



COVID-19 Vaccine Uptake and its Determinants among Health Care Workers in Somali Region of Ethiopia

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Authors' contributions

This work was carried out in collaboration among all authors. Author OO conceived the manuscript documentation, drafted and finalized the manuscript. Authors AMF and MAA developed the study proposal, coordinated the field work, data collection and analysis. All the authors read, reviewed, and approved the final draft of the manuscript.

Article Information

DOI: 10.9734/AJRID/2022/v9i330268

Open Peer Review History:

This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: <https://www.sdiarticle5.com/review-history/84745>

Original Research Article

Received 17 February 2022
Accepted 22 March 2022
Published 25 March 2022

ABSTRACT

Aims: Healthcare workers are known to be at higher risk of COVID-19 infection and have a role in transmitting the infection to others in the work environment and communities. Public health measures and vaccination are the major strategies being implemented to prevent and control the infection. The study assessed COVID -19 vaccine uptake and its determinants among health care workers in Somali region of Ethiopia.

Study Design: This was a cross-sectional analytical study.

Place and Duration of Study: Somali Region in October 2021.

Methodology: A structured self-administered questionnaire adapted from the WHO Strategic Advisory Group of Experts on Immunization vaccine hesitancy survey question was used and

administered to 427 healthcare workers in eight selected sites. Bivariate analysis and multiple logistic regression were used to assess association between vaccine uptake and some selected determinants. The level of significance was set at a p-value<5%.

Results: About 71% of the health workers have been vaccinated at least once and vaccination was significantly higher among those with perceived risk of being infected ($\chi^2 = 12.19$, $p < 0.05$), perceived benefit of the vaccine ($\chi^2 = 47.30$, $p < 0.05$) and perceived protection of the vaccine for their communities ($\chi^2 = 22.13$, $p < 0.05$). About 45% of the respondents believed the vaccine was very safe and vaccination was significantly higher among those who believed the safety of the vaccine ($\chi^2 = 23.06$, $p < 0.05$). Vaccine uptake was higher among medical doctors than other health professionals, (AOR = 2.32, 95% CI: 1.09–5.48), $p < 0.05$. The study showed significant relationship between inclination towards vaccination and actual vaccination where about 78% of those who had desired to be vaccinated actually got vaccinated. Other factors associated with vaccination uptake were colleagues getting vaccinated and support by community and religious leaders to vaccination.

Conclusion: The study identified key determinants to vaccine uptake among the health workers which included perceived risk of being infected, perceived benefit, safety of the vaccines and perceived protection of the vaccine for their communities. These require targeted Social and behavioural change communication strategies to address.

Keywords: COVID 19; Vaccine; health workers; uptake; determinants.

1. INTRODUCTION

The coronavirus disease 2019 (COVID-19) have resulted in loss of lives and significant social and economic impacts since the first case was detected in China in 2019, and its subsequent declaration as a pandemic on 11th March 2020 [1]. Ethiopia recorded its first confirmed case of COVID 19 on 13th March 2020 and Somali region reported its first case on 30th April 2020. Public health measures and vaccination are the major strategies being implemented to prevent and control the infection.

Vaccines have been one of the most successful public health interventions in the prevention and control of diseases, however vaccine hesitancy has been identified as a global problem. WHO in 2019 listed vaccine hesitancy among the top threat to health [2]. The World Health Organization defines vaccine hesitancy as a “delay in acceptance or refusal of safe vaccines despite availability of vaccine services [3]. Healthcare workers are at least three times higher risk of COVID-19 infection with the risk of transmitting to others in the work environment and communities [4,5]. As part of the preventive measure, COVID 19 vaccination was rolled out in the Somali region of Ethiopia on 23rd March 2021 and health care workers were prioritized in line with global prioritization recommendation [6]. However, this prioritization has been reported not to be associated with optimal uptake among the health workers [7]. Vaccine hesitancy among healthcare workers is an area of concern because of their roles as trusted sources of health information to the community and their

high risk of exposure to infections acquired in a healthcare setting and potential spread to the community.

In view of the possible impact of vaccine hesitancy among health workers on the control of the pandemic, this study aimed at assessing COVID-19 vaccine uptake and its determinants among health care workers in Somali region of Ethiopia.

2. MATERIALS AND METHODS

2.1 Design

This was a cross-sectional analytical study conducted in October 2021

2.2 Study Population and Setting

The study was conducted among 427 healthcare workers who completed the questionnaires in eight selected sites of Somali region of Ethiopia which were Jigjiga, Wajale, Shinile, Degahbour, Kebridahar, Gode and Dolo-ado woredas. A sample size of 440 was used, determined by using the single population proportion formula taking the proportion of uptake of the COVID-19 vaccine at 22.5% [8] at 95% confidence interval (CI) and 5% marginal error [9].

Purposive method was used to select four hospitals and four health centers among the health facilities where COVID 19 vaccination has been successfully rolled out and have very high number of health workers. The four hospitals,

namely Karamara, Degahbour, Kabridahar and Gode Hospitals, and predetermined sample size was allocated to each hospital. The total number of health care professionals in the four hospitals was 1260. The 4 health centers are Kebribayah, Togwajaale, Shinile and Dolo-ado. The total number of health care professionals in the four selected health centers was 191. To obtain representative samples from the selected hospitals and health centers, proportional allocation was performed. A simple random sampling method was used to select participants from the health facilities using the staff registers and individuals who volunteered and consented to participate were recruited into the study.

2.3 Data Collection and Statistical Analysis

A structured self-administered questionnaire adapted from the WHO SAGE (Strategic Advisory Group of Experts on Immunisation) vaccine hesitancy survey sample question was used to collect the data [10]. The survey consisted of questions that assessed socio-demographic characteristics, vaccination history and determinant specific questions.

Data were coded and entered into Epi Info software (version 3.5.1; CDC) and exported into Stata software (version 14.1; StataCorp LP) for analysis. Descriptive statistics were used to

describe the sociodemographic characteristics of health workers and Pearson’s chi-square was used to analyse the association between vaccination and the determinants. The association between vaccine uptake as the outcome variable and the socio-demographic factors as the predictor variables was done using multiple logistic regression and presented as adjusted odds ratios (AORs). The level of significance was set at a p-value <5% with a 95% confidence interval. Table 1 shows the generic description of the determinants of COVID 19 vaccination.

3. RESULTS AND DISCUSSION

3.1 Socio-demographic Characteristics

Table 2 shows the socio-demographic profile of the 427 health workers who completed the questionnaire, the response rate was 97% with 285(66.7%) male and 208(48.7%) of them were married. The mean participants’ age was 29.05+8.03 and 382(89.5%) were urban residents with 369(86.4%) being muslims. Most of the participants were nurses, 273(63.9%) and only 22(5.1%) has pre-existing co-morbidity with Diabetes mellitus being the commonest chronic disease,17(77.3%). Social media was the main source of information on COVID 19 with 264(61.8%) of the respondents.

Table 1. The Generic description of the determinants of COVID-19 vaccination

| Determinants | Generic description | Contextualization for the study. |
|-------------------------------|---|---|
| Perceived self-access | An individual’s belief that he/she can do a particular behavior given his/her current knowledge, resources and skills. | We asked the respondents what might make it easier and what might make it difficult for them to get a COVID-19 vaccine. |
| Perceived social Norms | The perception that other people are important to an individual and think that he/she should do the behavior (injunctive norms), and plan to do the behavior (descriptive norms). | We asked respondents: <ul style="list-style-type: none"> • if their close family and friends would want them to get COVID-19 vaccine. • if their community and religious leaders would want them to get COVID-19 vaccine. • who would approve of them getting COVID-19 vaccine. • who would disapprove of COVID-19 vaccination. |
| Perceived safety | A person’s perception on how safe the vaccine is . | We asked respondents how much safe the COVID -19 vaccine |
| Perceived susceptibility/risk | A person’s perception of how vulnerable or at risk they feel vis-à-vis the problem or disease. | Respondents were asked what proportion of people in their community have had COVID-19, how likely they thought it was that someone in their household would contract COVID-19, and how concerned they were about getting COVID-19. |

Table 2. Socio-demographics characteristics of the respondents

| Variables | Healthcare workers, N (%) N=427 |
|--|--|
| Mean age(years)±SD | 29.05±8.03 |
| Sex | |
| Male | 285(66.7) |
| Female | 142(33.3) |
| Residence | |
| Urban | 382(89.5) |
| Rural | 45(10.5) |
| Ethnicity | |
| Somali | 349(81.7) |
| Oromo | 12(2.8) |
| Gurage | 7(1.6) |
| Amhara | 43(10.1) |
| Others | 16(3.8) |
| Marital status | |
| Married | 208(48.7) |
| Single | 208(48.7) |
| Religion | |
| Muslim | 369(86.4) |
| Christian | 58(13.6) |
| Profession | |
| Doctors | 58(13.6) |
| Nurses | 273(63.9) |
| Other Health workers | 44(10.3) |
| Support staffs(non-clinical) | 52(12.2) |
| Co-morbidity status | |
| Yes | 22(5.1) |
| No | 405(94.9) |
| Type of comorbidities | |
| DM | 17(77.3) |
| Hypertension | 4(18.2) |
| Heart disease | 1(4.5) |
| Primary source of information for Covid-19 | |
| TV | 151(35.4) |
| Radio | 12(2.8) |
| Social media | 264(61.8) |

3.2 Perceived Access to Vaccination and Risk of Getting Infection

Table 3 shows the respondents perceived access to COVID 19 vaccination and risks to COVID 19 infection. Regarding access to the vaccination services, all the respondents reported easy access to vaccination. In terms of perceived risk to getting the infection, 380 (89%) of the respondent reported any level of perceived risk. The levels of perceived risk are a little, moderate and very concerned. Similarly, for patients’ concern, the perceived risk was 383(89.7%) among the respondents.

3.3 Barriers and Opportunities (Perceived Social Norms)

Fig. 1 shows some opportunities and barriers associated with COVID19 vaccination among the

respondents. Opportunities (perceived social norms) such as safety when visiting friends and families (66%), colleagues getting vaccinated (72%) and support by community and religious leaders (78%) and trust towards government policy and handling of the pandemic (68%) to vaccination are some of the factors identified to improve vaccination.

Association between perceived risks, benefits, safety and inclination towards vaccination and being vaccinated:

Table 4 shows the bivariate analysis of the association between perceived risks and benefits and vaccination among respondents using Pearson chi-squared test. A total of 303(71%) of the respondents have received at least one dose of AstraZeneca vaccine which was the only vaccine available at the time of conducting the study. It shows that vaccination of health workers was

significantly higher among those with perceived risk of being infected ($\chi^2 = 12.19$, $p < 0.05$). Likewise, vaccination of health workers was significantly higher among those who perceived COVID-19 vaccine as very important ($\chi^2 = 47.30$, $p < 0.05$). Similarly, vaccination among health workers was significantly higher among those who believed being vaccinated will protect the community they served ($\chi^2 = 22.13$, $p < 0.05$). In terms of vaccine safety, 45.4% of the respondents believed the vaccine is safe and the vaccination was significantly higher among those who believed the safety of the vaccine ($\chi^2 = 23.05$, $p < 0.05$). A total of 337 (78.9%) of the 427 health workers said they were willing to be vaccinated, however only 272 (80.7%) of them actually got vaccinated. The analysis found that

vaccination was significantly higher among those who had desired to be vaccinated, ($\chi^2 = 67.776$, $p < 0.05$).

3.4 Socio Demographic Factors Associated with the COVID-19 Vaccination

Table 5 shows multivariate logistic regression analysis of sociodemographic factors and vaccination. The study found higher vaccine uptake among medical doctors than other health professionals (AOR = 2.32, 95% CI: 1.09–5.48), $p < 0.05$, but no association between the participants' age, gender, co-morbidity and vaccine uptake.

Table 3. Perceived access to COVID vaccination and Perceived Risk to COVID infection among respondents

| Perceived access to COVID vaccination | Healthcare workers, N (%) |
|---|---------------------------|
| How easy to get vaccination services | |
| Very easy | 427(100) |
| Perceived Risk to COVID infection | |
| How concerned are you about getting COVID -19? | |
| Not at all concerned | 47(11.0) |
| A little concerned | 64(15.0) |
| Moderately concerned | 106(24.8) |
| Very concerned | 210(49.2) |
| How concerned are you about your patients getting COVID -19 from you? | |
| Not at all concerned | 44(10.3) |
| A little concerned | 67(15.7) |
| Moderately concerned | 110(25.8) |
| Very concerned | 206(48.2) |

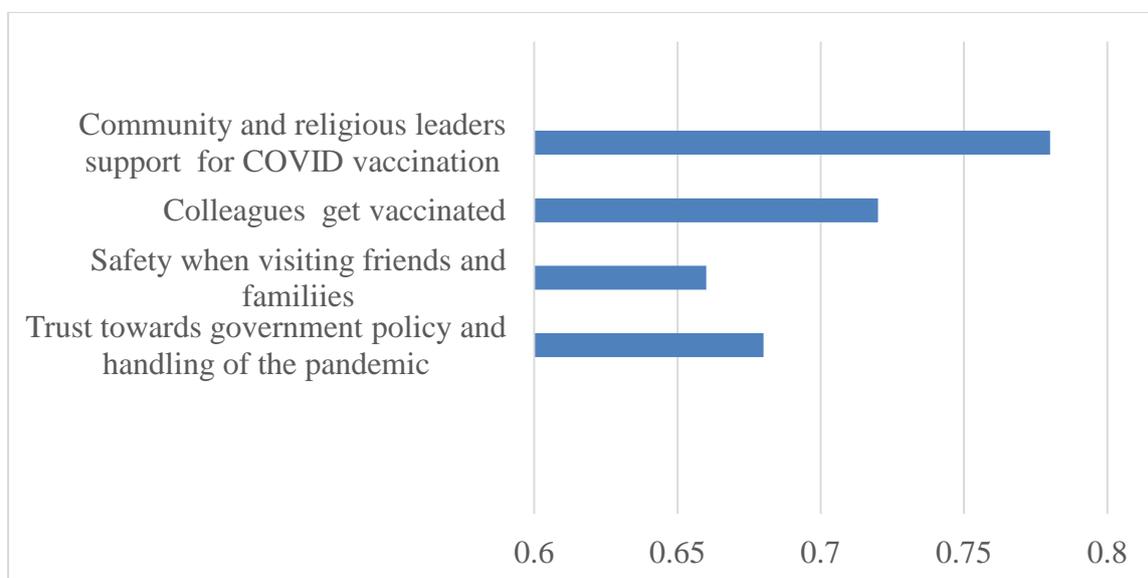


Fig. 1. Opportunities and Barriers to COVID19 vaccination among respondents

Table 4. Association between perceived risks, benefits, safety, inclination toward vaccination and actual Vaccination

| Variable | Vaccination status | | chi-square (χ^2) statistic (P-value) |
|---|--------------------|-----------|---|
| | Yes (n, %) | No (n, %) | |
| | 303(71) | 124(29) | |
| How concerned are you about getting Covid-19 | | | |
| Not all concerned | 27(61.4) | 17(38.6) | 12.19(0.0067) |
| A little concerned | 36(56.3) | 28(43.7) | |
| Moderately concerned | 70(66) | 36(34) | |
| Very concerned | 170(79.8) | 43(20.2) | |
| How important do you think getting a COVID19 vaccine will be for your health? | | | |
| Not at all important | 16(47.3) | 10(52.7) | 47.30(0.0001) |
| A little important | 19(36) | 34(64) | |
| Moderately important | 68(66) | 35(34) | |
| Very important | 207(83.1) | 42(16.9) | |
| How much do you think getting a COVID-19 vaccine for yourself will protect other people in your community from Covid-19? | | | |
| Not at all important | 16(50) | 16(50) | 22.13(0.0001) |
| A little important | 18(47.3) | 20(52.7) | |
| Moderately important | 85(64) | 48(36) | |
| Very important | 184(82.1) | 40(17.9) | |
| How safe do you think a COVID-19 vaccine will be for you? | | | |
| Not at all safe | 18(51.4) | 17(48.6) | 23.05(0.00039) |
| A little safe | 24(47) | 27(53) | |
| Moderately safe | 108(73.5) | 39(26.5) | |
| Very safe | 153(78.9) | 41(21.1) | |
| Inclination towards COVID-19 vaccination | | | |
| If a COVID19 vaccine were recommended and available for you, would you get it? | | | |
| Yes | 272(80.7) | 65(19.3) | 67.78(0.0001) |
| No | 17(28.8) | 42(71.2) | |
| Not sure | 14(45.2) | 17(54.8) | |

3.5 Discussion

The study identified the vaccine uptake and the associated determinants among health workers in the selected study sites.

The study found that 71% of the health workers have been vaccinated at least once which is higher than the finding in a study conducted earlier in Ethiopia which showed vaccine uptake of 62.1% among health professional [11]. This is however lower than 90% reported

in a survey among health workers in hospitals in South Africa [12]. Similarly, a study in USA reported that 70% of the hospital based health workers had received full dose of the COVID19 vaccine [13] while studies in China and United Arab Emirates reported coverage of 76.9% and 89.2% among healthcare workers respectively among health workers [14,15]. A report from WHO found that only 27% of health workers in Africa have been fully vaccinated against COVID-19 compared to 80% in high income countries [16].

Table 5. Socio-demographic profile and association with the COVID-19 vaccination

| Variables | Vaccinated Health workers n= 303 AOR 95% CI | P value |
|-------------------------------|--|---------|
| Age | | |
| <40 | 0.69(0.31-1.53) | 0.36 |
| ≥40 | Ref | |
| Sex | | |
| Male | Ref | |
| Female | 0.72(0.45-1.13) | 0.15 |
| Residence | | |
| Urban | 1.01(0.50-2.01) | 0.99 |
| Rural | Ref | |
| Education/profession | | |
| Doctor | 2.32(1.09–5.48) | 0.045 |
| Nurse | 1.67(0.89-3.15) | 0.11 |
| Other Health workers | 1.03(0.44-2.39) | 0.95 |
| Support staffs (non-clinical) | Ref | |
| Marital status | | |
| Married | Ref | |
| Single | 0.86(0.56-1.34) | 0.56 |
| Religion | | |
| Muslim | Ref | |
| Christian | 0.88(0.47-1.65) | 0.70 |
| Comorbidities | | |
| Yes | Ref | |
| No | 2.10(0.85-5.21) | 0.11 |

In the study, vaccination was significantly higher among health workers with perceived risk of being infected, this is similar to the findings in studies in Egypt, Ethiopia, Vietnam and Italy and a scoping review which reported that the willingness to take the COVID-19 vaccine was significantly positively correlated with the health workers perception of the severity of COVID-19 infection and risk of getting infected [8,17-20]. A study in Saudi Arabia found that health workers who perceived themselves as being at a lower risk are not highly concerned about getting COVID infection and were not fully engaged in preventive measures for COVID-19, including vaccination [21].

Vaccine uptake was significantly higher among those who perceived COVID -19 vaccine was beneficial for their protection and the communities they served. Similarly, other studies found that collective responsibility emerged as an important determinant, with participants wanting to be vaccinated in order to protect people with weaker immune systems and also because they regarded vaccination as a collective effort to control COVID-19 infection [22,23].

Vaccination was significantly higher among those who believed the safety of the vaccine.

This is similar to finding in studies in South Africa, Ethiopia, Egypt, and Democratic Republic of the Congo which reported that concerns regarding safety and effectiveness are important predictors of vaccine hesitancy among the health workers [18,23-25].

Other factors associated with COVID-19 vaccination uptake in the study were colleagues getting vaccinated and support by community and religious leaders for vaccination. This is similar to finding from a previous study in Ethiopia which reported that health workers would delay accepting the vaccine and would prefer to wait and observe the effects of the vaccine on other people due to concerns of long-term side effects [26]. Similarly, the findings in some studies reported that advise from peers and belief that vaccines are compatible with religion are factors that determined the likelihood of accepting vaccination [26,27].

In the study about 80.7% of those who had desired to be vaccinated actually got vaccinated, which is similar to a study in USA where about 70% of parents who were willing to vaccinate their children actually did but lower than a study in Poland where 96% of people who declared the willingness to vaccinate actually got vaccinated [28,29].

The study found higher vaccine uptake among medical doctors than other health professionals. This is similar to finding from a systematic review which reported that vaccine confidence is higher among health workers with higher education levels (physicians) compared to nurses and attributed this to their better exposure to recent scientific research and sufficient knowledge about the new vaccines [26]. While other study reported that health workers with lower education may have lower awareness and risk perception, and more prone to follow community misconceptions [8]. However, a study in South Africa among hospital health workers found no association between vaccine acceptance and professional category of workers [12].

The study found no association between the participants' age, gender, co-morbidity, and vaccine uptake. This is similar to a study in South Africa which reported that factors such as age, co-morbidity and were not associated with vaccine acceptance [12]. This is however in contrast to many studies that have reported higher vaccine acceptance with health workers who were male, of older age, with pre-existing co-morbid illnesses [30-33]

4. CONCLUSION

Vaccine hesitancy among healthcare workers is an area of concern because of their roles as trusted sources of health information to the community and their high risk of exposure to infections acquired in a healthcare setting and potential spread to the community.

The study identified key determinants to vaccine uptake among the health workers which included perceived risks of being infected, perceived benefits, safety of the vaccines and perceived protection of the vaccine for their communities. These require targeted social and behavioural change communication strategies to address. Improving vaccine uptake among the health workers will help in scaling up vaccine uptake among the population in view of the role health workers play as change agents in their communities.

5. STRENGTH AND LIMITATIONS

This to our knowledge is the first study on vaccine uptake among health workers in the region. The limitations include social desirability and recall bias due to self-reported responses and limited generalizability to the population. The

study was conducted in governmental health facilities and may not represent the views of health care workers private health facilities. Despite these limitations, the study highlighted the determinants of COVID-19 vaccination uptake among health workers and will help in developing appropriate socio-behavioural change communication strategy to improve and sustain vaccine uptake among health workers. This will also contribute to improving vaccine uptake among the general population because of the influence of the health workers on the population being their major source of trusted information.

ETHICAL APPROVAL

Ethical Approval to conduct the study was obtained from the Somali Regional Health Bureau

COMPETING INTERESTS

Authors have declared that no competing interests exist.

The view expressed are that of the authors and not of the affiliated institutions.

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