

Coverage and Determinants of COVID-19 Vaccination Among Pregnant Women: An Experience From a Low-Income Country

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Abstract

Purpose: to determine COVID-19 vaccination coverage among pregnant women and investigate the factors affecting vaccine uptake.

Design: Analytical cross-sectional study.

Setting: Palestinian health care facilities. Between October and November 2021 – eight months after the country's first COVID-19 vaccination.

Sample: We needed 820 people to estimate vaccination coverage among pregnant women with a precision rate of 3%. Therefore, we invited 950 pregnant Palestinian women who were eligible and had a response rate of 91.6%.

Measures: An interviewer-administered questionnaire examined vaccination uptake, attitudes, and concerns about the COVID-19 vaccine.

Analysis: Bivariable and multivariable analysis using SPSS.

Results: vaccination uptake was reported by 219 pregnant women [25.5%, 95% CI: 22.6% – 28.5%]. Knowledge (aOR=2.0; 95% CI: 1.2-3.1), perceived benefits (aOR=1.1; 95% CI: 1.06-1.16), employment (aOR=5; 95% CI: 3.1-8.1), and underlying medical condition (aOR=2.1; 95% CI: 1.1-4.1) predicted uptake. Reporting vaccine barriers reduces vaccine uptake (aOR=.92; 95% CI: .89-95).

Conclusions: Pregnant women's COVID-19 vaccination rates are low. Concerns regarding the COVID-19 vaccine for infants affected their decision. COVID-19 vaccination regulations and legislative nudges drove maternal vaccination. Vaccine fears and misconceptions among pregnant women should be addressed.

Keywords

COVID-19 vaccine, uptake, pregnant, prenatal, communication

Purpose

The COVID-19 vaccine has been proven safe during pregnancy.¹ Moreover, most scientific societies currently indicate it for pregnant and breastfeeding mothers.² In addition, it protects pregnant women and their newborns against COVID-19 adverse outcomes.³ However, their vaccination acceptance is lower than nonpregnant women's.^{4,5}

Many studies have been undertaken to determine why pregnant women are hesitant to get vaccinated, and the main reasons were that they believe the vaccine would harm them and their unborn child.⁵ However, few studies have examined the actual vaccination coverage, most of which were conducted in developed countries.⁶

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In Palestine, COVID-19 vaccination began in February 2021 and followed a similar pattern to that in other developing countries, with limited stepwise eligibility beginning with high-risk groups and gradually declining. Initially, pregnant women were not eligible for vaccination, but efforts were made to include and begin vaccination of pregnant women immediately upon FDA approval. Palestine is an Eastern Mediterranean state and provides free immunization to the general public. It conforms to WHO recommendations and public-friendly health promotion campaigns to increase vaccination rates among vulnerable groups. However, while all pregnant women in Palestine are currently offered and have easy access to the COVID-19 vaccine, there is scant data on its uptake and coverage. As a result, we shed additional light on this issue, which will support in determining the primary barriers to vaccination among pregnant women, assisting policymakers in confronting this pandemic and health providers in vaccine promotion.

Methods

Design

A cross-sectional design was adopted in this study.

Sample

We collected data from pregnant women at their prenatal care visits in four randomly selected districts of the West Bank of Palestine between October and November 2021. An institutional review board approved the study. We calculated the sample size using the equation $n = [DEFF * Np(1-p)] / [(d^2 / Z^2) - 2 * (N-1) + p * (1-p)]$. We used the following parameters: (a) $Z = 1.96$ is the confidence level statistic; (b) a precision rate of 3% (suitable if the prevalence is between 10% and 90%); and (c) an estimated 50% of women are vaccinated (to get the maximum sample size), yielding an 820-person sample size. We invited 950 pregnant Palestinian women who were determined to be eligible. The total sample consisted of 860 pregnant women, representing a response rate of 90.5%.

Measures

The authors developed the questionnaire following a review of existing COVID-19 vaccination research. We used a face-to-face interviewer-administered questionnaire. It was divided into three sections: the first analyzes the respondents' demographic and clinical features, including their age, educational level, occupation status, income, gestational week, high-risk pregnancy, and underlying medical condition. The second section evaluates the key outcome variable for the study, vaccination coverage, which was defined as any pregnant woman who received at least two

doses of any COVID-19 vaccine prior to or during her pregnancy. Additionally, this section evaluates perceived COVID-19 and COVID-19 vaccine knowledge and a history of COVID-19 diagnosis. The third section assessed attitudes toward COVID-19 vaccination through five-point Likert scale statements ranging from "strongly disagree" to "strongly agree" to assess attitudes toward COVID-19 vaccination using the health belief model's (HBM) constructs. The HBM is an effective theoretical framework for studying pregnant women's vaccination attitudes. Its primary assumption is that pre-existing beliefs can be used to anticipate future behaviors.⁷ According to HBM, perceived susceptibility, severity, benefits, barriers, and cues to action all play a role in motivating people to adopt healthy lifestyle behaviors.

We conducted a pilot study on 30 pregnant women. Cronbach's alpha coefficients were .74 for perceived severity, .82 for varied benefits, and .71 for perceived barriers for attitude statements.

Analysis

We summarized pregnant women's demographic, obstetric, and clinical data. Multivariable logistic regression was used to find factors independently linked with vaccine uptake among pregnant women, and $P < .05$ was deemed significant.

The study was approved by the institutional review board of An-Najah National University (Reference #: Med. Sep. 2021/11) and the Palestinian Ministry of Health. The data collectors explained the study's objectives and invited pregnant women to participate voluntarily; those who agreed to participate provided written informed consent.

Results

Two hundred 19 pregnant women [25.5%, 95%CI: 22.6-28.5%] indicated receiving the COVID-19 vaccine. In univariate analysis, we found vaccination coverage higher among employed women, those with underlying medical conditions, a history of COVID-19 infection and pregnant women in their first trimester (Table 1). It was also higher among pregnant women who had a higher perceived knowledge of COVID-19 and its vaccine, as well as those who had a higher perceived disease susceptibility, severity, and vaccine benefits. At the same time, it was lower among women who had perceived vaccine barriers (Table 2).

Multivariable analysis showed that employed pregnant women (aOR=5; 95%CI: 3.1-8.1) and those with underlying medical conditions (aOR=2.1; 95%CI: 1.1-4.1) were more likely to get the vaccine (Table 1). Perceived COVID-19 vaccine Knowledge (aOR=2.0; 95%CI: 1.2-3.1) and perceived vaccine benefits (aOR=1.1; 95%CI: 1.06-1.16) predicted uptake. Besides, pregnant women with higher

Table 1. Pregnant women demographic characteristics (N=860).

Characteristic	Univariable Analysis			Multivariable Analysis	
	Vaccinated (n=219)	Unvaccinated (n=641)	P-Value*	Adjusted P-Value	Adjusted OR (95%CI)
Age (Mean ±SD)	28.7 ± 5.0	28.1 ± 5.5	.112	–	–
Educational level					
Diploma or higher	117 (26.7%)	322 (73.3%)	.415	–	–
Secondary or less	102 (24.2%)	319 (75.8%)			
Employment Status[†]					
Housewife [†]	156 (21.0%)	588 (79.0%)	<.001		I
Employed	63 (55.8%)	50 (44.2%)		<.001	5.0 (3.1-8.1)
Underlying medical condition					
Yes	19 (37.3%)	32 (62.7%)	.046	.048	2.1 (1.1-4.1)
No [†]	200 (24.7%)	609 (75.3%)			I
History of COVID-19 infection[†]					
Yes	69 (33.7%)	136 (66.3%)	.002	.068	1.5 (.97-2.2)
No [†]	150 (23.0%)	501 (77.0%)			I
Gestational age					
1 st trimester	60 (38.5%)	96 (61.5%)		.005	2.0 (1.3-3.2)
2 nd trimester	67 (26.4%)	187 (73.6%)	<.001	.863	1.1 (.67-1.6)
3 rd trimester [†]	92 (21.1%)	344 (78.9%)			I

*Chi-squared test and Independent t-test, †Numbers do not sum to the total (860) due to missing data, ‡Reference group, **OR**= Odds Ratio, **CI**= confidence interval.

Table 2. Pregnant women's attitudes, practices and perceived knowledge of COVID-19 and its vaccine.

Characteristic	Univariable Analysis			Multivariable Analysis	
	Vaccinated (n=219)	Unvaccinated (n=641)	P-Value*	Adjusted P-Value	Adjusted OR (95% CI)
Perceived COVID-19 Knowledge[†]					
Fair to very poor [†]	104 (19.6%)	427 (80.4%)	<.001		I
Very good to excellent	112 (34.6%)	212 (65.4%)		.187	.73 (.46-1.2)
Perceived COVID-19 vaccine knowledge[†]					
Fair to very poor [†]	69 (21.9%)	342 (78.1%)	.011		I
Very good to excellent	123 (29.5%)	294 (70.5%)		.006	2.0 (1.2-3.1)
Perceived COVID-19 susceptibility (Mean ± SD)	3.4 ± 1.2	3.0 ± 1.2	<.00	.380	1.1 (.90-1.3)
Perceived COVID-19 severity (Mean ± SD)	24.5 ± 4.9	22.9 ± 5.9	<.00	.916	1.02 (.96-1.05)
Perceived COVID-19 vaccine benefits (Mean ± SD)	24.0 ± 4.5	21.1 ± 5.2	<.00	<.001	1.1 (1.06-1.16)
Perceived COVID-19 vaccine barriers (Mean ± SD)	30.2 ± 6.8	33.6 ± 5.5	<.00	<.001	.92 (.89-.95)

*Chi-squared test and Independent t-test, †Numbers don't sum to total (860) due to missing data, ‡Reference group, OR= Odds Ratio, CI= confidence interval.

perceived vaccine barriers were less likely to get it (aOR=.92; 95%CI: .89-95) (Table 2).

Further sub-analysis was conducted to assess the difference between vaccinated women who received the vaccine prior to pregnancy (n=119) and those who received it during pregnancy (n=100). Employed pregnant women, those with higher perceived COVID-19 susceptibility and those with higher perceived COVID-19 vaccine benefits were more likely to receive the vaccine before pregnancy (P <.05), see Table 3.

Discussion

Summary

Low vaccine coverage would hinder worldwide efforts to eliminate the pandemic and its consequences. Only 25.5% of pregnant women reported being vaccinated, lower than prior studies anticipated.^{5,8} Women who had a greater perceived vaccine knowledge had a higher vaccination rate.

Table 3. A comparison of vaccinated women who received the vaccine before pregnancy and those who received it after pregnancy (n=219).

Characteristic	Vaccinated Pregnant Women		P-Value*
	Before Pregnancy (n=119)	During Pregnancy (n=100)	
Age (Mean ±SD)	29.0 ± 5.1	28.3 ± 4.8	.413
Educational level			
Diploma or higher	66 (56.4%)	51 (43.6%)	.510
Secondary or less	53 (52.0%)	49 (48.0%)	
Employment status			
Housewife	77 (49.4%)	79 (50.6%)	.020
Employed	42 (66.7%)	21 (33.3%)	
Underlying medical condition			
Yes	8 (42.1%)	11 (57.9%)	.263
No	111 (55.5%)	89 (44.5%)	
History of COVID-19 infection			
Yes	39 (56.5%)	30 (43.55)	.660
No	80 (53.3%)	70 (46.7%)	
Perceived COVID-19 knowledge			
Fair to very poor	45 (46.9%)	51 (53.1%)	.050
Very good to excellent	74 (60.2%)	49 (39.8%)	
Perceived COVID-19 vaccine knowledge			
Fair to very poor	52 (50.0%)	52 (50.0%)	.147
Very good to excellent	76 (59.8%)	45 (40.2%)	
Perceived COVID-19 susceptibility (Mean ± SD)	3.5 ± 1.1	3.1 ± 1.2	.014
Perceived COVID-19 severity (Mean ± SD)	24.9 ± 5.2	23.9 ± 4.7	.132
Perceived COVID-19 vaccine benefits (Mean ± SD)	24.7 ± 4.5	23.0 ± 4.3	.007
Perceived COVID-19 vaccine barriers (Mean ± SD)	30.5 ± 6.7	29.9 ± 6.8	.506

*Chi-squared test and independent t-test.

Additionally, pregnant women with higher education levels had a higher vaccination uptake rate, although it was not significant. Levels of education may be related to gaps in vaccine knowledge, which may have a negative impact on vaccine uptake. Previous research found that people with higher education levels have more knowledge of the COVID-19 vaccine.⁹ That lack of knowledge about the COVID-19 vaccine is associated with lower levels of intent to vaccinate.^{5,6}

Our results showed that perceived vaccine benefits and barriers were independently associated with vaccination rates. Perceived barriers reduce the likelihood of protective behavior. In the case of the COVID-19 vaccine, new information about side effects and growing doubts about its efficacy may discourage people from using it.¹⁰ On the other hand, perceived benefits were found to be the most powerful predictor of all health belief components in a meta-analysis of HBM research.¹¹ The relevance of public awareness of infection risk, vaccine safety, and the necessity and safety of maternal vaccination is emphasized.¹²

Pregnant women have additional concerns about their babies' safety and their own. That's why they demanded more evidence on the vaccine's safety and effectiveness in pregnant women.⁵ Regarding the association between the trimester of pregnancy and vaccine uptake, vaccination uptake is also most predictive during the third trimester, maybe because their

newborns are completely grown.⁶ When vaccinated women were compared in receiving the vaccine before or during pregnancy, those who received the vaccine before pregnancy had higher perceived COVID-19 susceptibility and vaccine benefits, these findings highlight the importance of these HBM constructs, particularly perceived benefits in increasing the likelihood of protective behavior. They also emphasize the importance of increasing vaccine awareness among pregnant women and providing new evidence regarding its safety and benefits during pregnancy to increase vaccination rates.

Policies and nudges are promoting COVID-19 vaccination in the workplace. Women are more inclined to follow their boss' vaccine advice.¹³ In addition, pregnant women with underlying medical conditions are more likely to obtain the vaccine. These ladies are more prone to COVID-19 consequences. They also gain more exposure to the health system and medical guidance, which helps them learn about COVID-19 and vaccines and encourages them to get vaccinated.

Limitations

Individuals' behaviors and attitudes change throughout time and in reaction to their circumstances; thus, the findings in this study are indicative of the data collection period. Despite efforts to ensure a representative sample, the sampling

technique utilized in this study may introduce selection bias and limit the generalizability of the results. Because the study relied on self-reported data from participants, some variables may have been over- or underestimated.

So What?

What is already known on this topic?

COVID-19 vaccination uptake remains poor among pregnant women.

What does this article add?

Fear of potential side effects on the baby prevents pregnant women from taking the COVID-19 vaccine. Employment regulation assists in vaccine uptake. Pregnant women who perceive themselves as knowledgeable are more likely to be vaccinated.

What are the implications for health promotion practice or research?

Concerns about the COVID-19 vaccine's safety for babies must be addressed openly, and pregnant women must be educated about vaccine safety. Employee vaccination requirements for COVID-19 are vital, as are legislative nudges. Focused health education and awareness are also encouraged. Post-vaccination surveillance is crucial to determine long-term safety.

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Authors Contributions

The study's conception and design were contributed to by ZN, BM, IA, HQ, and HM. IA, HQ, AM, and LQ prepared the materials and collected the data. ZN, BM, and HM analyzed and interpreted the data. AM and LQ drafted the initial draft of the manuscript. ZN and MB revised the manuscript and prepared it for submission. All authors provided feedback on earlier drafts of the manuscript. The final manuscript was read and approved by all authors.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Ethics and Consent

All procedures involving human participants in this study were conducted in accordance with institutional and/or national research committee ethical standards, as well as the 1964 Helsinki declaration and subsequent revisions or equivalent ethical standards (Reference no: Med. Sep. 2021/11). The protocol for the study was approved by the Palestinian ministry of health. The questionnaire summarized the survey, protected participant anonymity and confidentiality, and required written authorization from participants prior to commencing the study questions. Potential participants were advised that participation is voluntary and will have no effect on the healthcare they receive if they decline.

Availability of Data and Materials

The data that support the findings of this study are available on request from the corresponding author.

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