

## Adherence to COVID-19 vaccine among health care providers in Merowe Hospital in rural area at North Sudan

### Abstract:

**Aim:** To assess Adherence to COVID-19 vaccine among health care providers in Merowe hospital.

**Study design:** Cross-sectional descriptive study

**Methodology:** Study was carried out among 108 participants; they were selected by purposive sampling technique. Data was collected by questionnaire. Data was entered in to SPSS version 25. Analysis was done using frequency tables and cross tabulations, significance was regarded as  $P \leq 0.05$ .

**Result:** 52.8% were not vaccinated, while 72.2% from total participants would recommend the covid-19 vaccine to their family, friends and patients and 53.7% said that they had contribution in community campaigns to encourage people to get the vaccine; 64.7% of vaccinated participants took the vaccine because they were afraid of occupational hazards; 27.8% their response about vaccine effect in prevention was negative and there was a significant association between profession and contribution in community campaign,  $P$ -value equal 0.035.

**Conclusion:** nearly half of participants (47.2%) were immunized. Getting enough and correct information about the vaccines that are available was the main aspect that could enhance vaccination uptake. The current analysis offers the authorities profound insights into the anticipated challenges, issues, and potential course of action

**Keywords:** COVID-19, vaccination, community campaigns, vaccine effect

### Introduction:

Emerging respiratory viruses known to cause illnesses ranging from the common cold to severe acute respiratory syndrome are known as coronavirus (COV) infections (SARS). A zoonotic infection called COV can spread from person to person and from animal to person through contact<sup>(1)</sup>. To date, there is no highly efficient treatment for COVID-19, making preventive measures such as mask wearing, hand washing and social distance the only option to curb the pandemic<sup>(2)</sup>. The use of personal preventive measures by common people is essential to controlling the development of this infectious disease, although vaccination may be a vital defense against COVID-19<sup>(3)</sup>. Since the occurrence of pandemics, vaccines have been shown to protect unvaccinated individuals through herd immunity, if a greater proportion of the population is immune, in addition to providing direct immunity and preventing disease among vaccinated individuals. Vaccines are a life-saving invention that have been responsible for the

Formatted: Not Superscript/ Subscript

elimination and control of many infectious diseases in many parts of the world<sup>(4)</sup>. The development of vaccinations is one of the preventions, diagnosis, and treatment strategies that COVID-19, WHO, and healthcare organizations are focusing on<sup>(5)</sup>. ~~control~~Control of corona virus disease (COVID-19) through vaccination is not merely dependent on vaccine efficacy and safety. Instead, the vaccine needs also to have health professionals and general public acceptance for successful control of the virus<sup>(6)</sup>. At the beginning of November 2020, the first result of large phase-3 COVID-19 vaccine trials were announced<sup>(7)</sup>. More than 30 vaccine candidates have been or are currently being assessed through advanced clinical trials<sup>(8)</sup>. Several countries around the world have now started to vaccinate people, and many more have started preparations to do self-vaccination is well implemented, it could quickly and efficiently reduce the burden of the pandemic<sup>(9)</sup>. However, a high level of public acceptance and coverage is needed. Therefore, understanding the perceptions of beneficiary communities before investing in immunization is essential, especially in resource-constrained countries<sup>(10)</sup>. ~~vaccines~~Vaccines for COVID-19 were developed so quickly during 2020 was a welcome source of hope in an otherwise bleak year. The approval of several vaccines at the end of last year was seen by many as a turning point in the global response to the pandemic, raising expectations that the threats to public health would soon be tackled through national inoculation strategies and that, ultimately, restrictions on everyday life could be lifted. Sudan was the first country in the Middle East and North Africa to receive the COVID-19 Vaccines Global Access (COVAX) vaccine. It was supplied by over 800,000 doses of AstraZeneca's vaccine with an immunization supply chain that consisted of the national store, 18 state stores, 183 locality stores and 2,421 service points<sup>(11)</sup>. Health care providers are the first group to be vaccinated hence they are in direct contact with patients and at high risk to get infected, adherence of health care providers to covid-19 vaccine will play major role in combating the pandemic. One of the first vaccines to be approved and used for the vaccination of healthcare providers was Comirnaty (Pfizer/BioNTech, BNT162b2), administered in two doses and highly effective in preventing symptomatic and asymptomatic SARS-CoV-2 infections and COVID-19-related hospitalizations, severe disease, and death<sup>(12)</sup>. The effectiveness of Comirnaty seems to be proved also for the Delta Variant of Concern (VOC)<sup>(13)</sup>. To date, no sufficient data have been available to define how long two doses of the vaccine are effective in protecting against infection<sup>(14)</sup>.

Formatted: Not Superscript/ Subscript

Formatted: Not Superscript/ Subscript

Formatted: Not Superscript/ Subscript

Formatted: Not Superscript/ Subscript

Formatted: Not Superscript/ Subscript

Formatted: Not Superscript/ Subscript

Formatted: Not Superscript/ Subscript

Rural health care providers are vital to ensure equity in COVID-19 testing, vaccinations and in making sure rural residents have the information about vaccine safety, especially for populations who are at an increased risk for COVID-19 infection or severe illness due to systemic health and social inequities and geographic isolation<sup>(15)</sup>.

Thus, this study was conducted to assess Adherence of COVID-19 vaccine among health care providers in rural area at North Sudan.

## Materials and methods

A descriptive cross-sectional study was conducted in Merowe hospital in rural area at Northern state in Sudan, the hospital offers medical and health services for many villages around hospital, study period extended from December 2021 to March 2022. The Study population were health care providers who worked in Merowe hospital, they included (doctors, nurses, laboratory technician, anesthesiologist, pharmacist, radiologist and other health care providers, they were selected by purposive sampling technique and their number was 108 participants, data collection period was three weeks. The study was approved by the Research and Ethics Committee of Merowe University of Technology and the consent was obtained from all participants, before participating in the study. Participation in the study was voluntary and participants were assured that there would be no victimization of anyone who did not want to participate or who decided to withdraw after giving consent.

Data collection method and tools.

The data collection tool was a pre tested, semi-structured questionnaire self-administered, which was developed by the researchers using Google form distributed through participants emails and WhatsApp. The first section of the questionnaire collected participants' basic demographic information, such as age, gender, qualifications and specialty. The second section asked the participants about their information regarding covid 19 vaccine and the sources of information, availability of covid-19 vaccine in their state, participant's vaccination status, the cause of getting vaccine, recommended others to get covid-19 vaccine, participant's contribution in community campaigns and the participant's perception toward the vaccine effectiveness and its long term effects.

Data were analyzed by Statistical Package for Social Sciences (SPSS) version 25 and the results were displayed in Frequency tables and cross tabulations. Chi square test of statistical significance was used in the analysis and the level of statistical significance was determined by P. value of  $<0.05$ .

## Results & discussion:

**Table (1) distribution of participant's demographic data:**

Demographic data		Frequency	Percent %
<b>Age</b>	20 – 30	69	63.9%
	31 – 40	34	31.5%
	41 – 50	3	2.8%
	51 – 60	2	1.9%
<b>Gender</b>	Male	27	25
	Female	81	75
<b>qualifications</b>	Diploma	20	18.5%
	B.Sc.	63	58.3%
	Master	18	16.7%
	PhD	7	6.5%
<b>specialty</b>	Medicine	19	17.6%
	Nursing	35	32.4%
	Pharmacy	5	4.6%
	Anesthesia	7	6.5%
	Radiology	6	5.6%
	Laboratory	6	5.6%
	Others (Medical physics, medical engineering, health and infection control, dietitian, and medical statistic)	30	27.8%

Table (1) showsthat (69) of total participants with percentage 63.9% were (20 -30 years old),most of participants (81) were females with percentage 75% and only (27) of them were males with 25% percentage, (35)of participants with percentage 32.4% were nurses and(63) of participants with percentage 58% were holding bachelor degree.

**Table (2) participant's responds regarding covid 19 vaccine:**

Items	Respond	Frequency	Percent
-------	---------	-----------	---------

<b>Do you have any information about covid-19 vaccine?</b>	Yes	74	68.5%
	No	34	31.5%
<b>Availability of covid-19 vaccine at participant's institution</b>	Yes	42	38.9%
	No	66	61.1%
<b>Do you receive covid-19 vaccine?</b>	Yes	51	47.2%
	No	57	52.8%
<b>For vaccinated participant do you experience any side effects?</b>	Yes	23	45.1%
	No	28	54.9%
<b>Do you recommend the covid-19 vaccine to your family member?</b>	Yes	78	72.2%
	No	30	27.8%
<b>Do you have community campaigns to encourage people to get the covid 19 vaccine?</b>	Yes	76	70.4%
	No	32	29.6%

Table (2) reveals that (70) from participants with percentage 68.5% have sufficient information about covid-19 vaccine, (66) from participants with percentage 61.1% said that the vaccine is not available in their institution where the study was conducted, (57) from participants with percentage 52.8% were not vaccinated, while 51 of them with 47.2% were vaccinated, (23) out of (51) vaccinated participants with 45.1% have experience side effects, (78) from total participants with 72.2% said that they would recommend the covid-19 vaccine to their family, friends and patients and (58) from participants with 53.7% said that they had contribution in community campaigns to encourage people to get the vaccine.

**Table (3): source of information about covid-19 vaccine:**

source of information	Frequency	Percent
<b>Social media</b>	40	37.0%
<b>Internet</b>	53	49.1%
<b>Colleagues</b>	15	13.9%

Table (3) shows that (53) of participants with percentage 49.1% get their information about covid-19 vaccine from the internet, while 40 of them with percentage 37% get their information from social media, and only 15 participants with percentage 13.9% get their information from their colleagues.

**Table (4): Causes of Getting Vaccinated:**

Statements	Frequency	Percent
------------	-----------	---------

<b>afraid of occupational hazards</b>	33	64.7%
<b>you need it to build your immunity</b>	14	27.4%
<b>your hospital advises you</b>	4	7.8%

Table (4) shows that (33) out of 51 vaccinated participants with 64.7% took the vaccine because they were afraid of occupational hazards, while (14) out of 51 vaccinated participants with 27.4% took it because they need the vaccine to build their immunity, since only 4 out of 51 vaccinated participants with 7.8% said they took the vaccine because their hospitals advised them.

**Table (5) participants perception about Covid 19 vaccine effectiveness:**

statements	strongly agree	Agree	Neutral	Disagree	strongly disagree
<b>Covid 19 vaccine is effect in prevention</b>	20 (18.5%)	26 (24.1%)	29 (26.9%)	30 (27.8%)	3 (2.8%)
<b>fear of long-term effect</b>	13 (12.0%)	37 (34.3%)	20 (18.5%)	33 (30.6%)	5 (4.6%)

Table (5) display the perception of participants about effectiveness of vaccine and fear of long-term effect of it, regarding effectiveness of vaccine 20 participants with 18.5% said they were strongly agreed with the statement, while 26 of them with 24.1% were agree, and 29 participants with 26.9% were neutral, since most 30 participants with 27.8% were disagree, and only 3 participants with 2.8% were strongly disagree. About fear of long-term effect of some covid-19 vaccine types, 13 participants with 12% said they were strongly agreed with the statement, while 37 of them with 34.3% were agree, and 20 participants with 18.5% were neutral, since most 33 participants with 30.6% were disagree, and only 5 participants with 4.6% were strongly disagree.

**Table (6) Cross Tabulation between type of profession and vaccinated status and contribution in community campaign to encourage people to take the vaccine:**

Profession	are you	Total	P value	would you	Total	P value
------------	---------	-------	---------	-----------	-------	---------

	vaccinated?				contribute any community campaign to encourage people to take the vaccine?			
	No	Yes			No	Yes		
<b>Anesthesiologist</b>	5 (71.4%)	2 (28.6%)	<b>7</b> <b>(100%)</b>	<b>0.313</b>	6 (85.7%)	1 (14.3%)	<b>7</b> <b>(100%)</b>	<b>0.035</b>
<b>Doctor</b>	8 (42.1%)	11 (57.9%)	<b>19</b> <b>(100%)</b>		9 (47.4%)	10 (52.6%)	<b>19</b> <b>(100%)</b>	
<b>Laboratories</b>	4 (57.1%)	3 (42.9%)	<b>7</b> <b>(100%)</b>		5 (71.4%)	2 (28.6%)	<b>7</b> <b>(100%)</b>	
<b>Nurses</b>	15 (42.9%)	20 (57.1%)	<b>35</b> <b>(100%)</b>		9 (25.7%)	26 (74.3%)	<b>35</b> <b>(100%)</b>	
<b>Others</b>	16 (55.2%)	13 (44.8%)	<b>29</b> <b>(100%)</b>		14 (48.3%)	15 (51.7%)	<b>29</b> <b>(100%)</b>	
<b>Pharmacist</b>	4 (80.0%)	1 (20.0%)	<b>5</b> <b>(100%)</b>		3 (60.0%)	2 (40.0%)	<b>5</b> <b>(100%)</b>	
<b>Radiologist</b>	5 (83.3%)	1 (16.7%)	<b>6</b> <b>(100%)</b>		4 (66.7%)	2 (33.3%)	<b>6</b> <b>(100%)</b>	
<b>Total</b>	<b>57</b> <b>(52.8%)</b>	<b>51</b> <b>(47.2%)</b>	<b>108</b> <b>(100%)</b>		<b>50</b> <b>(46.3%)</b>	<b>58</b> <b>(53.7%)</b>	<b>108</b> <b>(100%)</b>	

Table (7) reveals that there is an association between profession and taken vaccine the relationship was insignificant P .value equal 0.313 it was more than 0.05.

Formatted: Highlight

Health care provider's adherence and acceptance to COVID 19 vaccines play critical role in the general population's vaccination behavior through their consultation. This study represents a guide for health authorities and public health experts in Sudan to enable them to maximize adherence and acceptance of COVID-19 vaccination.

In this study, 47.2% of the participants were vaccinated against COVID-19, while 52.8% were not vaccinated. This may be due to a shortage of vaccine doses in hospital and may be due to their doubts about the effectiveness of the vaccine and their fear of long-term side effects. This result is consistent with previous study conducted on Saudi health care workers (HCWs) (n = 673), in which only about a quarter intended to have the vaccine as soon as it becomes available in their country, while another quarter would delay until the vaccine safety is confirmed<sup>(6)</sup>.

Formatted: Not Superscript/ Subscript

Similar results were shown by Egyptian HCWs (n = 496), of whom 13.5% totally agreed to receive the vaccine, and 32.4% somewhat agreed<sup>(5)</sup>. It also agreed with the study conducted in the USA with 36% acceptance and 56% hesitancy<sup>(16)</sup>.

Regarding to Socio demographic data, the present study revealed that highest percentage (57%) of the study sample were female and remaining (25%) were male. This result agreed with the finding of a study conducted in Egypt which concluded that the majority of study HCWs were female. Regarding to educational level the majority of sample (58.3%) had bachelor degree. This result agreed with study conducted in Egypt where the majority of participants (40%) were bachelor degree honor<sup>(5)</sup>.

Formatted: Not Superscript/ Subscript

Regarding to sufficient information about covid-19 vaccine (68.5%) of participants have sufficient information about covid-19 vaccine. This result was disagreed with study conducted in USA where a high percentage of HCWs did not trust information about COVID-19 and its severity (16). About recommendation of people to get the vaccine (72.2%) of participants would recommend the vaccine for their family, friends and patients. This is disagreed with the study conducted in Egypt where only (42.1%) would recommend the vaccine for their family friends and patients.

Concerning participants perception about Covid 19 vaccine effectiveness 27.8 were disagreed that the covid 19 vaccine is effect in prevention while, Centers for Disease Control and Prevention said that COVID-19 vaccines continue to protect against severe disease, hospitalization, and death in children and adolescents<sup>(17)</sup>.

Formatted: Not Superscript/ Subscript

The leading factor that could increase vaccination adherence among this study participants was to get sufficient and accurate information about the available vaccines. This ~~finding which~~ finding, which revealed the major obstacle for vaccination adherence and acceptance, actually represented the solution that could be quickly adopted and provided by the authorities to maximize vaccination adherence, acceptance and coverage.

The limitations of this study are that it did not evaluate some psychological factors that may be associated with vaccine adherence among health care providers.

#### **Conclusion & Recommendation:**

~~study~~ Study concluded that the lack of sufficient clinical trials and concern over the vaccine's side effects were the main causes of vaccine uncertainty and refusal. This study provides early insight into the adherence and acceptance of the COVID-19 vaccine among healthcare providers in Merowe Hospital; it showed that nearly half of participants (47.2%) were immunized. Getting enough and correct information about the vaccines that are available was the main aspect that could boost vaccination uptake. The current analysis offers the authorities profound insights into the anticipated challenges, issues, and potential course of action.

Designing efficient and evidence-based measures to encourage the use of the COVID19 vaccine among healthcare providers is therefore urgently required. They are at a high risk of getting sick and passing the disease to others. If the vaccination is not widely embraced and accepted, the virus will continue to spread, making it difficult to implement recovery plans. In order to allay any concerns over the vaccine, healthcare professionals need to receive greater knowledge in health-related topics.

#### **Declaration of Conflicting Interests:**

The author(s) declared the following potential conflicts of interest with respect to the research, authorship, and/or publication of this article: The authors declare absence of conflicts of interest.

#### **References:**

1. Alqudeimat, Y., Alenezi, D., AlHajri, B., Alfouzan, H., Almokhaizeem, Z., Altamimi, S., Almansouri, W., Alzalalah, S. and Ziyab, A.H., Acceptance of a COVID-19 vaccine and its related determinants among the general adult population in Kuwait. *Medical Principles and Practice*, 2021. 30(3), pp.262-271.  
<https://www.karger.com/Article/Abstract/514636>
2. Elhadi, M., Alsoufi, A., Alhadi, A., Hmeida, A., Alshareea, E., Dokali, M., Abodabos, S., Alsadiq, O., Abdelkabar, M., Ashini, A. and Shaban, A., Knowledge, attitude, and acceptance of healthcare workers and the public regarding the COVID-19 vaccine: a cross-sectional study. *BMC public health*, 2021. 21(1), pp.1-21.  
<https://link.springer.com/article/10.1186/s12889-021-10987-3>
3. Machida, M., Nakamura, I., Kojima, T., Saito, R., Nakaya, T., Hanibuchi, T., Takamiya, T., Odagiri, Y., Fukushima, N., Kikuchi, H. and Amagasa, S., Acceptance of a COVID-19 Vaccine in Japan during the COVID-19 Pandemic. *Vaccines*, 2021. 9(3), p.210.  
<https://www.mdpi.com/2076-393X/9/3/210>
4. Alle, Y.F. and Oumer, K.E., 2021. Attitude and associated factors of COVID-19 vaccine acceptance among health professionals in Debre Tabor Comprehensive Specialized Hospital, North Central Ethiopia:: cross-sectional study. *Virusdisease*, 2021, 32(2), pp.272-278.  
<https://link.springer.com/article/10.1007/s13337-021-00708-0>
5. Fares, S., Elmnyer, M.M., Mohamed, S.S. and Elsayed, R., COVID-19 vaccination perception and attitude among healthcare workers in Egypt. *Journal of primary care & community health*, 2021. 12, p.21501327211013303.  
<https://journals.sagepub.com/doi/full/10.1177/21501327211013303>

6. Noushad, M., Nassani, M.Z., Alsalhani, A.B., Koppolu, P., Niazi, F.H., Samran, A., Rastam, S., Alqerban, A., Barakat, A. and Almoallim, H.S., COVID-19 vaccine intention among healthcare workers in Saudi Arabia: a cross-sectional survey. *Vaccines*, 2021. 9(8), p.835.  
<https://www.mdpi.com/2076-393X/9/8/835>
7. Saied, S.M., Saied, E.M., Kabbash, I.A. and Abdo, S.A.E.F., Vaccine hesitancy: Beliefs and barriers associated with COVID-19 vaccination among Egyptian medical students. *Journal of medical virology*, 2021, 93(7), pp.4280-4291.  
<https://onlinelibrary.wiley.com/doi/full/10.1002/jmv.26910>
8. Biswas, N., Mustapha, T., Khubchandani, J. and Price, J.H., The nature and extent of COVID-19 vaccination hesitancy in healthcare workers. *Journal of community health*, 2021, 46(6), pp.1244-1251.  
<https://link.springer.com/article/10.1007/s10900-021-00984-3>
9. Qunaibi, E., Bashedi, I., Soudy, M. and Sultan, I., Hesitancy of Arab healthcare workers towards COVID-19 vaccination: a large-scale multinational study. *Vaccines*, 2021. 9(5), p.446.  
<https://www.mdpi.com/2076-393X/9/5/446>
10. Qattan, A.M., Alshareef, N., Alsharqi, O., Al Rahahleh, N., Chirwa, G.C. and Al-Hanawi, M.K., Acceptability of a COVID-19 vaccine among healthcare workers in the Kingdom of Saudi Arabia. *Frontiers in Medicine*, 2021. 8, p.644300.  
<https://www.frontiersin.org/articles/10.3389/fmed.2021.644300/full>
11. Evenett, S.J., Hoekman, B., Rocha, N. and Ruta, M., The Covid-19 Vaccine Production Club: Will Value Chains Temper Nationalism? 2021. (preprint).  
<https://pesquisa.bvsalud.org/global-literature-on-novel-coronavirus-2019-ncov/resource/pt/ppcovidwho-8119>
12. Sheikh, A., McMenam, J., Taylor, B. and Robertson, C., Collaborators PHSatEI. SARS-CoV-2 Delta VOC in Scotland: demographics, risk of hospital admission, and vaccine effectiveness. *Lancet*, 2021. 397(10293), pp.2461-2.
13. Porto, M., Castro, B., Diaz, Z., Pedrosa, Y., Ramos, M. and Lecuona, M., SARS-CoV-2 infection in properly vaccinated healthcare workers. *International Journal of Infectious Diseases: 2021. IJID: Official Publication of the International Society for Infectious Diseases*.  
<https://europepmc.org/article/pmc/pmc8188749>

14. Shahcheraghi, S.H., Ayatollahi, J., Aljabali, A.A., Shastri, M.D., Shukla, S.D., Chellappan, D.K., Jha, N.K., Anand, K., Katari, N.K., Mehta, M. and Satija, S., An overview of vaccine development for COVID-19. *Therapeutic delivery*, 2021. 12(3), pp.235-244.  
<https://www.future-science.com/doi/full/10.4155/tde-2020-0129>
15. Greene, M.J., 2021. HEALTH NEWS & NOTES. Policy.  
[https://www.npaihb.org/wp-content/uploads/2021/04/April-QBM/NPAIHB-HNN\\_April\\_2021.pdf](https://www.npaihb.org/wp-content/uploads/2021/04/April-QBM/NPAIHB-HNN_April_2021.pdf)
16. Shekhar, R., Sheikh, A.B., Upadhyay, S., Singh, M., Kottewar, S., Mir, H., Barrett, E. and Pal, S., COVID-19 vaccine acceptance among health care workers in the United States. *Vaccines*, 2021. 9(2), p.119  
<https://www.mdpi.com/2076-393X/9/2/119>
17. Marks, K.J., Whitaker, M., Anglin, O., Milucky, J., Patel, K., Pham, H., Chai, S.J., Kirley, P.D., Armistead, I., McLafferty, S. and Meek, J., Hospitalizations of children and adolescents with laboratory-confirmed COVID-19—COVID-NET, 14 States, July 2021–January 2022. *Morbidity and Mortality Weekly Report*, 2022. 71(7), p.271.  
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8853476/>