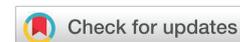


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Research Article

Healthcare workers attitude towards SARS-COVID-2 Vaccine, Ethiopia

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Abstract

Background: The COVID-19 vaccine pandemic is expected to control the pandemic. The vaccine acceptance in Africa is yet unknown. This survey was conducted to explore attitudes of healthcare workers towards COVID-19 vaccine and predictors of negative attitude.

Materials and methods: A cross sectional online survey was performed among 1110 healthcare workers to understand COVID-19 vaccine acceptability, encouragement of patients to take COVID-19 vaccine, encouragement of family members to take COVID-19 vaccine, and fears/concerns about COVID-19 vaccine. COVID-19 vaccine acceptance was compared across demographic variables and COVID-19 vaccine attitudes.

Results: The response rate was 60.2%. Out of the 668 respondents, substantial majority were physicians 49.4% and nurses 32.9%. The vaccine acceptance rate was 72.2% (482/668). Only about 64% reported that they would encourage their patients or families to get vaccinated. Those who reported they would accept the vaccination were highly likely to encourage their family members to be vaccinated (OR 58.13, 95% CI 9.7 – 348.32, P 0.001) over those who reported they would not encourage their family to be vaccinated. Majority (77%) had one or more fears/concerns about the COVID-19 vaccine. Among the fears/concerns were vaccine adverse reaction, effectiveness of the vaccine, vaccine was made too fast to be safe, and COVID-19 from the vaccine.

Conclusion: The high vaccine hesitancy rate (27.8%) among healthcare workers in Ethiopia is genuinely concerning. Healthcare workers are the main source of health-related information for their communities. Thus, we need to equip them with the most accurate and credible knowledge to increase COVID-19 acceptance in Ethiopia.

Introduction

The SARS-COVID-2 pandemic is still an alarmingly increasing. It has already claimed the lives of 1.76 million people in the world [1]. It has also detrimental effect in the world economy and societal interactions. An international poll conducted in April 2020 found that 61% of those surveyed identified COVID-19 as the most concerning national issue, overtaking unemployment, health care, and poverty [2]. Despite

mitigating measures such as 6 feet distancing, masking, and lock down efforts, the virus is still at large.

Vaccines have been long known to prevent transmission of infections. They have also contributed to eradication of diseases such as smallpox from this world. We believe therefore a vaccine against SARS-COVID-2 is a key strategy to end transmission of the SARS-COV-2, control the pandemic, and returning socio-economic lives to normalcy.

Development of vaccines take very long time, financial, and other resources. SARS-COVID-2 vaccine has been developed recently by Pfizer, Moderna, and Johnson and Johnson in USA. There are a lot of pharmaceutical companies in the world who are also in process of developing the vaccine. The Pfizer and Moderna vaccines had Emergency Use Authorization and vaccination of front-line health care workers has started in USA and UK. Now Johnson and Johnson one dose vaccine is approved and it is in the process of distribution.

However, the fact that the SARS-COVID 2 vaccine developed in short time and its unknown long-term side effect has caused some parts of the society including healthcare workers not to be confident on its effectiveness. Negative attitudes towards vaccines and an uncertainty or unwillingness to receive vaccinations are major barriers to managing the COVID-19 pandemic in the long-term. A survey conducted by Kimberly A Fisher et al during the coronavirus pandemic, April 16–20, 2020, in the US revealed that approximately 3 in 10 adults were not sure they would accept vaccination and 1 in 10 did not intend to be vaccinated against COVID-19 [3]. Elsie Paul et al also reported almost similar result in Britain. Among 32, 361 British adults, 14% of respondents reported unwillingness to receive a vaccine for COVID-19, whilst 22% were unsure [4].

The SARS-COVID-2 effect is much expected to be much more deleterious in resource limited countries like Africa. Vaccines are just beginning to become available in Africa. Even if available, dose may not be enough for the whole population and prioritizing target group such as front health workers will be the initial solution to halt the spread of the virus. But to our knowledge, no one currently knows the attitude of Africans towards the SARS-COVID 2 vaccines. There are no published studies or reports to date. Thus, we conducted this study to explore attitudes of Ethiopian healthcare workers aged 18 and above towards the COVID-19 vaccine and predictors of negative attitude.

Materials and methods

This study was conducted in Ethiopia by investigators. A structured questionnaire was prepared in English by the investigators. The questionnaire included questions on demography, workplace information, COVID-19 vaccine acceptance when available to them, whether they will encourage their patients to get COVID-19 vaccinated when it is available to them, whether they will encourage their families to get COVID-19 vaccinated when it is available to them, and whether they have fears or concerns about the COVID-19 vaccine. The questionnaire link was created using Microsoft forms.

<https://forms.office.com/Pages/ResponsePage.aspx?id=DQSIkWsWoyxEjajBLZtrQAAAAAAAAAAAAAMAAMyPI5ZUNzQxTzRESURJVFpDTkswTVhDR0o4RUpBSi4u>

The study was conducted according to the principles of the Declaration of Helsinki and Fulfilled the Ethiopian National Health Research and Ethics Guideline. The study was approved by MetroWest Medical Center IRB, reference number 2021-016, for Abrazo Arizona group. Participation was fully voluntary

based including not responding after reading the instructions and questions.

The questionnaire was distributed among adult Ethiopian healthcare workers (physicians, health officers, nurses, laboratory technicians, Pharmacists, and other healthcare workers such as pharmacy tech, phlebotomists etc....) practicing in Ethiopia aged 18 years and above. It was distributed via email, telegram, Facebook messenger, viber, and other social media. Hospital research coordinators, members of nursing association, and investigators used email and social media accounts to distribute the questionnaires. The participants were instructed to fill only one time to avoid duplications. Responses of the health workers were directly received by investigators and converted to excel for further analysis.

Sample size determination

We calculated a total sample size of 668 using a population proportion formula with assumption of 95 % level of confidence, margin of error of 3.78, and estimated response rate of 60 percent based on Federal Ministry of health unpublished report there were 73514 health workers in 2014 [5]. Seven years have elapsed since the 2014 report, a projection was made with an estimated growth rate of 3 percent. The projected current healthcare worker number was estimated to be 90413. A total of 1110 health workers were invited. The study participants were selected randomly with the goal that they would be representative of the health workers of Ethiopia. To attract higher response rate, the questionnaire was designed to be respondent friendly. It was short survey questionnaire with clear questions, non-offensive, and easy to respond. Participants were eligible if they had access to the internet via computer, tablets, or smartphone. We believe that the major reason for not responding might have been access to internet.

Statistical methods

A total of 702 responses were obtained. Data cleaned after conversion to excel. Responses (34) from other countries such as Ghana, Sierra Leone, South Sudan, Eritrea, Uganda, and Lesotho are excluded in the analysis of the study. For data analysis, Covid-19 acceptance response rate was dichotomized into 0= No and 1= yes. A scoring system was generated for fears/concern response. Those who did not have any fears or concerns were given a score of 0, those who have one concern or fear is given 1, and two concern 2, and a maximum of score 5.

Descriptive statistics were calculated for each response using Epi Infor version 7 software. Associations of demographic factors with COVID-19 vaccine acceptance, willingness to encourage family or patients, risk/concern, and risk/concern score were calculated using CDC Epi Info version 7.

Results

A total of 668 health workers completed the survey. General characteristics of the study population are shown in Table 1. A substantial majority of the health workers belonged to the age group 18–44 years (94 %) and Males (n 463; 69.3 %). Most were Physicians (n 330; 49.4 %) and Nurses (n 220 ;32.9 %).



The majority were also Hospital workers 75.6% (505). The rest were from private clinics, health centers, and other health institutions including not for profit organizations, and health administration offices. Dwellers of Addis Ababa were 213 (31.9 %), Gondar 177 (26.5%), Mekelle 146 (21.9%), and other cities of Ethiopia 132 (19.7 %).

Most of the participants 482/668 (72.2 %) reported that they would accept a COVID-19 vaccine when the vaccine is available to them. The vaccine acceptance differed by demographic characteristics with males (76 %) compared to females (63.4) (OR 1.63, 95 % CI 1.13-2.37, P 0.01), older adults aged 30-44 (73.6%) compared with their younger and older age groups, 78.8 % Physicians and 71.43% of health officers (not statistically significant OR 1.44, CI 0.65-3.12, P 0.37) compared to nurses and others. Most health center workers (79.2%) and hospital workers (72.1 %) reported they would be willing to be vaccinated when the vaccine is available to them compared to those who work in clinics (68.6%) and other institutions (65.7%). Tables 1,3.

Among healthcare workers, 71.2 percent (198/278) who gave direct care to COVID-19 patient in the last one year preceding the survey, and 73.7 percent (70/95) those who were diagnosed

Table 2: COVID-19 vaccine Acceptance across Healthcare Workers COVID status and attitude towards COVID-19 vaccine, 2021 Ethiopia

	Total(N=668)	COVID-19 vaccine
	n (%)	Acceptance n (%)
Will you take the COVID-19 vaccine when available to you?		
Yes	482(72.2)	-
No	186(27.8)	-
Have you been diagnosed with COVID-19 infection during the past one year?		
Yes	95(14.2)	70(73.7)
No	573(85.8)	412(71.9)
Have you provided direct patient care to a COVID-19 patient?		
Yes	278(41.6)	
No	390(58.4)	284(72.8)
I will encourage my family members to take COVID-19 vaccine?		
No	68(10.2)	4(5.9)
Unsure	115(17.2)	48(41.7)
Yes	485(72.6)	430(88.7)
I will encourage my patients to take COVID-19 vaccine?		
No	54(8.0)	5(9.3)
Unsure	130(19.5)	49(37.7)
Yes	484(72.5)	428(88.4)

Table 1: COVID-19 vaccine Acceptance across Healthcare Workers Demographic characteristics, 2021 Ethiopia.

	Total(N=668) n (%)	COVID-19 vaccine acceptance n(%)
Age		
18-29 years	389 (58.2)	278(71.5)
30-44 years	239 (35.8)	176(73.6)
45-59 years	35(5.2)	24(68.6)
60 or more	5 (0.8)	4(80.0)
Gender		
Female	205 (30.7)	130(63.4)
Male	463 (69.3)	352(76.0)
Job title		
Health officer/ Clinical officer	35 (5.2)	25(71.4)
Lab technician	34 (5.1)	22(64.7)
Nurse	220 (32.9)	146(66.4)
Other	18 (2.7)	8(44.4)
Pharmacist	31(4.6)	21(67.7)
Physicians	330(49.4)	260(78.8)
Work Institution		
Private Clinic	35(5.2)	24(68.6)
health center	24(3.6)	19(79.2)
Hospital	505 (75.6)	368(72.1)
Other	104(15.6)	71(65.7)
Residence		
Addis Ababa	213(31.9)	149(70.0)
Gondar	177(26.5)	120(67.8)
Mekelle	146(21.9)	108(74.0)
Werabe	37(5.5)	30(81.1)
Other cities	95(14.2)	75(79.0)

with COVID-19 before the survey reported that they would get the vaccine when available to them. However, no statistical significance was demonstrated when compared to those who did not give care to COVID-19 patients (OR 0.797, 95 % CI 0.5 - 1.27, P 0.3401) and those who were diagnosed with COVID-19 (OR 1.27, 95 % CI 0.65-2.49, P 0.48). Table 2,4.

When asked whether they would encourage their patients and their families to get vaccinated, 64.1 (428/668) and 64.4 (430/668) of the study participants reported that they would encourage their patients and families, respectively. Out of all participants, 17.2 % (115/668) were unsure that they would encourage their family and 19.46 % (130/668) were unsure whether to encourage their patients to be vaccinated or not when the vaccine is available. Among those who were unsure to encourage their family members, 34.3 % (12/35) were health officers, 22.2 % (4/18) others, 17.3 % (38/220) were nurses and 16.1 % (53/330) physicians. Those who reported they would accept the vaccination were highly likely to encourage their family members to be vaccinated (OR 58.13, 95 % CI 9.7 - 348.32, P 0.00001) over those who reported they would not encourage their family to be vaccinated. Those who were not sure also had statistically significant response (OR 12.42, 95 % CI 2.24-68.95, P 0.004) over those who reported that they would not encourage their families.

Majority of the participant (77 %) had one or more fears or concerns about the COVID-19 vaccine. We classified their fears or concerns on score of 0-5 where 0 represents no fear, 1 for one concern for example the vaccine is not effective, 2 for two concerns or fears for example the vaccine is not effective and the vaccine will cause an adverse effect/side effect, 3 for three different fears or concerns etc. and the maximum score recorded was 5 which represents five different concerns or fears



about the vaccine. Based on the scoring, 314 (47.01 %) surveyed healthcare workers had one concern, about 40 percent had 2 or more concerns, and 0.6 percent (4/668) had five concerns (Tables 5,6).

Higher fear/concern score was noticed among those who said they would be vaccinated but not sure whether they would encourage their patients (1.5), health officers who were not sure to encourage their family to take COVID-19 vaccine (average score of 2), and health officers who were unsure to encourage their patients to take COVID-19 vaccine (1.8).

Among the fears or concerns most mentioned were I will have an adverse reaction/side effect to the vaccine 193/514 (37.6 %), The vaccine will not be effective 161 (31.3 %), The vaccine was made too fast to be safe 156 (30.4 %), I will get COVID-19 infection from the vaccine 91 (17.7%), and I was infected by COVID-19 vaccine and I do not want the vaccine 22 (4.3 %). Religion was mentioned by 8 respondents and some 5 (1.0 %) also mentioned concerns about microchips being inserted to the body with the vaccine injection. Tables 5,6.

Despite no fears or concerns, 16.7 % of those who had no fear would not accept the vaccine. In contrast, 74.5 % of the

participants would accept the vaccine despite one or more concerns or fears on the vaccine but the likelihood of being vaccinated is high among those who do not have fears (OR 2.76, 95% CI 1.84-4.13, P < 0.0001) than those who have fears.

Discussion

Vaccine acceptability of 72.2 percent is comparable with studies done in US and other countries in the world [6,7]. But the fact that this survey was done among healthcare workers who are expected to have low vaccine hesitancy rate is genuinely concerning. Of course, Ethiopian population is mainly young which is also reflected among health workers in our study (94 percent age group 18-44 years). This might have affected the vaccine acceptability rate since young population of a community may think that they will not have severe disease even if they acquire COVID-19 infection as they are expected to have few comorbid diseases. We did not ask in our survey the participants' medical history which is one of the limitations of our study. But according to Lianna matt McLemon who wrote on Dec 17, 2020 CIDRAP newsletter "Data reveal deadliness of COVID-19, even in young adults" stated that 38% of all excess deaths occurred in adults aged 25 to 44 years March through July 2020 were COVID-19 related [8].

Table 3: Logistic regression for COVID-19 vaccine acceptance by Healthcare Workers Demographic characteristics, 2021 Ethiopia.

Term	Odds Ratio	95%	C.I.	Coefficient	S.E.	Z-Statistic	P-Value
Age (30-44 years/18-29 years)	1.42	0.94	2.17	0.35	0.21	1.65	0.10
Age (45-59 years/18-29 years)	0.94	0.41	2.12	-0.07	0.42	-0.16	0.87
Age (60 or more/18-29 years)	1.97	0.20	19.44	0.68	1.17	0.58	0.56
Sex (Male/Female)	1.69	1.14	2.50	0.52	0.20	2.62	0.01
Occupation (Lab tech/HO)	0.70	0.24	2.03	-0.36	0.54	-0.66	0.51
Occupation (Nurse/HO)	0.90	0.39	2.09	-0.11	0.43	-0.25	0.80
Occupation (Other/HO)	0.36	0.11	1.24	-1.02	0.63	-1.62	0.11
Occupation (pharmacist/HO)	0.93	0.30	2.83	-0.08	0.57	-0.13	0.90
Occupation (Physician/HO)	1.66	0.70	3.94	0.51	0.44	1.12	0.25
where do you work?2 (health center/clinic)	1.58	0.44	5.68	0.46	0.66	0.69	0.49
where do you work?2 (hospital/clinic)	0.98	0.42	2.27	-0.02	0.43	-0.06	0.96
where do you work?2 (other/clinic)	1.00	0.41	2.43	-0.01	0.46	-0.01	1.00
Which city do you live? (Gondar/Addis ababa)	0.74	0.46	1.20	-0.30	0.25	-1.23	0.22
Which city do you live? (Mekelle/Addis ababa)	1.32	0.78	2.22	0.27	0.27	1.03	0.30
Which city do you live? (other city Ethiopia/Addis ababa)	1.30	0.741	2.37	0.26	0.31	0.84	0.40
Which city do you live? (Werabe/Addis ababa)	1.54	0.62	3.85	0.43	0.47	0.93	0.35
CONSTANT	*	*	*	0.31	0.55	0.57	0.57

Table 4: Logistic regression for COVID-19 vaccine Acceptance by Healthcare Workers COVID status and attitude towards COVID-19 vaccine, 2021 Ethiopia.

Term	Odds Ratio	95%	C.I.	Coefficient	S.E.	Z-Statistic	P-Value
Have you been diagnosed with COVID-19 infection during the past (Yes/No)	1.27	0.65	2.49	0.24	0.34	0.70	0.48
Have you provided direct patient care to a COVID-19 patient? (Yes/No)	0.80	0.50	1.27	-0.23	0.24	-0.95	0.34
I will encourage my family members to take COVID-19 vaccine? (Unsure/No)	12.42	2.24	68.95	2.52	0.87	2.88	0.01
I will encourage my family members to take COVID-19 vaccine? (Yes/No)	58.13	9.70	348.33	4.06	0.91	4.45	0.0000
I will encourage my patients to take COVID-19 vaccine? (Unsure/No)	0.78	0.13	4.59	-0.25	0.91	-0.28	0.78
I will encourage my patients to take COVID-19 vaccine? (Yes/No)	2.22	0.35	13.94	0.80	0.94	0.85	0.40
CONSTANT	*	*	*	-2.68	0.57	-4.67	0.00

**Table 5:** Fears or concerns of 668 Healthcare Workers, 2021 Ethiopia.

Concern or fears of Healthcare Workers	Total(N=668) n (%)	Total (N=514) n (%)
I will get COVID infection from the vaccine	91 (13.6)	17.7
The vaccine was made too fast to be safe	156 (23.4)	30.4
I will have an adverse reaction to the vaccine	193 (28.9)	37.6
The vaccine can cause infertility	16 (2.4)	3.1
The vaccine will not be effective	161(24.1)	31.3
I was infected by COVID-19 infection so do not want the vaccine	22(3.3)	4.3
I do not want to be vaccinated due to my religion	8(1.2)	1.6
I do not trust the vaccine	2 (0.3)	0.4
The vaccine contains microchips	5(0.8)	1.0
Long term effects of the vaccine are not known	2(0.3)	0.4
I do not have any concern	154(23.1)	-

Table 6: COVID-19 vaccine acceptability across Healthcare Workers Fear/concern score, 2021 Ethiopia.

Fear/concern score	Total (N=668) n (%)	COVID-19 vaccine acceptance n (%) *
0	154 (23.1)	123 (25.5)
1	314(47.0)	214(44.4)
2	114(17.0)	84(17.4)
3	66(9.9)	50(10.4)
4	16(2.4)	7(1.5)
5	4(0.6)	4(0.8)

*Total number of health care workers who would accept COVID-19 vaccine 482 (72.2%)

Level of education may have an impact on vaccine acceptability in Ethiopia as reported in other studies [7]. Though it is not statistically significant, physicians and health officers reported a higher vaccine acceptability than nurses and other healthcare workers. But this needs larger study to confirm whether level of education has an impact in vaccine acceptability in Ethiopia. Being a hospital worker and health center had a higher vaccine acceptance rate which is expected since hospital workers (72.1%) and health center workers might have seen patients with COVID-19 infection who had suffered from COVID-19 (severe disease) or died which is also supported by high acceptance rate among healthcare workers who had given direct care to COVID-19 patients in the last one year preceding the survey although the gross acceptance rate is about 71.2 percent which is similar to the general response rate of 72.2 percent. Thus, our study demonstrated that working in hospital or taking care of COVID-19 patients did not have any significant impact on acceptability of the vaccine among health workers.

Surprisingly, healthcare workers were reluctant to encourage their patients and families to get vaccinated (64.1 and 64.4% respectively) though we saw a better positive response rate in those who were willing to get vaccinated. This might be due to vaccine trust. Thus, we investigated if healthcare workers have fears or concerns about the vaccine. Majority of the participants had one or more fears (77%) and

about 40 percent had 2 or more fears or concerns. Those who have fewer fears, or no fears had significant (OR of 2.76, P value < 0.0001) vaccine acceptance rate. Thus we believe that the vaccine hesitancy of about 30 percent and low patient or family encouragement are due to COVID-19 vaccine fear or concerns despite having good COVID-19 knowledge rate among health workers reported by Asemahagn in study done in Amhara region [9] though the study was conducted before availability of the vaccine.

The most reported fears or concerns includes adverse reaction/side effect of the vaccine, vaccine effectiveness, vaccine was made too fast to be safe and I will get COVID-19 infection from the vaccine. These might be genuine concerns since the vaccines were made fast in relation to vaccines made in the past. But health workers should be aware that we are now in different era. Technology and communication have tremendously improved which enabled the vaccine to be made fast. The vaccine is effective also 94-95 percent at least to our knowledge currently. Health workers need information or continuous healthcare education on COVID-19 and COVID-19 vaccine to increase the vaccine acceptance rate in Ethiopia.

The result is alarming since this high vaccine hesitancy in health workers due to misinformation and distrust may have large impact on the community and may be difficult to halt the spread of the disease in Ethiopia. We will have some knowledge about the COVID-19 vaccine acceptance by the public when our survey on Ethiopian public COVID-19 vaccine acceptance rate is complete, which is currently in progress.

This study would have been more informative if it the questionnaire was formatted with more open-ended questions or if it was a qualitative survey.

Conclusion

Healthcare workers are the main source of health-related information to their communities. Patients trust their physician's recommendations. In countries like Ethiopia where mitigating measures such as social distancing is difficult due to high family size, living situations, economic status etc.... vaccination has a major role in controlling the spread of the disease. Thus, we need to have a better acceptance rate of COVID-19 vaccine among healthcare workers in Ethiopia. We strongly recommend equipping healthcare workers with the most accurate and credible knowledge on the pandemic, to have serious discussions on COVID-19 vaccine, and other measures to be taken by concerned institutions, health associations and public health officials to combat misinformation on COVID-19 vaccine.

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