




Willingness to Receive COVID-19 Vaccination Among Adult Diabetes Patients in Woldia Comprehensive Specialized Hospital, North Ethiopia; A Cross-Sectional Study

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Background: According to recently published data, individuals infected with COVID-19 having concomitant diabetes may experience disease worsening or even death. The purpose of this study was to determine diabetes patients' willingness to get the COVID-19 vaccine as well as its magnitude and determinants.

Methods: Three hundred eighty six diabetes patients who visited Woldia Comprehensive Specialized Hospital during February and March 2022 participated in this institution-based cross-sectional study. Descriptive statistics were used to demonstrate frequencies and percentages, while logistic regression was used to identify the relevant determinants of vaccination readiness. Age, gender, income, place of residence, COVID-19 exposure, length of diabetes, awareness of and attitudes toward the COVID-19 immunization were all evaluated as associated factors.

Results: Out of 386 study participants, 268 (69.43%) were male and 146 (37.82) completed their secondary schooling. From 386 study participants 82.6% (95% CI; 78.5–86.3%) were willing to get vaccinated. The uptake of the COVID-19 vaccination among diabetes patients was independently influenced by sex (Adjusted Odd Ratio [AOR] = 6.84 (2.98, 15.68)), exposure to the illness (AOR 8.98 (3.22, 25.04)), attitude (AOR = 2.63 (1.2, 5.77)), and length of the disease (AOR = 0.62 (0.51, 0.76)).

Conclusion: Most of the study participants were willing to get the COVID-19 immunization. The relevant agency should make the immunization available in order to enhance disease control and reduce infection-related complications with special consideration of diabetes patients.

Keywords: COVID-19, diabetes, willingness

Introduction

A huge global threat is posed by the continuing coronavirus disease 2019 (COVID-19) pandemic, which is caused by the SARS-CoV-2 coronavirus. COVID-19 can cause mild to severe symptoms, including asymptomatic infection, mild upper respiratory tract disease, and severe viral pneumonia, which can cause respiratory failure and even death.¹

Although the majority of COVID-19 infected patients are expected to have a good prognosis, chronic disorders common in the elderly, such as hypertension, diabetes, and cerebral vascular disease, as well as their susceptibility conditions, can contribute to poor clinical results.²

The most prevalent comorbidities among COVID-19 patients were hypertension and diabetes, followed by cardiovascular diseases and respiratory system conditions.³ Symptomatic COVID-19 infection was connected to diabetes and hypertension, according to another cross-sectional study conducted in Ethiopia. Additionally, it is thought that having diabetes and COVID-19 infection at the same time will make the disease worse.⁴

Emerging information suggests that diabetes comorbidity in patients with COVID-19 is associated with disease deterioration and even death. According to the Centers for Disease Control and Prevention (CDC), diabetes patients had a fivefold increased risk of acquiring SARS-CoV-2 and a threefold increased risk of dying from COVID-19. This might be as a result of acute or chronic immune-compromising diabetes complications.⁵ According to Wang et al COVID-19 patients admitted to the intensive care unit (ICU) were more likely to have preexisting diabetes compared to who were not admitted.⁵ Similarly, Wu et al found that comorbid diabetes was more commonly seen in patients who developed acute respiratory distress syndrome (ARDS) than in those who did not develop.⁶ Guo et al also compared the clinical features of COVID-19 patients with and without diabetes and found that those with diabetes had a greater likelihood of becoming severely ill, as evidenced by a higher incidence of organ damage, hypercoagulability, and elevated levels of inflammatory markers.⁷ In keeping with the aforementioned findings, in Ethiopia, diabetes was linked to reduced probabilities of achieving clinical recovery compared to individuals without the condition.⁸ The prevalence of 1.3% diagnosed and 5% undiagnosed diabetes patients during this period of COVID-19 creates challenge for health-care systems of Ethiopia.⁹

One of the prevention methods, COVID-19 vaccination, produced the same strength of immune response and side effects in diabetes patients compared to the general population.¹⁰ COVID-19 immunization was introduced in Ethiopia on March 13, 2021, and numerous vaccines (eg, Johnson & Johnson, AstraZeneca, Pfizer, Sinopharm, Sinovac) were made accessible.^{11,12} Following the WHO's prioritization road map, a nationwide deployment and vaccination strategy was designed, with priority immunization for frontline health professionals and support personnel, the elderly with underlying illnesses, and other high-risk categories.¹³

As Ethiopia marks one year of COVID-19 vaccination by the middle of March 2022, more than 21 million people—roughly 20% of the population—have gotten at least one dose of the vaccine.¹⁴ Global vaccine inequity combined with vaccine hesitancy has contributed to low COVID-19 vaccine coverage in Ethiopia. According to a study among the general population of Ethiopia, only 31.4% were willing to get COVID-19 vaccinated.¹⁵

We are aware of no published data on the factors influencing vaccine acceptance among people with diabetes in Ethiopia. In order to ensure optimal vaccine distribution and improve immunization rates, research is needed to determine the acceptability of vaccines among diabetes patients.

Method

Study Setting

This facility-based cross-sectional study was conducted from March 15 to April 20, 2022, in Woldia, a comprehensive specialized hospital located in North Ethiopia. The study was conducted at a diabetes clinic of WCSH, which is found in Woldia town. According to the 2014 national population project conducted by the central statistical agency of Ethiopia (CSA), there are about 180,000 inhabitants in the town. The hospital serves the residents of North Wollo district as well as nearby populations from the Tigray and Afar regions. WCSH has Emergency OPD service, Adult OPD, diabetes clinic, youth friend service, under five OPD, inpatient room, maternal and child health service, laboratory, card room and drug store. There are about 17 specialists, 45 general practitioners, 172 nurses, and 66 midwives. In the previous month of data collection, around 850 diabetes patients visited the diabetes clinic. Consecutive sampling techniques were used.

Sample Size Determination

Since there are no published data on the prevalence of willingness to receive the COVID-19 vaccine among diabetes patients in Ethiopia, the sample size was calculated using a single population proportion formula, taking a 50% proportion into account. The final sample size was 386, with a margin of error (d) of 0.05 and a 95% confidence interval.

Populations of the Study

The source population of the study was all diabetes patients who had follow-up at Woldia Comprehensive Specialized Hospital, whereas the study population was all diabetes patients who had visited Woldia Comprehensive Specialized Hospital during the data collection time.

Eligibility Criteria

Patients with diabetes who had already begun the immunization and registered on their medical record charts, and/or who were unable to respond due to a serious illness were not included in the study.

Study Variables

The outcome variable of the study was the willingness to receive the COVID-19 vaccine (yes/no options). The independent variables were respondents' sociodemographic data (sex, marital status, age, religion, educational level, average monthly income, occupation, residence, presence of health insurance, duration of chronic illness, exposure to COVID-19 infected individuals), knowledge, and attitude towards COVID-19 vaccine.

Operational Definition

Willingness to receive COVID-19 vaccine: a "yes" response to the question "are you willing to take the COVID-19 vaccine?" Was considered willing to get vaccinated.¹⁶

Knowledge about COVID-19 vaccine; Respondents scored 70% and above on questions assessing knowledge about the COVID-19 vaccine were considered to have good knowledge while respondents who scored less than 70% were considered to have poor knowledge. There were seven questions which were targeted for the assessment of knowledge about COVID-19.

Attitude towards the COVID-19 vaccine: Respondents who scored greater than or equal to 70% scored attitude questions were considered to have a positive attitude while respondents who scored less than 70% were considered as having a negative attitude.¹⁶ Nine questions were used to assess the attitude towards COVID-19 vaccine.

Data Collection Procedures and Quality Control

The data were collected through a face-to-face interview using a pre-tested structured questionnaire adapted from various published literatures.¹⁶⁻¹⁸ The questionnaire was prepared in English and translated to the local language (Amharic) and re-translated back to the English version to ensure consistency. Training was given to the data collectors and supervisors on the aim of the study, clarity of the measuring tool, and ethical considerations. The data were collected by three BSc. nurses, and one supervisor supervised the data collection process. A daily meeting and supervision was also established to assess challenges that occur during data collection.

Data Processing and Analysis

The data were entered into Epi data and exported to SPSS version 25 software. A description summary (frequency distribution, proportion, mean and standard deviation) was used to summarize the variables. A binary logistic regression model was used to investigate factors associated with willingness to receive the vaccine. Variables that were significantly associated with the dependent variable in bivariate analysis and with P-value <0.25 were further analyzed in the multivariate analysis to identify their associated effects on taking the COVID-19 vaccine.

Result

Sociodemographic Characteristics

Out of a total of 386 study participants, 268 (69.43%) were male and 146 (37.82) completed their secondary schooling. The mean age of the study participants was 56.7±7.9 (the minimum age was 21 and the maximum age was 72 years) (Table 1).

Health Related Characteristics of the Study Participants

Above half (55.44%) of the study participants had type 2 diabetes mellitus, out of them 169 (91.6%) were willing to receive the vaccine (Figure 1). Hypertension, cardiac diseases and Asthma were found among 141 (36.53%), 77 (19.95%) and 75 (19.43%) study participants, respectively. From study participants whose family member were infected with COVID-19 (223 (57.77%), 211 (96.4%)) were willing to receive COVID-19 vaccine (Table 2)

Table 1 Sociodemographic Related Characteristics of Study Participants in Woldia Comprehensive Specialized Hospital

Variables		Willingness to Accept Vaccine		Total (%) [N = 386]
		Yes (%)	No (%)	
Sex	Male	239 (86.2)	29 (13.8)	268 (69.43)
	Female	80 (67.8)	38 (32.2)	118 (30.57)
Religion	Orthodox	160 (87.4)	23 (12.6)	183 (54.63)
	Muslim	120 (78.9)	32 (21.1)	152 (39.38)
	Protestant	39 (76.5)	12 (23.5)	51 (13.21)
Marital status	Married	50 (92.6)	4 (7.4)	54 (18)
	Single	204 (82.9)	42 (17.1)	246 (63.73)
	Widowed	45 (72.6)	17 (27.4)	62 (16.06)
	Divorced	20 (83.3)	4 (16.7)	24 (6.22)
Educational status	Illiterate	29 (78.4)	8 (21.6)	37 (59.68)
	Informal	22 (88)	3 (22)	25 (6.48)
	Primary	71 (73.2)	26 (26.8)	97 (25.13)
	Secondary	120 (82.2)	26 (17.8)	146 (37.82)
	College and above	77 (95.1)	4 (4.9)	81 (20.98)
Residence	Urban	242 (87.4)	35 (12.6)	277 (71.76)
	Rural	77 (70.6)	32 (29.4)	109 (28.24)
Occupation	Housemaid	72 (75)	24 (25)	96 (68.08)
	Farmer	37 (82.2)	8 (17.8)	45 (11.66)
	Private	86 (85.1)	15 (14.9)	101 (26.16)
	Government employee	114 (85.1)	20 (14.9)	134 (34.71)
	Unemployed	10 (100)	0	10 (2.59)
Health insurance	Yes	189 (80.1)	47 (19.9)	236 (61.14)
	No	130 (86.7)	20 (13.3)	150 (38.86)

Proportion of Willingness to Receive COVID-19 Vaccine and Determining Factors

The proportion of willingness to receive COVID-19 was 82.6% with 95% CI (78.5, 86.3). The probability of diabetes patients to take COVID-19 vaccine was six times higher among male patients compared to female (Adjusted Odd Ratio [AOR]=6.84 (2.98, 15.68)). The study also indicated that the odds of intention to take the COVID-19 vaccine were 2.63 times (AOR = 2.63 (1.2, 5.77)) times higher among those participants who had positive attitude of COVID-19 vaccine compared counterparts. Diabetes patients who had history of exposure to COVID-19 had 8.9 times (AOR 8.98 (3.22, 25.04)) more willing to receive COVID-19 vaccine than their counterpart (Table 3).

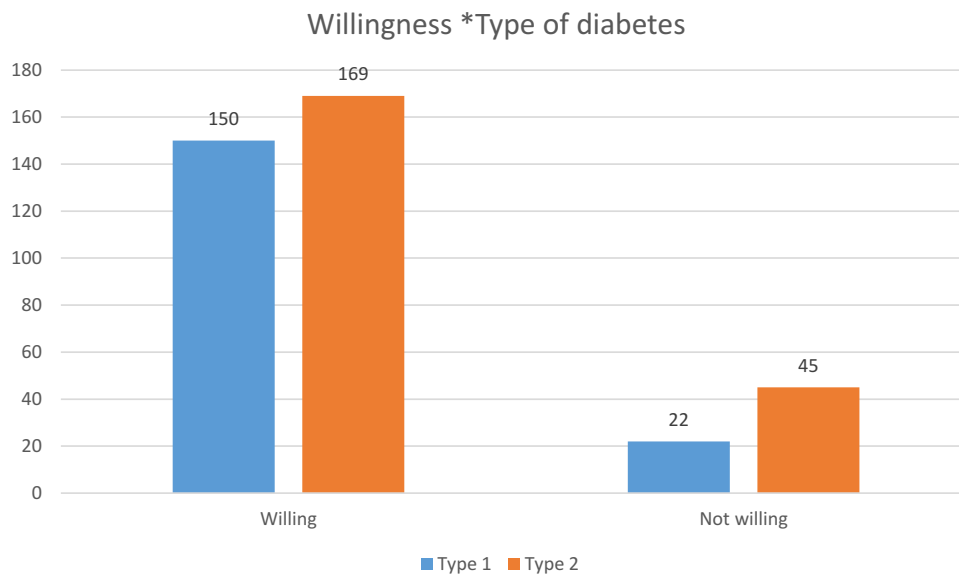


Figure 1 Willingness of study participant to receive COVID-19 vaccine stratified by type of diabetes in Woldia comprehensive specialized hospital.

Discussion

Vaccination is a crucial method for hampering the COVID-19 pandemic by achieving herd immunity in the population. The efficiency of this approach depends on vaccination uptake in the population. The up-to-date assessments on COVID-19 have shown 60–75% of the population needs to be vaccinated to attain herd immunity and stop the transmission of the disease.¹⁹

Table 2 Health-Related Characteristics of the Study Participants in Woldia Comprehensive Specialized Hospital

Variable	Category	Willingness		Total (%) [N = 386]
		Yes (%)	No (%)	
Anti-diabetic drug	Oral hypoglycemic	163 (81.9)	36 (18.1)	199 (51.55)
	Insulin	114 (87.7)	16 (12.3)	130 (33.68)
	Both	42 (73.7)	15 (26.3)	57 (14.77)
Type of diabetes	Type 1	150 (87.2)	22 (12.8)	172 (44.33)
	Type 2	169 (78.9)	45 (21.1)	214 (55.67)
Comorbidity	Hypertension	117 (82.9)	24 (17.1)	141 (36.53)
	Asthma	62 (82.6)	13 (17.4)	75 (19.43)
	Cardiac diseases	71 (92.2)	6 (7.8)	77 (19.95)
	Other	6 (54.5)	5 (45.5)	11 (2.85)
	None	21 (75)	7 (25)	28 (7.25)
	HIV/AIDS	30 (78.9)	8 (21.1)	38 (9.84)
	More than 1	12 (75)	4 (25)	16 (4.14)
Source of information	Health worker	236 (81.4)	54 (18.6)	290 (75.13)
	Friends	36 (80)	9 (20)	45 (11.66)
	Neighbor	21 (100)	0	21 (5.44)

Table 3 Determinants of Willingness to Take COVID-19 Vaccine Among Diabetic Patients in Woldia Comprehensive Specialized Hospital

Variables		No. (%) [N=386]	Crude Odd Ratio [COR] (95% CI)	AOR(95% CI)	p-value
Sex	Female	118 (30.57)	Ref		
	Male	268 (69.43)	3.91 (2.27, 6.75)	6.84 (2.98, 15.68)	0.007
Residency	Rural	109 (28.24)	Ref		
	Urban	277 (71.76)	2.87 (1.67, 4.95)	4.03 (1.74, 9.37)	0.004
Knowledge	Poor	74 (19.19)	Ref		
	Good	312 (80.81)	3.00 (1.67, 5.38)	2.92 (1.14, 7.44)	0.026
Attitude	Negative	89 (23.06)	Ref		
	Positive	297 (76.96)	4.56 (2.61, 7.97)	2.63 (1.2, 5.77)	0.007
History of exposure	No	139 (36.01)	Ref		
	Yes	247 (63.99)	8.36 (4.53, 15.44)	8.98 (3.22, 25.04)	0.002
Duration in year (mean \pm SD)		5.38 \pm 2.9	0.54 (0.45, 0.65)	0.62 (0.51, 0.76)	0.004

The magnitude of willingness to get COVID-19 vaccinated in our study was 82.6%. This was in-line with findings from Italy²⁰ and Wolaita, Ethiopia.²¹ While it was higher than reports from Saudi Arabia,²² china,^{23,24} Sub-Saharan Africa²⁵ and Uganda.²⁶ On the other hand, the magnitude was lower than from findings among the general population in Ethiopia.²⁷ The discrepancy in these data may be due to sociodemographic characteristics.

In this investigation, male diabetes patients were six times more likely than female diabetes patients to receive COVID-19 vaccine, which was consistent with studies conducted in Ghana and Italy^{20,28} but not in Saudi Arabia.²² This disparity could be explained by males' better health-seeking behavior than females.^{29,30} The perceived concern that adult males with COVID-19 have a higher risk of death than their female counterparts across all age groups may increase health-seeking behavior for COVID-19 vaccination. This may result in a high demand for vaccination among males.³¹ As a result, increasing COVID-19 vaccination adoption requires focusing on raising vaccine awareness among female diabetes patients.

Similarly, city dwellers were 4.03 times more likely than rural dwellers to receive the COVID-19 vaccine. This could be due to improved availability to vaccine information, which leads to an increase in health-seeking behavior among the more vulnerable urban population. Respondents with high awareness of the COVID-19 vaccination were 2.92 times more willing to take the vaccine in this study than those with low knowledge. This was consistent with findings from reports on Ethiopia's HIV/AIDS patients,³² Palestine,³³ and the USA.³⁴ This could be related to the fact that the majority of respondents in our current study were from metropolitan areas and were educated, allowing for easier access to vaccine information and, as a result, higher awareness of COVID-19. Because people who have information on the effectiveness of the COVID-19 vaccine are more likely to get vaccinated, having good knowledge about the vaccine enhances compliance towards getting vaccinated.³⁵

Positive attitude was associated with willingness to receive COVID-19 vaccine with an AOR of 2.63, which was supported by findings from Ethiopia among people living with HIV/AIDS, chronic patients, health-care workers, and those at risk of infection^{36,37} and South Africa.³⁸ People who have a positive attitude toward the COVID-19 vaccine have a strong belief in the perceived benefits, cues to action, and perceived severity, all of which are significant associated factors of intention to acquire COVID-19 immunization.³⁹ As a result, public awareness campaigns should focus on providing more information about COVID-19 vaccine safety and reassuring the public in order to continue this favorable attitude toward vaccination intentions.

Furthermore, patients with a history of COVID-19 exposure were 9 times more likely (AOR= 8.98)^{3,22,25} to want to be vaccinated against COVID-19, despite the fact that research from Nigeria contradicted this.⁴⁰ It is possible that persons with a history of exposure have a higher inclination to get vaccinated because of their sickness experience. Diabetes patients who were longer lived with the diseases were less willing to receive vaccine than their counter part. This could be explained as those patients with longer duration will adapt the diseases condition and perceive as they are competent enough to fight the infection.

However, we have strived to report the current evidences on the willingness of diabetes patients to take COVID-19 vaccination, this study may be limited to its single center study.

Conclusion

According to this study, the majority of diabetes patients were willing to get the COVID-19 vaccine. The responsible body should offer the vaccine for better disease control and to reduce infection complications, particularly in diabetes patients. On the other hand, poor knowledge and a negative attitude toward the vaccine were identified as determinates for patients who were unwilling to receive the vaccine, so health professionals, religious leaders, and other influential persons should counsel about the benefits of COVID-19 vaccination and increase their awareness of the vaccine is recommended.

Data Sharing Statement

The data set used and analyzed for the study is available from the corresponding author on reasonable request.

Ethical Approval and Consent to Participate

The research was carried out in accordance with the Declaration of Helsinki's guidelines and regulations. Ethical approval was obtained from Woldia University ethical review board. Permission letter was obtained from medical director office of Woldia comprehensive specialized hospital with protocol number ERC001/2022. Informed consent was obtained from the study participants. Confidentiality of patients' information was kept anonymous in any process of the study.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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