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## RESEARCH ARTICLE

# The COVID-19 Vaccination Acceptance among Jordanian Pregnant Women: A Cross-sectional Descriptive Study

Salwa AbuAlrub<sup>1,\*</sup>, Hind B. AlShekh<sup>2</sup>, Salam Bani Hani<sup>3</sup> and Muhammed Abu Baker<sup>4</sup>

<sup>1</sup>Department of Applied Sciences, Faculty of Irbid College, Al-Balqa Applied University, P.O. Box 1293, Irbid, Jordan

<sup>2</sup>Department of Maternal and Pediatric Health Nursing, Al-Bayt University, Al-Mafraq, Jordan

<sup>3</sup>Department of Adult Health Nursing, Al-Bayt University, Al-Mafraq, Jordan

<sup>4</sup>Obstetrics and Gynecology Specialist, Ministry of Health MOH, Princess Raya Hospital, Deir Abu Said, Jordan

### Abstract:

#### Introduction:

Pregnant women are vulnerable to severe COVID-19 illness and complications. Worldwide, the vaccination rate among pregnant women is suboptimal. In Jordan, the acceptance rate of COVID-19 vaccination among pregnant women is not reported.

#### Objectives:

This study aims to estimate the prevalence of pregnant women who accept receiving the COVID-19 vaccine during pregnancy, compare beliefs of accepting and non-accepting groups regarding COVID-19 vaccination, and determine predictors of accepting vaccination.

#### Materials and Methods:

Cross-sectional descriptive design recruited 350 participants utilizing the convenience sampling method.

#### Results:

The results revealed that 35.4% of pregnant women accepted to receive a COVID-19 vaccine. The means belief score ( $M=3.57$ ,  $SD=0.45$ ) was significantly higher for the accepting group than the non-accepting group ( $M=2.95$ ,  $SD=0.47$ ). Pregnant women who accepted COVID-19 vaccination demonstrated higher perceived benefits, higher cues to action, and lower perceived barriers compared to pregnant women who refused vaccination. Multiple logistic regression was used to determine the predictors of pregnant women's acceptance of COVID-19 vaccination. It was found that the model is significant [ $F=32.9$ ,  $P<0.01$ ] at the level of education ( $\beta=-.128$ ,  $p=0.002$ ), economic status ( $\beta=-.526$ ,  $p<0.01$ ), trimester of pregnancy ( $\beta=.093$ ,  $p=0.019$ ), and belief mean score ( $\beta=-.332$ ,  $p<0.01$ ).

#### Conclusion:

The vast majority of pregnant women who participated in this study exhibited high perceived susceptibility and severity to COVID-19 disease. However, the acceptance rate of COVID-19 vaccination is low due to doubts about the efficacy of the vaccine, and fears of its harmful effect on pregnant women and their unborn children. Government, policymakers, and health care system should adopt an intensive action plan to promote vaccination among pregnant women.

**Keywords:** Pregnant women, Acceptance, Vaccination, COVID-19, Beliefs, Vaccination.

### Article History

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## 1. INTRODUCTION

COVID-19 is an acute transmissible respiratory disease caused by a coronavirus that first emerged in China at the end of 2019 and spread tremendously across many countries, result-

ing in a devastating global pandemic in a short period with a spike in mortality and morbidity rates [1] which prompted many health agencies and companies to produce and approve several vaccines to limit the negative impact of this pandemic [2].

During pregnancy, several physiological and immunological changes occur in a woman's body contributing to the

\* Address correspondence to this author at the Department of Applied Sciences, Faculty of Irbid College, Al-Balqa Applied University, P.O. Box 1293, Irbid, Jordan; E-mail: [Salwa.Abual@Bau.edu.jo](mailto:Salwa.Abual@Bau.edu.jo)

increased risk of exposure to COVID-19 infection and its complications. According to the report of the Center for Diseases Control and Prevention (CDC), which reviewed cases from January to October 2020 included 461,825 women with positive test results for COVID-19 with data on pregnancy status and found that 6.6% were pregnant [3]. A multinational cohort study compared the outcomes of pregnancy for 706 infected women with COVID-19 and 1424 who were not infected. Women with COVID-19 were at higher risk of preeclampsia, cesarean delivery, viral infections, using mechanical ventilators, admission to the intensive care unit, preterm birth, and neonatal complications [4]. In response, numerous formal entities such as the Advisory Committee on Immunization Practice ACIP, A Society for Maternal-Fetal-Medicine SMFM, and the American College of Obstetrics and Gynaecologist ACOG, Food and Drug Administration FDA recommended COVID-19 vaccination for pregnant women in line with the general population and offered them the autonomy of vaccination decision [5].

The center for disease control and Prevention CDC classified pregnant women as vulnerable to COVID-19 infection and its complications [6]. A retrospective cohort Turkish study consisting of 1065 pregnant women hospitalized with COVID-19 between March 2020 and January 2022 found that in pre delta pandemic during 2020, the rate of maternal death was 1.28%, admission to Intensive Care Unit 4.1%, having a critical disease 13% which increased significantly with the progress of delta wave pandemic in 2021 to 7%, 11.5%, 17.5% respectively [7]. Vaccination during pregnancy decreases the likelihood of severe COVID-19 infection and complications because it stimulates the immune response more than the natural infection [8]. Also, vaccines do not contain live viruses, making it impossible for the virus to replicate and transmit to the fetus through the placenta [9]. In addition, there is an experimental study that indicates the presence of high levels of antibodies IgA in the breast milk of mothers who were vaccinated during pregnancy [10]. Therefore, the benefits of administering vaccination during pregnancy exceed its unlikely possible harm. A surveillance review in the United States aimed to assess the safety of the COVID-19 vaccine in pregnancy enrolled 3958 pregnant women who received the mRNA vaccine. This study revealed that the vaccine does not increase the incidence of spontaneous abortion, intrauterine fetal death, stillbirth, preterm birth, congenital anomalies, or neonatal growth restriction [11].

The World Health Organization (WHO) considered a decline in vaccination as one of the top obstacles to overcoming the pandemic [12], with pregnant women being less likely to get vaccinated compared to non-pregnant women. Acceptance of getting vaccination is highly influenced by an individual's health beliefs regarding the vaccine's safety to their health and the health of their fetus. Other concerns regarding vaccine safety involve the lack of research on COVID-19 vaccines and their effectiveness, as well as having not received a strong recommendation for vaccination from healthcare providers [13]. On the other hand, women who received COVID-19 vaccinations harboured fear regarding being infected with COVID-19, and many believed that receiving the covid-19 vaccine serves as a measure to protect

their health and that of their fetus [14].

Vaccination is one of the most effective interventions to prevent the disease and its spread; several behavioral theories were proposed to predict the behaviour of receiving COVID-19. Health Belief Model (HBM) is one of the most commonly used theoretical models that intends to identify the factors that influence health behaviors. The HBM dimensions are perceived susceptibility, severity, benefits, barriers, and cues to action [15]. This model was widely used to determine the predictors of vaccination acceptance during pregnancy. A cross-sectional study in China surveyed 1,392 pregnant women to investigate their acceptance of COVID-19 vaccination using HBM. Results indicated that the acceptance of vaccination was significantly associated with high perceived susceptibility to contract the disease, high perceived severity of COVID-19 infection consequences, high perceived benefits of the vaccine to the pregnant and her fetus, and a strong recommendation by doctors and other health care providers for vaccination. Moreover, the acceptance of vaccination was associated with low perceived barriers as concerns regarding the safety and effectiveness of the vaccine [16].

In Jordan, the Ministry of Health provided free vaccination for all residents, with vaccination being optional and not mandated for pregnant women. An online Jordanian study surveyed 414 women including 195 who were pregnant found that their attitude toward vaccination was moderate, 39.7% were apprehensive about the side effect of the vaccine on their pregnancy, 54.5% believed that the vaccine is useful in decreasing the chance of contracting the disease, 40% agreed that they would receive their vaccination if recommended by a doctor. 23.2% thought that vaccines might cause the disease [17]. To our knowledge, in Jordan currently, there is no available published study that estimates COVID-19 vaccination acceptance and coverage among pregnant women. This study aims to: 1) Estimate the percentage of vaccination acceptance among pregnant women. 2) Compare a group of women who accept receiving COVID-19 vaccination with the non-accepting group in terms of their belief about the disease and vaccine and 3) Determine the predictors of vaccination acceptance based on their demographic and obstetric history variables.

## **2. METHODS**

### **2.1. Design and Setting**

A cross-sectional descriptive design was used. The study was conducted at antenatal clinics of major public hospitals that serve the largest proportion of the urban and suburban population in Northern Jordan. An electronic web-based questionnaire was prepared and data were collected with a face-to-face interview by a trained research assistant.

### **2.2. Population and Sampling**

The target population of this study was all Jordanian pregnant women who (1) had a live fetus and (2) whose age was more than 18 years. The accessible population was the pregnant women who received antenatal care in obstetric clinics in the major public hospitals of Northern Jordan from

March 2022 to May 2022. A convenience sampling method was used to satisfy the exploratory purpose of this study. The sample size was calculated using G-power with a medium effect size,  $\alpha=.05$ , and power=.95 [18]. The minimum required sample was 300 participants. However, 350 pregnant women participated in this study.

### 2.3. Measurement

The questionnaire was developed based on HBM dimensions, which is a model that explains individual behaviour as dependent on their perception of the threat of the diseases (COVID-19 in this study), and their evaluation of the action needed in response to the threat of disease (COVID-19 vaccination). Based on this model, it is assumed that pregnant women will receive a vaccination if they believe that they are at risk of COVID-19 disease (perceived susceptibility). Pregnant women will intend to receive the vaccine if they believe that COVID-19 disease will adversely affect their health and the health of their unborn child (perceived severity). Furthermore, if they believe that the benefits of COVID-19 vaccination (perceived benefits) outweighs its risks and barriers (perceived barriers). Also, the recommendation of healthcare providers, relatives and friends for vaccination may influence pregnant women's attitudes, therefore prompting them to receive vaccination (cues to action) [19].

The questions of each dimension were adapted after an intensive review of previously published research tools of various vaccines for preventable infectious diseases [16, 20]. The first part of the questionnaire includes questions related to the client's demographic data (age, occupation, economic status, address, and level of education) and obstetric history (gravidity, parity, complications during current and previous pregnancies, vaccination during previous pregnancies, and trimester of pregnancy). The second part includes questions assessing participants' acceptance of COVID-19 vaccination during pregnancy. This questionnaire categorizes acceptance for pregnant women as having received the COVID-19 vaccine, or having intent to receive the COVID-19 vaccine during their pregnancy. The third part asks questions to assess pregnant women beliefs regarding COVID-19 vaccination during pregnancy based on HBM dimensions (2- items for perceived susceptibility, 2-items for perceived severity, 4-items for perceived benefits of COVID-19 vaccine, 4- items for vaccine perceived barrier, 2-items for cues to action). A 5-point Likert scale graded from (1=strongly disagree, 2= disagree, 3= neutral, 4= agree, and 5= strongly agree). The questionnaire contains 10 positive and 4 negative statements; items 9,10,11,12 were negative and scored reversely. So, a higher mean score indicates a higher belief.

The questionnaire was translated from English to Arabic and then returned to English to ensure content validity by two professional scholars who demonstrated both written and verbal fluency in both languages. The questionnaire was tested on 30 participants to check clarity, easily of administration, and simplicity. The reliability for internal consistency using Cronbach  $\alpha= 0.76$  for the whole questionnaire.

### 2.4. Ethical Consideration

Ethical approval was obtained from Institution Review Board (IRB) at Al Balqa-University and the Ministry of Health (#MOH\13913). The participants were checked for eligibility by the researcher assistant, and study purposes and the right to participation decision were explained. Pregnant women were informed that their answering questions was considered implicit consent of participation and that their information would be kept anonymous and confidential.

### 2.5. Data Analysis

Data were analyzed using Statistical Package of Social Science (SPSS) version 26. Descriptive statistics for demographic, obstetric history, and participants' belief items (frequencies, percentages, means, and standard deviation). For the belief scale, participants' responses of (1=strongly disagree, 2=disagree, 3= neutral) were merged to indicate disagreement while 4= agree and 5= strongly agree were merged to indicate agreement. The T-test was used to examine the difference between belief means scores of accepting and non-accepting groups. The Chi-square test was used to compare the frequency distributions of the two groups in terms of their belief regarding COVID-19 vaccination. Multiple logistic regressions were utilized to identify predictors of COVID-19 vaccination acceptance,  $p$ -value less than 0.05 is considered significant.

## 3. RESULTS

The study recruited 350 pregnant women. The majority of participants were between 26 and 35 years old, and less than half of the participants had a primary or secondary level of education ( $n=155$ , 44.3%). The participants had an income between 500-800 JOD ( $n=153$ , 43.3%). The vast majority were housewives ( $n=316$ , 90.3%), and more than half of the participants lived in rural areas ( $n=211$ , 60.3%). In terms of health characteristics, the order of pregnancy for almost of women was second or more ( $n=276$ , 78.9%), about ( $n=217$ , 62%) had 2 or more children, and ( $n=194$ , 55.4%) was in the 3<sup>rd</sup> trimester of pregnancy. The largest percentage of women ( $n=267$ , 77%) had not any complications during their current or previous pregnancies. (Table 1).

An independent sample t-test was used to examine the differences in COVID-19 belief means for pregnant women who reported acceptance to receive the COVID-19 vaccine *versus* those who reported refusal. There is a significant difference in total belief mean scores ( $p < 0.01$ ) that women who accepted to receive the vaccine had a higher belief ( $M=3.57$ ,  $SD=0.45$ ) compared with those who refused ( $M=2.95$ ,  $SD= 0.47$ ) (Table 2).

A significant association between items of belief related to barriers and acceptance of receiving vaccine  $p > 0.001$ . More than three fourth of women who accepted to receive the vaccine disagree that the vaccine may cause severe adverse effects for them (80.6%), may cause adverse effects for their fetus (83.1%), vaccine is ineffective (82.3%). It may cause transmission of coronavirus for them (84.7%). In contrast, more than 60% of women who refused to receive vaccines agree with these items 79.2%, 79.6%, 66.8%, and 64.6%, respectively.

A statistically significant relationship was found between belief about the benefits of the COVID-19 vaccine, and the acceptance of receiving it  $p < 0.05$ . More than half of participants who accepted vaccination believe that it is safe (56.5%), protects them from corona infection (55.6%), reduces the risk of its infection (57.3%), and protects their fetus from

the infection (51.6%) while less than 50% of participants who refused vaccination agree with that. Moreover, considering cues to action belief items, 58.1% of participants who accepted vaccination and 82.3% of those who refused agreed that they would vaccinate if their physician recommended the vaccine to be taken  $p < 0.01$  (Table 3).

**Table 1. Demographic and obstetrics history variables (N=350).**

Variables	F (%)	Variables	F (%)
<b>Age</b>		<b>Parity</b>	
18-25	85 (24.3)	No	86 (24.6)
26-35	182 (52.0)	One	47 (13.4)
More than 35	83 (23.7)	Two or more	217 (62)
<b>Education</b>		<b>Trimester of pregnancy</b>	
Illiterate	9 (2.6)	1 <sup>st</sup> trimester	59 (16.9)
Primary or secondary	155(44.3)	2 <sup>nd</sup> trimester	97(27.7)
Diploma	57 (16.3)	3 <sup>rd</sup> trimester	194 (55.4)
Bachelor and high studies	129 (36.9)		
<b>Economic status ( JOD)</b>		<b>complication during the current pregnancy</b>	
Low: < 500	147 (42)	Yes	79(22.8)
Moderate: between 500-800	153(43.4)	No	267 (77.2)
High: > 800	50 (14.3)		
<b>Employment</b>		<b>Complications during previous pregnancies</b>	
Employed	34(9.7)	Yes	78 (22.4)
Housewife	316 (90.3)	No	270 (77.6)
<b>Living address</b>		<b>Vaccination in previous pregnancies</b>	
City	139(39.7)	Yes	121 (34.6)
Rural	211 (60.3)	No	229(65.9)
<b>Gravida</b>		<b>Having chronic disease</b>	
1 <sup>st</sup> pregnancy	74 (21.1)	Yes	33(9.5)
Second pregnancy or more	276 (78.9)	No	316(90.5)
<b>Received COVID-19 Vaccine or intent to receive it</b>		-	-
Yes	124 (35.4)		
No	226 (64.6)		

**Table 2. Means differences in belief scores between accepting vaccination vs. non-accepting group.**

Variable	Accept Mean (SD)	Refuse Mean (SD)	t	df	P	Mean Difference
<b>Total mean score of belief</b>	3.577(.45)	2.95(.47)	12.09	264.8	0.01	0.624

Note: N=Number, F= Frequency, %=Percentages.

**Table 3. Participants' beliefs toward COVID-19 vaccination.**

Belief Items Questionnaire	Responses	COVID-19 Vaccine Acceptance		p
		Yes Frequency (%)	No Frequency (%)	
1- Are you worried to be infected with COVID-19?	Agree Disagree	78 (62.9) 46 (37.1)	131 (58) 95 (42)	.368
2- Are you worried that your unborn baby will catch COVID-19?	Agree Disagree	81 (65.3) 43 (34.7)	140 (61.9) 86 (38.1)	.531
3- Do you think that infection with COVID-19 during pregnancy cause serious health problems?	Agree Disagree	92 (74) 32 (25.8)	171 (75.7) 55 (24.3)	.761
4- Do you think that infection with COVID-19 during pregnancy cause serious health problems for unborn babies?	Agree Disagree	79(63.7) 45(36.3)	151(66.8) 75(33.2)	.558
5- Do you think that the COVID-19 vaccine is safe during pregnancy?	Agree Disagree	70 (56.5) 54 (43.5%)	83 (36.7) 143(63.3)	0.00*
6- Do you think that COVID-19 vaccines will protect you from corona infection?	Agree Disagree	69(55.6) 55(44.4)	98(43.4) 128(56.6)	0.028*

(Table 3) contd.....

Belief Items Questionnaire	Responses	COVID-19 Vaccine Acceptance		p
		Yes Frequency (%)	No Frequency (%)	
7- Do you think that COVID-19 vaccines will decrease the risk of corona infection?	Agree Disagree	71(57.3%) 53(42.7)	101(44.7) 125(55.3)	0.024*
8- Do you think that COVID-19 vaccines will protect your unborn baby from corona disease?	Agree Disagree	64(51.6) 60(48.4)	91(40.3) 135(59.7)	0.041*
9- Do you think that the COVID-19 vaccine may cause severe adverse effects for you?	Agree Disagree	24(19.4) 100(80.6)	179(79.2) 47(20.8)	0.00*
10- Do you think that vaccine may cause severe adverse effects for your fetus?	Agree Disagree	21(16.9) 103(83.1)	180(79.6) 46(20.4)	0.00*
11- Do you think that the COVID-19 vaccine is ineffective?	Agree Disagree	22 (17.7) 102(82.3)	151(66.8) 75(33.3)	0.00*
12- Do you think that the COVID-19 vaccine may cause transmission of coronavirus for you?	Agree Disagree	19(15.3) 105(84.7)	146(64.6) 80(35.4)	0.00*
13- Will you take the vaccine if it is recommended by your family and friends?	Agree Disagree	54(43.5) 70(56.5)	103(45.6) 123(54.4)	0.715
14- Will you take the vaccine if it is recommended by your physician?	Agree Disagree	72(58.1) 52(41.9)	186(82.3) 40(37.7)	0.00*

Note: \* Results statistically significant at  $p < 0.05$ .

Table 4. Predictors of pregnant women's acceptance of COVID-19 vaccination.

Predictors	Unstandardized Coefficient		Standardized Coefficient	t	Sig.	95.0% Confidence Interval for B	
	B	St. error				Beta	Lower bound
Education	-.192	.062	-.128	-3.094	.002*	-.315	-.070
Economic status	-1.080	.084	-.526	-12.843	.001*	-1.246	-.915
Trimester of pregnancy	.176	.074	.093	2.366	.019*	.030	.321
Belief means score	-.838	.104	-.322	-8.073	.001*	-1.043	-.634

Note: \* Results statistically significant at  $p < 0.05$

However, no significant relationship was found between acceptance of vaccination and participants' beliefs regarding their susceptibility to catching the disease and its severity on them and their fetus  $p > 0.05$ . For example, 62.9% of participants who accepted vaccination agreed that they are worried to be infected with COVID-19 compared with 58% of those who refused, while 74% and 75.7% from both groups agreed that infection with COVID-19 during pregnancy cause severe adverse effects.

Multiple logistic regression was utilized to determine the predictors of pregnant women's acceptance of COVID-19 vaccination. Participant demographic variables, health variables, and belief mean scores were inserted as predictors. Results indicated that the model is significant [ $F=32.9, P < 0.01$ ]. Level of education ( $\beta = -.128, p = 0.002$ ), economic status ( $\beta = -.526, p < 0.01$ ), Trimester of pregnancy ( $\beta = .093, p = 0.019$ ), and mean belief score ( $\beta = -.322, p < 0.01$ ) were significant determinants, and this means that the highest proportion of participants who accepted vaccination had high education level (53.3% have bachelor degree), moderate level of economic status (55.6% receive between 400-800JOD/month), in the 3<sup>rd</sup> trimester of pregnancy 46.6%, and have a higher level of belief score (Table 4).

4. DISCUSSION

The rate of COVID-19 vaccine acceptance among pregnant

women in this study was at a lower level in comparison with other countries around the world. For example, the rate of acceptance was 77.4% in China, 60.8% in Thailand, and 74.8% in Saudi Arabia [16, 21, 22]. This was inconsistent with an online survey that was conducted by Skjefte, Ngirbabul [23], which recruited 5,294 pregnant women in 16 countries and found that the overall acceptance level was 52%, it was more than 80% in India and Mexico, and less than 45% in Russia and the United States. While there were 1,181 women who participated in a study in the UK to know their view on the COVID-19 vaccine during pregnancy stated that 81% of participants would refuse vaccination if they were pregnant [24]. Reasons indicated by the study include doubts regarding the safety of the vaccine claiming that it developed in a short period and there is no evidence that it will not cause serious adverse effects for the mothers and their fetus. Also, trust in the safety of the vaccine was the strongest predictor of vaccination acceptance, whereas mistrust was the common reason for hesitancy among pregnant women in the survey that was conducted in 16 countries [23]. This is congruent with what was found in this study that more than half of the participants who accepted vaccinations agree that it is safe. In the literature, there were no differences in the percentage of maternal and neonatal adverse outcomes such as miscarriages, preterm births, and small gestation age comparable with previous studies before the pandemic [11]. However, the WHO recommended pregnant women get the COVID-19 vaccine to

avoid the risk of preterm delivery and serious complication if contracting COVID-19 during pregnancy [12].

More than half of pregnant women in the group who demonstrated acceptance for vaccination believes in the efficacy of the vaccine in protecting the mother and her fetus against the disease while conversely in the non-accepting group. This is supported by a Jordanian published study which revealed that approximately half of pregnant and lactating women believe that the vaccine would decrease the incidence of contracting the disease for pregnant and their fetuses [17]. It is also consistent with findings presented in one national online survey that recruited 2,213 pregnant women in the United States and another that recruited 206 pregnant in Saudi Arabia [21, 25]. An observational cohort study between December, 2020 and June, 2021 to evaluate the effectiveness of COVID-19 vaccine involved 10,861 vaccinated pregnant women matched to 10,861 unvaccinated pregnant in control group. This indicated that 131 vaccinated women were infected with COVID-19 *versus* 235 infected women in the control group [26]. Moreover, binding and neutralizing antibodies were found in the newborn cord blood of mothers vaccinated during pregnancy [27].

There is a significant inverse relationship between participants' beliefs in barriers and acceptance of COVID-19 vaccination. More than 80% of pregnant women who accepted vaccination reported disagreements with perceived barrier items (COVID-19 vaccine could cause serious side effects for mothers and their fetuses), (vaccine is ineffective), (vaccine may cause COVID-19 infection). In literature, concerns regarding the side effects of vaccines were the major cause for vaccination reluctant in many previous studies [13, 23, 24].

Indeed, pregnant women reported less post-vaccine chills, fever, headache, and myalgia than non-pregnant women. Also, the mRNA COVID-19 vaccine was 96% effective in reducing the incidence of infection and 97% in reducing symptomatic infection after one to eight weeks of the 2<sup>nd</sup> dose [25]. Here, it is worth mentioning that COVID-19 variants appeared at regular periods, namely, omega, delta, alpha, beta, and omicron [28]. So, at the current status, omicron is the current surge in different countries that has direct effects and consequences like the other variants [29].

Concerning participants' beliefs of susceptibility and severity of the disease, it was found that more than 50% of participants in both accepting and non-accepting groups were worried about being infected with the disease and concerned about its serious effect on them and their fetuses. Surprisingly, there was no significant association between items of these variables and accepting vaccination. This is consistent with the results of the US cross-section online study, which surveyed 226 pregnant women using the HBM and found that neither susceptibility variable nor the severity variable was significantly associated with COVID-19 vaccination acceptance [30]. In contrast, Chinese research using the same model indicated that pregnant women who were worried about contracting COVID-19 had a higher vaccination acceptance rate [16]. However, the pro-inflammatory state that occurs physiologically in the 1<sup>st</sup> and 3<sup>rd</sup> trimesters of pregnancy provokes pregnant women's risk for infectious disease as

COVID-19 [31].

Regarding cues to action, pregnant women's attitude toward vaccination is highly affected by their doctors. About two third of participants in the non-accepting group reported they would get the vaccine if recommended by their doctors. This was consistent with the findings of the study that was conducted by Liu, Iketani [32] in which there was a similar percentage of pregnant women in South Korea who indicated that receiving information from their doctors may affect their decision about vaccination. Despite the vital role health care providers have in persuading their clients to get the vaccination by providing up-to-date information that helps a pregnant woman decide. Unfortunately, only 24% of healthcare workers in Spain endorsed that they have sufficient information about the vaccine, 27% agreed that it is safe, and only 32% agreed that it is effective. This hesitancy among healthcare providers was due to a lack of scientific evidence and exclusion of pregnant women from clinical trials. Nonetheless, Marbán-Castro, Nedic [33] stated that the attitude of healthcare providers toward the importance and safety of the vaccine during pregnancy was enhanced by nearly 50% after the national government recommendation. However, healthcare providers were the long-standing partners in the safe administration of COVID-19 vaccine, so their positive attitude toward immunizing pregnant women are recommended behavior for vaccination [34, 35] Besides, other barriers were found related to peer pressure since it was found that social norms could increase the acceptance level of vaccination [36]. Nevertheless, according to this study, family and peer pressure were not significantly indicative of COVID-19 vaccination.

Our findings suggested that level of education; economic status; gestational age; and mean belief score were significant predictors of accepting vaccination. More than half of the participants who accepted vaccination have a bachelor's degree. This is supported by one study in France and another in Pennsylvania that found a higher acceptance rate among pregnant women with higher education [37, 38]. This could be related to the fact that educated participants are more knowledgeable about the disease and its negative effect on pregnancy. Most participants who accepted to be vaccinated in this study have a moderate level of income which is inconsistent with the findings conducted by Skirrow, Barnett [24], who reported that pregnant women with low income were more likely to refuse vaccination. The majority of accepting group participants were in the 2<sup>nd</sup> or 3<sup>rd</sup> trimester of pregnancy, which aligns with findings in the literature [16, 23, 24]. This could be explained by the fact that all fetus body systems had been completely formed in late pregnancy and there is little risk of congenital anomalies [22].

## 5. CLINICAL IMPLICATIONS

This study had several clinical implications that could be summarized in adopting strategies that could improve vaccination acceptance among pregnant women, conducting an educational campaign at the community level to raise people's awareness and combat the spread of misinformation and rumors about COVID-19 vaccination during pregnancy.

Moreover, providing vaccination in all maternity care centers and recommending pregnant women to vaccinate at antenatal care visits.

## 6. STRENGTH AND LIMITATION

To our knowledge, this study was the first to estimate the rate of COVID-19 vaccination among pregnant women in Jordan. The convenience sampling method was used in maternity care clinics (antenatal clinics) at a public hospital in Northern Jordan which limits the generalization of the study, indicating that it may not be representative of all regions of Jordan. Also, the attitude of pregnant women in the antenatal clinics as a special population could differ in their acceptance of vaccination about the general pregnant population. The questionnaire contained close-ended questions that limited having an adequate explanation and detailed information. Moreover, the effect of some factors, such as social media and government obligations, on vaccination acceptance was not investigated. On the other hand, face-to-face interviews reduced the chance of misunderstanding as the participants could ask for clarification of any question. Participants with varied demographic and health characteristics were included in the study. However, the data were collected after the Omicron wave that could impact the attitude of pregnant women toward vaccination.

## CONCLUSION

The acceptance rate of COVID-19 vaccination among pregnant women in Jordan is low. Most women, who accept vaccination believe that it's safe, decreases the incidence of contracting disease, and protects the mothers and their fetuses. On the other hand, the majority in the non-accepting group believe that it is not effective, and causes serious harm for the mothers and their fetuses. Multiple efforts are needed to improve public knowledge about the importance and safety of vaccines.

## AUTHORS' CONTRIBUTION

Study conception S. A

Data Collection H. B. A

Data analysis S. B. H

Data interpretation and discussion M. A. B., S.A

Final review and editing S.B.H, S. A, H.B.A

## LIST OF ABBREVIATIONS

**WHO** = World Health Organization

**HBM** = Health Belief Model

**CDC** = Center for Disease Control

## ETHICS APPROVAL AND CONSENT TO PARTICIPATE

We obtained ethical approval from the Institution Review Board (IRB) at Al Balqa Applied University and the Jordanian Ministry of Health (reference #: 13913).

## HUMAN AND ANIMAL RIGHTS

No animals were used in this research. All procedures performed in studies involving human participants were in accordance with the ethical standards of institutional and/or research committees and with the 1975 Declaration of Helsinki, as revised in 2013.

## CONSENT FOR PUBLICATION

Informed consent was obtained from all participants of this study.

## AVAILABILITY OF DATA AND MATERIALS

The data and supportive information are available within the article.

## STANDARDS OF REPORTING

STROBE guidelines were used.

## FUNDING

None.

## CONFLICT OF INTEREST

The authors declare no potential conflict of interest.

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