

Causes of Refusing of COVID-19 Vaccination Among Medical Care Providers in Omdurman Teaching Hospital, Khartoum, Sudan, 2022

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Abstract: **Background:** Vaccination against COVID-19 has been available in Sudan since 2021. Despite the existence of the COVID-19 vaccine and the increasing vaccination rates among, there are reports of refusal to get vaccinated in a different segment of the population, including medical care providers. Data on the acceptance of vaccination and its influencing factors are necessary. The aim of this study was to investigate the reasons leading to reject vaccination among medical care providing in Omdurman teaching hospital in Sudan. **Methods:** A cross-sectional survey was conducted among 307 participants of medical care providers at Omdurman teaching hospital. Data were collected through direct interview. SPSS version 20 was used for analysis. **Results:** Approximately 46.57 % of the medical care providers in the study had refused COVID-19 vaccination. 20.5% of nurses were refused compared to 19.86% of doctors refused to get vaccine. Reasons for refusing a COVID-19 vaccination were identified as: it's a new vaccine, there is no enough data, and they don't believe in vaccine. **Conclusions:** Approximately near half of the medical care providers in this study, were indicated to refuse COVID-19 vaccination. The development of effective vaccine will be an important landmark for vaccine hesitancy and refusal among medical care providers.

Keywords: Coronavirus disease, Sudan, Doctors, enough data, population segment, influencing factors.

1. Introduction

Coronavirus disease (COVID-19) is an infectious disease brought on by the SARSCoV- 2 virus. This virus belongs to a broad family of viruses that are known to cause illnesses ranging from the common cold to more serious conditions like Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS). Several coronaviruses are circulating in animals that have not yet infected people, including SARS-CoV, which was spread from civet cats to humans in China in 2002, and MERS-CoV, which was spread from camels to humans in Saudi Arabia in 2012 [1]. Most people infected with the virus experienced mild to moderate respiratory illness, but in some cases disease will be seriously and people will require medical attention [2].

The global efforts to lessen the effects of the pandemic, and to reduce its health and socioeconomic impact, rely to a large

extent on the preventive efforts. Thus, huge efforts by the scientific community and pharmaceutical industry backed by governments' support, were directed towards developing efficacious and safe vaccines for SARS-CoV-2. These efforts were manifested by the approval of several vaccines for emergency use, in addition to more than 60 vaccine candidates in clinical trials. Moreover, more than 170 COVID-19 vaccine candidates are in the pre-clinical phase [3]. The COVID-19 vaccines are highly effective, but no vaccine provides 100 per cent protection.

In late 2020 and early 2021, many nations allowed the use of COVID-19 vaccines in the general populace. All of the COVID-19 vaccine are attempting to develop virus immunity, and some of them may also be able to prevent transmission. The antigen in the instance of COVID-19 is commonly the unique spike protein that can be seen on the virus's surface and that it typically uses to help it infiltrate human cells [4]. A number of COVID-19 vaccines are currently available for production and sale. Several companies received emergency licenses from various health organizations during the month of December 2020, including Moderna in the United States, Pfizer-BioTech in the United States and Europe, Oxford Astra Zeneca in the United Kingdom, and Sinopharm in China [5].

Scientists around the world are working faster than ever to develop and produce vaccines that can stop the spread of COVID-19 [2]. There are four categories of vaccines in clinical trials, whole virus: vaccines use a weakened or deactivated version of the disease-causing virus to trigger protective immunity against it. Protein subunit: two-dose vaccine which is a combination of spike proteins and an adjuvant. Viral vector and nucleic acid [RNA and DNA] two doses. Some of them try to smuggle the antigen into the body, others use the body's own cells to make the viral antigen [2].

COVID-19 vaccination hesitancy rates in the general population have now been explored across the world and are fairly well established [6]. For example, in a recent systematic review which was conducted by Sallam and his co-workers reported, that the highest rates for COVID-19 vaccine

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acceptance in the general population were reported in Ecuador, Malaysia, Indonesia, and China [$>90\%$ for all countries]. In contrast, the lowest rates were reported for Kuwait, Jordan, Italy, Russia, Poland, United States, and France [$<60\%$ for all countries] [7]. In some studies done by Misir, it has been shown that COVID-19 vaccination hesitancy rates differ worldwide by perceived susceptibility to and severity of COVID-19 and several sociodemographic characteristics such as sex, age, education, income, and occupation [1]. Medical care providers [MCP] were selected as priority groups for vaccination in the majority of countries as COVID-19 vaccines were released in late 2020 and early 2021 [8].

Local medical care providers [MCP] are among the most respected and important experts in the world when it comes to helping people and families make decisions about vaccinations [9], and they play an important roles in their communities outside of their professional responsibilities. Most of the medical professionals around the world frequently have vaccine hesitation [10]. The general public's refusal rates to receive the COVID-19 vaccine have now been studied globally, raised significant international concerns, and are largely well-established [11]. MCP were a source of hope, a means of fighting the pandemic and continuing to help others while safeguarding themselves [12]. Little is known about the scope and predictors of COVID-19 vaccination rejection among healthcare professionals, despite media stories and scientific publications. The complexity of this issue may make it difficult to analyze how vaccine refusal, including readiness to receive COVID-19 vaccinations, affects the world as a whole [7].

Interesting study was done by Biswas and his team were found the global prevalence rate of COVID-19 vaccine refusal among 41,098 nurses from 36 countries was 20.7% [8]. The refusal rate of COVID-19 vaccination in Africa is not studied very well. There was study done by Berhe and his colleges in Ethiopia on the issue showed that, about 38.5% of the medical professionals have declined the COVID-19 vaccination [5]. The complex nature of motives behind vaccine hesitancy can be analyzed using the epidemiologic triad of environmental, agent and host factors [1]. Environmental factors include public health policies, social factors and the messages spread by the media [13]. Host factors are dependent on knowledge, previous experience, educational and income levels. The most common reasons behind refusal of vaccine included: perceived risks vs. benefits, certain religious beliefs and lack of knowledge and awareness. The aforementioned reasons can be applied to COVID-19 vaccine hesitancy, as shown by the recent publications that showed a strong correlation between intent to get coronavirus vaccines and its perceived safety, association of the negative attitude towards COVID-19 vaccines and unwillingness to get the vaccines, and the association of religiosity with lower intention to get COVID-19 vaccines [6]. Concerns about potential side effects were identified as one of the reasons for refusing vaccination [14]. Recent report suggest that many healthcare workers (HCWs) are also hesitant about or are delaying getting the COVID-19 vaccine [15]. Some reports estimate that the rates of COVID-19 vaccination hesitancy in HCWs may be similar to rates in the general

population. For example, in December 2020 Kaiser Family Foundation poll found that 29% of the HCWs were reluctant to get COVID-19 vaccines as opposed to 27% of the individuals in the general population [12]. In contrast, in an early 2021 assessment of skilled nursing facilities across the United States conducted by Sallam and his co-workers, illustrated that more than three-fourths (77.8%) of the residents of these facilities compared to a little more than a third (37.5%) of the staff in these facilities received at least one dose of the COVID-19 vaccine [7]. These estimates are of concern even though HCWs were designated as priority groups for COVID-19 vaccination across the world. Given the scattered scientific evidence and a plethora of media reports, it remains to be known to what extent and why are HCWs hesitant towards obtaining COVID-19 vaccination.

Earlier study that assessed attitudes towards vaccines revealed the existence of regional variability in perceiving the safety and effectiveness of vaccination [16]. Higher-income regions were the least certain regarding vaccine safety with 72%–73% of people in Northern America and Northern Europe who agreed that vaccines are safe. This rate was even lower in Western Europe (59%), and in Eastern Europe (50%), despite the presence of a substantial variability in Eastern European countries [from 32% in Ukraine, 48% in Russia, to 77% in Slovakia]. However, the majority of people in lower-income areas agreed that vaccines are safe, with the highest proportions seen in South Asia (95%) and in Eastern Africa (92%) [6]. A similar pattern was observed regarding vaccine effectiveness, with Eastern Europe as the region where people are the least likely to agree that vaccines are effective, as opposed to South Asia and Eastern Africa. The assessment of such regional differences can be invaluable in addressing and fighting public health threats posed by vaccine hesitancy. Despite the huge efforts made to achieve successful COVID-19 vaccines, a major hindrance can be related to vaccine hesitancy towards the approved and prospective COVID-19 vaccination. In addition, some people emphasized that their own immune system was strong enough to deal with a possible infection and therefore they did not need vaccination. According to their own statements, some of them relied on preventive and supportive measures like a balanced diet or taking supplemental vitamins to bolster up their immune system, rendering vaccination, in their opinion unnecessary [8].

Another reason to refuse vaccination were users' concerns about various potential side effects and possible vaccine-related damage. Some users justified rejecting vaccination citing the lack of long-term studies and insufficient reliable information about side effects and consequential damages. Among others, these fears were related to the risk of getting cancer, changes and damages to their genetic makeup, infertility and death. These concerns were often associated with past vaccine and drug scandals [17]. Another reason for users refusing vaccination was that some did not feel sufficiently informed about the vaccination and that the available information was perceived as incomprehensible. This lack of transparent and user-oriented information in some cases resulted in the spread of misinformation and conspiracy theories. The lack of

knowledge led to a general mistrust and a negative attitude towards information on the disease itself and vaccines among some of the users. These beliefs, which were mostly based on misinformation or conspiracy theories, led to strong downplaying or denial of COVID-19 among users and a subsequent lack of willingness to get vaccinated. Mistrust in authorities, political stakeholders or in representatives of the pharmaceutical industry also played an important role. There were doubts about the reliability and integrity of information and the intentions of certain groups, organizations or institutions in promoting vaccination, which users attributed to previous misconduct. For example, users were convinced that the pharmaceutical industry had a mere financial interest in promoting vaccination against COVID-19 development and approval of the vaccines compared to previous vaccines against other diseases was another reason given by users for refusing vaccination. They expressed concern that the vaccines were not sufficiently tested and that long-term negative physical consequences could not be ruled out. The partial emergency approval of the vaccines also led to concerns. Also, vaccines from specific manufacturers were sometimes rejected. Users justified this with differences in perceived effectiveness and suspected side effects of vaccines from certain manufacturers. The respective country of development or production also played a role in rejecting these vaccines [3]. Spiritual or religious beliefs, such as the protection by God or the protective effect of precious stones, also led to a refusal of vaccination against COVID-19 by some users [18].

Thus, the purpose of this study was to review the reasons for COVID-19 vaccination refusal among medical care providers at Omdurman teaching hospital, which is considered one of the largest health facilities in Khartoum, Sudan.

2. Materials and Methods

A. Study Design

This is a cross-sectional hospital-based study. A sectional survey was conducted among a group of MCP at Omdurman teaching hospital in Khartoum city, Sudan.

Written ethical clearance and approval were reviewed and approved by Scientific Committee of Napata College (<https://napata.edu.sd>). Study participants were also given a full right to refuse/withdraw from the study process at any time in the study process. Participants in the study were informed about the purpose of the study and the privacy of information provided. Written informed consent for participation was required for this study in accordance with the national legislation and the institutional requirements.

B. Study Area

The study was conducted in Omdurman teaching hospital in Khartoum city, Sudan.

This hospital was selected due to the presence of an estimated number of trained and qualified medical staff, as well as its strategic location, where this hospital was adopted because it covers large population area with high number of MCP, and the quality of the medical service provided, covering all specialties

as well as providing patients with diagnostic capabilities.

C. Study Population

All medical care providers including physicians, pharmacists, nurses, anasethia technician, and laboratory technicians, who concern with covid-19 vaccine.

D. Sampling

Sample size was calculated using Yamani formula:

$$n = \frac{N}{1 + N(e)^2}$$

where:

n = sample size N = population size = 600

e = level of precision or sampling of error = 0.04

Total population = 307

E. Data Collection, Data Management, and Analysis

Similar to how cross-sectional studies on medical professionals' rejection of the COVID-19 vaccination are carried out. Data were collected from 1st of November to 20th of December 2022. Direct interview with medical professionals who have declined the covid-19 vaccination in Omdurman teaching hospital, Khartoum, Sudan was conducted to fill out the questionnaires. The obtained findings were compared with those from other studies conducted all through world.

Data were entered, cleaned, and analyzed using SPSS program version 20. Then data was summarized using descriptive statistics using frequencies and percentages.

3. Results

A. Participants Description

There is a total 307 medical care providers (MCP) were included in the study. Most of the MCP were females 186 (60.6%), while 121 (39.4%) were males (Figure 1). Doctors 159 (51.7%), Nurses 107 (34.8 %), Laboratory technician 25 (8.1%), Anasethia technician 10 (3.2%), pharmacists 6 (1.9%) (Table 1). Also, 225 (73.28%) participants who are less than 31 years old, followed by 62 (20.19%) between 31-40 years old, last group was 20 (6.5%) more than 40 years old (Figure 2).

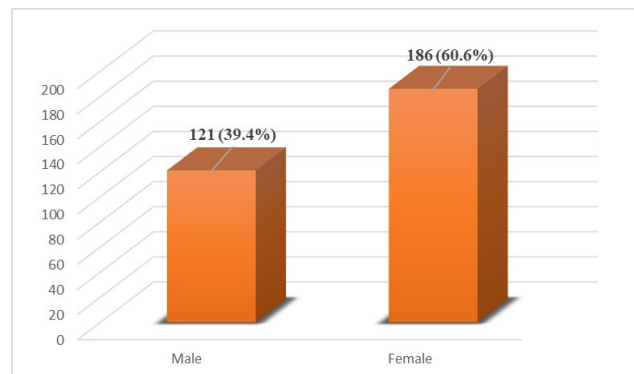


Fig. 1. Gender distribution among the study population

Table 1
The distribution of job among medical care providers in the study

Job description	Number	Percentage (%)
Doctors	159	51.7%
Nurses	107	34.8%
Laboratory technicians	25	8.1%
Anesthesia technicians	10	3.2%
Pharmacists	6	1.9%
Total	307	100%

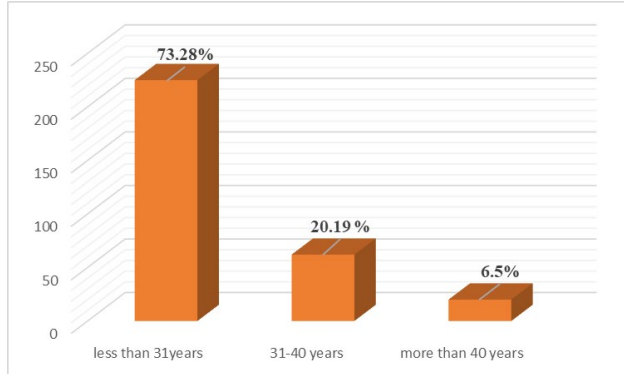


Fig. 2. Age distribution among the study group

B. Source of Information About COVID-19 Vaccination

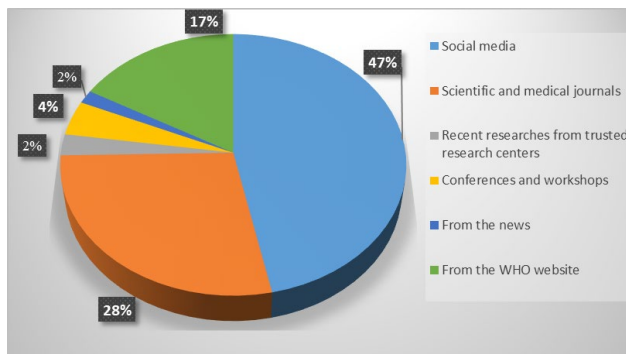


Fig. 3. Source of information about COVID-19 vaccination among study group

Final analysis of 307 MCP showed that there is a clear difference and discrepancy in the source of information, whether about the Covid-19 or the vaccination of Covid -19. Social media sources were the most common source of COVID-19 information (47%), followed by scientific and medical journals source (28%), 17 % were based on their information from WHO web site, about 4% from conferences and workshops, and only 2% from news and recent researches from trusted research centers (Figure 3).

C. Prevalence of COVID-19 Vaccination Acceptance and Refusal Rate

About 164 (53.43%) of MCP accepted to get COVID-19 vaccination as follows: 82 (26.7%) male, 82 (26.7%) females, 98 (31.9%) doctors, 44 (14.3%) nurses, 14 (4.5%) Laboratory technicians, 8 (2.6%) Anesthesia technicians, based on the age group, 109 (35.5%) less than 31 years old, about 45 (14.6%) 31-40 years old, and 10 (3.2%) above 40 years old. While 143 (46.57%) refused to get vaccine.

39 (1.7%) male, 104 (33.8%) females (Figure 5), 61 (19.86%) doctors, 63 (20.5%) nurses, 11 (3.58%) Laboratory technicians, 2 (0.65%) Anesthesia technicians, and 6 (1.95%) pharmacists. Based on the age group, 116 (37.7%) less than 31 years old, about 17 (5.5%) between 31-40 years old, and 10 (3.2%) above 40 years old (Table 2). The Fisher exact test statistic value is 0.0011. The result is significant at $p < .05$ between doctors and nurses. Job description value was significantly difference at $p < .05$, the p -value is .001214. statistically associated with COVID-19 vaccine refusal. Statistic value is 0.0001 in the gender category who refused and not refused to get covid-19 vaccine (Table 3).

D. Major Reasons of Refusal COVID-19 Vaccine

Our analysis revealed three major categories of reasons for refusing a COVID-19 vaccination were identified: it's a new vaccine and there is no enough data, they don't believe in vaccine, and it has many complications (Figure 5).

Table 2
Prevalence of COVID-19 vaccination acceptance and refusal rate among MCP

		Vaccination	
		Not Refused (%)	Refused (%)
Gender	Male	82 (26.7%)	39 (1.7)
	Female	82 (26.7%)	104 (33.8)
Job description	Doctors	98 (31.9%)	61 (19.86)
	Nurses	44 (14.3%)	63 (20.5)
	Laboratory technicians	14 (4.5)	11 (3.58)
	Anesthesia technicians	8 (2.6)	2 (0.65)
	pharmacists	0	6 (1.95)
Age /Years	Less than 31	109 (35.5)	116 (37.7)
	31-40	45 (14.6)	17 (5.5)
	more than 40	10 (3.2)	10 (3.2)
	Total	164 (53.43%)	143 (46.57%)

Table 3
Statistical analysis of the data using fisher exact test (P value < 0.05)

	Not Refused (%)	Refused (%)	P value < 0.05
Male	82 (26.7%)	39 (1.7%)	0.0001
Female	82 (26.7%)	104 (33.8%)	
Doctors	98 (31.9%)	61 (19.86%)	0.001214
Nurses	44 (14.3%)	63 (20.5%)	
Laboratory technicians	14 (4.5%)	11 (3.58%)	
Anesthesia technicians	8 (2.6%)	2 (0.65%)	
Pharmacists	0	6 (1.95%)	

About 8.3 % from doctors, 3.7 % from Nurses, 8 % Lab. technician, 10 % Anesthesia technicians, and 33 % Pharmacists said they refused Covid 19 vaccine because it's a new vaccine and there is no enough data. 6.4% doctors, 14 % nurses, 4 % Lab. technician, 10 % Anesthesia technicians, and 16.7 % pharmacists refused the vaccine because they don't believe in it. There is 4.48 % doctors, 11.2 % nurses, 16 % Lab. technician refused Covid 19 vaccine because it has many complications (Figure 6).

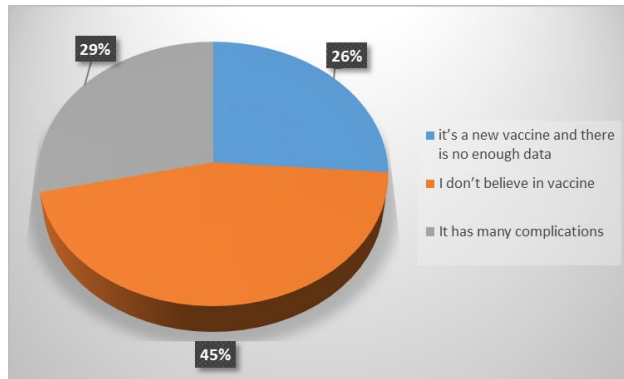


Fig. 4. Distribution of refusal reasons among the study group

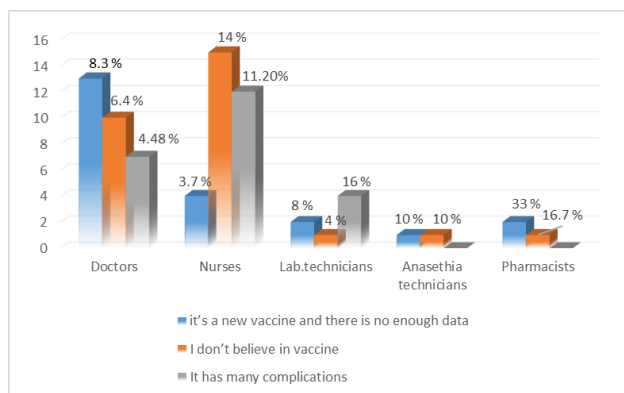


Fig. 5. Distribution of refusal reasons among the study group

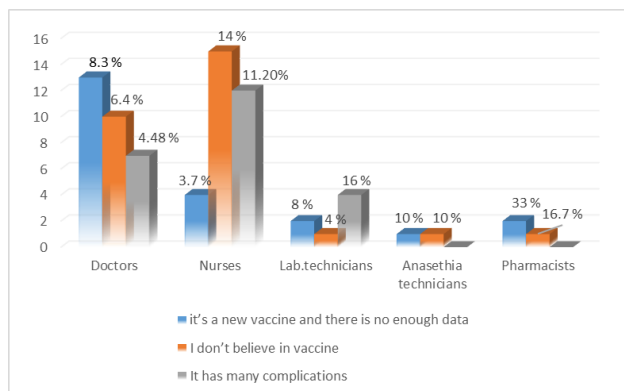


Fig. 6. Distribution of major refusal reasons among the study subjects

4. Discussion

Vaccination is one of the most important strategies for the long-term management of the COVID-19 pandemic (13). Given that considerable proportions of the populations in many countries are still hesitant to get vaccinated (10), insights into reasons for poor vaccine acceptance are needed in order to

inform public health measures aiming to further increase COVID-19 vaccination rates in the population. 46.57% refused to get Covid 19 vaccine. In our study most of the MCP were females (33.8%). The refusal levels of the COVID- 19 vaccine among younger participants was higher among participants less than 31years old.

This study showed that younger age groups were less likely to refuse the COVID-19 vaccine, a finding similar to the studies conducted in France (19), and the United Kingdom (20) .

This could be owing to the active engagement of young MCP in various social media platforms, which are mostly disseminating. The information gaps, Information gaps, which are associated with information that is not sufficiently sensitive to the needs of the target group, may be the cause of refusal to receive the COVID-19 vaccine. For example, misinformation provided by the social media, it was found that a significant percentage of participants (47%) were using social media searching information about Covid- 19 vaccine, it may not be trusted source, and suggests that there is a need to create credible and accurate information tailored to medical care populations who use social media as an information source (2). Information from untrusted journals and workshops lacked a lot of credibility, so many did not rely on it. Even those who relied on their sources from the WHO later questioned the organization because of the imprecision of its positions towards the pandemic (2). During the pandemic, it was challenging to obtain information directly from conferences and workshops, may be due to difficulty of traveling at the time of pandemic to attend these conferences played a role in decision-making. Information on potential side effects of COVID-19 vaccination was one of a reasons of refusal. Misinformation on the different sources can also be an important reason for refusing vaccination. A low perceived benefit of the vaccination and a high risk of getting COVID-19 can also be counteracted. The present study investigated reasons of refusal COVID-19 vaccination among MCP. In our analysis, three main categories of reasons were identified, which reflect different opinions and views.

45% of the study group refused to get vaccine because they don't believe in vaccine, they have opinions about vaccination, its efficacy, when and where the clinical trials took place, and in general and that vaccine can be a source of disease.

Many of MCP said it's a new vaccine and there is no enough data and thought that vaccine against COVID-19 had not yet been sufficiently investigated or that they were not as effective as attenuated or inactivated vaccines. Another reason to refuse vaccination were MCP concerns about various potential side effects and possible vaccine-related damage, the lack of long-term studies and insufficient reliable information about side effects and consequential damages. Recent study showed about 29 % refused to vaccine due to this reason.

The data obtained from this study are similar to other studies for example a study conducted in Germany by Fieselmann 2022 explaining these reasons (11).

Our findings are in line with studies from other countries, which have shown that, amongst others, poor perception of government and public health responses to the pandemic,

concerns about vaccine side effects and safety, and unfavorable illness perceptions about COVID-19 such as a low perceived risk of infection are relevant reasons for poor uptake of COVID-19 vaccines (20), (5). With regard to vaccinations related to other diseases, similar reasons as in our and previous research on COVID-19 vaccine hesitancy were reported in other studies, such as a lack of confidence in vaccinations and a low perceived risk of contracting the disease (6).

COVID-19 vaccine is new vaccine for this reasons, doctors, nurses, Laboratory technicians, anesthesia technicians, and pharmacists refused to get the vaccine (8.3 % 3.7, 8 %, 10 %, 33 %) respectively. While 6.4% doctors, 14 % nurses, 4 % Laboratory technicians, 10 % Anesthesia technicians, and 16.7 % pharmacists, in another hand there is 4.48 % doctors, 11.2 % nurses, 16 % Laboratory technician refused Covid 19 vaccine because it has many complications.

Nurses were more likely to refuse to get vaccinated to COVID-19 than medical doctors, a finding consistent with findings from Ethiopia (5). This may be due to the fact that the level of misinformation or disinformation toward the vaccine may be higher among nurses compared to medical doctors. Given nurses are the front-line workers in many departments of health facilities, this finding is extremely concerning. Medical doctors staffs were came next to nurses more likely to refuse to get the COVID-19 vaccine, and more than laboratory technicians, Anesthesia technicians, and pharmacists, this may be due to the fact that clinicians may be assumed that they are at risk of infection, severity, and morbidity than others.

Many studies including this study, have clarified a number of other reasons that influenced MCP decisions about vaccine. Most of them feel inadequately informed about vaccination or do not understand the information available. Moreover, MCP may refuse a COVID-19 vaccination due to systemic mistrust in authorities (10), political stakeholders or representatives of the pharmaceutical industry (13). Still, because of the novelty of COVID-19, its tremendous impact on societies all over the world, further insights into individuals' perception about COVID-19 vaccines are warranted (6). The aforementioned strategies aiming to promote COVID-19 vaccination uptake need to be further strengthened and evaluated with regard to their effectiveness.

5. Conclusion

A considerable percentage of medical care providers refused to get COVID-19 vaccination. MCP of younger age groups were highly likely to refuse to get vaccinated. These imply the need to target these sections, and the need to understand the refusal of COVID-19 vaccination. Moreover, the issue of refusal among health workers may also affect the general population by implication and hence, it requires serious attention. We recommend for researchers to conduct a qualitative study for an in-depth understanding of potential barriers to refusal, and also perform large-scale surveys by including additional variables. It is essential to know the frequency and reasons for vaccine hesitancy and refusal and to develop a national vaccination strategy accordingly.

To the best of our knowledge, this is the first study in Sudan

to investigate the readiness to get vaccinated against COVID-19.

Author Contributions

All authors contributed significantly to the publication whether in designing the questionnaire, data analysis, and writing up of the manuscript. They have agreed to the content of the manuscript and declared no conflict of interest. TAMI conceptualized the study, contributed to data analysis, designing tables and figures, writing and revision of the final manuscript. AMAA contributed in designing the questionnaire, and data collection. ONEA contributed to data collection and analysis. OMAM contributed to data collection and analysis. HAA revised the questionnaire questions, contributed to data analysis, writing and revising the final manuscript.

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Conflict of Interest

There is no conflict of interest to declare.

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