

Community Awareness and Perception Regarding Vaccination against COVID-19, Concerns about Side Effects in Gezira State, Sudan

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Abstract

Introduction: Vaccine hesitancy is undermining individual and community protection from vaccine-preventable diseases. This study aimed to investigate the level of awareness and perception of the COVID-19 vaccine and its determinants among people in Wad Madani City, Gezira State, as well as its known side effects.

Methods and Results: This cross-sectional, descriptive, and correlative study included 400 participants (56.8% females and 43.2% males) who visited Wad Madani neighborhood COVID-19 centers during the data collection period (June 2022). The data was collected using a structured questionnaire based on prior published studies. Approximately 93.0% of the participants knew the importance of the COVID-19 vaccines, 84.8% knew about their effectiveness, and 83.8% knew that the vaccines help to reduce the risk of virus infection. However, only 58.0% were vaccinated against COVID-19. The results showed that 56.8% of the participants did not develop side effects. Among those who did, the most common side effects were headache and fever (10.2%), injection site pain (7.9%), myalgia (7.1%), and chills and swelling (5.6%). The results showed that 52.5% had negative perceptions of the COVID-19 vaccines. Urban residents were 2.17 times more likely to have a positive perception of the COVID-19 vaccine than rural residents ($P=0.05$). Furthermore, study participants with nuclear family type have shown a positive attitude toward the COVID-19 vaccines and were 2.32 times more likely to have had a positive attitude than participants with extended family ($P=0.036$). Moreover, participants not vaccinated were found to be less likely to have had a positive attitude toward the COVID-19 vaccine, when compared with vaccinated participants ($P=0.005$).

Conclusion: Although society is aware of the need for COVID-19 immunization, the community has a low positive perception toward COVID-19 vaccination. Similarly, people in rural areas are less aware of the significance of immunization. Local health officials must collaborate to address public fears about vaccinations through the media. (*International Journal of Biomedicine*. 2024;14(2):312-318.)

Keywords: COVID-19 • vaccination • hesitancy • awareness • perception

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Abbreviations

COVID-19, coronavirus disease 2019; Pct, percentage; SARS-CoV-2, severe acute respiratory syndrome coronavirus 2.

Introduction

The spread of SARS-CoV-2 has caused significant casualties and placed enormous strain on public health systems around the world, necessitating the implementation of various prevention and control strategies, including vaccine development and vaccination. As of November 2023, at least 70.5% of the world's population had received at least one dose of a COVID-19 vaccine.⁽¹⁾

On February 28, 2024, the CDC recommended that people 65 and older should get an additional dose of any updated COVID-19 vaccine at least four months after their previous shot. This recommendation reflects that the risk of severe disease from COVID-19 continues throughout the year and is highest among older adults.

Each COVID-19 vaccine causes the immune system to create antibodies to fight COVID-19. The main types of COVID-19 vaccines currently available or being studied include messenger RNA (mRNA) vaccine (Pfizer-BioNTech and Moderna COVID-19), vector vaccine (Janssen/Johnson & Johnson COVID-19 vaccine, Oxford-AstraZeneca ChAdOx1 nCoV-19), protein subunit vaccine 9 (Novavax COVID-19).⁽²⁻⁴⁾

Large-scale vaccination against COVID-19 required comprehensive monitoring of vaccine safety. The Global COVID Vaccine Safety (GCoVS) Project, established in 2021 under the multinational Global Vaccine Data Network™, facilitated a comprehensive assessment of vaccine safety.⁽⁵⁾

Vaccines, regardless of the disease or vaccination program, are generally controversial. Vaccine hesitancy is a term used to describe delaying or refusing a vaccine despite its availability and is classified as one of the top ten threats to global health.^(6,7)

Globally, vaccine hesitancy, reluctance to take vaccine, is determined by characteristics such as self-satisfaction, expediency, self-confidence, and various sociocultural and demographic factors. Vaccine hesitancy is undermining individual and community protection from vaccine-preventable diseases.

Understanding the fundamental factors determining the community's preferences and desires for a future vaccine may contribute to developing measures to improve the global immunization program.⁽⁸⁾ This study aimed to investigate the level of awareness and perception of the COVID-19 vaccine and its determinants among people in Wad Madani City, Gezira State, as well as its known side effects.

Materials and Methods

We present a cross-sectional, descriptive, and correlative study based on health facilities. The research population consisted of people who visited Wad Madani neighborhood COVID-19 centers during the data collection period (June 2022). The study included 400 participants (56.8% females and 43.2% males). The data was collected using a structured questionnaire based on prior published studies. The total number of questions in the questionnaire was 27; sociodemographic data consists of six questions, 11 questions for awareness, and ten questions for perception.

Statistical analysis was performed using the statistical software package SPSS version 21.0 (SPSS Inc, Armonk, NY: IBM Corp). Group comparisons with respect to categorical variables are performed using the chi-square test. Multivariable-adjusted ORs, their respective 95% CIs, and P-values were calculated. A probability value of $P < 0.05$ was considered statistically significant.

Ethical Considerations

The study protocol was reviewed and approved by the Ethics Committee at the University of Gezira's Department of Family Medicine (ECUG/FM/20/2/2023). Written informed consent was obtained from each research participant. All identifiable information about participants was removed, and the data were coded to ensure anonymity.

Results

Table 1 displays the socio-demographic details of the study participants. Most respondents (78/2%) were older than 25. Regarding marital status, 71.2% of the study participants were married. Participant's education level was 69.8% for high school or less graduates, 28.8% for college graduates, and 1.5% for postgraduate degrees. Most study participants (87.8%) lived in urban areas, while only 12.3% lived in rural areas. More than two-thirds of the participants came from a nuclear family, while a minority came from an extended family. The analysis showed that vaccination status was not associated with gender, age, marital status, places of residence, or family type. Only one significant association was found between education level and vaccination status ($P = 0.032$). More than half of those who graduate from college were vaccinated against COVID-19.

Table 1.

The socio-demographic details of the study participants (n=400).

Variables	Responses	Count	Pct	Vaccinated	Unvaccinated	P
Gender	Male	173	43.2	100 (57.8)	73 (42.2)	0.944
	Female	227	56.8	132 (58.1)	95 (41.9)	
Age	18-25 years	87	21.8	47 (54.0)	40 (46.0)	0.395
	Over 25 years	313	78.2	185 (59.1)	128 (40.9)	
Marital status	Married	285	71.2	169 (59.3)	116 (40.7)	0.408
	Unmarried	115	28.8	63 (54.8)	52 (45.2)	
Education level	High school or less	279	69.8	153 (54.8)	126 (45.2)	0.032
	Diploma/ bachelor's degree	115	28.8	73 (63.5)	42 (36.5)	
	Postgraduate studies	6	1.5	0 (0.0)	6 (100)	
Places of residence	Urban	351	87.8	201 (57.3)	150 (42.7)	0.425
	Rural	49	12.2	31 (63.3)	18 (36.70)	
Family type	Nuclear	350	87.5	201 (57.4)	149 (42.6)	0.540
	Extended	50	12.5	31 (62.0)	19 (3.0)	

A set of statements was developed to assess the study participants' awareness of the COVID-19 vaccine (Table 2). Of the study participants, 86.0% have received all the necessary vaccines during their lifetime. Approximately 93.0% [95.0, CI: 90.3-95.7] of the participants knew the importance of the COVID-19 vaccines, 84.8% knew about their effectiveness, and 83.8% knew that the vaccines help to reduce the risk of virus infection. However, only 58.0% [95.0%, CI: 52.8-63.2] were vaccinated against COVID-19. The results indicated that 53.2% [95.0%, CI: 548.1-58.5] of the participants knew that the COVID-19 vaccines have side effects, while 20.5% of the vaccinated participants recognized they had side effects after receiving the vaccine. However, it is remarkable that the participants were less aware of the vaccines' effectiveness in reducing mortality and complications related to COVID-19.

Table 2.

The study participants' awareness of the COVID-19 vaccine (n=400).

Questions	Count	Pct	(95.0% CI)
Have you received all the recommended vaccines? (Yes)	344	86.0	82.4-89.6
Did you receive the COVID-19 vaccine? (Yes)	232	58.0	52.8-63.2
Do you have any chronic diseases? (Yes)	141	35.2	30.3-40.3
Do you know about the COVID-19 vaccines? (Yes)	372	93.0	90.3-95.7
Do you know how effective the COVID-19 vaccination is? (Yes)	339	84.8	81.0-88.6
Do COVID-19 vaccines help to reduce the risk of virus infection? (Yes)	284	83.8	80.0-87.6
Do COVID-19 vaccines vaccine is effective in reducing mortality from COVID-19? (Yes)	15	4.4	2.3-6.5
Would COVID-19 vaccines produce immunity against COVID-19? (Yes)	19	5.6	3.2-8.0
Will COVID-19 vaccines reduce the complications of COVID-19? (Yes)	21	6.2	3.7-8.7
Do know COVID-19 vaccines have side effects? (Yes)	213	53.2	48.1-58.5
Did you get any side effects after receiving the COVID-19 vaccine? (Yes)	82	20.5	16.3-24.7

The COVID-19 vaccine side effects. results showed that 56.8% of the participants did not develop side effects. Among those who did, the most common side effects were headache and fever (10.2%), injection site pain (7.9%), myalgia (7.1%), and chills and swelling (5.6%). Moreover, a lesser percentage of the vaccinated participants experienced other side effects, such as nausea (3.0%), tiredness/fatigue (2.6%), and sore throat (2.3%) (Figure 1).

Table 3 summarizes the participants' perceptions of the COVID-19 vaccines. The results showed that 52.5% had negative perceptions. The mean perception score was 9.03±1.54, on a scale from 1 to 10. Most study participants (98.8%) agreed that coronavirus prevention measures and masks are still necessary even after vaccination. Moreover, 97.7% agreed that COVID-19

is a major public health issue that necessitates vaccines, 96.0% perceived that patients with the risk factors should be the first ones to get the vaccines, and 95.5% agreed that everyone should be required to get the vaccines. Notably, 22.0% of study participants perceived that diseases provide better immunity than vaccines. Based on Bloom's cut-off point criteria and levels of perception, the participants who got the mean and above score were considered to have positive perception (>9.03) points, and those who got less than the mean score were considered to have a negative perception (<9.03 points).

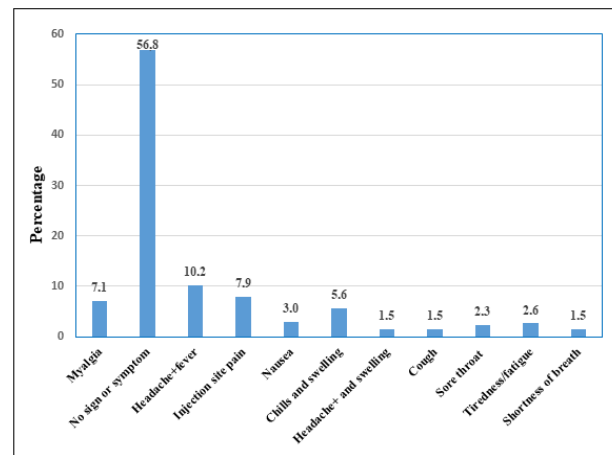


Fig. 1. COVID-19 vaccine side effects.

Table 3.

The participants' perceptions of the COVID-19 vaccines

Perception regarding COVID vaccination statements*	Agree (n / %)	Disagree (n / %)
Is COVID-19 a major public health issue that necessitates vaccines?	391/97.9	9/223
Is the government providing enough information about the vaccine's safety and efficacy?	353/88.2	47/11.8
COVID-19 vaccine was effective at preventing COVID-19.	375/93.8	25 (6.2)
Diseases provide better immunity than vaccines do	88/22.0	312 (78.0)
Everyone should be required to get the COVID-19 Vaccine	382/95.5	18 (4.5)
COVID-19 vaccinations are safe to use in the long term.	273/68.2	127 (31.8)
I believe that even after vaccination, coronavirus prevention measures and masks are still necessary.	395/98.8	5 (1.2)
I will recommend to my family to get COVID-19 vaccine	381/95.2	19 (4.8)
I believe that the COVID-19 vaccine would reduce the number of productive hours missed due to COVID-19 disease.	365/91.2	35 (8.8)
Patients with risk characteristics, in my opinion, should be the first to receive the COVID-19 vaccine.	384/96.0	16 (4.0)
Overall perception		
Positive perception	190/47.5	
Negative perception	210/52.5	

*These statements were used to compute the overall score of perception

As revealed in Table 4, there were differences among the participants' sources of information about the COVID-19 vaccine. Most participants from urban areas got their information from public media (70.2%), followed by social media platforms (5.2%), colleagues, friends, and relatives (5.2%), and lastly, from newspapers (2.8%). In the same order, in smaller percentages, were the results for participants from rural areas. This indicates that public and social media platforms are important sources of information about the COVID-19 vaccine for both urban and rural residents.

Table 4.

The participants' sources of information about the COVID-19 vaccine.

Source of information	Residence		Total
	Urban (n/%)	Rural (n/%)	
Public media	281 (70.2)	13 (3.2)	294 (73.5)
Colleagues, friends, and relatives	21 (5.2)	12 (3.0)	33 (8.2)
Social media platforms	21 (5.2)	10 (2.5)	31 (7.8)
Different sources of information	17 (4.2)	8 (2.0)	25 (6.2)
Newspapers	11 (2.8)	6 (1.5)	17 (4.2)
Total	351 (87.8)	49 (12.2)	400 (100)
<i>P</i> -value <0.0001			

The results showed a significant association between residents and reasons for willingness to take the COVID-19 vaccine. Among urban residents, the most common reason was

protecting themselves from COVID-19 (76.7%), followed by protecting their relatives from infection (5.6%), and last was putting an end to the pandemic (4.3%). In the same order, in smaller percentages, were the results for participants from rural areas. This indicates that the important reasons that encouraged residents from both urban and rural areas were to protect themselves from COVID-19, protect their relatives from infection, and end the pandemic (Figure 2).

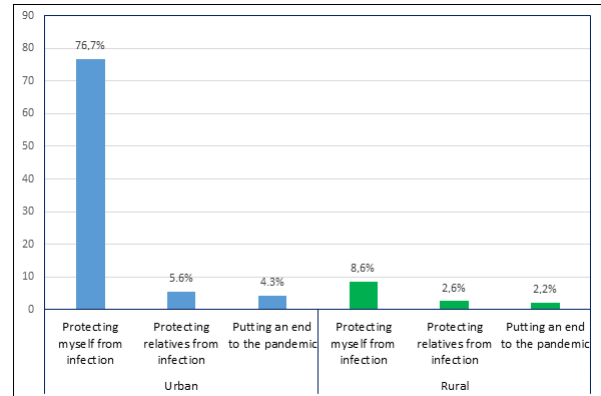


Fig. 2. Reasons for willingness to take COVID-19 vaccine (*P* = 0.002).

Table 5 illustrates the results of a multivariate analysis of factors significantly associated with the study participants' perceptions of the COVID-19 vaccines

Table 5.

The results of a multivariate analysis of factors significantly associated with the study participants' perceptions of the COVID-19 vaccines adjusted by knowledge.

Predictors	Responses	Unadjusted model			Adjusted model		
		B	OR (95% CI)	<i>P</i> -value	B	OR (95% CI)	<i>P</i> -value
Gender	Male	R					
	Female	-0.09	0.92 (0.62-1.36)	0.660	-0.27	0.76 (0.50-1.17)	0.213
Age group	18-27 years	R					
	More than 25 years	-0.82	0.44 (0.27-0.73)	0.001	-0.31	0.73 (0.35-1.53)	0.408
Marital status	Married	R					
	Unmarried	0.73	2.08 (1.33-3.26)	0.001	0.39	1.48 (0.77-2.83)	0.241
Education level	High school or less	R					
	Bachelor's degree and above	0.50	1.66 (1.07-2.56)	0.023	0.20	1.22 (0.73-2.04)	0.453
Residence	Urban	R					
	Rural	-1.41	0.24 (0.12-0.50)	0.000	0.77	2.17 (1.98-4.79)	0.050
Family type	Nuclear	R					
	Extended	1.44	4.24 (2.05-8.74)	0.000	0.84	2.32 (1.06-5.08)	0.036
Do you know about the COVID-19 vaccines	No	R					
	Yes	-3.33	0.04 (0.01-0.27)	0.001	0.13	1.14 (0.74-1.76)	0.547
Did you receive the COVID-19 vaccine	No	R					
	Yes	-0.05	0.95 (0.64-1.42)	0.808	2.91	0.05 (0.01-0.42)	0.005

adjusted by knowledge. It is worth noting that some factors were significantly associated with the study participants' perceptions of the vaccines. These were place of residence, family type, and receiving the COVID-19 vaccine. Urban residents were 2.17 times more likely to have a positive perception of the COVID-19 vaccine [$B=0.77$, $P=0.05$, ($OR=2.17$, 95% CI: 1.98-4.79)] than rural residents. Furthermore, study participants with nuclear family type have shown a positive attitude toward the COVID-19 vaccines and were 2.32 times more likely to have had a positive attitude than participants with extended family [$B=0.84$, $P=0.036$, ($OR=2.32$, 95% CI: 1.06-5.08)]. Moreover, participants not vaccinated were found to be less likely to have had a positive attitude toward the COVID-19 vaccine, when compared with vaccinated participants [$B=-2.91$, $P=0.005$, ($OR=0.05$, 95% CI: 0.01-0.42)]. However, gender, age group, marital status, and education level were not associated with factors related to the study participants' perceptions toward the COVID-19 vaccine ($P>0.05$).

Discussion

COVID-19, as a global challenge, requires a global response. Sudanese medical authorities have ensured immunization coverage through COVID-19 vaccination programs. Despite huge efforts and money invested in COVID-19 training, this study discovered that a significant percentage of participants lacked an understanding of the disease's transmission mode and showed insufficient awareness of risk factors and disease avoidance, with a positive perception of only 47.5%.

According to the most recent findings, the older people polled were more likely to be vaccinated against COVID-19, which agreed with the outcomes of Lazarus et al.⁽⁹⁾ In the current study, participants over 25 were more likely to be vaccinated than those under 25. Older people are more vulnerable to bacterial infections due to declines in physical ability and poor immunological response. Whether it involves pathogenic organisms or not, older people are more likely to become very unwell and have a higher fatality rate.⁽¹⁰⁾ While the elderly are more prone to severe COVID-19 infections and death, higher disease concern in this group has been linked to favorable opinions for COVID-19 vaccines.⁽¹¹⁾ Moreover, because older people are more likely to acquire vaccine information from reputable sources such as radio and television, they are less likely to be overwhelmed with misinformation, contributing to vaccine reception.

In this study, male and female vaccination rates for COVID-19 were nearly identical, in contrast to recent research that found women to be more motivated to be vaccinated against COVID-19 than men, which contradicts previous studies that found men to have higher rates of influenza vaccination.⁽¹²⁾ This could be because women perceive health threats differently than men. According to the current study, highly educated groups were significantly more likely to receive COVID-19 immunizations than less educated ones. This could be because higher educated people gain more information from social media and other sources, and they are

more concerned about the efficacy and negative repercussions of COVID-19 vaccines, which influences their willingness to be vaccinated. Previous influenza vaccine research had comparable results.⁽¹³⁾

The investigation discovered that our participants exhibited negative attitudes and perceptions, which contradicts the revelation that a high level of knowledge was highly associated with more positive attitudes and perceptions. At the same time, in a study by Papagiannis et al.,⁽¹⁴⁾ Greek healthcare workers had a high level of knowledge concerning the SARS-CoV-2 pandemic, which was significantly associated with positive attitudes and practices toward preventive health measures. Health professionals' high level of knowledge about SARS-CoV-2 may have contributed considerably to the successful management of the pandemic in Greece. Published data from a knowledge, attitude, and practice survey conducted during COVID-19 among the general population in China revealed a high rate of correct answers in the knowledge questionnaire, which the authors attributed to the participants' high educational level and the severity of the public health program.⁽¹⁵⁾

The dangers of SARS-CoV-2 and the necessity for immunization should be actively promoted throughout vaccine promotion initiatives. Validation of the vaccine's efficacy by credible sources, medical advice, and government media marketing of the vaccine's utility can all influence citizens to choose immunization.⁽¹⁶⁾

Based on our findings, the percentage of participants who had a solid comprehension of COVID-19 was significantly higher among those who received the COVID-19 vaccine than those who did not, and extended family members had more knowledge than nuclear family members.

In our study, widespread belief in the efficacy of conventional healthcare in preventing and curing COVID-19, as well as misinformation from social media platforms, newspapers, colleagues, friends, and relatives, may have contributed to the lower knowledge rating among non-vaccinated and nuclear family participants.

According to the WHO, the side effects of COVID-19 vaccines are mostly minor and last only a few days. In our study, the most prevalent adverse effects were headache, muscle discomfort, fever, tiredness, and joint pain. These findings are consistent with the results reported by Riad et al.,⁽¹⁷⁾ Zhu et al.,⁽¹⁸⁾ and numerous other studies. The most frequently stated local side effect was injection discomfort. A study by Almughais et al.⁽¹⁹⁾ included 2,530 participants from different regions of Saudi Arabia. The most common vaccine among the study group was Pfizer-BioNTech COVID-19 vaccine, for which 73.8% of the population was provided; the remaining 26.2% received the Oxford-AstraZeneca vaccine. Regarding the Pfizer-BioNTech vaccine, the common systemic side effects that followed the first dose included headaches, followed by muscle pain, fever, and joint pain. Vaccine side effects were more frequently reported by smokers and those who received the AstraZeneca vaccine. The documented side effects among our study participants indicate that vaccinations have safe characteristics. These findings are consistent with the results reported in a study by

Alhazmi et al.,⁽²⁰⁾ in which Oxford-AstraZeneca and Pfizer-BioNTech vaccines were received by 75% and 25% of the study participants, respectively. Side effects associated with COVID-19 vaccines have been reported by 60% of the study subjects, and most of them reported fatigue (90%) and pain at the site of the injections (85%).

More research is needed to determine the efficacy of current vaccines in protecting against COVID-19. Another study on the assessment in Jordan of side effects and perceptions after COVID-19 found that most post-vaccination side effects were common and non-life threatening (fatigue, chills, disorientation, fever, headache, joint pain, and myalgia). Only 10% of participants had severe side effects, whereas 39% and 21% had moderate and mild side effects. At the same time, the results of the GCoV-S Project should also be noted.⁽⁵⁾ This multi-country analysis confirmed pre-established safety signals for myocarditis, Guillain-Barré syndrome, and cerebral venous sinus thrombosis. Other potential safety signals that require further investigation were identified.

Conclusion

Although society is aware of the need for COVID-19 immunization, it has been observed that the community has a low positive perception toward COVID-19 vaccination. Similarly, people in rural areas are less aware of the significance of immunization. Local health officials must collaborate to address public fears about vaccinations through the media, which has a significant and powerful influence, particularly now that different variants of SARS-CoV-2 are developing and spreading.

Competing Interests

The authors declare that they have no competing interests.

Acknowledgments

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