COVID-19 vaccine uptake and its determinants among adult population in Somali region of Ethiopia.

ABSTRACT

Aims: To ensure effectiveness of COVID 19 vaccine in controlling the pandemic, high vaccination coverage rates are necessary to achieve herd immunity which will help reduce the transmission of the virus and ensure reduction in the risk of transmission of infection. The study assessed COVID-19 vaccine uptake and its determinants among the adult population in Somali region of Ethiopia.

Study design: This was a cross-sectional analytical study

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

Methodology: A structured interviewer-administered questionnaire adapted from the World Health Organization (WHO) Strategic Advisory Group of Experts on Immunisation vaccine hesitancy survey question, administered to 433 adult population in eight selected sites. Bivariate analysis and multiple logistic regression were used to test association between vaccine uptake and some selected determinants. The level of significance was set at a p-value<5%.

Results: Only 29% of the respondents had received at least one dose of COVID 19 vaccine, 219(50.6%) reported no concern at all in getting infected and the perception of low risk of infection was significantly higher among those not vaccinated (χ^2 =12.62, p<0.05). Only 101(23.3%) of the respondents reported the vaccine was very important in the prevention of the disease and perceived no benefit was significantly higher among those not vaccinated (χ^2 =32.30, p<0.05). Only 79(18.2%) of the respondents believed the vaccine was very safe and perceived lack of safety of the vaccine was significantly higher among those not vaccinated (χ^2 =22.24, p<0.05). There was positive association between level of education and vaccine uptake (AOR = 1.90, 95% CI: 1.02–2.52; p<0.05) while 126(47.5%) of those who had desired to be vaccinated actually got vaccinated. Other factors associated with COVID-19 vaccination uptake were friends getting vaccinated and support by community and religious leaders.

Conclusion: The perceived low risk among the population to COVID19 infection which significantly affected the poor vaccine uptake is a major concern. With only half of the population who intended to be vaccinated and ended up being vaccinated shows the need for targeted socio behavioural change communication strategies with focus on benefit of the vaccine not only to individual but to the other members of their community.

Keywords: COVID 19, Vaccine, adult population, 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 infection on 13th March 2020 and Somali region of Ethiopia reported its first case on 30th April 2020. Non-pharmaceutical Public health measures and vaccination are the major strategies being implemented to prevent and control the infection in the country.

Vaccines have been one of the most successful public health interventions in the prevention and control of diseases, however vaccine hesitancy has been reported as a global problem. The World Health Organization (WHO) in 2019 listed vaccine hesitancy among the top threats to health[2]. WHO defines vaccine hesitancy as a "delay in acceptance or refusal of safe vaccines despite availability of vaccine services[3].

As part of the preventive measures, COVID 19 vaccination was rolled out in Somali region of Ethiopia on 23rd March 2021. However, in order to ensure effectiveness of the COVID 19 vaccine in controlling the pandemic, high vaccination coverage rates are necessary to achieve herd immunity which will help reduce the transmission of the virus and ensure reduction in the risk of transmission of infection among the general population especially the most vulnerable individuals[4,5] .

The study aimed at assessing COVID -19 vaccine uptake and its determinants among the adult population in Somali region. Even though studies have been done on COVID 19 vaccine hesitancy and uptake among the population, vaccine acceptance and determining factors have been found to be complex in nature and context-specific, varying across time, place, and perceived behavioral nature of the community [6]. Thus, the need to for the study in this context especially being a pastoralist community with associated cultural and religious practices that affect health service utilization.

2. MATERIAL AND METHODS

2.1 DESIGN.

This was a cross-sectional analytical study conducted between 3rd and 28th October 2021

2.1 STUDY POPULATION AND SETTING.

The study was conducted among 433 adult population (>18years) who were eligible for COVID19 vaccination based on the National Deployment Vaccination Plan [7]. The study was conducted in eight selected sites of Somali region of Ethiopia which were Jigjiga, Wajale, Shinile, Degahbour, Kebridahar, Gode, Kebribeyah and Dolo-ado woredas/cities. The sample size of 500 was used determined using the single population proportion formula by taking the proportion of uptake of the COVID-19 vaccine at 19.1%,[8] at 95% confidence interval (CI) and 5% marginal error[9]. However only 433 of the population completed the questionnaires.

Multistage sampling technique was used in selecting the participants for the study. In the first stage, 6 cities in the region and 2 woredas (districts) based on their population and adequate COVID 19 immunization services

were selected. The total sample size was allocated proportionally to these eight districts/cities. In the second stage, two kebeles (sub districts) each from the 8 districts/cities were randomly selected and the total sample size was allocated by probability proportional to size(PPS) to each kebele based on their number of registered households. In the 3rd stage, using the list of the households as sampling frame, systematic random sampling technique was employed to select the study participants from the kebeles.

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2.3 DATA COLLECTION AND STATISTICAL ANALYSIS

 A structured interviewer administered questionnaire adapted from the World Health Organization(WHO) Strategic Advisory Group of Experts (SAGE) on Immunisation vaccine hesitancy survey sample questions 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 the respondents 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 socio-demographic covariates that showed statistically significant association with vaccine uptake at 10% level of significance in the Chi-square test were included in the logistic regression model. The level of significance was set at a p-value of less than 0.05 with a 95% confidence interval.

Table 1 shows the generic description of the determinants of COVID 19 vaccination.

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 COVID-19 vaccine.
Perceived social Norms	The perception that other people are important to an individual think that he/she should do the behavior (injunctive norms), and plan to do the behavior (descriptive norms).	We asked respondents: • 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. • if they would get a COVID-19 vaccine if a health worker recommended it
Perceived safety	A person perception how safe is the vaccine.	We asked respondents how much safe is 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.

3.1 RESULTS AND DISCUSSION

Socio-demographic characteristics

Table 2 shows the demographic profile of the 433 respondents who completed the questionnaire,241(55.7%) were male and 349(80.6%) of them were married. The mean age was 51.24$\pm$17.43, 375(86.6%) were urban residents and 413(95.4%) were muslims. Two hundred and thirty-two (53.6%) of them had no formal education and 237(54.7%) had pre-existing co-morbidity. Two hundred and twenty-eight (52.6%) of them cited television as the commonest source of information on COVID-19' .

Table 2: Socio-demographic characteristics of the respondents

Variables	Respondents, N (%) N=433

Mean age(years)±SD	51.24±17.43
Sex	
Male	241(55.7)
Female	192(44.3)
Residence	
Urban	375(86.6)
Rural	58(13.4)
Ethnicity	
Somali	406(93.8)
Oromo	6(1.4)
Gurage	3(0.7)
Amhara	17(3.9)
Others	1(0.2)
Marital status	
Married	349(80.6)
Single	60(13.9)
Divorced	18(4.1)
Widowed	6(1.4)
Religion	
Muslim	413(95.4)
Christian	20(4.6)
Education level	
No formal education	232(53.6)
Primary	52(12.0)
Secondary	43(9.9)
College and above	106(24.5)
Presence of medical Co-morbidities	
Yes	237(54.7)
No	196(45.3)
Primary source of information on COVID-19	
TV	228(52.6)
Radio	125(28.9)
Social media	80(18.5)

*Perceived access to vaccination and risk of getting infection*

Table 3 shows the respondents perceived access to vaccination and risks of getting infected with the virus. One hundred and fifty-nine(36.7%) reported very easy access to the vaccination services, conversely among those who reported concerns about access, inability to leave their job to get vaccinated was the commonest reason. In terms of perceived risk to the getting infected, 219(50.6%) of the respondents reported not concerned at all about getting infected with COVID 19 infection.

Table 3: Perceived access to COVID vaccination and risks of getting infected among respondents

	Respondents N=433 n (%)
Perceived access to Vaccination	
How easy to get vaccination services	
Not at all easy	79(18.3)
A little easy	97(22.4)
Moderately easy	98(22.6)
Very easy	159(36.7)
What makes it hard to get vaccine	
Nothing. It's not hard	289(66.7)
The opening times are inconvenient	37(8.6)
I am unable to leave work duties	50(11.6)
There is no onsite vaccination close to my place of work/home	22(5.1)
Mobile vaccination is not available	12(2.8)
Waiting time is too long	19(4.4)
Perceived Risk to COVID infection	
How concerned are you about getting Covid-19?	
Not at all concerned	219(50.6)
A little concerned	82(18.9)
Moderately concerned	99(22.9)
Very concerned	33(7.6)

Barriers and opportunities (perceived social norms)

Figure 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 was reported by 56% of the respondents while 74% of them considered friends or family members getting vaccinated as motivation for getting vaccinated. The support for COVID vaccination by community and religious leaders was considered as opportunity for vaccination by 87% of the respondents. However only 48% of the respondents had trust towards government policy and handling of the pandemic.
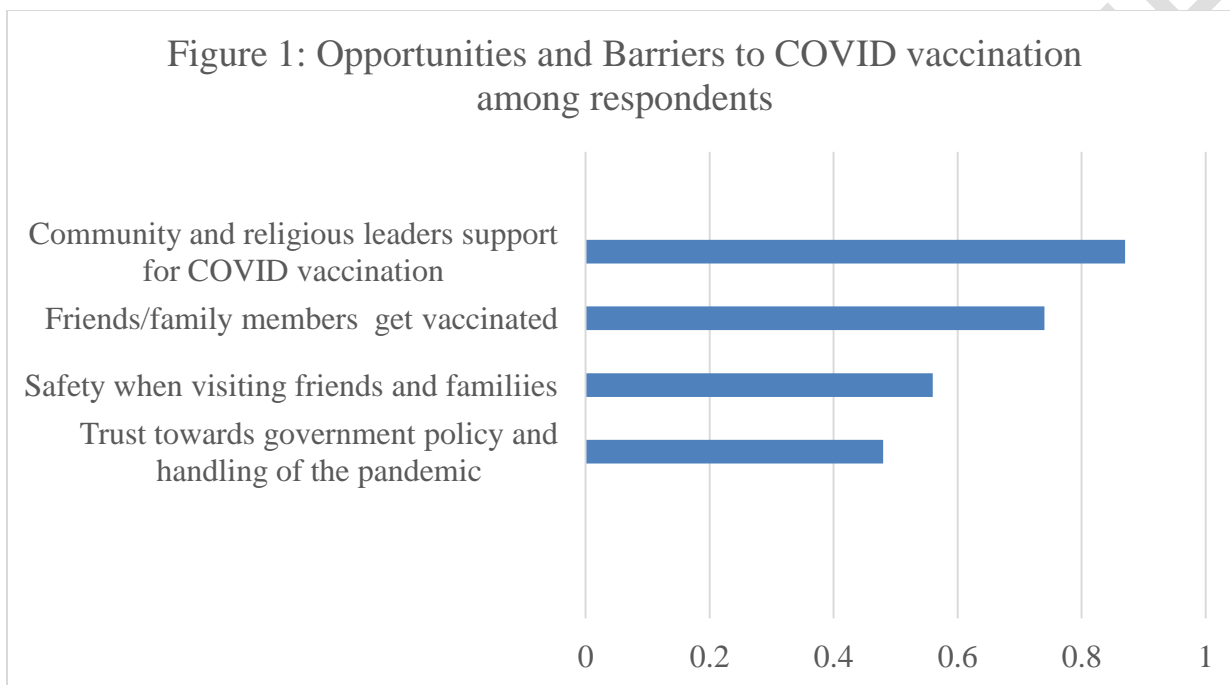
Figure 1: Opportunities and Barriers to COVID vaccination among respondents

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

Table 4 shows the result of the bivariate analysis of the association between perceived risk and benefit and vaccination among respondents using Pearson chi-squared test. Only 126(29.1%) of the respondents had received at least one dose of the vaccine and 219(50.6%) of the respondents reported no concern at all in getting infected with COVID 19 infection. The perception of low risk of infection was significantly higher among those not vaccinated (χ^2 =12.62, p<0.05). Only 101(23.3%) of the respondents reported the vaccine was very important in the prevention of the disease and perceived no benefit was significantly higher among those not vaccinated (χ^2 =32.30, p<0.05). Only 104(24%) of the respondents believed being vaccinated will protect other members of the communities where they lived. Only 79(18.2%) of the respondents believed the vaccine was very safe and perceived lack of safety of the vaccine was significantly higher among those not vaccinated (χ^2 =22.24 , p<0.05).

A total of 275(63.5%) of the 433 respondents were willing to be vaccinated, however only 126(47.5%) of them actually got vaccinated. The analysis found that vaccination was significantly higher among those who had desired to be vaccinate, (χ^2 67.78, p<0.05).

Table 4: Association between perceived risks, benefits, safety and inclination towards vaccination and being Vaccinated

Variables	Respondents' Vaccination status(N=433) N (%)		chi-square (χ^2) statistic (P-value)
	Yes (n, %) 126(29.1)	No (n, %) 307(71.9)	
How concerned are you about getting COVID-19			
Not all concerned	49(22.4)	170(77.6)	12.62(0.006)
A little concerned	29(35.4)	53(64.6)	
Moderately concerned	40(40)	59(60)	
Very concerned	8(25.8)	23(74.2)	
How important do you think getting a COVID -19 vaccine will be for your health?			
Not at all important	4(5.6)	67(94.4)	32.30(0.0000)
A little important	25(23.4)	82(76.4)	
Moderately important	56(37.8)	92(66.2)	
Very important	41(40.6)	60(59.4)	
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	9(9.8)	82(91.2)	25.72(0.00001)
A little important	28(26.4)	78(73.6)	
Moderately important	52(40)	78(60)	
Very important	36(34.6)	68(65.4)	
How safe do you think a COVID-19 vaccine will be for you?			
Not at all safe	14(12.3)	100(87.7)	22.22(0.00059)
A little safe	41(31.5)	89(68.5)	
Moderately safe	42(38.2)	68(61.8)	
Very safe	29(36.7)	50(63.3)	

Inclination towards Vaccination			
If a COVID -19 vaccine were available for you, would you get it?			
Yes	102(37.1)	173(62.9)	==24.81==(0.0001)
No	12(11.8)	89(88.2)	
Not sure	12(21)	45(79)	

Socio demographic factors associated with the COVID-19 vaccination

Table 5 shows multivariate logistic regression analysis of sociodemographic ==characteristics and COVID 19 vaccination. The odd of getting vaccinated was 1.90 higher among those having a college degree or above than those with no formal education(AOR = 1.90, 95%CI: 1.02–2.52), p<0.05 . The odd of getting vaccinated was 1.43 among those who are Christian that muslims AOR = 1.43, 95% CI: 1.43–11.24), p<0.05==

Table 5: Association between socio-demographic characteristics and COVID-19 vaccination

Variables	Respondents N=126 AOR 95% CI	P value
Age		
<40	1.01(0.58-1.77)	0.96
≥40	Ref	
Sex		
Male	Ref	
Female	1.19(0.75-1.90)	0.45
Residence		
Urban	1.40(0.63-3.16)	0.41
Rural	Ref	
Education		
No formal education	Ref	
Primary	1.57 (0.76-3.24)	0.22
Secondary	1.20(0.54-2.67)	0.64
College and above	1.90(1.02-3.51)	0.042
Marital status		

Married	Ref	
Single	1.91(0.98-3.73)	0.06
Religion		
Muslim	Ref	
Christian	4.01(1.43-11.24)	0.008
Comorbidities		
Yes	Ref	
No	1.08(0.68-1.73)	0.74

3.2 DISCUSSION

The study identified the vaccine uptake and the associated determinants among adult population in the selected study sites.

Only 29.1% of the adult population have received at least one dose of the vaccine which is similar to a previous study in Ethiopia among the general population which reported vaccine hesitancy rate of 68.6%[11] . This is however much lower than the findings from a systematic review meta-analysis which reported estimated pooled prevalence of acceptance rate of COVID-19 vaccine among adults in Africa of 48.93%[12]. The subgroup analysis revealed that the pooled prevalence of COVID-19 vaccine acceptance among adults in Africa was highest at 66.03% in Southern Africa and lowest at 24.28% in Northern Africa. However, the vaccine uptake rate in Turkey, USA, Saudi Arabia were found to be higher and ranged from 66% to 78% among the adult population[12] . The differences were suggested to be due to the sociodemographic characteristics of the study population and the awareness level of the study participants toward the COVID-19 vaccine[12]. A study in Bangladesh also reported that knowledge about COVID-19 and vaccination were significantly associated with the acceptance of COVID-19 vaccines[13].

About half of the respondents in the study reported they were not concerned about getting infected with COVID 19 infection. This is similar to the findings in previous studies in Ethiopia which reported that the perceived threat to COVID-19 infection was generally low[14-16]. The studies showed that between 45% and 58% of the respondents perceived their chance of getting COVID-19 infection was high and were worried about the likelihood of getting COVID-19 infection[14,15]. Studies have reported that risk perception is not influenced only by individual beliefs and perception but wider socio-cultural, environmental and political conditions[17,18] .The involvement of people in high risk activities that predisposed them to COVID 19 infection but not getting infected was suggested can lead to higher risk tolerance and low resilience and perception[17,18].

The study found that the perception of low risk of infection was significantly higher among those not vaccinated. Two studies in Bangladesh including one that used the Health Belief Model and the Theory of

Planned Behavior Model reported that respondents were more likely to seek vaccination if they reported greater levels of perceived susceptibility[19,20].   Likewise, a study in Ethiopia which used Willingness To Pay (WTP) model to assess COVID vaccination uptake reported that high perceived risk of COVID-19 infection was important factor affecting respondents' willingness to pay for COVID-19 vaccine[15] . These studies suggested the need for communication strategy that emphasised raising perceived risk of COVID-19 infection to improve vaccine acceptance and uptake[15,19-21].

In the study, only 23.3% of the respondents reported the vaccine was very important in the prevention of the COVID 19 infection. This is   much lower than finding from a previous study in Ethiopia among teachers which reported that more than half of the participants perceived COVID-19 vaccination will reduce their chances of getting infected with the virus and prevent them from death associated with COVID-19 infection [15]. The average level of education of the participants may have been responsible for this difference which is supported by the finding in this study which found that vaccine uptake was higher significantly among those with college education or above. A systematic review on attitudes, acceptance and hesitancy among the general population reported that participants who expressed hesitancy usually did not believe that the vaccine is necessary to combat the pandemic[22] .

Some studies in USA aimed at developing public health messages based on evidence to address vaccine hesitancy and foster public understanding of the COVID-19 vaccine found that participants with higher perceived benefits showed higher positive attitudes toward the COVID-19 vaccine and greater intention to vaccinate[23,24] .The studies found that even though several forms of public messages can increase vaccine intentions, but messaging that emphasized personal health benefits had the largest impact[23,24] .

In the study, only 18.2% of the respondents believed the vaccine was very safe and perceived lack of safety of the vaccine was significantly higher among those not vaccinated. Similarly, concern about safety and side effects of the vaccine was reported as the main determinants of both uncertainty and unwillingness to vaccinate against COVID19 in some studies [25,26].[2] A global survey conducted in 19 countries reported that 71.5% of the respondents would take a COVID‑19 vaccine if it is proven to be safe and effective [27]. A study in Bangladesh reported that among population which accepted to be vaccinated, only 35.14% showed the willingness to take the COVID-19 vaccine immediately, while 64.86% would delay the vaccination until they are convinced about the vaccine's efficacy and safety[13].

Other factors associated with COVID-19 vaccination uptake in the study were friends and family members getting vaccinated and support by community and religious leaders to vaccination. This is similar to findings in some studies which reported that advice from peers and believe that vaccines are compatible with religion were factors that determined the likelihood of accepting vaccination[28,29].

Similarly, other studies have reported family friends as important driving force for vaccine acceptance and a study in Malaysia on the use of the health belief model to assess predictors of intent to receive COVID-19 vaccine and willingness to pay reported that participants wanted to vaccinate only when other closely related people were vaccinated publicly[19,30].

The study shows about 50% of those who had desired to be vaccinated actually got vaccinated. This is much lower than many studies on intention to vaccinate and actual vaccination[31,32]. A study in USA reported 70%

of parents who were willing to vaccinate their children actually got them vaccinated[31]and a study in Poland, 96% of people who declared the willingness to vaccinate actually got vaccinated[32] .

Studies have reported that the undecided individuals are more flexible to change their minds to receive the vaccine by appropriate awareness campaigns[27,32]. However, a study reported that willingness to receive the vaccine may not be a good predictor of acceptance because vaccine decisions are determined by many factors[26] .

The study found association between having college degree or above or being a Christian and vaccine uptake among the respondents, but no association was found with age, gender or marital statusThe association between level of education and vaccine hesitancy is similar to other studies which reported increased vaccine hesitancy among the less educated[13,22,29]. However, a country-level analysis observed that in Canada, Spain, and the UK, the highly educated were linked to lower acceptance of the COVID-19 vaccine[33] . However, no study reported any difference among the various religions and vaccine uptake even though religion generally was reported to have effect on vaccination[28,29].

Conclusion:

To ensure effectiveness of the vaccine in controlling the pandemic, high vaccination coverage rates are necessary to achieve herd immunity. The perceived low risk among the population to COVID19 infection which significantly affected the poor vaccine uptake is a major concern. With only half of the population who intended to vaccinate and ended up being vaccinated shows the need for targeted socio behavioural change communication strategies with focus on benefit of the vaccine not only to individual but to the other members of their community.

Strength and limitations

This to our knowledge is the first study on vaccine uptake among adult population in the region. The limitations include social desirability and recall bias due to self-reported responses and limited generalizability to the population. Secondly most of the respondents were in the urban areas and may not reflect the experience of those in the rural areas. Despite these limitations the study highlights the determinants of COVID 19 vaccination among the adult population and will help in developing appropriate socio behavioural change communication strategy to improve and sustain vaccine acceptance among the population.

Ethical approval. This study was approved by Somali Regional health bureau.

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