

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

Dabala Jabessa¹, Firomsa Bekele²

¹Department of Statistics, College of Natural and Computational Sciences, Mettu University, Mettu, Ethiopia; ²Department of Pharmacy, College of Health Sciences, Mettu University, Mettu, Ethiopia

Correspondence: Dabala Jabessa, Department of Statistics, College of Natural and Computational Sciences, Mettu University, Mettu, Ethiopia, Tel +251-921837083, Email debelajabessa125@gmail.com

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}

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.

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

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	43	87.7	30	13
	No	307	12.3	64	243
Level of Acceptance	Low	248	70.8	76	172
	High	102	29.2	35	67
Perception level	Low	233	66.5	43	190
	High	117	33.5	59	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	0.47	0.21	1.56	(0.14, 0.85)	0.63
	Female	Ref		1		
Education	Illiterate	-0.32	1.45	0.72	(-0.87, 0.14)	0.002
	Primary and secondary	-0.67	0.54	0.51	(-1.2, 1.27)	0.78
	College and higher	Ref		1		0.63
Marital status	Single	0.09	0.16	1.09	(-1.01, 1.03)	0.63
	Married	Ref		1		
Religion	Orthodox	Ref		1		0.32
	Muslim	-0.56	0.89	0.57	(-1.56, 1.09)	0.54
	Protestant	-0.61	0.34	0.54	(-1.59, 1.23)	0.65
	Others	0.34	0.20	1.40	(0.17, 1.03)	0.84
COVID-19 tested	Yes	Ref		1		
	No	-2.06	3.78	0.13	(-4.47, 0.58)	0.09
Level of acceptance	Low	-0.34	0.45	0.71	(-0.67, 0.08)	0.023
	High	Ref		1		
Perception level	Low	-1.04	2.34	0.35	-2.03-0.24	0.001
	High	Ref		1		
Age	18-29	Ref		1		0.30
	30-39	0.96	0.71	2.61	(0.71-1.12)	0.64
	40-49	1.05	0.65	2.85	(0.12-2.34)	0.54
	≥50	-1.22	0.74	0.29	(-3.1-0.34)	0.001
Occupation	Employed	Ref		1		0.12
	Unemployed	-0.15	0.34	0.86	(-0.72-0.17)	0.004
	College/ university students	-0.36	1.30	1.53	(-1.43-1.67)	0.73
	Others*	0.43	0.57	1.53	0.13-1.83	0.57
Residence	Rural	-1.37	0.85	0.25	(-2.62-1.25)	0.53
	Urban	1		1		
Monthly income	≤40 USD(Low)	-0.16	2.73	0.85	(-.74-2.33)	0.00
	41-99 USD(Middle)	-0.62	0.48	0.53	(-1.14-0.78)	0.65
	≥100USD(High)	Ref		1		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.

References

1. Pal M, Berhanu G, Desalegn C, Kandi V. Severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2): an update. *Cureus*. 2020;2:e7423.
2. Islam A, Sayeed MA, Rahman MK, et al. Spatiotemporal patterns and trends of community transmission of the pandemic COVID-19 in South Asia: Bangladesh as a case study. *Biosaf Health*. 2021;3:39–49. doi:10.1016/j.bsheal.2020.09.006

3. ElBagoury M, Tolba MM, Nasser HA, et al. The find of COVID-19 vaccine: challenges and opportunities. *J Infect Public Health*. 2021;14:389–416. doi:10.1016/j.jiph.2020.12.025
4. Wang W, Wu Q, Yang J, et al. Global, regional, and national estimates of target population sizes for covid-19 vaccination: descriptive study. *BMJ*. 2020;371. doi:10.1136/bmj.m4704
5. Cascini F, Pantovic A, Al-Ajlouni Y, Failla G, Ricciardi W. Attitudes, acceptance and hesitancy among the general population worldwide to receive the COVID-19 vaccines and their contributing factors: a systematic review. *EClinicalMedicine*. 2021;40:101113. doi:10.1016/j.eclinm.2021.101113
6. Holder J. Tracking coronavirus vaccinations around the world. *New York Times*. 2021;19.
7. WHO. 15 African countries hit 10 % COVID –19 vaccination goal. 2021.
8. Ditekemena JD, Nkamba DM, Mutwadi A, et al. Covid-19 vaccine acceptance in the democratic Republic Of Congo: a cross-sectional survey. *Vaccines*. 2021;9:1–11. doi:10.3390/vaccines9020153
9. Kabir R, Mahmud I, Chowdhury MTH, et al. COVID-19 vaccination intent and willingness to pay in Bangladesh: a cross-sectional study. *Vaccines*. 2021;9:416. doi:10.3390/vaccines9050416
10. Yeh YC, Chen IH, Ahorsu DK, et al. Measurement invariance of the drivers of COVID-19 vaccination acceptance scale: comparison between Taiwanese and mainland Chinese-speaking populations. *Vaccines*. 2021;9(3):297. doi:10.3390/vaccines9030297
11. Kukreti S, Rifai A, Padmalatha S, et al. Willingness to obtain COVID-19 vaccination in general population: a systematic review and meta-analysis. *J Glob Health*. 2022;12:5006.
12. Wake AD. The acceptance rate toward COVID-19 vaccine in Africa: a systematic review and meta-analysis. *Glob Pediatr Health*. 2021;8:2333794X211048738.
13. Crawshaw J, Konnyu K, Castillo G, van Allen Z, Grimshaw JM, Presseau J. Factors affecting COVID-19 vaccination acceptance and uptake among the general public: a living behavioural science evidence synthesis. *Ottawa Hosp Res Inst*. 2021;1:1–54.
14. Arce JSS, Warren SS, Meriggi NF, et al. COVID-19 vaccine acceptance and hesitancy in low- and middle-income countries. *Nat Med*. 2021;27:1385–1394.
15. chen H, Li X, Gao J, et al. Health belief model perspective on the control of COVID-19 vaccine hesitancy and the promotion of vaccination in China: web-based cross-sectional study. *J Med Internet Res*. 2021;23(9):e29329. doi:10.2196/29329
16. Bekele F, Fekadu G, Wolde TF, Bekelcho LW. Patients' acceptance of COVID-19 vaccine: implications for patients with chronic disease in low-resource settings. *Patient Prefer Adherence*. 2021;15:2519. doi:10.2147/PPA.S341158
17. Seboka BT, Yehualashet DE, Belay MM, et al. Factors influencing covid-19 vaccination demand and intent in resource-limited settings: based on health belief model. *Risk Manag Healthc Policy*. 2021;14:2743–2756. doi:10.2147/RMHP.S315043
18. Shitu K, Wolde M, Handebo S, Kassie A. Correction to: acceptance and willingness to pay for COVID-19 vaccine among school teachers in Gondar City, Northwest Ethiopia. *Trop Med Health*. 2021;49(1):63. doi:10.1186/s41182-021-00337-9
19. Alradhawi M, Shubher N, Sheppard J, Ali Y. Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID- 19. The COVID-19 resource centre is hosted on Elsevier Connect, the company ' s public news and information. *Int J Surg*. 2020;78:147–148. doi:10.1016/j.ijssu.2020.04.070
20. Seydou A. Who wants COVID-19 vaccination? In 5 West African countries, hesitancy is high, trust low. *Afrobarom*. 2021;432:1–13.
21. Belsti Y, Gela YY, Akalu Y, et al. Willingness of Ethiopian population to receive COVID-19 vaccine. *J Multidiscip Healthc*. 2021;14:1233–1243. doi:10.2147/JMDH.S312637
22. Echoru I, Ajambo PD, Keirania E, Bukenya EEM. Sociodemographic factors associated with acceptance of COVID-19 vaccine and clinical trials in Uganda: a cross-sectional study in western Uganda. *BMC Public Health*. 2021;21:1–8. doi:10.1186/s12889-021-11197-7
23. Pittet D. SARS-CoV-2 transmission via willingness to vaccinate against COVID-19 in Australia on the first female WHO regional director. *Lancet Infect Dis*. 2021;21:318–319.
24. Alqudeimat Y, Alenezi D, AlHajri B, et al. Acceptance of a COVID-19 vaccine and its related determinants among the general adult population in Kuwait. *Med Princ Pract*. 2021;30:262–271. doi:10.1159/000514636
25. Uneven E. Public health in practice. *Public Health*. 2021;2:1–3.
26. Graffigna G, Palamenghi L, Boccia S. Relationship between citizens ' health engagement and intention to take the COVID-19 vaccine in Italy: a mediation analysis. *Vaccines*. 2020;8:1–11.
27. Wake AD. The willingness to receive covid-19 vaccine and its associated factors: "vaccination refusal could prolong the war of this pandemic" – a systematic review. *Risk Manag Healthc Policy*. 2021;14:2609–2623. doi:10.2147/RMHP.S311074
28. Gan L, Chen Y, Hu P, et al. Willingness to receive SARS-CoV-2 vaccination and associated factors among Chinese adults: a cross sectional survey. *International Journal of Environmental Research and Public Health*. 2021;18:1993. doi:10.3390/ijerph18041993
29. Unroe KT, Evans R, Weaver L, Rusyniak D, Blackburn J. Willingness of long-term care staff to receive a COVID-19 vaccine: a single state survey. *J Am Geriatr Soc*. 2021;593–599. DOI:10.1111/jgs.17022
30. Shekhar R, Sheikh AB, Upadhyay S, Singh M, Kottewar S. COVID-19 vaccine acceptance among health care workers in the United States. *Vaccines*. 2021;9:1–15.
31. Kamel FO. Beliefs and barriers associated with COVID- 19 vaccination among the general population in Saudi Arabia. *BMC Public Health*. 2021;21:1–8.
32. Wong LP, Alias H, Wong P, Lee HY, Abubakar S. The use of the health belief model to assess predictors of intent to receive the COVID-19 vaccine and willingness to pay. *Hum Vaccin Immunother*. 2020;16:2204–2214. doi:10.1080/21645515.2020.1790279
33. Reiter PL, Pennell ML, Katz ML. Acceptability of a COVID-19 vaccine among adults in the United States: how many people would get vaccinated? *Vaccine*. 2021;38:6500–6507. doi:10.1016/j.vaccine.2020.08.043
34. Elharake JA, Galal B, Alqahtani SA, et al. International journal of infectious diseases COVID-19 vaccine acceptance among health care workers in the Kingdom of Saudi Arabia. *Int J Infect Dis*. 2021;109:286–293. doi:10.1016/j.ijid.2021.07.004
35. Neumann-Böhme S, Varghese NE, Sabat I, et al. Once we have it, will we use it? A European survey on willingness to be vaccinated against COVID-19. *Eur J Heal Econ*. 2020;21:977–982. doi:10.1007/s10198-020-01208-6
36. Wouters OJ, Shadlen KC, Salcher-Konrad M, et al. Challenges in ensuring global access to COVID-19 vaccines: production, affordability, allocation, and deployment. *Lancet*. 2021;397:1023–1034. doi:10.1016/S0140-6736(21)00306-8

37. Alle YF, Oumer KE. Attitude and associated factors of COVID-19 vaccine acceptance among health professionals in Debre Tabor Comprehensive Specialized Hospital, North Central Ethiopia; 2021: cross-sectional study Statistical Package for Social Science United States of America. *VirusDisease*. 2021;32:272–278. doi:10.1007/s13337-021-00708-0
38. Orangi S, Pinchoff J, Mwanga D, et al. Assessing the level and determinants of covid-19 vaccine confidence in Kenya. *Vaccines*. 2021;9:1–11. doi:10.3390/vaccines9080936
39. Islam MS, Siddique AB, Akter R, et al. Knowledge, attitudes and perceptions towards COVID-19 vaccinations: a cross-sectional community survey in Bangladesh. *BMC Public Health*. 2021;21:1–11. doi:10.1186/s12889-021-11880-9
40. El Mohandes A, Oreská S, Špiritović M, et al. OPEN COVID - 19 vaccine acceptance among adults in four major US metropolitan areas and nationwide. *Sci Rep*. 2021;11:1–12. doi:10.1038/s41598-021-00794-6
41. Fisher KA, Bloomstone SJ, Walder J, Crawford S, Fouayzi H, Mazor KM. A survey of U. S. adults annals of internal medicine attitudes toward a potential SARS-CoV-2 vaccine. *Ann Internal Med*. 2020. doi:10.7326/M20-3569
42. Khubchandani J, Sharma S, Price JH, et al. COVID - 19 vaccination hesitancy in the United States: a rapid national assessment. *J Community Health*. 2021;46:270–277. doi:10.1007/s10900-020-00958-x
43. Thanapluetiwong S, Chansirikarnjana S, Sriwannopas O, Assavapokee T, Ittasakul P. Factors associated with COVID-19 vaccine hesitancy in Thai seniors. *Patient Prefer Adhere*. 2021. 15:2389–2403.
44. Solis Arce JS, Warren SS, Meriggi NF, et al. COVID-19 vaccine acceptance and hesitancy in low and middle income countries, and implications for messaging. *medRxiv*. 2021;2021:1385–1394.
45. Rad MK, Fakhri A, Stein L, Araban M. Health-care staff beliefs and coronavirus disease 2019 vaccinations: a cross-sectional study from Iran. *Asian J Soc Health Behav*. 2022;5:40–46. doi:10.4103/shb.shb_13_22
46. Wong LP, Alias H, Danaee M, et al. COVID-19 vaccination intention and vaccine characteristics influencing vaccination acceptance: a global survey of 17 countries. *Infect Dis Poverty*. 2021;10:1–14. doi:10.1186/s40249-021-00900-w
47. Rieger MO. Willingness to vaccinate against COVID-19 might be systematically underestimated. *Asian J Soc Health Behav*. 2021;4:81–83. doi:10.4103/shb.shb_7_21
48. Adane M, Ademas A, Kloos H, Jaafar MH, Abdullah H. Knowledge, attitudes, and perceptions of COVID-19 vaccine and refusal to receive COVID-19 vaccine among healthcare workers in northeastern Ethiopia. *BMC Public Health*. 2022;22:1–14. doi:10.1186/s12889-021-12362-8

Patient Preference and Adherence

Dovepress

Publish your work in this journal

Patient Preference and Adherence is an international, peer-reviewed, open access journal that focusing on the growing importance of patient preference and adherence throughout the therapeutic continuum. Patient satisfaction, acceptability, quality of life, compliance, persistence and their role in developing new therapeutic modalities and compounds to optimize clinical outcomes for existing disease states are major areas of interest for the journal. This journal has been accepted for indexing on PubMed Central. The manuscript management system is completely online and includes a very quick and fair peer-review system, which is all easy to use. Visit <http://www.dovepress.com/testimonials.php> to read real quotes from published authors.

Submit your manuscript here: <https://www.dovepress.com/patient-preference-and-adherence-journal>