BMJ Open

Psychological Problems among College Students during School Closure due to COVID-19 Pandemic Lockdowns; A Cross-sectional Study

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2020-045623
Article Type:	Original research
Date Submitted by the Author:	12-Oct-2020
Complete List of Authors:	Woday, Abay; Samara University, Public Health; Dream Science and Technology College, Dessie, Ethiopia, Public Health Mihret, Setegn; Wollo University Biset, Gebeyaw; Wollo University, pediatrics Kassa, Ayesheshim ; Dessie Health Science College, Dessie, Amhara region, Ethiopia, Nursing
Keywords:	EPIDEMIOLOGY, Health policy < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, MENTAL HEALTH, PUBLIC HEALTH

I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our licence.

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which Creative Commons licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

Psychological Problems among College Students during School Closure due to COVID-19 Pandemic Lockdowns; A Cross-sectional Study

Abay Woda Tadesse[1,2], Setegn Mihret[3,2], Gebeyaw Biset[3,2], Ayesheshim Muluneh[4,2]

Affiliations:

[1]Samara University, college of Medicine and health sciences, Departments of public health, Samara, Afar region, Ethiopia. [2]Dream Science and Technology College Dessie, Amhara region, Ethiopia. [3]Wollo University, College of Medicine and Health Sciences, School of Nursing and Midwifery, Departments of paediatrics health nursing, Amhara region, Dessie, Ethiopia. [4]Dessie Health Science College Department of nursing and midwifery, Dessie, Amhara region, Ethiopia.

Corresponding Author: Abay Woday Tadesse, E-mail*:* *abaywoday@yahoo.com*

Institutional email: *abaywonday@su.edu.et*

P.O.BOX: 132

Co-authors email address:

Setegn Mihret, E-mail: setegnmihret5@gmail.com

Gebeyaw Biset, E-mail: gebeyawbiset@yahoo.com

Ayesheshim Muluneh, E-mail: ashumuluneh327@gmail.com

Authors' Contributions

All authors conceived and designed the study. AWT, and GB supervised the data collection. AWT, AM and SM performed the data analysis, interpretation of data, and drafted the manuscript and critically reviewed the manuscript. All authors read and approved the final manuscript.

Acknowledgements

We would like to than Dream science and Technology College for its ethical approval. Furthermore, our deepest gratitude goes to the hospital staffs, participants, data collectors and supervisors.

Abstract

Objective: The central aim of this study was to assess the level of psychological problems among college students during school closure because of the emerging COVID-19 Pandemic.

Methods: A cross-sectional study was conducted among 422 college students who were learning at randomly selected public and private colleges and universities in Dessie town. The sample was proportionally allocated into the four randomly selected colleges and the students were recruited using a systematic random sampling technique with every 6th interval that was obtained from each college's registrar office. The data analysis was done using SPSS version 24.0. Variables with p-value < 0.25 in the bivariate analysis were entered into the multivariable logistic regression model. Model fitness was checked using the Hosmer-Lemeshow model fit-ness-test. Statistical significant level was declared at a p-value < 0.05.

Results: This study involved 408 students with a response rate of 96.6%. In this study, 77.2%, 71.8%, and 48.5% of the students had experienced depression, anxiety, and stress related psychological problems, respectively. The multivariable logistic regression model showed that being female [AOR=1.68, 95% CI 1.09, 2.91], having inadequate practice of prevention measures [AOR=1.74: 95% CI 1.01, 3.02] and living urban residency [AOR=0.76: 95% CI 0.48, 0.94] were the independent predictors of psychological problems among students.

Conclusions: The study revealed the level of anxiety, stress, and depression disorders are optimally high among students. Therefore, local governments should develop effective psychological interventions for students. Moreover, it is important to consider the educational enrollment types and academic years of the students.

Keywords: COVID-19, Psychological problems, Anxiety, Stress, Depression, Students, Ethiopia

Article Summary

Strengths and limitations of this study

1. **Strengths of the study**

- School closure and stay-at-home order by the national exposed the students for psychological problems.
- We used internationally accepted tools for the assessment of of psychological problems (DASS-21).
- In this study, 77.2%, 71.8%, and 48.5% of the college students had experienced depression, anxiety, and stress related psychological problems, respectively.

2. **Limitations of the study**

- The study was limited to college students only due to financial constraints and it may not represent student from high schools and pre-college schools.

Introduction

Severe acute respiratory infection (SARS) is a group of respiratory tract infections caused by a beta coronavirus (SARS-COV2) [1-3]. Corona Virus Disease-2019 ("COVID-19") is a family of SARS caused by Novel Coronavirus and was first detected in December 2019 in Wuhan, China. Since it has been declared a global pandemic by the World Health Organization (WHO), it has made the rapid spread across the world and causes high mortality and morbidity [2-5]. Globally, there is an estimated number of 7 million cases and nearly half a million deaths [6-8]. Following this pandemic, nations across the globe have taken different preventive measures. These include movement restriction, confinement to home and closure of the school, and other social services that lead to increased psychosocial stress among the community, especially students [9-17].

A study conducted in china revealed that 53.8% of respondents had experienced moderate to severe psychological crises, in which students were found to contribute a greater number than the larger communities [18]. Another study in China revealed that around 25% of college students experienced anxiety due to the pandemic [19]. A study conducted in Singapore revealed that 14.5%, 8.9%, and 7.7% of participants screened positive for anxiety, depression and stress respectively [20]. Pieces of evidence had suggested that the pandemic resulted in loneliness, anxiety, depression, insomnia, suicide. societal rejection, discrimination, and stigmatization among people [21, 22].

Ethiopia has taken different prevention and control measures to halt the spread of COVID-19. These include school closure, stay at home, keep social and physical distances, putting hand washing basin in places where people use in common (banks, Churches/mosques, markets), preparation of isolation centers, and establishment of state emergency at the national level [23-25]. However, still, there is no specific intervention to address the psychological problem of COVID 19 in the country.

Moreover, the studies conducted across the globe have been investigated the psychological problems of COVID-19 pandemic predominantly focused on health care workers and patients [26-28]. Therefore, this study was intended to generate evidence regarding the prevalence of psychological problems due to COVID-19 and its determinants among college students.

Methods and Materials

Study Setting and Participants

The community-based cross-sectional study design was conducted from April 15-May 15, 2020 to assess the psychological problems of COVID-19 on students who were learning in the four randomly selected private and public colleges and Universities, Namely; Dream Science and Technology College, Dandi Boru College, Unity University, and Dessie Health Science College. These higher institutions are found in South Wollo Zone, Dessie city administration. Dessie city administration is located 401Km away from the capital city of Ethiopia, Addis Ababa. The city has eight private colleges, one private University, and three public colleges which accommodate a total of 20,907 students in different fields of study.

All active students, registered for second-semester academic year, and those 16 and above years of age were included in this study. However, students who were seriously ill during the data collection period were not included in this study.

The sample size was calculated for both determinants and prevalence of psychological problems due to COVID 19 and the maximum sample size was considered for this study. Thus, the final sample size was determined using a single population proportion formula with assumptions: 5% type I error, 95% Confidence Intervals, 50% proportion since no study in Ethiopia on this problem. Finally, the researchers added 10% to compensate for the non-response of participants and the final sample size became 422.

$$n=\frac{(Za/z)^2(P)(1-P)}{d^2}$$

Where: n = required sample size, Zα/2 = critical value for normal distribution at 95 % confidence level (1.96), p = proportion of psychological problems, and d = 0.05 (5 % margin of error).

From a total of twelve colleges and universities found in Dessie city administration, four higher institutions (three colleges and one university) were randomly selected. The calculated sample size was proportionally allocated in each college based on the second-semester academic student number reports. To calculate the required number of participants from each college, we multiplied the total number of students actively learning in each college by the sampling fraction (n/N). The sampling fraction is approximately equal to six for all colleges. Accordingly, every 6th participants were selected using a systematic random sampling technique from each college registrar office log-book.

Study variables:

Dependent variable: the psychological problem of COVID 19 (Yes/No) that was assessed using Depression, Anxiety, and Stress Scales (DASS-21).

Independent variables: sociodemographic characteristics (age, residence, sex, marital status, educational level, the field of study, income, family size, religion), knowledge, attitude and practice towards the preventive measures of COVID-19.

Data Collection Tools and Procedures

The questionnaire was adopted from studies conducted before this study [19, 29-31] and modified into context. The questionnaire was developed in the English language and it consists of sociodemographic characteristics, 20-items for knowledge, eight items for attitude, and 12-items for the practice of preventive measures against COVID-19. The psychological problem was assessed by using DASS-21 [i.e. the Depression, Anxiety, and Stress Scales] [29]. The tools were translated into the local language (Amharic) and back to English to keep its consistency. The tool was pretested on 5% (21 participants) of samples other than selected colleges those found in Woldia town and some amendments were made based on the pretest findings. The data was

collected using both phone-call and personal interviews. Phone-call was used for students who are out of Dessie town. The study participants were approached by trained health professionals who were working out of the selected colleges.

Data management and analysis

The data were cleaned, coded, and entered into Epi data version 3.1 software and exported to SPSS version 24.0 for analysis. The descriptive statistics was done and the results were presented using texts, frequency tables, figures, and median with Interquartile range (IQR).

Bivariate logistic regression analysis was done to assess the association between the dependent variable with each independent variable. The socio-demographic factors, knowledge, attitude, and practice of preventive measures against COVID-19 were the factors included in the bivariate logistic regression analysis. Thus, independent variables with a p-value of less than 0.25 were considered in the final model. Correlation between independent variables was assessed but we did not find any correlation between independent variables. The model fitness was also checked using the Hosmer-Lemeshow model fit-ness test. Finally, multivariable logistic regression analysis was done to control potential confounders and to identify the factors associated with the psychological problem of COVID-19 among students. The statistical significance level was declared at a P-value <0.05.

Operational Definitions

Psychological problem: it was defined as students who were experienced all form of psychological problems [Depression, Anxiety, and Stress] related with COVID-19 pandemic that was measured using DASS-21[29]. Here, the scales were classified as normal, moderate, and severe for each psychological problems (DAS). However, we merged moderate and severe scales together in each psychological problems since the values of moderate scales were minimal.

*Knowledge level***:** students who were correctly answered 70% or more (14/20) of the knowledge questions were considered as students with a good knowledge level while students who answered correctly below 70% of the knowledge questions were considered as having poor knowledge.

Attitude level: students who were correctly answered 70% or more (5.6/8) of the attitude questions were considered as students with a positive attitude while students who correctly answered below 70% of the attitude questions were considered as students with a negative attitude.

Practice level: students who were correctly answered 70% or more (8.5/12) of the practice questions were considered as students with a good practice e level while students who correctly answered below 70% of the practice questions were considered as students with a poor practice.

Results:

Sociodemographic characteristics of Participants

In this study, 422 participants were involved with a response rate of 96.6%. The median age of the participants was 21 years with three Interquartile Range (IQR). Of the total students; 155 (38.0%) were lived in the rural residence, 194 (47.5%) were females, 215 (52.7%) were learning TVET or diploma level training, and 340 (83.3%) were living with their families during the COVID-19 lockdown. In this study, the participants had a median of 5 total family size with 3 IQR (**Table 1).**

Table 1: Sociodemographic, knowledge, attitude and practices of students towards COVID-19 in Dessie town Private and Public Colleges/Universities, Amhara region, Ethiopia, 2020 (n=408)

List of Predictors	Category of variables	Frequency (#)	Percentage (%)
Age of participants (in years)	16-20	166	40.7
	More than 20	242	59.3
Residence	Urban	253	62.0
	Rural	155	38.0
Sex of the participants	Male	214	52.5
	Female	194	47.5
Marital status	Single*	360	88.2
	Married	48	11.8
Religion of the participants	Orthodox	207	50.7
	Muslim	183	44.9
	Others+	18	4.4
Type of Education enrollment	TVET (Diploma)	215	52.7
	Degree (First)	193	47.3
Program	Regular	377	92.4
	Evening (Extension)	31	7.6
Field of Study	Health related	233	57.1
	Business related	129	31.6
	Technology related	46	11.3
Academic year	Year I	151	37.0
	Year II	180	44.1
	Year III	58	14.2
	Year IV+	19	4.7
Living with;	Families	340	83.3
	Relatives	28	6.9
	Alone	21	5.1
	Others++	19	4.7

Total family size (including extended families)	< 5	198	48.5
	5+	210	51.5
Monthly income for education (in ETB)	< 1000	349	85.5
	1000-1500	47	11.5
	> 1500	12	2.9
Knowledge level of students towards COVID-19	Poor	124	30.4
	Good	284	69.6
Attitude towards COVID-19	Negative	178	35.0
	Positive	230	65.0
Practice towards preventive measures COVID-19	Poor	143	43.6
	Good	265	56.4

Keynote: Single* (living together, divorced, and widowed), Others+ (Protestant, Catholic), Others++ (friends, sister/son-in-laws)

COVID-19 and its Psychological problem on Students

In this study, the overall psychological problem among college students due to COVID-19 was 16.2% (95% CI: 12.7%, 19.9%) which was measured using the students' experience of all forms of psychological problems [anxiety, depression, and stress disorders]. Moreover, 315 (77.2%) of the students had reported that they are experienced depression disorder. Similarly, 293 (71.8%) and 198 (48.5%) of students had experienced anxiety and stress disorders respectively **(Fig. 1**).

Determinants of Psychological Problems among Students during COVID-19

The selection of variables to be entered into a multivariable logistic regression model was based on clinical significance, predictor variables with p-value < 0.25 in the bivariable logistic regression, and absence of multi-collinearity between independent variables. In this study, the selected covariates include; the sex of participants, residence, field of study, living conditions, attitude level, and practice of preventive measures against COVID-19 were entered into the

multivariable logistic regression analysis model. The multivariable logistic regression model was done with backward elimination methods.

In this study, the odds of the psychological effect of COVID among female students was twice higher compared to male students [AOR=1.68, 95% CI 1.09, 2.91]. students with inadequate practice of prevention and control measures had experienced twice greater odds of the psychological problems of COVID 19 compared to students having adequate practices [AOR=1.74: 95% CI 1.01, 3.02]. Moreover, students who were living in urban residency had 24% less likely to experience psychological problems compared to students currently living in rural areas [AOR=0.76: 95% CI 0.48, 0.94]. However, sex of participants, field of study, living conditions, and attitude towards COVID 19 were not significantly associated with the psychological problems of COVID-19 among students **(Table 2**).

Table 2: Factors associated with psychological problems among students in colleges/ universities in Dessie, town, Amhara region, Ethiopia, 2020

List of variable	Category of variables	Psychological Problem		COR (95% CI)	AOR (95% CI)
		Present (%)	Absent (%)		
Residence	Urban	38 (57.6)	215 (62.9)	0.81 (0.47, 1.37)	0.76 (0.48, 0.94)*
	Rural	28 (42.4)	127 (37.1)	1.00	1.00
Sex of participants	Females	41 (62.1)	173 (50.6)	1.61 (0.93, 2.75)	1.68 (1.09, 2.91)*
	Males	25 (37.9	169 (49.4)	1.00	1.00
Field of study	Health related	35 (53.0)	198 (57.9)	1.00	1.00
	Business	23 (34.8)	106 (31.0)	1.23 (0.69, 2.18)	1.38 (0.74, 2.57)
	Technology	8 (12.1)	38 (11.1)	1.19 (0.51, 2.76)	1.54 (0.63, 3.77)
Living with;	Family	61 (92.4)	279 (81.6)	1.00	1.00
	Others+	5 (7.6)	63 (18.4)	0.36 (0.14, 0.94)	0.94 (0.25, 3.48)

Attitude towards COVID-19	Negative	32 (48.5)	146 (42.7)	1.26 (0.76, 2.14)	1.42 (0.81, 2.51)
	Positive	34 (51.5)	196 (57.3	1.00	1.00
Practice towards COVID-19	Inadequate	31 (47.0)	112 (32.7)	1.82 (1.07, 3.10)	1.74 (1.01, 3.02)*
	Adequate	35 (53.0)	230 (67.3)	1.00	1.00

Key: COR- Crude Odds Ratio, AOR- Adjusted Odds Ratio, * P-value < 0.05, Others+ (alone, relatives, and friends)

Discussion

In this study, the overall psychological effect of COVID-19 among college students was low that was measured using the experience of all of anxiety, depression, and stress disorders. The multivariable logistic regression model showed that residence, poor practice, and sex of the participants were the independent predictors of the psychological problem of COVID 19 among students.

In this study, the overall psychological problem of COVID-19 among college students was 16.2%. This finding is lower than studies conducted in northern Ethiopia (85.3%) [27], University of Dhaka (43.4%) [32], Jilin Province, China (40.4%) [33], 194 cities in China (53.8%) [34]. The outbreak of COVID-19 has shown many psychological problems [35] that need provision of improved psychological interventions at national, regional, and district levels. The discrepancy might be due to differences in the measurement of the psychological problems. In the current study, psychological problem among students was measured using the co-existence of all of anxiety, stress and depression. However, the psychological problem in the previous study was measured using either stress or anxiety or depression.

In our study, more than three-fourth (77.2%) of the students had experienced depression disorder. This finding is higher than studies conducted in Hubei Province, China (37.1%) [36], and 194 cities in China (16.5%) [34]. Furthermore, our study showed that nearly three-fourth (71.8%) of students had experienced anxiety disorders during the lockdown. This finding is higher than a

study conducted in China that found only one-fourth (25%) of college students presented anxiety disorder [19]. This finding is also higher than studies conducted in Hubei Province, China (29%) [36], and 194 cities in China (28.8%) [34]. Moreover, in this study, nearly fifty percent (48.5%) of students had experienced stress disorders during the lockdown. This finding is higher than studies conducted in Samara University, Northeast Ethiopia (53.2%) [37] and 194 cities in China (8.1%) [34]. In Ethiopia, the widespread outbreak of COVID 19 is directly associated with these adverse mental health consequences among students who are out of school.

In this study, the odds of psychological problem of COVID among female students was twice higher compared to male students. This finding is similar to studies conducted in Hubei Province, China [36], and Jilin Province, China [33]. In Ethiopia, female students prone to gender-based violence, poor social and economic support [37, 38]. Consequently, these conditions can easily lead them into loose of self-confidence and many stressors in life. Hence, they are victims of stress disorders compared to their counterparts, male students.

This study revealed that students who were living in urban residency had 24% less likely to experience psychological problems compared to students currently living in rural areas. This finding is similar to a study conducted in China [19]. Moreover, students with poor preventive practice had experienced twice greater odds of psychological problems of COVID 19 compared to students having adequate practices. Many studies revealed that students out of school and in the final stage of graduation are more prone to many psychological crises [17, 33] which is due to poor adherence to the preventive measure of COVID 19 pandemic.

Limitation of the study: the study was done using a phone call interviews which may be prone to social desirability bias. Besides, the study was not involved adolescents in high schools and pre-

college schools. Thus, it may not represent all of the adolescents in Dessie town. Moreover, the study also share the limitations of a cross-sectional study design.

Conclusions

In this study, the overall psychological problem of COVID 19 among students was low. The multivariable logistic regression analysis showed residence, sex, and level of preventive practice were the independent predictors of psychological problems among students.

However, the level of anxiety, stress, and depression disorders are optimally high among students. Therefore, the Ministry of Sciences and Higher Education [MOSHE] and local governments should develop effective strategies and interventions to address students with psychological problems. Moreover, it is important to consider the educational enrollment types and academic years of the students during the interventions.

List of Abbreviations

AOR	Adjusted Odds Ratio
COR	Crude Odds Ratio
COVID 19	Corona Virus Diseases 19
DASS	Depression, Anxiety, Stress Scale
DSTC	Dream Science and Technology College
WHO	World Health Organization

Declarations

Ethical Issues and Consent to Participate

The ethical approval was obtained from Dream Science and Technology Institutional Health Research Ethics Review Committee with approval letter of DSTC/DHS/031/2020. Then,

permission letter was written for selected Colleges for cooperation and support. We had obtained verbal consent from individual study participants before beginning of data collection. We avoided personal identifier to ensure confidentiality and anonymity of study participants.

Consent to publish

Not applicable

Availability of Data and Materials

All materials and data related to this article are included in the main document of the manuscript. However, if anyone has any interest to have raw data, he/she can contact the corresponding author.

Competing Interests

The authors declare that they have no competing interests.

Funding source

There is no specific funding source offered to conduct the study.

List of References

1. Skowronski DM, Astell C, Brunham RC, Low DE, Petric M, et al. Severe acute respiratory syndrome (SARS): a year in review. *Annu Rev Med* 2005, 56:357-381.
2. Wu D, Wu T, Liu Q, Yang Z. The SARS-CoV-2 outbreak: what we know. *International Journal of Infectious Diseases* 2020.
3. Zumla A, Hui DS, Perlman S. Middle East respiratory syndrome. *The Lancet* 2015, 386(9997):995-1007.
4. Lu H, Stratton CW, Tang YW. Outbreak of Pneumonia of Unknown Etiology in Wuhan China: the Mystery and the Miracle. *Journal of Medical Virology*.
5. CDC. People who are at higher risk for severe illness. *Retrieved April 5th* 2020.
6. Wang Y, Xu B, Zhao G, Cao R, He X, Fu S. Is quarantine related to immediate negative psychological consequences during the 2009 H1N1 epidemic? *General hospital psychiatry* 2011, 33(1):75-77.
7. Tsai YY. Public risk perceptions, communications, and trust: A comparison of the SARS and the novel influenza H1N1 outbreaks in Taiwan. *China Media Research* 2010, 6:69-79.
8. Cowling BJ, Ng DM, Ip DK, Liao Q, Lam WW, et al. Community psychological and behavioral responses through the first wave of the 2009 influenza A (H1N1) pandemic in Hong Kong. *The Journal of infectious diseases* 2010, 202(6):867-876.
9. Holmes EA, Ghaderi A, Harmer CJ, Ramchandani PG, Cuijpers P, et al. The Lancet Psychiatry Commission on psychological treatments research in tomorrow's science. *The Lancet Psychiatry* 2018, 5(3):237-286.

10. Burke RM. Active monitoring of persons exposed to patients with confirmed COVID-19—United States, January–February 2020. *MMWR Morbidity and mortality weekly report* 2020, 69.
11. Zettler I, Schild C, Lilleholt L, Böhm R. Individual differences in accepting personal restrictions to fight the COVID-19 pandemic: Results from a Danish adult sample. 2020.
12. Dong Y, Mo X, Hu Y, Qi X, Jiang F, Jiang Z, Tong S: Epidemiology of COVID-19 among children in China. *Pediatrics* 2020.
13. Roy-Byrne PP, Davidson KW, Kessler RC, Asmundson GJ, Goodwin RD, et al. Anxiety disorders and comorbid medical illness. *General hospital psychiatry* 2008, 30(3):208-225.
14. Smeeding SJ, Bradshaw DH, Kumpfer K, Trevithick S, Stoddard GJ. Outcome evaluation of the Veterans Affairs Salt Lake City Integrative Health Clinic for chronic pain and stress-related depression, anxiety, and post-traumatic stress disorder. *The Journal of alternative and complementary medicine* 2010, 16(8):823-835.
15. Kiecolt-Glaser JK, McGuire L, Robles TF, Glaser R. Psychoneuroimmunology: Psychological influences on immune function and health. *Journal of consulting and clinical psychology* 2002, 70(3):537.
16. Glaser R, Kiecolt-Glaser JK. Handbook of human stress and immunity: Academic Press; 2014.
17. Lee J. Mental health effects of school closures during COVID-19. *The Lancet Child & Adolescent Health* 2020, 4(6):421.
18. Wang C, Pan R, Wan X, Tan Y, Xu L, Ho CS, Ho RC. Immediate psychological responses and associated factors during the initial stage of the 2019 coronavirus disease (COVID-19) epidemic among the general population in China. *International journal of environmental research and public health* 2020, 17(5):1729.
19. Cao W, Fang Z, Hou G, Han M, Xu X, et al. The psychological problem of the COVID-19 epidemic on college students in China. *Psychiatry research* 2020:112934.
20. Liu N, Zhang F, Wei C, Jia Y, Shang Z, et al. Prevalence and predictors of PTSS during COVID-19 Outbreak in China Hardest-hit Areas: Gender differences matter. *Psychiatry research* 2020:112921.
21. Xiang Y-T, Yang Y, Li W, Zhang L, Zhang Q, et al. Timely mental health care for the 2019 novel coronavirus outbreak is urgently needed. *The Lancet Psychiatry* 2020, 7(3):228-229.
22. Yao H, Chen J-H, Xu Y-F. Patients with mental health disorders in the COVID-19 epidemic. *The Lancet Psychiatry* 2020, 7(4):e21.
23. Jemal B, Ferede ZA, Mola S, Hailu S, Abiy S, et al. Knowledge, attitude and practice of healthcare workers towards COVID-19 and its prevention in Ethiopia: a multicenter study. 2020.
24. FMOH: COVID 19 Handbook for health professionals Federal Minstry of Health, Ethiopia, Availabile: https://www. www.moh.gov.et accessed on May 12, 2020.
25. FMOH: Infection Prevention and Control Interim Protocol for COVID-19 In Health Care Settings in Ethiopia. April, 2020. Availabile: https://www. www.moh.gov.et accessed on May 12, 2020
26. McBride O, Murphy J, Shevlin M, Gibson-Miller J, Hartman TK, Hyland P, Levita L, Mason L, Martinez AP, McKay R: Monitoring the psychological problem of the COVID-19 pandemic in the general population: an overview of the context, design and conduct of the COVID-19 Psychological Research Consortium (C19PRC) Study. 2020.

27. Tadesse DB, Gebrewahd GT, Demoz GT. Knowledge, Attitude, Practice and Psychological response toward COVID-19 among Nurses during the COVID-19 outbreak in Northern Ethiopia, 2020. 2020.
28. Tan BY, Chew NW, Lee GK, Jing M, Goh Y, et al. Psychological problem of the COVID-19 pandemic on health care workers in Singapore. *Annals of Internal Medicine* 2020.
29. Ng F, Trauer T, Dodd S, Callaly T, Campbell S, Berk M. The validity of the 21-item version of the Depression Anxiety Stress Scales as a routine clinical outcome measure. *Acta neuropsychiatrica* 2007, 19(5):304-310.
30. Joshi K, Jamadar D. Knowledge, attitude and practices regarding COVID-19 among medical students–A cross sectional study.
31. Maheshwari S, Gupta PK, Sinha R, Rawat P. Knowledge, attitude, and practice towards coronavirus disease 2019 (COVID-19) among medical students: A cross-sectional study. *Journal of Acute Disease* 2020, 9(3):100.
32. Imtiaz A, Hasan ME, Hossain MA, Khan NM. Attitudes toward COVID-19 among Young Adults: Role of Psychological Distress. 2020.
33. Liang L, Ren H, Cao R, Hu Y, Qin Z, Li C, Mei S. The Effect of COVID-19 on Youth Mental Health. *Psychiatric Quarterly* 2020.
34. Qiu J, Shen B, Zhao M, Wang Z, Xie B, Xu Y. A nationwide survey of psychological distress among Chinese people in the COVID-19 epidemic: implications and policy recommendations. *General psychiatry* 2020, 33(2).
35. Duan L, Zhu G. Psychological interventions for people affected by the COVID-19 epidemic. *The Lancet Psychiatry* 2020, 7(4):300-302.
36. Ahmed MZ, Ahmed O, Aibao Z, Hanbin S, Siyu L, Ahmad A. Epidemic of COVID-19 in China and associated Psychological Problems. *Asian journal of psychiatry* 2020:102092.
37. Tesfaye Kelemu R, Bayray Kahsay A, Ahmed KY. Prevalence of Mental Distress and Associated Factors among Samara University Students, Northeast Ethiopia. *Depression Research and Treatment* 2020, 2020:7836296.
38. Solomon A, Mihretie G, Tesfaw G. The prevalence and correlates of common mental disorders among prisoners in Addis Ababa: an institution based cross-sectional study. *BMC Research Notes* 2019, 12(1):394.

Annex I: List of Figures

Fig.1: Types of psychological problems in which students experienced during the lockdown of COVID-19.

List of Figures

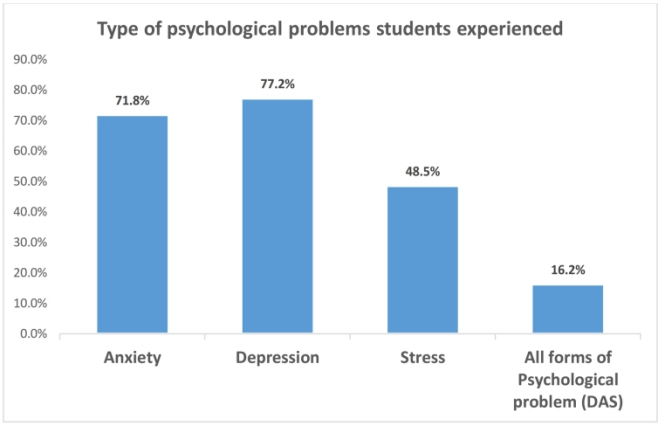

Figure 1: Types of psychological problems students experienced during the lockdown of COVID-19, June 2020, Ethiopia.

Fig.1: Types of psychological problems in which students experienced during the lockdown of COVID-19.

215x279mm (300 x 300 DPI)

BMJ Open

Psychological Problems and Associated factors among College Students related to COVID-19 Pandemic Lockdown in Amhara region, Ethiopia; A Cross-sectional Study

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2020-045623.R1
Article Type:	Original research
Date Submitted by the Author:	31-Mar-2021
Complete List of Authors:	Woday Tadesse, Abay; Samara University, Public Health; Armauer Hansen Research Institute, Malaria and NTDs Mihret, Setegn; Wollo University Biset, Gebeyaw; Wollo University, pediatrics Kassa, Ayesheshim ; Dessie Health Science College, Dessie, Amhara region, Ethiopia, Nursing
Primary Subject Heading:	Mental health
Secondary Subject Heading:	Epidemiology, Mental health
Keywords:	EPIDEMIOLOGY, Health policy < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, MENTAL HEALTH, PUBLIC HEALTH

I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our licence.

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which Creative Commons licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

Psychological Problems and Associated factors among College Students related to COVID-19 Pandemic Lockdown in Amhara region, Ethiopia; A Cross-sectional Study

Abay Woda Tadesse[1,2,5], Setegn Mihret Tarekegn[3,2], Gebeyaw Biset Wagaw[3,2], Ayesheshim Muluneh Kassa[4,2]

Affiliations:

[1]Samara University, college of Medicine and health sciences, Departments of public health, Samara, Afar region, Ethiopia. [2]Dream Science and Technology College Dessie, Amhara region, Ethiopia. [3]Wollo University, College of Medicine and Health Sciences, School of Nursing and Midwifery, Departments of paediatrics health nursing, Amhara region, Dessie, Ethiopia. [4]Dessie Health Science College Department of nursing and midwifery, Dessie Ethiopia. [5]Armauer Hansen Research Institute, Addis Ababa, Ethiopia.

Corresponding Author: Abay Woday Tadesse, E-mail: abaywoday@yahoo.com

Institutional email: abaywonday@su.edu.et

P.O.BOX: 132

Co-authors email address:

Setegn Mihret Tarekegn, E-mail: setegnmihret5@gmail.com

Gebeyaw Biset Wagaw, E-mail: gebeyawbiset@yahoo.com

Ayesheshim Muluneh Kassa, E-mail: ashumuluneh327@gmail.com

Keywords: COVID-19, SARS-2, Psychological Problem, College Students
Word count: 2740

Abstract

Objective: The central aim of this study was to assess the level of psychological problems among college students during school closure because of the emerging COVID-19 Pandemic.

Design: Institution-based cross-sectional study design.

Settings: Colleges in Amhara Regional State, Ethiopia.

Participants: Participants were college students [n=422, >18 years] who were actively enrolled in the selected colleges preceding the survey.

Methods: The data entry was done using Epi info 7.02 and the data analysis was done using SPSS version 24.0. Variables with p-value of less than 0.25 in the bivariate analysis were entered into the multivariable logistic regression model. Model fitness was checked using the Hosmer-Lemeshow model fit-ness-test. Statistical significant level was declared at a p-value < 0.05.

Results: This study involved 408 students with a response rate of 96.6%. In this study, 77.2%, 71.8%, and 48.5% of the students had experienced depression, anxiety, and stress related psychological problems during the lockdown, respectively. The multivariable logistic regression model showed that being female [AOR=1.68, 95% CI 1.09, 2.91], having inadequate practice of prevention measures [AOR=1.74: 95% CI 1.01, 3.02] and living urban residency [AOR=0.76: 95% CI 0.48, 0.94] were the independent predictors of psychological problems among students.
Outcome: the psychological problem level.

Conclusions: The study revealed that the level of anxiety, stress, and depression disorders are optimally high among students. Therefore, local governments should develop effective psychological interventions for students. Moreover, it is important to consider the educational enrollment types and academic years of the students.

Article Summary

Strengths and limitations of this study

1. Strengths of the study

- School closure and stay-at-home order by the national exposed the students for psychological problems.
- We used internationally accepted tools for the assessment of psychological problems, DASS-21.
- In this study, 77.2%, 71.8%, and 48.5% of the college students had experienced depression, anxiety, and stress related psychological problems, respectively.

2. Limitations of the study

- The study was limited to college students only due to financial constraints and it may not represent student from high schools and pre-college schools.

Introduction

Severe acute respiratory infection (SARS) is a group of respiratory tract infections caused by a beta coronavirus (SARS-COV2) [1, 2]. Corona Virus Disease-2019 ("COVID-19") is a family of SARS caused by Novel Coronavirus and was first detected in December 2019 in Wuhan, China. World Health Organization (WHO) has declared this disease as a global pandemic and it causes an estimated number of 7 million cases and nearly half a million deaths [1, 3]. Countries across the globe have taken different preventive measures. These include; movement restriction, confinement to home, social distance, lockdown, and closure of the school that lead to increased psychosocial stress among the community, especially students [4-8].

A study conducted in china revealed that 53.8% of respondents had experienced moderate to severe psychological crises, in which students were found to contribute a greater number than the larger communities [9]. Another study in China revealed that around 25% of college students experienced anxiety due to the pandemic [10]. A study conducted in China revealed that 14.5%, 8.9%, and 7.7% of participants screened positive for anxiety, depression and stress respectively [11]. Pieces of evidence had suggested that the pandemic resulted in loneliness, anxiety, depression, insomnia, suicide, impact on economic well-being, societal rejection, discrimination, and stigmatization among people [8, 12-14].

Ethiopia has taken different prevention and control measures to halt the spread of COVID-19. These include school closure, stay at home, keep social and physical distances, putting hand washing basin in places where people use in common (banks, Churches/mosques, markets), preparation of isolation centers, and establishment of state emergency at the national level [15-17]. However, still, there is no specific intervention to address the psychological problem of COVID 19 in the country. Moreover, the studies conducted across the globe have been investigated the psychological problems because of COVID-19 pandemic predominantly focused on health care

workers and patients [18-20]. Therefore, this study was intended to generate evidence regarding the prevalence of psychological problems due to COVID-19 and its determinants among college students.

Specific Objectives:

1) To determine the prevalence of psychological problems related to COVID-19 pandemic lockdown (depression, anxiety, and stress) among college students in Amhara region, Dessie town, July 2020.
2) To identify the factors associated with psychological problems related to COVID-19 pandemic lockdown.

Methods

Study Setting and Participants

The community-based cross-sectional study design was conducted from April 15-May 15, 2020 to assess the psychological problems among college students related to COVID-19 pandemic, who were learning in the four randomly selected private and public colleges and Universities, Namely; Dream Science and Technology College, Dandi Boru College, Unity University, and Dessie Health Science College. These higher institutions are found in South Wollo Zone, Dessie city administration. Dessie city administration is located 401Km away from the capital city of Ethiopia, Addis Ababa. The city has eight private colleges, one private University, and three public colleges, which accommodate 20,907 students in different fields of study.

All active students, registered for second-semester academic year, and those 16 and above years of age were included in this study. However, students who were seriously ill during the data collection period were not included in this study.

The sample size was calculated for both determinants and prevalence of psychological problems due to COVID 19 and the maximum sample size was considered for this study. Thus, the final sample size was determined using a single population proportion formula with assumptions: 5% type I error, 95% Confidence Intervals, 50% proportion since no study in Ethiopia on this problem. Finally, the researchers added 10% to compensate for the non-response of participants and the final sample size became 422.

$$n=\frac{(Za/z)^2(P)(1-P)}{d^2}$$

Where: n = required sample size, Zα/2 = critical value for normal distribution at 95 % confidence level (1.96), p = proportion of psychological problems, and d = 0.05 (5 % margin of error).

From a total of twelve colleges and universities found in Dessie city administration, four higher institutions (three colleges and one university) were randomly selected. The calculated sample size was proportionally allocated in each college based on the second-semester academic student number reports. To calculate the required number of participants from each college, we multiplied the total number of students actively learning in each college by the sampling fraction (n/N). The sampling fraction is approximately equal to six for all colleges. Accordingly, every 6th participants were selected using a systematic random sampling technique from each college registrar office log-book.

Study variables:

Dependent variable: the psychological problem among college students related to COVID-19 pandemic (Yes/No) that was assessed using Depression, Anxiety, and Stress Scales (DASS-21).

Independent variables: sociodemographic characteristics (age, residence, sex, marital status, educational level, the field of study, income, family size, religion), knowledge, attitude and practice towards the preventive measures of COVID-19.

Data Collection Tools and Procedures

The questionnaire was adopted from studies conducted before this study [10, 21-23] and modified into context. The questionnaire was developed in the English language and it consists of sociodemographic characteristics, 20-items for knowledge, eight items for attitude, and 12-items for the practice of preventive measures against COVID-19. The psychological problem was assessed using Depression, Anxiety, and Stress Scales, DASS-21 [24-26] that contains 7-items for each psychological problem components. The tools were translated into the local language (Amharic) and back to English to keep its consistency. The tool was pretested on 5% (21 participants) of samples other than selected colleges those found in Woldia town and some amendments were made based on the pretest findings. The data was collected using both phone-call and personal interviews. Phone-call was used for students who are out of Dessie town. Trained health professionals who were working out of the selected colleges approached the study participants.

Data management and analysis

The data were cleaned, coded, and entered into Epi data version 3.1 software and exported to SPSS version 24.0 for analysis. The descriptive statistics was done and the results were presented using texts, frequency tables, figures, and median with Interquartile range (IQR).

Bivariate logistic regression analysis was done to assess the association between the dependent variable with each independent variable. The socio-demographic factors, knowledge, attitude, and practice of preventive measures against COVID-19 were the factors included in the bivariate logistic regression analysis. Thus, independent variables with a p-value of less than 0.25 were considered in the final model. Correlation between independent variables was assessed but we did not find any correlation between independent variables. The model fitness was also checked using

the Hosmer-Lemeshow model fit-ness test. Finally, multivariable logistic regression analysis was done to control potential confounders and to identify the factors associated with the psychological problem of COVID-19 among students. The statistical significance level was declared at a P-value <0.05.

Operational Definitions

Psychological problem was defined as students who were experienced all form of psychological problems [i.e. Depression, Anxiety, and Stress; DAS] related to COVID-19 pandemic that was measured using DASS-21 [24-26]. Here, the scales were classified as normal, moderate, and severe for each psychological problems (DAS). However, we merged moderate and severe scales together in each psychological problem measurements since the values of moderate scales were minimal.

*Knowledge level***:** students who were correctly answered 70% or more of the knowledge questions were considered as students with a good knowledge level while students who answered correctly below 70% of the knowledge questions were considered as having poor knowledge.

Attitude level: students who were correctly answered 70% or more of the attitude questions were considered as students with a positive attitude while students who correctly answered below 70% of the attitude questions were considered as students with a negative attitude.

Practice level: students who were correctly answered 70% or more of the practice questions were considered as students with a good practice e level while students who correctly answered below 70% of the practice questions were considered as students with a poor practice.

Patient and Public Involvement statement

"No patient involved"

Results:

Sociodemographic characteristics of Participants

In this study, 422 participants were involved with a response rate of 96.6%. The median age of the participants was 21 years with three Interquartile Range (IQR). Of the total students; 155 (38.0%) were lived in the rural residence, 194 (47.5%) were females, 215 (52.7%) were learning TVET or diploma level training, and 340 (83.3%) were living with their families during the COVID-19 lockdown. In this study, the participants had a median of 5 total family size with 3 IQR (**Table 1).**

Prevalence of Psychological Problem Related to COVID-19

In this study, the overall psychological problem among college students due to COVID-19 was 16.2% (95% CI: 12.7%, 19.9%) which was measured using the students' experience of all forms of psychological problems [anxiety, depression, and stress disorders]. Moreover, 315 (77.2%) of the students had reported that they are experienced depression disorder. Similarly, 293 (71.8%) and 198 (48.5%) of students had experienced anxiety and stress disorders respectively **(Fig. 1**).

Determinants of Psychological Problems among Students Related to COVID-19

The selection of variables to be entered into a multivariable logistic regression model was based on clinical significance, predictor variables with p-value < 0.25 in the bivariable logistic regression, and absence of multi-collinearity between independent variables. In this study, the selected covariates include; the sex of participants, residence, field of study, living conditions, attitude level, and practice of preventive measures against COVID-19 were entered into the multivariable logistic regression analysis model. The multivariable logistic regression model was done with backward elimination methods.

In this study, the odds of the psychological problem due to COVID among female students was twice higher compared to male students [AOR=1.68, 95% CI 1.09, 2.91]. students with

inadequate practice of prevention and control measures had experienced twice greater odds of the psychological problems because of COVID 19 compared to students having adequate practices [AOR=1.74: 95% CI 1.01, 3.02]. Moreover, students who were living in urban residency had 24% less likely to experience psychological problems compared to students currently living in rural areas [AOR=0.76: 95% CI 0.48, 0.94]. However, field of study, living conditions, and attitude towards COVID 19 were not significantly associated with the psychological problems of COVID-19 among students **(Table 2**).

Discussion

Coronavirus disease 2019 (COVID-19) affected the global mental health, as evidenced by accelerated increase in cases and deaths related to the pandemic worldwide [27],. In this study, the overall psychological problems related to COVID-19 among college students was measured using the experience of all forms of psychological problems (i.e. anxiety, depression, and stress disorders). The multivariable logistic regression model showed that residence, poor practice, and sex of the participants were the independent predictors of the psychological problems related to COVID 19 among college students.

In this study, the overall psychological problems among college students because of COVID-19 was 16.2%. This finding is lower than studies conducted in northern Ethiopia (85.3%) [19], University of Dhaka (43.4%) [28], Jilin Province, China (40.4%) [29], 194 cities in China (53.8%) [30]. The outbreak of COVID-19 has shown many psychological problems [31] that need provision of improved psychological interventions at national, regional, and district levels. The discrepancy might be due to differences in the measurement of the psychological problems. In the current study, psychological problems among students was measured using the co-

existence of all of anxiety, stress and depression. However, the psychological problems in the previous study was measured using either stress or anxiety or depression.

In our study, more than three-fourth (77.2%) of the students had experienced depression disorder. This finding is higher than studies conducted in Hubei Province, China (37.1%) [32], and 194 cities in China (16.5%) [30], and systematic review (14.6% to 48.3%) [33]. Furthermore, our study showed that nearly three-fourth (71.8%) of students had experienced anxiety disorders during the lockdown. This finding is higher than a study conducted in China that found only one-fourth (25%) of college students presented anxiety disorder [10], and longitudinal study conducted in China (28.8%) [27], and 16.5%. This finding is also higher than studies conducted in Hubei Province, China (29%) [32], systematic review (6.33% to 50.9%) [33], and 194 cities in China (28.8%) [30]. Moreover, in this study, nearly fifty percent (48.5%) of students had experienced stress disorders during the lockdown. This finding is higher than studies conducted in Samara University, Northeast Ethiopia (53.2%) [34], systematic review (8.1% to 81.9%) [33], and 194 cities in China (8.1%) [30]. In Ethiopia, the widespread outbreak of COVID 19 is directly associated with these adverse psychological consequences among students who are out of school. In this study, the odds of psychological problems due to COVID among female students was twice higher compared to male students. This finding is similar to studies conducted in Hubei Province, China [32], systematic review [33], and Jilin Province, China [29]. In Ethiopia, female students prone to gender-based violence, poor social and economic support [34]. Consequently, these conditions can easily lead them into loose of self-confidence and many stressors in life. Hence, they are victims of stress disorders compared to their counterparts, male students.

This study revealed that students who were living in urban residency had 24% less likely to experience psychological problems compared to students currently living in rural areas. This

finding is similar to a study conducted in China [10]. Moreover, students with poor preventive practice had experienced twice greater odds of psychological problems due to COVID 19 compared to students having adequate practices. Many studies revealed that students out of school and in the final stage of graduation are more prone to many psychological crises [7, 29] which is due to poor adherence to the preventive measure of COVID 19 pandemic.

Limitation of the study: This study mainly used self-reported questionnaires to measure psychiatric symptoms and did not make clinical diagnosis. This may over-estimate the overall psychiatric symptoms that in turn may increase the level of psychological problems among college students. Moreover, the study also share the limitations of a cross-sectional study design.

Conclusion

In this study, the overall psychological problems among college students because of COVID 19 was comparable to other studies conducted across the developing world. Moreover, the level of anxiety, stress, and depression disorders were optimally high among students. The multivariable logistic regression analysis showed residence, sex, and level of preventive practice were the independent predictors of psychological problems among students.

Therefore, the Ministry of Sciences and Higher Education [MOSHE] and local governments should develop effective strategies and interventions to address students with psychological problems. Moreover, it is important to consider the educational enrollment types and academic years of the students during the interventions

List of Abbreviations

AOR	Adjusted Odds Ratio
COR	Crude Odds Ratio
COVID 19	Corona Virus Diseases 19

DASS	Depression, Anxiety, Stress Scale
DSTC	Dream Science and Technology College
WHO	World Health Organization

Ethical Issues and Consent to Participate

The ethical approval was obtained from Dream Science and Technology Institutional Health Research Ethics Review Committee with approval letter of DSTC/DHS/031/2020. Then, permission letter was written for selected Colleges for cooperation and support. We had obtained verbal consent from individual study participants before beginning of data collection. We avoided personal identifier to ensure confidentiality and anonymity of study participants.

Consent to publish

Not applicable

Availability of Data and Materials

All materials and data related to this article are included in the main document of the manuscript. However, if anyone has any interest to have raw data, he/she can contact the corresponding author.

Competing Interests

The authors declare that they have no competing interests.

Funding source:

There is no specific funding offered to conduct this study.

Contributorship Statement

All authors conceived and designed the study. AWT, and GBW supervised the data collection. AWT, AMK and SMT performed the data analysis, interpretation of data, and drafted the manuscript and critically reviewed the manuscript. All authors read and approved the final manuscript.

Acknowledgements

We would like to than Dream science and Technology College for its ethical approval. Furthermore, our deepest gratitude goes to the hospital staffs, participants, data collectors and supervisors.

List of References

1. Wu D, Wu T, Liu Q, Yang Z: The SARS-CoV-2 outbreak: what we know. *International Journal of Infectious Diseases* 2020.
2. Zumla A, Hui DS, Perlman S: Middle East respiratory syndrome. *The Lancet* 2015, 386(9997):995-1007.
3. Control CfD, Prevention: People who are at higher risk for severe illness. *Retrieved April 5th* 2020.
4. Burke RM: Active monitoring of persons exposed to patients with confirmed COVID-19—United States, January–February 2020. *MMWR Morbidity and mortality weekly report* 2020, 69.
5. Zettler I, Schild C, Lilleholt L, Böhm R: Individual differences in accepting personal restrictions to fight the COVID-19 pandemic: Results from a Danish adult sample. 2020.
6. Dong Y, Mo X, Hu Y, Qi X, Jiang F, Jiang Z, Tong S: Epidemiology of COVID-19 among children in China. *Pediatrics* 2020.
7. Lee J: Mental health effects of school closures during COVID-19. *The Lancet Child & Adolescent Health* 2020, 4(6):421.
8. Tran BX, Nguyen HT, Le HT, Latkin CA, Pham HQ, Vu LG, Le XTT, Nguyen TT, Pham QT, Ta NTK *et al*: Impact of COVID-19 on Economic Well-Being and Quality of Life of the Vietnamese During the National Social Distancing. *Frontiers in psychology* 2020, 11:565153-565153.
9. Wang C, Pan R, Wan X, Tan Y, Xu L, Ho CS, Ho RC: Immediate psychological responses and associated factors during the initial stage of the 2019 coronavirus disease (COVID-19) epidemic among the general population in China. *International journal of environmental research and public health* 2020, 17(5):1729.
10. Cao W, Fang Z, Hou G, Han M, Xu X, Dong J, Zheng J: The psychological impact of the COVID-19 epidemic on college students in China. *Psychiatry research* 2020:112934.
11. Liu N, Zhang F, Wei C, Jia Y, Shang Z, Sun L, Wu L, Sun Z, Zhou Y, Wang Y: Prevalence and predictors of PTSS during COVID-19 Outbreak in China Hardest-hit Areas: Gender differences matter. *Psychiatry research* 2020:112921.
12. Xiang Y-T, Yang Y, Li W, Zhang L, Zhang Q, Cheung T, Ng CH: Timely mental health care for the 2019 novel coronavirus outbreak is urgently needed. *The Lancet Psychiatry* 2020, 7(3):228-229.
13. Yao H, Chen J-H, Xu Y-F: Patients with mental health disorders in the COVID-19 epidemic. *The Lancet Psychiatry* 2020, 7(4):e21.
14. Le XTT, Dang KA, Toweh J, Nguyen QN, Le HT, Toan DTT, Phan HBT, Nguyen TT, Pham QT, Ta NKT: Evaluating the psychological impacts related to COVID-19 of Vietnamese people under the first Nationwide partial lockdown in Vietnam. *Frontiers in psychiatry* 2020, 11:824.

15. Jemal B, Ferede ZA, Mola S, Hailu S, Abiy S, Wolde GD, Tilahun A, Tesfaye B, Lemma DT, Alimaw AA: Knowledge, attitude and practice of healthcare workers towards COVID-19 and its prevention in Ethiopia: a multicenter study. 2020.
16. FMOH: COVID 19 Handbook for health professionals Federal Minstry of Health, Ethiopia, Availabile: https://www.FMOH.gov.et. 2020.
17. FMOH: Infection Prevention and Control Interim Protocol for COVID-19 In Health Care Settings in Ethiopia. Addis Ababa, Ethiopia: FMOH; 2020. Availabile: https://www.FMOH.gov.et
18. McBride O, Murphy J, Shevlin M, Gibson-Miller J, Hartman TK, Hyland P, Levita L, Mason L, Martinez AP, McKay R: Monitoring the psychological impact of the COVID-19 pandemic in the general population: an overview of the context, design and conduct of the COVID-19 Psychological Research Consortium (C19PRC) Study. 2020.
19. Tadesse DB, Gebrewahd GT, Demoz GT: Knowledge, Attitude, Practice and Psychological response toward COVID-19 among Nurses during the COVID-19 outbreak in Northern Ethiopia, 2020. 2020.
20. Tan BY, Chew NW, Lee GK, Jing M, Goh Y, Yeo LL, Zhang K, Chin H-K, Ahmad A, Khan FA: Psychological impact of the COVID-19 pandemic on health care workers in Singapore. *Annals of Internal Medicine* 2020.
21. Joshi K, Jamadar, Deepak: Knowledge, attitude and practices regarding COVID-19 among medical students–A cross sectional study. 2020.
22. Maheshwari S, Gupta PK, Sinha R, Rawat P: Knowledge, attitude, and practice towards coronavirus disease 2019 (COVID-19) among medical students: A cross-sectional study. *Journal of Acute Disease* 2020, 9(3):100.
23. Tee ML, Tee CA, Anlacan JP, Aligam KJG, Reyes PWC, Kuruchittham V, Ho RC: Psychological impact of COVID-19 pandemic in the Philippines. *Journal of affective disorders* 2020, 277:379-391.
24. Ng F, Trauer T, Dodd S, Callaly T, Campbell S, Berk M: The validity of the 21-item version of the Depression Anxiety Stress Scales as a routine clinical outcome measure. *Acta neuropsychiatrica* 2007, 19(5):304-310.
25. Wang C, Chudzicka-Czupała A, Grabowski D, Pan R, Adamus K, Wan X, Hetnał M, Tan Y, Olszewska-Guizzo A, Xu L *et al*: The Association Between Physical and Mental Health and Face Mask Use During the COVID-19 Pandemic: A Comparison of Two Countries With Different Views and Practices. *Frontiers in Psychiatry* 2020, 11(901).
26. Le HT, Lai AJX, Sun J, Hoang MT, Vu LG, Pham HQ, Nguyen TH, Tran BX, Latkin CA, Le XTT: Anxiety and depression among people under the nationwide partial lockdown of Vietnam. *Frontiers in public health* 2020, 8:656.
27. Wang C, Pan R, Wan X, Tan Y, Xu L, McIntyre RS, Choo FN, Tran B, Ho R, Sharma VK: A longitudinal study on the mental health of general population during the COVID-19 epidemic in China. *Brain, behavior, and immunity* 2020, 87:40-48.
28. Imtiaz A, Hasan ME, Hossain MA, Khan NM: Attitudes toward COVID-19 among Young Adults: Role of Psychological Distress. 2020.
29. Liang L, Ren H, Cao R, Hu Y, Qin Z, Li C, Mei S: The Effect of COVID-19 on Youth Mental Health. *Psychiatric Quarterly* 2020.
30. Qiu J, Shen B, Zhao M, Wang Z, Xie B, Xu Y: A nationwide survey of psychological distress among Chinese people in the COVID-19 epidemic: implications and policy recommendations. *General psychiatry* 2020, 33(2).

31. Duan L, Zhu G: Psychological interventions for people affected by the COVID-19 epidemic. *The Lancet Psychiatry* 2020, 7(4):300-302.
32. Ahmed MZ, Ahmed O, Aibao Z, Hanbin S, Siyu L, Ahmad A: Epidemic of COVID-19 in China and associated Psychological Problems. *Asian journal of psychiatry* 2020:102092.
33. Xiong J, Lipsitz O, Nasri F, Lui LM, Gill H, Phan L, Chen-Li D, Iacobucci M, Ho R, Majeed A: Impact of COVID-19 pandemic on mental health in the general population: A systematic review. *Journal of affective disorders* 2020.
34. Tesfaye Kelemu R, Bayray Kahsay A, Ahmed KY: Prevalence of Mental Distress and Associated Factors among Samara University Students, Northeast Ethiopia. *Depression Research and Treatment* 2020, 2020:7836296.

List of Tables:

Table 1: Sociodemographic, knowledge, attitude and practices of students towards COVID-19

List of Predictors	Category of variables	Frequency (#)	Percentage (%)
Age of participants (in years)	16-20	166	40.7
	More than 20	242	59.3
Residence	Urban	253	62.0
	Rural	155	38.0
Sex of the participants	Male	214	52.5
	Female	194	47.5
Marital status	Single*	360	88.2
	Married	48	11.8
Religion of the participants	Orthodox	207	50.7
	Muslim	183	44.9
	Others+	18	4.4
Type of Education enrollment	TVET (Diploma)	215	52.7
	Degree (First)	193	47.3
Program	Regular	377	92.4
	Evening (Extension)	31	7.6
Field of Study	Health related	233	57.1
	Business related	129	31.6
	Technology related	46	11.3
Academic year	Year I	151	37.0

	Year II	180	44.1
	Year III	58	14.2
	Year IV+	19	4.7
Living with;	Families	340	83.3
	Relatives	28	6.9
	Alone	21	5.1
	Others++	19	4.7
Total family size (including extended families)	< 5	198	48.5
	5+	210	51.5
Monthly income for education (in ETB)	< 1000	349	85.5
	1000-1500	47	11.5
	> 1500	12	2.9
Knowledge level of students towards COVID-19	Poor	124	30.4
	Good	284	69.6
Attitude towards COVID-19	Negative	178	35.0
	Positive	230	65.0
Practice towards preventive measures COVID-19	Poor	143	43.6
	Good	265	56.4

Keynote: Single* (living together, divorced, and widowed), Others+ (Protestant, Catholic), Others++ (friends, sister/son-in-laws)

Table 2: Factors associated with COVID-19 related psychological problems among college students, Ethiopia.

List of variable	Category of variables	Psychological problems		COR (95% CI)	AOR (95% CI)
		Yes (%)	No (%)		
Residence	Urban	38 (57.6)	215 (62.9)	0.81 (0.47, 1.37)	0.76 (0.48, 0.94)*
	Rural	28 (42.4)	127 (37.1)	1.00	1.00
Sex of participants	Females	41 (62.1)	173 (50.6)	1.61 (0.93, 2.75)	1.68 (1.09, 2.91)*
	Males	25 (37.9	169 (49.4)	1.00	1.00
Field of study	Health related	35 (53.0)	198 (57.9)	1.00	1.00
	Business	23 (34.8)	106 (31.0)	1.23 (0.69, 2.18)	1.38 (0.74, 2.57)
	Technology	8 (12.1)	38 (11.1)	1.19 (0.51, 2.76)	1.54 (0.63, 3.77)
Living with;	Family	61 (92.4)	279 (81.6)	1.00	1.00
	Others+	5 (7.6)	63 (18.4)	0.36 (0.14, 0.94)	0.94 (0.25, 3.48)
Attitude towards COVID-19	Negative	32 (48.5)	146 (42.7)	1.26 (0.76, 2.14)	1.42 (0.81, 2.51)
	Positive	34 (51.5)	196 (57.3)	1.00	1.00
Practice towards COVID-19	Inadequate	31 (47.0)	112 (32.7)	1.82 (1.07, 3.10)	1.74 (1.01, 3.02)*
	Adequate	35 (53.0)	230 (67.3)	1.00	1.00

Key: COR- Crude Odds Ratio, AOR- Adjusted Odds Ratio, * P-value < 0.05, Others+ (alone, relatives, and friends)

List of Figures

Fig.1: Types of psychological problems in which students experienced during the lockdown of COVID-19.

List of Figures

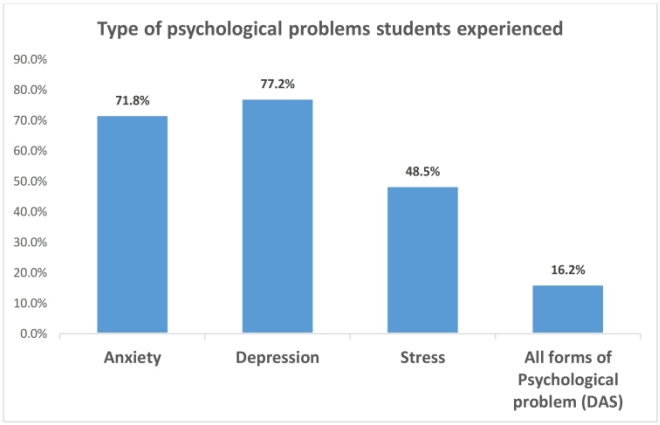

Figure 1: Types of psychological problems students experienced during the lockdown of COVID-19, June 2020, Ethiopia.

Fig.1: Types of psychological problems in which students experienced during the lockdown of COVID-19.

215x279mm (600 x 600 DPI)

STROBE Statement—Checklist of items that should be included in reports of ***cross-sectional studies***

	Item No	Recommendation	Page No
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3
Objectives	3	State specific objectives, including any prespecified hypotheses	4
Methods			
Study design	4	Present key elements of study design early in the paper	4
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	4
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	4
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	5
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	*6*
Bias	9	Describe any efforts to address potential sources of bias	6
Study size	10	Explain how the study size was arrived at	5
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	6
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	6&7
		(*b*) Describe any methods used to examine subgroups and interactions	N/A
		(*c*) Explain how missing data were addressed	
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	N/A
		(*e*) Describe any sensitivity analyses	6
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	8
		(b) Give reasons for non-participation at each stage	8
		(c) Consider use of a flow diagram	N/A
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	8
		(b) Indicate number of participants with missing data for each variable of interest	N/A
Outcome data	15*	Report numbers of outcome events or summary measures	8
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	8&16

		(*b*) Report category boundaries when continuous variables were categorized	
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	
Discussion			
Key results	18	Summarise key results with reference to study objectives	9
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	11
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	10&11
Generalisability	21	Discuss the generalisability (external validity) of the study results	11
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	12

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

BMJ Open

Psychological Problems and Its Associated Factors among College Students related to COVID-19 Pandemic Lockdown in Amhara region, Ethiopia; A Cross-sectional Study

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2020-045623.R2
Article Type:	Original research
Date Submitted by the Author:	27-Jul-2021
Complete List of Authors:	Woday Tadesse, Abay; Samara University, Public Health; Armauer Hansen Research Institute, Malaria and NTDs Mihret, Setegn; Wollo University Biset, Gebeyaw; Wollo University, pediatrics Kassa, Ayesheshim ; Dessie Health Science College, Dessie, Amhara region, Ethiopia, Nursing
Primary Subject Heading:	Mental health
Secondary Subject Heading:	Epidemiology, Mental health
Keywords:	EPIDEMIOLOGY, Health policy < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, MENTAL HEALTH, PUBLIC HEALTH

I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our licence.

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which Creative Commons licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

Psychological Problems and Its Associated factors among College Students related to COVID-19 Pandemic Lockdown in Amhara region, Ethiopia; A Cross-sectional Study

Abay Woda Tadesse[1,2,5], Setegn Mihret Tarekegn[3,2], Gebeyaw Biset Wagaw[3,2], Ayesheshim Muluneh Kassa[4,2]

Affiliations:

[1]Samara University, college of Medicine and health sciences, Departments of public health, Samara, Afar region, Ethiopia. [2]Dream Science and Technology College Dessie, Amhara region, Ethiopia. [3]Wollo University, College of Medicine and Health Sciences, School of Nursing and Midwifery, Departments of paediatrics health nursing, Amhara region, Dessie, Ethiopia. [4]Dessie Health Science College Department of nursing and midwifery, Dessie Ethiopia. [5]Armauer Hansen Research Institute, Addis Ababa, Ethiopia.

Corresponding Author: Abay Woday Tadesse, E-mail: abaywoday@yahoo.com

Institutional email: abaywonday@su.edu.et

P.O.BOX: 132

Co-authors email address:

Setegn Mihret Tarekegn, E-mail: setegnmihret5@gmail.com

Gebeyaw Biset Wagaw, E-mail: gebeyawbiset@yahoo.com

Ayesheshim Muluneh Kassa, E-mail: ashumuluneh327@gmail.com

Keywords: COVID-19, SARS-2, Psychological Problem, College Students
Word count: 2740

Abstract

Objective: The central aim of this study was to assess the **Level of Psychological Problems** among college students during school closure because of the emerging COVID-19 Pandemic.

Design: Institution-based cross-sectional study design.

Settings: Colleges in Amhara Regional State, Ethiopia.

Participants: Participants were college students [n=422, >18 years] who were actively enrolled in the selected colleges preceding the survey.

Methods: The data entry was done using Epi info 7.02 and the data analysis was done using SPSS version 24.0. Variables with a p-value of less than 0.25 in the bivariate analysis were entered into the multivariable logistic regression model. Model fitness was checked using the Hosmer-Lemeshow model fit-ness-test. Statistical significant level was declared at a p-value < 0.05.

Results: This study involved 408 students with a response rate of 96.6%. In this study, 77.2%, 71.8%, and 48.5% of the students had experienced depression, anxiety, and stress-related psychological problems during the lockdown, respectively. The multivariable logistic regression model showed that being female [AOR=1.68, 95% CI 1.09, 2.91], having an inadequate practice of prevention measures [AOR=1.74: 95% CI 1.01, 3.02] and living urban residency [AOR=0.76: 95% CI 0.48, 0.94] were the independent predictors of psychological problems among students.
Outcome: the psychological problem level.

Conclusions: The study revealed that the levels of anxiety, stress, and depression disorders are optimally high among college students. Therefore, local governments should develop effective psychological interventions for students. Moreover, it is important to consider the educational enrollment types and academic years of the students.

Article Summary

Strengths and limitations of this study

1. Strengths of the study

- School closure and stay-at-home declarations by the federal and lower government administrative exposed the students to psychological problems.
- We used internationally accepted tools for the assessment of psychological problems, DASS-21.
- In this study, 77.2%, 71.8%, and 48.5% of the college students had experienced depression, anxiety, and stress-related psychological problems, respectively.

2. Limitations of the study

- The study was limited to college students only due to financial constraints and it may not represent students from high schools and pre-college schools.

Introduction

Severe acute respiratory infection (SARS) is a group of respiratory tract infections caused by a beta coronavirus (SARS-COV2) [1, 2]. Corona Virus Disease-2019 ("COVID-19") is a family of SARS caused by Novel Coronavirus and was first detected in December 2019 in Wuhan, China. World Health Organization (WHO) has declared this disease as a global pandemic and it causes an estimated 134 million cases and nearly four million deaths by the end of June 2021 [3, 4]. According to the Ethiopian Public Health Institute (EPHI) report, there are an estimated 265, 350 confirmed cases and more than 3,900 deaths by the end of June 2021.

Countries across the globe have taken different preventive measures. These include; movement restriction, confinement to home, social distance, lockdown, and closure of the school that leads to increased psychosocial stress among the community, especially students [5-9].

A study conducted in China revealed that 53.8% of respondents had experienced moderate to severe psychological crises, in which students were found to contribute a greater number than the larger communities [10]. Another study in China revealed that around 25% of college students experienced anxiety due to the pandemic [11]. A study conducted in China revealed that 14.5%, 8.9%, and 7.7% of participants screened positive for anxiety, depression, and stress respectively [12]. Pieces of evidence had suggested that the pandemic resulted in loneliness, anxiety, depression, insomnia, suicide, impact on economic well-being, societal rejection, discrimination, and stigmatization among people [9, 13-15].

Ethiopia has taken different prevention and control measures to halt the spread of COVID-19. These include school closure, stay at home, keep social and physical distances, putting hand washing basins in places where people use in common (banks, Churches/mosques, markets), preparation of isolation centers, and establishment of state emergency at the national level [16-18].

However, still, there is no specific intervention to address the psychological problem of the COVID-19 in the country. Moreover, the studies conducted across the globe have been investigated the psychological problems because of the COVID-19 pandemic predominantly focused on health care workers and patients [19-21]. Therefore, this study was intended to generate evidence regarding the prevalence of psychological problems due to the COVID-19 and its determinants among college students.

Specific Objectives:

1) To determine the prevalence of psychological problems related to COVID-19 pandemic lockdown (depression, anxiety, and stress) among college students in Amhara region, Dessie town, July 2020.
2) To identify the factors associated with psychological problems related to COVID-19 pandemic lockdown.

Methods

Study Setting and Participants

The community-based cross-sectional study design was conducted from April 15-May 15, 2020 to assess the psychological problems among college students related to the COVID-19 pandemic, who were learning in the four randomly selected private and public colleges and Universities, Namely; Dream Science and Technology College, Dandi Boru College, Unity University, and Dessie Health Science College. These higher institutions are found in South Wollo Zone, Dessie city administration. Dessie city administration is located 401Km away from the capital city of Ethiopia, Addis Ababa. The city has eight private colleges, one private University, and three public colleges, which accommodate 20,907 students in different fields of study.

All active students, registered for a second-semester academic year, and those 16 and above years of age were included in this study. However, students who were seriously ill during the data collection period were not included in this study.

The sample size was calculated for both determinants and prevalence of psychological problems due to COVID 19 and the maximum sample size was considered for this study. Thus, the final sample size was determined using a single population proportion formula with assumptions: 5% type I error, 95% Confidence Intervals, 50% proportion since no study in Ethiopia on this problem. Finally, the researchers added 10% to compensate for the non-response of participants and the final sample size became 422.

$$n=\frac{(Za/z)^2(P)(1-P)}{d^2}$$

Where: n = required sample size, Zα/2 = critical value for normal distribution at 95 % confidence level (1.96), p = proportion of psychological problems, and d = 0.05 (5 % margin of error).

From a total of twelve colleges and universities found in Dessie city administration, four higher institutions (three colleges and one university) were randomly selected. The calculated sample size was proportionally allocated in each college based on the second-semester academic student number reports. To calculate the required number of participants from each college, we multiplied the total number of students actively learning in each college by the sampling fraction (n/N). The sampling fraction is approximately equal to six for all colleges. Accordingly, every 6th participant was selected using a systematic random sampling technique from each college registrar's office logbook.

Study variables:

Dependent variable: the psychological problem among college students related to COVID-19 pandemic (Yes/No) that was assessed using Depression, Anxiety, and Stress Scales (DASS-21).

Independent variables: sociodemographic characteristics (age, residence, sex, marital status, educational level, the field of study, income, family size, religion), knowledge, attitude and practice towards the preventive measures of COVID-19.

Data Collection Tools and Procedures

The questionnaire was adopted from studies conducted before this study [11, 22-24] and modified into context. The questionnaire was developed in the English language and it consists of sociodemographic characteristics, 20-items for knowledge, eight items for attitude, and 12-items for the practice of preventive measures against COVID-19. The psychological problem was assessed using Depression, Anxiety, and Stress Scales, DASS-21 [25-27] that contains 7-items for each psychological problem component. The tools were translated into the local language (Amharic) and back to English to keep their consistency. The tool was pretested on 5% (21 participants) of samples other than selected colleges found in Woldia town and some amendments were made based on the pretest findings. The data was collected using both phone-call and personal interviews. Phone-call was used for students who are out of Dessie town. Trained health professionals who were working out of the selected colleges approached the study participants.

Data management and analysis

The data were cleaned, coded, and entered into Epi data version 3.1 software and exported to SPSS version 24.0 for analysis. The descriptive statistics were done and the results were presented using texts, frequency tables, figures, and median with Interquartile range (IQR).

Bivariate logistic regression analysis was done to assess the association between the dependent variable with each independent variable. The socio-demographic factors, knowledge, attitude, and practice of preventive measures against COVID-19 were the factors included in the bivariate logistic regression analysis. Thus, independent variables with a p-value of less than 0.25 were

considered in the final model. Correlation between independent variables was assessed but we did not find any correlation between independent variables. The model fitness was also checked using the Hosmer-Lemeshow model fit-ness test. Finally, multivariable logistic regression analysis was done to control potential confounders and to identify the factors associated with the psychological problem of COVID-19 among students. The statistical significance level was declared at a P-value <0.05.

Operational Definitions

Psychological problem was defined as students who have experienced all forms of psychological problems [i.e. Depression, Anxiety, and Stress; DAS] related to the COVID-19 pandemic that was measured using DASS-21 [25-27]. Here, the scales were classified as normal, moderate, and severe for each psychological problem (DAS). However, we merged moderate and severe scales together in each psychological problem measurements since the values of moderate scales were minimal.

*Knowledge level***:** students who were correctly answered 70% or more of the knowledge questions were considered as students with a good knowledge level while students who answered correctly below 70% of the knowledge questions were considered as having poor knowledge.

Attitude level: students who were correctly answered 70% or more of the attitude questions were considered as students with a positive attitude while students who correctly answered below 70% of the attitude questions were considered as students with a negative attitude.

Practice level: students who were correctly answered 70% or more of the practice questions were considered as students with a good practice e level while students who correctly answered below 70% of the practice questions were considered as students with poor practice.

Patient and Public Involvement statement

"No patient involved"

Results:

Sociodemographic characteristics of Participants

In this study, 422 participants were involved with a response rate of 96.6%. The median age of the participants was 21 years with three Interquartile Range (IQR). Of the total students; 155 (38.0%) were lived in rural residences, 194 (47.5%) were females, 215 (52.7%) were learning TVET or diploma level training, and 340 (83.3%) were living with their families during the COVID-19 lockdown. In this study, the participants had a median of 5 total family sizes with 3 IQR (**Table 1).**

Prevalence of Psychological Problem Related to COVID-19

In this study, the overall psychological problem among college students due to COVID-19 was 16.2% (95% CI: 12.7%, 19.9%) which was measured using the students' experience of all forms of psychological problems [anxiety, depression, and stress disorders]. Moreover, 315 (77.2%) of the students had reported that they are experienced depression disorder. Similarly, 293 (71.8%) and 198 (48.5%) of students had experienced anxiety and stress disorders respectively **(Fig. 1**).

Determinants of Psychological Problems among Students Related to COVID-19

The selection of variables to be entered into a multivariable logistic regression model was based on clinical significance, predictor variables with p-value < 0.25 in the bivariable logistic regression, and absence of multi-collinearity between independent variables. In this study, the selected covariates include; the sex of participants, residence, the field of study, living conditions, attitude level, and practice of preventive measures against COVID-19 were entered into the multivariable logistic regression analysis model. The multivariable logistic regression model was done with backward elimination methods.

In this study, the odds of the psychological problem due to COVID among female students was twice higher compared to male students [AOR=1.68, 95% CI 1.09, 2.91]. students with inadequate practice of prevention and control measures had experienced twice greater odds of the psychological problems because of COVID 19 compared to students having adequate practices [AOR=1.74: 95% CI 1.01, 3.02]. Moreover, students who were living in urban residency had 24% less likely to experience psychological problems compared to students currently living in rural areas [AOR=0.76: 95% CI 0.48, 0.94]. However, the field of study, living conditions, and attitude towards COVID 19 were not significantly associated with the psychological problems of COVID-19 among students **(Table 2**).

Discussion

Coronavirus disease 2019 (COVID-19) affected global mental health, as evidenced by the accelerated increase in cases and deaths related to the pandemic worldwide [28],. In this study, the overall psychological problems related to COVID-19 among college students were measured using the experience of all forms of psychological problems (i.e. anxiety, depression, and stress disorders). Though the figure seems small, it represents the con-joined occurrence of the psychological disorders reported by students. Thus, this prevalence is optimal compared to other similar studies conducted in developing countries which measured the situation of the problem using the existence of either of the three psychological problems. Furthermore, the multivariable logistic regression model showed that residence, poor practice, and sex of the participants were the independent predictors of the psychological problems related to COVID 19 among college students.

In this study, the overall psychological problems among college students because of COVID-19 was 16.2%. This finding is lower than studies conducted in northern Ethiopia (85.3%) [20],

University of Dhaka (43.4%) [29], Jilin Province, China (40.4%) [30], 194 cities in China (53.8%) [31]. The outbreak of COVID-19 has shown psychological problems [32] in the form of depression, anxiety, and stress that need the provision of improved psychological interventions at global, national, regional, and district levels. The discrepancy might be due to differences in the measurement of the outcome variable (i.e. psychological problem). In our study, psychological problem among students was measured using the co-existence of anxiety, stress, and depression together while it was measured using either stress or anxiety or depression in the previous studies.

In our study, more than three-fourths (77.2%) of the students had reported as they have experienced depression disorder during the pandemic-related lockdown. This finding is higher than studies conducted in Hubei Province, China (37.1%) [33], 194 cities in China (16.5%) [31], and a systematic review (14.6% to 48.3%) [34]. Similarly, our study showed that nearly three-fourth (71.8%) of students had experienced anxiety disorders during the lockdown. This finding is higher than a study conducted in China that found only one-fourth (25%) of college students presented with anxiety disorder [11], a longitudinal study conducted in China (28.8%) [28], and 16.5%. This finding is also higher than studies conducted in Hubei Province, China (29%) [33], a systematic review (6.33% to 50.9%) [34], and 194 cities in China (28.8%) [31]. Moreover, in this study, nearly fifty percent (48.5%) of students had experienced stress disorders during the lockdown. This finding is higher than studies conducted in Samara University, Northeast Ethiopia (53.2%) [35], systematic review (8.1% to 81.9%) [34], and 194 cities in China (8.1%) [31]. In Ethiopia, the widespread outbreak of COVID-19 is directly associated with these adverse psychological consequences among college students who are out of school because of the national lockdown and school closure orders. Thus, students are more likely to suffer from the fear of

schools might not be opened again. On top of this, most of the college students were coming from the countryside to attend their school in the towns and the national lockdown policy was declared before these students go back to their home villages. As a result, these students were supposed to be suffered from the fear of acquiring the newly emerged disease, COVID-19 compared to other community members.

In this study, the odds of psychological problems due to COVID among female students was twice higher compared to male students. This finding is similar to studies conducted in Hubei Province, China [33], systematic review [34], and Jilin Province, China [30]. In Ethiopia, female students are prone to gender-based violence, poor social and economic support [35]. Consequently, these conditions can easily lead them to lose self-confidence and many stressors in life. Hence, they are victims of psychological disorders (i.e. depression, anxiety, and stress) compared to their counterparts, male students.

This study revealed that students who were living in urban residences had 24% less likely to experience psychological problems compared to students currently living in rural areas. This finding is similar to a study conducted in China [11]. Students in urban residences had more exposure to the media to get real information about the safety measures and other preventive measures forwarded by the government and the international communities. Therefore, students who were living in the urban were less likely to develop psychological problems compared to students in the rural residence where adequate information about the existing situation is not accessible.

In this study, students with poor preventive practice had experienced twice greater odds of psychological problems due to COVID 19 compared to students having adequate practices. Previous studies revealed that students out of school and in the final stage of graduation are more

prone to many psychological crises [8, 30] which is due to poor adherence to the preventive measure of the COVID 19 pandemic.

Limitation of the study: This study mainly used self-reported questionnaires to measure psychiatric symptoms and did not make clinical diagnoses. This may overestimate the overall psychiatric symptoms that in turn may increase the level of psychological problems among college students. Moreover, the study also shares the limitations of a cross-sectional study design.

Conclusion

In this study, the overall psychological problems among college students because of COVID-19 were comparable to other studies conducted across the developing world. Moreover, the levels of anxiety, stress, and depression disorders were optimally high among students. The multivariable logistic regression analysis showed residence, sex, and level of preventive practice were the independent predictors of psychological problems among students.

Therefore, the Ministry of Sciences and Higher Education [MOSHE] and local governments should develop effective strategies and interventions to address students with psychological problems. Moreover, it is important to consider the educational enrollment types and academic years of the students during the interventions.

List of Abbreviations

AOR	Adjusted Odds Ratio
COR	Crude Odds Ratio
COVID 19	Corona Virus Diseases 19
DASS	Depression, Anxiety, Stress Scale
EPHI	Ethiopia Public Health Institute
WHO	World Health Organization

Ethical Issues and Consent to Participate

The ethical approval was obtained from Dream Science and Technology Institutional Health Research Ethics Review Committee with an approval letter of DSTC/DHS/031/2020. Then, a permission letter was written for selected Colleges for cooperation and support. We had obtained verbal consent from individual study participants before beginning the actual data collection. We avoided personal identifiers to ensure confidentiality and anonymity of study participants.

Consent to publish

Not applicable

Availability of Data and Materials

All materials and data related to this article are included in the main document of the manuscript. However, if anyone has any interest to have raw data, he/she can contact the corresponding author.

Competing Interests

The authors declare that they have no competing interests.

Funding source:

There is no specific funding offered to conduct this study.

Contributorship Statement

All authors conceived and designed the study. AWT, and GBW supervised the data collection. AWT, AMK and SMT performed the data analysis, interpretation of data, and drafted the manuscript and critically reviewed the manuscript. All authors read and approved the final manuscript.

Acknowledgements

We would like to than Dream science and Technology College for its ethical approval. Furthermore, our deepest gratitude goes to the hospital staffs, participants, data collectors and supervisors.

List of References

1. Wu D, Wu T, Liu Q, Yang Z: The SARS-CoV-2 outbreak: what we know. *International Journal of Infectious Diseases* 2020.
2. Zumla A, Hui DS, Perlman S: Middle East respiratory syndrome. *The Lancet* 2015, 386(9997):995-1007.
3. WHO: Coronavirus disease (COVID-19) Situation Report – 191. **Available: https://www.who.int/emergencies/diseases/novel-coronavirus-2019/situation-reports-191**. 2020
4. Wu Y, Ho W, Huang Y, Jin D-Y, Li S, Liu S-L, Liu X, Qiu J, Sang Y, Wang Q: **SARS-CoV-2 is an appropriate name for the new coronavirus**. *The Lancet* 2020, **395**(10228):949-950.
5. Burke RM: Active monitoring of persons exposed to patients with confirmed COVID-19—United States, January–February 2020. *MMWR Morbidity and mortality weekly report* 2020, 69.
6. Zettler I, Schild C, Lilleholt L, Böhm R: Individual differences in accepting personal restrictions to fight the COVID-19 pandemic: Results from a Danish adult sample. 2020.
7. Dong Y, Mo X, Hu Y, Qi X, Jiang F, Jiang Z, Tong S: Epidemiology of COVID-19 among children in China. *Pediatrics* 2020.
8. Lee J: Mental health effects of school closures during COVID-19. *The Lancet Child & Adolescent Health* 2020, 4(6):421.
9. Tran BX, Nguyen HT, Le HT, Latkin CA, Pham HQ, Vu LG, Le XTT, Nguyen TT, Pham QT, Ta NTK *et al*: Impact of COVID-19 on Economic Well-Being and Quality of Life of the Vietnamese During the National Social Distancing. *Frontiers in psychology* 2020, 11:565153-565153.
10. Wang C, Pan R, Wan X, Tan Y, Xu L, Ho CS, Ho RC: Immediate psychological responses and associated factors during the initial stage of the 2019 coronavirus disease (COVID-19) epidemic among the general population in China. *International journal of environmental research and public health* 2020, 17(5):1729.
11. Cao W, Fang Z, Hou G, Han M, Xu X, Dong J, Zheng J: The psychological impact of the COVID-19 epidemic on college students in China. *Psychiatry research* 2020:112934.

12. Liu N, Zhang F, Wei C, Jia Y, Shang Z, Sun L, Wu L, Sun Z, Zhou Y, Wang Y: Prevalence and predictors of PTSS during COVID-19 Outbreak in China Hardest-hit Areas: Gender differences matter. *Psychiatry research* 2020:112921.
13. Xiang Y-T, Yang Y, Li W, Zhang L, Zhang Q, Cheung T, Ng CH: Timely mental health care for the 2019 novel coronavirus outbreak is urgently needed. *The Lancet Psychiatry* 2020, 7(3):228-229.
14. Yao H, Chen J-H, Xu Y-F: Patients with mental health disorders in the COVID-19 epidemic. *The Lancet Psychiatry* 2020, 7(4):e21.
15. Le XTT, Dang KA, Toweh J, Nguyen QN, Le HT, Toan DTT, Phan HBT, Nguyen TT, Pham QT, Ta NKT: Evaluating the psychological impacts related to COVID-19 of Vietnamese people under the first Nationwide partial lockdown in Vietnam. *Frontiers in psychiatry* 2020, 11:824.
16. Jemal B, Ferede ZA, Mola S, Hailu S, Abiy S, Wolde GD, Tilahun A, Tesfaye B, Lemma DT, Alimaw AA: Knowledge, attitude and practice of healthcare workers towards COVID-19 and its prevention in Ethiopia: a multicenter study. 2020.
17. FMOH [Ethiopia]. COVID 19 Handbook for health professionals Federal Minstry of Health, Ethiopia, Availabile: https://www.FMOH.gov.et. 2020.
18. FMOH [Ethiopia]. Infection Prevention and Control Interim Protocol for COVID-19 In Health Care Settings in Ethiopia. Addis Ababa, Ethiopia: FMOH; 2020. Availabile: https://www.FMOH.gov.et
19. McBride O, Murphy J, Shevlin M, Gibson-Miller J, Hartman TK, Hyland P, Levita L, Mason L, Martinez AP, McKay R: Monitoring the psychological impact of the COVID-19 pandemic in the general population: an overview of the context, design and conduct of the COVID-19 Psychological Research Consortium (C19PRC) Study. 2020.
20. Tadesse DB, Gebrewahd GT, Demoz GT: Knowledge, Attitude, Practice and Psychological response toward COVID-19 among Nurses during the COVID-19 outbreak in Northern Ethiopia, 2020. 2020.
21. Tan BY, Chew NW, Lee GK, Jing M, Goh Y, Yeo LL, Zhang K, Chin H-K, Ahmad A, Khan FA: Psychological impact of the COVID-19 pandemic on health care workers in Singapore. *Annals of Internal Medicine* 2020.

22. Joshi K, Jamadar, Deepak: Knowledge, attitude and practices regarding COVID-19 among medical students–A cross sectional study. 2020.
23. Maheshwari S, Gupta PK, Sinha R, Rawat P: Knowledge, attitude, and practice towards coronavirus disease 2019 (COVID-19) among medical students: A cross-sectional study. *Journal of Acute Disease* 2020, 9(3):100.
24. Tee ML, Tee CA, Anlacan JP, Aligam KJG, Reyes PWC, Kuruchittham V, Ho RC: Psychological impact of COVID-19 pandemic in the Philippines. *Journal of affective disorders* 2020, 277:379-391.
25. Ng F, Trauer T, Dodd S, Callaly T, Campbell S, Berk M: The validity of the 21-item version of the Depression Anxiety Stress Scales as a routine clinical outcome measure. *Acta neuropsychiatrica* 2007, 19(5):304-310.
26. Wang C, Chudzicka-Czupała A, Grabowski D, Pan R, Adamus K, Wan X, Hetnał M, Tan Y, Olszewska-Guizzo A, Xu L *et al*: The Association Between Physical and Mental Health and Face Mask Use During the COVID-19 Pandemic: A Comparison of Two Countries With Different Views and Practices. *Frontiers in Psychiatry* 2020, 11(901).
27. Le HT, Lai AJX, Sun J, Hoang MT, Vu LG, Pham HQ, Nguyen TH, Tran BX, Latkin CA, Le XTT: Anxiety and depression among people under the nationwide partial lockdown of Vietnam. *Frontiers in public health* 2020, 8:656.
28. Wang C, Pan R, Wan X, Tan Y, Xu L, McIntyre RS, Choo FN, Tran B, Ho R, Sharma VK: A longitudinal study on the mental health of general population during the COVID-19 epidemic in China. *Brain, behavior, and immunity* 2020, 87:40-48.
29. Imtiaz A, Hasan ME, Hossain MA, Khan NM: Attitudes toward COVID-19 among Young Adults: Role of Psychological Distress. 2020.
30. Liang L, Ren H, Cao R, Hu Y, Qin Z, Li C, Mei S: The Effect of COVID-19 on Youth Mental Health. *Psychiatric Quarterly* 2020.
31. Qiu J, Shen B, Zhao M, Wang Z, Xie B, Xu Y: A nationwide survey of psychological distress among Chinese people in the COVID-19 epidemic: implications and policy recommendations. *General psychiatry* 2020, 33(2).
32. Duan L, Zhu G: Psychological interventions for people affected by the COVID-19 epidemic. *The Lancet Psychiatry* 2020, 7(4):300-302.

33. Ahmed MZ, Ahmed O, Aibao Z, Hanbin S, Siyu L, Ahmad A: Epidemic of COVID-19 in China and associated Psychological Problems. *Asian journal of psychiatry* 2020:102092.
34. Xiong J, Lipsitz O, Nasri F, Lui LM, Gill H, Phan L, Chen-Li D, Iacobucci M, Ho R, Majeed A: Impact of COVID-19 pandemic on mental health in the general population: A systematic review. *Journal of affective disorders* 2020.
35. Tesfaye Kelemu R, Bayray Kahsay A, Ahmed KY: Prevalence of Mental Distress and Associated Factors among Samara University Students, Northeast Ethiopia. *Depression Research and Treatment* 2020, 2020:7836296.

List of Tables:

Table 1: Sociodemographic, knowledge, attitude and practices of students towards COVID-19

List of Predictors	Category of variables	Frequency (#)	Percentage (%)
Age of participants (in years)	16-20	166	40.7
	More than 20	242	59.3
Residence	Urban	253	62.0
	Rural	155	38.0
Sex of the participants	Male	214	52.5
	Female	194	47.5
Marital status	Single*	360	88.2
	Married	48	11.8
Religion of the participants	Orthodox	207	50.7
	Muslim	183	44.9
	Others+	18	4.4
Type of Education enrollment	TVET (Diploma)	215	52.7
	Degree (First)	193	47.3
Program	Regular	377	92.4
	Evening (Extension)	31	7.6
Field of Study	Health related	233	57.1
	Business related	129	31.6
	Technology related	46	11.3

Academic year	Year I	151	37.0
	Year II	180	44.1
	Year III	58	14.2
	Year IV+	19	4.7
Living with;	Families	340	83.3
	Relatives	28	6.9
	Alone	21	5.1
	Others++	19	4.7
Total family size (including extended families)	< 5	198	48.5
	5+	210	51.5
Monthly income for education (in ETB)	< 1000	349	85.5
	1000-1500	47	11.5
	> 1500	12	2.9
Knowledge level of students towards COVID-19	Poor	124	30.4
	Good	284	69.6
Attitude towards COVID-19	Negative	178	35.0
	Positive	230	65.0
Practice towards preventive measures COVID-19	Poor	143	43.6
	Good	265	56.4

Keynote: Single* (living together, divorced, and widowed), Others+ (Protestant, Catholic), Others++ (friends, sister/son-in-laws)

Table 2: Factors associated with COVID-19 related psychological problems among college students, Ethiopia.

List of variable	Category of variables	Psychological problems		COR (95% CI)	AOR (95% CI)
		Yes (%)	No (%)		
Residence	Urban	38 (57.6)	215 (62.9)	0.81 (0.47, 1.37)	0.76 (0.48, 0.94)*
	Rural	28 (42.4)	127 (37.1)	1.00	1.00
Sex of participants	Females	41 (62.1)	173 (50.6)	1.61 (0.93, 2.75)	1.68 (1.09, 2.91)*
	Males	25 (37.9	169 (49.4)	1.00	1.00
Field of study	Health related	35 (53.0)	198 (57.9)	1.00	1.00
	Business	23 (34.8)	106 (31.0)	1.23 (0.69, 2.18)	1.38 (0.74, 2.57)
	Technology	8 (12.1)	38 (11.1)	1.19 (0.51, 2.76)	1.54 (0.63, 3.77)
Living with;	Family	61 (92.4)	279 (81.6)	1.00	1.00
	Others+	5 (7.6)	63 (18.4)	0.36 (0.14, 0.94)	0.94 (0.25, 3.48)
Attitude towards COVID-19	Negative	32 (48.5)	146 (42.7)	1.26 (0.76, 2.14)	1.42 (0.81, 2.51)
	Positive	34 (51.5)	196 (57.3)	1.00	1.00
Practice towards COVID-19	Inadequate	31 (47.0)	112 (32.7)	1.82 (1.07, 3.10)	1.74 (1.01, 3.02)*
	Adequate	35 (53.0)	230 (67.3)	1.00	1.00

Key: COR- Crude Odds Ratio, AOR- Adjusted Odds Ratio, * P-value < 0.05, Others+ (alone, relatives, and friends)

List of Figures

Fig.1: Types of psychological problems in which students experienced during the lockdown of COVID-19.

List of Figures

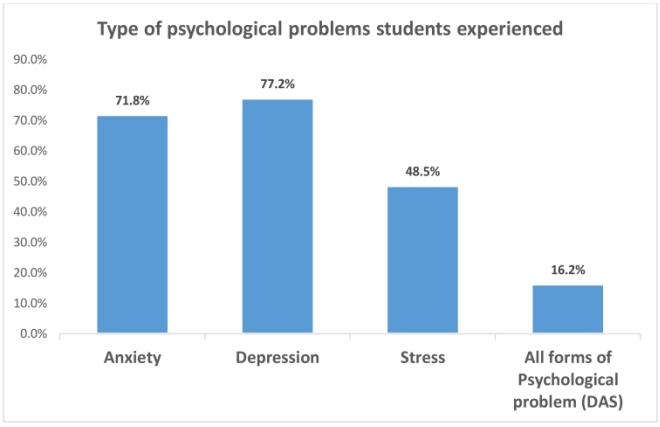

Figure 1: Types of psychological problems students experienced during the lockdown of COVID-19, June 2020, Ethiopia.

Fig.1: Types of psychological problems in which students experienced during the lockdown of COVID-19.

215x279mm (600 x 600 DPI)

STROBE Statement—Checklist of items that should be included in reports of ***cross-sectional studies***

	Item No	Recommendation	Page No
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3
Objectives	3	State specific objectives, including any prespecified hypotheses	4
Methods			
Study design	4	Present key elements of study design early in the paper	4
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	4
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	4
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	5
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	*6*
Bias	9	Describe any efforts to address potential sources of bias	6
Study size	10	Explain how the study size was arrived at	5
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	6
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	6&7
		(*b*) Describe any methods used to examine subgroups and interactions	N/A
		(*c*) Explain how missing data were addressed	
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	N/A
		(*e*) Describe any sensitivity analyses	6
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	8
		(b) Give reasons for non-participation at each stage	8
		(c) Consider use of a flow diagram	N/A
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	8
		(b) Indicate number of participants with missing data for each variable of interest	N/A
Outcome data	15*	Report numbers of outcome events or summary measures	8
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	8&16

		(*b*) Report category boundaries when continuous variables were categorized	
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	
Discussion			
Key results	18	Summarise key results with reference to study objectives	9
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	11
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	10&11
Generalisability	21	Discuss the generalisability (external validity) of the study results	11
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	12

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.