



RESEARCH ARTICLE

Perception of nurses, medical laboratory scientists, and midwives toward coronavirus vaccination in Khartoum State, 2021—a cross sectional study [version 1; peer review: awaiting peer review]

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Abstract

Background: Nurses, medical laboratory scientists and midwives comprise a large portion of healthcare personnel. Healthcare personnel have an important role in guiding and encouraging patients and communities, and showing role modeling behavior.

Objective: This study aimed to evaluate and explore the perception of nurses, medical laboratory scientists, and midwives toward coronavirus vaccination.

Methods: A descriptive cross-sectional facility-based study was conducted. Data were collected using an online Google form questionnaire. Demographic variables were analyzed using frequencies and percentages. The association between independent variables and the decision of receiving the COVID-19 vaccine were evaluated by binary logistic regression and Chi-square test.

Results: In this study, 375 responses were collected, of which 324 (86.4%) were female. The majority of the participants (73.9%) were aged between 20 and 30 years. There were 160 (42.7%) medical laboratory scientists, 145 (38.7%) nurses, and 70 (18.7%) midwives. More than half of the participants (53.6%) accepted receiving vaccination against COVID-19. Results showed a positive correlation of vaccine acceptance with nurses, medical laboratory scientists, and midwives, suggesting that they are more likely to be vaccinated.

Conclusion: There was a good perception towards COVID-19 vaccination, as 53.4% of the participants accepted receiving the COVID-19 vaccine, which is a good rate for acceptance. This finding

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has a positive impact on the whole vaccination process, as the recommendations of medical laboratory scientists, nurses, and midwives affect the behavior of the general population toward vaccination.

Keywords

coronavirus. COVID-19, vaccination, perception, nurses, midwives, laboratory scientists

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Introduction

On December 31, 2019, an unknown etiology caused pneumonia cases in the Hubei Province of China, Wuhan City, and this was reported to the World Health Organization (WHO) by the China Country Office. A new type of coronavirus (novel coronavirus, nCoV) was identified by the Chinese authorities and was isolated on 7 January 2020 as the causative agent [<https://www.who.int/emergencies/disease-outbreak-news/item/2020-DON229>], [https://reliefweb.int/report/china/novel-coronavirus-china-disease-outbreak-news-12-january-2020?gclid=CjwKCAiAv9ucBhBXEiwA6N8nYNZaGQ-SiItvL6okVamGegRAKJA4GZvpjroHts6qKoKfhYlu9FvqGMRoCbRQQAvD_BwE].

Coronaviruses are single-stranded RNA viruses categorized into four groups based on the genetic homology: Alpha, Beta, Gamma, and Delta. The betacoronaviruses include SARS-CoV, MERS-CoV 3, and recently the new coronavirus SARS-CoV-2. The name of the virus means crown or halo and originated from the Latin word *corona*, referring to the crown-like projections on the surface of the virus.¹ The family of coronaviruses include viruses with a wide host range and include many types, causing either a mild chest cold or serious infections such as Middle East respiratory syndrome (MERS) and severe acute respiratory syndrome (SARS) [<https://www.cdc.gov/coronavirus/2019-ncov/your-health/about-covid-19/basics-covid-19.html>]. The official name for the new disease was declared by the WHO as coronavirus disease 2019, abbreviated to COVID-19 on February 11, 2020 [<https://www.cdc.gov/coronavirus/2019-ncov/your-health/about-covid-19/basics-covid-19.html>].

The symptoms of COVID-19 vary from mild to moderate respiratory discomfort that may recover without medical intervention. Underlying medical conditions and advanced age may lead to serious illness [<https://www.who.int/emergencies/diseases/novel-coronavirus-2019/question-and-answers-hub/q-a-detail/coronavirus-disease-covid-19>]. The spreading of COVID-19 continued even after preventive measures such as social distancing, face masks, quarantine and travel restrictions were applied, resulting in serious consequences to life, the economy and health, with the only hope being the development of a successful vaccine.² Research centers and pharmaceutical companies began the development of vaccines from the emergence of SARS-CoV-2 and the publication of the first genome.³

Early in December 2020, the first vaccination program began. There have been no less than 13 diverse vaccines administered, including Pfizer/BioNtech Comirnaty, SII/Covishield, AstraZeneca/AZD1222, Moderna COVID-19, Janssen/Ad26.COVS.2.S, and Sinopharm COVID-19 [[https://www.who.int/emergencies/diseases/novel-coronavirus-2019/question-and-answers-hub/q-a-detail/coronavirus-disease-\(covid-19\)-vaccines?adgroupsurvey={adgroupsurvey}&gclid=CjwKCAiAv9ucBhBXEiwA6N8nYFcBFmhpV-5rCPhQ0zJRZIn4aG7o0T9XyDP9ZmMW1mNsfOnqXxwHRoCUggQAvD_BwE](https://www.who.int/emergencies/diseases/novel-coronavirus-2019/question-and-answers-hub/q-a-detail/coronavirus-disease-(covid-19)-vaccines?adgroupsurvey={adgroupsurvey}&gclid=CjwKCAiAv9ucBhBXEiwA6N8nYFcBFmhpV-5rCPhQ0zJRZIn4aG7o0T9XyDP9ZmMW1mNsfOnqXxwHRoCUggQAvD_BwE)]. These vaccines enable our bodies to recognize and protect against the virus that causes COVID-19. Vaccines may work as mRNA vaccines, protein subunit vaccines, or vector vaccines [<https://www.cdc.gov/coronavirus/2019-ncov/vaccines/different-vaccines/how-they-work.html>].

Patient acceptance of vaccination is influenced by the usage of the vaccination by healthcare workers, along with the reduction of vaccine hesitancy. Vaccinated healthcare workers influence the patient to take the vaccine.⁴ Additionally, there is a constant correlation between vaccine hesitancy amongst healthcare personnel and that reported in the general population.⁵ Healthcare workers guide and provide trusted information about the vaccine to the general population, and prevent the spreading of misleading and confusing information.² The intention of healthcare workers to advocate a vaccine for patients relies on their attitudes and knowledge regarding vaccines.⁴

Methods

Study design

This was a descriptive, analytical cross-sectional facility-based study. The questionnaire was conducted online using a Google form. These forms were sent via social media to obtain the answers from participants.

Study area

The study was carried out in Khartoum State, Sudan.

Study population

The study population consisted of nurses, laboratory scientists, and midwives who worked in Khartoum State.

Inclusion criteria

Any nurse, midwife, or laboratory scientist who worked in Khartoum State was eligible to participate.

Exclusion criteria

Other healthcare workers and those who worked in a different state.

Sample size

The sample size was 375, and it was estimated assuming a prevalence of 23.3% of satisfaction regarding the teaching methodology, a 1.96 confidence level, and a sample error of 5%.

Sampling technique

A simple random sampling technique was applied for this study. The questionnaire was sent online to collect data from the participants, then the data were collated on an Excel spreadsheet and analyzed using SPSS (RID:SCR_002865).

Data collection

An online Google form questionnaire was used to collect the data from the participants.

Ethical approval

Ethical approval was obtained from the Committee of Medical Laboratory Science, ethical No. (DSR-IEC-04-1-2021). Written and verbal informed consent was taken from participants before starting the study for data collection and publication.

Data analysis

Data were extracted into a Microsoft Excel spreadsheet and loaded to SPSS version 22.0 (RID:SCR_002865) for final analysis.

Results

In this study, 375 responses were collected, and, of these, 324 (86.4%) were female and 51 (13.6%) were male. The majority (277, 73.9%) of the participants were aged between 20 and 30 years. There were 160 (42.7%) medical laboratory scientists, 145 (38.7%) nurses, and 70 (18.7%) midwives. More than half of the participants 211 (56.3%) were working in the Department of Microbiology in the Khartoum locality, 247 (65.9%) had reached university level, and 138 (36.8%) of the participants had 5–10 years of work experience.

Regarding work circumstances (Figure 1), the majority of respondents had not worked in an isolation center nor had contact with COVID-19 patients (88% and 76%, respectively). About 40% had already had or had been suspected to have COVID-19. Figure 2 shows the level of knowledge according to participant self-estimation. The highest number of participants obtained their information from social media (Figure 3).

There was a significant association between the refusal of vaccination and age group, occupation, level of education, and years of experience. Participants who were aged between 20 and 30 years, studied till university, were nurses, and had

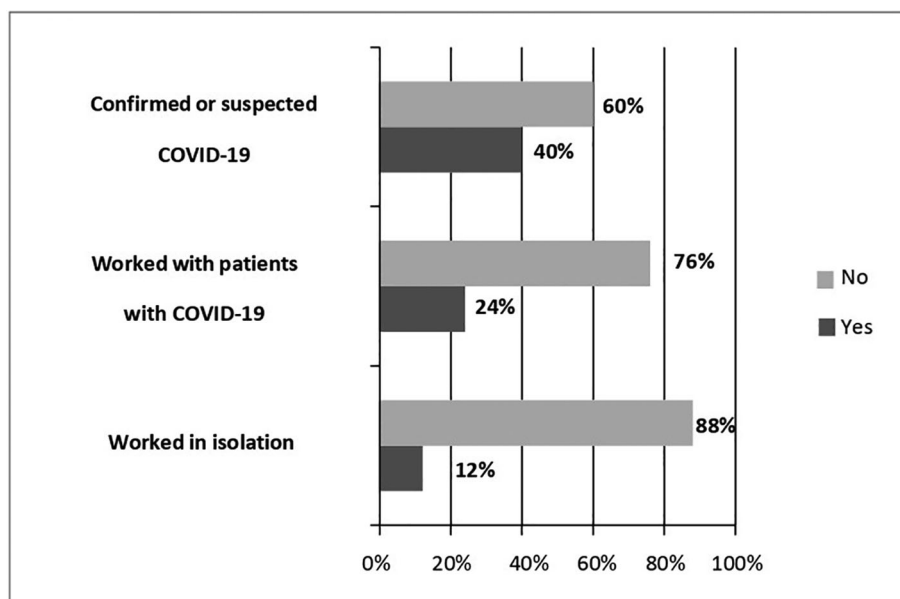


Figure 1. Work circumstances.

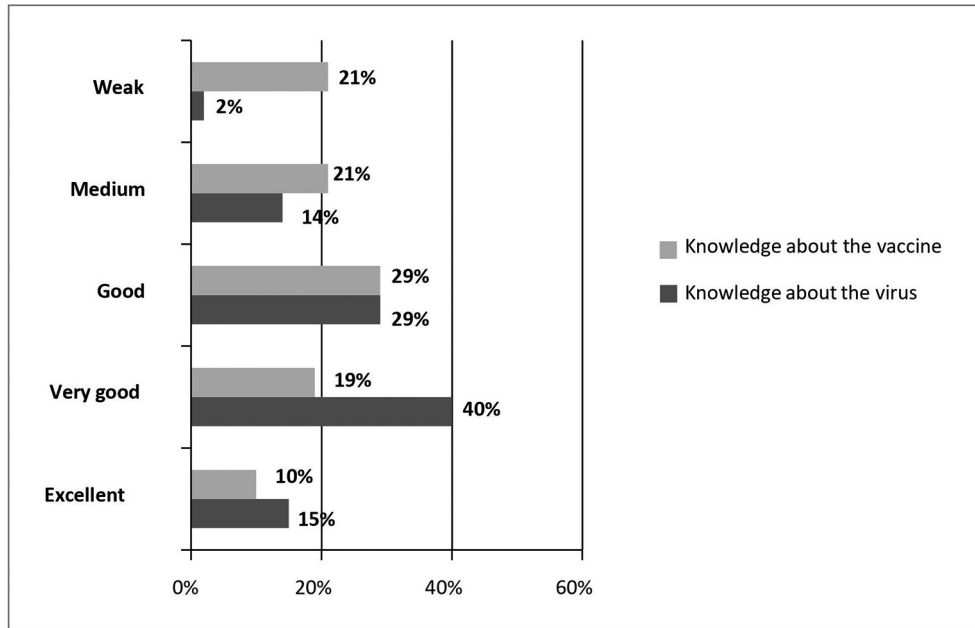


Figure 2. Subjective level of knowledge about the vaccine and virus.

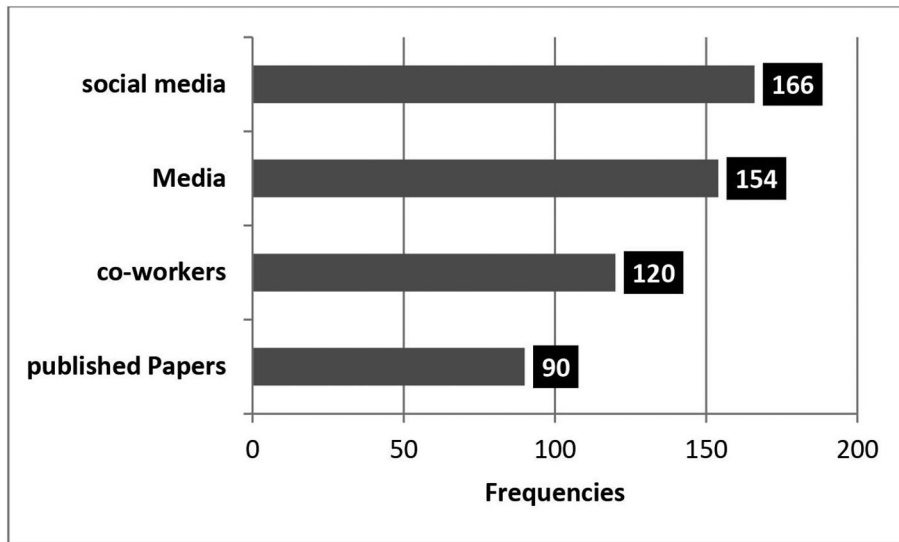


Figure 3. Sources of knowledge.

1–5 years of experience had the highest rate of refusal. On the other hand, there was no significant relation between refusal of vaccination and sex, place of work, working in isolation centers, engaging with COVID-19 patients, and whether the participant had had a suspected or confirmed case of COVID-19. A total of 51% of participants agreed that manager encouragement and advocating affected the decision of whether to have the vaccine. Binary logistic regression was performed for further analysis, and there was no significant association between the dependent variable (vaccination refusal) and the independent variables, as shown in [Table 1](#). Nurses and participants who were over 40 years old were less likely to refuse the vaccine. In contrast, men were 1.7 times more likely to refuse the vaccine than females (OR 1.7, 95% CI 0.94–3.32) and participants who were aged between 30 and 40 years, had 5–10 years of work experience, and had postgraduate qualifications were more prone to refuse the vaccination (OR 1.3, 95% CI 0.38–4.44; OR 1.5, 95% CI 0.64–3.59; OR 3.0, 95% CI 0.48–19.7, respectively).

Table 1. Association between vaccine refusal and selected characteristics, Department of Microbiology.

	B	P value	OR	CI (95%)	
				Lower	Upper
Sex					
Female (reference)					
Male	0.572	0.075	1.77	0.943	3.328
Age group					
20–30 years (reference)					
31–40 years	0.263	0.675	1.300	0.380	4.444
> 41 years	-0.113	0.844	0.894	0.291	2.742
Occupation					
Medical laboratory scientists (reference)					
Midwives	-0.397	0.130	0.673	0.403	1.124
Nurses	-0.411	0.319	0.663	0.295	1.488
Experience years					
>10 years (reference)					
<1 year	0.818	0.865	0.914	0.323	2.583
1–5 years	0.233	0.562	1.314	0.522	3.309
6–10 years	0.340	0.338	1.522	0.645	3.594
Educational level					
High school (reference)					
University	0.204	0.818	1.226	0.216	6.950
Postgraduate	0.129	0.233	3.092	0.483	19.790
Institute	0.922	0.340	2.513	0.379	16.678

Table 2 shows some of the factors that may affect vaccine acceptance and the decision to have the vaccine from the personal perspective of participants; the most agreed factor that may increase acceptance was to increase knowledge about vaccine effectiveness (88%).

The main cause for refusal was insufficient information about vaccine effectiveness, which was reported by 76 participants (Figure 4).

Table 2. Factors that affect vaccine acceptance.

	Strongly agree	Agree	Disagree	Strongly disagree
Knowing more about vaccine effectiveness will increase acceptance	152 (41%)	176 (47%)	28 (8%)	19 (5%)
Attending lectures about the vaccine will increase acceptance	128 (34%)	197 (53%)	37 (10%)	13 (4%)
Linking travel with vaccination increases the vaccination rate	175 (47%)	153 (41%)	38 (10%)	9 (2%)
Updating the curriculum with COVID-19 related information is important	177 (45%)	167 (45%)	25 (7%)	6 (2%)
Encouragement by managers will affect the decision to take the vaccine	55 (15%)	134 (36%)	149 (40%)	37 (10%)

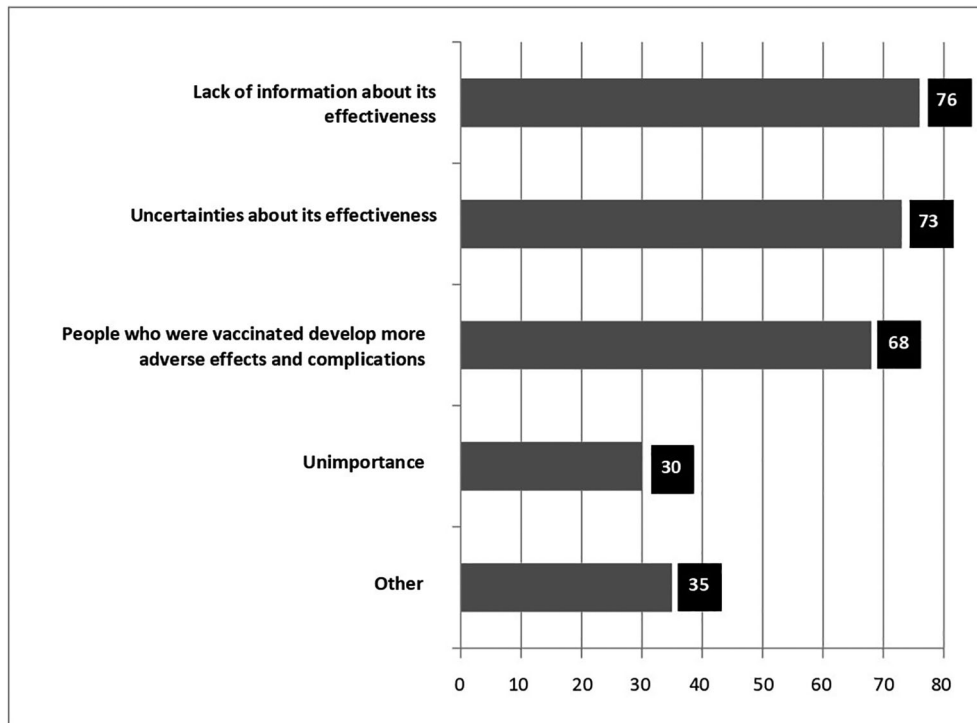


Figure 4. Factors that affect the vaccination decision.

Discussion

Infectious diseases have been a threat to public health for decades, and the main route to eradicate them is by developing vaccines. COVID-19 has become a global issue that has affected the economy, social life, and many other aspects. Healthcare workers' thoughts about the COVID-19 vaccine play a crucial role in the acceptance rate in the population because they are regarded as a trustworthy and credited provider of healthcare information to the population.

In this study, more than half of the participants (53.6%) accepted receiving the COVID-19 vaccine. This result was in line with a study carried out in Saudi Arabia by Barry *et al.*, which evaluated COVID-19 vaccine confidence among healthcare workers and discovered that two-thirds of participants expressed a desire to have a potential COVID-19 vaccine.⁶ A study in France showed a 77.6% acceptance rate,⁷ and a study carried out in western India showed that 89.4% of people were prepared to have the COVID-19 vaccine.⁸ Meanwhile, our findings were inconsistent with the studies carried out in Egypt, with a 21% acceptance rate,² in Congo with 28%,⁴ and in the USA with 36%.⁹ The study's findings showed that there was no significant association between acceptance of the COVID 19 vaccine and sex, but the willingness to receive the vaccine varied.

These results were similar to a study by Fakonti *et al.* in Cyprus, which demonstrated that females were more likely than males to accept vaccination.¹⁰

Regarding age, older participants (more than 40) were more likely to be vaccinated, consistent with the study by Kumar *et al.*¹¹ This finding could be interpreted as this age group being more responsive than the other age groups and therefore more likely to accept the vaccine.

Furthermore, participants with 5–10 years' work experience and with postgraduate qualifications were the least likely to accept vaccination.

In this study, the results showed a positive correlation of vaccine acceptance with nurses, midwives, and medical laboratory scientists, suggesting that they are more likely to be vaccinated, and their direct contact with COVID patients may lead to higher acceptance of COVID-19 vaccination. In this study, 61% of the participants said they encouraged their family members to be vaccinated, which would increase the acceptance rate. This was in line with a study by Fares *et al.*,² and a study by Shekhar *et al.*,⁹ whose study revealed that healthcare workers who are vaccinated are more likely to recommend vaccines to family, friends, and their patients.

Insufficient information about vaccine effectiveness was the main reason for vaccine refusal, agreeing with the study carried in western India,⁸ followed by uncertainty about vaccine effectiveness, and adverse effects and complications after vaccination. This finding could be used to minimize the refusal by providing more accurate and sufficient information and studies about vaccines and their possible adverse effects and complications. The most common information sources used in this study were social media followed by mass media. The refusal of vaccination was significantly associated with knowledge of the COVID-19 vaccine (P value 0.003). Approximately 110 respondents stated that they had great knowledge of COVID-19 vaccinations.

In terms of the working place, there was no significant association between vaccine refusal and whether participants worked in isolation facilities for COVID-19 or interacted with COVID-19 patients directly.

There are a number of limitations in this study. There was a sex imbalance, with 324 (86%) participants being female and only 14% being male, which could have had an impact on the outcome. In addition, the study was carried in Khartoum State only so the perception of COVID-19 vaccination may be different in other areas of the country.

Finally, only medical laboratory scientists, nurses, and midwives were included in our sample; therefore, our results cannot be generalized to other healthcare professionals.

Conclusions

There was a good perception toward COVID-19 vaccination, as 53.4% of the participants accepted having the COVID-19 vaccine, which is a good rate of acceptance. This finding has a positive impact on the whole vaccination process, as medical laboratory scientists, nurses, and midwives make up a large proportion of the healthcare workers around the country and of the general population, and they have a high impact as their recommendations affect the behavior of the general population toward vaccination. Age, occupation, educational level, and years of experience were significantly associated with vaccination acceptance. Insufficient information about vaccine effectiveness was the main reason for vaccination refusal, which can be corrected by providing more accurate and sufficient information and clinical trials on vaccines to increase the rate of acceptance.

Ethical approval

Ethical approval was received from the Committee of Medical Laboratory Science, ethical No. (DSR-IEC-04-1-2021).

Consent

Written and verbal consent was obtained from participants before starting the study for data collection and publication.

Data availability

Underlying data

Figshare: Hala Data dictionary.docx. <https://doi.org/10.6084/m9.figshare.21630002.v1>.¹²

The project contains the following underlying data:

- Hala Data dictionary.docx (data file headings)
- Hala data.xlsx (raw data)

Extended data

Perception of nurses, medical laboratory scientist and midwives toward coronavirus vaccination at Khartoum State, 2021. <https://docs.google.com/forms/d/e/1FAIpQLSdZDYvP6iDpidFWSumjfmh73-XBv0waHqnLJ8MXA510Lvprg/viewform>.¹³

The project contains the following underlying data:

- Original questionnaire

Data are available under the terms of the [Creative Commons Attribution 4.0 International license](https://creativecommons.org/licenses/by/4.0/) (CC-BY 4.0).

References

1. Richman DD, Whitley RJ, Hayden FG: *Clinical Virology*. 4th ed. Washington: ASM Press; 2016.
2. Fares S, Elmnyer MM, Mohamed SS, *et al.*: **COVID-19 vaccination perception and attitude among healthcare workers in Egypt**. *J. Prim. Care Community Health*. 2021; **12**: 21501327211013303.
3. Harapan H, Wagner AL, Yufika A, *et al.*: **Acceptance of a COVID-19 vaccine in Southeast Asia: A cross-sectional study in Indonesia**. *Front. Public Health*. 2020; **8**: 381. Published 2020 Jul 14.
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4. Kabamba Nzaji M, Kabamba Ngombe L, Ngoie Mwamba G, *et al.*: **Acceptability of vaccination against COVID-19 among healthcare workers in the Democratic Republic of the Congo**. *Pragmat. Obs. Res*. 2020; **11**: 103–109. Published 2020 Oct 29.
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5. Naz H, Cevik F, Aykin N: **Influenza vaccination in healthcare workers**. *Infect. Control Hosp. Epidemiol*. 1997; **18**(3): 189–194.
6. Barry M, *et al.*: **Covid-19 vaccine confidence and hesitancy among health care workers: A cross-sectional survey from a MERS-COV experienced nation**. *PLoS One*. 2021; **16**(11): e0244415.
[PubMed Abstract](#) | [Publisher Full Text](#) | [Free Full Text](#)
7. Detoc M, *et al.*: **Intention to participate in a COVID-19 vaccine clinical trial and to get vaccinated against COVID-19 in France during the pandemic**. *Vaccine*. 2020; **38**(45): 7002–7006.
[PubMed Abstract](#) | [Publisher Full Text](#) | [Free Full Text](#)
8. Dara S, Sharma SK, Kumar A, *et al.*: **Awareness, attitude, and acceptability of healthcare workers about COVID-19 vaccination in Western India**. *Cureus*. September 30, 2021; **13**(9).
9. Shekhar R, Sheikh AB, Upadhyay S, *et al.*: **COVID-19 Vaccine acceptance among health care workers in the United States**. *Vaccines*. 2021; **9**: 119.
[PubMed Abstract](#) | [Publisher Full Text](#) | [Free Full Text](#)
10. Fakonti G, Kyprianidou M, Toumbis G, *et al.*: **Attitudes and acceptance of COVID-19 vaccination among nurses and midwives in Cyprus: a cross-sectional survey**. *Front. Public Health*. 2021; **9**: 656138.
[PubMed Abstract](#) | [Publisher Full Text](#) | [Free Full Text](#)
11. Kumar R, Alabdulla M, Elhassan NM, *et al.*: **Qatar healthcare workers' COVID-19 vaccine hesitancy and attitudes: a national cross-sectional survey**. *Front. Public Health*. 2021; **9**: 727748.
[PubMed Abstract](#) | [Publisher Full Text](#) | [Free Full Text](#)
12. Figshare: **Hala Data dictionary.docx**.
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