

Knowledge, Attitude and Acceptance of Pregnant Women Toward COVID-19 Vaccine



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ABSTRACT

Background: Pregnant women are vulnerable to COVID-19 infection and this affect negatively on their health and their babies so, the COVID 19 vaccines are recommended in many countries. **Aim:** This study aims to assess knowledge, attitude and acceptance of pregnant women toward COVID 19 vaccine. **Metued:** A descriptive study design was used. The study was carried out at antenatal outpatient clinic in the new Obstetrics and Gynecology hospital at Mansoura University A purposive sample was utilized. The study subjects included 163 pregnant women. Three questionnaires were utilized; structured interviewing questionnaire, studied pregnant women's attitude toward COVID 19 vaccine questionnaire and studied pregnant women's acceptance toward COVID-19 vaccines questionnaire. **Results:** The present study results showed that 80.4% of the studied pregnant women knew that COVID-19 is a viral infection, 81.1% of them knew that COVID-19 could be fatal, 46.6% of them knew types of COVID-19 vaccines, 57% of them agreed that COVID-19 vaccines were important for their protection against COVID-19 disease. On other hand 86.5% of them were worry about side effect of vaccine. 49.7% of studied pregnant women were hesitated to receive COVID-19 vaccine. **Conclusion:** More than half of the studied pregnant women had good knowledge and positive attitude toward COVID-19 vaccine and about half of them were hesitated to receive the vaccine. **Recommendation:** Design a simple brochure to improve pregnant women's knowledge, attitude and acceptance toward COVID-19 vaccine.

Keywords: Acceptance, Attitude, COVID-19 vaccines, knowledge, Pregnant Women

Introduction

Coronavirus disease is defined as a disease caused by the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2). The illness has mostly affected patients who suffer from chronic comorbidities such as heart diseases, immunological defects, diabetes, and airway disease (Chan et al., 2020). The disease is characterized by rapid transmission through the nasal route and can occur by close contact with an infected person (Riou & Althaus, 2020).

Vaccine acceptance is influenced by multiple determinants dynamically interacting with each other, including the pregnant women's knowledge and attitudes regarding vaccination, societal norms, and perceived vaccination-related benefits and risks (Sallam, 2021). Hesitancy may arise from multiple factors, including concerns about the vaccine's safety and effectiveness, or mistrust in either vaccine development or regulatory processes. These attitudes and beliefs may stem from various causes, among which misinformation is one of the main determinants (Jennings et al., 2021).

Respiratory viral infections during pregnancy have been linked to factors such as low birth weight and preterm birth in several studies. Additionally, high fever in early pregnancy may increase the chances of certain birth defects. According to some studies, pregnant women with COVID-19 have an increased risk of having premature and/or low-birth weight babies, postpartum hemorrhage, and problems that necessitate cesarean delivery (Elsaddig & Khalil, 2021).

During pregnancy women's immunological, cardiovascular, and respiratory systems undergo significant physiological changes, perhaps a little amount of stress can exacerbate the disease severity. Pregnancy, on the other hand, produces hypercoagulability, endangering lives due to venous and arterial thromboembolism. According to early evidence and observational research, COVID-19 patients have a higher risk of thrombosis (Samji & Manoj, 2020).

Recently, the American College of Obstetricians and Gynecologists, the Society for Maternal-Fetal Medicine, and the Centers for Disease Control and Prevention declared that all pregnant women should be vaccinated to reduce maternal and fetal-neonatal morbidity and mortality (*American College of Obstetricians and Gynecologists, 2021*).

Significance of the study

COVID-19 infection, a severe acute respiratory syndrome, was declared a global pandemic by the World Health Organization in March 2020. The pandemic has resulted in severe illness and death among millions of people globally. Various COVID-19 vaccination trials have shown greater than 90% effectiveness in preventing severe COVID-19 disease and death (*Allan et al., 2022*). Pregnant women are at increased risk of severe disease, intensive care unit admission, and invasive ventilation when compared with non-pregnant patients of the same age (*Dey et al., 2021*). Therefore, pregnant women are classified as a high-risk population for COVID-19 infection (*CDC, 2020*). There is now concrete evidence that pregnant women are at a higher risk of severe illness from COVID-19 than non-pregnant women, especially if infection occurs during the third trimester of pregnancy. In this cohort, the risk of ICU admission is around 1%, while the likelihood of invasive mechanical ventilation is around 0.3% (*Martins et al., 2022*).

Assessing pregnant women's knowledge, attitudes, and acceptance regarding the COVID-19 vaccine is important in order to enhance the health of pregnant women and their unborn babies and decrease the negative outcomes during the pregnancy by increasing their acceptance and knowledge toward COVID-19.

Study Aim

This study aims to assess knowledge, attitude, and acceptance of pregnant women toward COVID-19 vaccine.

Research Questions

1. What are knowledge and attitude of pregnant women toward COVID -19 vaccine?
2. Does the pregnant woman accept to take COVID-19 vaccine?

3. Method

3.1 Study design

A descriptive cross sectional study design was used in this study. A descriptive study assessed knowledge, attitude and acceptance of something new in a defined population at specific point or

period without attempting to draw any inferences or offer any causes for the prevalence.

Study setting

The study was conducted at antenatal outpatient clinic at new obstetric and gynecology hospital at Mansoura university hospital. It provided services daily to women from urban and rural areas. The setting is opened 5 days weekly from 9am to 2pm. The care was provided by 4 nurses and 5 physicians daily. The antenatal outpatient clinic is consisted of one floor that is divided into 6 parts; reception, waiting room for women, antenatal examination room, gynecological examination room, vesicular mole room and resting room for health care providers. During COVID-19 pandemic the number of cases who are admitted to the unit is limited to 30 cases per day to control infection spread.

Subjects

A purposive sample of 163 pregnant women who attended to predetermine setting for follow-up.

Inclusion Criteria

- Age 19 –45 years old.
- Pregnant women who didn't receive the COVID-19 vaccine.
- Either primiparous or multiparous women.

Exclusion Criteria

- Pregnant women who were diagnosed with suspected or confirmed COVID-19 disease.

Sample size calculation

Based on data from literature (Atalay et al., 2021), considering level of significance = 5%, Power = 80%, Formula of calculating sample size was

$$n = [2(Z\alpha/2 + Z\beta)^2 \times p(1-p)] / (p_1 - p_2)^2 \text{ where}$$

n = sample size required in each group,

p = pooled proportion (proportion of event in group 1 + proportion of event in group 2)/2

p1-p2 = difference in proportion of events in two groups

$Z\alpha/2$: This depends on level of significance, for 5% this was 1.96

$Z\beta$: This depends on power, for 80% this was 0.84

$$n = [2(1.96 + 0.84)^2 \times 0.37(1-0.37)] / (0.15)^2 = 162.4$$

Based on above formula the sample size required was 163.

Tools of data collection: Consist of three tools

Tool I: Structured interview questionnaire

This tool was developed by the researcher after reviewing the national and international relevant literature (Alhamdi et al., 2021). It was consisted of three parts:

Part I: Demographic Data of the Studied pregnant Women as age, occupation, level of education, residence, income and marital status.

Part II: Obstetrical and Medical Data of the studied pregnant Women as gestational age, parity, gravidity, number of antenatal visits, previous obstetrical complications, previous neonatal complications, previous medical complications, current medical and obstetrical problems...etc.).

Part III: The Studied Pregnant Women's Knowledge Regarding COVID-19 Vaccines:

This tool was developed by the researcher after reviewing the relevant literature (Atalay et al., 2021, Deng et al., 2021 and Farhana, & Mannan, 2021) to assess the studied pregnant woman general knowledge about COVID-19 disease and knowledge about COVID-19 vaccines. It included (43) questions as (types of COVID-19 vaccines, time to take, the number of doses, the interval between the doses and the side effects of each vaccine...etc.).

Scoring system

A scoring system was applied to assess the level of knowledge of each subject, 2 point for each correct answer, 1 point for an incorrect answer and zero point for unsure. Poor (< 50%), fair from (50 to <70 %) and (good ≥70 %) (Hoque et al., 2020).

Tool II: The Studied Pregnant Women's Attitude Toward COVID-19 Vaccines Questionnaire:

This tool was adapted from (Atalay et al., 2021) to assess the pregnant women's attitude toward COVID-19 vaccine. It included 14 items as (It's important to get a vaccine to protect yourself from COVID-19 disease, coronavirus vaccination should be mandatory for everyone, without a coronavirus vaccination I am likely to catch coronavirus, When you watch news about COVID-19 vaccine on social media you become nervous and anxious, It would be very easy for you to have a coronavirus vaccination...etc). This tool was adapted because some items were added to scale as item 6, 11 and 12.

Scoring system

A scoring system was applied to each item using 3 point likert scale, disagree, neutral and agree. The total attitude score was categorized as either negative attitude (<60% of the total score) or positive attitude (≥60% of total score) (Atalay et al., 2021).

Tool III: The Studied Pregnant Women's acceptance Toward COVID-19 Vaccines Questionnaire:

This Tool was developed by the researcher after reviewing the relevant literature (Atalay et al., 2021, Buckus, Hoque, & Van Hal, 2020, Deng et al., 2021) and Farhana, & Mannan, 2021) to assess acceptance of the studied pregnant women toward COVID-19 vaccines. It included (6) questions as (do you accept the vaccine, the reason for acceptance, the reason for refusal or hesitancy, which type of vaccine do you like to take, why you choose this vaccine, the preferred time to take the vaccine...etc).

Validity & Reliability of the tool

Data collection tools were tested and juried for the content validity by three expertise's in women health and midwifery nursing field (Assist. Prof. Dr/ Amal Yousef, Assist. Prof. Dr/ Eman Fadel and Assist. Prof. Dr/ Ahlam Goda). The experts assessed the tool for clarity, relevance and applicability. Changes were considered according to their comments as certain sentences were simplified to be easily understood by the women. The Cronbach's alpha value (internal consistency) of the knowledge was (0.896) and of the attitude was (0.901) which indicated high reliability of the tools.

Pilot Study

A pilot study was carried out on 17 pregnant women (10% of the sample size) who visited antenatal outpatient clinic in the previously mention settings. The pilot study was conducted to evaluate the clarity and applicability of the tools used in the study prior to start the data collection, as well as the time required for response. Adjustments of the tools were made as paraphrase of some words. The pilot study was excluded from the sample size.

Data Collectial Drocess

The current study was done through two phases:

Preparatory Phase

- This process was started by obtaining approval from the concerned authorities in the previous mentioned setting. Tools for data collection were designed after reviewing the national and international related literatures. Then pilot study was conducted on 17 pregnant women before collecting the actual sample. This process took about one month from beginning of June 2022 to the beginning of July 2022.

Data collection phase

- The current study was carried out from beginning of July 2022 to the end of December 2022. The researcher attended the previously mentioned setting three days per week until the end of complete data of studied women (163).
- The researcher introduced herself to the studied pregnant women, chose the studied pregnant women according to inclusion criteria, explained the aim of the study and obtained the studied pregnant women's consent to participate in the study after assuring the confidentiality of data.
- The researcher meet each studied pregnant woman individually for about 20 - 30 minutes in a comfortable room to collect data by using the data collection tools. Before starting the data collection process, the researcher followed the necessary COVID-19 precautions during collection the data.
- The researcher started first by asking the studied pregnant woman about demographic and obstetrical data.
- Then the researcher asked the studied pregnant women questions to assess their general knowledge about COVID-19 disease and COVID-19 vaccines.
- Then the researcher assessed attitude toward COVID-19 vaccines during the pregnancy among the studied pregnant women.
- After that the researcher assessed acceptance of COVID-19 vaccines during the pregnancy among the studied pregnant women.
- The researcher attended the study setting until completion the data collection process.

Data Analysis

All statistical analyses were performed using SPSS for windows version 25.0 (SPSS, Chicago, IL). Continuous data were normally distributed and were expressed in mean \pm standard deviation (SD). Categorical data were expressed in number and percentage. Chi-square test (or fisher's exact test when applicable) was used for

comparison of variables with categorical data. The reliability (internal consistency) test for the questionnaires used in the study was calculated. Statistical significance was set at $p < 0.05$.

Ethical Considerations

The Ethics Committee of the Faculty of Nursing, Mansoura University granted official permission and an official letter from the Faculty of Nursing, Mansoura University was directed to the director of Obstetric and Gynecological Hospital at Mansoura University Hospital to obtain official permission to conduct the study after explaining its aim. The research's aim was explained to the studied pregnant women, and signed permission to participate in the study was acquired. Participation in the study was entirely optional, and all studied pregnant women were free to leave at any moment. Throughout the study, anonymity, privacy, safety, and confidentiality were strictly maintained. The studied pregnant women were informed that the findings were utilized as part of the required research for the Master's degree, as well as for publishing and education.

Results

Table 1 illustrates that **44.8%** of the studied pregnant women aged from **25-<30** with mean age **29.3 \pm 7.5** years. More than half of them **54%**, **56.4%** respectively were housewives and had a secondary education. **68.7%** were from rural areas, **55.2%** of them hadn't enough income and **98.0%** of the studied pregnant women were married.

Table 2 shows that **80.4%**, **76.7%** and **76.1%** of the studied pregnant women respectively knew that the COVID-19 is a viral infection, knew the main symptoms of COVID-19 disease and it spreads via respiratory droplets of infected individuals. Also, **75.5%**, **77.3%** and **81.0%** of them respectively knew that the avoiding crowded places prevent the transmission of COVID-19; the patients with chronic diseases were more likely to be severe cases and COVID-19 could be fatal.

Table 3 clarifies that **46.6%** of the studied pregnant women knew the types of COVID-19 vaccines. **68.4%** of them knew that Astrazeneca vaccine is one of the types of COVID-19 vaccines. Also, **73.7%** of them knew Sinopharm vaccine and **22.4%** of them knew Johnson & Johnson vaccine and only **9.2%** of them knew Moderna vaccine.

Table 4 shows that **63.2%**, **57.9%** respectively of studied pregnant who accepted to take the vaccine accepted to take it because the health care professional recommended it & the protective measures are not enough. Also, **39.5%** of the pregnant women who accepted to take the

vaccine had chosen sinopharm vaccine and **26.3%** choose to take Pfizer vaccine. **31.6%**, **73.7%** respectively of the pregnant women who will take the vaccine accepted to take it because the vaccine is more effective and most of people take it.

Table 5 shows that there was a highly statistical significance association between the studied pregnant women who accepted to take the COVID-19 vaccines and the positive attitude ($p < 0.001$).

Figure 1 demonstrates that more than half **52.1%** of the studied pregnant women had a good knowledge about COVID-19 vaccines and **27.6%** of them had a fair knowledge and only **20.2%** of them had a poor knowledge about COVID-19 vaccines.

Figure 2 illustrates that **65%** of the studied pregnant women had a positive attitude toward COVID-19 vaccines. While **35.0 %** of them had a negative attitude.

Figure 3 illustrate that **49.7%** of the studied pregnant women were hesitated to receive the COVID-19 vaccine and **27%** of them refused to receive it. While, only **23.3%** of them accepted to take it.

Figure 4 Illustrate that **100.0%**, **76.0%** and **32.8%** respectively of the studied pregnant women who hesitated or refused to take the vaccine the reasons for refusal and hesitancy were the vaccine will harm the baby, the lack of data about COVID-19 vaccine safety during the pregnancy and afraid from needle.

Figure 5 Illustrate that **55.3%** of the studied pregnant women preferred to take the vaccine after the delivery and **34.2%** of them preferred to take it after the breastfeeding. While only **10.5%** of them preferred to take the vaccine during the pregnancy.

Figure 6 Illustrate that **40.5%** of the studied pregnant women were not confident regarding COVID-19 vaccines. While, **22.7%** of them were confident.

Table 1. Distribution of the Studied Pregnant Women According to Their Demographic Data n= (163)

Items	n (163)	%
Age (Years)		
19 – < 25	38	23.3
25 – < 30	73	44.8
30 – < 45	52	31.9
Mean ±SD	29.3 ±7.5	
Level of education		
Basic education	20	12.3
Secondary education	92	56.4
University or Higher education	51	31.3
Occupation		
Housewife	88	54.0
Employed	75	46.0
Residence		
Rural	112	68.7
Urban	51	31.3
Income		
Not enough	90	55.2
Enough	62	38.0
Enough & safe	11	6.7
Marital status		
Married	159	98.0
Divorced	4	2.0

Table 2. Distribution of the Studied Pregnant Women According to Their General Knowledge Regarding COVID-19 n= (163)

Items	No		I don't know		Yes	
	n	%	n	%	n	%
-COVID -19 is a viral infection	15	9.2	17	10.4	131	80.4
-Main symptoms of COVID -19 disease	18	11.0	20	12.3	125	76.7
-COVID - 19 virus spreads via respiratory droplets of infected individuals	10	6.1	29	17.8	124	76.1
-Asymptomatic people transmit the disease to others	22	13.5	24	14.7	117	71.8
-Isolation period of COVID-19 is 2 weeks	16	9.8	31	19.0	116	71.2
-Washing hands and wearing face masks prevent the transmission	16	9.8	30	18.4	117	71.8
-Avoiding crowded places prevent COVID - 19 diseases	15	9.2	25	15.3	123	75.5
-Patients with chronic diseases are more likely to be severe cases	11	6.7	26	16.0	126	77.3
-COVID - 19 could be fatal	10	6.1	21	12.9	132	81.0

Table 3. Distribution of the Studied Pregnant Women According to Their Knowledge Regarding Types of COVID -19 vaccines N= (163)

Items	No		I don't know		Yes	
	n	%	n	%	n	%
-Do you Know types of Vaccines?	62	38.0	25	15.3	76	46.6
Types of COVID-19 vaccine (n=76) #						
-AstraZeneca	18	23.7	6	7.9	52	68.4
-Pfizer	42	55.3	13	17.1	21	27.6
-Sinopharm	4	5.3	16	21.1	56	73.7
-Moderna	6	7.9	63	82.9	7	9.2
-Johnson & Johnson	6	7.9	53	69.7	17	22.4

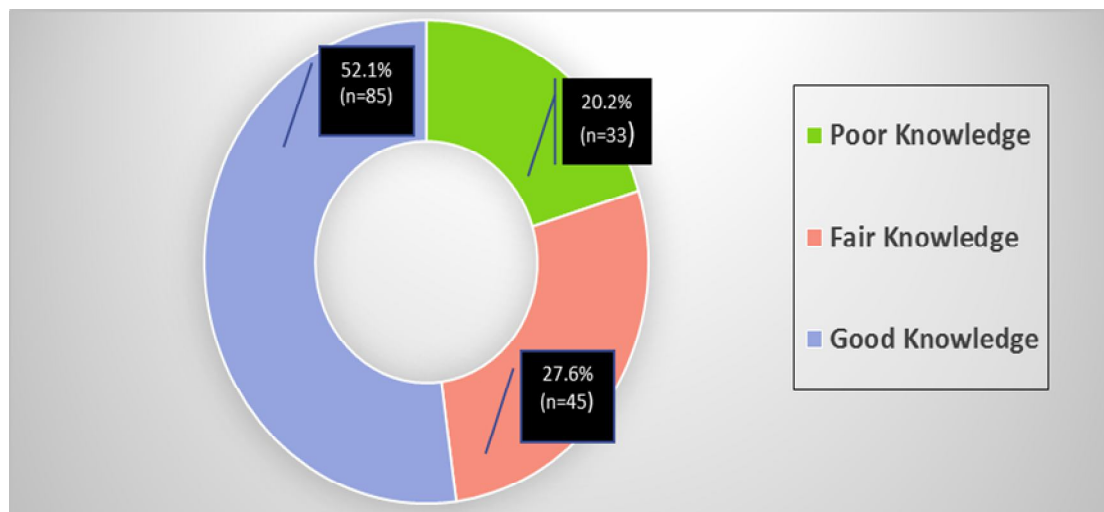


Figure 1. Total Knowledge Level of the Studied Pregnant Women's Regarding COVID-19 Vaccines (N=163)

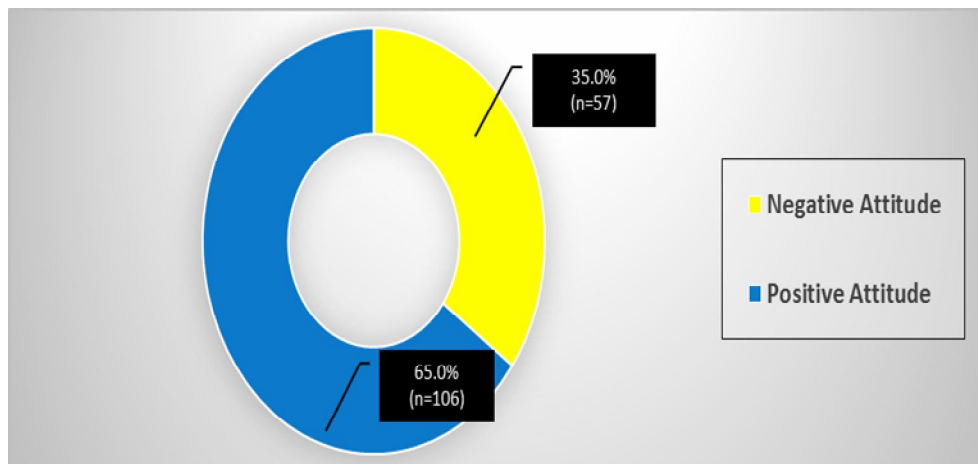


Figure 2. Total Attitude Level of the Studied Pregnant Women's Regarding COVID-19 Vaccines (n=163)

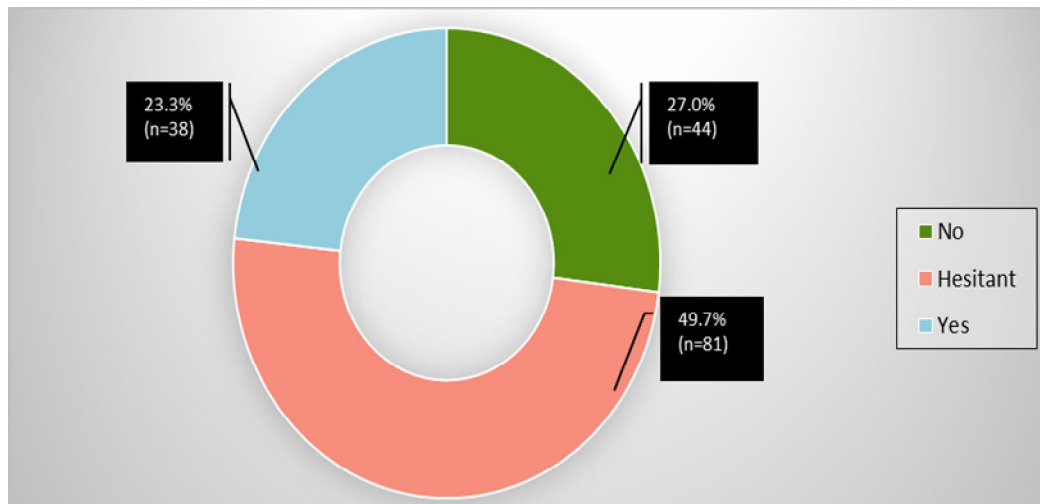


Figure 3. Studied Pregnant Women's Acceptance to Take Coronavirus Vaccine (n=163)

Table 4. Distribution of the Studied Pregnant Women According to their Acceptance Regarding COVID-19 Vaccines

Items	n (38)	%
Reasons for acceptance		
-Give a protection from corona virus	13	34.2
-The protective measures are not enough	22	57.9
-The benefits of taking COVID-19 vaccine outweigh the risks	7	18.4
-The health care professional recommended it	24	63.2
Type of vaccine accepted		
-AstraZeneca vaccine	6	15.8
-Pfizer vaccine	10	26.3
-Sinopharm vaccine	15	39.5
-Moderna vaccine	4	10.5
-Johnson & Johnson vaccine	3	7.9
Reasons for choosing vaccines		
-Available	10	26.3
-More effective	12	31.6
-Less side effect than the other coronavirus vaccination	11	28.9
-Most of people take it	28	73.7

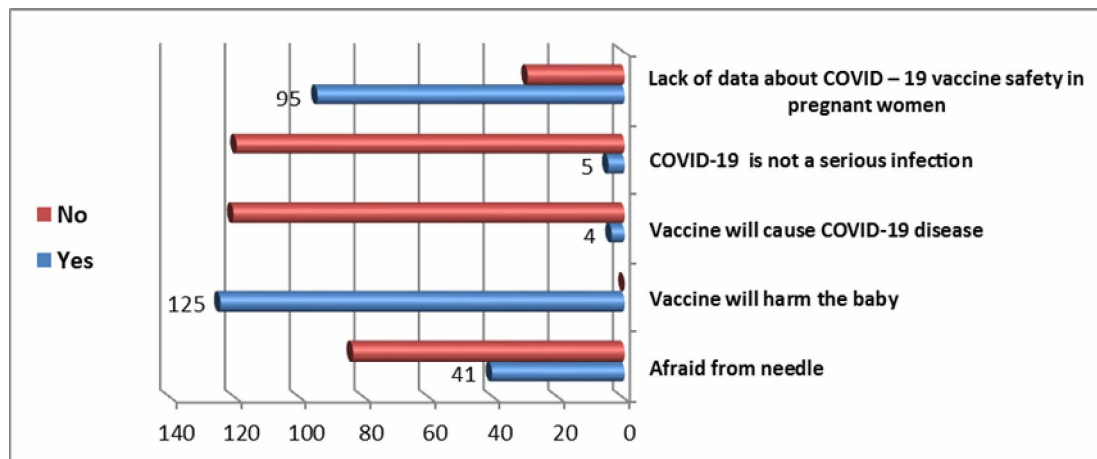


Figure 4. Reasons for refusal and hesitancy n= (125)

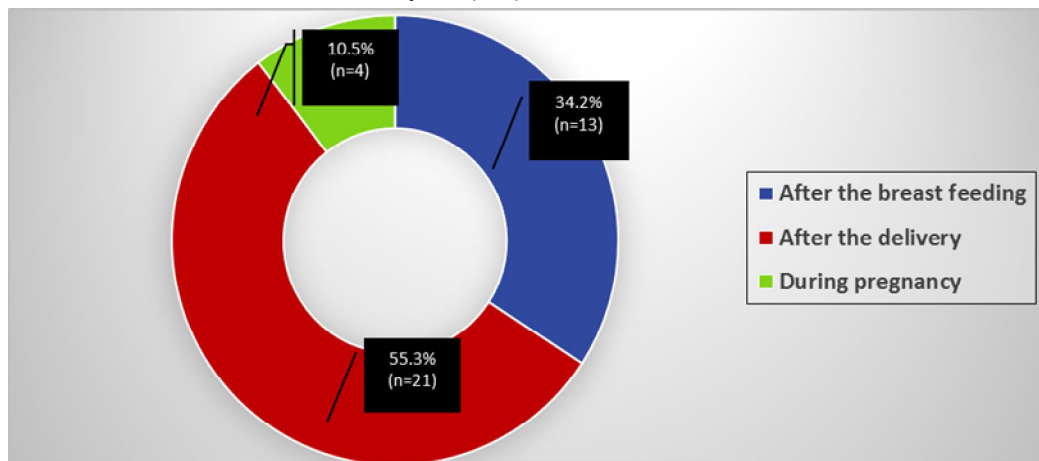


Figure 5. Preferred time to take the vaccine (n=38)

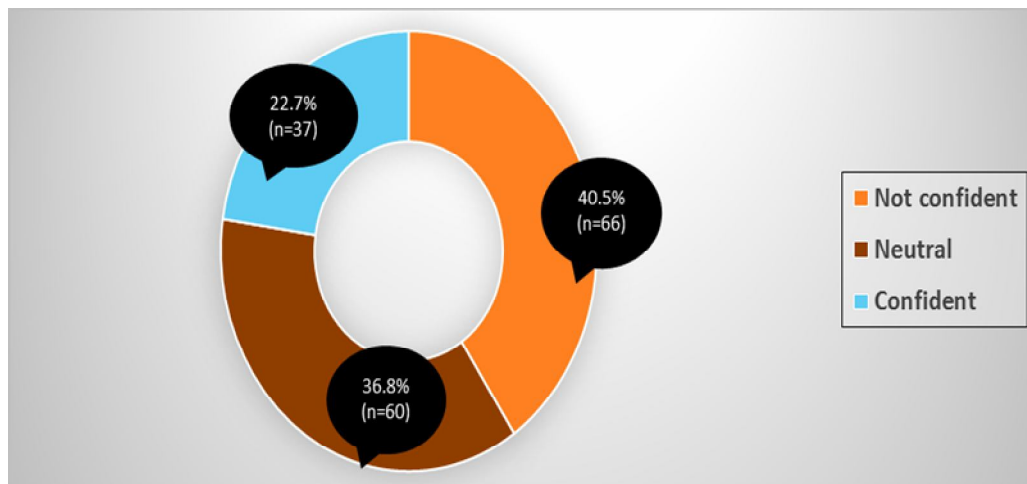


Figure 6. Confidence of the studied pregnant women regarding COVID-19 vaccines safety (N=163)

Table 5. Association Between Vaccine Acceptance with the Attitude and knowledge Level

	Not accepted n=(44)		Hesitant (n=81)		Accepted n=(38)		Significance test	
	n	%	n	%	n	%	X ²	P
Knowledge level								
Poor Knowledge	12	27.3	15	18.5	6	15.8		
Fair Knowledge	10	22.7	23	28.4	12	31.6		
Good Knowledge	22	50.0	43	53.1	20	52.6	2.234	0.693
Attitude Level								
Negative Attitude	28	63.6	14	17.3	15	39.5		
Positive Attitude	16	36.4	67	82.7	23	60.5	21.163	<0.001**

Discussion

Regarding the general knowledge of pregnant women toward COVID-19, the current study findings showed that the majority of the studied pregnant women knew that the COVID-19 is a viral infection and it could be fatal. More than two-thirds of them knew the main symptoms of COVID-19 and the COVID-19 virus spreads by the droplets of infected individuals. More than two-thirds of them knew that the avoiding crowded places prevent the transmission of COVID-19 and the patients with chronic disease are more likely to be severe cases.

The current study findings were in the same line with a study done by *Allagoo et al. (2020)* who assess the knowledge, attitude and practice among the pregnant women in South Nigeria they reported that majority of the pregnant women knew the main symptoms of COVID-19 disease, more than two-thirds of them knew that the COVID-19 spreads by the droplets of infected individuals and the majority of them knew that the avoiding crowded places prevent the transmission of COVID-19. Moreover, the current study findings were in agreement with *Kamal et al. (2020)* who assess the knowledge, attitude and practice among the pregnant women they reported that more than two-thirds of the pregnant women knew that the COVID-19 infection is fatal, the COVID-19 disease can transmit by the infectious droplets and the avoiding crowded places prevent the transmission of COVID-19.

Regarding to the pregnant women's knowledge toward the types of COVID-19 vaccines, the study findings showed that less than half of the studied pregnant women knew the types of COVID-19 vaccines. The current study result was disagree with *Simmons et al. (2022)* who studied the knowledge and hesitancy of pregnant women regarding COVID-19 vaccines in

California and they reported that most of pregnant women knew the types of vaccines. Also, the present study findings were not in the same line with *Goncu Ayhan et al. (2021)* who studied COVID-19 vaccine acceptance in pregnant women and they reported that most of participants knew the types of COVID-19 vaccines.

Regarding to knowledge level of pregnant women toward COVID-19 vaccines, the present study results revealed that more than half of the studied pregnant women had a good knowledge about COVID-19 vaccines, less than one-third of them had a fair knowledge and less than one-third of them had a poor knowledge about COVID-19 vaccines. The present study findings were supported by *Chekol Abebe et al. (2022)* who studied COVID-19 vaccine uptake and associated factors among pregnant women attending antenatal care in Northern Ethiopia who reported that more than half of participants had good knowledge regarding COVID-19 vaccine. In addition, the study findings were supported by *Aisyah (2022)* who assess the factors related to the attitude of pregnant women regarding COVID-19 vaccines and they reported that more than half of participants had good knowledge toward COVID-19 vaccines and this can explained by the regular antenatal care visits during pregnancy and routine obstetric care pregnant women who have follow-up ANC can get information about Covid-19 vaccines and advice about the spread of the pandemic.

Regarding to the pregnant women's attitude toward COVID-19 vaccines, the study findings showed that more than half of the studied pregnant women had a positive attitude toward COVID-19 vaccines. While one-third of them had a negative attitude. This study findings were in agreement with a study done by *Aynalem et al. (2022)* they reported that more than half of studied pregnant women had a positive attitude toward COVID-19 vaccines. Similar findings were reported in the

study by *Mose & Yeshaneh. (2021)* who found that more than half of studied pregnant women had a positive attitude.

Moreover, the study results were in consistent with *ul Ain et al. (2022)* who studied the attitude of pregnant and lactating women in Islamabad Pakistan and they reported that more than half of pregnant women have positive attitude regarding COVID-19 vaccination. Also, the study findings were supported by *Aisyah (2022)* who clarified that more than half of pregnant women have positive attitude toward COVID-19 vaccines.

Regarding the acceptance of pregnant women toward COVID-19 vaccines, the study findings clarified that less than one- third of them accepted to take the vaccine; about half of the studied pregnant women were hesitated to receive the COVID-19 vaccine and less than one-third of them refused to receive the vaccine. These findings were in the same line with *Goncu Ayhan et al. (2021)* who studied COVID-19 vaccine acceptance in pregnant women and they reported that there was a low acceptance rate in low risk pregnancies women and high risk pregnancies women. Also the present study findings were similar to *Lazarus et al. (2021)* who studied the acceptance of pregnant women toward COVID-19 vaccine and they reported that about one-third of the pregnant women were hesitated to receive the vaccine.

In addition, the current results in the same line with the results were observed by *Aynalem et al. (2022)* who reported that less than half of the studied pregnant women accepted to receive the vaccine, more than half of them refused to receive it. As well as, the present study results supported by *Battarbee et al. (2022)* who studied the attitude of pregnant women regarding COVID-19 illness and COVID-19 vaccination in Birmingham and New York and they reported one-third of the pregnant women accept to receive the vaccine.

Regarding to the type of vaccine accepted among the studied pregnant women, the present study revealed that more than one-third of the studied pregnant women who accepted to take the vaccine had chosen sinopharm vaccine and less than one-third of them choose to take Pfizer vaccine. The present study results were in disagreement with *Riad et al. (2021)* who studied COVID-19 vaccine acceptance in pregnancy and lactating women they reported that more than half of pregnant women choose to take the Pfizer vaccine. Also, the present study results were in contrast with *Blakeway et al. (2022)* who studied the COVID-19 vaccination during pregnancy in

London and they reported most of participants choose to receive the Pfizer vaccine.

Regarding the reasons for refusal and hesitancy of COVID-19 vaccine among the studied pregnant women, the present study found that all the studied pregnant women who hesitated or refused to take the vaccine refused it because the vaccine will harm the baby and more than two-thirds of them refused it due to the lack of data about COVID-19 vaccine safety during the pregnancy. This study results supported by *Goncu Ayhan et al. (2021)* who reported that the majority of the pregnant women refused the vaccine because the vaccine will harm the baby and about two-thirds of them refused it due to the lack of data about COVID-19 vaccine safety during the pregnancy.

Concerning to the preferred time to take the COVID-19 vaccine the present study found that more than half of the studied pregnant women who accepted to take the vaccine preferred to take it after the delivery, less than one-third of them preferred to take it after the breastfeeding and less than one-third of them preferred to take it during the pregnancy. The present study findings were in agreement with *Riad et al. (2021)* who reported that more than half of pregnant women preferred to take the vaccine after the delivery and low percent of them preferred to take it during the pregnancy.

Also, the present study results supported by *Blakeway et al. (2022)* they reported that less than one-third of participants accept to take the vaccine during pregnancy. While, the present study findings were in disagreement with *Skirrow et al. (2022)* who studied the acceptance of COVID-19 vaccine during and after the pregnancy in UK and reported that more than half of pregnant women preferred to take the vaccine during the pregnancy.

The same results were observed by *Moini et al. (2023)* who studied the reasons of refusal toward COVID-19 vaccine during the pregnancy in Iran and they found that most of participants refused the vaccine because the vaccine may harm their babies and one-third of them refused it due to the lack of data about COVID-19 vaccine safety during the pregnancy.

Concerning the confidence of the studied pregnant women regarding COVID-19 vaccine safety, the present study found that less than half of the studied pregnant women were not confident regarding COVID-19 vaccine safety. This result in the same line with *Skjefte et al. (2021)* they reported that less than half of the studied pregnant women in Colombia, Philippines, South Africa,

Italy and Australia were not confident regarding the COVID-19 vaccine safety. The same results were reported by Rikard- Bell et al. (2023) who assessed the acceptance and reasons of refusal among the pregnant women toward COVID-19 vaccines in Australia and New Zealand and they found that less than half of the studied pregnant women were confident regarding COVID-19 vaccine safety. This can explain by lack of guidance from public health officials and providers also likely led to a lack of confidence and low level of knowledge.

As regards to the association between vaccine acceptance with the attitude and knowledge level the present study found that there was a highly statistical significance association between the studied pregnant women who accepted to take the COVID-19 vaccines and the positive attitude. The study findings were in agreement with a study done by Tao et al. (2021) who revealed that the acceptance rate was associated with low level of perceived barriers, high level of perceived benefit, and high level of perceived cues to action.

The current study result was corresponding well with Skjefte et al. (2021) they showed that there is a relatively high likelihood of acceptance in middle-income countries, such as Brazil, India and South Africa and the more positive vaccine attitude. This also in harmony with Chekol Abebe et al. (2022) who found that participants with a positive attitude toward the COVID-19 vaccine had a higher likelihood of taking the COVID-19 vaccine than those with a negative attitude. Moreover, similar with a study conducted by Aynalem et al. (2022) they indicated that women who had a positive attitude toward COVID-19 vaccine were 2.1 more likely to receive COVID-19 vaccine.

Conclusion

More than half of the studied pregnant women had good knowledge and positive attitude regarding COVID-19 vaccine. About half of them were hesitated to receive the COVID-19 vaccine.

Recommendations

Simple designed brochures should be provided to pregnant women to increase their knowledge, improve their attitude and acceptance regard COVID-19 vaccines. Health organizations should work in collaboration to increase the acceptance of vaccine and to control the pandemic.

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