No	104(60.8)	97(76.4)	129(91.5)	330(75.2)				
History of Flu Vaccination in the Last Two Years								
Yes	12 (100)	11(91.7)	33 (91.7)	**56(93.3)**	**.003**	.302	.993	**.001**
No	125 (57.3)	133(76)	188 (91.7)	446(74.6)				

(*Continued*)

https://doi.org/10.1017/dmp.2023.142 Published online by Cambridge University Press

Table 3. (*Continued*)

	COVID-19 vaccine acceptance				Analysis			
	Pregnancy[a]	Lactating period[b]	Reproductive age[c]		a	b	c	d
Variable	X ± SD	X ± SD	X ± SD	Total[d]	p	p	p	p
History of vaccine rejection in the past								
Yes	2 (66.7)	3 (27.3)	22(88)	27(69.2)	.801	**<.001**	.479	.285
No	135 (59.5)	141(80.1)	199(92.1)	475(76.2)				

**Mann Whitney U test, x^2 = Chi-square, Row percentage taken.* a: Pregnancy b: Lactating c: Nonpregnant reproductive age, d: Whole population.

Table 4. Multinomial regression analysis of factors associated with COVID-19 vaccine acceptance

	COVID-19 vaccine acceptance							
	Vaccine rejection (0 doz)				Undecided (1 doz)			
	95% (CI)				95% (CI)			
Variables (N = 658)	Sig.	OR	Lower	Upper	Sig.	OR	Lower	Upper
Intercept	**.044**				**.000**			
COVID-19 fear								
Mean	**.001***	.909	.860	.960	.134	.969	.930	1.01
Year (years)								
18-29	.274	1.53	.712	3.31	**.026***	2.50	1.11	5.62
30-48	–	–	–	–	–	–	–	–
Education								
Primary school	.944	1.04	.301	3.63	**.000***	9.21	3.26	25.96
High school	.460	.753	.354	1.59	**.000***	4.43	2.01	9.74
≥ University	–	–	–	–	–	–	–	–
Marital status								
Married	.375	1.82	.483	6.89	.250	2.39	.540	10.65
Single	–	–	–	–	–	–	–	–
Employment status								
Unemployed	.975	.989	.484	2.02	**.010***	2.57	1.25	5.29
Employed	–	–	–	–	–	–	–	–
Perceived family income								
Low/Middle	**.002***	3.42	1.57	7.44	.524	.840	.492	1.43
Good/High	–	–	–	–	–	–	–	–
Region								
Western and central	.420	1.31	.674	2.57	.154	.591	.287	1.21
North	–	–	–	–	–	–	–	–
Smoking								
Yes	.107	.288	.063	1.309	.577	.715	.22	2.32
No	–	–	–	–	–	–	–	–
History of chronic disease								
No	.856	.924	.393	2.17	.616	1.29	.470	3.57
Yes	–	–	–	–	–	–	–	–
Gravidity								
Mean	.649	.861	.451	1.64	.200	1.41	.831	2.42
Parity								
0	.641	.658	.113	3.82	**.007***	7.87	1.74	35.55
1	.431	.651	.223	1.89	**.015***	3.51	1.27	9.69
≥ 2	–	–	–	–	–	–	–	–
Reproductive period								
Pregnancy	.083	2.83	.872	9.22	**.032***	3.985	1.12	14.10
Lactating	.139	2.09	.787	5.57	**.028***	3.845	1.15	12.78
Reproductive age	–	–	–	–	–	–	–	–

(*Continued*)

https://doi.org/10.1017/dmp.2023.142 Published online by Cambridge University Press

Table 4. (*Continued*)

	COVID-19 vaccine acceptance							
	Vaccine rejection (0 doz)				Undecided (1 doz)			
	95% (CI)				95% (CI)			
Variables (N = 658)	Sig.	OR	Lower	Upper	Sig.	OR	Lower	Upper
History of flu vaccination in the last two years								
Yes	.066	.142	.018	1.13	.457	.578	.136	2.45
No	–	–	–	–	–	–	–	–
History of vaccine rejection in the past								
Yes	**.000***	8.55	3.20	22.80	.688	1.41	.259	7.77
No	–	–	–	–	–	–	–	–

Note: The reference category is: Those who had 2 doses or more of the vaccine were included.
CI(Confidence Interval), Adjusted OR(Odds Ratio), Nagelkerke = R^2 = .409, X^2 = 242.207, p = .000, *$p < 0.05$.
The bold expressions show that the analysis result is significant ($p < 0.05$).

COVID-19 infection and transmitting the infection to others, safety of the vaccine, acceptance of the vaccine by health-care professionals, and chronic diseases are among the reasons for getting vaccinated.[5,32] The major factors supporting vaccine acceptance are trust in health-care professionals, government and the pharmaceutical industry, and media/social media.[33] There are various thoughts about the efficacy and safety of the vaccine and its side effects. The reasons behind vaccine hesitancy are insufficient information about the vaccine; fear of getting the virus with the vaccine, change the genetic structure, and cause infertility; the thought that people are being used as a guinea pig in the vaccine application, the vaccine will be ineffective as a result of the mutation of the COVID-19 virus and will harm the pregnancy and the baby, and it will have long-term side effects and harm the breastfeeding process.[12,18,34,35] Vaccine hesitancy is recognized as 1 of the top 10 threats to global health by the WHO.[36] In this study, the most common reasons for vaccine hesitancy or rejection were the lack of knowledge about the vaccine in women of reproductive age, the presence of COVID-19 infection in pregnant women, and the concern that it may harm the baby and not trusting the vaccine in lactating women. The pregnant women were concerned about getting vaccinated because they feared that the vaccine might harm the unborn baby, cause pregnancy complications, and unknown long-term health consequences.[35] One study revealed that Singaporean pregnant women were concerned about the safety of the vaccine (92.9%), while lactating mothers were concerned about possible adverse effects on the baby (75.6%).[34] Current results suggest that concerns and barriers to vaccine acceptance are similar.

In our study, health-care providers (HCPs) were ranked first among vaccine information sources for all participants. In pregnant and lactating women, preference for HCPs and family-friends was significant. Nonpregnant women of reproductive age, on the other hand, preferred scientific publications such as books, journals, and articles with the statements of official institutions (Turkey Ministry of Health or the WHO) and showed a significant difference compared with pregnant and puerperal women. This difference may be due to the fact that pregnant and lactating women have more contact with health professionals to receive care specific to the period they are in. Disinformation through social media and conspiracy theories increase anxiety and hesitation about the vaccine.[36] Confidence in HCPs, scientific authorities, and strong scientific evidence are strongly associated with vaccine acceptance.[37] Individuals are more likely to accept the COVID-19 vaccine when they receive advice from health-care professionals. It is hoped that vaccine acceptance by HCPs will increase the vaccine acceptance rates among the general public.[12,18,36,38] HCPs have an important consultancy role in immunization programs and should address COVID-19 vaccine concerns with up-to-date information. HCPs should inform pregnant women of the maternal and fetal risks associated with the transmission of COVID-19 infection and build confidence by providing available information about the benefits and potential side effects of vaccines, based on the current evidence. Therefore, HCPs are of great importance in COVID-19 vaccine acceptance.[12,27]

There are many factors affecting COVID-19 vaccine acceptance. Factors such as individuals' psychosocial, cultural, and demographic characteristics; explanations of HCPs, COVID-19 infection experiences, the presence of a chronic illness, and previous history of vaccine rejection affect vaccine acceptance.[12,17] It has been observed that COVID-19 vaccine acceptance is low in females and younger age groups, and the acceptance rate increases with increasing age.[20,23] It is known that pregnancy at advanced maternal age is a risk factor for adverse outcomes such as higher neonatal intensive care unit admissions, premature births, spontaneous abortion, preeclampsia, cesarean deliveries, and low birth weight babies.[2,4–6] Elderly pregnant women are more likely to be afraid of being infected with COVID-19 and to accept COVID-19 vaccine.[17,18] In this study, the vaccine acceptance rate was found to be high in pregnant women over 30 years of age and lactating mothers. The study revealed that vaccine hesitancy increased 2.5 times in women aged 18-29 in the general population. As age increases, vaccine acceptance increases.

Studies have shown that higher education levels have increased confidence in and acceptance of the COVID-19 vaccine.[22,33,37] In this study, those with primary school education level had 9 times more vaccine hesitancy and those with high school education level had approximately 4.5 times more vaccine hesitancy compared with those with a higher level of education. However, contrary to our study, there are studies showing that individuals with a postgraduate education level have higher hesitancy and negative beliefs about the COVID-19 vaccine compared with those with a low level of education.[17,39,40] The study revealed that fear of COVID-19 affected vaccine acceptance during periods other than pregnancy, but low-level fear of COVID-19 in the general population increased vaccine rejection. It was observed that participants' fear of the COVID-19 pandemic affected their vaccine acceptance and has become a

https://doi.org/10.1017/dmp.2023.142 Published online by Cambridge University Press

motivating factor. Similarly, 1 study revealed that extreme fear of COVID-19 infection increased vaccine acceptance.[5]

It was further revealed that vaccine rejection rates increased approximately 3.5 times in women who perceived their family income as low or middle. This finding may be attributed to low education level and cultural characteristics. Some studies found that those with middle or high income showed a positive attitude toward the vaccine.[21,26,41] Low-income groups have been shown to be at higher risk of contracting COVID-19 due to their overcrowded living conditions, use of public transport, and greater likelihood of working outside the home.[40] It is, therefore, important to bridge the gap between COVID-19 vaccine acceptance among individuals in lower and upper socio-economic groups.

In this study, vaccine hesitancy increased 2.5 times in unemployed women. Contrary to working women in some studies, vaccine acceptance rate increased in nonworking women,[42,43] and no relationship was found in others.[33,43] These differences in vaccine acceptance may be due to differences in the population, such as different demographics, economics, and education levels. Fertility was a strong determinant influencing vaccine acceptance in the study, with nulliparous women experiencing approximately 8-fold, and primiparous women 3.5 times vaccine hesitancy. In studies, it has been determined that young, single, nulliparous or women who are planning a future pregnancy experience vaccine hesitancy due to the side effects of vaccines and safety concerns.[18,43] Acceptance of the vaccine, knowledge, beliefs, and attitudes toward the vaccine affect childless women more.

Factors such as trust in the safety and efficacy of COVID-19 vaccines, not being afraid of possible side effects, trust in childhood vaccines, and history of past influenza vaccination may cause pregnant women to accept COVID-19 vaccines.[18,26,39,44] In the present study, vaccine acceptance rates were found to be higher in pregnant women who have had the flu vaccine in the last two years. The vaccination acceptance rate was found to be lower in lactating women with a history of vaccination rejection. In the whole research population, the rate of COVID-19 vaccine rejection increased 8.5-fold in women with a history of vaccine rejection. Previous negative attitudes toward the vaccine seem to affect the rates of being vaccinated against COVID-19. HCPs have an important role in immunization programs. Trust in HCPs and scientific authorities and strong scientific evidence increases vaccine acceptance.[37] All vaccinations during pregnancy are optional; however, HCPs need to inform women about the risks of contracting COVID-19 infection during pregnancy, as well as the benefits and potential side effects of current vaccines, based on available evidence, and thus build confidence.

Limitations

The study was conducted online, which brought about some negative aspects related to conducting a study in the electronic environment such as security concerns, uncertainty regarding the respondents, problems in accessing the data collection forms, and misunderstanding of the research questions.

Conclusions

As a result, the vaccine acceptance rate was found to be low in pregnant and lactating women, and in this group of women, vaccine hesitancy increased approximately 4 times compared with nonpregnant reproductive-aged women. The scarcity of data describing the safety and efficacy of the COVID-19 vaccine in pregnant and lactating women and concerns about the fetus and infant adversely affected the vaccine acceptance rates. Vaccine acceptance levels in pregnant and lactating Turkish women are insufficient to provide herd immunity. Many professional committees have provided HCPs with recommendations to assist pregnant and lactating women in making vaccine decisions. HCPs should provide individuals with evidence-based information in support of their vaccine acceptance decision and explain the risks and benefits of vaccination. Therefore, it can be stated that HCPs in primary care play a key role in informing society and individuals. Vaccination campaigns should be made especially for pregnant and lactating women and guidelines should be published.

Data Availability. Due to the sensitive nature of the questions asked in this study, survey respondents were assured raw data would remain confidential and would not be shared.

Acknowledgments. The authors thank all women have contributed to this research.

Funding. The authors received no funding for this work.

Competing interests. The authors declare no conflict of interest.

Ethical standards. Ethical permission to carry out the research was obtained from Ege University Medical Faculty Medical Publication Ethics Committee (Approval number: (21-12.2T/21)). Written informed consent was obtained from all women who participated in the study.

References

1. **World Health Organization**. WHO Coronavirus (COVID-19) Dashboard World Health Organization. 2022. Accessed August 11, 2022. https://covid19.who.int/
2. **Duarte G, Coutinho CM, Rolnik DL, *et al.*** Perspectives on administration of COVID-19 vaccine to pregnant and lactating women: a challenge for low- and middle-income countries. *AJOG Glob Rep.* 2021;1(4):100020. doi: 10.1016/j.xagr.2021.100020
3. **Mose A, Yeshaneh A.** COVID-19 vaccine acceptance and its associated factors among pregnant women attending antenatal care clinic in southwest Ethiopia: institutional-based cross-sectional study. *Int J Gen Med.* 2021;14:2385-2395. doi: 10.2147/IJGM.S314346
4. **Sculli MA, Formoso G, Sciacca L.** COVID-19 vaccination in pregnant and lactating diabetic women. *Nutr Metab Cardiovasc Dis.* 2021;31(7): 2151-2155. doi: 10.1016/j.numecd.2021.04.012
5. **Sutton D, D'Alton M, Zhang Y, *et al.*** COVID-19 vaccine acceptance among pregnant, breastfeeding, and nonpregnant reproductive-aged women. *Am J Obstet Gynecol MFM.* 2021;3(5): 100403. doi: 10.1016/j.ajogmf.2021.100403
6. **Yang Z, Wang M, Zhu Z, *et al.*** Coronavirus disease 2019 (COVID-19) and pregnancy: a systematic review. *J Matern Fetal Neonatal Med.* 2022;35(8):1619-1622. doi: 10.1080/14767058.2020.1759541
7. **Cheng B, Jiang T, Zhang L, *et al.*** Clinical characteristics of pregnant women with Coronavirus disease 2019 in Wuhan, China. *Open Forum Infect Dis.* 2020;7(8):ofaa294. doi: 10.1093/ofid/ofaa294
8. **Yu N, Li W, Kang Q, *et al.*** Clinical features and obstetric and neonatal outcomes of pregnant patients with COVID-19 in Wuhan, China: a retrospective, single-centre, descriptive study. *Lancet Infect Dis.* 2020;20(5):559-564. doi: 10.1016/S1473-3099(20)30176-6
9. **Bekmezci E, Karakoç H.** The effect of COVID-19 on maternal and fetal health: a systematik review. *J Educ Res Nurs.* 2020;17(3):207-2013. doi: 10.5222/HEAD.2020.89090
10. **Goncu Ayhan S, Oluklu D, Atalay A, *et al.*** COVID-19 vaccine acceptance in pregnant women. *Int J Gynaecol Obstet.* 2021;154(2): 291-296. doi: 10.1002/ijgo.13713

11. **Lis-Kuberka J, Berghausen-Mazur M, Orczyk-Pawilowicz M.** Attitude and level of COVID-19 vaccination among women in reproductive age during the fourth pandemic wave: a cross-sectional study in Poland. *Int J Environ Res Public Health.* 2022;19(11):6872. doi: 10.3390/ijerph19116872
12. **Garg I, Shekhar R, Sheikh AB, *et al.*** COVID-19 vaccine in pregnant and lactating women: a review of existing evidence and practice guidelines. *Infect Dis Rep.* 2021;13(3):685-699. doi: 10.3390/idr13030064
13. **Centers for Disease Control and Prevention**. Pregnancy or breastfeeding, COVID-19 vaccines while pregnant or breastfeeding. 2022. Accessed July 28, 2022. https://www.cdc.gov/coronavirus/2019-ncov/vaccines/recommendations/pregnancy.html
14. **American College of Obstetricians and Gynecologists**. COVID-19 vaccination considerations for obstetric–gynecologic care. 2022. Accessed July 28, 2022. https://www.acog.org/clinical/clinical-guidance/practice-advisory/articles/2020/12/covid-19-vaccination-considerations-for-obstetric-gynecologic-care
15. **British Fertility Society**. Covid-19 vaccines and fertility. 2022. Accessed August 11, 2022. https://www.britishfertilitysociety.org.uk/2021/07/27/bfs-arcs-covid-19-vaccines-fertility-2/
16. **Patwary MM, Alam MA, Bardhan M, *et al.*** COVID-19 vaccine acceptance among low- and lower-middle-income countries: a rapid systematic review and meta-analysis. *Vaccines (Basel).* 2022;10(3):427. doi: 10.3390/vaccines10030427
17. **Tao L, Wang R, Han N, *et al.*** Acceptance of a COVID-19 vaccine and associated factors among pregnant women in China: a multi-center cross-sectional study based on health belief model. *Hum Vaccin Immunother.* 2021;17(8):2378-2388. doi: 10.1080/21645515.2021.1892432
18. **Skjefte M, Ngirbabul M, Akeju O, *et al.*** COVID-19 vaccine acceptance among pregnant women and mothers of young children: results of a survey in 16 countries. *Eur J Epidemiol.* 2021;36(2):197-211. doi: 10.1007/s10654-021-00728-6
19. **Wang J, Jing R, Lai X, *et al.*** Acceptance of COVID-19 vaccination during the COVID-19 pandemic in China. *Vaccines (Basel).* 2020;8(3):482. doi: 10.3390/vaccines8030482
20. **Detoc M, Bruel S, Frappe P, *et al.*** Intention to participate in a COVID-19 vaccine clinical trial and to get vaccinated against COVID-19 in France during the pandemic. *Vaccine.* 2020;38(45):7002-7006. doi: 10.1016/j.vaccine.2020.09.041
21. **Fisher KA, Bloomstone SJ, Walder J, *et al.*** Attitudes toward a potential SARS-CoV-2 vaccine: a survey of U.S. adults. *Ann Intern Med.* 2020;173(12):964-973. doi: 10.7326/M20-3569
22. **Lazarus JV, Ratzan SC, Palayew A, *et al.*** A global survey of potential acceptance of a COVID-19 vaccine. *Nat Med.* 2021;27(2):225-228. https://doi.org/10.1038/s41591-020-1124-9
23. **Salali GD, Uysal MS.** COVID-19 vaccine hesitancy is associated with beliefs on the origin of the novel coronavirus in the UK and Turkey. *Psychol Med.* 2020;1-3. doi: 10.1017/S0033291720004067
24. **Turkey Ministry of Health**. COVID-19 Vaccination Information Platform [Internet] [cited 2022 Jul 5]. Republic of Turkey Ministry of Health, 2022. https://covid19asi.saglik.gov.tr/EN-78317/turkish-national-covid-19-vaccine-administration-strategy.html
25. **Turkish Statistical Institute**. Women by Statistics, 2021. 2021. Accessed July 5, 2022]. https://data.tuik.gov.tr/Bulten/Index?p=Istatistiklerle-Kadin-2021-45635
26. **Gencer H, Özkan S, Vardar O, *et al.*** The effects of the COVID 19 pandemic on vaccine decisions in pregnant women. *Women Birth.* 2022;35(3):317-323. doi: 10.1016/j.wombi.2021.05.003
27. **Martins I, Louwen F, Ayres-de-Campos D, *et al.*** EBCOG position statement on COVID-19 vaccination for pregnant and breastfeeding women. *Eur J Obstet Gynecol Reprod Biol.* 2021;262:256-258. doi: 10.1016/j.ejogrb.2021.05.021
28. **Bakioğlu F, Korkmaz O, Ercan H.** Fear of COVID-19 and positivity: mediating role of intolerance of uncertainty, depression, anxiety, and stress. *Int J Ment Health Addict.* 2021;19(6):2369-2382. doi: 10.1007/s11469-020-00331-y
29. **Oluklu D, Goncu Ayhan S, Menekse Beser D, *et al.*** Factors affecting the acceptability of COVID-19 vaccine in the postpartum period. *Hum Vaccin Immunother.* 2021;17(11):4043-4047. doi: 10.1080/21645515.2021.1972710
30. **Carbone L, Di Girolamo R, Mappa I, *et al.*** Worldwide beliefs among pregnant women on SARS-CoV-2 vaccine: a systematic review. *Eur J Obstet Gynecol Reprod Biol.* 2022;268:144-164. doi: 10.1016/j.ejogrb.2021.12.003
31. **Nikpour M, Sepidarkish M, Omidvar S, *et al.*** Global prevalence of acceptance of COVID-19 vaccines and associated factors in pregnant women: a systematic review and meta-analysis. *Expert Rev Vaccines.* 2022;21(6):843-851. doi: 10.1080/14760584.2022.2053677
32. **Sirikalyanpaiboon M, Ousirimaneechai K, Phannajit J, *et al.*** COVID-19 vaccine acceptance, hesitancy, and determinants among physicians in a university-based teaching hospital in Thailand. *BMC Infect Dis.* 2021;21(1):1174. doi: 10.1186/s12879-021-06863-5
33. **Riad A, Jouzová A, Üstün B, *et al.*** COVID-19 vaccine acceptance of Pregnant and Lactating Women (PLW) in Czechia: an analytical cross-sectional study. *Int J Environ Res Public Health.* 2021;18(24):13373. doi: 10.3390/ijerph182413373
34. **Jayagobi PA, Ong C, Yeo KT, *et al.*** Perceptions and acceptance of COVID-19 vaccine among pregnant and lactating women in Singapore: a cross-sectional study. *medRxiv.* 2021. doi: 10.1101/2021.06.29.21259741
35. **Kiefer MK, Mehl R, Costantine MM, *et al.*** Characteristics and perceptions associated with COVID-19 vaccination hesitancy among pregnant and postpartum individuals: A cross-sectional study. *BJOG.* 2022;129(8):1342–1351. doi: 10.1111/1471-0528.17110
36. **Saied SM, Saied EM, Kabbash IA, *et al.*** Vaccine hesitancy: beliefs and barriers associated with COVID-19 vaccination among Egyptian medical students. *J Med Virol.* 2021;93(7):4280-4291. doi: 10.1002/jmv.26910
37. **Kuciel N, Mazurek J, Hap K, *et al.*** COVID-19 vaccine acceptance in pregnant and lactating women and mothers of young children in Poland. *Int J Womens Health.* 2022;14:415-424. doi: 10.2147/IJWH.S348652
38. **Dodd RH, Pickles K, Nickel B, *et al.*** Concerns and motivations about COVID-19 vaccination. *Lancet Infect Dis.* 2021;21(2):161-163. doi: 10.1016/S1473-3099(20)30926-9
39. **Magadmi RM, Kamel FO.** Beliefs and barriers associated with COVID-19 vaccination among the general population in Saudi Arabia. *BMC Public Health.* 2021;21(1):1438. doi: 10.1186/s12889-021-11501-5
40. **Mein SA.** COVID-19 and health disparities: the reality of "the great equalizer". J Gen Intern Med. 2020;35(8):2439-2440. doi: 10.1007/s11606-020-05880-5
41. **Cascini F, Pantovic A, Al-Ajlouni Y, *et al.*** Attitudes, acceptance and hesitancy among the general population worldwide to receive the COVID-19 vaccines and their contributing factors: a systematic review. EClinicalMedicine. 2021;40:101113. doi: 10.1016/j.eclinm.2021.101113
42. **King WC, Rubinstein M, Reinhart A, *et al.*** COVID-19 vaccine hesitancy January-May 2021 among 18-64-year-old US adults by employment and occupation. *Prev Med Rep.* 2021;24:101569. doi: 10.1016/j.pmedr.2021.101569
43. **Khan MSR, Watanapongvanich S, Kadoya Y.** COVID-19 vaccine hesitancy among the younger generation in Japan. Int J Environ Res Public Health. 2021;18(21):11702. doi: 10.3390/ijerph182111702
44. **Mappa I, Luviso M, Distefano FA, *et al.*** Women perception of SARS-CoV-2 vaccination during pregnancy and subsequent maternal anxiety: a prospective observational study. *J Matern Fetal Neonatal Med.* 2022;35(25):6302-6305.

https://doi.org/10.1017/dmp.2023.142 Published online by Cambridge University Press