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Corona Virus Disease-19 Vaccination, Willingness for Vaccination and Associated Factors Among Patients Attending Chronic Follow Up in The Referral Hospitals Bahir Dar, Ethiopia, 2022

Mulu, Kebede

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BAHIR DAR UNIVERSITY
COLLEGE OF MEDICINE AND HEALTH SCIENCES
DEPARTMENT OF ADULT HEALTH NURSING

**CORONA VIRUS DISEASE-19 VACCINATION, WILLINGNESS
FOR VACCINATION AND ASSOCIATED FACTORS AMONG
PATIENTS ATTENDING CHRONIC FOLLOW UP IN THE REFERRAL
HOSPITALS BAHIR DAR, ETHIOPIA, 2022**

BY: MULU KEBEDE (BSc)

**A THESIS SUBMITTED TO THE DEPARTMENT OF ADULT HEALTH
NURSING, COLLEGE OF MEDICINE AND HEALTH SCIENCES, BAHIR DAR
UNIVERSITY IN PARTIAL FULFILLMENT FOR THE REQUIREMENTS OF
THE DEGREE OF MASTERS IN ADULT HEALTH NURSING**

AUGUST 2022

BAHIR DAR, ETHIOPIA

BAHIR DAR UNIVERSITY
COLLEGE OF MEDICINE AND HEALTH SCIENCES
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BAHIR DAR, ETHIOPIA

Declaration

I, the undersigned below declare and confirm that this thesis which is entitled “Corona virus disease-19 vaccination, willingness for vaccination and associated factors among patients attending chronic follow up in the referral hospitals of Bahir Dar, Ethiopia, 2022” is my own work. I followed all ethical principles in the preparation, data collection, data analysis and completion of this thesis. All scholarly matter that is included in the thesis has been given recognition through citation. I confirm that I have cited and referenced all sources used in this document. Every effort has been made to avoid plagiarism in the preparation of this thesis. This will be submitted in partial fulfillment of the requirement for the degree of masters in adult health nursing from Bahir Dar University College of Medicine and Health Sciences, Department of Adult Health Nursing.

The thesis will be deposited in the Bahir Dar University digital library and will be available to local, national and international scientific community through publications.

I declare that this thesis has not been submitted to any other institution anywhere for the award of any academic degree, diploma or certificate.

The student:

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Approval

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Approval for defense

I hereby certify that I had advised, supervised, and evaluated this research paper which is entitled “Corona virus disease-19 vaccination, willingness for vaccination and associated factors among patients attending chronic follow up in the referral hospitals of Bahir Dar, Ethiopia, 2022”. A hospital based cross-sectional study was investigated by Mulu Kebede with my advice, guidance, and support. Hence, I approve as this can be submitted as the final thesis paper for defense.

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Examiners approval form

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DEPARTMENT OF ADULT HEALTH NURSING

Approval of Thesis Report

I hereby certify that I have examined this thesis report entitled "Corona virus disease-19 vaccination, willingness for vaccination and associated factors among patients attending chronic follow up in the referral hospitals of Bahir Dar, Ethiopia, 2022" by Mulu Kebede. We recommend and approve the thesis report for a degree of "Masters of Science in Adult Health Nursing".

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Abstract

Background: Despite the fact that the disease has spread throughout the world, with millions infected and killed, global COVID-19 vaccine coverage remains low, particularly in developing countries including Ethiopia. Except for detecting low COVID 19 vaccine utilization, epidemiological data is insufficient to assess the amount of COVID-19 vaccination, willingness for vaccination, and associated factors.

Objective: This study aimed to assess COVID-19 vaccination, willingness for vaccination and associated factors among patients attending chronic follow up in the referral hospitals of Bahir Dar, Ethiopia, 2022

Method: A hospital-based cross-sectional study was conducted among 400 patients attending chronic follow up in the referral hospitals of Bahir Dar: From May 09 - June 09/2022. A systematic random sampling technique was used to select participants. Data were gathered using a pre-tested questionnaire, and checked for its consistency and accuracy. The data were entered to Epi data version 4.6 and analyzed using SPSS version 23. Descriptive analysis was performed to find the frequencies and percentages. Binary logistic regression analysis was done to assess the association between the dependent and independent variables. Variables having p-value < 0.25 in the bi-variable analysis were fitted into the multi-variable logistic regression. Finally, variables with p-value < 0.05 in the 95% confidence interval in the multi-variable binary logistic regression were considered as significant factors associated with the outcome variables.

Results: From a total of 423 participants, 400 (95% response rate) were included for analysis. The COVID-19 vaccination was less than 50% (46.8%), while the willingness for vaccination was 60.5%. About 56% and 68% of the respondents had good knowledge and favorable attitude respectively. Older people with age groups >64 years were 2.7 times more likely to be vaccinated. Similarly, those people living in the urban area had 3.94 times increased COVID-19 vaccination. Furthermore, the probability of being vaccinated among respondents with good knowledge and favorable attitude were 70% and 79%, respectively. The willingness for vaccination was increased among those individuals with favorable attitude (adjusted odds ratio: 1.82). In contrast, the urban populations were less likely to be willing for COVID-19 vaccination (adjusted odds ratio: 0.46). The majority of

the respondents (19.7% for vaccination) and (35.7% for willingness for vaccination)) misunderstood that the vaccine may aggravate their disease condition.

Conclusion and recommendation: The overall COVID-19 vaccination and willingness for vaccination was low compared to what was estimated by WHO. The majority of the respondents had good knowledge and favorable attitude. Age, residence, knowledge and attitude were factors associated with COVID-19 vaccination, while residence and attitude were associated with the willingness for vaccination. Increase accessibility of the vaccine, health education, strengthening vaccination campaign and community-based researches are recommended.

Key words: COVID-19, vaccination, willingness, factors, chronic follow up, Bahir Dar, Ethiopia

List of Abbreviations and Acronyms

AOR	Adjusted Odds Ratio
CHF	Chronic Heart Failure
CI	Confidence Interval
COR	Crude Odds Ratio
COVID-19	Coronavirus Disease 2019
DCSH	Dessie Comprehensive Specialized Hospital
DM	Diabetes mellitus
FHCSH	Felege Hiwot Comprehensive Specialized Hospital
GCSH	Gondar Comprehensive Specialized Hospital
HCW	Health Care Worker
ICU	Intensive Care Unit
MOH	Ministry of Health
NCD	Non-Communicable Disease
SPSS	Statistical Packages for Social Sciences
SARS-CoV-2	Severe Acute Respiratory Syndrome Corona Virus-2
TGCSH	Tibebe-Ghion Comprehensive Specialized Hospital
USA	United States of America
WHO	World Health Organization

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1. Introduction

1.1. Background information

The current pandemic corona virus was named as corona virus disease 2019 (COVID-19) by the World Health Organization (WHO) which began in the beginning of December 2019 near Wuhan City, Hubei Province, China (1). The COVID-19 is an acute respiratory disease syndrome caused by the coronavirus-2 (SARS-CoV-2) that can spread rapidly with an increase emergency of new strains (2).

COVID-19 is a highly communicable disease transmitted to susceptible individuals by close contact, respiratory droplets and nasopharyngeal secretion (3). Standard precautions of infection prevention and control mechanisms have been considered as the most priorities of COVID-19 prevention before the advent of COVID-19 vaccines (4). Despite the implementation of preventive measures across the world, the burden of the pandemic is not significantly reduced (5). These challenges prompted the need for timely and effective vaccine development (6), and considered as the best strategy for controlling the transmission of the disease (5). The COVID-19 vaccine play a vital role in reducing the infection of COVID-19, prevent complications and reduce transmission particularly among high-risk groups such as health care workers (HCWs), the elderly, and individuals with chronic diseases (7). Globally, there have been more than 331 candidate vaccines (137 clinical trial and 194 preclinical trial) (8).

The Food and Drug Administration issued or authorized emergency use of COVID-19 vaccines including Pfizer-BioNTech and Moderna (in December 2020), and Janssen (in February 2021). During that time especial emphasis was given for health care workers (HCWs), elderly people and patients with chronic disease (6, 9). Furthermore, Pfizer-BioNTech was authorized and recommended for persons aged ≥ 12 years, while Moderna and Janssen have been recommended for persons aged ≥ 18 years (9). As per the July 27, 2022 WHO report, 11 vaccines were approved by WHO for emergency use listing in adults. These are messenger RNA (mRNA) based vaccines like (BNT162b2 from Pfizer-BioNTech (USA/Germany), mRNA-1273 from Moderna/USA/; viral vector-based vaccines that include Ad26.COV2.S from Johnson & Johnson (USA/Belgium), AZD1222 from Oxford-AstraZeneca (United Kingdom), Covishield from

Serum Institute of India; those with inactivated virus based vaccines like BBIBP-CorV from Sinopharm (China), CoronaVac from Sinovac (China), Covaxin from Bharat Biotech (India); and those protein based vaccines including Covovax from Serum Institute of India (India), and NVX-CoV2373 from Novavax (USA) (10-13).

The Ethiopian Ministry of health employed 1st the Astra Zeneca COVID-19 vaccination through the COVAX facility and Covishield vaccines since March 7, 2021 where front-line HCWs were vaccinated first (14). However, with available COVID-19 vaccines, the vaccine coverage remains low and become a huge challenge, where vaccine hesitancy is one of the predominant obstacle (15, 16).

1.2. Statement of the problem

The magnitude and geographical expansion of COVID-19 are causing a great concern in the world (17), with over 546 million confirmed cases and over 6.3 million deaths have been reported in the globe till 3 July 2022 (18). Although COVID-19 can infect all individuals, not all people are equally affected by the virus, develop the disease and die (19). Chronic follow up patients, especially when they are unvaccinated (20-22), are more likely to be progressed to severe conditions (23), with an increased mortality (24). Globally, chronic diseases are the leading cause of disability and death (25). The impact of these chronic disease is also increasing in low-income countries (26).

A study conducted in USA reported that more than 99% of deaths from COVID-19 are occurred among unvaccinated high risk individuals (22). Another similar study conducted in USA also showed that the probability of hospital admission was 94.4% in unvaccinated persons compared with vaccinated persons (27). According to one study conducted among 43,127 SARS-CoV2 infected and hospitalized adults in California, from May 1–July 25, 2021, 25.3% and 71.4% were from those fully vaccinated and unvaccinated people, respectively with increased the intensive care unit (ICU) among unvaccinated groups (28).

The economic burden of COVID-19 is also very high. The International Monetary Fund estimates that global economic losses could exceed US\$5.3 trillion by 2026, if COVID-19 becomes endemic. The severity is estimated to be high in developing countries having low vaccine access and coverage, with a massive increase complications, hospitalization and death (15).

As the burden of COVID-19 is increasing, promising COVID-19 vaccine candidates have been produced, with a potential demand for their distribution, and optimize their effectiveness (29). A community-level vaccine coverage of 65 to 80+% (average 70%) is required to protect the community from COVID-19 infection, which also depends on the vaccine efficacy, its coverage and willingness for vaccination (30). However, the global COVID-19 vaccine coverage is still lagging especially in developing countries (31). More importantly, vaccine access is highly

inequitable in the world with coverage ranging from 1% (in the low and middle income countries) to over 70% (in the developing countries) (15).

Availability and accessibility of a safe COVID-19 vaccine do not necessarily guarantee to mitigate the pandemic unless vaccine recipients are willing to utilize the vaccine (32, 33). Vaccine hesitancy or refusal had been reported among the top ten global health threats by the WHO (34). This vaccine hesitancy is variable based on the difference in sociodemographic, economic, political, and personal factors (35). Addressing these barriers is crucial to attain maximum vaccine coverage and eradicate this pandemic (36).

Few studies had been conducted in Ethiopia and reported a variable result on willingness for vaccination. However, these studies were conducted either on the general adult population (37) or on HCWs (38, 39). Although one study was conducted among chronic follow up patients, during our proposal development, at Dessie Comprehensive Specialized Hospital (DCSH) in 2021, it was conducted within a month of the 1st vaccine announcement in the country where the quality and safety issues of the vaccine were the great issues (8). Furthermore, we had included the vaccination and associated factors in addition to willingness for vaccination. To the best of our searching, there are no studies conducted in this issue before in the aforementioned study area.

To promote vaccination against COVID-19, we need to know the base line of the uptake status, whether people are willing to take COVID-19 vaccines, the reasons why they are unwilling to uptake or accept, and other related determinant factors. Therefore, the aim of this study is to assess COVID-19 vaccination, willingness for vaccination and associated factors among patients attending chronic follow up in the referral hospitals of Bahir Dar, Ethiopia from May to June 2022.

1.3. Significance of the study

Assessing COVID-19 vaccine uptake, acceptance and associated factors is relevant for different groups especially for patients with chronic disease, HCWs, policymakers and researchers.

Initially, this finding is important for the study participants to be aware on the issues related with COVID-19 vaccine. The result of this study is also served as source of information for health service providers and stakeholders to develop action plans for COVID-19 pandemic control and implement the plans in the region.

The finding might be used as an input for policy makers to address the issues related to this pandemic control in the country. This study will also provide a framework or used as a base line data for future research.

2. Literature review

2.1. Corona virus disease-19 vaccination

Authorized vaccines protect against SARS-CoV-2 infection and reduce the severity of the disease, even with the new and emerging variants (40). WHO estimated COVID-19 full vaccination population coverage targets for 2021-2022. That is to reach 10%, 40% and 70% by the end of September 2021, December 2021 and June 2022, respectively. The 10% coverage target by end September 2021 was not met by 56 countries. Although about 70 countries had already met the 40% coverage target before the estimated time, those with below 10% coverage, are in hard to achieve the 40% coverage by the end of December 2021 (15, 41). According to the WHO report countries with low rates of primary series vaccine coverage should first achieve high primary series coverage rates(15).

Achieving high and equitable COVID-19 vaccine coverage is important to decrease COVID-19 cases, hospitalization and death (42). According to a previous global data conducted in 2021, a total of 3, 741, 377, 801 (48%) of the world population had received at least one dose vaccine, while 2, 831, 198, 903 people (36.3%) were fully vaccinated. By region, America, Europe and Asia had high vaccination coverage with at least one dose of 67%, 58% and 56%, respectively. In contrast to this, Africa had the lowest coverage which was only 7.5% (43). However as per March 20, 2022 report, 64% of the world population had received at least one dose of a COVID-19 vaccine, while only 14.4% of people in low-income countries and 21% of the Ethiopian population have received at least one dose (44).

Globally, 60% of people had been fully vaccinated since the 29 May 2022. Although a milestone was seated for all countries to reach 70% of people fully vaccinated by 30 June 2022, only two countries in the African Region (Seychelles and Mauritius) had achieved this target. In line with this, only 225 million people (20%) had received at least one dose, and 169 million people (14.7%) had been fully vaccinated in the region (45). According to the data reported on July 6/ 2022, the vaccination coverage in Ethiopia is reached to 38.4% (18). The African Union endorsed to vaccinate at least 60% of each country's population with a safe and efficacious vaccine by the end of 2022, to achieve the population-level immunity needed to bring the pandemic under control (46). Over 70% of people in high-income countries are fully vaccinated

against COVID-19 where as in low-income countries (4-14.4%) (47). This is very low that required by WHO to achieve 70% COVID-19 vaccine coverage globally by mid-2022 (48).

According a study conducted among 435 Indian cancer patients, on June 2021, 348 (80%) patients had not received even a single dose of the COVID-19 vaccine, only 66 (15.2%) patients had received the first dose, and 21 (4.8%) had received both the doses (49).

Another study conducted among patients with non-communicable disease (NCD) and their caregivers in rural areas of Malawi by 2022, 22% of respondents had received at least one dose, with 19% being fully vaccinated (50).

According to a study conducted on COVID-19 vaccination among patients with DM in Sudan, 31% received the vaccine, out of which, 17.8% received the first dose, 13.2% received the second dose, and 0.2% received the third dose (51).

A study conducted among individual with serious underlying medical conditions, in Australia reported that 81.5% (3813 of 4681) had received at least one dose of COVID-19 vaccine (52).

A study conducted among older adults aged ≥ 60 years in Bangladeshi reported that one-thirds of the participants (35.5%) were vaccinated, with 23% full dose vaccination (53).

2.2. Factors associated with COVID-19 vaccination

According to a study in Europe, vaccine effectiveness, safety, and side effects matter COVID-19 vaccination. Although less likely, religious factors, and belief in natural or traditional remedies were also considered as barriers that affect COVID-19 uptake (54). One study conducted in USA, reported that the uptake was lower among females and those with a history of COVID-19 infection, (55). In a study conducted by 2021, in USA, the uptake ranged from 38.3 to 80.0% (56).

According to one previous study conducted in India, most of the participants (47.1%) took the COVID-19 vaccine based on the advice from a doctor. The major factor for not taking the COVID-19 vaccine was hesitancy or refusal (77%), with the two most common reasons that

were reported to affect vaccination were fear of side-effects or afraid that the vaccine might aggravate their disease condition or therapy (38%), and lack of information (26.7%) (49).

One study conducted among adults with a chronic medical condition, in Gondar Comprehensive Specialized Hospital (GCSH), Ethiopia, reported that having health insurance, good living status, being confident with the country's health care system, having a good knowledge about COVID-19 were the major factors associated with COVID-19 vaccination (57).

2.3. The willingness for COVID-19 vaccination

Though vaccines against COVID-19 are available or soon ready for public use, the success of immunization programs, which aimed to increase vaccine coverage of the targeted population and provide a better public health effect, would largely rely on the public attitude and perception on willingness for vaccination. The promotion strategies by governments and other concerned bodies should be based on the public willingness for vaccination, so as to ensure the effective and equitable distribution of COVID-19 vaccines at least for high risk groups (58, 59).

Some studies concerning on the willingness for COVID-19 vaccinations have been conducted in different countries in the world and varied from one area to another. According to one global report, on the willingness for COVID-19 vaccination for available vaccines was (80 to 90%) in China, Brazil and South Africa, compared to (50-60%) in Russia, Poland and France (54, 60). Another similar study conducted on vaccine hesitancy in the world also reported that the willingness for vaccination was not equally distributed. That is, a high willingness for COVID-19 vaccination was reported in Ecuador (97.0%), Malaysia (94.3%), Indonesia (93.3%), China (91.3%), France (58.9%), US (56.9%), Poland (56.3%), Russia (54.9%) and Italy (53.7%). However, very low willingness for COVID-19 vaccination was found in Jordan (28.4%) and Kuwait (23.6%). Very low Willingness for COVID-19 vaccination was also reported in the Middle East and African countries (16). This could represent a major problem in the global efforts to control the current COVID-19 pandemic.

A study conducted on Willingness for COVID-19 vaccination among the elderly and chronic disease in China reported that the acceptance was 79.08% (61). Another similar study conducted

between March 2021 and May 2021 among patients with chronic disease in mainland China reported that the willingness to get vaccine was 70.6% (62).

A study conducted from the total 709 Saudi Arabian DM patients, 36.2% were willing to take the vaccine (63). Another study done between March and April 2021 among chronic patients in Uganda reported that 70.1% participants were willing to accept the COVID-19 vaccine (64).

Some studies conducted in Ethiopia among different groups and reported a variable COVID-19 vaccine acceptance. According to a study conducted in West Guji zone, Ethiopia, the acceptance among patients with chronic disease was 39.5% (65). A study conducted in DCSH among chronic patients in 2021 also reported 59.4% COVID-19 vaccine acceptance (8). In a recently published study in GCSH among adults with chronic medical condition, the intention to get vaccine was 63.8% (57). A similar study done among adult chronic patients in GCSH also reported that the willingness to get COVID-19 vaccine was 54.6% (66).

2.4. Factors associated with the willingness for COVID-19 vaccination

The willingness for COVID-19 vaccination had been associated with socioeconomic and demographic patterns (67). Exposure to misinformation about COVID-19 (68) and public concerns over the safety of vaccines contributed to the observed declines in the willingness for vaccination. Therefore, measures need to address public acceptability, trust and concern over the safety and benefit for approved vaccines (69).

According to a study conducted among the elderly and chronic patients in China, the main reasons for vaccine hesitancy were concern for vaccine safety or its effectiveness, low perceived infection risk and waiting for others to be vaccinated. On the other hand, perception for vaccination importance, vaccine confidence, trust in HCWs, perceived high infection risk were the factors that are associated with increased willingness for COVID-19 vaccination (61).

A study conducted among all adults in USA also reported higher willingness for vaccination among males, older adults age ≥ 55 years, and college and/or graduate degree holders (70).

Another similar study conducted in Malaysia, by 2020, hesitance was caused by concerns regarding side effects, safety, lack of information, effectiveness, religious, and cultural factors related to the COVID-19 vaccine (71).

A similar study conducted in Russia reported that the willingness for vaccination is increased when the vaccine was stated or proven safe and effective. Furthermore, being male, low monthly income, positive trust in the healthcare system, believe that vaccination helps reduce the risk of virus infection and disease complications have been considered to increase willingness for vaccination (5).

According to a study conducted among patients with chronic disease in West Guji zone, Ethiopia, age ≥ 40 years, urban residence, having upper respiratory tract infection, previous COVID-19 infection, having health insurance, good knowledge and favorable attitude towards the vaccine were the factors associated with The willingness for COVID-19 vaccination (65).

A study done in Dessie, Ethiopia, also reported that knowing any one diagnosed with COVID-19, having health insurance, knowledge and attitude towards the COVID-19 vaccine were the factors associated with The willingness for COVID-19 vaccination (8).

A similar study conducted among adult chronic patients in Gondar also reported that individuals lost their family members or friends due to COVID-19, having good knowledge, favorable attitude towards COVID-19 vaccine, perceived threat of COVID-19 infection and perceived benefit of the COVID-19 vaccine were the major factors that increase the willingness for COVID-19 vaccination (66).

Although some studies had been conducted in some parts of the world especially in high income countries, there was insufficient epidemiological data in low income countries including Ethiopia on COVID-19 vaccination and the willingness for vaccination. There for, the aim of this study was to assess these gaps and provide an input for the responsible bodies.

3. Conceptual-Framework

The conceptual framework shown below is adapted after reviewing different literatures (5, 8, 37, 42, 54). This conceptual framework showed the effect of independent variables (sociodemographic variables, Chronic disease condition, knowledge, attitude and concerns on vaccination and acceptance) on the dependent variables (vaccination and willingness) (figure 1).

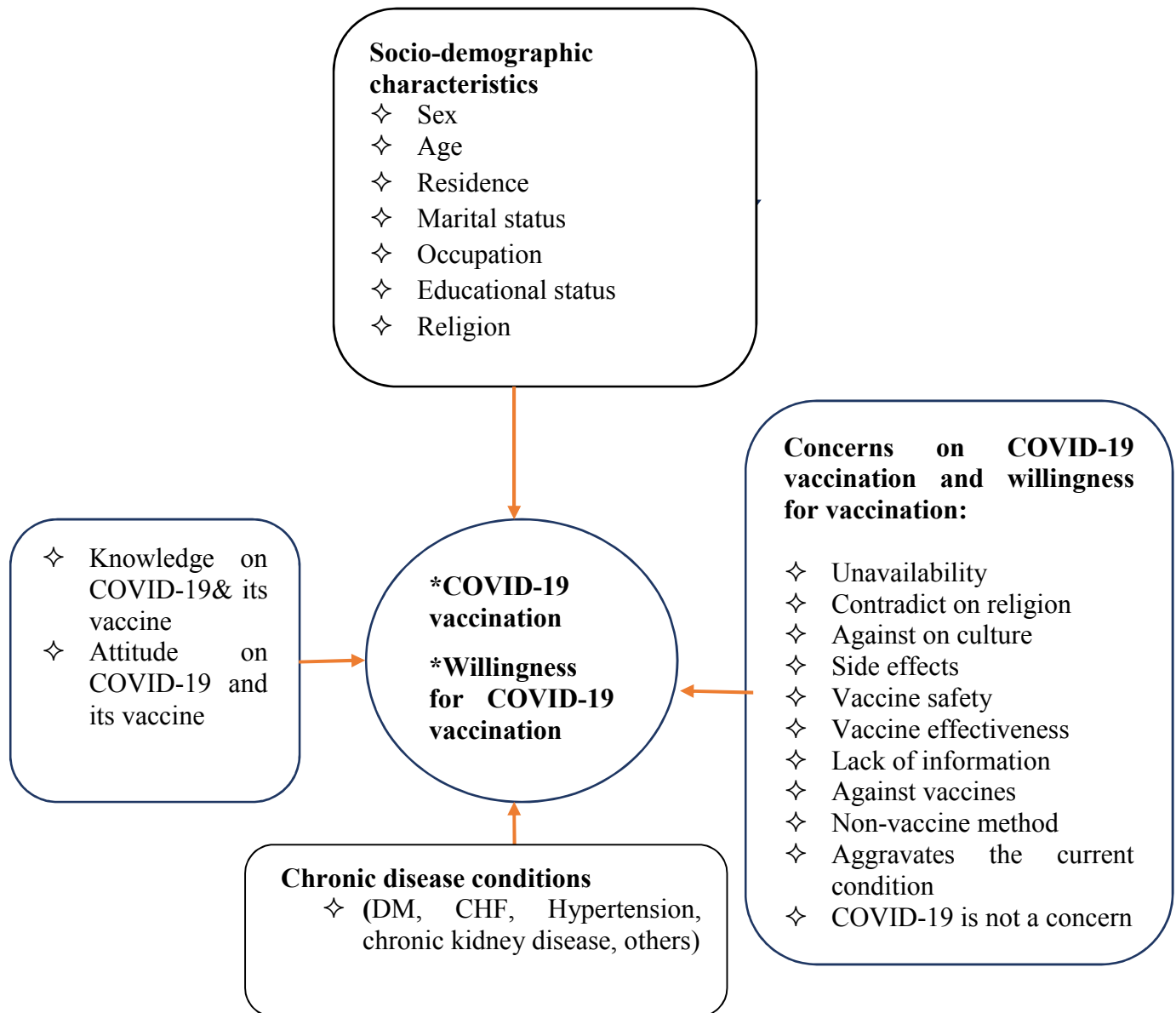


Figure 1. Conceptual framework of a study on COVID-19 vaccination, willingness for vaccination and associated factors among patients attending chronic follow up in the referral hospitals of Bahir Dar, Ethiopia, May to June 2022.

4. Research Objectives

4.1. General objective

To assess COVID-19 vaccination, willingness for vaccination and associated factors among patients attending chronic follow up in the referral hospitals, Bahir Dar, Ethiopia, 2022.

4.2. Specific objectives

To determine COVID-19 vaccination among patients attending chronic follow up in the referral hospitals of Bahir Dar, Ethiopia, 2022

To determine the willingness for COVID-19 vaccination among patients attending chronic follow up in the referral hospitals of Bahir Dar, Ethiopia, 2022

To identify factors associated with COVID-19 vaccination among patients attending chronic follow up in the referral hospitals of Bahir Dar, Ethiopia, 2022

To identify factors associated with the willingness for COVID-19 vaccination among patients attending chronic follow up of the referral hospitals, Bahir Dar, Ethiopia, 2022

5. Methods and Materials

5.1. Study design and period

Hospital based cross-sectional study design was conducted from May 09 to June 09/2022

5.2. Study area

The study was conducted at the two referral hospitals in Bahir Dar, Ethiopia: Felege Hiwot Comprehensive Specialized Hospital (FHCSH) and Tibebe-Ghion Comprehensive Specialized Hospital (TGCSH). FHCSH is the largest referral hospital in the Amhara National Regional State, whereas TGCSH is a teaching hospital affiliated with Bahir Dar University College of Medicine and Health Sciences. Each hospital serves for more than 7 million people in Bahir Dar and the neighboring areas. About 700 patients attending chronic follow up (including those with CHF, hypertension, DM, and other conditions) referred from various health facilities in Bahir Dar city administration and adjacent zones are served in each hospital per month.

5.3. Population

5.3.1. Source population

All patients attending chronic follow up in the two referral hospitals of Bahir Dar city administration.

5.3.2. Study population

All patients attending chronic follow up in the two referral hospitals of Bahir Dar that was served during the study period and fulfill the inclusion criteria.

5.4. Eligibility Criteria

5.4.1. Inclusion criteria

All patients with chronic diseases who were volunteer to participate were included in the study.

5.4.2. Exclusion criteria

Patients with chronic diseases under the age of 18 and those patients who were unable to respond due to severe illness were excluded from the study.

5.5. Study Variables

5.5.1. Dependent Variables

- ✧ COVID-19 vaccination
- ✧ Willingness for COVID-19 vaccination

5.5.2. Independent Variables

- ✚ Socio-demographic variables: age, sex, residence, marital status, occupation, education level, religion, ethnicity, health insurance,
- ✚ Reasons or concerns for vaccination: unavailability of vaccine, absence during the vaccination campaign, fear of side effects, vaccine safety, fear that the vaccine may aggravate the disease condition or affect treatment, doubt on its effectiveness, belief on culture or religion, lack of information, misinformation, against vaccines.
- ✚ Reasons or concerns for the willingness of vaccination: Fear of infection due to vaccine, fear of side effects, vaccine safety, fear that aggravate disease condition and affect treatment, doubt on its effectiveness, contradict culture or religion, against vaccines in general, COVID-19 is not a serious concern, non-vaccine preventive mechanisms are enough and misinformation.
- ✚ Knowledge and attitude related with COVID-19 and its vaccine
- ✚ Chronic disease condition: Hypertension, DM, CHF, kidney problem, others

5.6. Operational definitions

Vaccination: is defined as a measure of the estimated percentage of people in a sample or population who received a COVID-19 vaccine or vaccines (72). Hence for vaccination, the respondents were asked if they had taken or not taken a COVID-19 vaccine before with a “Yes” “No” “question that is “Yes (for taking)” and “No (for not taking)”. Reasons for not vaccination at the time of vaccine delivery were evaluated by using 9 questions modality.

Willingness for vaccination: was considered as the intention to receive the available COVID-19 vaccines. Participants were asked to assess their willingness for vaccination using a one-item question, 'If a vaccine against COVID-19 is available will you take it? There were a dichotomized response options including "Yes" and "No". Based on this, "Yes" was considered as willingness and "No" as hesitant or refusal) (72). In addition to this if the answer is "No", questions comprising 10 items were considered to assess reasons or concerns of refusal for available vaccines (8).

Chronic disease condition: All individuals of any medical illness irrespective of the duration of the follow up available during the study period were considered

Knowledge: Ten items were used to assess respondents' knowledge about the COVID-19 and its vaccine. Those who correctly answered the question (who said "Yes" had received one point, while incorrect response (who said "No" were given "0" values), and those who said I do not know were given "-1" values. Respondents who scored 70% and above were taken as having good knowledge while those who scored less than 70% was considered as having poor knowledge towards the COVID-19 and its vaccine (8, 73).

Attitude: Ten items were used to assess the respondents' attitude on the COVID-19 vaccine. Those who agreed were receive 1 point, neutral 0 points, and disagreed got -1 point. The respondents' attitudes with a cutoff point greater than or equal to 70% were considered as a favorable attitude while less than 70% was taken as having an unfavorable attitude towards the COVID-19 vaccine (8, 73).

5.7. Sample size determination

The sample size for the first two objectives that is for vaccination and willingness for vaccination was calculated using a formula for single population proportion considering the following assumptions. n = sample size, confidence level = 95%, critical value ($Z_{\alpha/2}$) = 1.96, degree of precision (d) = 0.05. The proportion (p) was taken 0.05 as no previous study had been conducted on COVID-19 vaccination among chronic follow up patients. However, for willingness to vaccination, the value of p was taken as 0.59 from the previous study (8). For the associated

factors the sample size was calculated from previously available data (8) using epi info software (Table 1).

$$n = \frac{Z^2 P(1-P)}{d^2}$$

1. For vaccination: $\frac{(1.96)^2 * 0.5(1-0.5)}{(0.05)^2} = 384$

2. For willingness to vaccination: $\frac{(1.96)^2 * 0.59(1-0.59)}{(0.05)^2} = 372$

Table 1. Epi info software-based sample size analysis for the study conducted on COVID-19 vaccination, willingness for vaccination and associated factors among patients attending chronic follow up in the referral hospitals of Bahir Dar, Ethiopia, from May 09 to June 09/2022

R No/ /	Factors	CI	Po wer	Ratio (un exposed/exp osed)	%Out- come in non- exposed	Risk ratio	AOR	%Out- come in exposed	Samp le size
1	Know a person diagnosed with COVID-19	95%	80	1	54.37	1.375	2.482	74.7	174
2	Knowledge	95%	80	1	25.8	2.73	6.89	70.6	40
3	Attitude	95%	80	1	20.33	3.26	7.725	66.3	38

To increase the precision of our data, we considered the one with large sample size observed from all the above calculations. Hence the calculated sample size for this study was 384. By increasing a 10% non-response rate, the total sample size for this study was **423**.

5.8. Sampling technique

A systematic random sampling technique was employed to select study participants from those patients attending chronic follow up in each hospital during the study period. The sampling frame was taken from the lists of patients attending chronic follow up in the average monthly record (1392). The sampling fraction (K) was analyzed by dividing the sampling frame to the allocated sample size. That is, $1392/423 = 3.29$. Hence based on this calculation the value of K was considered as 3, and the sample was collected in every 3 patients attending chronic follow up in both referral hospitals until we achieved the sample size. The first study participant was selected by lottery method among the list from one to three. The next study participants were identified systematically in every 3rd interval until the required sample size was achieved.

5.9. Data collection tool and procedure

The data were collected using pretested questionnaire adapted from the previous relevant literatures (74). The questionnaire was prepared in English language, translated to the local language (Amharic) and was re-translated back to English by language experts (a PhD holder and Assistant professor in language) to ensure consistency. The questionnaire consisted different sections that covered socio demographic characteristics, questions related to vaccination and willingness for vaccination, knowledge, attitude and chronic disease condition. Reasons related with previously un-vaccination and COVID-19 vaccine refusal were also included in the questionnaire. The data was collected by 2 nurses in each hospital under the supervision of one MSc holder. The data was obtained through face-to-face interviews.

5.10. Data quality assurance

Before starting the real data collection, both data collectors and supervisors were trained by the principal investigator for one day on the objectives of the study, the content of the questionnaire, ethical issues, and methods of data collection. A pretest was also conducted on the 5% of the sample size at Debre Tabor Comprehensive Specialized Hospital. Based on the pretest evaluation, adjustment was done on the tool. The validity of the questionnaire was assessed by experts, and the experts agree that the tool was a valid measure of the concept being measured. The reliability of the questionnaire was also assessed using the Cronbach alpha test, giving a value of 0.76. The

principal investigator and supervisors were actively involved in the supervision and monitoring of the data collection. The completed questionnaire was checked on daily basis.

5.11. Data processing and analysis

During the data collection, the questionnaire was checked for its completeness. Unrecorded values or responses were manually cleaned up. Data was entered to the epi-data software version 4.6 and exported to SPSS version 23 for analysis. Descriptive analysis was done first to find the frequencies and percentages. Binary logistic regression analysis using crude odds ratio (COR) was performed to assess the association between determinants and outcome variables. Those variables with p-value <0.25 were entered to the multi variable binary logistic regression with AOR that was performed independently for each of the two out-come variables to adjust the confounders and assess the association between determinants and outcome variables. Variables having p-value less than 0.05 at the 95% confidence interval (CI) were considered as having a significance association for both COVID-19 vaccination and willingness for vaccination. Furthermore, model fitness was checked using the Hosmer and Lemeshow test. The findings were summarized and presented in tables and figures.

5.12. Ethical consideration

Ethical clearance was obtained on April 28/2022 from an ethical review board of Bahir Dar University, College of Medicine and Health Sciences. The permission letter was obtained from the ethical review board and provided to each of the selected referral hospitals. During the data collection time, the aim of the study was explained and informed consent was obtained from the study participants. There was no invasive procedure performed to conduct this study, and had no significant risk on the study participants. Participants was encouraged to feel free and guaranteed that their responses were kept private. The participants who were willing and sign the informed consent were interviewed. Confidentiality of the information was assured by coding system and used only for the study purpose.

6. Results

6.1. Socio-demographic characteristics

A total of 400 patients attending chronic follow up (with a 95% response rate) from the two comprehensive specialized hospitals were participated in this study.

The mean age of the study participants was 53.5 years (with the standard deviation of 17.3). Most of the study participants, 210 (52.5%) were from FHCSH. The majority of the study participants were female, 226 (56.5%). More than half, 205 (51.3%) of the participants were unable to read and write. Furthermore, most of the study participants were married, 297 (74.3%), Orthodox Christians, 325 (81.3%), and have Amhara ethnicity, 397 (99.2%). Majority, 166 (41.5%) of the participants were farmers. According to the medical illness analysis, most were diagnosed with hypertension (26.2%), which was followed by DM (18.2%). The detail description of the sociodemographic characteristics has been shown in Table 2.

Table 2: Socio-demographic characteristics of the study participants among the patients attending chronic follow up in the referral hospitals of Bahir Dar, Ethiopia, from May to June 2022.

Socio-demographic variables		Frequency	%
Facility/institution/	FHCSH	210	52.5
	TGCSH	190	47.5
Age in years	18-25	32	8%
	26-33	38	9.5%
	34-41	43	10.75%
	42-49	45	11.25%
	50-57	54	13.5%
	58-65	65	16.25%
	66-73	66	16.5%
	>73	57	14.25%
Sex	Male	174	43.5
	Female	226	56.5
Educational	Unable to read and write	205	51.3

background	Read and write only	47	11.8
	Primary education	56	14
	Secondary education	34	8.5
	College/University	58	14.5
Residence	Urban	196	49
	Rural	204	51
Marital status	Single	59	14.8
	Married	297	74.3
	Divorced	26	6.5
	Widowed	18	4.5
Religion	Orthodox Christian	325	81.3
	Muslim	71	17.8
	Protestant	4	1.0
Occupation	Farmer	166	41.5
	Merchant	60	15
	Housewife	83	20.8
	Government employee	56	14
	NGO	34	8.7
Ethnicity	Amhara	397	99.2
	Tigray	3	0.8
Chronic disease condition	Hypertension	105	26.2
	DM	73	18.2
	CHF	59	14.8
	Kidney problem	59	14.8
	Both DM& hypertension	55	13.8
	Respiratory problem	49	12.2

More than half, 223 (55.7%; 95%CI: 50.7-60.7%) of the respondents had good knowledge regarding COVID-19 and its vaccine. The majority, 338 (84.5%) of our study participants had information regarding the disease and its vaccine. From those who had information, most, 143 (42.3%) considered television and radio as the trusted source of information. Most, 270 (67.5%) and 295 (73.75%) of the respondents knew the transmission and the symptoms associated with COVID-19, respectively. The majority of participants, 300 (75%) knew that going in public crowded place is a risk. Similarly, most, 265 (66.25 %) knew that wearing mask is necessary even after vaccination. Furthermore, most 261 (65.2%) knew that chronic patients are among priority groups for the vaccine. Seventy-eight percent of the study participants also knew the availability of COVID-19 vaccine (Table 3).

Table 3: Participants knowledge on COVID-19 and its vaccine among the patients attending chronic follow up in the referral hospitals of Bahir Dar, Ethiopia, from May to June 2022.

Variables/items used to assess knowledge		Number (%)
Have information on COVID-19& its vaccine	No	62 (15.5)
	Yes	338 (84.5)
The source of information for those having information	Social media	39 (11.5)
	Television and radio	143 (42.3)
	Friends and families	50 (14.8)
	Health care workers	106 (31.4)
The COVID-19 transmitted via respiratory droplets of infected individuals	I do not know	55 (13.75)
	No	75 (18.75)
	Yes	270 (67.5)
The main clinical symptoms of COVID-19 are fever, fatigue, cough, and breathing problem	I do not know	40 (10)
	No	65 (16.25)
	Yes	295 (73.75)
Chronic patients including you are among the high priority groups for the vaccine	I do not know	13 (3.3)
	No	126 (31.5)
	Yes	261(65.2)
There is a vaccine for COVID-19	I do not know	26 (6.5)

	No	62 (15.5)
	Yes	312 (78)
The vaccine is provided for free in Ethiopia	I do not know	39 (9.7)
	No	69 (17.3)
	Yes	292 (73)
The provision of the vaccine is based on voluntary	I do not know	0 (0)
	No	0 (0)
	Yes	400 (100)
To prevent COVID-19 infection, individuals should avoid going to crowded places	I do not know	56 (14)
	No	44 (11)
	Yes	300 (75)
Vaccinated individuals should wear mask	I do not know	40 (10)
	No	95(23.75)
	Yes	265 (66.25)
Over all knowledge status	Good	223 (55.7)
	Poor	177 (44.3)

Most, 272 (68%; 95%CI: 63.2-72.5%) of the respondents had a favorable attitude towards the COVID-19 and its vaccine. More specifically, the majority, 291 (72.8%) of our respondents agreed that they are susceptible for COVID-19. Similarly, most of our respondents 316 (79%) and 306 (76.5%) agreed that the vaccine is essential for them and should be given to all, respectively. Most of the respondents, 245 (61.25%) agreed that vaccine provide long-term immunity and the vaccine can prevent complications of the disease, 250 (62.5%). The majority, 295 (73.7%) and 321(80.2%) of the respondents agreed that COVID-19 vaccine does not contradict or affect their religion and culture, respectively (Table 4).

Table 4: Attitude towards the COVID-19 vaccine among patients attending chronic follow up in the referral hospitals of Bahir Dar, Ethiopia, from May to June 2022

Variables/items used to assess attitude	Disagree	Neutral	Agree
	Number (%)	Number (%)	Number (%)
You believe that you are susceptible for COVID-19	47 (11.7%)	62 (15.5)	291 (72.8)
You think that COVID-19 can be prevented by the vaccine	14 (3.5)	60 (15)	326 (81.5)
The vaccine will help to provide long-term immunity	100 (25)	55 (13.75)	245 (61.25)
Vaccination will ease complications of the disease	56 (14)	94 (23.5)	250 (62.5)
COVID-19 vaccine is essential for you	16 (4)	68 (17)	316 (79)
You believe that COVID-19 vaccine should be given to all	19 (4.8)	75 (18.8)	306 (76.5)
COVID-19 vaccine does not affect my religion	41 (10.3)	64 (16)	295 (73.7)
COVID-19 vaccine does not affect my culture	14 (3.5)	65 (16.3)	321 (80.2)
You believe that COVID-19 vaccine saves your money and time	15 (3.8)	83 (20.7)	302 (75.5)
You believe that COVID-19 vaccine is the primary solution to prevent COVID-19	17 (4.3)	62 (15.5)	321 (80.3)
Attitude status	Unfavorable attitude	128	32%
	Favorable attitude	272	68%

6.2. Corona virus disease-19 vaccination and associated factors

From the total (n = 400) participants assessed for COVID-19 vaccination, 46.8% (95%CI: 41.8-51.8%) had taken at least one dose of the vaccine. More specifically, 120 (30%) had been fully vaccinated while the remaining 67 (16.8%) had been partially vaccinated or they had been informed to have another dose.

According to the multi-variable logistic regression analysis, age, residence, knowledge, and attitude towards the COVID-19 and its vaccine were significantly associated with COVID-19 vaccination. The odd of COVID-19 vaccination was 2.7 (95% CI: 1.17-6.2) among the older groups (age >64 years). Respondents living in the urban area were more likely to uptake the vaccine with (AOR :3.94; 95% CI: 1.64-9.5). The probability of COVID-19 vaccination among participants with good knowledge on COVID-19 and its vaccine were 69.7% with AOR of 2.3 (95%CI: 1.18-4.5), while the probability of vaccination among respondents with favorable attitude on COVID-19 and its vaccine were 79.2% with AOR of 3.8 (95% CI: 1.8–7.9) (Table 5).

Table 5: COVID-19 vaccination and associated factors among patients attending chronic follow up in the referral hospitals of Bahir Dar, Ethiopia, from May to June 2022

Variables	COVID-19 vaccination		COR	(95% CI)	p-value	AOR	(95% CI)	p-value
	n	n						
	Yes	No						
Age in years	18-64	102	175	1		1		
	>64	85	38	3.84 (2.44-6.04)	<0.001	2.7 (1.17-6.2)		*0.019
Sex	Male	90	88	1		1		
	Female	97	125	0.25 (0.17-0.38)	<0.001	0.5 (0.24-1.06)		0.072
Educational background	Illiterate	92	113	1				
	Read and write only	21	26	0.99 (0.5-1.9)	0.9	0.57(0.18-1.81)		0.34
	Primary education	25	31	0.99 (0.55-1.9)	0.98	0.56(0.2-1.6)		0.27
	Secondary education	17	17	1.2 (0.6-2.5)	0.58	0.36(0.08-1.63)		0.18
	College and above	32	26	1.5 (0.8-1.7)	0.17	1.4 (0.24-1.3)		0.085

Residence	Rural	59	145	1		1	
	Urban	128	68	4.63 (3.03-7.06)	<0.001	3.94 (1.64-9.5)	*0.002
Marital status	Single	31	28	1			
	Married	155	142	1.01 (0.6-1.8)	0.96	0.87(0.31-2.4)	0.79
	Divorced	18	8	0.5 (0.2-1.3;)	0.16	0.3(0.05-1.63)	0.16
	Widowed	9	9	1.1 (0.4-3.2)	0.85	0.45(0.08-2.6)	0.37
Religion	Orthodox Christian	148	177	1			
	Muslim	36	35	1.23 (0.7-2.0)	0.4		
	Protestant	3	1	3.6 (0.4-35)	0.3		
Occupation	Farmer	72	94	1		1	
	Merchant	32	28	1.5 (0.83-2.7)	1.89	0.7(0.21-2.27)	0.55
	Housewife	37	46	1.05 (0.6-1.8)	0.86	0.8(0.28-3.3)	0.7
	Gov. employee	38	18	2.76 (1.5-5.2)	0.002	0.8(0.36-11.9)	0.4
	Others	8	27	0.4 (0.17-0.90)	0.028	0.34(0.07-1.61)	0.17
Ethnicity	Amhara	185	212	1			
	Tigray	2	1	2.3 (0.2-25.5)	0.5		
	No	28	59	1.8(0.97-3.3;)	0.06	2.4 (0.86-6.7)	0.095
Chronic disease condition	Hypertension	42	63	1		1	
	DM	32	41	1.17 (0.64-2.14)	0.6	1.03(0.38-2.8)	0.95
	CHF	32	27;2	1.78 (0.93-3.39)	0.08	2.23(0.83-6.0)	0.11
	Kidney problem	30	29	1.55 (0.82-2.95)	0.18	1.66(0.56-4.9)	0.36
	Both DM& hypertension	30	25	1.8 (0.93-3.48)	0.08	1.4(0.5-4.0)	0.52
	Respiratory problem	21	28	1.13 (0.57-2.24)	0.74	2.18(0.71-6.67)	0.17
Knowledge status	Poor	50	127	1		1	
	Good	137	86	4.0 (2.65 -6.2)	<0.001	2.3 (1.18-4.5)	*0.014
Attitude status	Unfavorable	35	93	1	1	1	
	Favorable	152	120	3.4 (2.13-5.3)	<0.001	3.8 (1.84-7.87)	*<0.001

Key: * showed the presence of a significant association

Respondents who did not take COVID-19 vaccine before (n=213) were assessed for their concern. Based on the assessment, the majority, 42 (19.7%) of the respondents worried that the vaccine might aggravate their current disease condition and treatment which was followed by for those who were against the COVID-19 vaccine, 29 (13.6%). (Figure 2).

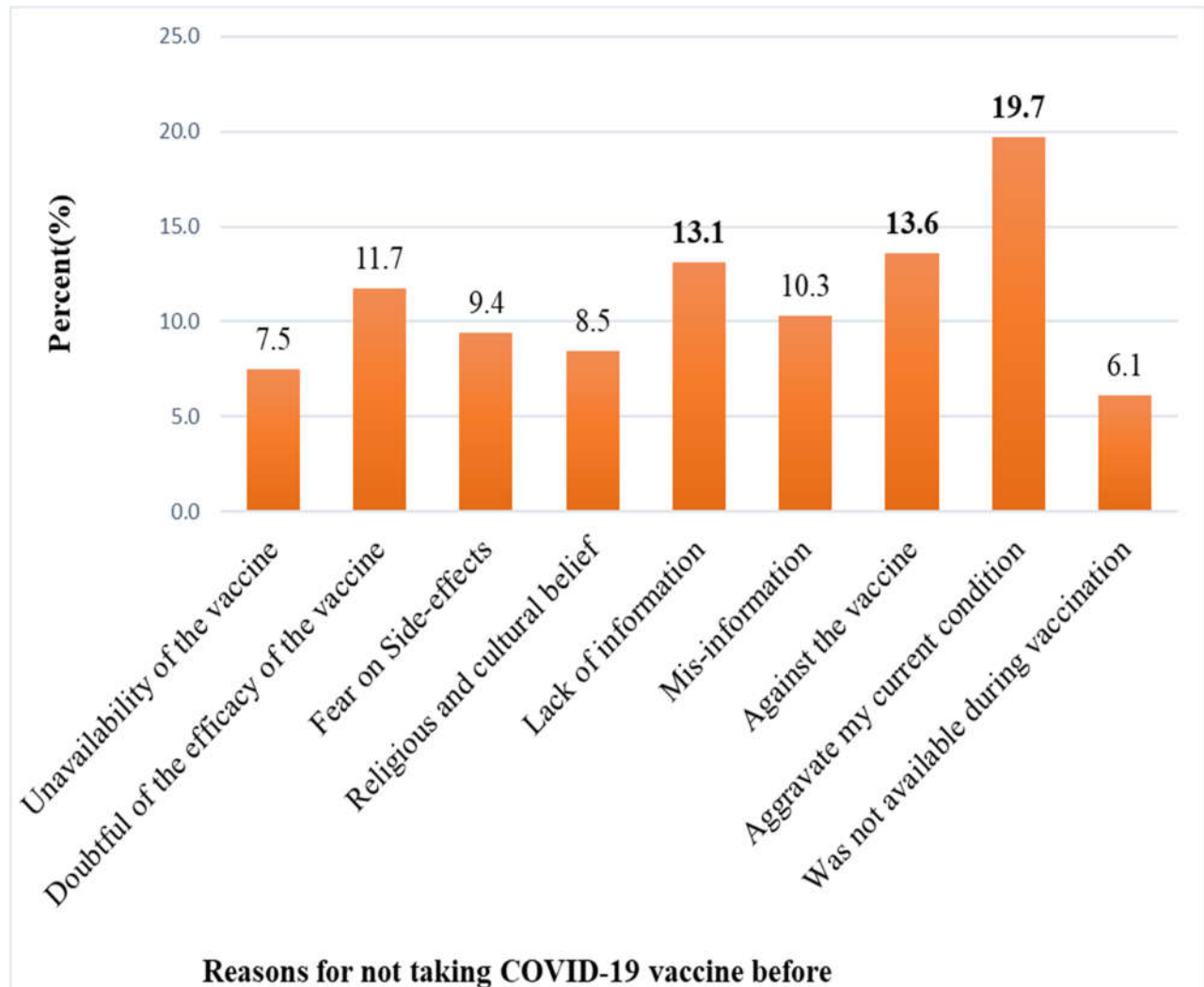


Figure 2: A bar graph showing respondents concerns or reasons for not taking COVID-19 vaccine before among patients attending chronic follow up in the referral hospitals of Bahir Dar, Ethiopia, from May to June 2022

6.3. Willingness for COVID-19 vaccination and associated factors

From the total (n = 280) participants assessed for the willingness for COVID-19 vaccination, the majority 170 (60.5%; 95%CI: 54.5-66.3%) of the respondents were willing to accept the COVID-19 vaccine if available. That is the overall percentage of respondent's vaccine refusal or hesitancy was 110 (39.5%).

According to the multi-variable binary logistic regression analysis, attitude and residence were significantly associated with the willingness for vaccination. Respondents who had favorable attitude were more likely to accept the COVID-19 vaccine with AOR 1.82 (95%CI: 1.03-3.21). Those people living in the urban area had increased vaccine refusal. That is the probability accepting COVID-19 vaccine among the urban population was 31.5% with AOR of 0.46 (95%CI: 0.22-0.92) (Table 6).

Table 6: The willingness for COVID-19 vaccination and associated factors among patients attending chronic follow up in the referral hospitals of Bahir Dar, Ethiopia, from May to June 2022

Variables	Willingness for vaccination (n=280)		COR (95% CI)	p-value	AOR (95% CI)	p-value	
	Yes	No					
Age in years	18-64	128	90	1	1		
	>64	42	20	1.5(0.82-2.71)	0.19	1.5(0.71-3.1)	0.29
Sex	Male	67	30	1			
	Female	103	80	0.6 (0.36-0.99)	0.49		
Educational background	Unable to read& write	86	54	1		1	
	Read and write only	21	12	1.12(0.51-2.5)	0.78	0.95(0.37-1.83)	0.92
	Primary education	26	15	1.11 (0.54-2.28)	0.78	1.45(0.6-3.47)	0.4
	Secondary education	18	10	1.15 (0.5-2.68)	0.74	1.24(0.39-3.96)	0.71
	College and above	19	19	0.64 (0.31-1.3)	0.22	0.34(0.08-1.5)	0.15

Residence	Rural	107	60	1		1	
	Urban	63	50	0.72 (0.44-0.8)	0.027	0.46 (0.22-0.9)	*0.043
Marital status	Single	27	18	1			
	Married	125	77	1.14(0.6-2.2)	0.69		
	Divorced	12	9	0.94(0.33-2.7)	0.91		
	Widowed	6	6	0.70(0.2-2.52)	0.59		
Religion	Orthodox Christian	94	137	1			
	Muslim	16	30	1.28(0.66-2.7)	0.47		
	Protestant	1	2	1.4(0.12-15.2)	0.8		
Occupation	Farmer	75	38	1			
	Merchant	24	16	0.78(0.37-1.64)	0.51		
	Housewife	37	27	0.71 (0.38-1.34)	0.29		
	Gov. employee	21	11	0.99 (0.44-2.77)	0.99		
	Others	13	18	0.38(0.17-0.85)	0.018	0.65(0.22-1.92)	0.43
Ethnicity	Amhara	170	109	1			
	Tigray	0	1	0.000	1		
Chronic disease condition	Hypertension	47	30	1		1	
	DM	24	25	0.63(0.31-1.3)	0.21	0.89(0.36-2.2)	0.8
	CHF	23	15	1.01(0.46-2.24)	0.98		
	Kidney problem	33	11	1.98(0.87-4.5)	0.103	1.18(0.46-3.05)	0.73
	Both DM& hypertension	24	12	1.32(0.58-3.02)	0.51		
	Respiratory problem	19	17	0.74(0.33-1.63)	0.45		
Knowledge status	Poor	89	55	1			
	Good	81	55	0.93(0.57-1.5)	0.75		
Attitude status	Unfavorable	53	51	1		1	
	Favorable	117	59	1.95(1.19-3.19)	0.008	1.82(1.03-3.21)	*0.039

Key: * showed the presence of a significant association

Out of 110 respondents who were assessed for their reason or concern of COVID-19 vaccine refusal, most, 39 (35.7%) were due to their threat that the vaccine may aggravate their current disease condition or affect their treatment which was followed by those who needed to apply non-vaccine preventable mechanisms, 17 (15.2%) (Figure 3).

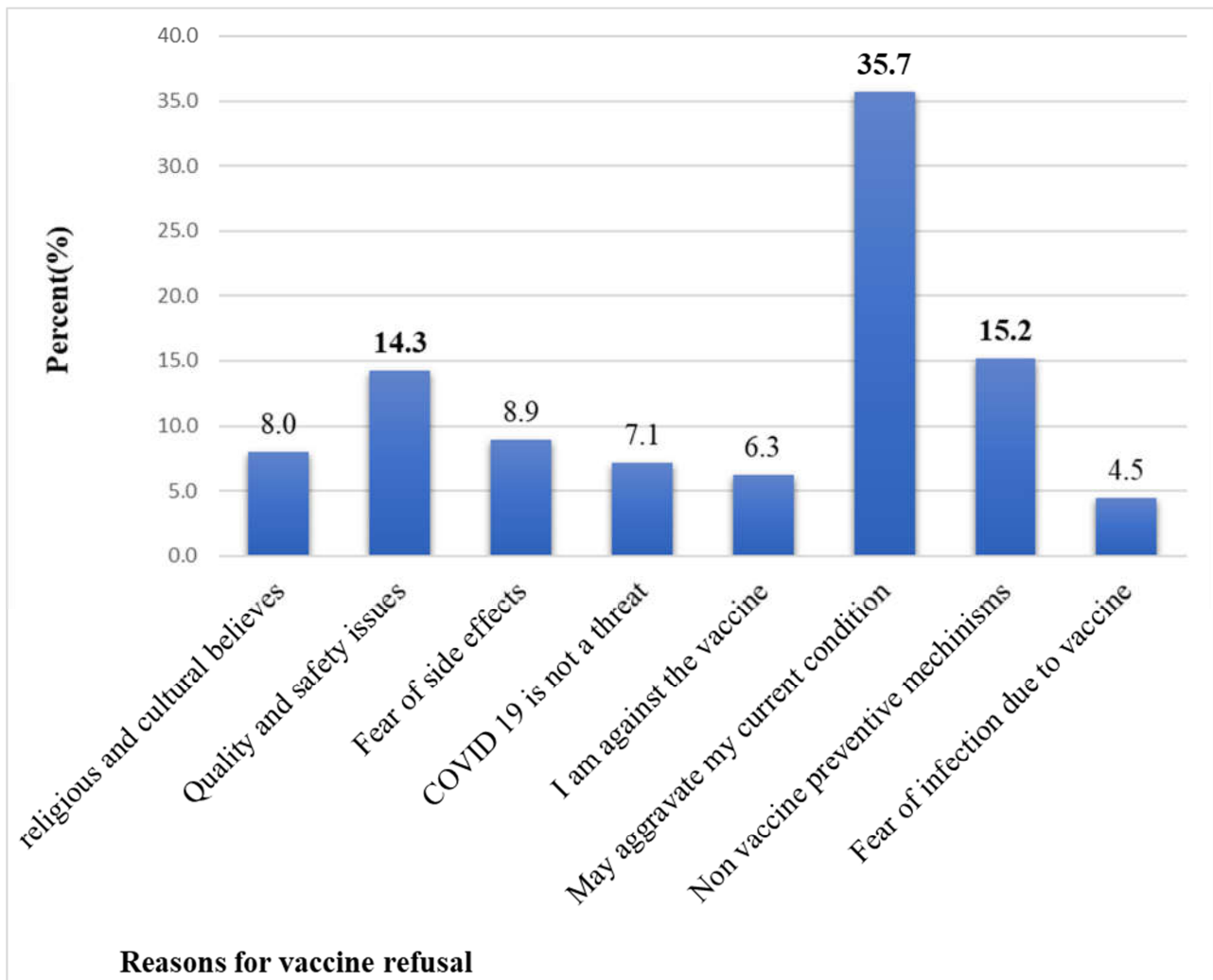


Figure 3: A bar graph showing respondents concerns or reasons of COVID-19 vaccine refusal among patients attending chronic follow up in the referral hospitals of Bahir Dar, Ethiopia, from May to June 2022

7. Discussion

A hospital-based cross-sectional study design was conducted among patients attending chronic follow up in the referral hospitals in Bahir Dar city administration from May 09–June 09/2022 to assess the overall COVID-19 vaccination, willingness for vaccination and associated factors. Our study found that from the total participants assessed for COVID-19 vaccination, 46.8% (95%CI: 41.8-51.8%) had taken at least one dose of COVID-19 vaccine, where, 120/400 (30%) had been fully vaccinated and 67/400 (16.8%) had been partially vaccinated. This implies that the vaccination was lower than what is expected by WHO to achieve the 70% vaccine coverage in the community (15, 30). Furthermore, more than 50% of our study groups, once exposed for COVID-19, might be vulnerable for increased COVID-19 associated morbidity, hospitalization and mortality (22, 27).

Our finding was higher than a previous study conducted among cancer patients in India (49), a study done among NCD patients in Malawi by 2022 (50) and among DM patients in Sudan (51). The discrepancy might be due to the difference in the time period of data collection and sociodemographic patterns of the study groups as discussed below. For example, for the study conducted in India, it only considered a specific group (only cancer patients aged 45 years and above) which might affect the outcome. The data was also collected by 2021 where the quality and safety of the vaccine was not assured, and the awareness and attitude of the people was low. The same is true for the study done in Malawi, where they considered those people from the rural area. The COVID-19 vaccination was reported lower among the rural population than the urban population (53). Our finding also supported that the vaccine coverage or uptake in the rural people was lower (20.24%) than the urban population (79.76%). This might be associated with inaccessibility of the vaccine in the rural areas or vaccine campaign was not strengthened in the rural areas. It might also be associated with lack of awareness of the rural people regarding the virus and its vaccine. In support of this, the study in Bangladesh also pointed out that the major problem or reason associated with low vaccine coverage was low access for vaccines in the rural community (53).

The odd of COVID-19 vaccination was 2.7 among the older age groups (age >64 years) as compared to the adult age groups (18 - 64 years). Respondents living in the urban area were also more likely to be vaccinated than those people living in the rural area with AOR of 3.94.

Similarly, respondents with good knowledge and favorable attitude towards COVID-19 and its vaccine were more likely to take the vaccine with AOR of 2.3 and 3.6, respectively. This implies that older people are highly threatened by the disease than the adult groups as the burden and severity was considered high in the older age groups since the emergency of the pandemic. In the case of residence, the increase uptake of COVID vaccine among the urban population might be due to increase accessibility of the vaccine, the presence of vaccine campaign, or increased awareness of the population. The same is true for participant's knowledge and attitude. Respondents who did not take COVID-19 vaccine were also assessed for their reasons or concerns for why they do not take the COVID-19 vaccine. The majority, 45 (19.7%) of the respondents worried that the vaccine might aggravate their current disease condition or treatment which was followed by those who were totally against the COVID-19 vaccine (13.6%). This indicated that, although the people had information, they either lacked awareness or misinformed. Availability and accessibility of a safe COVID-19 vaccine do not necessarily guarantee to mitigate the COVID-19 pandemic unless vaccine recipients are willing to utilize the vaccine (32, 33). The willingness for vaccination can be affected by multiple beliefs and misconceptions among different population classes (8). This is because public perceptions are largely rely on the knowledge, attitude, or acceptance for the available vaccine (58, 59). In our study, 60.5% (95%CI: 54.5-66.3%) individuals were willing to accept the vaccine if it is available with a 39.5% of vaccine refusal or hesitancy. This implies that although the people have information, either they do not understood or they had been misinformed on the effectiveness of the vaccine or its safety (8). Our finding is in agreement with the previous study conducted in DCSH (59.4%) (8) and GCSH (63.8%; 95% CI: 58.6–68.2) (57).

Our finding was higher than the study conducted among DM patients in Saudi Arabia, 36.2% (63), a study conducted among patients with NCD in rural areas of Malawi, 24% (95% CI: 12–40%) (50) and among patients with chronic disease in Guji zone, Ethiopia, 39.5% (95% CI: 35–44) (65). The disagreement might be due to the difference in the time period where the studies were conducted. As the perception regarding the quality and safety issues of the vaccine were misleading and in question during that time.

In contrast, our finding was lower than a study conducted among elderly and chronic patients in China, 79.08% (95% CI = 76.45–83.39) (61). It was also lower than another study conducted among patients with chronic diseases in mainland China, 70.6% (62). The difference might be due to the high burden of the disease in China during the time period where the pandemic was first existed. It might also be due to mandatory vaccination in China. This finding was also lower than the study done between March and April 2021 among chronic patients in Uganda (70.1%) (64). The source of this variation might be due to the study period where the burden of the pandemic was high that initiate the people to accept the vaccine. It might also due to the sociodemographic difference.

Respondents' attitude and residence were significantly associated with respondents' willingness for COVID-19 vaccination. This was in agreement with the previous study conducted in DCSH and Guji zone, Ethiopia (8, 65).

The probability of the willingness for COVID-19 vaccination was higher among individuals with favorable attitude and individuals living in the rural area. The implication is that the attitude/perception of the population matters than the knowledge to accept new things and findings. In the case of increased acceptance among the rural population, the implication is that the rural populations have high trust on the government and the health care system than the urban population.

8. Strength and limitation

This was the first study conducted to assess both COVID-19 vaccination and willingness for vaccination among patients attending chronic follow up whom they are one of the first WHO priority groups for COVID-19 vaccination. Although there were no serious issues encountered in this study, there were some participants that were totally against to give information. They rather preferred to talk their medical condition and availability of their treatment modalities. They were also preferred to talk on the importance of health insurance in the health facilities.

9. Conclusion and Recommendation

9.1. Conclusion

The overall COVID-19 vaccination and willingness for vaccination was low compared with what was estimated by WHO. Respondents' age, residence, knowledge, and attitude towards the COVID-19 vaccine were factors significantly associated with COVID-19 vaccination. On the other hand, residence, and attitude towards the COVID-19 and its vaccine were associated with vaccine willingness for vaccination. There was also a high level of misunderstanding by the study groups that the vaccine may aggravate the disease condition or affect treatment modality. The study found no significant difference in the vaccination and willingness for vaccination among respondents with different chronic disease conditions.

9.2. Recommendation

Based on the finding of this study, the following recommendations were forwarded to the respective stakeholders:

For HCWs: Health education on the effectiveness and safety of COVID-19 vaccine and the vaccine's effect or interaction on their underlining chronic disease condition and their treatment is recommended in the future. Vaccine campaign is also better to be strengthened

For community leaders and the religious leaders: Effective communication and open discussion is required to change the attitude of the community on COVID-19 vaccination.

For the Regional Health Bureau and Federal Ministry of Health: Increase the accessibility of COVID-19 vaccines especially in the rural population

For research community: To increase the representativeness of the study, community-based studies are recommended. Similarly, in order to check whether those willing people are able to take the vaccine or not, and provide a comprehensive data at the regional and national level follow up studies are recommended in the future.

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Appendixes

Annex 1: Information Sheet (English version)

Title: COVID-19 vaccination, willingness for vaccination and associated factors among patients attending chronic follow up in the referral hospitals of Bahir Dar, Ethiopia, 2022.: A cross-sectional study design

Dear participant you are being invited to take part in this research study. Please take some time to read the information presented here, which that explained the details of this research. Please ask the data collector any questions about any part of this research that you do not fully understand. (For study participants that cannot read the information, the content of the information sheet was fully read for them so that they can understand the aim of the study prior commencement). It is very important that you are fully and clearly understand what this research mean, and how you could be involved. Also, your participation is entirely voluntary and you are free to decline to participate. If you say no, this will not affect you negatively in any way whatsoever. You are also free to withdraw from the study at any time. This study is approved by the Institutional Review Board of Bahir Dar University

Purpose: The overall aim of the present study is to assess COVID-19 vaccination, willingness for vaccination and associated factors among patients attending chronic follow up in the referral hospitals of Bahir Dar, Ethiopia, 2022.

Risk and discomfort: The sampling procedure for collecting these information does not have any risk or discomfort.

Benefits and incentives: participating in this research will not have any significant individual benefit instead it will add value for the general population you live and know their status.

Confidentiality: The information that we collect from this research was kept confidential. Information about you that was collected from the study was stored in a file, which will not have your name on it, but a code number assigned to it. Which number belongs to which name will not be revealed to anyone except for the researcher and your clinician.

Right to refuse or withdraw: You have full right to refuse from participating in this research if you do not wish to do so and this will not affect your treatment or health services you get at this hospital in any way. You have also a full right to withdraw from this research at any time during data collection without losing any of your rights as a patient in the hospital. Once you confirmed withdrawal from this study, the entire data was disposed following standard operational procedures that are used by the hospital staffs.

Whom to contact

If you have any question, you can contact any of the following individuals:

Researcher: Ms. Mulu Kebede; Mobile: 0913513906

Advisors: Mr. Getenet Dessie; Mobile: 0936747438

Mr. Henok Biresaw; Mobile: 0918713075

Annex 2:

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Annex -5: - English version questionnaire

Bahir Dar University

College of Medicine and Health Sciences

Department of Adult Health Nursing

Title: COVID-19 vaccination, acceptance and associated factors among patients attending chronic follow up in the referral hospitals of Bahir Dar, Ethiopia, 2022.: A hospital based cross-sectional study

Name of institution: _____ Participant ID _____

S. No//	Socio-demographic characteristics	Possible choices to select
D1	Sex	1. Male 2. Female
D2	Age in years	_____
D3	Educational background	1. Unable to read and write 2. Read & write only 3. Primary school 4. Secondary school 5. College/University
D4	Residence	1. Urban 2. Rural
D5	Marital Status	1. Single 2. Married 3. Divorced 4. Other----- (specify)
D6	Religion	1. Orthodox Christian 2. Muslim 3. Protestant 4. Others
D7	Occupation	1. Government employee 2. Non-government employee 3. Housewife 4. Merchant 5. Farmer 6. Student 7. Other----- (specify)
D8	Ethnicity	1. Amhara 2. Tigray 3. Oromo 4. Others..... (specify)

	Chronic disease condition	
D10	Type of medical illness	<ol style="list-style-type: none"> 1. CHF 2. Hypertension 3. DM 4. Kidney problem 5. Respiratory problem
	Knowledge	Possible choices to select
K1	Do you have information on COVID-19	<ol style="list-style-type: none"> 1. Yes 2. No... (If “No”, Go to Q-K3)
K2	If yes for the above question, what is the most-trusted sources of information about the COVID-19	<ol style="list-style-type: none"> 1. Social media 2. Television and radio 3. Friends and families 4. Health care worker 5. others specify (_____)
K3	The main clinical symptoms of COVID-19 are fever, fatigue, cough, and breathing problem	<ol style="list-style-type: none"> 1. Yes 2. No 3. I do not know
K4	The COVID-19 virus spreads via respiratory droplets of infected individuals	<ol style="list-style-type: none"> 1. Yes 2. No 3. I do not know
K5	There is a vaccine for COVID-19.	<ol style="list-style-type: none"> 1. Yes 2. No 3. I do not know
K6	Chronic patients including you are among the high priority groups for the vaccine	<ol style="list-style-type: none"> 1. Yes 2. No 3. I do not know
K7	The vaccine is provided for free in Ethiopia	<ol style="list-style-type: none"> 1. Yes 2. No 3. I do not know
K8	The provision of the vaccine is based on voluntary not obligatory	<ol style="list-style-type: none"> 1. Yes 2. No 3. I do not know
K9	Vaccinated individuals should wear mask	<ol style="list-style-type: none"> 1. Yes 2. No 3. I do not know
K10	To prevent the infection by COVID-19, individuals should avoid going to crowded places	<ol style="list-style-type: none"> 1. Yes 2. No 3. I do not know
	Attitude	Possible choices to select
A1	You are susceptible to COVID-19	1. Agree 2. Neutral 3. Disagree
A2	COVID-19 can be prevented by the vaccine	1. Agree 2. Neutral 3. Disagree
A3	Do you believe that COVID-19 vaccine is essential for you	1. Agree 2. Neutral 3. Disagree

A4	The vaccine will help to provide long-term immunity	1. Agree 2. Neutral 3. Disagree
A5	Vaccination will ease complications of the disease	1. Agree 2. Neutral 3. Disagree
A6	Do you believe that covid-19 vaccine should be given to all	1. Agree 2. Neutral 3. Disagree
A7	COVID-19 vaccine will save our time and money	1. Agree 2. Neutral 3. Disagree
A8	COVID-19 vaccine is not against your culture	1. Agree 2. Neutral 3. Disagree
A9	COVID-19 vaccine does not contradict your religion	1. Agree 2. Neutral 3. Disagree
A10	COVID-19 vaccine is the primary and best solution to prevent COVID-19	1. Agree 2. Neutral 3. Disagree
COVID-19 vaccination and reasons for not taking a vaccine before		Possible choices to select
U1	Did you have taken COVID-19 vaccine?	1. Yes 2. No..... Go to Q-U4
U2	If “Yes” for the above question, did you take the vaccine voluntarily?	1. Yes 2. No
U3	If your answer for Q-U1 is yes, have you been informed to have another dose?	1. Yes 2. No
U4	If your answer for Q-U1 is “No”, what is your reasons for not taking the COVID-2019 vaccine before (choose that all apply to you)	Reasons for not taking COVID-19 vaccine before
		1. Unavailability of the vaccine
		2. Doubtful of the efficacy of the vaccine
		3. Fear on Side-effects
		4. Religion and culture concern
		5. Misinformed by another person
		6. Lack of information
		7. Aggravate my current condition
		8. Against the COVID-19 vaccine
		9. I was not there during the vaccination
	10. Others (specify _____)	

Ac1	If you do not take or partially take COVID-19 vaccine before, would you accept to take the vaccine if it is available for you?	<ol style="list-style-type: none"> 1. Yes 2. Not at all... go to Q-Ac2
Ac2	If your answer for Q-Ac1 is “not at all”, what is your reason for your hesitancy or refusal? (Choose all that apply from the right side)	Reasons for COVID-19 vaccine refusal
		1. Safety and quality issues of the vaccine
		2. I afraid the side effects
		3. I am against the vaccines in general
		4. I believe on GOD or my religion
		5. It contradicts my culture
		6. Non-vaccine preventive mechanisms are sufficient
		7. COVID-19 is not that serious concern in my area or my case
		8. Fear of infection due to vaccine
		9. Aggravate my current condition disease
		10. Misinformed by others

Key: D = demographic related questions; K = Knowledge related questions; A = Attitude related questions; U = Vaccination related questions and; Ac = Willingness for vaccination related questions

The questioners are adapted from (5, 8, 37, 42, 54).

Thank you for your participation

Annex -6: -

/Amharic Version questionnaire/

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D1		1. 2.
D2		_____
D3		1. 2. 3. 1 4. 2 5. /
D4		1. 2.
D5		1. / 2. / 3. / 4. _____
D6		1 2 3 4 _____
D7		1. / 2. / 3. 4. 5. 6. 7. _____
D8		1.

		2. 3. 4. ().....
D10	?	1. 2. 3. 4. 5. 6. -----
	-19	
K1	-19 ?	1 2. K2
K2	K1	1. 2. 3. 4. 5. -----
K3	-19	1. 2. 3.
K4	-19	1. 2. 3.
K5		1. 2. 3.
K6	-19	1. 2. 3.
K7		1. 2. 3.
K8		1. 2. 3.
K9		1. 2. 3.
K10		1. 2. 3.

A1		1. 2. 3.
A2		1. 2. 3.
A3		1. 2. 3.
A4		1. 2. 3.
A5		1. 2. 3.
A6		1. 2. 3.
A7		2. 3.
A8		1. 2. 3.
A9		1. 2. 3.
A10		1. 2. 3.

U1	-19 ?	1. 2. U4
U2	-19 / / ?	1. 2.
U3	?	1. 2.
U4	-U1 ? ()	_____ 1. 2. 3. 4. 5. 6.

		7. ;8
		8.
		9.
		10.
AC1	/ ?	1. 2. "AC2"
AC2	- "Ac1"	1. 2. 3. 4. / / 5. 6. ...) 7. 8. 9. /) 10.

- D=
U =

Ac =

K =

A =

(5, 8, 37, 42, 54).

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