MEKELLE UNIVERSITY

COLLEGE OF HEALTH SCIENCE

SCHOOL OF NURSING

COVID-19 VACCINE UPTAKE AND ASSOCIATED FACTORS AMONG PREGNANT WOMEN OF MEKELLE CITY, TIGRAY, ETHIOPIA: A MIXED STUDY DESIGN

BY: MEKONEN G/MESKEL (BScN, MSc fellow)

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Declaration

Ethical clearance was obtained from the institutional review board of Mekelle University, College of Health Science. The study was carried out after obtaining permission from selected public Health Facilities of Mekelle City. Besides, the objective of the study was briefly explained to those directors and CEOs to conduct smooth data collection. As I undersigned, this research thesis is my original work in partial fulfillment of the requirement for the degree of Master of Science in Maternity and Reproductive Health Nursing. I had also to acknowledged to my advisors, all the people and institution who gave support as well as all sources of material to work research thesis.

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This research thesis has been submitted for school of Nursing post graduate committee with my approval as university advisors.

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Approval sheet by the board of examiners

This thesis entitled "COVID-19 VACCINE UPTAKE AND ASSOCIATED FACTORS AMONG PREGNANT WOMEN OF MEKELLE CITY, TIGRAY, ETHIOPIA: A MIXED STUDY DESIGN" is conducted by Mekonen G/meskel is therefore to certify that the thesis has been accepted in partial fulfillment of the requirements for the Master's Degree in Maternity and Reproductive Health Nursing.

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Abbreviations and Acronym

AOR	Adjusted Odds Ratio
ARDS	Acute Respiratory Distress Syndrome
CEO	Chief Executive Officer
CI	Confidence Interval
COR	Crude Odds Ratio
COVID-19	Corona Virus Disease 19
DIC	Disseminated Intravascular Coagulopathy
ETB	Ethiopian Birr
FGD	Focused Group Discussion
HC	Health Center
HF	Health Facility
IDP	Internally Displaced population
MERS	Middle East Respiratory Syndrome
SARS-COV-2	Severe Acute Respiratory Syndrome Corona Virus 2
TRHB	Tigray Regional Health Beauro
USA	United States of America
WHO	World Health Organization

Abstract

Background: Adhering to the prevention practices for COVID-19 is paramount than treating the patients. The World Health Organization recommends different prevention and control measures for COVID-19. This study set out to assess COVID-19 vaccine uptake and associated factors among pregnant women in Tigray.

Objective: To assess COVID-19 vaccine uptake and associated factors among pregnant women attending antenatal care in selected public health facilities of Mekelle, Tigray, Ethiopia 2024.

Methodology: An institutional-based cross-sectional study design supplemented by a qualitative method was conducted among 228 pregnant women from December to February 2025. A systematic random sampling technique was used to select study participants for the quantitative study, and purposive sampling was used for the qualitative part. Data were collected by trained nurses and midwives using a structured questionnaire. The quantitative data were analyzed using IBM SPSS 27. The qualitative data were analyzed using thematic analysis. A binary logistic regression model was used to assess the association between the dependent and independent variables. Statistical significance was declared at a P value of < 0.05.

Result: The mean age of the respondents was 30.3 years, and 54.2% of them were multigravida. Good knowledge and positive attitude about the COVID-19 vaccine were found in 57.5% and 58.9% of the women, respectively. The magnitude of COVID-19 vaccine uptake was 14.5%, and all who took the vaccine reside in urban areas. The odds of uptake were about 6 times higher among pregnant women who attended formal education up to college/university (AOR=5.7, 95% CI: 1.6 to 21.2). The odds of uptake were 4-fold higher among pregnant women who had a history of contact with a confirmed COVID-19 case (AOR=4.1, 95% CI: 1.3 to 13.0). The odds of uptake were 3.6 times higher among pregnant women who had a positive attitude towards the COVID-19 vaccine (AOR=3.6, 95% CI: 1.3 to 9.8).

Conclusion and recommendation: This study found that COVID-19 vaccine uptake among pregnant women in Mekelle was low. Hence, health education and discussion about the benefits and safety of COVID-19 vaccination, ensuring that COVID-19 vaccines are readily available and accessible, and conducting outreach COVID-19

vaccination programs can improve uptake of COVID-19 vaccine among pregnant women.
Keywords: *COVID-19 vaccine uptake; pregnant women; attitude; Health Facilities, Antenatal care, factor*

1. Introduction

1.1. Background

Coronavirus disease 2019 (COVID-19) is an infectious disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), a newly emergent coronavirus, that was first recognized in Wuhan, China, in December 2019 (1). The World Health Organization (WHO) used the term SARS-CoV-2 to refer to a coronavirus that causes COVID-19 (2). The coronavirus belongs to a family of viruses that may cause various symptoms such as pneumonia, fever, breathing difficulty, and lung infection (3).

Previous outbreaks of coronaviruses were recorded in history as severe acute respiratory syndrome (SARS)-CoV and the Middle East respiratory syndrome (MERS)-COV (4). The new coronavirus, identified as the cause of the acute respiratory disease since the end of December 2019, later labeled as SARS-CoV2 by WHO is a different strain of coronavirus from SARS and MERS coronaviruses. The difference is genetic makeup, clinical presentations, case fatality, and the rate of spread across the world. SARS-CoV2 becomes the newest virus to cause global health fear (5).

Although most people with COVID-19 have mild to moderate symptoms, the disease can cause severe medical complications and lead to death in some people (6). The spectrum of this disease ranges from mild fatigue, myalgia, fever, dry cough, and dyspnea to severe manifestations like acute respiratory distress syndrome (ARDS), septic shock, disseminated intravascular coagulation (DIC), and acute renal failure. The SARS-CoV-2 infection has more severe manifestations in elderly adult males with chronic comorbidities like chronic lung diseases, obesity (body mass index >40), liver disease, chronic kidney disease, diabetes mellitus, under immunosuppressant drugs which can weaken the immune functions of these patients (7,8).

Human-to-human transmission of SARS-CoV-2 occurs mainly between family members, including relatives and friends who intimate contact with patients or incubation carriers (9). The main route of transmission are close contact (about 6 feet or two arm lengths)

with a person who has COVID-19, respiratory droplets when an infected person coughs, sneezes, or talks and touching a surface or object that has the virus on it, and then by touching mouth, nose, or eyes (10).

Currently, there is a vaccine but there is presently no specific antiviral drug regime used to treat critically ill patients. The management of patients mainly focuses on the provision of supportive care, e.g., oxygenation, ventilation, and fluid management (11).

The effectiveness of vaccination campaigns against the coronavirus 2019 disease (COVID-19) is not solely dependent on vaccine safety and efficacy; public and healthcare worker acceptance of vaccines appears to play a critical role in the pandemic's successful containment (12).

1.2. Statement of the problem

Globally, COVID-19 remains a major infectious disease, causing significant morbidity and mortality, particularly in developing countries. Fighting COVID-19 pandemic requires quick immunizing the entire world's population before the new strains emerge and spread that can supersede the immunity provided by vaccination. This is because the severe acute respiratory syndrome coronavirus 2 (SARS-COV-2) this is causing the outbreak has caused an unprecedented global crisis with disastrous health and socioeconomic effects in every country. Public trust is essential for the effective execution of global immunization programs, especially now that COVID-19 vaccines have been developed and certified (13,14).

The COVID-19 pandemic is still having a significant impact since more than 30 million illnesses and one million fatalities have been documented worldwide. Severe acute respiratory syndrome coronavirus (SARS-COV) 2 infections can range in severity from asymptomatic infection to deadly disease. Even though estimates of the number of people who have "recovered" from SARS-COV-2 infection presently however around 20 million, physicians are encountering and reading about patients who have severe symptoms and lasting end-organ failure following the virus. Since COVID-19 is a novel virus, there are still numerous unanswered questions regarding the clinical course, chief among them being whether there will be any long-term health repercussions (15,16).

Pregnant women may be more susceptible to experiencing more severe symptoms following a respiratory virus infection due to the physiological changes that take place in the immune and cardiovascular systems during pregnancy. There has been evidence connecting both MERS-COV and SARS-COV to increased rates of case fatalities and more serious pregnancy-related problems (17,18).

Due to a lack of information regarding COVID-19 infection during pregnancy, it is now impossible to rule out an increasing risk of miscarriage in pregnant women with COVID-19, given the high rate of miscarriage that has been documented in SARS cases it makes sense to monitor pregnant COVID-19 women for fetal development limitation,

since it has been seen in most SARS related continuing pregnancies (19).

Pregnant women are currently considered to be potentially sensitive to severe SARS-COV-2 infection because of clinical experience with pregnancies affected by infection with other coronaviruses, such as Middle Eastern Respiratory Syndrome and Severe Acute Respiratory Syndrome (SARS). The immune system, respiratory system, cardiovascular system, and coagulation issues are all significantly impacted by physiological changes that occur during pregnancy. These changes may have a beneficial or detrimental impact on the course of COVID-19 disease (16,20).

During the global epidemic, technologically advanced countries focused on the impact of COVID-19 on their populations. Meanwhile, the disease is probably growing quickly in poor and war-affected countries, where it can devastate these weak states. This is guaranteed in Libya, Syria, and Yemen, all of which have extensive destruction of their health care system, as well as a great deal of death, injury, and population relocation, as a result of their protracted and devastating armed conflict these nations were therefore unprepared for COVID-19 (21,22).

For the past three years, the Tigray region has been experiencing conflict and displacement; as a result, the population has not had access to health services, particularly the COVID-19 vaccine. Pregnant women in particular are now more susceptible to infections and communicable diseases as a result of this. Notwithstanding these efforts and strategies, COVID-19 remains a significant global health concern. In Tigray, not a single study has been conducted to date about COVID-19 vaccine uptake and its barriers among pregnant women. Thus, the purpose of this study is to evaluate the COVID-19 immunization uptake and its barriers among pregnant women attending antenatal care service in Ayder and Aksum referral hospitals, Tigray, Ethiopia.

1.3. Significance of the study

Although COVID-19 poses serious risks for pregnant women, data on vaccine uptake and associated factors are scarce, especially in the Tigray region. By providing evidence -based insights, this study will guide COVID-19 vaccination strategies for pregnant women. Additionally, it will serve as a baseline for future research in the area.

The study will provide data on major barriers to COVID-19 vaccine uptake among pregnant women. Understanding these factors is crucial for tailoring effective interventions.

Findings from this research will inform public health policies and guidelines related to maternal vaccination. Addressing barriers and leveraging facilitators can enhance vaccine acceptance.

The study's insights can be extrapolated to other settings and populations, contributing to broader efforts in combating the pandemic. In summary, this study bridges knowledge gaps, empowers evidence-based decision-making, and supports pregnant women in making informed choices regarding COVID-19 vaccination.

2. Literature review

2.1. COVID-19 vaccine uptake among pregnant women

COVID-19 is a major global health threat; pregnant mothers are the most vulnerable. The prevalence of COVID-19 vaccine uptake among pregnant mothers is varies from country to country.

A prospective cross-sectional study conducted at a tertiary care center in Bangkok, Thailand showed that the prevalence of accepting attitudes toward COVID-19 vaccination during pregnancy was 60.8% (23).

A facility-based cross-sectional study conducted among pregnant women in Jamaica showed that the prevalence of COVID-19 vaccine uptake by those pregnant women was 35% (24). Another cross-sectional study conducted in Poland and Ukraine regarding the acceptance of the COVID-19 vaccine revealed that the proportion of pregnant women with a positive intention to take the COVID-19 vaccine was 35.3% in Poland and 16.7% in Ukraine (25).

A prospective institutional-based cross-sectional study took place at a tertiary university hospital in Greece. According to the study findings, the overall COVID-19 vaccine coverage among pregnant women was 53.9% (26).

A descriptive cross-sectional study was employed in South Africa Durban at the Kwadabeka Community Health Center; the result showed that the prevalence of COVID-19 vaccine uptake among pregnant women was 63.3% (27).

A cross-sectional study conducted among pregnant women attending antenatal clinics at public health facilities in Dar es Salaam, Tanzania revealed that 45% of pregnant women exhibited vaccine hesitancy (28).

In a cross-sectional study conducted among pregnant mothers receiving antenatal care and those in the delivery ward at a general hospital in Accra, Ghana, the findings revealed that the overall prevalence of receiving at least one dose of the COVID-19 vaccine was 11.5% in the antenatal clinic and 4.5% in the delivery ward (29).

In Debre Markos, Ethiopia, a facility-based mixed cross-sectional study revealed that only 18.5% of the study subjects received the COVID-19 vaccine (30). Additionally, in another facility-based cross-sectional study conducted in Bahir Dar, Ethiopia, the overall prevalence of COVID-19 vaccine uptake among pregnant mothers was found to be 19.8% (31).

In Debre Tabor public health institutions, an institution-based cross-sectional study was conducted among pregnant women attending antenatal care units. The study revealed that only 14.4% of participants had received at least one dose of COVID-19 vaccines (32).

2.2. Factors associated with COVID-19 vaccine uptake among pregnant women

2.2.1. Socio-demographic factors

A descriptive cross-sectional study conducted in South Africa Durban at the Kwadabeka Community Health Center; revealed that pregnant women whose age is >39 are more likely to take the vaccine as compared to those <22 years of age and being married found to be a positive predictor than being single (27).

According to a facility-based cross-sectional study conducted in Uganda, factors associated with COVID-19 vaccine uptake including being age >41, having higher education, and having urban residency, were significantly associated with being vaccinated against COVID-19 (33).

In the study conducted in Debre Tabor, it was found that women in the age group 45 or older were 1.75 times more likely to receive the COVID-19 vaccine. Additionally, being married increased the likelihood by 1.26 times. However, women who attained a college or university education were less likely to take the COVID-19 vaccine (32).

In the study conducted in Bahir Dar, it was found that pregnant women living in urban areas were nearly 3.4 times more likely to receive the COVID-19 vaccine compared to those residing in rural areas (31).
In the study conducted in Gondar, Ethiopia, it was found that pregnant women aged >35

years were 5.7 times more likely to accept the COVID-19 vaccine compared to those in the age group between 18 and 24 years (34).

2.2.2. Medical and contact history factors

In Gondar's study, Women who have a contact history with COVID-19-positive diagnosed individuals are nearly seven times more likely to accept the COVID-19 vaccine. Additionally, women with pre-existing chronic medical conditions are three times more likely to do so (34).

In the mixed study conducted at public health institutions in Debre Markos town, women with chronic medical illnesses showed a statistically significant higher likelihood of accepting the COVID-19 vaccine (30).

2.2.3. Obstetrics-related factors

In a descriptive cross-sectional study conducted at the Kwadabeka Community Health Center in Durban, South Africa, it was found that women with 0-1 parity were 4.3 times more likely to accept the COVID-19 vaccine compared to those with four or more parity (27).

In a facility-based cross-sectional study conducted in Bahirdar, Ethiopia in 2022, the findings revealed that women in their third trimester of gestational age were three times more likely to accept the COVID-19 vaccine. Additionally, women with multi-parity were 2.3 times more likely to accept the vaccine (31).

2.2.4. Knowledge and attitude of women Toward COVID-19 vaccine uptake

The studies conducted in Bahir Dar, Gondar, and Debre Tabor, have provided valuable insights into the relationship between knowledge, attitude, and vaccine uptake (31,32,34). The study conducted in Bahir Dar revealed that women with good knowledge of the COVID-19 vaccine were 2.33 times more likely to take the vaccine. Additionally, having a positive attitude towards the vaccine was associated with a 2.68 times higher likelihood of vaccine acceptance (31).

Similarly, the study in Gondar found that women who possessed good knowledge about the COVID-19 vaccine were 2.3 times more likely to uptake the vaccine. A positive attitude towards vaccination was also significantly associated with a 2 times higher likelihood of vaccine uptake (34).

In Debre Tabor, researchers discovered that having good knowledge was linked to a 3.5 times higher likelihood of COVID-19 vaccine uptake. Furthermore, a positive attitude towards vaccination was even more strongly associated, with a 4.8 times higher likelihood of vaccine acceptance (32).

These findings underscore the importance of education and positive attitudes in promoting vaccine uptake among pregnant women. Public health efforts should focus on enhancing knowledge and fostering favorable attitudes to ensure widespread vaccine acceptance and protect both mothers and their unborn children.

2.3. Conceptual framework

The different factors that can affect COVID-19 vaccine uptake among pregnant women can be categorized as sociodemographic factors, medical and contact history, obstetric history, and knowledge and attitude (27,29–34).

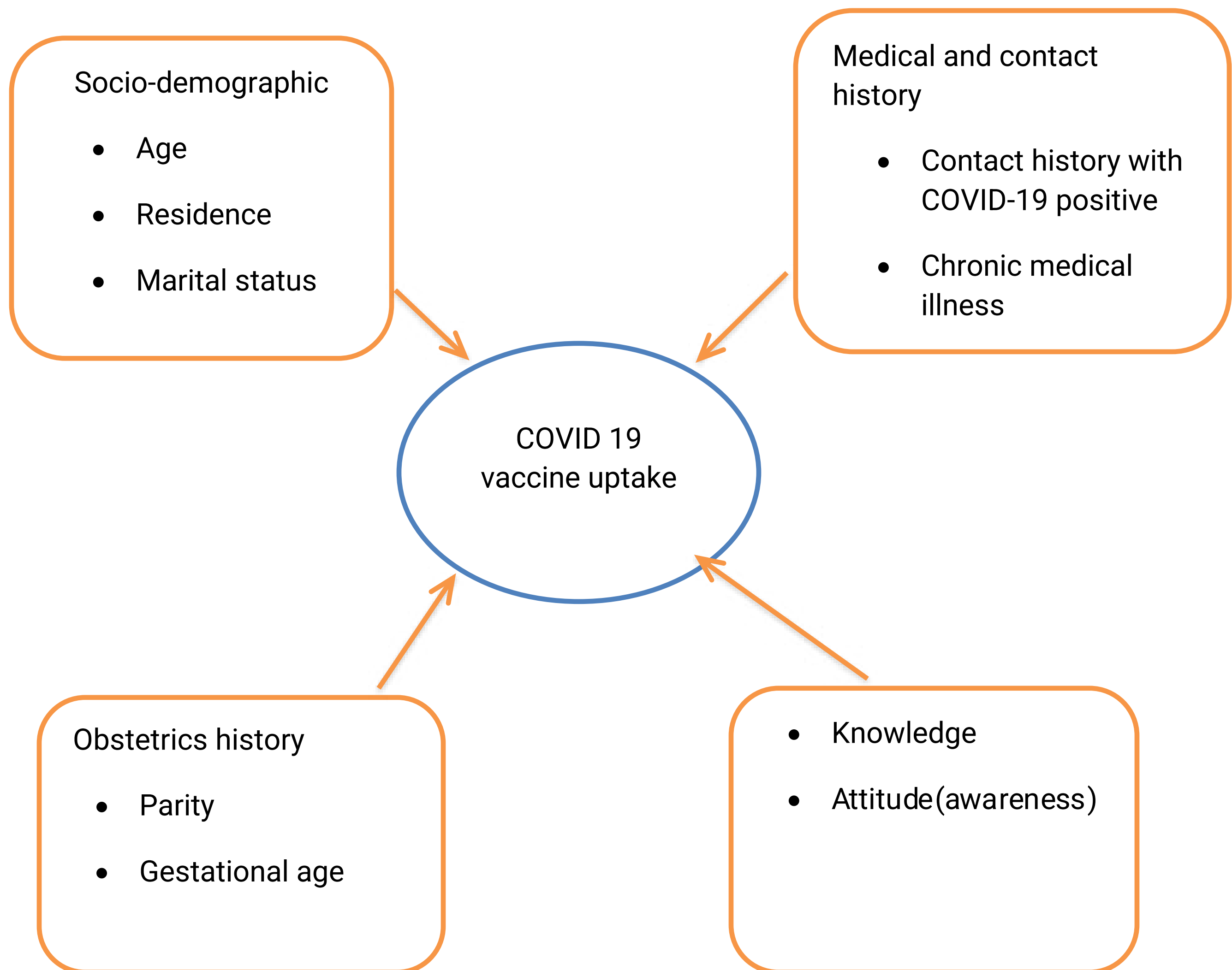

Figure 1: Conceptual framework to assess COVID-19 uptake and its associated factors among pregnant women in antenatal care unit in selected health facilities of Mekelle city, Tigray, Ethiopia, 2024.

3. Objectives

3.1. General objective

To assess COVID-19 vaccine uptake and associated factors among pregnant women attending antenatal care in selected public health facilities of Mekelle city, Tigray, Ethiopia 2024.

3.2. Specific objectives

- To determine COVID-19 vaccine uptake among the pregnant women attending antenatal care in selected public health facilities of Mekelle city, Tigray, Ethiopia 2024.
- To identify factor associated with COVID-19 vaccine uptake among the pregnant women attending antenatal care in selected public health facilities of Mekelle city, Tigray, Ethiopia 2024.

4. Methods and materials

4.1. Study area and period

The study was conducted at selected public health facilities of Mekelle city in Tigray regional state, Ethiopia. Tigray is one of the eleven states of Ethiopia. According to population projection of the region done in 2007, an estimated total population of seven million is found at an altitude of 13.50 N and longitude of 39.50 E, bordered by Eritrea in the North, Sudan in the west, and Afar and Amhara regions of Ethiopia in the east and south respectively. The capital city of Tigray regional state is Mekelle city. In Mekelle city, there are 15 public health facilities (11 Health centers, 2 primary hospitals and 2 general hospitals).

4.2. Study period

The study was conducted from December to February, 2024.

4.3. Study design

A health facility-based cross-sectional study involving both quantitative and qualitative approach of data collection was employed for this study.

4.4. Population

4.4.1. Source of population

All pregnant women living in the Tigray region

4.4.2. Study population

All pregnant women who were attending the antenatal care in selected public health facilities of Mekelle city.

4.4.3. Study unit

All pregnant women who are selected by systematic random sampling method in selected public health facilities of Mekelle city during the study period.

4.5. Eligibility criteria

All voluntary pregnant women who were attending antenatal care units in selected public health facilities of Mekelle city 2024 were eligible for this study.

4.6. Sample Size Determination

For the Quantitative part

The sample size is calculated using a single population proportion formula and the prevalence of COVID-19 vaccine uptake (P=14.4%), which is obtained from a previous mixed cross-sectional study done in Debre Tabor in 2022 (32) with a Z-value of 1.96 at a 95% confidence interval with a margin of error is 5%and 20% non-response rate.

Where:

n = the minimum sample size required

Z= the critical value for a given confidence interval

p = expected proportion of the event to be studied (to be estimated based on findings of previous studies)

d = margin of error

❖ The formula for single proportion formula is:

$$n = \frac{(z_{\alpha/2})^2 p(1-p)}{d^2} = \frac{(1.96)^2 0.144(1-0.144)}{0.05^2} = 190$$

By adding 20% non-response rate= 190 + 20% non-response rate =190+38= 228

For the qualitative part

Eight pregnant women subjected to Focus Group Discussion of each health facility were recruited purposively until richness of ideas is ensured.

4.7. Sampling technique and procedure

A total of four public health facilities two general hospitals (Mekelle and Quiha) and two health centers (Kasech and Semen) were selected randomly. On average, Mekelle hospital provide 300, Quiha Hospital provide 220, Semen health center provides 140,

and Kasech health center provide 120 ANC services per month which is equivalent to 780 total ANC services. To select study participants from selected health facilities a systematic random sampling method was employed. The sampling interval was every three pregnant women. Starting with the first pregnant women every pregnant woman was included in our study. The first pregnant woman was determined using lottery method, which involves random selection process.

Proportional allocation details as follows:

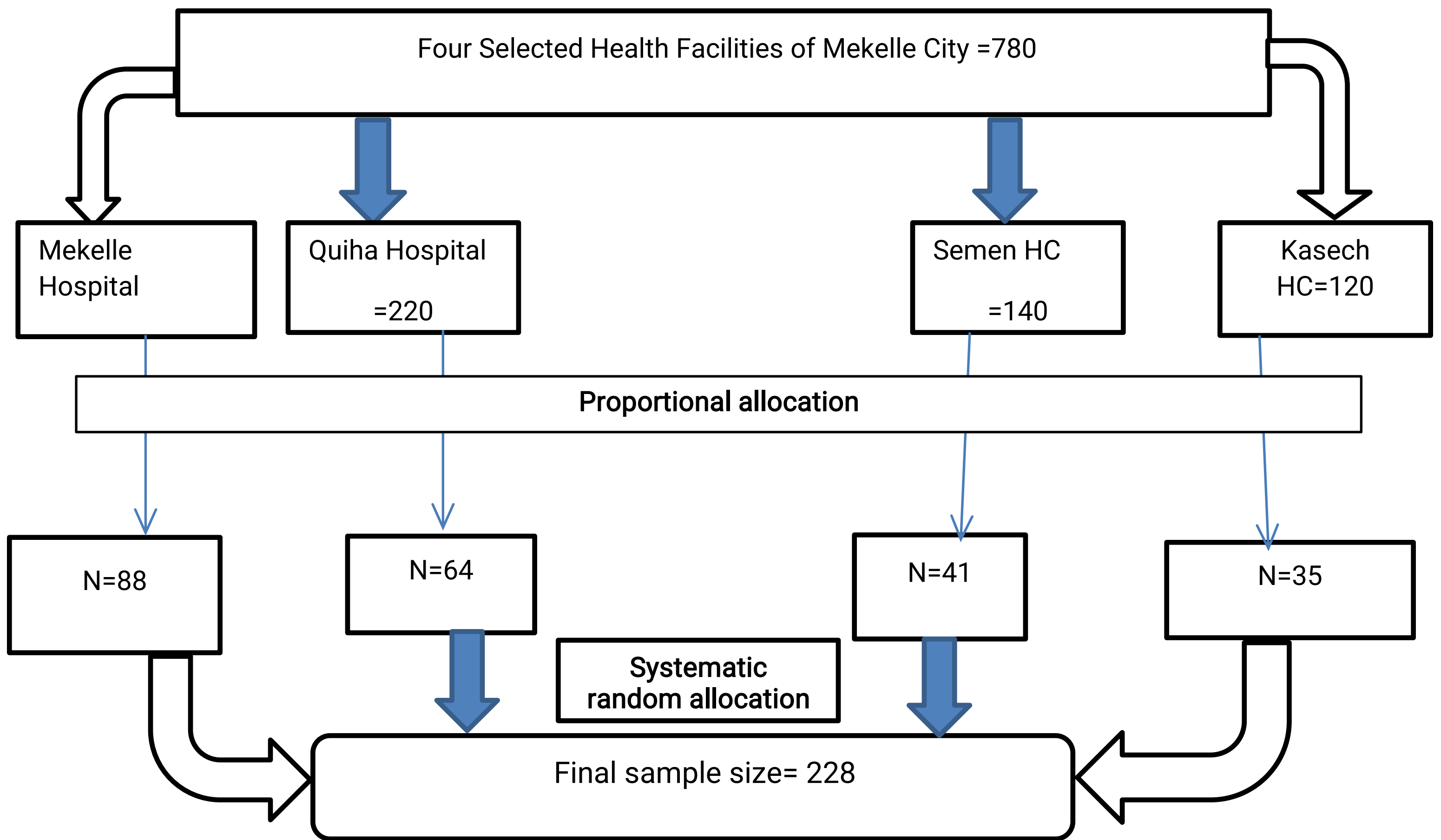

Figure 2: Schematic presentation of sampling procedure on COVID-19 uptake and associated factors among pregnant women in selected public health facilities of Mekelle city, Tigray, Ethiopia 2025.

For the qualitative part

To choose the study participants who are accessible for the FGD, a purposive sampling strategy is employed. Three groups each containing of 8 participants were recruited in to the FGD session purposively. This allocation is based on the saturation of ideas, homogenesis of participants, time and other characteristics.

4.8. Data Collection Tools and Procedure

For quantitative part

In the study, data were collected using a structured interviewer-administered questionnaire. The questionnaire is adopted by reviewing different literature (4,16,17,19,32,35,36). The questionnaire comprises five subparts: socio-demographic

information, obstetric factors, medical and contact history, and knowledge and attitude-related questions. These questions have been adapted and modified from similar studies. The questionnaire is initially prepared in English and then translated into the local language (Tigrigna) by an individual proficient in both languages. To ensure consistency, the translated version is back-translated to English by a different person. Data collection is carried out by four BSc-trained nurses and supervised by two MSc-level nurses over four weeks. To maintain skip logic integrity, consistency, and validity, and minimize data entry errors, kobo collect mobile application is used.

For the Qualitative Part

The open-ended questions subjected to FGD with the following themes: Knowledge and awareness about the COVID-19 vaccine, Perceived risks and benefits, Barriers and Facilitators, Decision-making factors, and communication channels is used. One note taker and tape recorder are recruited while participants are conducting the FGD. Likewise, the Principal Investigator is present to support and facilitate during the FGD session.

4.9. Study variables

4.9.1. Dependent variable

COVID-19 vaccine uptake (Categorized as Yes (Coded as 1) and No (Coded as 0).

4.9.2. Independent variables

Socio-demographic factors: -age, marital status, religion, education, occupation, and residence

Obstetric factors: -gravidity, parity, number of ANC visits,

Medical and contact history: - chronic medical illness, history of contact with COVID-19 cases, history of COVID-19, family history of COVID-19, testing for COVID-19), COVID-19 **knowledge about vaccine: -**knowledge will be measured by 9 questions, such as Have you ever heard about COIVD-19 vaccine, do you know Currently people taking COVID-19 vaccine, do you Know COVID-19 vaccine is effectiveness, Does COVID-19 vaccine have disadvantage, Does COVID-19 vaccine increase immunity.

Attitude about vaccine: - is measured by twelve items adapted from previous literature,

New COVID-19 vaccine has no health problem, Taking COVID-19 vaccine is important for us, do you take COVID-19 vaccine without dilemma, COVID-19 will not be reduced, I will encourage my families /friends to take COVID-19 vaccine, COVID-19 vaccine can reduce COVID-19 pandemic.

4.10. Operational Definition of Terms

COVID-19 vaccine uptake

Vaccine uptake is defined as asking the question "Have you ever been vaccinated with any of COVID-19 vaccines at least once?" if the response is yes, the women are considered as vaccinated if not the women is considered as not vaccinated

Knowledge about the vaccine: - An eight-item set of questions are used to assess respondents' knowledge regarding the COVID-19 vaccine. For knowledge-assessing questions, participants who answer "yes" are received a score of 1, while those who respond "no" or "I don't know" were given a score of 0. The overall knowledge score is categorized as follows:

- Good knowledge: Participants scoring at or above the median value of the knowledge-assessing items.
- Poor knowledge: Participants scoring below the midpoint of the scale (32).

Attitude about vaccine: - A set of twelve questions are used to gauge participants' attitude towards the COVID-19 vaccine. Respondents who said they "Agree or Strongly agree" in attitude-assessing questions are received a score of 1, while those who indicated they "Strongly disagree or disagree or neutral" received a score of 0. The participants are classified as having a positive or negative attitude based on the median score of their answers. Individuals who achieve a score of at least the median on the COVID-19 vaccine attitude assessment questions are deemed to possess a positive attitude, while those who fall short of the median are classified as having a negative attitude (32).

4.11. Data Processing and Analysis

For the Quantitative part

Data is checked manually, coded, and entered into kobo collect then submitted to the

server. Finally, it is exported to SPSS version 27 for analysis. The data is processed by carrying out simple descriptive statistics. The frequency with percentage distribution was used to describe categorical variables. Continuous variables were described using an appropriate combination of measure of central tendency and measure of dispersion.

A binary logistic regression model was used to assess the association between the dependent and independent variables. All explanatory variables with a p-value of <0.25 during bivariate analysis was fitted into the multivariable logistic regression model to control the possible effect of confounders and then, the variables that have been independent association with outcomes variable was identified based on AOR, with 95% CI. A p-value less than 0.05 was used to announce a significant association. Model fitness and multicollinearity was assessed using Hosmer-Lemeshow test and Variance Inflation Factor (VIF). A model was considered as good fit for the data if the p-value for the Hosmer-Lemeshow test is greater than 0.05. The absence of multicollinearity was assumed if the values for VIF are less than five.

Finally, the result was presented in the form of text, tables, figures, and charts.

For the Qualitative Part

Thematic analysis was carried out. The data analysis process was un fold in three stages:

- Familiarization: Initially, engagement in thorough reading and re-reading of the transcripts was made to deepen understanding of the data.
- Organizing and Coding: organization and coding of the data was made.
- Categorization and Summarization: The coded segments were categorized into different families. Each family of codes were undergone review and summarization. The goal is to condense the text while retaining its content and contextual meaning, ensuring internal consistency. Finally, thematic analysis is conducted and triangulation using the developed themes.

4.12. Data Quality Control

For the Quantitative part

To ensure data quality, a one-day training session was held for four data collectors and two supervisors a week before the actual data collection. During this training, participants were familiarized with the questionnaire's concepts, ethical conduct requirements, confidentiality protocols, and participants' rights. This training aims to minimize variations between data collectors. In addition, the data collectors were received training on how to use the kobo Collect mobile application for interviews. Leveraging kobo collect was not only contributed to data quality but also allowed continuous oversight of the collected data on a server.

The questionnaire was translated in to the local language, Tigrigna, and then back-translated to English to ensure accuracy and consistency. Throughout the data collection process, daily communication was occurred among the principal investigator, supervisors, and data collectors. The collected data also was monitored and evaluated continuously on a server. Additionally, a pre-test was administered to 5% of the participants at Mekelle health center. Based on the pre-test results, necessary modifications to the questionnaire were made before the actual data collection period. These adjustments aim to enhance specificity, reliability, and validity, aligning with the study's objectives.

For the Qualitative part

In this study, robust qualitative data quality control measure was employed to ensure the credibility, transferability, dependability and confirmability research findings.

To establish credibility, engagement in prolonged field work spending extensive time immersed in the research setting to develop a deep understanding of the context and phenomenon under study was maintained. Complementary data collection method including focus groups and observational field notes to triangulate our data sources was employed.

Throughout the data collection and analysis process, active engagement in peer

debriefing sessions with data collectors to discuss emerging themes, interpretation and potential bias was practiced. It was also implemented member checking, where we were shared our premilitary findings with study participants to ensure their perspective have been accurately representing.

Finally, to promote confirmability, engagement in reflexive practices, critical examining our own positionality, assumptions and potential biases throughout the data collection process was made. Triangulation techniques to cross validate interpretation and ensure they are grounded in the data rather the research subjectivity was utilized.

By systemically applying those qualitative data quality control measures, the finding from this study contributed robust, trust worthy, and meaning full insight to the field.

4.13. Ethical Consideration

Ethical clearance and approval were issued (MU-IRB 2272/2024) and provided by Institutional Review Board (IRB) of Mekelle University, College of Health Sciences. After getting an approval letter from the IRB, an official letter for cooperation was written to Tigray Regional Health Bureau and correspondence health facilities. The official letter was submitted to TRHB and each health facilities of all concerned bodies including the ANC clinic. Confidentiality was kept and personal identification such as the name of the participants was not recorded. Privacy of the pregnant women was maintained to the maximum level. Any participation in this study is voluntary.

5. Result

For this study a total of 228 pregnant women who came for antenatal care visit were contacted and 14 (6.1%) were non-respondents, giving a response rate of 93.1%. Among the respondents, 84 (39.3%) were from Mekelle GH, 59 (27.6%) from Quiha GH, 39 (18.2%) from Semen HC, and 32 (15.0%) from Kasech HC.

5.1 Socio-demographic characteristics

The mean age of the respondents was 30.3 years (SD=5.5), and the most common age group was 25 to 29 years, accounting for 70 (32.7%) of them. About 80% of the respondents were followers of the orthodox religion. The remaining 38 (17.8%) and 5 (2.3%) were Muslims and Protestants, respectively. Regarding residence, 193 (90.2%) and 21 (9.8%) were from urban and rural areas, respectively. Married women accounted for 190 (88.8%) of the respondents. Regarding educational status, 63 (29.5%) had no formal education. The remaining women attended up to either primary school (12.6%), secondary school (34.1%), or college or above (23.8%). The most commonly reported occupations were housewife (40.7%) and merchant/self-employed (29.9%). Internally displaced women accounted for 12 (5.6%) of the respondents.

Table 1: Sociodemographic characteristics of women who visited four public health facilities of Mekelle for antenatal care contact (N=214).

Variable	Category	Frequency (N=214)	Percent [95% CI]		
			%	LL	UL
Facility	Semen HC	39	18.2	13.5	23.8
	Kasech HC	32	15.0	10.7	20.2
	Quiha GH	59	27.6	21.9	33.8
	Mekelle GH	84	39.3	32.9	45.9
Age category	20-24	34	15.9	11.5	21.2
	25-29	70	32.7	26.7	39.2
	30-34	50	23.4	18.1	29.4
	35+	60	28.0	22.3	34.3
Religion	Orthodox	171	79.9	74.2	84.9
	Muslim	38	17.8	13.1	23.3
	Protestant	5	2.3	0.9	5.0
Residence	Urban	193	90.2	85.7	93.6
	Rural	21	9.8	6.4	14.3
Marital status	Married	190	88.8	84.0	92.5
	Single	10	4.7	2.4	8.1
	Divorced	8	3.7	1.8	6.9

	Widowed	6	2.8	1.2	5.7
Educational status	Unable to read and write	35	16.4	11.9	21.7
	Able to read and write but no formal education	28	13.1	9.1	18.1
	Primary school (1-8)	27	12.6	8.7	17.6
	Secondary school (9-12)	73	34.1	28.0	40.6
	College and above	51	23.8	18.5	29.9
Occupation	House wife	87	40.7	34.2	47.3
	Merchant/Self-employee	64	29.9	24.1	36.3
	Governmental Employee	25	11.7	7.9	16.5
	Private Employee	24	11.2	7.5	16.0
	Other (student, daily labourer, military)	14	6.5	3.8	10.5
Category	Host community	202	94.4	90.7	96.9
	Internally displaced people	12	5.6	3.1	9.3

HC = Health Center, GH = General Hospital, LL= Lower limit, UL= Upper limit

5.2 Chronic medical illness

The magnitude of chronic medical illness was 17 (7.9%) and the two most common chronic medical illnesses were diabetes (4.2%) and hypertension (4.2%).

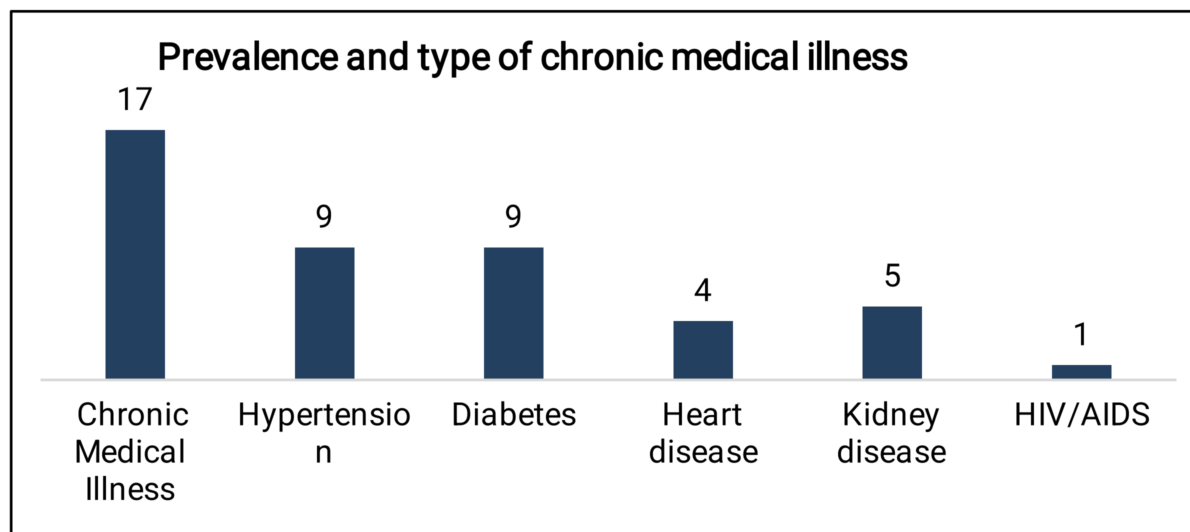

Figure 3: Chronic Medical Illnesses characteristics of women who visited four public health facilities of Mekelle for antenatal care contact (N=214).

5.3. Obstetric characteristics

More than half (54.2%) of the respondents were multigravida. Unplanned pregnancy was reported by 41 (19.2%) of participants. Among the total pregnant women, 51 (23.8%), 127 (59.3%), and 36 (16.8%) were on first trimester, second trimester, and third trimester of pregnancy, respectively. The majority (47.2%) of participants had four or more antenatal care (ANC) contacts. The remaining had two to three (41.1%) or only one (11.7%) ANC contacts.

Table 2: Obstetric characteristics of women who visited four public health facilities of Mekelle for antenatal care contact (N=214).

Variable	Category	Frequency (N=214)	Percent [95% CI]		
			%	LL	UL
Gravidity	Primigravida	98	45.8	39.2	52.5
	Multigravida	116	54.2	47.5	60.8
Parity (N=116)	Primiparous	35	30.2	22.4	38.9
	Multiparous	81	69.8	61.1	77.6
Planned pregnancy	No	41	19.2	14.3	24.8
	Yes	173	80.8	75.2	85.7
Trimester of the current pregnancy	First trimester	51	23.8	18.5	29.9
	Second trimester	127	59.3	52.7	65.8
	Third trimester	36	16.8	12.3	22.3
Number of ANC contacts	1	25	11.7	7.9	16.5
	2 to 3	88	41.1	34.7	47.8
	4 or more	101	47.2	40.6	53.9

LL= Lower limit of 95% CI, UL= Upper limit of 95% CI

5.4. COVID-19 related characteristics

History of contact with confirmed COVID-19 cases was found in 28 participants (13.1%). Concerning previous history of COVID-19 infection, 18 participants (8.4%) had been previously infected. Regarding COVID-19 test, 29 participants (13.6%) had undergone testing. Among those tested for COVID-19 infection (N=29), only 2 (6.9%) of them tested positive. Only 31 respondents (14.5%) had received the COVID-19 vaccine. Of those vaccinated, 18 (58.1%) and 13 (41.9%) of them received only one dose and two doses, respectively. The most common reasons for non-vaccination were insufficient information about the vaccine (70.5%), the unavailability of the vaccine (57.9%), fear of side effects (36.1%), and concerns about infertility (21.9%). Knowledge about the COVID-19 vaccine was evaluated using nine questions. Among the participants, 123 (57.5%) demonstrated good knowledge, while the remaining 91 (42.5%) had poor knowledge. Attitudes towards the COVID-19 vaccine were assessed using 12 items.

Positive attitudes were exhibited by 126 participants (58.9%), while 88 participants (41.1%) displayed negative attitudes.

Table 3: COVID-19 related characteristics of women who visited four public health facilities of Mekelle for antenatal care contact (N=214).

Variable	Category	Frequency (N=214)	Percent [95% CI]		
			%	LL	UL
History of contact with confirmed COVID-19 cases	No	186	86.9	81.9	90.9
	Yes	28	13.1	9.1	18.1
Prior history of COVID -19 infection	No	196	91.6	87.3	94.8
	Yes	18	8.4	5.2	12.7
Family history of COVID-19 Infection	No	196	91.6	87.3	94.8
	Yes	18	8.4	5.2	12.7
Tested for COVID-19 Infection	No	185	86.4	81.4	90.5
	Yes	29	13.6	9.5	18.6
COVID-19 test result (N=29)	Positive	2	6.9	1.5	20.3
	Negative	27	93.1	79.7	98.5
Are you vaccinated for COVID-19?	No	183	85.5	80.3	89.7
	Yes	31	14.5	10.3	19.7
How many doses?	One	18	58.1	40.6	74.1
	Two	13	41.9	25.9	59.4
Reason for non-vaccination	Vaccine was not available	106	57.9	50.7	64.9
	Fear of side effects	66	36.1	29.4	43.2
	It is a biological weapon	30	16.4	11.6	22.3
	It causes infertility	40	21.9	16.3	28.3
	Unreliable due to the short time for vaccine development	18	9.8	6.2	14.8
	I have no enough information	129	70.5	63.6	76.7
	Vaccine cause COVID-19	2	1.1	0.2	3.5
	Vaccine is ineffective	3	1.6	0.5	4.3
Attitude towards COVID-19 vaccine	Negative attitude	88	41.1	34.7	47.8
	Positive attitude	126	58.9	52.2	65.3
Knowledge about COVID-19 vaccine	Poor	91	42.5	36.0	49.2
	Good	123	57.5	50.8	64.0

LL= Lower limit of 95% CI, UL= Upper limit of 95% CI

5.5. Predictors of COVID-19 vaccine uptake

The magnitude of COVID-19 vaccine uptake in this study was 31 (14.5%), and all who took the vaccine were from an urban area. To identify predictors of vaccine uptake other than residence,

a multivariable binary logistic regression model composed of six variables (educational status, contact history with confirmed COVID-19 infected person, COVID-19 test, gravidity, attitude towards COVID-19 vaccine, knowledge about COVID-19 vaccine) were fitted and three of them (education, contact history, and attitude) were identified as independent predictors of vaccine uptake in addition to residence. The odds of uptake were about 6 times higher among pregnant women who attended formal education up to college/university compared to those pregnant women who had no formal education. The odds of uptake were 4-fold higher among pregnant women who had a history of contact with a confirmed COVID-19 case. Lastly, the odds of uptake were 3.6 times higher among pregnant women who had a positive attitude towards COVID-19 vaccine than those who had a negative attitude towards the vaccine. Hosmer-Lemeshow test was insignificant (p=0.957), saying that the multivariable model is a good fit for the data.

Table 4: Predictors of COVID-19 vaccine uptake among women who visited four public health facilities of Mekelle for antenatal care contact (N=214).

Predictor	COR [95% CI]	P-value	AOR [95% CI]	P-value
Educational status				
No formal education	1		1	1
Primary school	1.8 [0.4, 8.9]	0.445	2.0 [0.4, 10.9]	0.403
Secondary school	2.6 [0.8, 8.7]	0.116	1.9 [0.5, 6.9]	0.350
College/University	5.0 [1.5, 16.6]	0.008	5.7 [1.6, 21.2]	0.009
History of contact with confirmed COVID-19 cases				
Yes	3.5 [1.4, 8.8]	0.007	4.1 [1.3, 13.0]	0.018
No	1		1	
COVID-19 test				
Yes	2.7 [1.1, 6.8]	0.036	1.6 [0.5, 5.2]	0.414
No	1		1	
Gravidity				
Primigravida	2.1 [1.0, 4.5]	0.065	2.0 [0.8, 5.0]	0.118
Multigravida	1		1	
Knowledge				
Good	1.7 [0.7, 3.7]	0.215	1.4 [0.6, 3.6]	0.451
Poor	1		1	
Attitude				
Positive	2.7 [1.1, 6.6]	0.028	3.6 [1.3, 9.8]	0.011
Negative			1	

5.6. Qualitative Result

Pregnant women who come for antenatal care visits were selected for Focus Group Discussion purposively. Three FGD session are conducted on which a total of 24 pregnant women participated. A series of questions including; What do you know about COVID-19, How do you

prevent COVID-19, what do you know about COVID-19 vaccine, how do you think COVID-19 Vaccine affects your pregnancy, what do you think the advantages and disadvantage of the COVID-19 vaccine, why do you think people refuse COVID-19 vaccine, and how do you tell people should get vaccinated for COVID-19 are present for FGD allocating 60 minutes each.

knowledge about COVID-19

Most Participants demonstrate general understanding of the transmission, sign and symptom of COVID-19. Likewise, few participants didn't know the transmission and sign and symptoms of COVID-19.

Almost all participants mentioned the prevention methods of COVID-19. However, many of them didn't mention about vaccine as a prevention method. They said "I *keep distance, cover my nose and mouth, wash my hand, use sanitizer or alcohol, isolate myself,"*

Some of the participants said they heard about COVID 19 vaccine and availability. Some of them were not certain about the availability or effectiveness of the vaccine. While others were not sure about the vaccine. They said, "*I am not sure whether the vaccine is available since the conflict, I am not sure whether the vaccine is effective, I don't know about the vaccine*"

Many of the participants reflect safety concerns for their fetus. They said they don't have enough information about the importance, side effects and any risk for their pregnancy. They said "*I feel the vaccine might affect my pregnancy, it might cause miscarriage, I scared that the vaccine might cause COVID-19*"

Several of the participants think the vaccine prevent and reduce COVID 19 in the general population, somehow, they were uncertain on pregnant women due to fear of their pregnancy. They said "*I think the vaccine prevent from acquiring COVID-19 and death particularly for general population. However, I feel the vaccine affect pregnancy despite the prevention effect.*

Whereas, few said the vaccine is equally important to pregnant women that it prevent from becoming ill. They said "*it is very important to take the vaccine to prevent from acquiring COVID -19*

Reasons for COVID-19 vaccine refusal

During the discussion participants share a range of perspectives on why people refuse to take COVID-19 vaccine.

Most of them said, they fear for side effects "*I think people refrain from taking the vaccine due to the fear of certain side effects."*

While some said COVID -19 is no more existent "*I think people say COVID -19 is not a threat this time so there is no need to take the vaccine"*

Few said, many people say that the vaccine by itself causes COVID-19 disease. They have a suspicion on the effectiveness of the vaccine "*I heard some say the vaccine is fake it is not effective rather it causes COVID -19"*

Whereas, some said, they think people don't refuse rather they don't have enough information about the vaccine and access "*I guess there is information gap and low access/vaccine availability from the scratch, of those things are corrected, many people might get vaccinated"*

6. Discussion

The purposes of this study were to determine COVID-19 vaccine uptake among the pregnant women, identify factors associated with COVID-19 vaccine uptake among the pregnant women, and explore the barriers of COVID-19 vaccine uptake among the pregnant women. The magnitude of COVID-19 uptake was (14.5%) and factors that significantly predict uptake were residence, educational status, contact history and attitude towards COVID-19 vaccine.

This study has revealed that the magnitude of uptake among pregnant women was low. This finding is in comparable with previous studies from Ethiopia. In a study conducted at Debre Markos, 18.5% of the study subjects received the COVID-19 vaccine (30). A study conducted in Bahir Dar, Ethiopia, also found an overall prevalence of COVID-19 vaccine uptake among pregnant mothers to be 19.8% (31). Another study conducted at Debre Tabor also revealed that only 14.4% of pregnant women had received at least one dose of COVID-19 vaccines (32). But our finding is lower than studies conducted in South Africa (63.3%), Thailand (60.8%), Greece (53.9%), Jamaica (35%), and Poland (35.3%) (23–27). This study and the other Ethiopian studies have showed that the uptake of COVID-19 vaccine among pregnant women is low in Ethiopia. The possible explanation is low resource to mobilize and distribute the vaccine, frequent interruption of vaccine supplies due to devastating war in the country in the last five years, lack of adequate women empowerment in terms of education, and absence of sustainable awareness creation due to war and siege that led to complete communication blockade.

In our study, all vaccinated pregnant women were from urban areas, highlighting a significant disparity in vaccine coverage between urban and rural areas. The disparity in vaccine uptake is in line with existing literature (33,37–39). For example, a study conducted in Ethiopia found a remarkable geographic disparities in COVID-19 vaccine, with urban residents being more likely to receive the vaccine compared to rural residents (38). This disparity can be attributed to multiple factors, including higher access to healthcare facilities, better levels of health literacy, and more resilient healthcare infrastructure in urban areas.

In the current study, the odds of COVID-19 vaccine uptake were about six times higher among pregnant women who attended formal education up to college or university compared to those who had no formal education. This finding is congruent with findings from other studies (33,39,40). A study conducted in New York city; USA also found that having less than a bachelor’s degree was related with non-acceptance of COVID-19 vaccine. In this study, the most

prevalent reasons for non-acceptance were fear of side effects and risk to the fetus (41). Another study conducted in Uganda also found that women with higher level educational status were more likely to accept COVID-19 vaccination compared to those with lower levels of education (33). This large disparity highlights the pivotal role of education in modifying health behaviors and vaccine acceptance. Education is a known key determinant of health outcomes. Usually, higher levels of education are linked with better health literacy, better ability to seek out reliable information, better understanding of the benefits and risks of vaccines, and ability to make informed decisions about own health. This is particularly essential in the case of COVID-19 vaccine(39,40).

This study revealed that the odds of COVID-19 vaccine uptake were 4-folds higher among pregnant women who had a history of contact with a confirmed COVID-19 case. Exposure to confirmed COVID-19 case may increase the perceived hazard of infection. In addition, pregnant women with history of contact with confirmed case have the chance to observe the severity of the disease. Lastly, this study has found a higher odds of COVID-19 vaccine uptake among pregnant women who had a positive attitude towards the COVID-19 vaccine. This finding aligns with previous studies conducted in Amhara regional state of Ethiopia (32,40). This is attributed to the fact that pregnant woman with positive attitude is more likely to search for reliable information, involve in discussions with health professionals, and make informed decisions about COVID-19 vaccine and its uptake.

7. Strength and limitation of the study

7.1. Strength of the study

The study involved both quantitative and qualitative methods of data collections to maximize the reliability of the data collected. Combining the two types of data can be benefitial for having detailed, contextualized insights of qualitative data and the generability of quantitative data assuring validity.

Since it is triangulated with qualitative, findings of the qualitative data can be used for further development of hypothesis or research

7.2 Limitation of the study

This study uses a cross-sectional study design, hence the cause–effect relation-ship for all significant associations can not be established and doesn't allow to track changes in prevalence or identify trends over time, restricting dynamic understanding of the phenomenon under study.

In addition, only governmental health facilities in the study setting were included. This may not be representative of pregnant women who are attending private facilities.

Social desirability bias could have also affected the quality of data collected because study subjects might get difficulty to give negative responses in the presence of an interviewer working in the same institution. However, to minimize this bias, proper orientation on purpose of the study and anonomousity was given before starting the interview. For each faciliy, one data collector was assigned. This may introduced interviewer bias.

8. Conclusion and recommendations

This study found that COVID-19 vaccine uptake among pregnant women in Mekelle was 14.5%, comparable to previous studies conducted in Ethiopia but lower than findings from middle-income and high-income countries. The odds of COVID-19 vaccine uptake were significantly higher among pregnant women from urban areas, with higher educational status, contact history with confirmed COVID-19 cases, and a positive attitude towards the vaccine.

According to the qualitative findings, the most common reasons for COVID-19 vaccine uptake refusal were fear of fetal side effects, misconceptions about the vaccine, and lack of information.

Here are the recommendations based on the findings of this study.

The recommendation for health professionals is to:

- Provide health education about the benefits and safety of COVID-19 vaccination for pregnant women to create positive attitude towards the vaccine and create better awareness.
- Make discussion with pregnant women to address concerns and misconceptions about the COVID-19 vaccine.
- Provide information and diffuse misconception regarding COVID-19 vaccine.

The recommendation for health facilities is to:

- Ensure that COVID-19 vaccines are readily available and accessible to all pregnant women attending antenatal care services.
- Conduct outreach COVID-19 vaccination programs to reach underserved and rural areas.
- Promote demand creation through risk communication campaign, Information and education programs at community and health facility level.

The recommendation for health bureaus is to:

- Conduct community-based health education campaigns to raise awareness about the advantage of COVID-19 vaccination for pregnant women.
- Create strategies to decrease the urban-rural disparity in vaccine coverage

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ANNEXES

Annex I. Personal Information Sheet

Title of Research: COVID-19 vaccine uptake among pregnant women in Tigray region comprehensive specialized hospitals

Institution: Mekelle University College of health science and comprehensive specialized hospital

Principal Investigator: Mekonen

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Advisors: Dr. Gerezgiher Buruh (PhD, Associate professor) and Mr. Yohans Tesfay (MSc, Assistant professor)

Purpose: The study aims to assess the COVID-19 vaccine uptake among pregnant women in Tigray region's comprehensive specialized hospitals

Duration: The question that is going to be asked usually takes about 30-35 minutes.

The benefit of the study: -the result of the study will be helpful for all pregnant women to the future by identifying factors associated with COVID-19 which is useful in delivering improved health care service.

Risk of the study: - Participating in this study will not have major risks or harm associated with data collection. You may feel a little physical fatigue and take some time.

Rights of Participants: - You have full right to participate or to refuse and you can ask question if it is not clear for you.

Confidentiality: - Issue will be maintained, no identification will be recorded.

Questionnaires ID_______________

Annex II: Consent form

Greetings, my name is ____________________

I am collecting data from you related to COVID-19 Vaccination status (uptake), and knowledge and attitude related to COVID-19 disease. This study aims to understand the extent of COVID-19 infection, vaccination, awareness and knowledge about the disease among pregnant women who are attending antenatal care in two tertiary hospitals of Tigray, Ethiopia. Participation in this study is entirely voluntary, and you may choose to stop participating at any time. You will not receive any direct benefits or be harmed by participating in this study. Your privacy is fully guaranteed and that collected data will be kept confidential.

Consent:

Are you Volunteer to participate: Yes: ____ No: ____

Annex III: Questionnaire (English version)

Part one: Socio-economic/demographic conditions

No	Variables	Alternatives	Response	Remark
1	Age (in years)	___________		
2	Religion	Orthodox		
		Muslim		
		Protestant		
		Catholic		
		Other (Specify)		
3	Residence	Urban		
		Rural		
4	Marital status	Married		
		Single		
		Divorced		
		Widowed		
5	Educational status	unable to read and write		
		Able to read and write but no formal education		
		Primary school (1-8)		
		Secondary school (9-12)		
		College and above		
6	Occupation	House wife		
		Merchant/Self-employee		
		Governmental Employee		
		Private Employee		
		Student		
		Daily laborer		
		Military		
		Other (Specify)		
7	Category	Host community		
		Internally displaced people (IDP)		

Part two maternal medical and contact history

No	Variables	Alternatives	Response	Remark
1	Chronic medical illness (Check all that apply)	Hypertension		
		Diabetes		
		Heart disease		
		Kidney disease		
		Liver disease		
		Chronic respiratory disease		
		HIV/AIDS		

		Other (Specify)		
2	History of contact with confirmed COVID-19 cases	Yes		
		No		
3	Prior history of COVID-19 infection	Yes		
		No		
4	Family history of COVID-19 Infection	Yes		
		No		
5	Tested for COVID-19 Infection	Yes		
		No		
6	COVID-19 test result	Positive		If Q4 is yes
		Negative		
7	Are you vaccinated for COVID-19?	Yes		
		No		
8	How many doses?			If Q7 is yes
9	If No, what are the reasons for non-vaccination	Vaccine was not available		If Q7 is No
		Fear of side effects		
		It is a biological weapon		
		It causes infertility		
		Unreliable due to the short time for vaccine development		
		I have no enough information		
		Vaccine cause COVID-19		
		Vaccine is ineffective		
		No vaccine is needed (COVID-19) is overrated		
		Other (Specify)		

Part three Obstetrics history

No	Variables	Alternatives	Response	Remark
1	Gravidity	Primigravida		
		Multigravida		
2	Parity	Nulliparous		
		Primiparous		
		Multiparous		
3	Planned pregnancy	Yes		
		No		
4	Trimester of the current pregnancy	First trimester		

		Second trimester		
		Third trimester		
5	Number of ANC visits	___________		

Part four Knowledge of COVID-19 Vaccination among pregnant mothers in the Tigray region

	Variables	Alternatives	Response	Remark
1	Have you ever heard about the COIVD-19 vaccine	Yes		
		No		
		I don't know		
2	Do you know Currently people taking COVID-19 vaccine	Yes		
		No		
		I don't know		
3	Do you Know that COVID-19 vaccine is effectiveness	Yes		
		No		
		I don't know		
4	Does COVID-19 vaccine have disadvantage	Yes		
		No		
		I don't know		
5	Does COVID-19 vaccine increase immunity	Yes		
		No		
		I don't know		
6	Do you think COVID-19 vaccine has a side effect	Yes		
		No		
		I don't know		
7	Vaccine candidates are being developed	Yes		
		No		
		I don't know		
8	Does the vaccine can prevent COVID-19 infection	Yes		
		No		
		I don't know		
9	What prevention methods do you know for COVID-19 disease	Handwashing with soap and water		
		Distance		
		Vaccination		
		Quarantine/Isolation		
		Wearing a mask		
		Other (Specify)		

Part five Attitude towards COVID-19 Vaccination among pregnant women in Tigray

region

No	Variables	Alternatives	Response	Remark
1	New COVID-19 vaccine has no health problem	Strongly agree		
		Agree		
		Neutral		
		Disagree		
		Strongly disagree		
2	Taking COVID-19 vaccine is important for us	Strongly agree		
		Agree		
		Neutral		
		Disagree		
		Strongly disagree		
3	I will take COVID-19 vaccine without dilemma	Strongly agree		
		Agree		
		Neutral		
		Disagree		
		Strongly disagree		
4	COVID-19 will not be reduced	Strongly agree		
		Agree		
		Neutral		
		Disagree		
		Strongly disagree		
5	I will encourage my family/friends to take COVID-19 vaccine	Strongly agree		
		Agree		
		Neutral		
		Disagree		
		Strongly disagree		
6	COVID-19 vaccine should be distributed fairly	Strongly agree		
		Agree		
		Neutral		
		Disagree		
		Strongly disagree		
7	I feel COVID-19 vaccine is essential	Strongly agree		
		Agree		
		Neutral		
		Disagree		
		Strongly disagree		
8	COVID-19 vaccine can reduce COVID-19 pandemic	Strongly agree		
		Agree		
		Neutral		
		Disagree		
		Strongly disagree		

9	I support COVID-19 vaccine campaign	Strongly agree		
		Agree		
		Neutral		
		Disagree		
		Strongly disagree		
10	FDA should distribute safe and effective vaccine	Strongly agree		
		Agree		
		Neutral		
		Disagree		
		Strongly disagree		
11	COVID-19 vaccine side effects hesitate me to vaccination	Strongly agree		
		Agree		
		Neutral		
		Disagree		
		Strongly disagree		
12	I don't take the COVID-19 vaccine by payment	Strongly agree		
		Agree		
		Neutral		
		Disagree		
		Strongly disagree		

Part six opinion towards COVID-19 Vaccination among pregnant women in Tigray region

1. What do you know about COVID-19?
2. How do you prevent COVID-19?
3. What do you know about COVID-19 vaccine?
4. How do you think COVID-19 Vaccine affects your pregnancy?
5. What do you think the advantages and disadvantage of the COVID-19 vaccine?
6. Why do you think people refuse COVID-19 vaccine?
7. How do you tell people should get vaccinated for COVID-19?

Annex IV፡ ቅጥዒ ፍቓድ

ሰላም፡ ስመይ _____________________ .

ምስ ኩነታት ክታበት ኮቪድ-19 (ኣወሳስዳ)፣ ከምኡ እውን ምስ ሕማም ኮቪድ-19 ዝተተሓሓዘ ፍልጠትን ኣተሓሳስባን ዝተኣሳሰረ መረዳእታ ይእክብ ኣለኹ። እዚ መፅናዕቲ ኣብ ክልተ ሪፈራል ሆስፒታላት ትግራይ ኢትዮጵያ ኣብ ቅድመ ሕርሲ ዝከታተላ ዘለዋ ነፍሰጾራት ብዛዕባ እቲ ሕማም ክሳብ ክንደይ ረኺሲ፣ ክታበት፣ ንቕሓትን ኣፍልጦን ብዛዕባ እቲ ሕማም ንምርዳእ ዝዓለመ እዩ። ኣብዚ መጽናዕቲ ምስታፍ ምሉእ ብምሉእ ወለንታዊ እዩ፣ ኣብ ዝኾነ እዋን ምስታፍካ ከተቋርጽ ትኽእል ኢኻ። ኣብዚ መጽናዕቲ ብምስታፍካ ዝኾነ ቀጥታዊ ጥቕሚ ወይ ጉድኣት ኣይክትበጽሕን ኢኻ። ብሕታዊነትካ ምሉእ ውሕስነት ኣለዎ፡ ዝተኣከበ ዳታ ድማ ምስጢራዊ ክኸውን እዩ።

ፍቃድ፥

ክትሳተፊ ወለንተኛ ዲኺ: እወ: ____ ኣይፋል: ____

Annex V: ቃለ-መሕትት ብትግርኛ

ክፋል ሓደ: ማሕበረ ስነቁጠባ

ተ.ቁ,	ሕቶታት	መማረፂታት	መልሲ	መብርሂ
1	ዕድመ (ብሙሉእ ዓመት)	____________		
2	ሃይማኖት	ኦርቶዶክስ		
		ሙስሊም		
		ፕሮቴስታንት		
		ካቶሊክ		
		ካሊእ (ይገለፅ)		
3	ትነብረሉ ቦታ	ከተማ		
		ገጠር		
4	ኩነታት ሓዳር	ዝተመርዓወት		
		ዘይተመርዓወት		
		ዝተፋተሐት		
		ሰብኣያ ዝሞታ		
5	ኩነታት ትምህርቲ	ምንባብን ምፅሓን ዘይትኽእል		
		ምንባብን ምፅሓፍን ትኽእል ግን ስሩዕ ትምህርቲ ዘይወሰደት		
		ቀዳማይ ብርኪ (1-8)		
		ካልኣይ ብርኪ (9-12)		
		ኮሌጅን ልዕሊኡን		
6	ስራሕ	ኣላይት ገዛ/ኣምበይቶ ገዛ		
		ነጋዲት/ናይ ወልቀ ስራሕ ዘለዋ		
		ሰራሕተኛ መንግስቲ		
		ሰራሕተኛ ወልቀ ትካል		
		ተምሃሪት		
		መዓልታዊት ሰራሕተኛ		
		ወታደር		
		ካሊእ (ይገለፅ)		
7	ምደባ	ነባሪት		
		ተመዛባሊት		

ክፋል 2: ናይ ኣዶ ናይ ሕክምና ታሪኽን ርክባትን

ተ.ቁ,	ሕቶታት	መማረፂታት	መልሲ	መብርሂ
1	ሕዱር ሕማም (ካብ ሓደ ንላዕሊ ምምላስ ይከኣል እዩ።)	ፀቕጢ ደም		
		ሕማም ሽኮር		
		ሕማም ልቢ		
		ሕማም ኩላሊት		

		ሕማም ፀላም ከብዲ		
		ሕዱር ናይ ሳምባ ሕማም		
		ኤች ኣይ ቪ /ኤድስ		
		ካሊእ (ይገለፅ)		
2	ብሕክምና ዝተረጋገፀ ሕማም ኮቪድ ምስ ዘለዎ ሰብ ተራኺብኪ ትፈልጢ ዶ	እወ		
		ኣይፋል		
3	ቅድሚ ሕዚ ሕማም ኮቪድ-19 ተታሒዝኪ ትፈልጢ ዶ?	እወ		
		ኣይፋል		
4	ካብ ቤተሰብኪ፣ ሕማም ኮቪድ-19 ተታሒዙ ዝፈልጥ ሰብ ኣሎ ዶ?	እወ		
		ኣይፋል		
5	ን ሕማም ኮቪድ-19 ተመርሚርኪ ትፈልጢ ዶ?	እወ		
		ኣይፋል		
6	ውፅኢት ምርመራ እንታይ ነይሩ?	ኣለዋ		
		ናፃ		
7	ክታበት ኮቪድ-19 ተኸቲብኪ ዶ?	እወ		
		ኣይፋል		
8	ክንደይ ግዘ ተኸቲብኪ?			
9	ንምንታይ ዘይተኸተብኪ	ክታበት ኣይነበረን		
		ጎናዊ ሳዕቤን ፈሪሐ		
		ስነ-ሂወታዊ ጦር መሳርሒ ኢለ ስለዝሓሰብኩ		
		መኻንንት ስለዘምፅእ		
		ኣብ ሓፂር ግዘ ዝተሰርሐ ስለዝኾነ ኣይተኣማመኩሉን		
		እኩል ሓበሬታ ኣይነበረንን		
		ባዕሉ ሓማም ኮቪድ-19 ስለዘምፅእ		
		እቲ ክታበት ወፅኢታዊ ኣይኮነን		
		እቲ ሕማም ተጋኒኑን ክታበት ኣያድልዮን እዩ።		
		ካሊእ (ይገለፅ)		

ክፋል ሰለስተ፥ ኩነታት ጥንስን ሕርስን ወሊድን

ተ.ቑ,	ሕቶታት	መማረፂታት	መልሲ	መብርሂ
1	በዝሒ ጥንሲ	ናይ መፈለምታ		
		ብዙሕ ዝጠነሰት		
2	በዝሒ ወሊድ (parity)	ዘየወለደት		
		ሓደ ግዘ ጥራሕ ዝወለደት		
		ብዙሕ ዝወለደት		
3	እቲ ጥንሲ ዝተተለመ ድዩ?	እወ		
		ኣይፋል		
4	ዕድመ ጥንሲ	ናይ መፈለምታ ሲሶ (0-14 ሰሙን)		
		ካልኣዋይ ሲሶ (15-27		

		ሰሙን)		
		ሳልሳዋይ ሲሶ (28 ሰሙንን ድሕሪኡን)		
5	በዝሒ ናይ ጥንሲ ክትትል	___________		

ክፋል ኣርባዕተ፥ ኣፍልጦ ብዛዕባ ክታበት ሕማም ኮቪድ-19

ተ.ቁ,	ሕቶታት	መማረፂታት	መልሲ	መብርሂ
1	ብዛዕባ ክታበት ሕማት ኮቪድ-19 ሰሚዕኺ ትፈልጢ ዶ	እወ		
		ኣይፋል		
		ኣይፈልጥን/እንድዒ/ግሉል (Neutral)		
2	ኣብዚ ሕዚ እዋን ሰባት ክታበት ኮቪድ-19 ይወስዱ ከምዘለዉ ትፈልጢ ዶ?	እወ		
		ኣይፋል		
		ኣይፈልጥን		
3	ክታበት ኮቪድ-19 ውፅኢታዊ ምዃኑ ትፈልጢ ዶ?	እወ		
		ኣይፋል		
		ኣይፈልጥን		
4	ክታበት ኮቪድ-19 ጉድኣት ኣለዎ ኢልኪ ትሓስቢ ዶ?	እወ		
		ኣይፋል		
		ኣይፈልጥን		
5	ክታበት ኮቪድ-19 ሕማም ናይ ምክልኻል ዓቕሚ ይውስኽ ዶ?	እወ		
		ኣይፋል		
		ኣይፈልጥን		
6	ክታበት ኮቪድ-19 ጎናዊ ሳዕቤን ኣለዎ ኢልኪ ትሓስቢ ዶ?	እወ		
		ኣይፋል		
		ኣይፈልጥን		
7	ብዙሓት ዓይነት ናይ ኮቪድ-19 ክታበታት ይምረቱ ምህላዎም ትፈልጢ ዶ?	እወ		
		ኣይፋል		
		ኣይፈልጥን		
8	እቲ ክታብት ሕማም ኮቪድ-19 ይከላኸል ዶ?	እወ		
		ኣይፋል		
		ኣይፈልጥን		
9	እንታይ ዓይነት መከላኸሊ መንገድታት ሕማም ኮቪድ-19 ትፈልጢ?	ኢድካ ብማይን ሳሙናን ምሕፃብ		
		ርሕቐትካ ምሕላው		
		ክትባት		
		ምውሻብ/ምፍላይ		
		መሸፈኒ ኣፍን ኣፍንጫን ምግባር		
		ካሊእ (ይገለፅ)		

ሓሙሻይ ክፋል ኣተሓሳስባ/ኣረኣእያ ኣብ ክታበት ኮቪድ-19

ተ.ቁ,	ሕቶታት	መማረፂታት	መልሲ	መብርሂ
1	ሓድሽ ክታበት ኮቪድ-19 ዝኾነ ናይ ጥዕና ፀገም የብሉን	ኣዝየ ይስማዕማዕ		
		ይስማዕማዕ		

		እንድዒ/ግሉል (Neutral)		
		ኣይስማዕማዕን		
		ኣዝየ ኣይስማዕማዕን		
2	ክታበት ኮቪድ-19 ምውሳድ ንዓና ኣገዳሲ እዩ።	ኣዝየ ይስማዕማዕ		
		ይስማዕማዕ		
		እንድዒ/ግሉል (Neutral)		
		ኣይስማዕማዕን		
		ኣዝየ ኣይስማዕማዕን		
3	ክታበት ኮቪድ-19 ብዘይ ውዝግብ ክወስድ እየ	ኣዝየ ይስማዕማዕ		
		ይስማዕማዕ		
		እንድዒ/ግሉል (Neutral)		
		ኣይስማዕማዕን		
		ኣዝየ ኣይስማዕማዕን		
4	ኮቪድ-19 ኣይክንኪን እዩ።	ኣዝየ ይስማዕማዕ		
		ይስማዕማዕ		
		እንድዒ/ግሉል (Neutral)		
		ኣይስማዕማዕን		
		ኣዝየ ኣይስማዕማዕን		
5	ስድራይ /ፈተውተይ ክታበት ኮቪድ-19 ክወስዱ ከተባብዖም እየ	ኣዝየ ይስማዕማዕ		
		ይስማዕማዕ		
		እንድዒ/ግሉል (Neutral)		
		ኣይስማዕማዕን		
		ኣዝየ ኣይስማዕማዕን		
6	ክታበት ኮቪድ-19 ብፍትሓዊ መንገዲ ክዕደል ኣለዎ።	ኣዝየ ይስማዕማዕ		
		ይስማዕማዕ		
		እንድዒ/ግሉል (Neutral)		
		ኣይስማዕማዕን		
		ኣዝየ ኣይስማዕማዕን		
7	ክታበት ኮቪድ-19 ኣገዳሲ/ጠቓሚ ኮይኑ ይስምዓኒ።	ኣዝየ ይስማዕማዕ		
		ይስማዕማዕ		
		እንድዒ/ግሉል (Neutral)		
		ኣይስማዕማዕን		
		ኣዝየ ኣይስማዕማዕን		
8	ክታበት ኮቪድ-19 ለበዳ ኮቪድ-19 ኽቕንስ ይገብር እዩ።	ኣዝየ ይስማዕማዕ		
		ይስማዕማዕ		
		እንድዒ/ግሉል (Neutral)		
		ኣይስማዕማዕን		
		ኣዝየ ኣይስማዕማዕን		
9	ወፍሪ ክታበት ኮቪድ-19 እድግፍ	ኣዝየ ይስማዕማዕ		
		ይስማዕማዕ		

		እንድዒ/ግሉል (Neutral)		
		ኣይስማዕማዕን		
		ኣዝየ ኣይስማዕማዕን		
10	በዓል ስልጣን ቁፅፅር ምግብን መድሓኒት ውሑስን ውጽኢታውን ክታበት ክዕድል ኣለዎ።	ኣዝየ ይስማዕማዕ		
		ይስማዕማዕ		
		እንድዒ/ግሉል (Neutral)		
		ኣይስማዕማዕን		
		ኣዝየ ኣይስማዕማዕን		
11	ኮቪድ-19 ክታበት ጎናዊ ሳዕቤናት ክታበት ንክይወስድ ከድሕርሕር ይገብሩኒ	ኣዝየ ይስማዕማዕ		
		ይስማዕማዕ		
		እንድዒ/ግሉል (Neutral)		
		ኣይስማዕማዕን		
		ኣዝየ ኣይስማዕማዕን		
12	ክታበት ኮቪድ-19 ብኽፍሊት ኣይወስድን'የ	ኣዝየ ይስማዕማዕ		
		ይስማዕማዕ		
		እንድዒ/ግሉል (Neutral)		
		ኣይስማዕማዕን		
		ኣዝየ ኣይስማዕማዕን		

ሻዱሻይ ክፋል ርድኢት ኣብ ክታበት ኮቪድ-19

1. ብዛዕባ ኮቪድ-19 እንታይ ትፈልጢ?
2. ሕማም ኮቪድ-19 ብኸመይ ትከላኸሊ?
3. ብዛዕባ ክትባት ኮቪድ 19 አንታይ ትፈልጢ?
4. ክትባት ኮቪድ-19 ንጥንስኺ ብኸመይ ይጸልዎ ኢልኪ ትሓስቢ?
5. ጎናዊ ሳዕቤን ክትባት ኮቪድ 19 እንታይ ይመስለኪ?
6. ሰባት ንክትባት ኮቪድ 19 ዘይወስድሉ ምክንያት እንታይ ይመስለኪ?
7. ሰባት ክታባት ኮቪድ-19 ንክወስዱ እንታይ ኢልኪ ትመኽሪ?