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# Risk perception and preventive behaviours of COVID-19 among university students, Gondar, Ethiopia: a cross-sectional study

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## ABSTRACT

**Objective** This study aimed to assess COVID-19 preventive behaviours and their associated factors among university students.

**Methods** An institution-based cross-sectional study was employed among 405 university students and the study participants were chosen using a stratified simple random selection procedure. A pretested self-administered questionnaire was used to assess participants' perception of and preventive behaviour towards COVID-19. A multivariable logistic regression analysis was employed to identify factors associated with COVID-19 preventive behaviour.

**Result** A total of 405 students participated in this study with a response rate of 97.4%. The mean age of the participants was 23.6 (SD ±2.4, range 19–30) years. Two hundred and twenty of the participants (45.7% with 95% CI 41.0% to 51.0%) had good preventive behaviour towards COVID-19. COVID-19 preventive behaviour was significantly associated with age (adjusted OR (AOR)=1.1, 95% CI 1.00 to 1.2), female sex (AOR=1.6, 95% CI 1.02 to 2.60), knowing anyone infected with COVID-19 (AOR=4.05, 95% CI 1.9 to 8.8), participants who had high perceived susceptibility (AOR=2.14, 95% CI 1.44 to 3.35) and participants who were enrolled in health programmes (AOR=4.23, 95% CI 2.6 to 7.0).

**Conclusion and recommendation** The overall COVID-19 preventive behaviour among university students is unsatisfactory. Students' COVID-19 preventive behaviour was influenced by age, sex, knowing a COVID-19 infected person, perceived susceptibility and the sort of programme in which they had enrolled. The findings revealed that health communication interventions aimed at changing people's perceptions of COVID-19 and related prevention strategies are urgently needed to improve this population's COVID-19 preventive behaviour.

## INTRODUCTION

The COVID-19 pandemic is a global public health threat that has infected hundreds of millions and caused the death of several million.[1] As per the 24 August 2021 WHO report, over 4.5 million new cases of COVID-19 have been reported globally, and 68 000 new deaths have been reported worldwide during 16–22 August 2021.[2]

**Strength and limitations of the study**

► The instrument used for data collection in this study was pretested and content validity was assessed with a panel discussion among experts.
► During questionnaire administration, the study used a self-administered technique using COVID-19 safety precautions.
► Due to participants' self-reporting, our study may be influenced by social desirability bias.
► It may not possible to establish causal relationships because of the cross-sectional nature of the study.

In July 2021, the third wave of the virus occurred in the African continent. On 15 July 2021, Africa recorded a 43% week-on-week rise in COVID-19 deaths, as hospital admissions increased rapidly and countries faced shortages in oxygen intensive care beds.[3] As of 1 September 2021, the Ethiopian Public Health Institute announced the presence of 308 134 confirmed cases and 4675 deaths of COVID-19 in Ethiopia.[4] The virus can be transmitted from person to person through respiratory droplets, direct contact with an infected individual, or indirect contact with a surface or object that is contaminated with respiratory secretions.[5] Different preventive measures were declared by the government to mitigate the risk of COVID-19. However, compliance with these measures is not at the desired level.[6]

University students' engagement in COVID-19 preventive behaviours varies across countries in the world. As an illustration, it was 87.94% in China.[7] The use of COVID-19 preventive measures was 96.4%, 95.4%, 94.1% and 84.3% in Japan, Pakistan, Saudi Arabia and Jordan, respectively.[8–11] In Africa, COVID-19 preventive behaviour was 88.8%, 92% and 56.8% in Nigeria, Egypt and Ethiopia, respectively.[12–14]

Different bodies of literature showed that the practice of COVID-19 preventive measures is significantly associated with sex[12 13 15] and age of the participants.[7 11] Additionally, studies conducted in Portugal, Saudi Arabia and Egypt revealed that participants' perceived susceptibility had a significant association with engaging in COVID-19 preventive behaviours.[9 13 15] Studies conducted in Nigeria, Jordan, China and Indonesia showed the presence of a significant association between practising COVID-19 preventive measures and the type of programmes students enrolled in in higher education institutions.[7 11 12]

Despite the high prevalence of COVID-19, university students' attitudes regarding COVID-19 prevention are unsatisfactory. Because they live in such a crowded atmosphere, university students are at a higher risk of contracting COVID-19. As a result, we're interested in learning more about their level of COVID-19 preventive behaviour. That enables us to design tailored health intervention programmes that can change their behaviour towards practising COVID-19 precaution measures.

## METHODS AND MATERIALS
### Study design and setting
An institution-based cross-sectional study was conducted among University of Gondar undergraduate students from 1 August 2021 to 27 August 2021. It is located in Gondar, Amhara, Ethiopia. The university has five campuses (Atse Fasil, Maraki, Atse Tewodros, Gondar College of Medicine and Health Sciences, and Teda). During the data collection period, 5173 undergraduate students were attending their classes in the regular programmes. Of those undergraduate students 3780 were enrolled in non-health programmes and 1393 were health science students.

### Population
The study participants were regular undergraduate students who are attending their class at the University of Gondar in 2021. Students who were not available throughout the data collection period and those who were severely ill to the extent they were not able to fill out the questionnaire were excluded from the study.

### Sample size determination and sampling method
The sample size was determined using a single population proportion formula, where the following assumptions were considered: P (56.8%),[16] d (margin of error=5%) and Zα/2 (the value of the standard normal curve score corresponding to the given CI = 1.96) corresponding to 95% confidence level, and a 10% non-response rate. Given this, the final sample size was computed to be 416.

A stratified simple random sampling technique was used to recruit the study participant. First, stratification

was done based on the type of programme as health and non-health. The sample was proportionally allocated to each stratum. Finally, study participants were selected randomly using computer-generated random numbers.

### Study variables
#### Dependent variable
COVID-19 preventive behaviour was the outcome variable for this study (which was categorised into two (good and poor)).

#### Independent variable
Sociodemographic variables (age, sex, monthly income, religion, residence, and presence of comorbid illness), COVID-19 related variables (knowing anyone infected with COVID-19, ever tested for COVID-19, if tested what was the result and heard of negative information), type of programme participants enrolled in and student's perception towards COVID-19.

### Data collection and data quality control
Data were collected using a pretested, structured, self-administered questionnaire prepared by the investigators after reviewing various literature.[17–20] A pretest was done among Gondar Technology College students located in Gondar city. Necessary amendment was made for identification of ambiguity in the questionnaire. After receiving a one-day training on the goal of the study, data collecting procedures, ethical considerations during data collection, and COVID-19 preventive safety precautions, two public health professionals were assigned to data collection. During the data collection process, COVID-19 preventatives were taken. Each returned instrument was reviewed for completeness and consistency on a daily basis. Supervisors (investigators) had been given feedback for the data collectors based on their daily reports on a daily basis.

### Measurements
#### Perceived susceptibility
Perceived susceptibility was defined as a student's subjective perception of the risk of getting COVID-19 and it was measured by six items on a five-point Likert Scale. It was categorised into high and low based on the cut-off point computed using the demarcation threshold formula: ((highest score − lowest score)/2) + lowest score = ((30 − 6)/2) + 6 = 18. Accordingly, participants who scored 18 and above were considered as having high perceived susceptibility and those who scored below 18 as having low perceived susceptibility to COVID-19 (α=0.85).[20–22]

#### Perceived severity
Perceived severity refers to a student's perception of the seriousness of contracting COVID-19 and is measured by four items on a five-point Likert Scale. It was categorised into high and low based on the cut-off point computed using the demarcation threshold formula: ((highest score − lowest score)/2) + lowest score = ((20 − 4)/2) + 4 = 12. Accordingly, participants who scored 12 and above were

considered to have high perceived severity of COVID-19, and those who scored below 12 were considered to have low perceived severity of COVID-19 ($\alpha=0.73$).[20–22]

## COVID-19 preventive behaviour

COVID-19 preventive behaviour refers to the preventive measures taken by the students to prevent COVID-19. This comprised key preventive measures including handwashing, physical distancing and facemask-wearing practices and is measured by seven items on a four-point response scale (1=rarely, 2=sometimes, 3=most of the time and 4=all the time). The sum score computes the score of each item and categorises based on the bloom's cut-off as poor if practice score was <60% (<12 points), moderate if practice score was between 60% and 79% (12–13.9 points), and good if practice score was ≥80% (≥14 points). Finally, It was further classified into poor and good COVID-19 preventive behaviour by merging moderate and good categories into good preventive behaviour ($\alpha=0.82$).[23]

## Data processing and analysis

All collected data were entered into Epidata V.4.6 and transferred to STATA V.14 statistical software for its analysis. Data were coded and cleaned for completeness and consistency. Descriptive statistics were expressed as mean, SD, percentage and frequency using tables and graphs. Multivariable logistic regression analysis was done to identify factors associated with good COVID-19 preventive behaviours. Moreover, the magnitude of the association between different independent variables with regard to dependent variables was measured using ORs with a 95% CI. The Hosmer-Lemeshow goodness-of-fit test was done to assess model fitness which indicated that the final model was well fitted. Furthermore, the multicollinearity between the explanatory variables was assessed using variance inflation factor (VIF) to identify and avoid redundant variables that may affect our estimate. The VIF of all independent variables included in the model was less than 5, which was in the acceptable range.

## Patient and public involvement

No members of the public were involved in the design or conduct of the study.

## RESULT

A total of 405 students participated in this study with a response rate of 97.4%. The mean age of the participants was 23.6 (SD ±2.4, range 19–30) years. Two hundred and twenty-five (55.6%) of the participants were male. Three hundred and fifteen (77.8%) of the students were Christian. Two hundred and eighteen (53.8%) of the students came from urban areas (table 1).

## Participants' perceptions of COVID-19

The study participants' perception of COVID-19 was evaluated based on perceived susceptibility and perceived severity. Two hundred and nine (51.6%) of the participants

**Table 1** Sociodemographic characteristics of University of Gondar students, north-west, Ethiopia (n=405)

| Variables | Frequency | Proportion |
|---|---|---|
| Age[c] (years) | 23.6 (SD ±2.4)* | |
| Sex | | |
| Female | 180 | 44.4 |
| Male | 225 | 55.6 |
| Religion | | |
| Christian | 315 | 77.8 |
| Muslim | 90 | 22.2 |
| Place of origin | | |
| Urban | 218 | 53.8 |
| Rural | 187 | 46.2 |
| Monthly income[c] (ETB) | 600 (350–1000)† | |
| Type of programme | | |
| Health | 113 | 28 |
| Non-health | 292 | 72 |
| Having known chronic illness | | |
| Yes | 43 | 10.6 |
| No | 362 | 89.4 |
| Know someone infected with COVID-19 | | |
| Yes | 177 | 43.7 |
| No | 228 | 56.3 |
| Ever tested for COVID-19 | | |
| Yes | 148 | 36.5 |
| No | 257 | 63.5 |
| Test result | | |
| Positive | 26 | 17.6 |
| Negative | 122 | 82.4 |
| Heard negative information about COVID-19 | | |
| Yes | 209 | 51 |
| No | 196 | 49 |

*≠ (mean with SD).
†¥ (median with IQR).
c, continuous variable; ETB, Ethiopian Birr.

had low perceived susceptibility for COVID-19 (figure 1). One hundred seventy-six (43.5%), 166(41%) and 219 (54.1%) of the participants believed the chance of getting COVID-19 in the next few months is great, were worried about the likelihood of getting COVID-19 and believed religious persons aren't affected by COVID-19, respectively (table 2).

With regard to perceived severity, two hundred and forty-eight (61.2%) of the participants had high perceived
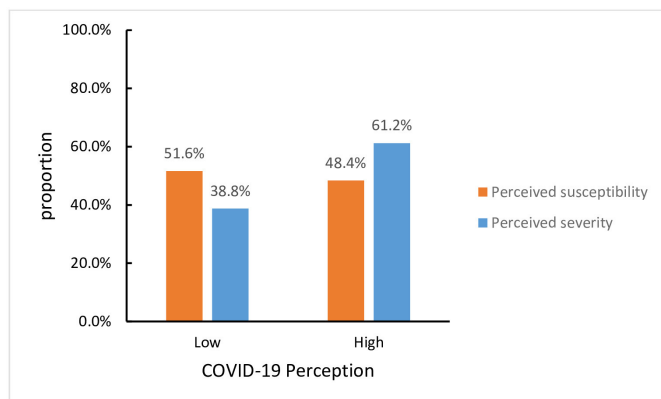
**Figure 1** Participants' perceived susceptibility and severity towards COVID-19.

severity for COVID-19. About 39.3% (159) and 44.7% (181) of the participants perceived that likelihood of recovering from the disease is very high and COVID-19 infection is a fatal (killer) disease, respectively (table 2).

### Preventive behaviour towards COVID-19

Among the participants 54.3% (95% CI 49.0% to 59.0%) had poor COVID-19 preventive behaviour and 45.7% (95% CI 41.0% to 51.0%) had good preventive behaviour. With regards to COVID-19 preventive behaviour, only 12.8%, 10.4% and 22.7% of the participants had kept their physical distance, washed their hands frequently for at least 20 min and wore face masks as recommended, respectively. A large number of students, that is 46.9%, 45.7% and 34.8% reported that they rarely kept their physical distance, washed their hands frequently for at least 20 s and wore a face mask, respectively (table 3).

### Factors associated with COVID-19 preventive behaviour

Multivariable binary logistic regression analysis was conducted to identify explanatory variables, which have a statistically significant association with the outcome of interest (COVID-19 preventive behaviour). The variables were age, sex, religion, monthly income, place of origin, presence of comorbid illness, knowing anyone infected with COVID-19, ever tested for COVID-19, ever heard of negative information about COVID-19, type of programme, perceived severity and perceived susceptibility.

The output of the multivariable binary logistic regression analysis revealed that age (adjusted OR (AOR)=1.1, 95% CI 1.001 to 1.2), being female (AOR=1.6, 95% CI 1.02 to 2.6), those who know anyone infected with COVID-19 (AOR=4.045, 95% CI 1.9 to 8.8), those who had high perceived susceptibility to COVID-19 (AOR=2.14, 95% CI 1.44 to 3.35), being a health science student (AOR=4.23, 95% CI 2.6 to 7.0) were significantly associated with COVID-19 preventive behavior. A unit increase in age of the participant increases the odds of having good COVID-19 preventive behaviour by 10% and being female increases the odds of having good COVID-19 preventive behaviour by 60%. Furthermore, participants who know

**Table 2** Item scores for participants' perceived susceptibility and severity towards COVID-19 (n=405)

| | Strongly disagree | Disagree | Neutral | Agree | Strongly agree |
|---|---|---|---|---|---|
| **Perceived susceptibility** | | | | | |
| Worried about the likelihood of getting COVID-19 | 76 (18.8%) | 75 (18.5%) | 88 (21.7%) | 112 (27.7%) | 54 (13.3%) |
| Religious persons aren't affected by COVID-19 | 60 (14.8%) | 73 (18%) | 53 (13.1%) | 113 (27.9%) | 106 (26.2%) |
| I think I have some immunity to corona virus | 50 (12.4%) | 56 (13.8%) | 97 (24%) | 128 (31.6%) | 74 (18.2%) |
| I don't care about the disease | 40 (10%) | 71 (17.5%) | 73 (18%) | 141 (34.7%) | 80 (19.8%) |
| Getting COVID-19 is currently a possibility for me | 71 (17.5%) | 129 (31.9%) | 71 (17.5%) | 75 (18.5%) | 59 (14.6%) |
| **Perceived severity** | | | | | |
| Recovery from the disease is high | 37 (9.1%) | 81 (20%) | 128 (31.6%) | 131 (32.3%) | 28 (7%) |
| I don't think it will cause me significant suffering | 49 (12%) | 98 (24.2%) | 98 (24.2%) | 127 (31.4%) | 33 (8.2%) |
| COVID-19 infection is fatal | 47 (11.6%) | 93 (23%) | 84 (20.7%) | 109 (26.9%) | 72 (17.8%) |
| I'm afraid of getting COVID-19 | 47 (11.6%) | 103 (25.4%) | 66 (16.4%) | 135 (33.3%) | 54 (13.3%) |

**Table 3** COVID-19 preventive behaviours among university students, Gondar, north-west Ethiopia, 2021 (n=405)

| COVID-19 key preventive behaviours | Response category | | | |
| --- | --- | --- | --- | --- |
| | Rarely | Sometimes | Many times | Always |
| Keep physical distance by 2 m | 190 (47%) | 92 (22.7%) | 71 (17.5%) | 52 (12.8%) |
| Place a tissue paper or bend elbow when coughing sneezing | 141 (34.8%) | 101 (25%) | 89 (22%) | 74 (18.2) |
| Don't leave my dormitary unless absolutely necessary | 176 (43.5%) | 95 (23.5%) | 79 (19.5%) | 55 (13.5%) |
| Wash hands regularly | 185 (45.7%) | 110 (27.2%) | 68 (16.8%) | 42 (10.3%) |
| Don't touch my eyes, nose and mouth with my hands | 137 (33.8%) | 95 (23.5%) | 104 (25.7%) | 69 (17%) |
| Use alcohol or sanitiser to clean hands | 128 (31.6%) | 98 (24%) | 105 (26%) | 74 (18.4%) |
| Wear face mask consistently | 141 (34.8%) | 100 (24.7%) | 72 (17.8) | 92 (22.7) |

anyone infected with COVID-19 were 4.5 times more likely to have good COVID-19 preventive behaviours than their counterparts. The odds of having good COVID-19 preventive behaviour increased by 14% among individuals who had high perceived susceptibility. The odds of having good COVID-19 preventive behaviour were 4.23 times higher among health science students (table 4).

## DISCUSSION

The present study was aimed to assess university students' COVID-19 preventive behaviour and its associated factors. In the present study less than half (45.7%) of the participants had good preventive behaviour towards COVID-19.

The results of the present study are in harmony with a study done elsewhere in Ethiopia.[16] However, the result of the present study is lower than that of studies done in Nigeria (88.8%), Pakistan (95.4%), Egypt (92%) and Jordan (84.3%).[9 11–13] The discrepancy could be explained by the fact that those studies only included participants who were participating in health programs, which could increase the adoption of COVID-19 preventative behavior. Moreover, the result of the current study is higher than that of a study conducted in Mizan Tepi University (42.8%).[24] The possible reason for the discrepancy might be explained by the difference in the tool used to measure the outcome of interest. Moreover, the finding of the present study highlighted the need for urgent interventions that can enhance students' compliance to COVID-19 preventive behaviours.

The present study revealed that the age of participants, sex of participants, knowing a COVID-19 infected person, perceived susceptibility and types of programmes in which they are enrolled were significantly associated with COVID-19 preventive behaviour.

Older participants were 1.1 times more likely to have good COVID-19 preventive behaviour compared with younger ones. This association was supported by studies done in China and Jordan.[7 11] Additionally, the participants' preventive behaviour towards COVID-19 is significantly associated with the sex of the participants. That is, being female increases the likelihood of practising COVID-19 preventive measures than being male. This outcome is in line with studies done in Nigeria, Egypt, Jordan, Portugal, Saudi Arabia, Iran and Indonesia[9 11–13 15 25] Furthermore, the participants' preventive practice towards COVID-19 is significantly associated with their risk of perception (perceived susceptibility). As the participants believe themselves to be highly susceptible to COVID-19, their likelihood of COVID-19 preventive practice will also be higher. This result is consistent with the studies conducted in Portugal, Saudi Arabia and Egypt.[9 13 15] This result can also be explained according to the Health Belief model that postulates: people will take a recommended preventive behaviour if they have a high-risk perception of disease. Accordingly, in this study students with higher perceived susceptibility were more likely to take the recommended COVID-19 preventive behaviours. In light of this, behaviour change communication to enhance students' compliance to COVID-19 preventive practice should be based on raising students' risk perception about the pandemic. Moreover, the participants' COVID-19 preventive behaviour was significantly associated with the type of programme in which they had enrolled. Participants enrolled in health programmes were more likely to use COVID-19 preventive behaviours than non-health science students. This finding is consistent with the studies conducted in Portugal, Saudi Arabia and Egypt.[9 13 15] This discrepancy might be due to health science students being more exposed to health-related information including COVID-19 which may inflate the outcome. As compared with non-health science students, health science students might use COVID-19 protective equipment, especially during clinical practice which may create a gap between these two programmes.

There are certain limitations to this study that should be mentioned. It may not be possible to establish causal relationships because of the cross-sectional nature of the study, and the data reflect the situation at the time of the study. Furthermore, because this study was dependent on the participant's self-report, there could be bias in the results due to recall and social desirability.

## CONCLUSION AND RECOMMENDATIONS

COVID-19 preventive behaviour was poor among university students. Increased age, female sex, knowing a COVID-19 infected person, high perceived susceptibility

**Table 4** Factors associated with COVID-19 preventive behaviour among university students in multivariable binary logistic regression, Gondar, north-west Ethiopia (n=405)

| Variable | COVID-19 preventive practice | | P value | Adjusted OR |
| | Good (n=220) | Poor (n=185) | | |
| | Frequency (%) | Frequency (%) | | |
| --- | --- | --- | --- | --- |
| Age (in years)c | 23.8 (±2.4)* | 23.5 (±2.4)* | 0.045 | 1.1 (1.002 to 1.21) |
| Sex | | | | |
| Male | 92 (40.9%) | 133 (59.1%) | | 1 |
| Female | 93 (51.7%) | 87 (48.3) | 0.039 | 1.63 (1.02 to 2.58) |
| Residence | | | | |
| Rural | 82 (43.8%) | 105 (56.2%) | | 1 |
| Urban | 103 (47.2%) | 115 (52.8%) | 0.69 | 0.9 (0.58 to 1.44) |
| Religion | | | | |
| Christian | 141 (44.8%) | 174 (55.2%) | | 1 |
| Muslim | 44 (48.9%) | 46 (51.1%) | 0.66 | 0.89 (0.52 to 1.51) |
| Monthly income (ETB)c | 600 (400 to 1000)† | 525 (235 to 1000)† | 1 | 1 (1 to1) |
| Presence of comorbid illness | | | | |
| Yes | 31 (72.1%) | 12 (27.9%) | <0.001 | 4.024 (1.85 to 8.77) |
| No | 154 (42.5%) | 208 (57.5%) | | 1 |
| Do you know anyone infected with COVID-19 | | | | |
| Yes | 97 (54.8%) | 80 (45.2%) | 0.04 | 1.67 (1.02 to 2.73) |
| No | 88 (38.6%) | 140 (61.4%) | | 1 |
| Have you ever tested for COVID-19 | | | | |
| Yes | 71 (48%) | 77 (52%) | | 1 |
| No | 114 (44.4%) | 143 (55.6%) | 0.57 | 0.86 (0.51 to 1.44) |
| If tested what was the result | | | | |
| Positive | 14 (53.8%) | 12 (46.2%) | 0.79 | 1.13 (0.45 to 2.84) |
| Negative | 57 (46.7%) | 65 (53.3%) | | 1 |
| Have you heard negative information about the COVID-19 vaccine | | | | |
| Yes | 93 (44.5%) | 116 (55.5%) | | 1 |
| No | 92 (46.9%) | 104 (53.1%) | 0.08 | 1.5 (0.94 to 2.45) |
| Perceived susceptibility | | | | |
| High | 110 (56.1%) | 86 (43.9%) | 0.001 | 2.14 (1.36 to 3.35) |
| Low | 75 (35.9%) | 134 (64.1%) | | 1 |
| Perceived severity | | | | |
| High | 113 (45.6%) | 135 (54.4%) | 0.21 | 0.74 (0.47 to 1.18) |
| Low | 72 (45.9%) | 85 (54.1%) | | 1 |
| Type of programme participants enrolled | | | | |
| Health | 80 (70.8%) | 33 (29.2%) | <0.001 | 4.22 (2.6 to 6.9) |
| Non-health | 105 (36%) | 187 (64%) | | 1 |

*≠ (mean with SD).
†¥ (median with IQR).
c, continuous variable; ETB, Ethiopian Birr.

and being a health science student were important factors positively associated with COID-19 preventive behaviour. Thus, health communication interventions targeted to bring about change in students' COVID-19 preventive behaviour are urgently required. Besides, such interventions would be effective if they focused on raising students' threat perception of COVID-19 and other factors identified by the present study.

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