Title of the Study: A Cross-Sectional Analysis of COVID-19 Vaccine Acceptance Among Pregnant Women in Omdurman, Sudan

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Abstract

Background

To combat the COVID-19 pandemic, WHO declared that it was imperative to achieve herd immunity by immunizing the entire world's population as soon as possible, to prevent the emergence and spread of new variants that could undermine the immunity provided by vaccines. Pregnancy and lactation periods are special times when susceptibility to morbidity and mortal- ity from certain diseases increase. The objective of this study was to determine whether pregnant women at the maternity hospital in Omdurman would accept the COVID-19 vaccine to forecast the efforts that must be made in this regard.

Method: A descriptive cross-sectional study was conducted in January 2023, involving 200 pregnant women attending Omdurman Maternal Hospital and data were collected using a questionnaire. Data were managed and analyzed using the Statistical Package for Social Science (SPSS) version 22

Results: The study showed that 55.4% of the participant group were unwilling to take the vaccine and less than half 43.6% were willing to take it, the most common predictors of acceptance were older age(p=0.118), low educational level (p=0.00), low-income level (p=0.00) being house- wives (p=0.00) and having no chronic co-morbidity(p=0.105).

Conclusion Our study reported a low acceptance of COVID-19 vaccination. The two major reasons for refusal were concerns about the possibility of harming the fetus and mother and concerns about vaccine safety. Ongoing public health initiatives are required to raise awareness, and more research on the safety of the COVID-19 vaccine in pregnant women is needed.

Keywords: Corona virus disease 2019, COVID-19 vaccine, Pregnancy, Vaccine acceptance

Introduction

Background

The outbreak of coronavirus disease 2019 (COVID-19), caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has created an unprecedented global crisis with devastating health and socioeconomic impacts in every nation. To fight against the COVID-19 pandemic, it is necessary to achieve herd immunity by vaccinating the global population as quickly as possible before the emergence and spread of new variants that can overcome immunity conferred by vaccines [1]. Pregnancy and lactation periods are special times when susceptibility to morbidity and mortality from certain diseases increase. Considering the COVID-19 disease, it has been shown that pregnant women (PW) are more likely to show symptoms, be hospitalized in intensive care units, and need ventilators compared to non-pregnant women (NPW) of the same age.

For this reason, it is of practical value that vaccination, which is the most effective method of coping with the current pandemic, is recommended for the population of pregnant and lactating women (PLW) [2, 3]. Vaccine hesitancy is one of the critical obstacles to the success of mass vaccination campaigns. In certain systemic reviews it was revealed that vaccine uptake during pregnancy is challenged by a wide array of barriers, including vaccine safety, perceived benefits, lack of recommendations by healthcare professionals, and lack of trust in healthcare providers and the pharmaceutical industry. One can also put forward that making decisions during pregnancy leads to changes in the priorities, concerns and risk perception of PLW compared to other members of society. In this context, it is imperative to investigate the factors that push this particular group to abstain from vaccination, thus achieving the success of vaccination programs [4].

Problem Statement

Sudan is a developing country that lacks resources and capabilities to reach all its citizens of all backgrounds. In the case of modern global health problems, the situation worsen due to the novelty of information related to these diseases, awareness of them and lack of spread to the extent that allows access to all target groups, As Pregnant women are susceptible to many consequences the most important of which are premature birth, adverse pregnancy outcomes, and postpartum outcomes for mothers and lactating children, fear is growing that the low acceptance rates mainly due to the absence of adequate information may be a real impediment to reach the desired goals. In addition, the World Health Organization (WHO) has reported that unwillingness to receive vaccines is a current threat to global health. Prior research has also revealed unprecedented challenges regarding global COVID-19 vaccine acceptance.

Justification

This study attempts to provide accurate statistical data on the level of acceptance of the Corona vaccine by pregnant women, which is also expected to lead to a better understanding of the factors associated with their acceptance to help guide vaccination efforts in these vulnerable populations.

Objectives

General Objective

To evaluate the Acceptance of COVID-19 vaccine and its associated factors among pregnant women attending Omdurman Maternity hospital.

Specific Objectives

- To measure the prevalence of COVID-19 vaccine acceptance among the participant group.
- To determine causes of COVID-19 vaccine rejection among the participating group.
- To determine Relationship Between Acceptance of COVID-19 Vaccination and Sociodemographic Characteristics.
- To determine Relationship Between Acceptance of COVID-19 Vaccination and gravidity, parity and co-morbidity.

Literature Review

A cross-sectional study of COVID-19 Vaccine Acceptance during Pregnancy and Influencing Factors in South Korea aimed to investigate COVID-19 vaccine acceptance during pregnancy and its influencing factors. An anonymous survey was distributed in the obstetrics departments to all pregnant or postpartum women, during prenatal or postpartum visit. The proportion of self-reported COVID-19 vaccination during pregnancy among the 436 women was 26.6%. Pregnancy-related independent factors influencing maternal COVID-19 vaccination were “received vaccine information about from obstetrics and gynecology (OBGYN) doctors” (OR 3.41, 95% CI 2.05–5.65), “cohabitant COVID-19 vaccination” (OR 2.43, 95% CI 1.06–5.59), and

"second trimester" (OR 7.35, 95% CI 1.54–35.15). In women who did not want to get vaccinated, the most common reason for that hesitancy was concern that the COVID-19 vaccine might affect the fetus (91.7%, 243/266), followed by distrust in COVID-19 vaccine effectiveness (42.6%, 113/266). This study showed that providing information about maternal COVID-19 vaccination, especially by OBGYN doctors, is crucial for increasing vaccination coverage among pregnant women. Providing updated evidence of COVID-19 vaccine efficacy and safety in pregnant women may be also helpful in increasing vaccine acceptance [2].

Another prospective study conducted in Ankara City Hospital in Turkey at the beginning of 2021 revealed that among the 300 female participants, only 37% were willing to get the COVID-19 vaccine. Their low acceptance of the vaccine was attributed to insufficient data on COVID-19 vaccine safety for pregnant women and the potential harm to the fetus. According to this study, accepting COVID-19 vaccination was found to have a slightly positive connection with the number of school-aged children. Additionally, pregnant women were more accepting of COVID-19 immunization in the first trimester than in the second and third trimesters [5].

Additionally, a study to survey the attitudes of pregnant and lactating women toward COVID-19 vaccination and determine the predictors of this attitude was conducted in Jordan. The survey was conducted between September and October 2021, and participants were recruited through social media, midwives, and gynecologists. The mean attitude of pregnant and lactating women toward COVID vaccination was moderate 71 (SD=100.5). Many factors predicted the attitude of pregnant and lactating women toward COVID-19 vaccination. The factors were the source of data regarding COVID-19 (B=−0.140, p=0.009), income level(B=−0.141, p=0.009), and social status (B=0.130, p=0.034). These results indicate that lower income, people who frequently hear news from news channels or the Ministry of Health, and those who are married showed a more positive attitude toward COVID-19 vaccination for children [6].

A fourth study to determine the Acceptance of COVID-19 Vaccine and Associated Factors Among Pregnant Women in Saudi Arabia was a cross-sectional, web-based study conducted in Western, Eastern, North, South, and Central Regions in Saudi Arabia between July and September 2021 among pregnant women, using multi-stage sampling. All pregnant women above 18 years were invited to participate in the study. Pregnant women under 18 years of age and those with a contraindication to receiving COVID-19 vaccination were excluded. Binomial logistic regression (univariate and multivariate) was used to identify the factors influencing vaccination acceptance.

Among the 5307 pregnant women, the acceptance level of the COVID-19 vaccine was 68%. In the multivariate regression model analysis, the most common predictors of acceptance were living in the North Region (P = 0.001, OR = 1.9), living in the South Region (P = 0.000, OR = 3.06), and living in the Central Region (P = 0.035, OR = 1.42) compared to those living in the Western Region. Gestational week (P = 0.018, OR=0.98), income of more than 8000 SR (P = 0.000, OR = 0.51), education level (primary, secondary, and university; P = 0.002, 0.008, and 0.010, respectively), gestational diabetes mellitus (P = 0.013, OR = 1.86), vaccination with the influenza vaccine during the present pregnancy (P = 0.000, OR = 4.55, OR = 1.81), vaccination with the tetanus vaccine during the present pregnancy (P = 0.039), and belief that the COVID-19 vaccine could harm their baby (P = 0.000, OR = 0.12).

This study reported high acceptance of COVID-19 vaccination.Two major reasons for refusal were concerns about the lack of data on COVID-19 vaccination safety and the possibility of harming the fetus. The study recommended that public health efforts, and more studies on COVID-19 vaccine safety in pregnant women would be helpful [3].

Methodology

Study Design

The study is a descriptive cross-sectional hospital-based study.

Study Area

The study was performed in the antenatal care clinics of Omdurman Maternity Hospital, located on Omdurman Maternity Hospital Street, between Albawaba and Al Morada Street, Omdurman. The hospital opened in 1957 and is now considered one of the best 100 hospitals in Africa.

Study Population

Pregnant women who attended the antenatal clinics in Omdurman Maternity Hospital in January 2023.

Inclusion Criteria

Pregnant women above 18 years old who attended Omdurman Maternity Hospital in January 2023.

Exclusion Criteria

Pregnant women under the age of 18 years.

Study Period

The study was carried out in January 2023.

Collection Tool

The data was collected using a questionnaire.

Sample Size and Sampling Technique

The sample size of this study was calculated using Solvin's formula:

$$n = \frac{N}{1 + Ne^2}$$

where:

- n: sample size
- N: total population (number of visits to the general referred clinic according to hospital records)
- e: margin of error

Given:

$$N = 396 \qquad \approx 200$$

$$\text{Sample size } (n) = \frac{396}{1 + 396 \times (0.05)^2}$$

Convenience sampling was used as a sampling technique.

Independent and Dependent Variables

Independent Variables

- Age
- Gravidity
- Parity
- Education status
- Occupation
- Husband's occupation
- Co-morbidity

Dependent Variables

- Acceptance of COVID-19 vaccine among pregnant women

Data Management and Analysis

Data were analyzed using SPSS version 22 and are presented in the form of tables and figures.

Ethical Clearance

The research was approved by the Department of Community Medicine at the University of Bahri and by the supervisor of the research. All pregnant women who participated were informed about the objectives of the questionnaire, and verbal consent was obtained. Citations for all information from other researchers were written.

Results

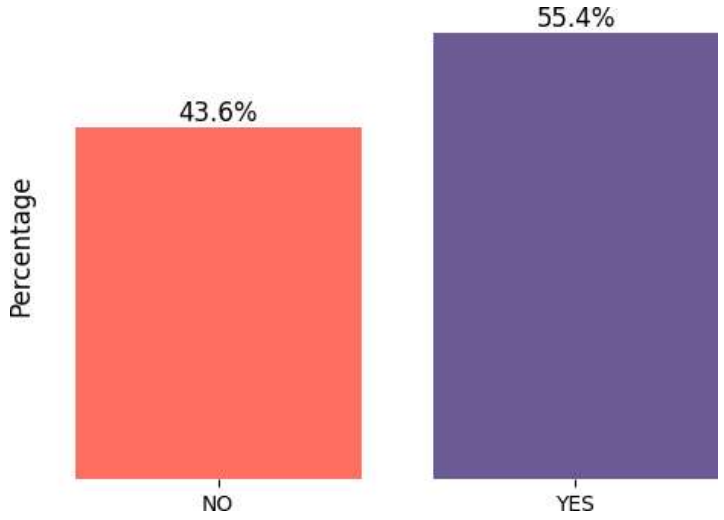

Figure 4.1: Shows acceptance of COVID-19 vaccine among the participant group (n=200)

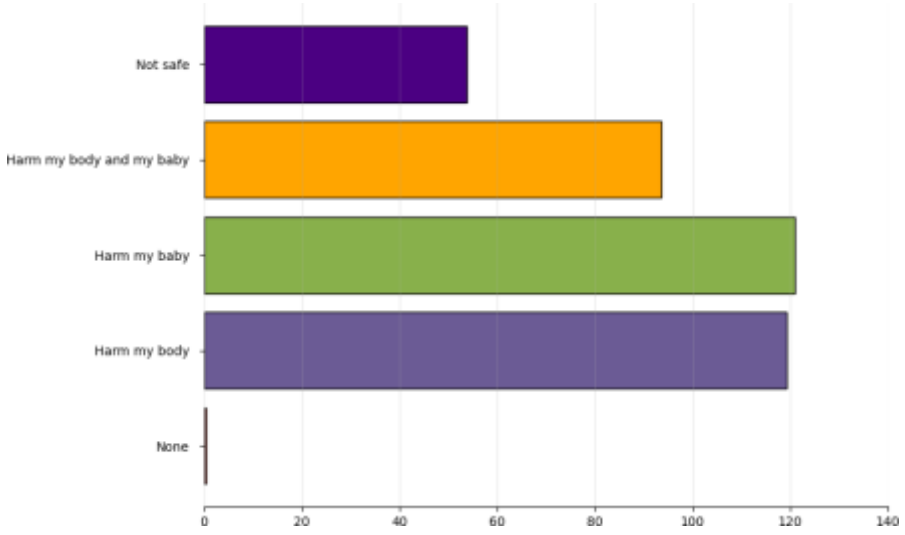

Figure 4.2: Shows causes of the vaccine refusal among the participants(n=200)

Table 4.1: Relationship between Acceptance of COVID-19 Vaccination and Sociodemographic Characteristics (n=200)

Relationship between Acceptance of COVID-19 Vaccination and Sociodemographic Characteristics (n=200)		
Variable	**Acceptance of COVID-19 Vaccine**	
	Not willing	**Willing**
Overall		
	112 (56%)	88 (44%)
Age		
<30 years	90 (60.1%)	58 (39.1%)
≥30 years	22 (42.3%)	30 (57.7%)
Education status		
Illiterate	14 (63.6%)	51 (58%)
Primary school	21 (44.7%)	26 (55.3%)
Secondary school	25 (59.5%)	17 (40.5%)
University	51 (58%)	37 (42%)
Occupation		
House wife	102 (58.6%)	72 (41.1%)
Governmental sector	2 (28.6%)	5 (71.4%)
Private sector	7 (38.9%)	11 (61.1%)
Husband occupation		
Not working	0 (0%)	0 (0%)
Governmental sector	7 (36.8%)	12 (63.2%)
Private	21 (41.2%)	30 (58.8%)
Merchant	84 (64.6%)	46 (35.4%)

Table 4.2: Relationship between Acceptance of COVID-19 Vaccination and Co-morbidity (n=200)

Relationship between Acceptance of COVID-19 Vaccination and Co-morbidity (n=200)		
Variable	**Acceptance of COVID-19 Vaccine**	
	Not Willing	**Willing**
Overall	112 (56%)	88 (44%)
None	105 (57.7%)	77 (42.3%)
Comorbidity (Diabetes, Hypertension, Heart disease, Asthma)	7 (38.9%)	11 (61.1%)

Table 4.3: Relationship between Acceptance of COVID-19 Vaccination and Gravidity, Parity, and Number of School-age Children (n=200)

Relationship between Acceptance of COVID-19 Vaccination and Gravidity, Parity, and Number of School-age Children (n=200)		
Variable	**Acceptance of COVID-19 Vaccine**	
	Not Willing	**Willing**
Overall	112 (56%)	88 (44%)
Gravidity		
<5 years ≥ 5*years*	78 (54.9%) 34 (58.6%)	64 (45.1%) 24 (41.4%)
Parity		
<5 years ≥ 5*years*	82 (55%) 30 (58.9%)	67 (45%) 21 (41.1%)
Number of School-age Children (P=0.426)		
<5 years ≥ 5*years*	111 (56.3%) 1 (33.3%)	86 (43.7%) 2 (66.7%)

Discussion and Conclusions

Discussion

Only when vaccination campaigns have a high level of acceptance and coverage can they be considered successful. To accomplish this, it is essential to evaluate COVID-19 risk perception, acceptance of COVID-19 vaccination, and trust in the medical system and media. The acceptance level of COVID-19 vaccination among our sample of pregnant women was low, with 43.6% being willing to receive COVID-19 vaccines. This result is similar to that of a previous study conducted in the United States in 2020, in which less than half of the pregnant women stated they were likely to receive the COVID-19 vaccination [7]. Another study in the same country reported that pregnant respondents had a similar rate of vaccine acceptance (44.3%) [8].

However the acceptance rate in our study, was higher than that in a Turkish study, which found that acceptance of COVID-19 vaccination was low (37%) in a sample of 111 pregnant women [5], but lower than the acceptance rate found in a study conducted in Saudi Arabia (68%) [3] and a study conducted in China (91%) [9]. Possible explanations for these variances are differences in access to healthcare services, differing awareness of the severity of COVID-19, information available in the study, and differences in the study population. Therefore, an investigation of the affecting factors will prove to be an asset in the future.

In addition to the aforementioned factors, some studies have mentioned additional reasons for doubting the vaccine, such as how quickly these vaccines are developed and approved, which is a barrier to their widespread use because they are typically made by private companies. Another issue that might have an impact on the vaccination campaign's success is the widespread of false information by anti-vaxxers and other preventive measures. Even medical professionals do not always trust vaccines, despite the fact that vaccination has been shown to be the most effective method for the prevention of some diseases.

According to the results of our study, approximately 55.4% of the participants were hesitant or against the COVID-19 vaccination. This is because of the reasons that have already been mentioned, as well as additional reasons that were not mentioned. It is naturally expected that the rates will vary slightly or significantly according to the degree of similarity and difference in circumstances in our study compared to other studies in other areas.

In a study performed in 15 different countries, the most common reason (57% to 80%) for COVID-19 vaccination hesitation was reported to be the unknown side effects of the vaccines in all countries. The second most common reason was doubts about the efficacy of vaccines (57% in Russia and 17% in Japan) [10].

In the study we conducted, the majority of the refusing pregnant women were afraid that the vaccine might harm their bodies or their baby, and even more were convinced that it would harm both. Additionally, a significant number of the study population were against the vaccine because they believed it was not safe and its damage could not be predicted.

As illustrated in Table 1, older women were more likely to receive the vaccine than younger women (p = 0.118). This finding is consistent with those of a previous study conducted in the United Kingdom [3] and a similar study conducted in Turkey [10]. It would also seem that the high rate of a high educational level (pregnant women who finished secondary school and university) among the population of the study (p = 0.000) will have access to better and more valid sources off information and gain understanding of the unknown side effects, resulting in a lower acceptance rate. This claim aligns with an Iranian study that found a clear inverse relationship between the two variables [11]. Additionally, considering the fact that most of the study population was supported by a merchant income (p = 0.000), which gives a prediction of a direct relationship between good income and low acceptance rate, this is contary to a study conducted in 16 countries [5], which considered that low income is the strongest predictor of high acceptance rate, and against another study conducted in Saudi Arabia [3]. This discrepancy may be explained by the surprisingly high number of merchants' wives in our sample.

Moreover, housewives (p = 0.000) among our participants were found to have more acceptance of COVID-19 vaccines when compared to those working in the private or governmental sector, but this is also probably due to the high rate of housewives in the study.

Our results also showed that the majority of participants had no co-morbidities (p = 0.105), so they believed they had a low risk of transmission (95% of them responded) and would be affected less. Therefore, they felt no need to put themselves in a risky position and take the vaccine. This observation is consistent with most of the studies that have discussed this topic and with a study conducted in 15 different countries [10].

Pregnant women in the sample, with gravidity, parity, and the number of school-age children each divided into two categories (less or more than five), had acceptance and rejection rates that

were close.

Considering the facts presented above, strategies for enhancing of societies' trust in vaccines are necessary.

Strengths and Limitations

This hospital-based study was conducted in one of the largest maternity hospitals in Sudan. The sample included participants from all regions of Khartoum, which is likely to provide generalizable and unbiased results that represent the pregnant population. However, the study was limited in terms of time, number, and resources, which caused many comparisons to lose their meaning.

Conclusion

Pregnant women in Khartoum are not highly accepting of COVID-19 vaccination. The government and Ministry of Health have been encouraging pregnant women to be vaccinated, as recommended by the WHO. However, fear of harming the fetus and the body, as well as a lack of data and sufficient information, are the two major concerns among pregnant women when considering COVID-19 vaccination.

Recommendations

1. Considering the reasons why some pregnant women refuse to receive the COVID-19 vaccine, continued efforts such as educational television programs and awareness campaigns about the safety of the COVID-19 vaccine for pregnant women are required to raise awareness.
2. More studies on the safety of the COVID-19 vaccine in pregnant women would assist in overcoming these obstacles and encourage pregnant women to be vaccinated.

Declarations:

-Ethics approval and consent to participate

The ethical clearance of this study was under the supervision of the department of Community Medicine, College of Medicine, University of Bahri

-Consent for publication

The authors consent for publication.

-Availability of data and materials

Data and material are available upon request

-Competing interests

Authors declare no competing interests

-Funding

No funding was required to conduct this research

-Authors' contributions - ALL AUTHORS INITIALS MUST BE MENTIONED ON THIS SECTION – use the author initials such as IE, ACE, XZ and so on.

Shaza Hassan: carried all research steps.

Aseel Halim reviewed the manuscript and edited it. Ali Alawab reviewed and edited the manuscript.

-Acknowledgements

We acknowledge the efforts of the department of Community Medicine, College of Medicine, University of Bahri.

STROBE Checklist

This study adheres to the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) guidelines.

Abbreviations

COVID-19	Coronavirus Disease 2019
SARS-CoV-2	Severe Acute Respiratory Syndrome Coronavirus 2
PW	Pregnant Women
NPW	Non pregnant women
WHO	World Health Organization
ANTI-VAXXER	A person who is opposed to vaccination

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Annexes

University of Bahri Faculty of Medicine

QUESTIONNAIRE TO ASSESS ACCEPTANCE OF COVID- 19 VACCINE AMONG PREGNANT WOMEN ATTENDING OMDURMAN MATERNITY HOSPITAL JANUARY 2023

Consent

□ Do you agree to participate in this study?

□ Your information will only be used for research purposes.

Section One: Sociodemographic Data

* Age:
  - □ <30
  - □ ≥30
* Gravidity (G):
  - □ <5
  - □ ≥5
* Parity (P):
  - □ <5
  - □ ≥5
* Number of school-age children:
  - □ <5
  - □ ≥5
* Co-morbidity:

- □ Yes (specify): _____
- □ No

* Education status:
  - □ Illiterate
  - □ Primary school
  - □ Secondary school
  - □ University
* Occupation:
  - □ House wife
  - □ Governmental official
  - □ Private sector
  - □ Worker
* Husband's occupation:
  - □ Government official
  - □ Private sector
  - □ Merchant

Section Two: Acceptance Rate Data

1. Have you ever been vaccinated? _____
2. Have you heard about the COVID-19 vaccine before? _____
3. If the COVID-19 vaccine were recommended for pregnant women, would you have vaccinated? _____
4. Reasons for refusing the COVID-19 vaccine? (Check all that apply)
   - □ Afraid of injection
   - □ Vaccine will harm my body
   - □ Vaccine will cause COVID-19 infection
   - □ Vaccine will harm my baby
   - □ COVID-19 is not a serious disease
   - □ I have low risk for COVID-19 infection
   - □ Lack of data about COVID-19 vaccine safety in pregnant women
   - □ I do not think the vaccine will work
   - □ I believe that even if I am sick, my baby and I will not encounter any negative events