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ORIGINAL RESEARCH

Willingness to receive the COVID-19 vaccine and associated factors among residents of Southwestern Ethiopia: A cross-sectional study

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Introduction: The COVID-19 vaccine is a key intervention toward containing the pandemic. Vaccines are thought to be a form of defense. One of the major challenges to managing the COVID-19 pandemic is the uncertainty or willingness to accept vaccinations. Our study aimed willingness to get the COVID-19 vaccine and the factors that influence it in Mettu Woreda, Ilu Ababor Zone, Ethiopia.

Methodology: Cross-sectional study design was conducted from August 1, 2021, to September 1, 2021, among rural residents of Mettu woreda's of Ilu Ababor Zone, Oromia, Ethiopia. The semi-structured data collection format was prepared to assess the magnitude of the communities' acceptance of the COVID-19 vaccine. A multivariable logistic regression analysis was used to determine the predictors of communities' acceptance of the COVID-19 vaccine at 95% CI.

Results: Of 350 participants from the study area, 59% of them were males and 41% females. Less than one-third (29.8%) of participants were willing to accept the COVID-19 vaccine. The results multivariable logistic regression revealed that the age group of ≥50 years (OR=0.29; 95% CI: −3.1–0.34) as compare with the 18–29 years, low monthly income (OR=0.85; 95% CI: −0.74–2.33), low perception level (OR=0.35; 95% CI: −2.03–0.24), government unemployed (OR=0.86; 95% CI: −0.72–0.1), low Level of acceptance (OR=0.72; 95% CI: −0.67, 0.08) and unwillingness to test COVID-19 (OR=0.13; 95% CI: −4.47, 0.58) were predictors of willingness to receive COVID-19 vaccine.

Conclusion: Less than one-third of the study, participants were willing to accept the COVID-19 vaccine. The likelihood of Willingness to accept the COVID-19 vaccine was low in the study area. Overall; low education, low vaccination perception, low income, jobless occupation, older age, and unwillingness to test for COVID-19 were associated with greater willingness to take the COVID-19 vaccine and are significantly associated with willingness to get the COVID-19 immunization.

Keywords: COVID-19, vaccine, willingness, Mettu, Ethiopia

Background

Coronavirus disease 2019 (COVID-19) is caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) also known as Novel coronavirus (nCov).[1–3] The COVID-19 pandemic is unlikely to be over unless vaccines that protect against severe disease and, ideally, drive herd immunity are widely distributed around the world. Although the spread of the virus can be slowed with physical separation, face coverings, testing and tracing, and possibly therapeutics, the risk of outbreaks and economic and social disruption will likely persist until effective vaccines are given to large segments of the global population to prevent hospitalization and severe disease, and ideally, herd immunity is achieved to stop the virus from spreading. Vaccines against COVID-19 are critical for preventing and managing the disease, as immunization is one of the most active and cost-effective health interventions for preventing infectious diseases.[4,5]

Received: 2 March 2022
Accepted: 26 April 2022
Published: 3 May 2022

About More than 3.93 billion people, or around 51.2% of the world's population, have received at least one dose of the Covid-19 vaccination. According to the region classification, Canada and the United States of America share the most COVID-19 doses of immunization, while Africa has the least.[6]

The World Health Assembly, the world's highest health policy-making organization, set a global aim in May of fully vaccinating 10% of each country's population by 30 September. Almost all high-income countries have achieved this goal. However, it is not applicable as predicted in Africa, where only 15 African countries have met the COVID-19 immunization target of 10%.[7]

Because the COVID-19 pandemic has spread globally, there is a pressing need to create effective vaccines as the most effective way to halt the spread. However, a high level of public acceptance and coverage is needed.[8] The definite intent to receive the SARS-CoV-2 vaccination among the general population varies depending on their COVID-19-related health beliefs[9] Despite the vaccine acceptance being variable across different groups, the drivers of the COVID-19 Vaccination Acceptance Scale (DrVac-COVID19S) were recently developed to better understand vaccination acceptance.[10]

The overall willingness among the general global population to get a COVID-19 vaccine is moderately high (60.1%); however, the existence of hesitancy might be a major obstacle to the global efforts to control the current pandemic.[11]

Before the COVID-19 pandemic, the World Health Organization listed vaccine hesitancy as one of the ten global threats to public health.[12] Different research and systematic reviews were conducted on the Willingness to Get the COVID-19 Vaccine and the Factors That Influence It. Knowing the amount of desire to get the COVID-19 vaccine and the factors that influence it would provide useful information and guidance for clinical deployment and intervention development. The systematic review conducted in the different regions showed that the main reasons for lower vaccine acceptance across all regions and more cited were fear of side effects and adverse reactions.[13,14]

The factors that directly promoted vaccination behavior were a lack of vaccine hesitancy, agreement with recommendations from friends or family for vaccination and absence of perceived barriers to COVID-19 vaccination.[15] Regarding the demographic factors, women were found to be less willing to accept the vaccine than men, while people under the age of 25 years and less well-educated respondents were marginally more willing to take the vaccine than educated.[16]

So far, Ethiopia has given out at least 5.06 million doses of COVID-19 vaccination. Assuming that each individual requires two doses, this would be enough to vaccinate around 2.3% of the population. Since the pandemic began on November 16, 2021, there have been 368,979 illnesses and 6630 coronavirus-related fatalities documented in the country.[17,18]

Throughout the world, COVID-19 has substantial health and economic impact that should not be overlooked; it has led in huge workforce reductions and an increase in worldwide unemployment.[19,20] The study conducted in Mettu, Ethiopia from August 1, 2021 to September 1, 2021 indicates that about 29.4% of the study population is willing to vaccinate. From this study, we understood that advanced age, residency, unemployment, occupation, COVID-19 test, the acceptance level of vaccine and educational status were all statistically significant predictors of readiness to get the COVID-19 vaccine.[5,20–23] Despite multiple studies conducted in the developed country, there was scanty of finding in our study area. A few studies were reported on the acceptance of the COVID-19 vaccine among health-care workers and no study was conducted among rural residents of our study area. Therefore, the study was paramount in assessing the level of vaccine acceptance among poor resource rural areas.

Methodology

The study design, area, and time

From August 1, 2021 to September 1, 2021, a cross-sectional study was undertaken among rural residents of Mettu woreda's through mailed questionnaires (115 participants) and face-to-face interviews (235 participants). The survey intended to assess intent to be vaccinated against COVID-19 among non-vaccinated participants and to identify predictors of and reasons among participants unwilling to get vaccinated.

Study variable

With COVID-19 vaccine acceptance, the outcome variable was treated as a binary response: "Will you get the COVID-19 vaccine?" Those who answered "Yes" with a code of "1" were termed vaccination accepters, whereas those who answered "No" with a code of "0" were considered unwilling to accept the COVID-19 vaccine.

$$y_{ij} = \begin{cases} 1, & \textit{if the participants respond to } \text{yes} \textit{ for willingness to vaccine acceptance} \\ 0, & \textit{if the participants respond to } \text{no} \textit{ for willingness to vaccine acceptance} \end{cases}$$

Inclusion and exclusion criteria

Being an Ethiopian resident, who was over the age of 18, was our inclusion criterion. Incomplete surveys and those who were severely ill to the extent they were not able to fill the questionnaire were excluded.

Sample size determination and sampling techniques

The sample size was determined using the single population proportion formula

$$n = \frac{\left(Z_{\frac{\alpha}{2}}\right)^2 * p(1-p)}{d^2}$$

Because no previous research on COVID-19 vaccine uptake in Ethiopia has been conducted, the best estimate (P) is 50%. Based on this assumption the ultimate sample size was estimated to be 350 people.

Data collection process and management

A semi-structured validated data collection tool was prepared to collect the data. Two medical doctor and two clinical pharmacists was recruited for data collection; one medical doctor was assigned to interview the participants. The training was given to data collectors and the interviewer before data collection. The perception level was assessed from 9 items questionnaire in which a good perception level was declared if the mean score of the perception level was above the mean score. To assure the consistency of the data collection tool, it was pretested at a nearby community called Bedele rural community before normal data collection.

Data processing and analysis

The data was collected by using ODK (open data Kit) and exported to Statistical Package for Social Science version 21.0 to conduct the data analysis following that, chi-square tests were performed on the frequencies, percentages, standard deviations, and averages. Finally, multivariable logistic regression analysis with maximum likelihood parameter estimation technique was used to derive the odds ratios (OR) and their 95% confidence intervals, which examine the relationship between willingness to get vaccinated against COVID-19 and socio-demographic characteristics. Model fitness was checked using the Hosmer and Lemeshow test, and a p-value of 0.05 and 95% CI were used to proclaim the significance of statistical tests.

Ethical approval and consent to participate

The ethical approval was obtained from the Mettu university's college of natural sciences' Natural Research Ethics Review Committee with an approval letter (Reference Number: MeU/CNS/204/11/8/2021). The study protocol was performed following with the Declaration of Helsinki. The official letter was delivered to the Mettu woreda offices and each participant's written consent was obtained before the start of data collection. The anonymization of the data was done to protect the respondents' privacy and confidentiality.

Results

Socio-Demographic Characteristics of the participants

A total of 350 rural residents were involved in our study, which gives 100% response rate from this 59% of them were males and 41% were females. The majority of the participants 238 (68%) were married. Most of the respondent's occupations 123

(35.1%) were unemployed and 89 (25.45%) of them were employed. Concerning educational level, most of them 189 (54%) were primary educated and 115 (32.8%) of them were college and higher-educated respondents (Table 1).

The perception and acceptance level of Participants

Of the study participants, most of them 248 (70.8%) had unwilling to accept the COVID-19 vaccine and 102 (29.2%) believed that they were willing to vaccine. In addition to this, most of the participants 233 (66.5%) have not enough perception level (Table 2).

Factors that Influence willingness to receive the COVID-19 vaccination

The relationship between covariates and response variables was calculated after modifying the possible predictor variable. Using logistic regression analysis and maximum likelihood estimate, the desire to accept the COVID-19 vaccine was linked to six variables: educational level, level of acceptance, perception level, age, occupation, and income. When comparing illiterate desire to receive COVID-19 vaccine to college or higher education group, illiterate willingness to take COVID-19 vaccination was less likely (OR= 0.51; 95% CI: −1.32, −0.07). This means that uneducated people were 0.51 less likely to accept COVID-19 vaccination than those with a college or higher education. Participants in the low and middle-income groups were less likely than those in the high-income group to accept COVID-19

Table 1 Socio-demographic characteristics of respondents among rural areas of Mettu woreda

Variable	Category	Frequency	Percentage	Willingness to receive the vaccination	
				Yes	No
Sex	Male	205	58.5	69	136
	Female	145	41.5	33	112
Education	Illiterate	46	13.2	13	33
	Primary and secondary	189	54	68	121
	College and higher	115	32.8	48	67
Marital status	Single	112	32	36	76
	Married	238	68	66	172
Religion	Orthodox	95	27.1	23	72
	Muslim	125	35.7	38	87
	Protestant	80	22.9	30	50
	Others	50	14.3	11	39
Age	18–29	117	33.4	44	73
	30–39	108	30.9	31	77
	40–49	80	22.9	20	60
	≥50	45	12.8	7	38
Occupation	Unemployed	123	35.1	25	98
	Employer	89	25.45	33	56
	College/ university students	75	21.45	31	44
	Others	63	18	13	50
Residence	Urban	205	58.5	72	133
	Rural	145	41.5	300	115
Monthly income	<40 USD(Low)	210	60	51	159
	41–99 USD(Middle)	88	25	22	66
	>100USD(High)	52	15	29	23

Abbreviation: USD, United States Dollar.

Table 2 Perception and willingness level of respondents among rural areas of Mettu Woreda

Variable	Category	Frequency	Percentage	Willingness to receive the vaccination	
				Yes	No
COVID-19 testing	Yes No	43 307	87.7 12.3	30 64	13 243
Level of Acceptance	Low High	248 102	70.8 29.2	76 35	172 67
Perception level	Low High	233 117	66.5 33.5	43 59	190 58

immunization (OR = 0.85; 95% CI: −0.74–2.33 and OR = 0.53; 95% CI: −1.14–0.78, respectively). Respondents not tested for COVID-19 were less likely willing to accept the vaccine; (OR = 0.13; 95% CI: −4.47–0.58) as compared with those who tested for COVID-19. In terms of COVID-19 vaccination awareness, participants with a low perception level were less likely to be eager to vaccinate (OR=0.35; 95% CI: −2.03–0.24) than those with a high perception level.

In addition to the above participants from the rural residences were less ready to take a prospective COVID-19 vaccine; (OR=0.25; 95 CI: −2.62–1.25) as compared to who residents in urban. Corresponding to the ages of the respondents (OR=2.85; 95% CI: 0.12–2.34), (OR= 2.61; 95% CI: 0.71–1.12) and (OR=0.29; 95% CI: −3.1–0.34) the odds of age between 30–39, 40–49 were also more likely ready to take the vaccine and greater than 49 years were less likely willing to take COVID-19 vaccination as compared with 18–29 years old, respectively. Male participants (33.7%) were more inclined to accept a COVID-19 vaccine than female participants (22.8%); Males were 1.56 times more likely than females to accept COVID-19 vaccination (OR=1.56; 95% CI: 0.14, 0.85) (Table 3).

Discussion

More than half of the world's population is reported to be subjected to long-term restrictions to prevent the spread of COVID-19.[23] Because vaccination looks to be a crucial preventative tool for halting the COVID-19 pandemic, public health efforts must address issues related to low vaccine acceptance as soon as possible.[24] Implementation of COVID-19 vaccination needs to have an adequate willingness of the population to tackle the global repercussions of the pandemic. Although the World Health Organization and its respective partners are working tirelessly to distribute the COVID-19 vaccine, they have been facing challenges in some countries to administer it appropriately.[25,26]

We generalize the overall willingness for vaccination among the population of Mettu Woreda, Ilu Ababor Zone, Oromia, Ethiopia. According to our research, acceptance of the COVID-19 vaccine was poor (29.2%). Low levels of knowledge, attitude, and intention to receive the COVID-19 vaccine may be a global problem. As a result, this study matched with the results of studies conducted in England (36.9%) and Egypt (34.3%).[22,23,27–31] but the willingness to accept the COVID-19 vaccine among our study participants was 29.2% less than that among Malaysian residents (94.4%),[32] adults in the United States (~70%),[33,34] and residents of 7 European countries (range: 80% in Denmark and 62% in France),[35] in Poland (57%) and Russia (55%).[36] The disproportion in methodology and research setting, as well as the socio-demographic characteristics of the study participants and the availability and accessibility of health service infrastructures, could all be factors.

This finding revealed that the age of the respondents was a significant factor in their refusal to obtain the COVID-19 vaccine. From this study, we conclude that in contrast to older participants, younger participants were more tolerant of vaccination. The desire to accept the COVID vaccine was found to be related to age in this study. When comparing age 18–29 years to age ≥50 years, the probabilities of willingness to take COVID 19 vaccine for older age were 0.29 times lower.[37] This was consistent with the study of Bekele.[16] This might be in our settings elderly populations were not aware of different social media that educates the relevance of vaccine.

Table 3 Factors that influence the willingness to receive the COVID-19 vaccine among rural residents of Mettu woreda

Variables	Category	Estimates	SD	OR	95% CI	P-value
Sex	Male Female	0.47 Ref	0.21	1.56 1	(0.14, 0.85)	0.63
Education	Illiterate Primary and secondary College and higher	−0.32 −0.67 Ref	1.45 0.54	0.72 0.51 1	(−0.87, 0.14) (−1.2, 1.27)	0.002 0.78 0.63
Marital status	Single Married	0.09 Ref	0.16	1.09 1	(−1.01, 1.03)	0.63
Religion	Orthodox Muslim Protestant Others	Ref −0.56 −0.61 0.34	 0.89 0.34 0.20	1 0.57 0.54 1.40	 (−1.56, 1.09) (−1.59, 1.23) (0.17, 1.03)	0.32 0.54 0.65 0.84
COVID-19 tested	Yes No	Ref −2.06	 3.78	1 0.13	 (−4.47, 0.58)	 0.09
Level of acceptance	Low High	−0.34 Ref	0.45	0.71 1	(−0.67, 0.08)	0.023
Perception level	Low High	−1.04 Ref	2.34	0.35 1	−2.03–0.24	0.001
Age	18–29 30–39 40–49 ≥50	Ref 0.96 1.05 −1.22	 0.71 0.65 0.74	1 2.61 2.85 0.29	 (0.71–1.12) (0.12–2.34) (−3.1–0.34)	0.30 0.64 0.54 0.001
Occupation	Employed Unemployed College/ university students Others*	Ref −0.15 −0.36 0.43	 0.34 1.30 0.57	1 0.86 1.53 1.53	 (−0.72–0.17) (−1.43–1.67) 0.13–1.83	0.12 0.004 0.73 0.57
Residence	Rural Urban	−1.37 1	0.85	0.25 1	(−2.62–1.25)	0.53
Monthly income	≤40 USD(Low) 41–99 USD(Middle) ≥100USD(High)	−0.16 −0.62 Ref	2.73 0.48	0.85 0.53 1	(−.74–2.33) (−1.14–0.78)	0.00 0.65 0.48

Note: *Others includes housewife, daily labor.

The odds of willingness to accept the COVID-19 vaccine among participants lactating who resided in rural areas were 0.85 times less likely than participants lactating who resided in urban areas. This suggestion was in line with the study conducted in Kenya said that respondents who were from rural counties had higher odds of reporting vaccine hesitancy as compared to those in urban counties.[22,38] This may be due to the people in urban residents have much more information about COVID-19 vaccinations than those in rural areas.[17,39]

The degree of education was also a predictor of hesitation to receive the COVID-19 vaccine. In our study we revealed that higher vaccine willingness was reported with an increasing level of education. Different researchers agreed that better-educated individuals are more likely to accept COVID-19 vaccination.[23,26,40–42] and low educational levels were linked to a significant level of vaccine reluctance. It's possible that better-educated people are more concerned about their health and well-being because they have access to more information sources, and they become more involved in life events that may affect them such as COVID-19 vaccines.[39,43]

Participants in the study who lived in rural regions and had lower household incomes were more likely to refuse the COVID-19 immunization; these studies were similar to studies by Callaghan et al and Fisher et al[41,42] Furthermore, when compared to males, female respondents exhibited a greater hesitancy to take COVID-19 immunization. The odds of willing to accept COVID-19 vaccination for males was 1.56 times more likely than females.[44] This expression was similar to a region of America, Southeast Asia and Iran.[45] However, our finding is inconsistent with females who expressed a higher unwillingness to accept COVID-19 vaccination than males in the Western Pacific region and Uganda.[22,46] On the contrary, the willingness to the vaccine was not determined by gender according to the study of Germany by Rieger.[47]

Another factor that influences COVID-19 willingness acceptance is perception level, which has been significant in spreading information that influences people's decisions to take the vaccine or not. As of the time of our study, vaccination perceptions were low, with significant effects on COVID-19 vaccination acceptance. This is consistent with the study of Bekele.[16] Refusal to be vaccinated was largely due to negative impressions of the upcoming COVID-19 vaccine.[13,48] As strength, the study was conducted in rural areas of low resource settings where lack of adequate health service and the predictors of willingness to receive vaccines were identified. As a limitation, social desirability bias in which residents answered questions in a manner that would be viewed favorably by others may have resulted in over-reporting of good perception as well as intended to receive the vaccines.

Conclusion

The proportion of the resident's willingness to take the COVID-19 vaccine was low in the study area. The result revealed that low education level, low level of perception about the use of vaccination, poor income category, being unemployed, older age, and unwanted to test COVID-19 were the predictor of willingness to get COVID-19 vaccine. Therefore, vaccine campaigns should be strengthened in rural areas of the Mettu community to disseminate the correct information and increase the awareness of residents toward the COVID-19 vaccine.

Abbreviations

CI, confidence interval; COVID-19, coronavirus disease −19; OR, odds ratio; SARS-COV-2, severe acute respiratory syndrome coronavirus 2

Data Sharing Statement

The whole data set and any materials relevant to this investigation can be acquired from the corresponding author upon reasonable request.

Author Contributions

All authors made substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data; took part in drafting the article or revising it critically for important intellectual content; gave final approval of the version to be published; and agree to be accountable for all aspects of the work.

Funding

Any public, commercial, or non-profit funding source had not given the authors a specific grant for this study effort.

Disclosure

There was no conflict of interest revealed by the authors for this study.

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