

Original Research

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Prevalence of COVID-19 in West Gondar Zone, Northwest Ethiopia: A Population-Based Retrospective Study

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Abstract

Objective: Coronavirus disease 2019 (COVID-19) has spread rapidly around the world, affecting every community directly or indirectly. Therefore, this study aims to investigate the prevalence of COVID-19 infection in the population of the West Gondar zone.

Method: A retrospective cross-sectional study was conducted from November 2020 to January 2021, in the West Gondar zone, Northwest Ethiopia. Records of study participants with required information like age, gender, travel history, type of specimen taken, and site of specimen taken were included. For analysis, the statistical package for social sciences (SPSS) version 20 software was used. Descriptive statistics were summarized as percentages and means \pm standard deviation. The chi-squared test is used to compare categorical data.

Results: A total of 1,166 participants were enrolled in this study. Of them, 16 individuals had positive results, giving a prevalence of 1.37% (95% CI: 0.66-2.08). Living in an urban area (P -value = 0.035) and being female (P -value = 0.045) was statistically associated with the positive rate for COVID-19.

Conclusions: This study revealed a low prevalence of COVID-19 infection in the study area despite the increasing and rapid dissemination of the disease. State-wide population prevalence study should be done to estimate the general prevalence of COVID-19 in Ethiopia.

In December 2019, the health authorities detected a novel coronavirus transmitted in the city of Wuhan, China, which was called severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).¹ The World Health Organization (WHO) announced a COVID-19 pandemic caused by SARS-CoV-2 on March 11, 2020, after the rapid global spread of the diseases.² The common symptoms at the onset of COVID-19 illness are fever, cough, fatigue, headache, hemoptysis, diarrhea, dyspnea, and lymphopenia.¹ COVID-19 showed some unique clinical features that include the targeting of the lower airway as evident by upper respiratory tract symptoms like rhinorrhea, sneezing, and sore throat.³

COVID-19 has spread rapidly around the world, affecting every community directly or indirectly. In Ethiopia, the first COVID-19 case was reported on March 13, 2020. The number of cases then increased due to newly imported cases, contacts of confirmed cases, and localized transmission.^{4,5} Stringent public health and social measures have been put in place by all countries to slow the spread of COVID-19.⁶ In response to COVID-19, the Government of Ethiopia has been taking a series of policy actions beyond public health initiatives alone. These include closing schools, restricting the use of public transportation, banning large meetings, and suspending sporting and religious gatherings. A state of emergency has been put in effect and staying at home and working from there has been strongly advised.⁴

In crises, where routine surveillance is partly functional, non-functional, or does not cover the whole population, community-based surveillance (CBS) is often applied to detect events of concern to public health.⁷ The CBS is an active process of community participation in detecting, reporting, responding to, and monitoring health events in the community.⁸ Surveillance systems should be geographically comprehensive and include all persons and communities at risk. Surveillance for COVID-19 aims to limit the spread of disease, enable public health authorities to manage the risk of COVID-19, and thereby enable economic and social activity to resume to the extent possible. Surveillance is also necessary to monitor the longer-term trends of COVID-19 transmission and the changes in the virus.⁶ Another potential benefit of population-based surveys is the tuning of the restrictive measures. Such measures generally apply to a community as a whole in geographic terms, mainly departing from a policy determined by local authorities.⁹

Individuals in the community can play an important role in the surveillance of COVID-19. Where possible, individuals who have signs and symptoms of COVID-19 should be able to

access testing at the primary care level. Where testing at the primary level is not possible, CBS may help identify clusters of COVID-19.¹⁰

The literature highlighted the prevalence of COVID-19 in different parts of Ethiopia. Accordingly, the prevalence of the virus was 7.5%, 6.2%, and 6.1% in Gambella, Dire Dawa, and Jijjiga, respectively.¹¹ Another study indicated that the prevalence of COVID-19 was 0.5% in Jima.¹² However, the prevalence of the virus is not reported in the current study area. Therefore, this study tried to investigate the prevalence of COVID-19 among the West Gondar zone population. This study will provide insight for the policy-makers to have generalizable population-based estimates of SARS-CoV-2 prevalence to establish and understand the groups most at risk for infection and to plan effective preventive and diagnostic approaches.

Methods

Study Setting, Design, and Period

A retrospective cross-sectional study was conducted from November 1, 2020, to January 10, 2021, in the West Gondar zone, Northwest Ethiopia. The zone is located in the northwestern part of Ethiopia and the western part of Amhara regional State. The West Gondar zone administration is found in Gendewuha town. The West Gondar zone is located 836 km away from Addis Ababa, the capital city of Ethiopia, and 347 km away from Bahirdar, the capital city of the Amhara region. The town is a border town between Sudan and Ethiopia. The elevation of Gendewuha town is 685 meters above sea level and is located on 12°58'N 36°12'E. Based on the 2005 national census conducted by the Central Statistical Agency of Ethiopia (CSA), the Zone has a 165,642 population, of whom, 82,655 are men and 82,987 women.¹³ It is a boundary zone between Ethiopia and Sudan. Hence, the population is exposed to different people who traveled to Sudan and different merchants from other zonal administrations of Ethiopia.

Study Participants

The study population was randomly selected from West Gondar zone residents. Records of study participants with required information like age, gender, travel history, type of specimen taken, and site of specimen taken were included. However, records of participants with incomplete data were excluded from the study.

Sample Size and Sampling Techniques

Since the study was retrospective, the sample size calculation was not applicable. A total of 1,166 study participants aged 6 months to 86 years were included.

Case Definitions for COVID-19

According to WHO case definitions of COVID-19 for surveillance¹⁴, a confirmed case is a person with laboratory confirmation of COVID-19 infection, irrespective of clinical signs and symptoms.

Data Collection Procedure and Tools

There was ongoing travelers' health screening at point of entries, follow-up of passengers coming to Ethiopia from abroad, rumor collection and information provision by means of toll-free call

center, rumor verification and investigation, mass screening and house to house search, contact tracing, and follow-up of persons who had contact with confirmed cases and laboratory investigation of suspected cases, quarantined individuals, contacts of confirmed cases, and pneumonia cases investigation. However, the study was focused on the house to house searching of COVID-19 cases done by the ministry of health (MoH) and Ethiopian public health institute (EPHI).

During the CBS by the MoH and EPHI, a random sample of households was selected and the data collectors select one participant per household, which was chosen at random for COVID-19 testing. If that household or person declined to participate, the data collectors sampled the nearest household that provided consent. If the random draw selected a person not in the household at the time, the data collectors contacted them by phone and arranged a test outside of the house to prevent over-representation of individuals. We have adapted a data collection tool from the WHO.¹⁵ The questionnaire incorporates socio-demographic and some clinical characteristics. Then, we collected the following data from the study participant records: age, gender, residence, travel history, date of specimen collection, type of specimen taken, site of specimen collection, and reverse transcriptase-polymerase chain reaction (RT-PCR) results from the laboratory registration logbook and soft copy materials documented by the EPHI and MoH.

Data Management and Analysis

Before entry, the data was cleaned and checked for any missing values. Microsoft Excel was used for editing, sorting, and coding. The excel file was then imported into SPSS (IBM Corporation, Armonk, NY) version 20 software for the statistical analyses. A Shapiro-Wilk test was used to check the normality of the data. Results are presented as mean \pm standard deviation, and the chi-squared test is used to compare categorical data. The statistical significance level is considered to be a P -values < 0.05 .

Ethical Considerations

The study was conducted under the declaration of Helsinki. This study was also done after approval of the protocol by the ethical review committee of the school of biomedical and laboratory sciences (Ref. No. SBMLS/2909/13) and the granting of a permission letter from the West Gondar zone health administration (Ref. No. MHS/28/2727/13). The information that might expose the identity of the study participants was not collected. Anonymity and confidentiality were strictly maintained. Since it was a retrospective study from medical records, a consent waiver to participate in the study was obtained from the ethical committee.

Results

A total of 1,166 participants were included in this study. Of these, 372 (31.9%) were female and 794 (68.1%) were male. Nine hundred thirty-four (80.1%) and 232 (19.9%) of the participants were urban and rural dwellers, respectively. The mean age of the participants was 29.55 ± 12.39 years. The majority (91.9%) of the study participants were in the age range of 20-39 years. The oro-pharyngeal sample was collected from 1,078 (92.5%) participants. On the other hand, oro-pharyngeal and nasopharyngeal samples were collected from 88 (7.5%) of the participants. None of the study participants had a travel history (Table 1).

Table 1. Sociodemographic characteristics of study participants at Northwest Ethiopia in 2020

Variables Categories		Frequency	Percentages
Sex	Male	794	68.1
	Female	372	31.9
Age in years	<20	263	22.6
	21-40	720	61.7
	41-60	162	13.9
	≥ 60	21	1.8
Residence	Urban	934	80.1
	Rural	232	19.9
Travel history	Yes	0	0
	No	1,166	100

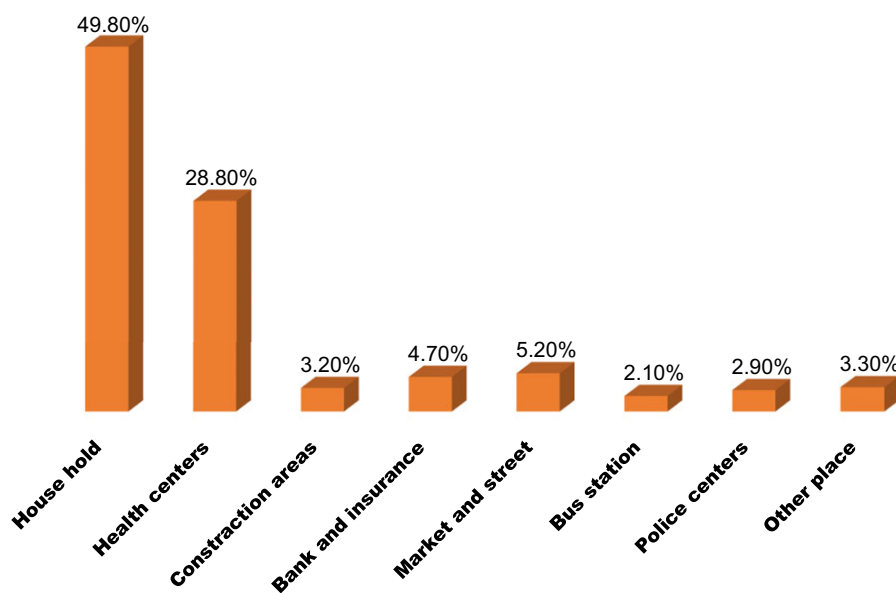


Figure 1. Sites of specimen collected among study participants at Metema woreda, Northwest Ethiopia.

Most of the specimen was collected from households (49.8%) and health centers (28.8%). On the other hand, 2.1% and 2.9% of the specimen was collected from the bus station and police center, respectively (Figure 1).

Prevalence of COVID-19

Of the total 1,166 subjects, 16 individuals had positive results for RT-PCR COVID-19, giving a frequency of 1.37% (95% CI: 0.66-2.08). Of the oro-pharyngeal swabs (n = 1078), 15 tested positive for SARS-CoV-2 RNA using RT-PCR assay, corresponding to a prevalence of 1.39%. Of the total nasopharyngeal specimens (n = 88), 1 tested positive for COVID-19, accounting for the prevalence of 1.14%.

All COVID-19 positive cases had no travel history. In most of the cases, 9 (1.25%) were in the age groups of 20-40 years (n = 1,596). Eleven (11) of 16 and 5 of 16 cases were found in Metema woreda (n = 591) and Gendewuha town (n = 159), respectively. Nine females and 7 males were positive for COVID-19 (Figure 2). Living in the urban area (P-value = 0.035) and female sex (P-value = 0.045) was statistically associated with the positive rate for COVID-19 (Table 2).

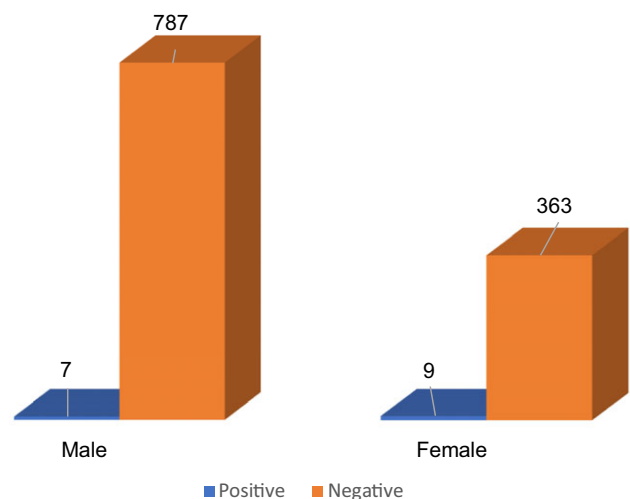


Figure 2. Cases of COVID-19 by gender among study participants at Metema woreda, Northwest Ethiopia.

Table 2. Association between socio-demographic characteristics and COVID-19 positivity rate

Variables	Categories	COVID-19 positive	COVID-19 negative	p-Value
Gender	Male	7 (0.88%)	787 (99.12%)	0.045
	Female	9 (2.42%)	363 (97.58%)	
Residence	Urban	15 (1.60%)	919 (98.4%)	0.035
	Rural	1 (0.43%)	231 (99.57%)	
Age (years)	<20	3 (1.14%)	260 (98.86%)	0.326
	20-40	9 (1.25%)	711 (98.75%)	
	>40	4 (2.19%)	179 (97.81%)	

Discussion

Recently, the WHO recommended nationwide population-based, age-stratified epidemiologic surveys and designed a study protocol to facilitate the collection and sharing of COVID-19 data to address the knowledge gap of the populations regarding the burden of COVID-19.¹⁶ The results of this zone-based population prevalence study indicated that an estimated 16 West Gondar zone residents were infected with SARS-CoV-2 from the start of the pandemic through March 13, 2020, giving a population prevalence of 1.37% (95% confidence interval [CI]: 0.66-2.08). The finding that persons had samples that tested positive for SARS-CoV-2 by RT-PCR, indicates the presence of an active infection.

This finding was comparable to a county-based random sample study in Indiana¹⁷ that reported a seroprevalence of 1.74%. However, the finding was lower than studies in Northeastern Ethiopia,¹⁸ the Oromia region,¹⁹ and Addis Ababa¹² detecting a COVID-19 prevalence of 3.3%, 5.5%, and 3.5%, respectively. Similarly, this finding was lower than population-based studies done in California²⁰ and Brazil,⁹ which reported a seroprevalence of 4.7% and 2.1%, respectively. Differences in ethnicity, socio-economic level of development, implementation of COVID-19 preventive measures, laboratory and clinical capacity, availability of resources, diagnostic approach, study design, and the knowledge and attitude of the populations across the countries account for the variability of the prevalence of SARS-CoV-2.

The finding of this study is higher than a study conducted in Slovenia² and Iceland,²¹ which reported a 0.15% and 0.6% seroprevalence of SARS-CoV-2, respectively. The absence or poor access to personal protective equipment (PPE), large family size with poor housing, mobility of the citizens to win daily bread, and engaging in very risky working conditions that allow them for infection are among the major factors that contribute to high chance of infection in the society. The tradition of eating raw meat, poor transportation facilities, unavoidable public gatherings, international travel and immigration, and low coverage of public health institutions, and poor medical facilities were the major contributing factors for the rapid dissemination of COVID-19.²²

The spread of COVID-19 across countries in the sub-Saharan African region seems to have been relatively low compared with the reported cases originating from other regions of the world.²³ Several factors played an important role in the lower prevalence and limited spreading of COVID-19 in the general population. Those include canceling of non-relevant medical procedures, the closing of markets and public gatherings, restriction of international travel, the closing of schools, prompt reporting of the results, and immediate epidemiologic contact tracing.

Living in an urban area was significantly associated with the positive rate for COVID-19. Ethiopia is the second most populous country in Africa next to Nigeria and the 12th from the world. The 2019 population density in Ethiopia is 115 people per km². Most of the time, urban residence had a condensed way of life that helps the easy transmission of COVID-19 through physical contact.²²

In the present study, we found that being female was significantly associated with the COVID-19 positivity rate. The impact of gender is observed to be significant in COVID-19 spread. Conti and Younes²⁴ showed that females are more influenced by viral infections than men. Similarly, a study done in Wuhan, China, showed that females were riskier than males.²⁵ In Ethiopia, educational support for females has not been well developed yet. This in turn limits the understanding of the female for COVID-19. A recent study in the northeastern Ethiopia region has also revealed that being female is significantly associated with low-level knowledge about the transmission, prevention, and control of the COVID-19 pandemic. According to this study, female study participants had 32 times odds of having a low level of knowledge in comparison with their male counterparts.²⁶ Other possible justifications might be that (1) more women are employed in higher-contact care and frontline service work (such as cashiers, cleaners, and nurses), (2) social norms and caregiving expose women to greater health risks, (3) women are the first to feel the impact of food insecurity, (4) sanitation and women's hygiene materials will be harder to come by, and (5) women may be employed in informal activities that are prone to disruption. On the other hand, Govindarajulu et al. have shown that women are less prone to viral infections as compared to men because of more CD4+ T-cells with improved immune responses, low viral load due to immune regulatory genes that are encoded by the X chromosome, steroid hormones.²⁷

Eleven of 16 cases were found in Metema woreda. This might be Metema has an international boundary of more than 60 km long distance between Ethiopia and Sudan. Ethiopia is a landlocked country bordered by Sudan and South Sudan on the west. Many cross-border drivers were tested positive for COVID-19 since the outbreak in Ethiopia. Ethiopia is also a host of many immigrants from the neighboring countries of South Sudan and Eritrea, and this can also contribute to the spread of the pandemic. Political instability in the border of Ethiopia leads to poor service delivery with very little coordination among the health sector, increasing violence, demonstration, and other similar factors that contribute to the spread of the virus.²² In addition, there is also low coverage of public health institutions and poor medical facilities in the border areas of Ethiopia. Ethiopia is among the countries with low coverage of public health institutions with very poor medical facilities.²⁸ The low coverage of health institutions will then increase the number of people lacking treatment which will lead to increased mortality. The fewer medical facilities in the health institution will increase the chance of death of patients that might be recovered. A study done by Alene et al showed that the risk of COVID-19-related death is high in Ethiopia border regions, where public health preparedness for responding to COVID-19 is limited.²⁹

Strengths and Limitations of the Study

The strength of the study is that it is for the first time, a survey regarding COVID-19 was conducted with a large sample of

population size in West Gondar important for accurate determination of the prevalence of COVID-19. Besides, the data collectors strongly adhere to the WHO infection prevention and control guidelines. However, the study was conducted in a single zone and at one point in time and, therefore, is not generalizable to other states and times. Further, there may be inaccurate results caused by the testing procedures.

Conclusion

This study revealed a low prevalence of COVID-19 infection in the study area, despite the increasing and rapid dissemination of the disease. A state-wide population prevalence study should be done to estimate the general prevalence of SARS-CoV-2 in Ethiopia.

Data availability statement. The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

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Author Contributions. T.A.: conceptualization, data curation, writing original draft, statistical analysis. Y.A.: conceptualization, data curation, and review the draft and final document. M.A.: conceptualization, statistical analysis, and review the draft and final document.

Conflicts of interest. None declared.

Ethical standards. Ethical clearance was obtained from the ethical review committee of the school of biomedical and laboratory sciences (Ref. No. SBMLS/2909/13). We also granted permission letter from West Gondar zone health administration (Ref. No. MHS/28/2727/13).

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