RESEARCH ARTICLE

Knowledge and attitude of the communities towards COVID-19 and associated factors among Gondar City residents, northwest Ethiopia: A community based cross-sectional study

Asefa Adimasu Taddese 1, Zelalem Nigussie Azene 2, Mehari Woldemariam Merid 1*, Atalay Goshu Muluneh 1, Demiss Mulatu Geberu 3, Getahun Molla Kassa 1, Melaku Kindie Yenit 1, Sewbesew Yitayih Tilahun 4, Kassahun Alemu Gelaye 1, Habtamu Sewunet Mekonnen 2, Abere Woreta Azagew 5, Chalachew Adugna Wubneh 6, Getaneh Mulualem Belay 6, Nega Tezera Assimamawi 3, Chilot Desta Agegnehu 7, Telake Azaie 8, Animut Tagele Tamiru 9, Bayew Kelkay Rade 3, Eden Bishaw Taye 10, Zewdu Andualem 11, Henok Dagne 11, Kiros Terefe Gashaye 12, Gebisa Guyasa Kabito 3, Tesfaye Hambisa Mekonnen 11, Sintayehu Daba 11, Jember Azanaw 11, Tsegaye Adane 11, Mekuriaw Alemayehu 11

1 Department of Epidemiology and Biostatistics, Institute of Public Health, College of Medicine and Health Sciences, University of Gondar, Gondar, Ethiopia, 2 Department of Women’s and Family Health, School of Midwifery, College of Medicine and Health Sciences, University of Gondar, Gondar, Ethiopia, 3 Department of Health Systems and Policy, University of Gondar, Gondar, Ethiopia, 4 Department of Psychiatry, College of Medicine and Health Sciences, University of Gondar, Gondar, Ethiopia, 5 Department of Medical Nursing, School of Nursing, College of Medicine and Health Sciences, University of Gondar, Gondar, Ethiopia, 6 Department of Pediatric and Child Health Nursing, School of Nursing, College of Medicine and Health sciences, University of Gondar, Gondar, Ethiopia, 7 School of Nursing, College of Medicine and Health Sciences and Comprehensive Specialized Hospital, University of Gondar, Gondar, Ethiopia, 8 Department of Health Education and Behavioral Sciences, Institute of Public Health, College of Medicine and Health Sciences, University of Gondar, Gondar, Ethiopia, 9 Department of General Midwifery, School of Midwifery, College of Medicine and Health Sciences, University of Gondar, Gondar, Ethiopia, 10 Department of Clinical Midwifery, School of Midwifery, College of Medicine and Health Sciences, University of Gondar, Gondar, Ethiopia, 11 Department of Environmental and Occupational Health and Safety Institute of Public Health, College of Medicine and Health Sciences, University of Gondar, Gondar, Ethiopia, 12 Department of Gynecology and Obstetrics, College of Medicine and Health Sciences, University of Gondar, Gondar, Ethiopia

* mehariho19@gmail.com

Abstract

Background

COVID-19 is the novel coronavirus responsible for the ongoing global outbreak of acute respiratory disease and viral pneumonia. In order to tackle the devastating condition of the virus, countries need to attack the virus with aggressive and targeted tactics. Thus, to strengthen the COVID-19 mitigation measures and to give rapid response, there is an urgent need to understand the public’s knowledge and attitude about of the pandemic at this critical moment.
Objective
This study was aimed to assess the knowledge and attitude of communities about COVID-19 and associated factors among Gondar City residents.

Methods
A community based cross-sectional study was done among 623 respondents in Gondar city from April 20-27/2020. Data were collected using a structured questionnaire adapted from different literatures. The data were entered using Epi data version 3.1 and then exported into STATA version 14 for analysis. Bi-variable and multivariable binary logistic regression were performed. Adjusted odds ratio with 95% CI was used to declare statistically significant variables on the basis of p value less than 0.05 in the multivariable binary logistic regression model.

Results
The overall knowledge and attitude of the community towards COVID19 was 51.85% [95% CI (47.91%-55.78%)] and 53.13% [95% CI (49.20, 57.06%)], respectively. In this study, being married [AOR = 0.60 at 95% CI: (0.42, 0.86)], educational level; primary [AOR = 3.14 at 95% CI: (1.78,5.54)], secondary [AOR = 2.81 at 95% CI: (1.70,4.63)], college and above [AOR = 4.49 at 95% CI: 7.92, 13.98]), and family size [AOR = 1.80, at 95% CI: (1.05, 3.08)] were emerged as statistically significant factors impacting the knowledge of the community about COVID-19. Besides, educational level; primary [AOR = 1.76 at 95% CI: (1.03, 3.01)], secondary [AOR = 1.69 at 95% CI: (1.07, 2.68)], and college & above [AOR = 2.38 at 95% CI: (1.50, 3.79)], and family size; four to six members [AOR = 1.84 at 95% CI (1.27, 2.67)], above seven members [AOR = 1.79 at 95% CI (1.08, 2.96)] were factors identified as significantly attribute for positive attitude of the communities towards COVID-19.

Conclusion
More than half of the respondents had better knowledge and attitude regarding COVID-19. Higher educational level and larger family size were significant factors predominately affecting the knowledge and attitude of the communities towards COVID-19.

Introduction
In China, Wuhan city, Hubei Province, a cohort of pneumonia cases of unknown cause was reported on December 31 2019 [1]. A novel coronavirus (2019-nCoV) has been incriminated as the cause for the aforementioned disease that has been continuing infecting more than 209 countries with around 1.5 million confirmed cases and 90 thousand deaths globally [2, 3]. In Ethiopia the first case was confirmed on March 13, 2020 [4]. The clinical feature of COVID-19 varies from mild flu like symptoms to severe pneumonia along with acute respiratory distress syndrome, septic shock and multi-organ failure, which in turn leads to in the risk of death. The pandemic (COVID-19) is claimed to be transmitted predominantly from person to person via inhalation the infected aerosols. Other modes of transmissions for the pandemic have also
been implicated such as contact with contaminated fomites, and direct person to the infected individual [5, 6].

The COVID-19 disease is spreading drastically in both developed and developing countries including Ethiopia and results in unprecedented catastrophic death and social crisis [7]. The reasons for the high burden of the pandemic in developing nations may ascribed to the limited resources to combat the disease, the use of mass transport, and low awareness of the communities about the disease. Studies, in China and Ethiopia noted that the proportion of communities’ good knowledge about COVID-19 was 90% and 54%, respectively [8, 9]. In Ethiopia, tremendous endeavors are being invested such as developing supportive and reliable informatics, risk assessment and contact tracing activities, laboratory testing, and disseminating information, education, and communication about the diseases through different outlets. However, the pandemic continues to affect the inhabitants of the country even in a more rapid rate.

Moreover, we cannot do community mass screening via blood test to identify the suspected cases, owing to mass transport; mass gathering in religion ceremony and market areas, get limited hygiene and sanitation services.

Therefore, to provide a rapid response against the pandemic, it is imperative to strengthen the taken prevention and control strategies. This calls up on enhancing the communities’ level of knowledge and attitude about the COVID-19. The main aim of this study was therefore to assess the knowledge and attitude of communities about COVID-19 and its associated factors among Gondar City residents, northwest Ethiopia.

Methods

Study area

The study was conducted at Gondar city, Amhara regional state, northwest Ethiopia. The city is located at Central Gondar Zone, Amhara regional state of Ethiopia, and is 748 kilometers far northwest of Addis Ababa, the capital of Ethiopia and, about 180 kilometers from Bahir Dar city, the capital of Amhara regional state. It has an altitude of 12˚36'N 37˚28'E and longitude of 12.60N 37.467'E with an elevation of 2133 meters above sea level and it embraces 12 administrative areas (sub-cities) which consist of 22 kebeles (the smallest administrative unit in Ethiopia). Gondar city is among one of the ancient and largely populated cities in the country. The city has now one public referral hospital and eight governmental health centers.

Study design and period

A community-based cross-sectional study was conducted from April 20 to 27, 2020.

Study participants

The source population of this study was all people of age 18 years and above residing in Gondar city while people aged 18 years and higher living in the selected kebeles of the city were the study population.

Sample size calculation and sampling procedures

The sample size was determined by using single population proportion formula by considering the following statistical assumptions:

- Confidence level (C1), 95%
- Proportion = 50%
- Margin of error 5%
Using the following single proportion formula:

\[ n = \frac{(Z^2/2) \times P(1 - P)}{W^2} \]

Where

- \( n \) = initial sample size
- \( Z = 1.96 \), the corresponding Z-score for the 95\% CI
- \( P = \) Proportion = 50\%
- \( W = \) Margin of error = 5\% = 0.05

\[ n = \frac{(1.96)^2 \times 0.5(1 - 0.5)}{(0.05)^2} = 384 \]

By considering 10\% non-response rate and design effect of 1.5, the final sample size was 635. The participants’ households were accessed using cluster sampling technique.

Out of 22 Kebeles, 8 Kebeles (Kebele 7, Kebele 8, Kebele 9, Kebele 13, Kebele 16, Kebele 17, Kebele 18, Kebele 20) were selected by using lottery method. Then from each kebele, one to two Ketena/s (the lowest administrative cluster) were selected depending on the numbers of households. The selected Ketena/s were considered as cluster and all households in the selected Ketena/s were included. Either parents in the household was interviewed or one family member aged above 18 years was the respondent in the household whenever the parents were not available at the time of data collection.

**Operational definitions**

**Information exposure.** Respondents were asked whether they heard or not about the various aspects of COVID-19. The responses were coded as yes or no and those who responded median and above score of the information exposure assessment questions were regarded as having good level of information exposure about COVID-19.

**Good knowledge.** Participants who responded median and above score of the knowledge assessment items about COVID-19 were labeled as having good knowledge otherwise poor knowledge about COVID-19.

**Favorable attitude.** Participants who responded median and above score of the attitude questions about the COVID-19 were considered as having favorable attitude towards COVID-19 otherwise unfavorable attitude.

**Study variables**

The dependent variables were knowledge and attitude of the communities towards COVID-19. Whereas socio-demographic related variables including sex, age, educational level, family size and communities’ attitude towards COVID-19 preventive measures were the independent variables.

**Data collection tools and procedures**

Data regarding the variables were collected through face-to-face interview using a structured questionnaire adapted from different literatures. The respondents were asked about the sources of information about COVID-19 and how much they trust those sources. They were also asked about the types of information that they wanted to receive. Participants were interviewed whether they performed precautionary measures including avoiding handshaking,
adopting hand washing, and practicing physical distancing. The full survey questionnaire is provided in the S1 Appendix.

Data were collected by BSc nurses and strictly followed by supervisors who managed the overall data collection process. A one-day training was given to the data collectors and supervisors about the purpose of the study, data collection tools, collection techniques and ethical issues during selection of the study participants and collection of the data. All responses to closed and open questions were written down manually by the interviewers. The supervisors assessed the consistency and completeness of data on a daily basis.

**Statistical analysis**

The data entry was performed using the statistical software Epi data version 3.1 and then exported to STATA version 14 for analysis. Descriptive statistics was carried out and presented with narration and tabulation. Binary logistic regression (Bi-variable and multivariable) analysis was performed to identify statistically significant variables using a cut-off p-value < 0.2 in the bi-variable analysis to identify candidate variables for multivariable binary logistic regression. Adjusted odds ratio with 95% confidence interval was used to declare statistically significant variables on the basis of p-value ≤ 0.05 in the multivariable binary logistic regression model. Hosmer and Lemeshow goodness of fit test was employed and decision was made at P-value > 0.05.

**Ethics approval and consent to participate**

Ethical clearance was obtained from the Institutional Review Board (IRB) of the University of Gondar and an official permission letter was gained from the city administrative office. Written informed consent was obtained from each participant before conducting the actual data collection process. Any identifiable issues were eliminated to ascertain confidentiality. Furthermore, appropriate infection prevention practices and principles related to COVID-19 were considered during data collection period. Data collectors provided health education for the household after the interview has been completed based on the gaps identified as appropriate.

**Results**

**Socio-demographic characteristics of the study participants**

In the current study, a total 623 study participants were involved making the response rate of 98.1%. The median age of the study participants was 33 ± 13.24 (SD) years. Four hundred two (64.53%) of the study participants were females. Three-fifth (59.87%) of the study participants were married. Regarding to the family size of the respondents, t344 (55.22%) had 4 to 6 family members in household. Of the respondents, 202 (32.42%) had attained college and above and 125 (20.06%) had no formal education (Table 1).

**Prevalence of knowledge about COVID-19**

In this study, the overall knowledge of the study participants about COVID-19 was 51.85% at 95% CI (47.91%, 55.78%) (Table 2).

**Prevalence of attitude towards COVID-19**

In the current study, the overall prevalence of the communities’ attitude towards COVID-19 was 53.13% at 95% CI (49.20, 57.06%) (Table 3)
In our study, those participants who were 40% less likely to have good knowledge about COVID-19 compared to unmarried participants [AOR = 0.60 at 95% CI: (0.42, 0.86)]. Respondents who had attained college and above were 7.92 times more knowledgeable than those who had no formal education [AOR = 7.92, at CI: (4.49, 13.98)]. Respondents who had seven and above family members were 1.80 times more likely to have good knowledge about COVID-19 compared to those respondents who had less than three family members [AOR = 1.80, at CI: (1.05, 3.08)] (Table 4).

Factors associated with knowledge about COVID-19

In our study, those participants who were 40% less likely to have good knowledge about COVID-19 compared to unmarried participants [AOR = 0.60 at 95% CI: (0.42, 0.86)]. Respondents who had attained college and above were 7.92 times more knowledgeable than those who had no formal education [AOR = 7.92, at CI: (4.49, 13.98)]. Respondents who had seven and above family members were 1.80 times more likely to have good knowledge about COVID-19 compared to those respondents who had less than three family members [AOR = 1.80, at CI: (1.05, 3.08)] (Table 4).

Table 1. Socio-demographic characteristics of the study participants in Gondar city, northwest Ethiopia, 2020.

| Variables       | Frequency (n = 623) | Percent (%) |
|-----------------|--------------------|-------------|
| Sex             | Male 221           | 35.47       |
|                 | Female 402         | 64.53       |
| Religion        | Orthodox 433       | 69.50       |
|                 | Muslim 154         | 24.72       |
|                 | Others* 36         | 5.78        |
| Age in years    | 18 to 26 163       | 26.16       |
|                 | 27 to 33 150       | 24.08       |
|                 | 34 to 45 174       | 27.93       |
|                 | Above 45 136       | 21.83       |
| Family size     | Up to 3 178        | 28.57       |
|                 | 4 to 6 344         | 55.22       |
|                 | 7 and above 101     | 16.21       |
| Educational level| No formal education125 | 20.06     |
|                 | Primary 101        | 16.21       |
|                 | Secondary 195      | 31.30       |
|                 | College and above 202 | 32.42   |
| Current marital status | Unmarried 250 | 40.13       |
|                 | Married 373        | 59.87       |
| Occupation status| Unemployed 448     | 71.91       |
|                 | Employed 175       | 28.09       |

* Protestant, Catholic, Jewish.

https://doi.org/10.1371/journal.pone.0248821.t001

Table 2. Knowledge of the study participants about COVID-19 in Gondar city, northwest Ethiopia, 2020.

| Variables                               | Frequency (n = 623) | Percent (%) |
|-----------------------------------------|--------------------|-------------|
| Knowledge about COVID-19 symptoms       | Poor 245           | 39.33       |
|                                         | Good 378           | 60.67       |
| Knowledge about COVID-19 Vulnerability  | Poor 256           | 41.09       |
|                                         | Good 367           | 58.91       |
| Knowledge about COVID-19 prevention measures | Poor 270           | 43.34       |
|                                         | Good 353           | 56.66       |
| Knowledge about COVID-19 transmission and incubation period | Poor 256           | 41.09       |
|                                         | Good 367           | 58.91       |
| Overall knowledge                       | Poor 300           | 48.15       |
|                                         | Good 323           | 51.85       |

https://doi.org/10.1371/journal.pone.0248821.t002
Factors associated with attitude towards COVID-19

In the multivariable analysis, level of education and family size continued to significantly affect the communities’ attitude towards COVID-19.

In this study, an increased in the level of education has been positively associated with communities’ attitude towards COVID-19 compared to those who had no formal education [primary education AOR = 1.76 at 95% CI: (1.03, 3.01), secondary AOR = 1.69 at 95% CI: (1.07, 2.68), and college & above AOR = 2.38 at 95% CI: (1.50, 3.79)]. Moreover, study participants who had seven and above family members were 1.79 times more likely to have positive attitude towards COVID-19 compared to those who had three and less family members (Table 5).

Discussion

In the current study, we have tried to assess the prevalence of knowledge and attitude of the community towards COVID-19 and the factors associated with it in Gondar city, northwest Ethiopia. Accordingly, our results yielded that the prevalence of communities’ who had good knowledge and positive attitude towards COVID-19 were 51.85% at 95% CI (47.91%, 55.78%) and 53.13% at 95% CI (49.20%, 57.06%), respectively.

The prevalence of the study participants with good knowledge is in agreement with earlier reports from Bangladesh [10] and Iran [11] but higher than a study conducted in Ethiopia [12]. The finding of our study (51.85% at 95% CI (47.91%, 55.78%)) however was lower than former evidences reported from Malaysia [13], Vietnam [14], Pakistan [15], Iran [16], Italy [17], Uganda [18], Nigeria [19], Tanzania [20], Pakistan [21], and two studies in China [22, 23].

Table 3. Attitude of the study participants towards COVID-19 in Gondar city, northwest, Ethiopia, 2020.

| Variables                        | Frequency (n = 623) | Percent (%) |
|----------------------------------|---------------------|-------------|
| Attitude towards COVID-19        | Negative            | 393         | 63.08       |
|                                  | Positive            | 230         | 36.92       |
| Attitude towards COVID-19        | Negative            | 298         | 47.83       |
| prevention measures              | Positive            | 325         | 52.17       |
| Overall Attitude towards COVID-19| Negative            | 292         | 46.87       |
|                                  | Positive            | 331         | 53.13       |

Table 4. Factors associated with knowledge of communities about COVID-19 in Gondar city, northwest Ethiopia, 2020.

| Variables                     | Knowledge Cor at 95% CI AOR at 95% CI |
|-------------------------------|---------------------------------------|
| Marital status                | Poor 147 1 1                        |
| Unmarried                     | 103                                   |
| Married                       | 197                                   |
| Educational level             | Good 176 0.63(0.45, 0.87) 0.60(0.42, 0.86)* |
| No formal education           | 93 32 1                               |
| primary                       | 50 51 2.96(1.69, 5.19) 3.14(1.78, 5.54)* |
| Secondary                     | 100 95 2.76(1.69, 4.50) 2.81(1.70, 4.63)* |
| College & above               | 57 145 7.39(4.46, 12.25) 7.92(4.49, 13.98)* |
| Occupational status           | Unemployed 213 1 1                   |
| Unemployed                    | 235                                   |
| Employed                      | 65 110 1.87(1.30, 2.67) 0.96(0.62, 1.50) |
| Family size                   | Good 183 1.27(0.89, 1.83) 1.47(0.99, 2.16) |
| Up to 3                       | 94 84 1                               |
| 4 to 6                        | 161                                   |
| 7 and above                   | 45 56 1.39(0.85, 2.27) 1.80(1.05, 3.08)* |

AOR = adjusted odd ratio, COR = crude odd ratio, * significant level, ## significant at p-value <0.05.

https://doi.org/10.1371/journal.pone.0248821.t003

https://doi.org/10.1371/journal.pone.0248821.t004
Regarding to the second outcome of our study, attitude of the communities' towards COVID-19 (53.13% at 95% CI (49.20%, 57.06%), was lower compared to the findings from Bangladesh [10], Pakistan [20], China[22] and Tanzania [20].

The possible explanations, for the observed discrepancies in the prevalence of knowledge and attitude of the communities' towards COVID-19 might be ascribed to differences in the study population, tools used to measure the outcome variables across the studies, timing of the study period, the sample size used, the level of information exchange.

In regard to the factors affecting the outcome variables, the socio-demographic variables like marital status, level of education and family size had significantly influenced the knowledge and attitude of the communities' towards COVID-19. As such, Forty-percent of the respondents who were married were less likely to have good knowledge regarding COVID-19 [AOR = 0.60 at 95% CI: (0.42, 0.86)]. This result is supported by a previous report from China [9]. This could be explained in that those married individuals may carry higher responsibilities to care for their children and their family at large and hence they might be eager to sought for information about the disease thereby they had good knowledge about COVID-19.

Moreover, respondents who attended higher level of education were more likely to have good knowledge and positive attitude compared to those respondents with no formal education [9, 10, 12]. This might be due to the fact that educational attainment is often used as a proxy measure of socio-economic status. And people with higher educational level have better income and have resources to secure information related to the COVID-19 thereby might have good knowledge and positive attitude towards the pandemic. This finding is indicative for policy makers and intervention strategies to focus on community members who have no formal education.

Finally, family size was one of the factors significantly associated with both good knowledge and positive attitude. Cognizant of this, study participants with higher family size were more likely to have good knowledge and positive attitude in the current study. The possible reason for this could be, family members might have discussion about COVID-19 and share information on how to care about each other from the pandemic and this will in turn enable for them to have good knowledge and positive attitude.

**Limitations of the study**

This study acknowledged some important possible limitations that should be considered when interpreting the results. First, the study was cross-sectional, a design that does not permit to establish cause-effect relationships. Second, social desirability bias due to self-report might have been introduced.

### Table 5. Factors associated with attitude of communities towards COVID-19 in Gondar city, northwest Ethiopia, 2020.

| Variables     | Attitude towards COVID-19 | COR at 95% CI | AOR at 95% CI |
|---------------|---------------------------|---------------|---------------|
|               | Negative                  | Positive      |               |               |
| Educational level | No formal education       | 74            | 51            | 1             | 1             |
|               | Primary                   | 46            | 55            | 1.73(1.02, 2.95) | 1.76(1.03, 3.01) |
|               | Secondary                 | 93            | 102           | 1.59(1.01, 2.50) | 1.69(1.07, 2.68) |
|               | College & above           | 79            | 123           | 2.26(1.43, 3.56) | 2.38(1.50, 3.79) |
| Family size   | Up to 3                   | 101           | 77            | 1             | 1             |
|               | 4 to 6                    | 146           | 198           | 1.78(1.23, 2.56) | 1.84(1.27, 2.67) |
|               | 7 and above               | 45            | 56            | 1.63(0.99, 2.67) | 1.79(1.08, 2.96) |

AOR = adjusted odd ratio, COR = crude odd ratio, * significant level, * significant at p-value <0.05.

https://doi.org/10.1371/journal.pone.0248821.t005
Conclusion and recommendation

In our study, more than half of the study participants had good knowledge and positive attitude towards COVID-19. The socio-demographic variables, such as marital status, level of education and family size were factors significantly affecting the knowledge and attitude of the communities” towards the diseases (COVID-19). We authors recommended that the intervention strategies to halt the pandemic could better provide a due attention on these segments of population including those who had no formal education, unmarried once, households with lower family members.

Supporting information

S1 Appendix. Full survey questionnaire. (DOCX)

S1 Dataset. This is the data set used in analysis for the current study. (XLS)

Acknowledgments

We are very indebted to Gondar city health office for permitting to conduct the study and providing the necessary preliminary information while conducting this study. We do wish to extend our gratitude to the study participants, supervisors and data collectors.

Author Contributions

Conceptualization: Asefa Adimasu Taddese, Zelalem Nigussie Azene, Mehari Woldemariam Merid, Atalay Goshu Muluneh, Demiss Mulatu Geberu, Getahun Molla Kassa, Melaku Kindie Yenit, Sewbesew Yitayih Tilahun, Kassahun Alemu Gelaye, Habtamu Sewunet Mekonnen, Aber Woretaw Azagew, Chalachew Adugna Wubneh, Getaneh Mulualem Belay, Nega Tezera Assimamaw, Chilot Desta Agegnehu, Telake Azale, Animut Tagele Tamiru, Zewudu Andualem, Henok Dagne, Kiros Terefe Gashaye, Gebisa Guyasa Kabito, Tesfaye Hambisa Mekonnen, Sintayehu Daba, Jember Azanaw, Tsegaye Adane.

Data curation: Asefa Adimasu Taddese, Zelalem Nigussie Azene, Mehari Woldemariam Merid, Atalay Goshu Muluneh, Getahun Molla Kassa, Melaku Kindie Yenit, Chilot Desta Agegnehu, Zewudu Andualem, Henok Dagne, Tsegaye Adane, Mekuriaw Alemayehu.

Formal analysis: Asefa Adimasu Taddese, Zelalem Nigussie Azene, Mehari Woldemariam Merid, Atalay Goshu Muluneh, Getahun Molla Kassa, Zewudu Andualem, Gebisa Guyasa Kabito.

Methodology: Asefa Adimasu Taddese, Mehari Woldemariam Merid, Atalay Goshu Muluneh, Getahun Molla Kassa, Melaku Kindie Yenit, Sewbesew Yitayih Tilahun, Kassahun Alemu Gelaye, Aber Woretaw Azagew, Chilot Desta Agegnehu, Zewudu Andualem, Henok Dagne, Tesfaye Hambisa Mekonnen.

Software: Asefa Adimasu Taddese.

Supervision: Kassahun Alemu Gelaye.

Validation: Asefa Adimasu Taddese, Zelalem Nigussie Azene, Mehari Woldemariam Merid, Demiss Mulatu Geberu, Melaku Kindie Yenit, Sewbesew Yitayih Tilahun, Kassahun Alemu Gelaye, Aber Woretaw Azagew, Chalachew Adugna Wubneh, Getaneh Mulualem Belay, Nega Tezera Assimamaw, Telake Azale, Animut Tagele Tamiru, Bayew Kelkay Rade, Eden
Bishaw Taye, Zewudu Andualem, Henok Dagne, Kiros Terefe Gashaye, Sintayehu Daba, Jember Azanaw, Tsegaye Adane, Mekuriaw Alemayehu.

**Visualization:** Demiss Mulatu Geberu, Melaku Kindie Yenit, Kassahun Alemu Gelaye, Habtamu Sewunet Mekonnen, Chalachew Adugna Wubneh, Nega Tezera Assimamaw, Telake Azale, Animut Tagele Tamiru, Kiros Terefe Gashaye, Gebisa Guyasa Kabito, Tesfaye Hambisa Mekonnen, Sintayehu Daba, Jember Azanaw, Mekuriaw Alemayehu.

**Writing – original draft:** Asefa Adimasu Taddese, Zelalem Nigussie Azene, Mehari Woldemariam Merid, Atalay Goshu Muluneh, Demiss Mulatu Geberu, Getahun Molla Kassa, Sewbesew Yitayih Tilahun, Habtamu Sewunet Mekonnen, Chalachew Adugna Wubneh, Getaneh Muluaele Belay, Nega Tezera Assimamaw, Chilot Desta Agegnehu, Animut Tagele Tamiru, Bayew Kelkay Rade, Eden Bishaw Taye, Zewudu Andualem, Henok Dagne, Gebisa Guyasa Kabito, Tesfaye Hambisa Mekonnen, Sintayehu Daba, Jember Azanaw, Tsegaye Adane.

**Writing – review & editing:** Asefa Adimasu Taddese, Zelalem Nigussie Azene, Mehari Woldemariam Merid, Atalay Goshu Muluneh, Demiss Mulatu Geberu, Getahun Molla Kassa, Melaku Kindie Yenit, Sewbesew Yitayih Tilahun, Kassahun Alemu Gelaye, Habtamu Sewunet Mekonnen, Abere Woretaw Azagew, Chalachew Adugna Wubneh, Getaneh Muluaele Belay, Nega Tezera Assimamaw, Chilot Desta Agegnehu, Telake Azale, Animut Tagele Tamiru, Bayew Kelkay Rade, Eden Bishaw Taye, Zewudu Andualem, Henok Dagne, Kiros Terefe Gashaye, Gebisa Guyasa Kabito, Tesfaye Hambisa Mekonnen, Sintayehu Daba, Jember Azanaw, Tsegaye Adane, Mekuriaw Alemayehu.

**References**

1. Joseph T, Ashkan M: International Pulmonologist’s Consensus On COVID-19. 2020.
2. Zhu N, Zhang D, Wang W, Li X, Yang B, Song J, et al: A novel coronavirus from patients with pneumonia in China, 2019. New England Journal of Medicine 2020.
3. Rolling updates on coronavirus disease (COVID-19) [https://www.who.int/emergencies/diseases/novel-coronavirus-2019/events-as-they-happen]
4. Ethiopia COVID-19 Monitoring Platform [https://www.covid19.et/Covid-19/Home/Dashboard/am]
5. European Centre for Disease Prevention and Control.: Infection prevention and control for the care of patients with 2019-nCoV in healthcare settings. ECDC: Stockholm; https://www.ecdc.europa.eu/sites/default/files/documents/nove-coronavirusinfection-prevention-control-patients-healthcare-settingspdf 2020.
6. Organization WH: Coronavirus disease 2019 (COVID-19): situation report, 72. 2020.
7. Africa faces a coronavirus catastrophe [https://www.theafricareport.com/24952/africa-faces-a-coronavirus-catastrophe/]
8. Henok Dagne, Kassahun Alemu, Demewoz Taddesse, Naomi Teshome, Zewudu Andualem, Baye Dagnew, et al: Prevention Practice and Associated Factors of Coronavirus-2019 (COVID-19) Outbreak Among Educated Ethiopians: An online Based Cross-sectional Survey. In.: 2020.
9. Zhong B-L, Luo W, Li H-M, Zhang Q-Q, Liu X-G, Li W-T, et al: Knowledge, attitudes, and practices towards COVID-19 among Chinese residents during the rapid rise period of the COVID-19 outbreak: a quick online cross-sectional survey. International journal of biological sciences 2020, 16(10):1745. https://doi.org/10.7150/ijbs.45221 PMID: 32226294
10. Ferdous MZ, Islam MS, Sikder MT, Mosaddek ASM, Zegarra-Valdivia J: Knowledge, attitude, and practice regarding COVID-19 outbreak in Bangladeshi people: An online-based cross-sectional study. medRxiv 2020.
11. Haque T, Hossain KM, Bhuiyan MMR, Ananna SA, Chowdhury SH, Islam MR, et al: Knowledge, attitude and practices (KAP) towards COVID-19 and assessment of risks of infection by SARS-CoV-2 among the Bangladeshi population: An online cross sectional survey. 2020.
12. Akalu Y, Ayelign B, Molla MD: Knowledge, attitude and practice towards COVID-19 among chronic disease patients at Addis Zemen Hospital, Northwest Ethiopia. Infection and drug resistance 2020, 13:1949. https://doi.org/10.2147/IDR.S258736 PMID: 32612371
13. Azlan AA, Hamzah MR, Sern TJ, Ayub SH, Mohamad E: Public knowledge, attitudes and practices towards COVID-19: A cross-sectional study in Malaysia. *Plos one* 2020, 15(5):e0233668. https://doi.org/10.1371/journal.pone.0233668 PMID: 32437434

14. Huynh G, Nguyen TNH, Vo KN, Pham LA: Knowledge and attitude toward COVID-19 among healthcare workers at District 2 Hospital, Ho Chi Minh City. *Asian Pacific Journal of Tropical Medicine* 2020, 13(6):260.

15. Hussain I, Majeed A, Imran I, Ullah M, Hashmi FK, Saeed H, et al: Knowledge, Attitude, and Practices Toward COVID-19 in Primary Healthcare Providers: A Cross-Sectional Study from Three Tertiary Care Hospitals of Peshawar, Pakistan. *Journal of community health* 2020:1–9. https://doi.org/10.1007/s10900-019-00710-0 PMID: 31372797

16. Taghrir MH, Borazjani R, Shiraly R: COVID-19 and Iranian Medical Students; A Survey on Their Related-Knowledge, Preventive Behaviors and Risk Perception. *Archives of Iranian medicine* 2020, 23(4):249–254. https://doi.org/10.34172/aim.2020.06 PMID: 32271598

17. Moro M, Vigezzi GP, Capraro M, Biancardi A, Nizzero P, Signorelli C, et al. 2019-novel coronavirus survey: knowledge and attitudes of hospital staff of a large Italian teaching hospital. *Acta Bio-medica: Atenei Parmensis* 2020, 91(3-S):29–34. https://doi.org/10.23750/abm.v91i3-s.9419 PMID: 32275264

18. Olum R, Chekwech G, Wekha G, Nassazi DR, Bongomin F: Coronavirus Disease-2019: Knowledge, Attitude, and Practices of Health Care Workers at Makerere University Teaching Hospitals, Uganda. *Frontiers in Public Health* 2020, 8:181. https://doi.org/10.3389/fpubh.2020.00181 PMID: 32426320

19. Reuben RC, Danladi MM, Saleh DA, Ejembi PE: Knowledge, Attitudes and Practices Towards COVID-19: An Epidemiological Survey in North-Central Nigeria. *Journal of community health* 2020:1–14. https://doi.org/10.1007/s10900-019-00710-0 PMID: 31372797

20. Hussain A, Garima T, Singh BM, Ram R, Tripti RP: Knowledge, attitudes, and practices towards COVID-19 among Nepalese Residents: A quick online cross-sectional survey. *Asian Journal of Medical Sciences* 2020, 11(3):6–11.

21. Fijan S, Šostar-Turk S, Cencič A: Implementing hygiene monitoring systems in hospital laundries in order to reduce microbial contamination of hospital textiles. *Journal of hospital infection* 2005, 61(1):30–38. https://doi.org/10.1016/j.jhin.2005.02.005 PMID: 15975691

22. Shi Y, Wang J, Yang Y, Wang Z, Wang G, Hashimoto K, et al: Knowledge and attitudes of medical staff in Chinese psychiatric hospitals regarding COVID-19. *Brain, Behavior, & Immunity-Health* 2020:100064. https://doi.org/10.1179/1743132814Y.0000000392 PMID: 24861496

23. Zhou M, Tang F, Wang Y, Nie H, Zhang L, You G, et al: Knowledge, attitude and practice regarding COVID-19 among health care workers in Henan, China. *Journal of Hospital Infection* 2020. https://doi.org/10.1016/j.jhin.2020.04.012 PMID: 32278701