

## Research Article

# Misinformation on COVID-19 Vaccine and Its Associated Factors among Residents in Gondar, Ethiopia, 2022

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**Introduction.** In the year 2019, a new strain of severe acute respiratory syndrome emerged in Wuhan, Hubei province, China, causing a new pneumonia outbreak. Misinformation about the coronavirus 2019 vaccine, combined with inequitable vaccine delivery around the world, is the bottleneck of the most promising instruments for ending pandemic. Vaccine confidence and vaccination rate can be affected by misinformation. The majority of COVID-19 vaccine misinformation has been on vaccine development, safety, and effectiveness as well as COVID-19 denial. Hence, this study is aimed at assessing the magnitude of misinformation on the COVID-19 vaccine and associated factor among residents in Gondar, Ethiopia, *Method.* A community-based cross-sectional study was conducted from May 8 to June 10, 2022, among 844 residents in Gondar town. A multistage cluster sampling method was employed to select study participants. An interview-administered questionnaire was used to collect the required data. The data were entered using EpiData 4.6 and transferred into SPSS version 20 for analysis. Descriptive statistics and bivariable and multivariable logistic regression analyses were done. An adjusted odds ratio (AOR) with 95% CI was used to determine explanatory factors associated with misinformation on the COVID-19 vaccine. *Result.* The proportion of misinformation about the COVID-19 vaccine was found to be 48%. Being male (AOR = 1.48, 95% CI: 1.03, 2.13), vaccination status (AOR: 7.37, CI: 4.59, 11.83), history of COVID-19 (AOR: 0.21, CI: 0.5, 0.78), health self-efficacy (AOR: 0.6, CI: 0.42, 0.86), perceived severity (AOR: 1.47, CI: 1.02, 2.12), knowledge towards COVID-19 vaccine (AOR: 1.85, CI: 1.28, 2.67), and attitude towards COVID-19 (AOR: 1.9, CI: 1.32, 2.76) vaccine were significant factors associated with misinformation on COVID-19 vaccine. *Conclusion and Recommendation.* The overall proportion of misinformation on the COVID-19 vaccine was found at 48%. Increasing community awareness of the COVID-19 vaccine and clarifying misunderstandings about it through media campaigns may help to lessen the tendency for misinformation in the community.

## 1. Introduction

In the year 2019, a new strain of SARS, the seventh in the series of human coronaviruses, emerged in Wuhan, Hubei province, China, causing a new pneumonia outbreak [1–3]. SARS-CoV-2 is a  $\beta$ -CoV that typically infects the respiratory, gastrointestinal, and central nervous systems of humans and mammals [4]. The route of transmission of the disease is through respiratory droplets, aerosols, touch, and fomites; it spreads from

person to person [2, 4]. Alpha coronavirus, beta coronavirus, gamma coronavirus, and delta coronavirus are the four genera that make up this family. Alpha and beta genera can spread to humans [5]. On March 11, 2020, the World Health Organization (WHO) proclaimed the novel coronavirus (COVID-19) outbreak a global pandemic [6–8]. On March 13, 2020, a COVID-19 case was identified in Addis Ababa, Ethiopia, according to the Federal Ministry of Health [9]. As of August 5, 2022, there had been 579,092,623 confirmed cases of

COVID-19 reported to WHO, with 6,407,556 deaths, beginning from when WHO declared the new coronavirus (COVID-19) outbreak as a worldwide pandemic on March 11, 2020 [5, 6]. In Ethiopia, from March 13, 2020, to April 6, 2022, there have been 469,879 confirmed cases of COVID-19, with 7,508 deaths reported to WHO [7].

Margaret Keenan, 90, became the first person outside of a trial to get the Oxford-AstraZeneca vaccine after it received rapid clinical approval [8]. Vaccines are the most critical tool to end the pandemic and save lives and livelihoods. Equitable access to safe and effective vaccines was crucial, and Africa must not be left behind. No one is safe until everyone is made safe by vaccination [9]. Misinformation can be defined as information that is false but not created to cause harm [10–12]. A study conducted in Bangladesh considered misinformation an umbrella term for general misinformation, conspiracy theories, and religious misinformation [13].

“We’re not only just fighting an epidemic; but also we’re fighting an infodemic.” On February 15, the WHO Director-General declared that WHO is making its best effort to control the 2019 coronavirus illness (COVID-19) outbreak. However, a global epidemic of misinformation, which is rapidly spreading through social media platforms and other outlets, poses a severe public health threat [14]. Concerning COVID-19 falsehoods, the network we have built encourages the spread of false evidence, inflicting harm to the national economy and public health [15]. Fake news, misinformation, and conspiracy theories have grown increasingly common in the age of social media, especially since the outbreak of COVID-19 [16]. In response, the government of the United Kingdom and WHO have produced a digital series to address common misconceptions circulating online and explain the safety of approved COVID-19 vaccines [17]. It also leads to mistrust in health authorities and undermines public health responses [18]. Misinformation about the COVID-19 vaccine, combined with inequitable vaccine delivery around the world, is a bottleneck for the most promising instruments for ending the pandemic [19]. The majority of COVID-19 vaccine misinformation has been on vaccine development, safety, and effectiveness, as well as COVID-19 denial [11]. According to the Pew Research Center’s research, YouTube and Facebook continue to dominate the online landscape, with 81% and 69% of users, respectively, reporting ever using these sites.

Reports from the Johns Hopkins Centre for Communication Programs in January 2021 showed that 63% of respondents from 23 countries were voluntary to be vaccinated for COVID-19, but this is below the expected for reaching herd immunity of 75% [17]. According to the findings of a study on misinformation exposure, more than one-third of Americans (38%) agree with at least one of the common false claims on COVID-19 [20]. According to a Google analysis of COVID-19 vaccine findings, circulating misinformation claiming COVID-19 vaccines cause female infertility coincided with significant increases in internet searches in the United States for topics related to infertility and COVID-19 vaccines, reflecting COVID-19 vaccine safety concerns [21]. When there are knowledge gaps or unresolved science, human nature attempts to reason, better

understand, and fill in the gaps, which lead to misinformation [11]. Comparing vaccine reluctance among those exposed to misinformation to those who were not, the researchers discovered that misinformation was more prevalent in the exposed group [22]. According to an online survey conducted across 40 different countries, the major finding of the research was that economically deprived countries are more vulnerable to the information crisis than wealthier countries, and respondents from countries with lower GDP per capita are more likely to believe in false information when confronted with it [23]. As result of a range of false beliefs regarding COVID-19 vaccine misinformation, 68.6% of respondents were unwilling to receive the COVID-19 vaccine; indeed, the community was the primary target of the COVID-19 vaccination misinformation dissemination, and Ethiopian MOH tried to identify the source of the misinformation [24, 25]. The Ethiopian government prioritizes financing the purchase of medical supplies and equipment. Funding for training, preparation, and capacity building came from the functionalization of the emergency operations center (EOC). Community discussions and information outreach including quarantine, isolation and treatment centers, project implementation and monitoring, and social media campaign exerted huge significance for the vaccine acceptance [26].

## 2. Conceptual Framework

The conceptual framework showed what was planned to find through this research, and it explains the relationship between misinformation on COVID-19 vaccine and the predictor variables such as sociodemographic factors, behavioral factors, psychological factors, technological factors, and health-related factors.

The solid line in the conceptual framework shows the direct relationships between misinformation on the COVID-19 vaccine and each predictor variable, whereas the dotted line shows the relationship that exists in predictor variables. The variables are collected from different literature conducted on misinformation on COVID-19 vaccine [27–32] (Figure 1).

## 3. Methods

*3.1. Study Design.* A community-based cross-sectional study was conducted.

*3.2. Study Area and Period.* The study was conducted in Gondar town from 08 May to 10 June 2022. Gondar is located at a 726 km distance northwest of Addis Ababa, the capital city of Ethiopia. According to the 2022 population projection of major cities in Ethiopia, the total population of Gondar town was estimated to be 392,089 [33]. The town has 25 kebeles. Currently, it has one referral hospital, which was the COVID-19 center during the pandemic, and eight public health centers (Figure 2).

*3.3. Source and Study Population.* All adults 18 and above years of age living in Gondar town were taken as source population, and all adults 18 and above years of age living

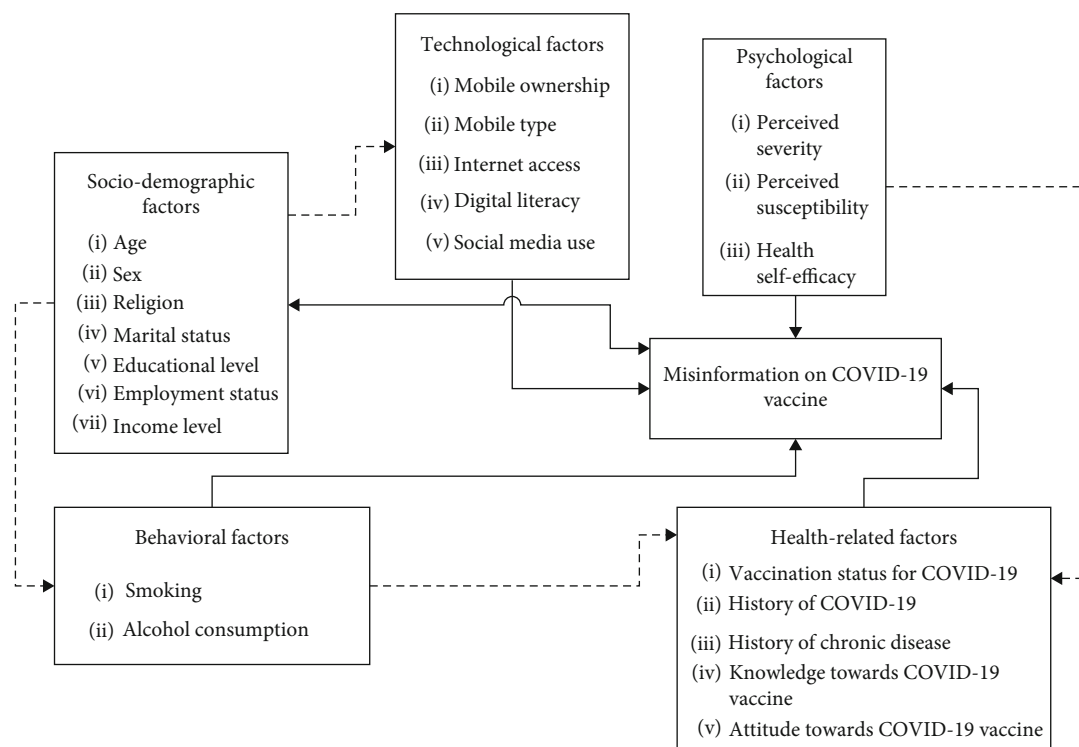


FIGURE 1: Conceptual framework for misinformation on COVID-19 vaccine among residents of Gondar town, 2022.

in the selected kebeles were taken as the study population and who were found during the data collection period.

**3.4. Inclusion and Exclusion Criteria.** In this study, those adults (18 and above years old) living in selected kebeles of Gondar town and available during the data collection period were included, and the participants he who are not able to hear and speak were excluded from this.

**3.5. Variable of Study. Dependent variable:** misinformation on COVID-19 vaccine.

Independent variables are as follows:

*Sociodemographic factors:* age, sex, religion, marital status, employment status, monthly income, and educational status.

*Technological factors:* mobile ownership, mobile type, social media use, internet access, digital literacy.

*Psychological factors:* perceived susceptibility, perceived severity, and health self-efficacy.

*Health-related factors:* vaccination status, history of COVID-19, attitude towards COVID-19 vaccine, history of chronic illness, and knowledge towards COVID-19 vaccine.

*Behavioral factors:* smoking and alcohol consumption.

## 4. Operational Definition

**4.1. Misinformation on COVID-19 Vaccines. Participants:** the COVID-19 vaccine misinformation was measured by eight claims taken from previous studies and CDC myths. Respondents were asked to indicate how much they agreed with eight statements on a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). Subsequently,

respondents who scored greater than or equal to the median value of COVID-19 vaccine misinformation questions were considered to be misinformed on the COVID-19 vaccine, and respondents who answered less than the median value of COVID-19 vaccine misinformation assessment questions were considered to be not misinformed on the COVID-19 vaccine [34–38].

*Digital literacy:* this refers to an individual’s ability to find, evaluate, and use information from various digital platforms [39, 40]. Eight-item questions with a five-point Likert scale from poor to excellent were used to measure the digital literacy of study participants. A dichotomous variable was created from the responses (high = greater than or equal to the mean value; low = below the median value).

*Social media use:* the most recent measure in July 2015 defined social media users as those who said “yes” to the question “Do you ever use a social networking site like Facebook, Twitter, or LinkedIn?” [41].

*Smoking:* respondents were asked a question about their smoking status: “Have you smoked cigarettes currently?” A smoker is a respondent who currently smokes either every day or sometimes [42].

Perceived susceptibility to COVID-19 assessed perception of the risk of contracting COVID-19. A single-item question was used with 5 scales (very unlikely = 1, unlikely = 2, neither = 3, likely = 4, and very likely = 5). Media A higher score represents a higher perceived susceptibility [42].

*Perceived severity of COVID-19:* this assesses the seriousness of contracting COVID-19. One-item question was used with 5 scales (not at all = 1, slightly = 2, somewhat = 3,

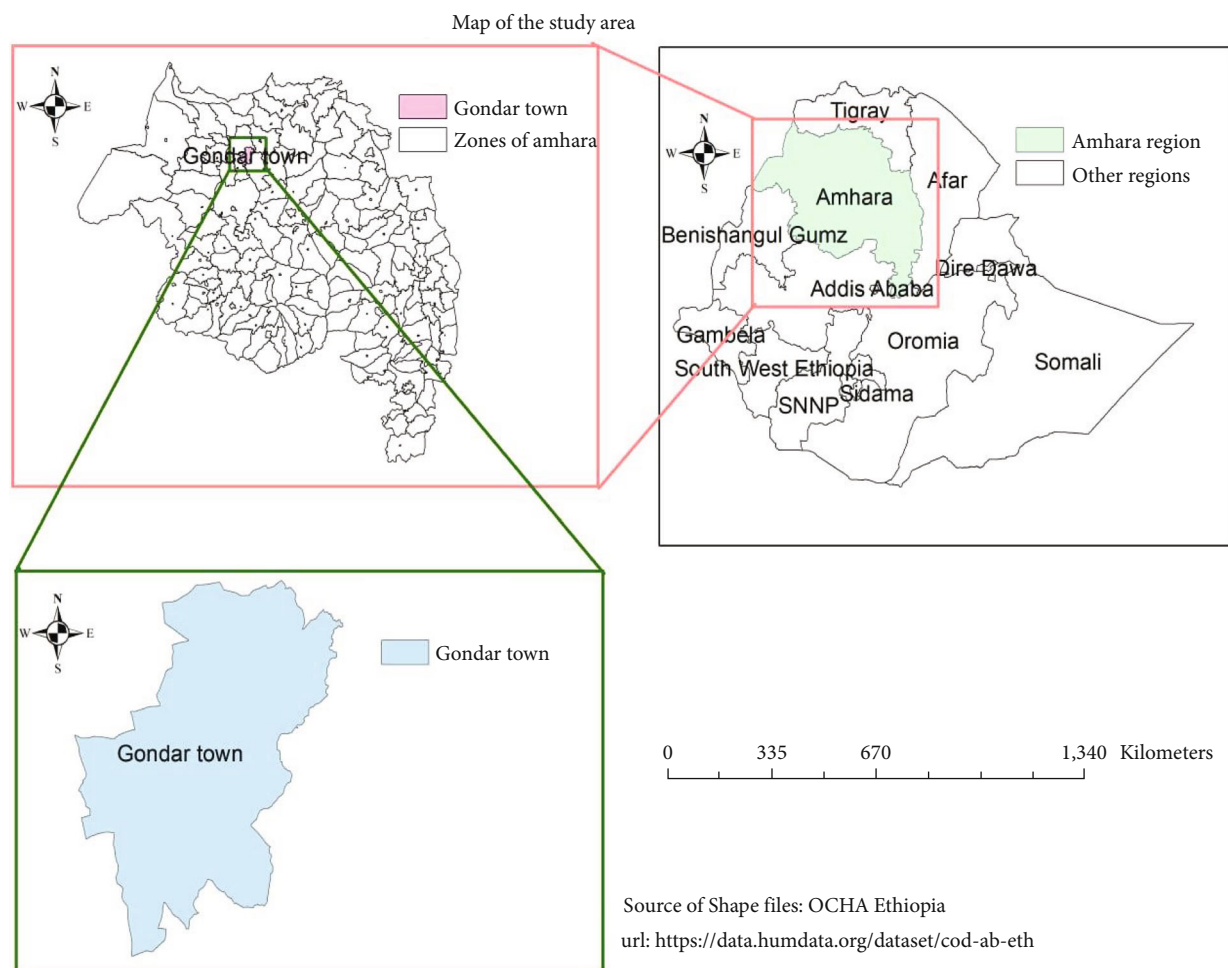


FIGURE 2: Map of study area COVID-19 vaccine misinformation among residents of Gondar town, 2022.

moderately = 4, and extremely = 5). Media A higher score represents a higher perceived severity [42].

**Health self-efficacy:** it measures how confident the participants are about their ability to take good care of their health. One-item question was used with 5 scales (completely confident = 5, very confident = 4, somewhat confident = 3, a little confident = 2, and not confident at all = 1). Media A higher score represents higher self-efficacy [42].

**Knowledge about COVID-19 vaccine:** participants' knowledge about the COVID-19 vaccine was measured by nine questions. Each question contains three responses: "yes," "no," and "I don't know." Finally, all knowledge scores were computed, and those study participants who responded above the mean score were considered to have good knowledge, whereas below the media value were labelled as having poor knowledge [31, 43].

**Attitude towards COVID-19 vaccine:** the attitude of respondents towards COVID-19 vaccine was computed by summing up all relevant six attitude-related questions, like "Do you think the newly discovered COVID-19 vaccine is safe?" (agree = 1, undecided = 2, and disagree = 3). "Do you think the COVID-19 vaccine is essential for us?" (agree = 1, undecided = 2, and disagree = 3). "Do you think the COVID vaccines developed in Europe and America are safer

than those made in other countries?" (agree = 1, undecided = 2, and disagree = 3). "May you encourage your family, friends, and relatives to get vaccinated for COVID-19?" (agree = 1, undecided = 2, and disagree = 3). "Do you think that it is not possible to reduce the incidence of COVID-19 without vaccination?" (agree = 1, undecided = 2, and disagree = 3). "Do you think the COVID-19 vaccine should be distributed fairly to all of us?" (agree = 1, undecided = 2, and disagree = 3). Accordingly, respondents who scored greater than or equal to the median value of the sum of attitude-related questions were considered to as having a positive attitude, and respondents who answered less than the mean value of the sum of attitude assessment questions were considered to have a negative attitude [31].

#### 4.2. Sample Size Determination and Sampling Procedure

**4.2.1. Sample Size Determination.** The sample size was calculated using the single population proportion formula with assumptions of a 95% confidence level (CI),  $Z(1 - \alpha/2) = 1.96$ , an expected magnitude of misinformation on the COVID-19 vaccine of 50% ( $p$ ) [44], and a 5% margin of error ( $d$ ). Since there was no similar study in our study setting on misinformation about the COVID-19 vaccine,



50% of the magnitude of misinformation on the COVID-19 vaccine was taken into account.

$$n = \frac{(Z\alpha/2)^2 \times pq}{d^2}, \quad (1)$$

$$n = \frac{(1.96)^2 \times 0.5 \times 0.5}{(0.05)^2} = 384,$$

where  $n$  is the required sample size,  $d$  is the margin of error,  $p$  is the magnitude of misinformation on COVID-19 vaccine, and  $q = 1 - p$ .

With a design effect of two and a 10% nonresponse rate, the final sample size was 844.

**4.2.2. Sampling Procedure.** A multistage cluster sampling method was employed to select study participants. From a total of 25 kebeles, eight kebeles (Kirkos, Lideta, Arbegnoch, Teda, Piasa, Shiromeda, Samunaber, and Gebriel) were selected by using a lottery method and considering the 30% thumb rule [45]. Then, from each kebele, one ketena (the lowest administrative cluster) was selected, depending on the number of households. Those selected ketenas were considered clusters, and in each household in the selected ketenas, a single individual was randomly selected from family members and interviewed. A randomly selected family member, aged 18 years and above, was taken as a respondent who was available at the time of data collection (Figure 3).

#### 4.3. Data Collection Tools and Procedures

**4.3.1. Data Collection Tools.** The questionnaire was first prepared in English, transcribed into Amharic, and again translated back to English for consistency; it had a closed-ended nature. It also included a Likert scale, yes/no, and lists of response options. The instrument (the tool) for the study was adopted from different literatures, and modifications were made to meet our context and the study objective. The questionnaire for the outcome variable was adapted from the CDC's common myths on the COVID-19 vaccine and previous studies [35–37, 46]. The instrument included different questions assessing sociodemographic characteristics, COVID-19 vaccine misinformation sources, behavioral characteristics, psychological characteristics, and health-related factors.

**4.3.2. Data Collection Procedure.** Data was collected from study subjects using a pretested and structured interview-administered questionnaire. Training was given for data collectors and supervisors. The data was collected by five trained data collectors guided by two supervisors. An interview was held by data collectors with the study participants at their convenience. The tool was pretested among Kolla Diba town residents by taking 5% of the total sample size to check for clarity of language, appropriateness, and internal consistency. Cronbach's alpha was computed to determine the internal consistency of the assessment tools, Cronbach's alpha of the outcome variable is 0.905, and the determinate factors are as follows: digital literacy = 0.949, knowledge = 0.769, and attitude = 0.782).

**4.4. Data Quality Control.** To control the quality, one-day data training was given for data collectors before the actual data collection. Properly designed and pretested questionnaires were used. Oral consent was obtained from each study participant. Participants were also informed that they could leave the program at any time if they were not comfortable with the questionnaire. Continuous supervision was maintained to control the data collection procedure. After data collection, questionnaires were reviewed and checked for completeness, and the data was cleaned to check for errors and missing values; any errors identified were corrected.

**4.5. Data Processing and Analysis.** A data entry form was prepared with EpiData version 4.6, and analysis was conducted using SPSS version 20. Bivariable analysis with a  $p$  value less than 0.2 was considered, and multivariable logistic regression was used to assess factors associated with misinformation on the COVID-19 vaccine. The Hosmer and Lemeshow tests were used to check model fit, and their  $p$  value was 0.64. The results were presented in the form of tables, figures, and text using frequencies and summary statistics such as mean, standard deviation, and percentage to describe the study population in relation to relevant variables.  $p$  value less than or equal to 0.05 was taken as cut off value for being significant. Before running the logistic regression model, the assumptions of multicollinearity were checked and showed all variance inflation factor (VIF) values less than three, which demonstrated the absence of multicollinearity. Finally, the Hosmer and Lemeshow test was used to measure model fitness, with a  $p$  value of  $>0.05$  considered statistically significant.

## 5. Result

**5.1. Sociodemographic Characteristics.** A total of 844 study subjects participated in this study. The median age of the study participants was 35 (IQR = 10), which ranges from 18 to 70 years; 50.8 percent (429) of the respondents were male. The majority of study respondents were Orthodox Christians (81.4% (687)). The result indicated that 47.7% (403/844) of study subjects were unemployed. Regarding education status, 24.5% (207) have certificates and diplomas. The majority of study subjects were married individuals 49.9% (421) (Table 1).

**5.2. Technological Characteristics.** The majority of the respondents (89.3%, or 754 of the 844) have mobile phones, and from those having mobile phones, around two-thirds have smart phones (65.5%) (494 of the 754). More than half of the study subjects 59.8% have Internet access. The majority of study subjects have low digital literacy (61.6% or 520/844). Of all respondents, more than half were social media users (57.8%, 488/844); of these social media users, Facebook was the preferred platform by major study subjects (69.5%) (399/488) (Table 2).

**5.3. Psychological Characteristics.** About half of the study subjects (51.2%, or 432) were not confident about their health. Regarding perceived severity, about 57.5% (485/844) of respondents perceived that COVID-19 is less severe. From

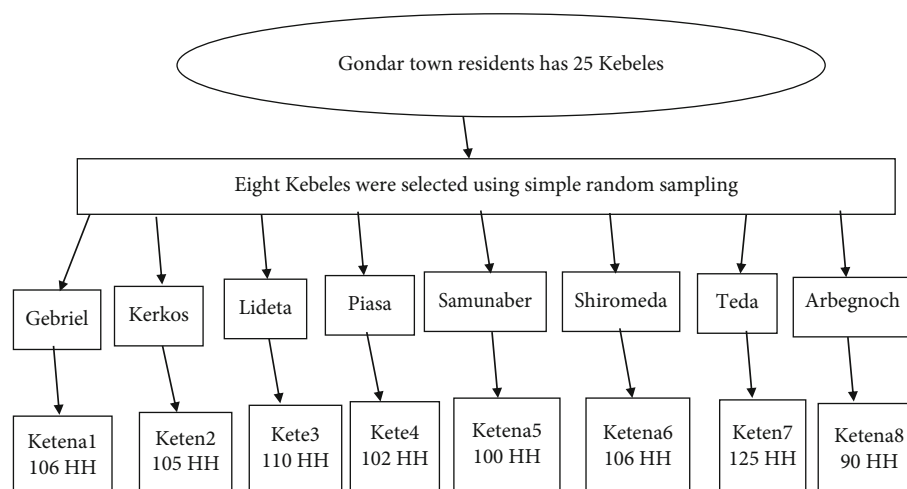


FIGURE 3: Sampling procedure COVID-19 vaccine misinformation among residents of Gondar town, 2022.

TABLE 1: Sociodemographic characteristics of respondents among Gondar town residents among residents of Gondar town, 2022.

Variable	Category	Frequency	Percentage
Age	Age < = 35	434	51.4
	Age > 35	410	48.6
Sex	Male	429	50.8
	Female	415	49.2
Religion	Orthodox	687	81.4
	Others	157	18.6
Educational status	Unable to read and write	69	8.2
	Able to read and write	142	16.8
	Elementary education	94	11.1
	Secondary education	133	15.8
	Certificate and diploma	207	24.5
	Degree and above	199	23.6
Current occupation	Unemployed	403	47.7
	Employed	287	34.0
	Daily wage workers	154	18.2
Marital status	Married	421	49.9
	Others	423	50.1
Monthly income (444)	Low income	318	71.6
	Middle income	112	13.2
	High income	14	1.7

the total respondents, about half of them (51.7%) (436) were less concerned about COVID-19 (Table 3).

**5.4. Health-Related Characteristics.** The majority of the respondents, 75.7% (639/844), were not vaccinated for COVID-19. Of the total participants, about 96.9% (818/844) have no history of COVID-19. 88.3% of respondents were not caught by any chronic disease. About half of respondents (435/844) have good knowledge about the COVID-19 vaccine.

Regarding attitude towards the COVID-19 vaccine, about 57% (481/844) had a positive attitude towards the COVID-19 vaccine (Table 4).

**5.5. Behavioral Characteristics.** The majority of the respondents 92.8% (783/844) were alcohol drinkers. Participants, 91.7% (774/754), were not smokers. Of the study subjects, 8.3%(80/844) were smokers. Of the study subjects, 7.2% (61/844) were nonalcohol drinkers (Table 5).

TABLE 2: Technological factors for misinformation on COVID-19 vaccine among residents of Gondar town, 2022.

Variable	Category	Frequency	Percentage
Mobile ownership	Yes	754	89.3
	No	90	10.7
Types of mobile phone (754)	Basic phone	260	34.5
	Smart phone	494	65.5
Internet access	Yes	505	59.8
	No	339	40.2
Access to regular dialup telephone line (505)	Yes	418	82.8
	No	87	17.2
Access to broadband (505)	Yes	120	23.8
	No	385	76.2
Access to wireless network(Wi-Fi) (505)	Yes	261	51.7
	No	244	48.3
Social media use	Yes	488	57.8
	No	356	42.2
Type of social media platform (488)	Facebook	339	69.5
	YouTube	46	9.4
	Tiktok	43	8.8
	Instagram	21	4.3
	WhatsApp	21	4.3
	Twitter	18	3.7

TABLE 3: Psychological characteristics for misinformation on COVID-19 vaccine among residents of Gondar town, 2022.

Variable	Category	Frequency	Percentage
Health self-efficacy	Confident	412	48.8
	Not confident	432	51.2
Perceived susceptibility	More concerned	408	49.3
	Less concerned	436	51.7
Perceived severity	Less severe	485	57.5
	More severe	359	42.5

5.6. *Misinformation on COVID-19 Vaccine.* Out of the total respondents, about half of them 52% were not misinformed, and 48% were misinformed (Figure 4).

From the total respondents, about half of them 405 (48%, CI, 44.6, 51.4) were misinformed on COVID-19 vaccine.

5.7. *Sources of Misinformation for COVID-19 Vaccine.* Out of the total respondents, about half of them 50.2% (424/844) heard the misinformation claims from social media platform followed by family/friends as their main sources 41.1% (348/844) (Figure 5).

5.8. *Factors Associated with Misinformation towards COVID-19 Vaccine.* The result of bivariate logistic regression analysis indicated that the sex of respondents, marital status, current work nature, vaccination status, type of mobile

phone, Internet access, smoking, history of chronic disease, history of COVID-19, having family or friends victimized by COVID-19, health self-efficacy, perceived severity, perceived susceptibility, knowledge of COVID-19 vaccine, and attitude towards COVID-19 were significantly associated with misinformation on COVID-19 vaccine.

In the multivariable analysis, sex, vaccination status, history of COVID-19, perceived severity, health self-efficacy, knowledge of COVID-19 vaccine, and attitude towards COVID-19 vaccine were significant factors associated with misinformation on COVID-19 vaccine.

The odds of being misinformed about the COVID-19 vaccine among male residents in the community were 1.48 times higher than those among female residents (AOR = 1.48, 95% CI: 1.03, 2.13). When compared with respondents who were vaccinated for COVID-19, participants who were not vaccinated for COVID-19 were 7.37 times more likely to be misinformed about the COVID-19 vaccine (AOR, 7.37 CI, 4.59, 11.83).

In this study, respondents who had a history of COVID-19 reduced misinformation by 79% when compared to those who did not have a COVID-19 history (AOR, 0.21, CI, 0.5, 0.78). This study reveals that respondents who are confident about their health reduce misinformation by 40% compared to those who are not confident about their health (AOR 0.6, CI 0.42, 0.86). Respondents who perceived COVID-19 as having a low severity were 1.47 times more likely to be misinformed about COVID-19 vaccine than those who perceived COVID-19 as highly severe (AOR: 1.47, CI: 1.28, 2.67).

TABLE 4: Health-related characteristics for misinformation on COVID-19 vaccine among residents of Gondar town, 2022.

Variable	Category	Frequency	Percentage
Vaccination status	Yes	205	24.3
	No	639	75.7
History of COVID-19	Yes	26	3.1
	No	818	96.9
History of chronic disease	Yes	99	11.7
	No	745	88.3
Victim family/friends COVID-19	Yes	428	50.7
	No	416	49.3
Knowledge towards COVID-19 vaccine	Poor knowledge	409	48.5
	Good knowledge	435	51.5
Attitude towards COVID-19 vaccine	Negative attitude	363	43
	Positive attitude	481	57

TABLE 5: Behavioral characteristics for misinformation on COVID-19 vaccine among residents of Gondar town, 2022.

Variable	Category	Frequency	Percentage
Smoking	Yes	70	8.3
	No	774	91.7
Alcohol drinking	Yes	783	92.8
	No	61	7.2

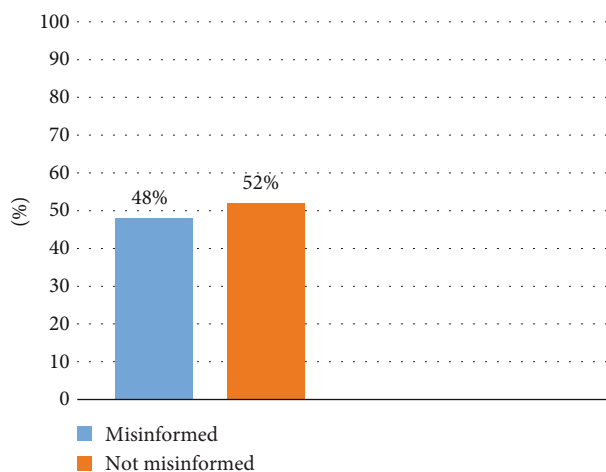


FIGURE 4: Misinformation proportion COVID-19 vaccine among Gondar town residents of Gondar town, 2022.

Participants who had poor knowledge towards the COVID-19 vaccine were 1.85 times more likely to be misinformed about the COVID-19 vaccine compared to participants who had good knowledge about the COVID-19 vaccine (AOR: 1.85, CI: 1.28, 2.67). In addition to this, the odds of being misinformed about the COVID-19 vaccine were 1.9 times higher among respondents who had positive attitudes about COVID-19 vaccine (AOR: 1.9, CI: 1.32, 2.76). The following table provides detailed information about the

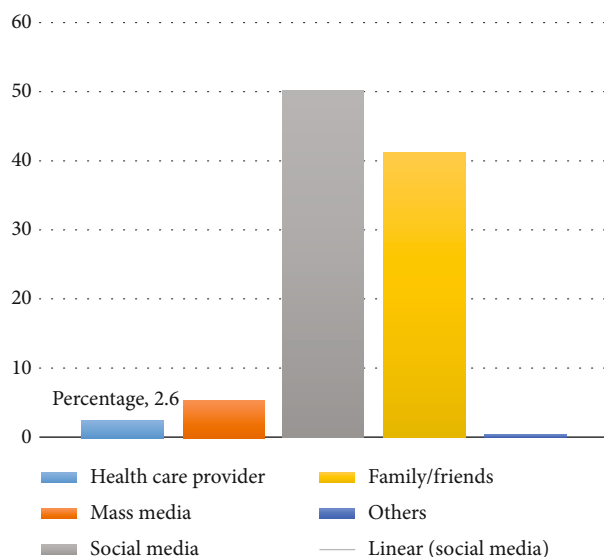


FIGURE 5: Misinformation sources for COVID-19 vaccine of Gondar town, 2022.

bivariate and multivariable analyses of factors associated with misinformation on COVID-19 vaccine (Table 6).

## 6. Discussion

This study has shown that about 48% of the population was misinformed about the COVID-19 vaccination. Social media was the major source of misinformation. Gender, vaccination status, history of infection with COVID-19, health self-efficacy, perceived severity, knowledge, and attitude towards the COVID-19 vaccine were significantly associated with misinformation on the COVID-19 vaccine.

Findings in this study have indicated that about half (48%, CI, 44.6, 51.4) of community residents were misinformed on the COVID-19 vaccine. Similarly, studies in the UK [47], New Zealand [22], USA [46], Dutch [48], and Australia [36] indicated that incorrect and misleading



TABLE 6: Associated factors with misinformation on COVID-19 vaccine among residents of Gondar town, 2022.

Variables	Misinformation on COVID-19		COR (95%)	AOR (95%)
	Yes N (%)	No N (%)		
<b>Age</b>				
≤36 years	238 (58.8)	228 (51.9)	1.32 (1, 1.73)	1.05 (0.67, 1.65)
>36	167 (41.2)	211 (48.1)	1	
<b>Gender</b>				
Male	224 (55.3)	205 (46.7)	1.41 (1.08, 1.85)	1.48 (1.03, 2.13)**
Female	181 (44.7)	234 (53.3)	1	
<b>Current work nature</b>				
Unemployed	215 (53.1)	188 (42.8)	1	
Employed	112 (27.7)	175 (39.9)	1.79 (1.31, 2.43)	1.39 (0.89, 2.16)
Daily laborers	78 (19.3)	76 (17.3)	1.11 (0.77, 1.61)	1.64 (0.91, 2.95)
<b>Marital status</b>				
Single	205 (50.6)	185 (42.1)	1	
Married	185 (45.7)	236 (53.8)	1.41 (1.07, 1.86)	0.8 (0.52, 1.25)
Divorced	13 (3.2)	11 (2.5)	0.94 (0.41, 2.14)	0.56 (0.15, 2.03)
Widowed	2 (0.5)	7 (1.6)	3.88 (0.79, 18.9)	2.2 (0.18, 26.64)
<b>Vaccination status</b>				
Yes	32 (7.9)	173 (39.4)	1	
No	373 (92.1)	266 (60.6)	7.58 (5.04, 11.4)	7.37 (4.59, 11.83)*
<b>Mobile ownership</b>				
Yes	370 (91.4)	384 (87.5)	1	
No	35 (8.6)	55 (12.5)	1.51 (0.97, 2.37)	1.23 (0.86, 2.22)
<b>Types of mobile phone</b>				
Basic phone	118 (31.9)	142 (37)	0.78 (0.59, 1.08)	0.62 (0.3, 1.27)
Smart phone	252 (68.1)	242 (63)	1	
<b>Internet access</b>				
Yes	253 (62.5)	252 (57.4)	1.24 (0.94, 1.63)	1.07 (0.5, 2.23)
No	152 (37.5)	187 (42.6)	1	
<b>Smoking</b>				
Smoker	24 (5.9)	16 (3.6)	1.67 (0.87, 3.18)	1.97 (0.78, 4.85)
Nonsmoker	381 (94.1)	423 (96.4)	1	
<b>History of chronic disease</b>				
Yes	30 (7.4)	69 (15.7)	0.43 (0.27, 0.67)	0.85 (0.47, 1.53)
No	375 (92.6)	370 (84.3)	1	
<b>History of COVID-19</b>				
Yes	3 (0.7)	23 (5.2)	0.14 (0.04, 0.45)	0.21 (0.5, 0.78)*
No	402 (99.3)	416 (94.8)	1	
<b>Having victim friend/family</b>				
Yes	181 (44.7)	247 (56.3)	0.63 (0.48, 0.82)	0.99 (0.68, 1.45)*
No	224 (55.3)	192 (43.7)	1	
<b>Health self-efficacy</b>				
Confident	234 (57.8)	178 (40.5)	0.49 (0.38, 0.66)	0.6 (0.42, 0.86)*
Not confident	171 (42.2)	261 (59.5)	1	
<b>Perceived susceptibility</b>				
Less concerned	252 (62.2)	184 (41.9)	2.28 (1.73, 3.00)	1.42 (0.99, 2.05)
More concerned	153 (37.8)	255 (58.1)	1	

TABLE 6: Continued.

Variables	Misinformation on COVID-19		COR (95%)	AOR (95%)
	Yes N (%)	No N (%)		
Perceived severity				
Low	269 (66.4)	216 (49.2)	2.04 (1.55, 2.69)	1.47 (1.02, 2.12)**
High	136 (33.6)	223 (50.8)	1	
Knowledge towards COVID-19 vaccine				
Poor	260 (64.2)	149 (33.9)	3.49 (2.63, 4.63)	1.85 (1.28, 2.67)**
Good	145 (35.8)	290 (66.1)	1	
Attitude towards COVID-19				
Negative	240 (59.3)	123 (28)	3.74 (2.8, 4.98)	1.9 (1.32, 2.76)**
Positive	165 (40.7)	316 (72)	1	

Note: \**p* value > 0.01, \*\**p* value < 0.001 and 1 reference category.

information has largely affected perceptions and the willingness of the community to take the vaccination against COVID-19. The result of this study is supported by a study conducted among people in the USA, Italy, and Canada [36]. This could be due to the increase in the number of social media users, which in turn causes the spread of unverified information about the COVID-19 vaccine.

A study finding from Jordan showed that 47.9% of respondents believed that COVID-19 is part of a global conspiracy, which supports this study's result [30]. Users of social media should receive trustworthy information from health agencies' verified social media profiles, and the mass media should deliver reliable information to the community.

The percentage of misinformation among community members is found to be 48% in this study, which is higher than the percentage found in a study conducted in Saudi Arabia, where the finding stated that the most widely held misconception among participants was that the COVID-19 vaccines have serious side effects, such as causing allergies, with 34.8% of respondents either agreeing or strongly agreeing with this false information [32]. This discrepancy can be caused by the low level of COVID-19 vaccine knowledge among the participants in this study.

Regarding misinformation on the COVID-19 vaccine, a study conducted in Korea found that 49.76% encountered misinformation about reusing masks [28], and respondents endorsing at least one misinformation item were significantly less likely to be vaccinated [46]. The two studies support the findings of this study.

Another study conducted in Australia stated that concerning a specific myth about treatment and prevention, 22% of participants concurred that heat kills viruses [49], which supports the findings of this study. A study conducted in Saudi Arabia found that 74.6% of participants believed social media had misrepresented the COVID-19 vaccination [50]. The number exceeds the percentage of misinformed in this study, and the difference could be due to participants' access to the Internet and social media being lower in this study. A study from the USA found that the misinformation that COVID-19 vaccines contain a microchip to track people was the most commonly spread about vaccines, which sup-

ports the conclusions of this study regarding COVID-19 vaccine misinformation [51].

According to this study's findings about misinformation sources, family/friends and social media account for 50% and 41%, respectively, of the misinformation about the COVID-19 vaccine. This finding is consistent with a previous study done in the UK that found social media to be the primary source of misinformation on the COVID-19 vaccine [45]. Social media user counseling is needed to clear the ambiguity about COVID-19 vaccine [52].

Findings of this study showed that males were 1.48 times more likely than females to be misinformed about the COVID-19 vaccine, which is consistent with a UK study that found females have less chance of misinformation on COVID-19 vaccine [47]. In addition, another study conducted in Australia found that greater support for symptom management and prevention misinformation for COVID-19 was significantly associated with male gender [49]. Findings of a study suggest that females had a lower tendency to share unverified information on social media compared to their male counterparts, which supports the findings of this study [53]. Women are more likely to follow COVID-19 prevention practices than males [54]. This may be because females are standing against misinformation claims posed in the community.

The result of this study indicates that respondents who were not vaccinated for COVID-19 were 7.37 times more likely to be misinformed on COVID-19 vaccine. This result is supported by the study conducted among people living in Ireland, Mexico, the UK, and the USA which stated that a one-unit increase in susceptibility to misinformation is associated with a 23% decrease in the likelihood to get vaccinated [55]. Similarly, this result is supported by a study conducted in the USA, which stated that respondents endorsing at least one misinformation item were significantly less likely to be vaccinated [46]. This could be because vaccinated individuals may have good awareness towards COVID-19 vaccine.

Findings of this study indicated that respondents who perceived COVID-19 as a not severe disease were 1.47 more likely to be misinformed on COVID-19 vaccine compared to those who perceived COVID-19 as a severe disease. A study

conducted in Bangladesh indicated that perceived severity has a substantial impact on the sharing of incorrect information which supports this finding's result [53]. Another study conducted in Jordan showed that the inclination to check information before sharing is adversely correlated with the perceived severity of the illness [56]. This could be because if the disease severity increased, individuals need to know the possible factual information about COVID-19 vaccine, and their chance of being misinformed also decreased.

This study also found that participants who were confident for their health reduced being misinformed by 40% compared to those who were not confident for their health. This finding was also supported by a study conducted in USA, which indicated that more self-efficacy was associated with more intent to rectify misinformation [57]. This could be those confident that their health relies on factual information.

Findings of this study also identified that having history of COVID-19 illness decreases being misinformed by 79%, and this finding is in contrast with a study which states that compared to individuals without cancer, participants in current cancer treatment showed much increased support of false information [58]. This could be because people who may be suffering from COVID-19 strive to find different preventive measures, and they may have facts about vaccine.

Regarding knowledge towards COVID-19 vaccine, the results of this study identified participants who had poor knowledge towards COVID-19 vaccine were more likely to be misinformed for COVID-19 vaccine compared to participants having good knowledge about COVID-19 vaccine. According to a study done in Korea, misinformation belief was linked to lower COVID-19 knowledge levels, which supports the findings of this study [28]. Another study conducted in India identified that participants who answered consuming herbal products and vitamins could prevent COVID-19 were 12 times more likely to have poor knowledge with reference to those who believed COVID-19 was airborne [59]. According to a Jordan study, participants' mean knowledge scores were lower when they held the conspiracy theory and biological warfare beliefs about COVID-19 [30]. These studies support the findings of this study; this could be due to respondents not having enough awareness about COVID-19 vaccine, and their chance of being misinformed increases.

This study identified that odds of being misinformed on COVID-19 vaccine among respondents who had negative attitude about COVID-19 vaccine were 1.9 times than to those respondents who had positive attitude about COVID-19 vaccine. This finding is in line with the study conducted in India, which showed that people who believed using herbal products, gargling with salt/vinegar, and COVID-19 is an airborne disease were likely to have poor overall scores on the attitude questions (80). A study conducted in Jordan found that by increasing a unit attitude more positively, the desire to double-check data before sharing increases by 47% [56]. This can be a result of people who have a negative attitude towards COVID-19 vaccine and who do not check the truthiness of the information they heard about the COVID-19 vaccination.

## 7. Strengths and Limitations

According to my literature search, this study is the first attempt in the area, so future researchers should use the results as baseline data. This study was done at the time that the government mobilized the community for COVID-19 vaccination.

The study used only quantitative approaches, in which sensitive issues might not be well addressed. Interview-administered data collection methods may be affected by socially desirable responses. The interview-administered data collection method may be affected by interviewer bias.

## 8. Conclusion and Recommendation

In general, misinformation on the COVID-19 vaccine among Gondar town residents was found to be 48%. Increasing community awareness of the COVID-19 vaccine and clarifying misunderstandings about it through campaigns may help to lessen the tendency for misinformation in the community. FMOH shall mobilize social and mainstream media for proper information distribution about the COVID-19 vaccine. It shall control the spread of misinformation through social media platforms by working corporately with different social media platform owners; improve the community's level of awareness, knowledge, and attitude towards the COVID-19 vaccine by implementing appropriate strategies and policies; furthermore, provide reliable information about the COVID-19 vaccine; prepare different programs through radio or television to deliver reliable information about the COVID-19 vaccine; and encourage the community to retrieve health-related information from the official social media pages of health agencies and the mass media. The coming researcher shall conduct studies on a larger scale at the country level.

## Abbreviations

AOR:	Adjusted odds ratio
COVID-19:	Coronavirus 2019
$\beta$ -CoV:	Beta coronavirus
SARS-CoV-2:	Severe acute respiratory syndrome coronavirus 2
WHO:	World Health Organization
COR:	Crude odds ratio
SD:	Standard deviation
SPSS:	Statistical package for the social sciences
IRB:	Institutional Review Board
IPH:	Institute of Public Health.

## Data Availability

All the data were included in the study, and data will be available upon a responsible request from the corresponding author.

## Ethical Approval

Ethical clearance was obtained from the Institutional Review Board (IRB (2119/2014)) of the University of Gondar College of Medicine and Health Sciences, Institute of Public

Health. Contact with the different official administrators at the University of Gondar was made through a formal letter obtained from the University of Gondar.

## Consent

Following the purpose and objective of the study, oral consent was obtained from each study participant. Participants were also informed that they could leave the program at any time if they were not comfortable with the questionnaire. To maintain the confidentiality of any information given by study participants, the data collection procedure was kept secret, keeping their privacy alone.

## Conflicts of Interest

The authors declare that they have no competing interests.

## Authors' Contributions

MZA had made a substantial contribution in writing the conception, designing the study, analyzing the data, and discussing the findings. KDG and ATJ were involved in drafting the manuscript, interpreting the results, and revising the manuscript. AAS and ATJ all made significant contributions to revising the manuscript and managing the data. All authors read and approved the final manuscript submission for publication.

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