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Perceptions and Predictive Factors of Jordanian Pregnant Women toward COVID-19 Vaccination

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Abstract:

Introduction: Vaccination is an effective strategy for preventing COVID-19 infection and its complications, particularly among pregnant women. This study aimed to assess the acceptability and perceptions of Jordanian pregnant women toward COVID-19 vaccination, as well as compare the perceptions of women who received the vaccine with those who did not, and examine the predictors of COVID-19 vaccine uptake among pregnant women.

Method: A descriptive cross-sectional correlational design was employed in the antenatal clinics of two major hospitals in Irbid, North Jordan. A convenience sample of 300 Jordanian pregnant women and a self-reported questionnaire were employed in the period between November 2022 and January 2023.

Results: The data were analyzed using SPSS version 26 software. Descriptive statisticsrevealed that 58.6% of women received two COVID-19 vaccine doses before pregnancy, but only 29% were willing to take it if given the choice. Approximately 47% believed that a previous infection gave them immunity, and 73% felt that strict precautions made vaccination unnecessary. Only 28% agreed that vaccination reduces the chance of getting COVID-19 or its complications. A t-test showed vaccinated women perceived COVID-19 as more severe (p=0.04). Logistic regression analysis revealed that working women and those with a college education were significantly more likely to be vaccinated than unemployed or less educated women (p=0.008 and p=0.005, respectively).

Discussion: The findings emphasized the importance of understanding pregnant women's perspectives on COVID-19 immunization to facilitate informed decision-making and improve public health outcomes.

Conclusion: Healthcare providers should actively implement targeted outreach programs for women from lower socio-economic status to improve awareness of COVID-19 risks and increase vaccination rates.

Keywords: COVID-19, Vaccination, Acceptability, Perceptions, Pregnant women, Jordan.

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1. INTRODUCTION

COVID-19 is a respiratory illness caused by the coronavirus SARS-CoV-2 [1]. As of June 2023, the World Health Organization (WHO) has received reports of 767,128,669 COVID-19 recorded cases, including 6,961,089 deaths. The Eastern Mediterranean Regional Office confirmed 23,383,069 cases and a total of 898,314,193

doses of the vaccine with an average coverage of 50% [2]. COVID-19 vaccination is recommended for all eligible individuals, including pregnant and breastfeeding women [3]. Despite its proven safety and effectiveness in preventing severe illness, death, and pregnancy-related complications, global vaccination rates among pregnant women remained low in 2022 (0.8%–6.1%) compared to 69.9% in nonpregnant individuals [4, 5].

Jordan has adopted a comprehensive COVID-19 vaccination strategy, prioritizing groups such as healthcare workers, the elderly, and individuals with chronic condi-tions. The country has established widespread access through hospitals, mobile clinics, and an online vacci-nation platform for appointment scheduling. Vaccines used include Pfizer-BioNTech, AstraZeneca, and Sinopharm, sourced through direct deals, donations, and the COVAX initiative. A nationwide awareness campaign was launched across media and community channels to promote vaccine uptake and address misinformation [6].

Vaccine acceptance is identified by the World Health Organization as a critical challenge to global health, with repercussions extending beyond individual refusals to entire communities [7]. In the USA, the toll of COVID-19 on pregnant women has been significant, with 207,793 reported cases and 296 deaths between January 22, 2020, and May 9, 2022 [1]. Persistent doubts regarding the safety and efficacy of vaccines, particularly regarding the duration of protection against COVID-19 and instances of reinfection, contribute to vaccine hesitancy. Moreover, the rapid development of vaccines has raised safety concerns, which have historically been associated with negative outcomes [8]. This hesitancy is exacerbated on a global scale, particularly among pregnant women, leading to lower vaccine acceptance and uptake rates. Several countries, including Saudi Arabia (57.1%), Scotland (32.3%), the US (40%), and England (53.7%), have obser-ved low COVID-19 vaccination rates among pregnant mothers [9].

A US cross-sectional study of 915 pregnant women found high levels of concern about COVID-19, with most fearing harm to themselves (80%) and their unborn babies (92%). Obstetricians were the most trusted information source (42%), followed by family physicians or primary care providers (28%). Despite these concerns, less than half were willing to receive the COVID-19 vaccine [10]. In Thailand, a survey of 176 pregnant women and their husbands found moderate belief in vaccine safety during pregnancy (40.9% of women and 46.6% of husbands) and similar acceptance rates (approximately 61%). Over half of the women preferred vaccination in the second trimester. Key concerns included potential harm to the baby (58.2%), side effects (17.9%), and efficacy (11.9%). Despite these concerns, the actual vaccination rate among the women was high at 88.3% [11]. A cross-sectional online survey conducted in Jordan, involving 195 pregnant and 218 breastfeeding women, found mixed perceptions of the COVID-19 vaccine. Primary reasons for vaccine hesitancy included concern for the child's well-being (32%), fear of side effects (22.5%), and lack of time (23.5%) [12].

Nurses play a vital role in increasing vaccine acceptance, raising awareness, and reducing vaccine hesitancy. The findings will equip healthcare providers, especially community health nurses who interact closely with vulnerable populations, with essential insights into pregnant women's attitudes toward the COVID-19 vaccine. This information will aid in the development of health-promoting strategies and programs, particularly in multi-component interventions aimed at improving attitudes and increasing vaccine coverage among pregnant women. Therefore, it is imperative to evaluate pregnant women's perceptions before initiating health education efforts.

The Health Belief Model is the most widely utilized theory in health promotion and education. Its core components, including perceived severity, susceptibility, benefits, and barriers, along with cues of action and modifying factors, form the framework. Health behavior can be elucidated by utilizing any combination of these perceptions individually or collectively [13]. Perceived severity refers to how seriously individuals view the consequences of contracting COVID-19. Those who believe the virus poses serious health risks may be more inclined to get vaccinated to protect themselves and others. Perceived barriers such as misinformation, access issues, or concerns about side effects can hinder vaccine uptake. Perceived benefits involve the belief that the vaccine is effective, safe, and offers protection. For example, pregnant women are more likely to get vaccinated if they believe in the safety and efficacy of the vaccine. Cues to action include triggers like medical advice, public health messages, or personal experiences with the virus [13].

This study examined the fundamental concepts of the Health Belief Model to gauge pregnant women's perceptions and acceptance of COVID-19 immunization.

The objectives of this study were to:

[1] Assess the acceptability and perceptions (including perceived severity, benefits, barriers, and cues to action) of Jordanian pregnant women regarding COVID-19 vaccination.
[2] Examine the socio-demographic variables that predict the uptake of COVID-19 vaccine.
[3] Compare the perceptions of women who received the vaccine before pregnancy with those who did not, in terms of their attitudes toward the COVID-19 vaccination.

2. MATERIALS AND METHODS

2.1. Study Design and Setting

A descriptive correlational cross-sectional design was employed to evaluate the acceptance, perceived severity, benefits, barriers, and cues of action regarding COVID-19 vaccination among pregnant women in Jordan. Additionally, to examine the socio-demographic variables that predict the uptake of COVID-19 vaccine in this population. The study was conducted at the antenatal care clinics of two major hospitals located in Irbid City, situated in the northern region of Jordan.

2.2. Population and Sample

This study targeted Jordanian pregnant women, with

the accessible population being pregnant women within the selected hospitals. A convenience sampling method was employed to enroll participants. The inclusion criteria included Jordanian pregnant women aged between 18 and 45 years who were able to read Arabic and consented to participate. Women who declined to participate or were unable to provide informed consent were excluded from the study. The sample size was determined using G*Power statistical software, with an alpha level of 0.05, a study power of 0.8, and a medium effect size of 0.5 for independent sample t-test, indicating a minimum requirement of 128 participants. However, a total of 300 women agreed to participate, resulting in a response rate of 93.8%.

2.3. Measurement

A tool was used to assess the acceptability and perception of COVID-19 vaccinations among pregnant women. Samannodi (2021) adapted and utilized an Arabic questionnaire that had previously been validated by Almaghaslah *et al*. (2021) [14.15]. Although both Arabic and English versions of the tool were available from the author, the Arabic version was used in this study, as it is the native language of the Jordanian participants. The questionnaire comprised five sections: The initial segment encompassed socio-demographic characteristics such as age, family monthly income, educational level, employment status, and place of residence, alongside obstetric history detailing the last menstrual period day, expected date of birth, number of prior pregnancies, live births, abortions, types of delivery, and any pregnancy-related health issues. It also explored vaccine history, including reports of chronic diseases, prior COVID-19 infection, hospitalization due to COVID-19, acceptance of the COVID-19 vaccine, and, if administered, the number of vaccine doses received. The second, third, fourth, and fifth sections delved into perceived severity, benefits, barriers, and cues for action. Each item was rated on a Likert scale from strongly disagree (5) to strongly agree (1), with some items being reverse-scored. Meanwhile, Cronbach's Alpha was computed for the entire instrument to assess internal consistency, yielding a value of 0.72, indicative of satisfactory reliability.

2.4. Data Collection and Ethical Considerations

Ethical approval was obtained from the Institution Review Board (IRB) at Jordan University of Science and Technology (reference #: 33/154/2022) and from the Ministry of Health (MOH). Eligible participants were provided with a consent form to sign, which clearly explained the study's objectives, assured anonymity and confidentiality, outlined voluntary participation, and stated the right to withdraw. Permission to utilize the Arabic version of the instrument was obtained from the researcher. Data were collected through face-to-face interviews conducted between November 2022 and January 2023, during which the researcher remained available to address any queries from participants. Completion of the questionnaire typically took approximately 15 minutes.

2.5. Data Analysis

The data underwent analysis utilizing the Statistical Package for the Social Sciences (SPSS version 26) software. Descriptive statistics were employed to characterize the demographic data and other variables under study. To evaluate the disparity in total perception between pregnant women who received the COVID-19 vaccine and those who did not, the t-test was utilized. Logistic regression was employed to evaluate the influence of various socio-demographic variables on the probability of receiving the COVID-19 vaccine. Significance testing was conducted at an alpha level of .05.

3. RESULTS

3.1. Sample Description

This study's participants included pregnant women aged between 18-45 years old (*mean*=30.8, *SD*=5.5). Notably, 67% of them had completed college education. The mean family monthly income was 475.5 Jordanian Dinar (*SD*=303), while the majority of participants were not employed (72.3%). Additionally, 48% of the sample resided in rural areas, while 52% resided in urban areas. Moreover, a significant portion of the participants, 85.7%, reported having no chronic diseases. Among the participants, 43% had experienced a previous COVID-19 infection, with the majority (95.3%) not requiring hospitalization during their illness. Additionally, prior to pregnancy, 29.7% of participants had not received the COVID-19 vaccine, while 11.7% had received one dose, and 58.6% had received two doses. During pregnancy, only a small proportion, 3.7%, had received booster doses. Lastly, only 29% of participants indicated that they would accept the vaccine if the decision were solely theirs Table **1**.

3.2. Pregnant Women's Perceptions of COVID-19 Vaccinations

The percentage of perceived severity was assessed on a scale ranging from "strongly agree" (1) to "strongly disagree" (5). For instance, 35% of participants indicated agreement that COVID-19 infection is not severe, leading them to believe they do not require the vaccine (with 13% strongly agreeing and 22% agreeing). Similarly, 46.4% of participants agreed that all individuals they knew who contracted COVID-19 experienced a mild form of the illness (with 12.7% strongly agreeing and 33.7% agreeing). Additionally, 47% of participants agreed that having had a previous COVID-19 infection conferred immunity against it (with 11.3% strongly agreeing and 35.7% agreeing) Table **2**.

The percentages of perceived barriers were measured on a scale ranging from "strongly agree" (1) to "strongly disagree" (5). For instance, a majority of participants (73%) agreed that their strict adherence to precautions rendered the vaccine unnecessary (with 36.7% strongly agreeing and 36.3% agreeing). Similarly, 63.7% of participants agreed that they were uncertain about the

vaccine's components (with 32% strongly agreeing and 31.7% agreeing). Moreover, 63.6% of participants agreed that the rapid vaccine approval process compromised safety assessment (with 31.3% strongly agreeing and 32.3% agreeing). Additionally, a majority (73.6%) agreed that they lacked awareness regarding the vaccine's effectiveness in pregnant women (with 35.3% strongly agreeing and 38.3% agreeing). Lastly, 62% of participants agreed that they refrained from taking the vaccine due to concerns about its safety for themselves and their babies during pregnancy (with 29.7% strongly agreeing and 32.3% agreeing) Table **3**.

Table 1. Participants' COVID-19 History and Acceptance of Receiving the Vaccine (N=300).

Variable	N	Percentage
Have chronic disease Yes No	43 257	14.3% 85.7%
Previous infected with COVID-19 Yes No	129 171	43% 57%
Need hospitalization Yes No	14 286	4.7% 95.3%
Receiving COVID-19 vaccine No Yes, one dose Yes, two doses	89 35 176	29.7% 11.7% 58.6%
Booster dose Yes No	11 289	3.7% 96.3%
If it's your decision, would you accept taking the vaccine? Yes No	87 213	29% 71%

Table 2. Percentages of Perceived Severity toward COVID-19 vaccination (N=300).

Variable	Strongly agree N (%)	Agree N (%)	Neutral N (%)	Disagree N (%)	Strongly disagree N (%)
COVID-19 infection is not serious, so I do not think I should take the vaccine	39(13%)	66(22%)	80(26.7%)	81(27%)	34(11.3%)
All people I know who got COVID-19 got the mild form	38(12.7%)	101(33.7%)	39(13%)	80(26.7%)	42(14%)
I have had a COVID-19 infection, and I think I've developed immunity against it	34(11.3%)	107(35.7%)	49(16.3%)	69(23%)	41(13.7%)

Table 3. Percentages of Perceived Barriers toward COVID-19 vaccination (N=300).

Variable	Strongly agree N (%)	Agree N (%)	Neutral N (%)	Disagree N (%)	Strongly disagree N (%)
I was very strict with precautions (mask, hand washing, and social distancing), so I think I do not need the vaccine	110(36.7%)	109(36.3%)	27(9%)	40(13.3%)	14(4.7%)
I am not sure about the components of the vaccine	96(32%)	95(31.7%)	67(22.3%)	31(10.3)	11(3.7%)
The vaccine approval process was fast, so the safety of the vaccine was not assessed adequately	94(31.3%)	97(32.3%)	67(22.3%)	31(10.3%)	11(3.7%)
I am not aware of the effectiveness of the vaccine on pregnant women	106(35.3%)	115(38.3%)	42(14%)	24(8%)	13(4.3%)
The vaccine has a magnetic piece that can spy on us	10(3.3%)	26(8.7%)	118(39.3%)	78(26%)	68(22.7%)
I have heard that blood clot is a common side effect of the vaccine	47(15.7%)	89(29.7%)	86(28.7%)	55(18.3%)	23(7.7%)
I have heard on social media that the vaccine is not safe as it would contain the COVID-19 virus	50(16.7%)	87(29%)	75(25%)	68(22.7%)	20(6.7%)
I have a food allergy/medication allergy, so I couldn't take the vaccine	19(6.1%)	41(13.7%)	67(22.3%)	120(40%)	53(17.7%)
I have heard the vaccine is unsafe for me and the baby during pregnancy, so I did not want to take it	89(29.7%)	97(32.3%)	52(17.3%)	48(16%)	14(4.7%)

The percentages of perceived benefits were also measured on a scale from "strongly disagree" (1) to "strongly agree" (5). For example, only 30.4% of participants agreed that vaccination would alleviate their worries about contracting COVID-19 (with 6.7% strongly agreeing and 23.7% agreeing). Similarly, only 28% of participants agreed that vaccination reduced the likelihood of contracting COVID-19 or experiencing its complications (with 5.3% strongly agreeing and 22.7% agreeing). Furthermore, only 21.3% of participants agreed that COVID-19 complications were more severe in pregnant women and that vaccination could protect against them (with 5% strongly agreeing and 16.3% agreeing) Table **4**.

The final aspect addressed cues for action regarding receiving the COVID-19 vaccine, which were evaluated on a scale ranging from "strongly agree" (1) to "strongly disagree" (5). For instance, 61.6% of participants agreed that they would consider taking the COVID-19 vaccine only if provided with adequate information about it (with 14.3% strongly agreeing and 47.3% agreeing). Similarly, 45% agreed that they would consider taking the COVID-19 vaccine only if it was widely adopted by the public (with 7.7% strongly agreeing and 37.3% agreeing). Finally, 64% of participants agreed that they would consider taking the COVID-19 vaccine only if it became mandatory (with 21% strongly agreeing and 43% agreeing) Table **5**.

Direct logistic regression analysis was conducted to evaluate the influence of several variables on the likelihood of respondents receiving the COVID-19 vaccine before pregnancy. The model encompassed five independent variables (age, family monthly income, educational level, employment status, and place of residence). The complete model containing all predictors was statistically significant, X^2 (5, n= 300) = 44.194, $p<$ 0.001, indicating that the model distinguished between participants who reported taking the vaccine and those who did not. The model as a whole explained 13.8% of the variance of taking the vaccine.

As depicted in Table **6**, two independent variables exhibited a unique and statistically significant contribution to the model: profession (p = 0.008) and educational level (p = 0.005), respectively. The primary predictor of vaccine uptake was profession, yielding an odds ratio of 3.526 (95% CI = 1.3988–8.892). This suggests that participants who were employed were 3.5 times more likely to accept the vaccine compared to those who were not, after controlling for all other variables in the model. The second predictor, educational level, demonstrated an odds ratio of 2.322 (95% CI = 1.282-4.204). This indicates that participants with a college-level education were 2.3 times more inclined to accept the vaccine compared to those with a lower educational attainment, again after controlling for all other factors in the model.

A t-test was used to analyze the differences between individuals who received the COVID-19 vaccine and those who did not, in terms of their perceptions. The results showed a significant difference between women who received the vaccine (mean = 9.26, SD = 2.74) and those who did not receive the vaccine (mean = 8.11, SD = 2.77) in terms of their perceived severity (t(122) = -2.076, p = 0.04) Table **7**.

Table 4. Percentages of Perceived Benefits toward COVID-19 vaccination (N=300).

Perceived benefits	Strongly agree N (%)	Agree N (%)	Neutral N (%)	Disagree N (%)	Strongly disagree N (%)
Taking the vaccine would make me less worried about catching COVID-19	20(6.7%)	71(23.7%)	68(22.7%)	106(35.3%)	35(11.7%)
Vaccination decreases my chance of getting COVID-19 or its complications	16(5.3%)	68(22.7%)	65(21.7%)	110(36.7%)	41(13.7%)
Complications of COVID-19 are more serious in pregnant women, so the vaccine would protect me against them	15(5%)	49(16.3%)	94(31.3%)	91(30.3%)	51(17%)
Vaccination would ease the precautionary measures, including work permits and travel bans	6(1.7%)	21(7%)	49(16.3%)	166(55.3%)	58(19.3%)

Table 5. Percentages of Perceived Cues of Action toward COVID-19 vaccination (N=300).

Cues of action	Strongly agree N (%)	Agree N (%)	Neutral N (%)	Disagree N (%)	Strongly disagree N (%)
I would only take the COVID-19 vaccine if I am given adequate information about it	43(14.3%)	142(47.3%)	66(22%)	29(9.7%)	20(6.7%)
I would only take the COVID-19 vaccine if the vaccine is taken by many in the public	23(7.7%)	112(37.3%)	77(25.7%)	61(20.3%)	27(9%)
I would only take the COVID-19 vaccine if it were mandatory	65(21.7%)	129(43%)	46(15.3%)	39(13%)	21(7%)

Table 6. Logistic Regression Analysis of Demographic Variables and the COVID-19 Vaccine Uptake (N=300).

Predictors	B	S.E.	Wald	df	*P*	OR	95.0% CI	
							Lower	Upper
Age	.024	.025	.870	1	.351	1.024	.974	.1.076
Monthly income	.001	.001	2.125	1	.145	1.001	1.000	1.003
Living place	.374	.288	1.685	1	.194	1.454	.826	2.556
Education	.842	.303	7.736	1	**.005**	2.322	1.282	4.204
Profession	1.260	.472	7.131	1	**.008**	3.526	1.398	8.892

Table 7. The Difference Between Pregnant Women Who Took the COVID-19 Vaccine and Those Who Did Not in Terms of the Total Perception toward COVID-19 Vaccination.

Perception	Groups (took the vaccine)	Means	T	df	P	Mean Difference
Severity	Yes No	9.26 8.11	-2.076	122	**0.04**	**-1.145**
Barriers	Yes No	24.54 22.43	-1.697	122	0.092	-2.116
Benefits	Yes No	14.26 13.08	-1.858	122	.066	-1.178
Cues of action	Yes No	8.03 8.33	.509	122	.591	.297

4. DISCUSSION

The mean age of participants was 30.8 years, ranging from 18 to 45 years, an age range considered optimal for pregnancy due to the lower risk of complications [16]. Over 70% of participants had received one to two doses of the COVID-19 vaccine before becoming pregnant, indicating a high vaccination rate among pregnant individuals. However, it is notable that 29.7% of participants had not been vaccinated before pregnancy, highlighting the ongoing need for vaccination promotion campaigns among expectant mothers. These findings aligned with vaccination rates among pregnant women in Asian regions, as reported by Mhereeg *et al*. (2022), indicating a high rate of COVID-19 vaccination [17]. Furthermore, only 3.7% of individuals received booster doses during pregnancy. This suggests potential lack of awareness among pregnant women regarding the necessity of booster doses or limited access to them. This observation is supported by the results of Al-Qerem *et al*. (2022), who noted high reluctance among Jordanian pregnant women to receive booster doses of COVID-19 vaccination [18].

The Health Belief Model (HBM) outlines perceived severity, susceptibility, benefits, and barriers as fundamental constructs that influence health behavior [13]. The study findings shed light on participants' perceptions of the severity, barriers, benefits, and cues of action related to COVID-19 vaccination. Regarding severity, a third of participants viewed COVID-19 infection as not severe enough to warrant vaccination, with 35% believing the infection did not necessitate vaccination. This perception may stem from the observation that many COVID-19 cases exhibit only mild symptoms or none at all. However, it is essential to recognize that even mild cases can have long-term health implications and contribute to disease transmission among vulnerable groups. This finding resonated with the results of Saied *et al*. (2021), who found a similar proportion of individuals questioning the seriousness of COVID-19 infection and the necessity of vaccination. However, their study focused on Egyptian medical students rather than Jordanian pregnant women [19].

The study revealed that pregnant women perceived several barriers to receiving the COVID-19 vaccine. A significant majority (73%) reported strict adherence to safety precautions, such as mask-wearing and hand hygiene, leading them to believe vaccination was unnecessary. Additionally, a substantial portion (63.7%) expressed skepticism regarding the vaccine's ingredients and the expedited approval process, raising concerns about its safety. Despite acknowledging concerns about potential adverse effects, such as blood clots, only a small fraction (12%) endorsed unfounded beliefs, including the notion that the vaccine contains a monitoring device. Moreover, many participants cited concerns over the vaccine's safety for pregnant women and their unborn children as a reason for not getting vaccinated. These findings highlighted the importance of addressing misinformation and concerns surrounding vaccine safety and efficacy, particularly among expectant mothers. This, in turn, is congruent with the findings of Ennab *et al*. (2022), who reported widespread misinformation and false beliefs about COVID-19 vaccination, particularly among pregnant women in Africa [20].

Furthermore, the study found that the majority of participants did not perceive significant benefits associated with receiving the vaccine. Only 30% believed vaccination would alleviate their concerns about

contracting COVID-19, indicating a lack of confidence in the vaccine's protective effects. Similarly, only 28% of the individuals felt vaccination could reduce their risk of contracting COVID-19 or experiencing its consequences, suggesting skepticism about its efficacy. These results aligned with those reported by Janik *et al*. (2022), who identified fear of adverse effects and doubts about the vaccine's benefits as factors contributing to low COVID-19 vaccination uptake among pregnant women in Poland [21].

Approximately 8.7% of participants believed that vaccination would lead to less stringent measures, such as relaxed employment permits and travel restrictions. This suggests that some individuals may have lacked motivation to receive the vaccine, perceiving it as unrelated to returning to pre-COVID-19 activities or lifestyles. This could also be attributed to a lack of knowledge and awareness regarding the benefits of COVID-19 vaccination in curbing community transmission. These findings agreed with research by Denford *et al*. (2022), indicating that access issues, such as movement control orders and travel restrictions, were not significant motivators for adults to get vaccinated against COVID-19 [22].

The study's findings shed light on cues of action that could influence vaccine acceptance decisions. A considerable proportion of participants expressed willingness to receive the vaccine only if adequately informed about it, underscoring the importance of effective communication strategies in promoting vaccine acceptance. This highlights the importance of health authorities addressing public concerns and inquiries about the safety and efficacy of COVID-19 vaccines.

The findings of this study have provided valuable insights into the factors influencing the acceptance of the COVID-19 vaccine among Jordanian pregnant women. Notably, profession and educational level emerged as significant independent variables strongly associated with the likelihood of receiving the vaccine before pregnancy. The observation that occupation plays a pivotal role in vaccine uptake resonated with previous research, which has consistently shown that individuals in certain professions, such as healthcare workers, exhibit higher vaccination rates [23]. This trend could be attributed to their heightened awareness of the benefits of vaccination and increased exposure to the virus in their workplace settings. Moreover, the mandatory vaccination policies enforced in specific employment sectors may have further contributed to this association.

Similarly, the finding that educational attainment serves as a significant predictor aligned with existing literature highlighting the positive correlation between higher education levels and health-related behaviors [24]. Individuals with higher academic qualifications often possess greater health literacy and are more likely to engage in proactive health practices. Thus, their inclination towards vaccine acceptance may stem from a better understanding of the importance of vaccination in safeguarding individual and public health. These findings underscore the multifaceted influences shaping vaccine acceptance behaviors and emphasize the need for tailored interventions addressing socio-demographic factors to enhance vaccine uptake rates among pregnant women.

The findings derived from the t-test revealed a notable disparity in the perceived severity of COVID-19 among pregnant women who received the vaccine compared to those who did not. Notably, those who received the vaccine exhibited a significantly higher average severity score compared to their non-vaccinated counterparts ($p = 0.04$). This study highlights the significant impact of perceived disease severity on the decision to receive immunization among pregnant women. This observation aligns with previous research, which has consistently identified perceived disease severity as a key predictor of vaccination uptake [25].

It is imperative to acknowledge that while this study focused on pregnant women in Jordan, the generalizability of the results to other populations may be limited. However, these findings underscore the importance of considering perceived severity in vaccine promotion efforts, particularly among pregnant women. Future research endeavors should investigate additional factors, such as healthcare accessibility and vaccine hesitancy, that may influence vaccination decisions among this population. By addressing these multifaceted determinants, public health interventions can be tailored to effectively promote vaccine acceptance and uptake among pregnant women across diverse socio-cultural contexts.

5. STUDY IMPLICATIONS AND RECOMMENDATIONS

This study holds several implications for practice that can inform healthcare providers and policymakers on strategies to enhance COVID-19 vaccine uptake among pregnant women. Firstly, medical professionals should prioritize providing pregnant women with comprehensive information about COVID-19 immunization, including its benefits and potential risks. Moreover, healthcare providers must ensure that expectant mothers are educated about the advantages and drawbacks of receiving the vaccine prior to conception. Utilizing various communication channels, such as social media platforms, can facilitate the dissemination of vaccine-related information and raise awareness among pregnant women.

Additionally, health organizations should implement policies aimed at promoting COVID-19 vaccine uptake among pregnant women. This entails training healthcare professionals to address concerns and misconceptions surrounding the vaccine, as well as developing initiatives to improve vaccine distribution and accessibility. To combat vaccine hesitancy and advocate for the safety and efficacy of the COVID-19 vaccine among pregnant women, comprehensive health education campaigns targeting the general public are essential. These initiatives underscore the importance of COVID-19 immunization for expectant mothers and highlight its potential benefits.

Furthermore, prospective studies are warranted to investigate the factors contributing to vaccine reluctance

and refusal among pregnant women. By identifying these variables, more targeted interventions can be developed to encourage COVID-19 vaccine uptake. Additionally, further research is needed to assess the safety and efficacy of the COVID-19 vaccine specifically for expectant mothers. Longitudinal studies can provide valuable insights into the long-term impacts of the vaccine on pregnancy outcomes, maternal health, and infant well-being, thereby addressing concerns and bolstering acceptance among pregnant women.

CONCLUSION

This study provides valuable insights into the perceptions and acceptance of COVID-19 vaccination among pregnant women in Jordan. While the data indicate a relatively high rate of vaccine uptake before pregnancy, the findings also revealed persisting concerns and hesitations among pregnant women themselves. There remains a need to encourage vaccination among pregnant women actively. Overall, the findings highlighted the importance of understanding pregnant women's perspectives on COVID-19 immunization to facilitate informed decision-making and improve public health outcomes. Healthcare providers should actively implement targeted outreach programs for women from lower socio-economic backgrounds to improve awareness of COVID-19 risks and increase vaccination rates among this vulnerable group.

STUDY LIMITATIONS

While the study's findings hold significant implications, there are certain limitations that may impact the broad applicability of its conclusions. Firstly, the cross-sectional design of the study poses challenges in establishing causality between variables, limiting the ability to infer causal relationships. Moreover, reliance on self-report questionnaires introduces the potential for response biases and social desirability effects, which may influence the accuracy of reported data. Additionally, the study's geographical focus on the northern region of Jordan restricts its generalizability to other settings or other pregnant women within different geographical areas in the country. These limitations underscore the need for further research utilizing diverse methodologies and broader sampling strategies to enhance the robustness and applicability of findings.

AUTHORS' CONTRIBUTIONS

It is hereby acknowledged that all authors have accepted responsibility for the manuscript's content and consented to its submission. They have meticulously reviewed all results and unanimously approved the final version of the manuscript.

LIST OF ABBREVIATIONS

WHO = World Health Organization

CDC = Centers for Disease Control and Prevention

MOH = Ministry of Health

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Ethical approval was obtained from the Institution Review Board (IRB) at Jordan University of Science and Technology (reference #: 33/154/2022).

HUMAN AND ANIMAL RIGHTS

All procedures performed in studies involving human participants were in accordance with the ethical standards of institutional and/or research committee and with the 1975 Declaration of Helsinki, as revised in 2013.

CONSENT FOR PUBLICATION

Informed consent was obtained from participants.

STANDARDS OF REPORTING

STROBE guidelines were followed

AVAILABILITY OF DATA AND MATERIALS

All data generated or analyzed during this study are included in this published article.

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CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

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