PLOS ONE

RESEARCH ARTICLE

Psychological impact during COVID-19 pandemic: A web-based cross-sectional study among students studying at College of Science and Technology (CST), Phuentsholing, Bhutan

Kezang Tshering [1]*, **Kezang Dema**[2]

1 Department of Pharmacy, Jigme Dorji Wangchuck National Referral Hospital, Thimphu, Bhutan,
2 Department of Information Technology, College of Science and Technology, Phuentsholing, Bhutan

* kezangtshe07@gmail.com, kezang07@hotmail.com

Abstract

The unprecedented experience of national lockdowns and uncertainty of academic career due to the COVID-19 pandemic has multifaceted impacts on mental health among university students worldwide. This study determined its impact on depression and anxiety level, and associated risk factors among engineering students studying at College of Science and Technology (CST), Phuentsholing, Bhutan during the first lockdown in the country. Self-reported depression and anxiety levels were assessed using Patient Health Questionnaire (PHQ-9) and Generalized Anxiety Disorder-7 (GAD-7) respectively. Data was collected using an e-questionnaire link generated in Google form and the link was shared with students via the student's official email group. A total of 278 students (response rate, 26.9%) completed the questionnaire. The majority of respondents were male (69.8%) and were aged from 18 to 30 (Mean: 21.7 ±SD 2.07) years. The prevalence of self-reported moderate to severe depression and anxiety were 44.2% (95% CI, 38.5–49.6) and 27.3% (95% CI, 22.3–32.4) respectively. Participants having their family members as frontline workers reported a significantly higher level of anxiety ($\chi2$ = 4.85, p = 0.028). In multivariable logistic regression analysis, students who were academically lagging showed a higher risk of depression (AOR = 5.36, 95% CI = 2.86–10.04) and anxiety (AOR = 3.83, 95%CI = 1.86–7.88) as compared to students who were not academically behind. A high percentage of depression and anxiety was reported by students of CST during the COVID-19 pandemic. Findings from the study highlight the importance of adopting appropriate online-based teaching and learning methods to ensure timely academic and professional achievements. Moreover, the relevant stakeholders should put health system strategies in place to provide psychological support to university students during the COVID-19 pandemic.

Introduction

The outbreak of coronavirus disease (COVID-19) was reported in December 2019 from the city of Wuhan, China [1]. COVID-19 is more contagious and spreads rapidly unlike severe acute respiratory syndrome (SARS) and the Middle East respiratory syndrome (MERS) [2]. The World Health Organization (WHO) declared COVID-19 as a global pandemic in the second week of March [3]. By the end of August 2020, more than 25.1 million people were infected causing 844,321 deaths worldwide [4].

In addition to mortality risk, COVID-19 imposed inevitable psychological distress among the general population across the globe [5, 6]. In particular, psychological impact among medical staffs [7], older adults [8], and children and adolescents [9] were reported from China during the COVID-19 outbreak. Similarly, psychological distress during the COVID-19 pandemic has been widely studied in various population. As reported in the systematic review, psychological disorder such as depression and anxiety among healthcare workers (HCWs) in African countries ranges from 9.5% to 73.3% and 12.5% to 71.9% respectively [10]. Moreover, COVID-19 frontline HCWs in Taiwan reported depressive symptoms (25.6%) and anxiety symptoms (30.6%) [11]. Further, 21.3% of Iranian HCWs reported severe and extremely severe anxiety during the COVID-19 pandemic [12]. Whereas, psychological distress among university students during the pandemic was rarely studied despite being highly vulnerable due to uncertainty of academic achievement, social life and future careers [13].

In Bhutan, the first case of COVID-19 was detected in a 76-year-old American tourist on March 6th, 2020 [14]. To curb the spread of COVID-19 among the Bhutanese population, the Royal Government of Bhutan (RGoB) implemented national preparedness and response plan [15]. The first-ever national lockdown was declared on August 11th by the RGoB following the detection of COVID-19 in a 27-year-old Bhutanese woman who came in close contact with several people residing in four different districts in Bhutan. On August 16th, 2020, Phuentsholing town located in Southern Bhutan was declared as the first red zone in Bhutan after a four-year-old female was tested positive in Rt-PCR for COVID-19 from the community. Following the detection of local transmission from the community, the RGoB declared the community as a red zone enforcing complete movement restriction and surveillance within the community leading to suspension of education institutions. Such response imposed unprecedented delay and disruption of routine academic activities forcing university students to adapt to a new online-based learning system. According to WHO, the total number of confirmed cases were 228 with a mortality rate of 0% as of September 4th 2020 in Bhutan [4].

Such unprecedented experience of national lockdown and uncertainty of academic career due to COVID-19 imposed multifaceted impacts on mental health among university students. Globally, the literature showed that significant proportions of university students reported depression and anxiety during the COVID-19 pandemic [16–18]. Different anxiety levels were reported by university students from Thailand, Indonesia and Taiwan [19]. However, there was a lack of study regarding the impact on mental health such as depression and anxiety among university students in Bhutan during this pandemic. Therefore, this study primarily aimed to determine the prevalence of self-reported depression and anxiety during the COVID-19 pandemic among students at the College of Science and Technology (CST), Phuentsholing located under the red zone. Moreover, we examined factors associated with depression and anxiety among our respondents to guide policy makers to put appropriate interventions in place for high-risk individuals. Although various risk factors were reported in previous studies, it differs due to cultural differences and the level of COVID-19 crisis across the country. Hence, we considered some of the variables such as students studying in the final academic year, pursuing study under government scholarship, academically lagging (having

one or more backlogs), living with family members during the lockdown, tested as COVID-19 positive within the last two weeks and having family members as a frontline worker as some of the potential risk factors in our setting.

Method

Design

A web-based cross-sectional study was conducted among students of CST using the official email platform of students from September 10th to October 10th, 2020. Our survey was anonymous and participants' confidentiality was ensured.

Setting

College of Science and Technology is in Southern Bhutan under Chhukha District providing various engineering programs in the country. It provides bachelor's degrees in Architecture, Civil engineering, Electrical engineering, Electronics and Communication Engineering, Information Technology Engineering and Masters of Engineering in Renewable Energy. Phuentsholing was the first region to be declared as a red zone in the country after detection of the first community transmission of COVID-19 in Bhutan and residents were put under strict strategic lockdown and surveillance by the RGoB.

Participants

Study participants included students studying at CST. Students aged ≥ 18 years and those who provided written informed consent were enrolled in the study. Students below 18 years old were excluded from the study due to inconvenience in obtaining written informed consent from their respective parents.

Data collection procedure

An online questionnaire link generated using Google form was shared via the student's official email on September 10th, 2020. A questionnaire link was shared with a total of 1035 students using their official email addresses. It took approximately 15 minutes to complete the questionnaire. An electronic written informed consent was obtained from each participant before they began the survey. Data was collected using the convenience sampling method. Research Ethics Board of Health (REBH), Ministry of Health of Bhutan approved our study (REBH/Approval/2021/039), and administrative clearance was also obtained from the Dean of Research and Industrial Linkage, CST.

Measures and covariates

Our survey questionnaire consisted of three parts. The first part obtained participant's socio-demographic characteristics, which included sex, age, final academic year (yes vs no), financial assistance for education (government scholarship vs self), academically lagging; having one or more backlogs (yes vs no), living area during national lockdown (urban vs rural), residing with family members during lockdown (yes vs no), monthly family income, residing under red-zone (yes vs no), experienced centralized quarantine (yes vs no), tested Rt-PCR positive for COVID-19 (yes vs no), family member tested Rt-PCR positive for COVID-19 (yes vs no), exercise at home during quarantine (yes vs no) and family member a front-line worker during COVID-19 pandemic (yes vs no). Individuals who were directly involved in the control of COVID-19 in the country such as healthcare workers, police, de-suung (guardians of peace

and harmony), media and essential material delivery services were considered as frontline workers in the study.

The second part of the questionnaire consisted of Patient Health Questionnaire-9 (PHQ-9) scale to assess depression among participants. Depression was categorized using PHQ-9 score as, none-minimal depression (0–4), mild depression (5–9), moderate depression (10–14), moderately severe depression (15–19) and severe depression (20–27). PHQ-9 was found to be reliable and valid in detecting the severity of depression among the general population [20, 21]. PHQ-9 score of ≥ 10 was considered optimum to detect depression [22].

The last part of the questionnaire included the Generalized Anxiety Disorder-7 (GAD-7) scale to assess symptoms of anxiety. Anxiety symptoms were classified using GAD-7 as, none (0–4), mild anxiety (5–9), moderate anxiety (10–14) and severe anxiety (15–21) [23]. A cut-off score of ≥ 10 for GAD-7 was considered the presence of anxiety among respondents in the study.

Data analysis

Participants' socio-demographic data were presented using descriptive statistics such as frequency and percentage. The prevalence of symptoms of depression and anxiety was determined using the aforementioned cutoff scores. Differences in prevalence of depression and anxiety among respondents with different categorical characteristics were compared using chi-square ($\chi 2$) tests. Multivariable logistic regression analysis was performed to identify risk factors associated with depression and anxiety. Adjusted odds ratio (AOR) and 95% confidence interval (95%CI) were presented to identify an association between risk factors and outcomes. The level of significance was set at $p < 0.05$ and data was analyzed in Statistical Package for Social Science (SPSS) version 21.

Results

Socio-demographic characteristics of participants

An online questionnaire link was shared among 1035 students of CST via official student's e-mail. Among which, 445 students opened an online questionnaire link, and 278 individuals completed the survey (26.9% response rate). The majority of our participants were male (69.8%) and were aged from 18 to 30 years (Mean: 21.7 SD ± 2.07). A majority (82.4%) of our respondents were pursuing undergraduate under full government scholarship whereas 76.3% were living with family members during the national lockdown. More than one-fourth (32.4%) of students were academically lagging as presented in Table 1.

Prevalence of depression and anxiety

The prevalence of depression (PHQ-9 ≥ 10) among our participants was 44.2% (95% CI, 38.5–49.6) with 34.2% (95% CI, 28.4–39.6) mild depression, 23.7% (95% CI, 18.7–29.1) moderate depression, 12.2% (95% CI, 8.6–16.2) moderately severe depression and 8.3% (95% CI, 5.0–11.9) severe depression. Prevalence of anxiety (GAD-7 ≥ 10) was 27.3% (95% CI, 22.3–32.4) with 37.4% (95% CI, 31.7–43.2) mild anxiety, 13.3% (95% CI, 9.7–17.6) moderate anxiety and 14.0% (95% CI, 10.1–18.3) severe anxiety. As shown in Table 2, Depression among students who are academically lagging was significantly higher than those who are not academically behind ($\chi 2 = 31.71$, $df = 1$, $p < 0.0005$). Anxiety was reported significantly higher by students who are academically lagging ($\chi 2 = 13.14$, $df = 1$, $p < 0.0005$) and students having their family members as a front-line worker ($\chi 2 = 4.85$, $df = 1$, $p = 0.028$) during COVID-19 pandemic.

Table 1. Socio-demographic characteristics of students studying at college of science and technology (n = 278).

Variables	Category	n	%
1. Sex	Male	194	69.8
	Female	84	30.2
2. Age (in years)	18–22	190	68.3
	≥23	88	31.7
3. Are you in final academic year?	No	195	70.1
	Yes	83	29.9
4. Studying under government scholarship?	No	49	17.6
	Yes	229	82.4
5. Academically lagging (having one or more backlogs)**?**	No	90	32.4
	Yes	188	67.6
6. Place of residence during national lockdown	Urban	144	51.8
	Rural	134	48.2
7. Living with family members during national lockdown?	No	66	23.7
	Yes	212	76.3
8. Monthly family income	Unknown	41	14.7
	<21,000	138	49.6
	≥21,000	99	35.6
9. Residing at Phuentsholing town during national lockdown?	No	203	73.0
	Yes	75	27.0
10. Ever experienced centralized quarantine in the past 2 weeks?	No	276	99.3
	Yes	2	0.7
11. Tested as COVID-19 positive in RT-PCR in last 14 days?	No	278	100.0
	Yes	0	0.0
12. Any of your family member tested COVID-19 positive in RT-PCR?	No	268	96.4
	Yes	10	3.6
13. Doing any sort of physical exercise at home during quarantine?	No	130	46.8
	Yes	148	53.2
14. Any of your family members a front-line worker?	No	136	48.9
	Yes	142	51.1

Factors associated with depression and anxiety

Table 3 shows the risk factors of depression and anxiety among study participants. In multivariable logistic regression analysis, individuals who are academically lagging were at higher risk of self-reported mental health symptoms compared with those who are not academically behind with AOR 5.51 (95% CI 2.95–10.29) and AOR 3.64 (95% CI 1.80–7.38) for depression and anxiety respectively.

Discussion

Studies showed a high prevalence of self-reported psychological distress such as depression and anxiety among college students during the COVID-19 pandemic across the globe [24, 25]. Our study was first to assess the self-reported psychological impact and its associated risk factors among students of CST in southern Bhutan during this current pandemic. CST is the only college under the Phuentsholing region in Southern Bhutan where the first community outbreak of COVID-19 took place in the country followed by the strict strategic lockdown. Such unprecedented closure of college caused academic and professional uncertainty leading to increased risk of psychological distress among students studying at CST.

Table 2. Level of depression and anxiety among participants with different socio-demographic characteristics.

Variables	Total	Depression		Anxiety	
	(n = 278)	(n = 123)	p value	(n = 76)	p value
Sex					
Male	194 (69.8)	83 (42.8)	0.456	48 (24.7)	0.140
Female	84 (30.2)	40 (47.6)		28 (33.3)	
Age (years)					
18–22	190 (68.3)	88 (46.3)	0.307	55 (28.9)	0.376
≥23	88 (31.7)	35 (39.8)		21 (23.9)	
Are you in final academic year?					
No	195 (70.1)	90 (46.2)	0.326	55 (28.2)	0.619
Yes	83 (29.9)	33 (39.8)		21 (25.3)	
Studying under government scholarship?					
No	49 (17.6)	26 (50.1)	0.171	13 (26.5)	0.889
Yes	229 (82.4)	97 (42.4)		63 (27.5)	
Academically lagging (having one or more backlogs)**?**					
No	90 (32.4)	18 (20.0)	< 0.0005	12 (13.3)	< 0.0005
Yes	188 (67.6)	105 (55.9)		64 (34.0)	
Place of residence during national lockdown					
Urban	144 (51.8)	67 (46.5)	0.427	36 (25.0)	0.865
Rural	134 (48.2)	56 (41.8)		40 (29.9)	
Living with family members during national lockdown?					
No	66 (23.7)	23 (34.8)	0.078	18 (27.3)	0.989
Yes	212 (76.3)	100 (47.2)		58 (27.4)	
Monthly family income					
Unknown	41 (14.7)	20 (48.8)	0.593	8 (19.5)	0.079
<21,000	138 (49.6)	63 (45.7)		46 (33.3)	
≥21,000	99 (35.6)	40 (40.4)		22 (22.2)	
Residing at Phuentsholing town during national lockdown?					
No	203 (73.0)	96 (47.3)	0.093	55 (27.1)	0.88
Yes	75 (27.0)	27 (36.0)		21 (28.0)	
Ever experienced centralized quarantine in the past 2 weeks?					
No	276 (99.3)	122 (44.2)	1.00	76 (27.5)	1.00
Yes	2 (0.7)	1 (50.0)		0 (0)	
Tested as COVID-19 positive in RT-PCR in last 14 days?					
No	278 (100)	-	-	76	-
Yes	0 (0)	-		0 (0)	
Any of your family member tested COVID-19 positive in RT-PCR?					
No	268 (96.4)	118 (44.0)	0.754	73 (27.2)	1.0
Yes	10 (3.6)	5 (50.0)		3 (30.0)	
Doing any sort of physical exercise at home during quarantine?					
No	130 (46.8)	61 (47.0)	0.399	37 (28.5)	0.694
Yes	148 (53.2)	62 (41.9)		39 (26.4)	
Any of your family members a front-line worker?					
No	136 (48.9)	57 (41.9)	0.470	29 (21.3)	0.028
Yes	142 (51.1)	66 (46.5)		47 (33.1)	

Our study found that 44.2% (95% CI, 38.5–49.6) and 27.3% (95% CI, 22.3–32.4) of students studying at CST experienced moderate-to-severe depression and anxiety respectively. Previous

Table 3. Factors associated with self-reported depression and anxiety among students studying at CST during COVID-19 pandemic.

Variables	Depression		Anxiety	
	AOR (95% CI)	*p*-value	AOR (95% CI)	*p*-value
Sex				
Male	-		-	
Female	1.29 (0.72–2.31)	0.394	1.64 (0.89–3.05)	0.116
Age (years)				
18–22	-		-	
≥23	0.94 (0.49–1.78)	0.841	0.84 (0.42–1.69)	0.619
Are you in final academic year?				
No	-		-	
Yes	0.97 (0.45–2.12)	0.947	0.65 (0.27–1.56)	0.333
Studying under government scholarship?				
No	-		-	
Yes	0.70 (0.35–1.42)	0.327	1.36 (0.62–2.99)	0.441
Academically lagging (having one or more backlogs)**?**				
No	-		-	
Yes	5.36 (2.86–10.04)	<0.0005	3.83 (1.86–7.88)	<0.0005
Place of residence during national lockdown				
Urban	-		-	
Rural	0.65 (0.37–1.14)	0.134	1.40 (0.75–2.60)	0.289
Living with family members during national lockdown?				
No	-		-	
Yes	1.45 (0.69–3.05)	0.333	1.28 (0.57–2.86)	0.548
Monthly family income				
Unknown	-		-	
<21,000	1.60 (0.69–3.67)	0.272	1.98 (0.80–4.89)	0.137
≥21,000	1.40 (0.77–2.56)	0.273	0.99 (0.37–2.66)	0.984
Residing at Phuentsholing town during national lockdown?				
No	-		-	
Yes	0.82 (0.38–1.78)	0.608	1.53 (0.66–3.58)	0.325
Ever experienced centralized quarantine in the past 2 weeks?				
No	-		-	
Yes	1.39 (0.82–23.60)	0.821		
Any of your family member tested COVID-19 positive in Rt-PCR?				
No	-		-	
Yes	1.27 (0.30–5.33)	0.743	1.48 (0.33–6.73)	0.611
Doing any sort of physical exercise at home during quarantine?				
No	-		-	
Yes	0.91 (0.53–1.54)	0.721	0.87 (0.49–1.56)	0.641
Any of your family members a front-line worker?				
No	-		-	
Yes	1.06 (0.63–1.79)	0.829	1.67 (0.93–2.969)	0.084

https://doi.org/10.1371/journal.pone.0263999.t003

studies which assessed depression during the COVID-19 pandemic using the same instrument reported various rates of moderate-to-severe depression among students from Pakistan (45%) [26], China (15.58%) [27] and Bangladesh (53.8%) [18]. Studies conducted among university students using different instruments in Egypt [28], Spain [29] and Turkey [30] reported 45.9%, 34.2% and 27.1% of moderate-to-severe depression respectively. With regard to anxiety, similar

studies reported moderate-to-severe anxiety ranging from 3.6% to 42.9% among college students worldwide [18, 26, 31]. Further, moderate-to-severe anxiety ranges from 12.1% to 47.1% according to previous studies which used different instruments (Depression Anxiety and Stress Scale– 21) to assess anxiety [28, 29, 32]. Such variations in prevalence of depression and anxiety could be attributed to variations in sociodemographic characteristics of study participants and instruments used to assess depression and anxiety. Moreover, such variations could be attributed to the country's COVID-19 strategic preparedness and response plan, cultural differences, and level of COVID-19 crisis across the country. Nonetheless, the level of psychological distress reported by our participants during the COVID-19 pandemic was alarming.

Studies across the globe reported various factors associated with depression and anxiety among university students during this current pandemic. However, unlike previous studies, our study showed a higher risk of depression (AOR: 5.51, 95%CI: 2.95–10.29) and anxiety (AOR: 3.64, 95%CI: 1.80–7.38) among students who were academically lagging than their counterparts. Our finding showed that students who are academically behind anticipated failure of timely academic achievements due to unprecedented disruption of academic activities caused by the current pandemic. Since college students are at the university-to-work transition period, the COVID-19 pandemic could affect their career plans leading to greater psychological impact among respondents who are academically lagging. This underscores the importance of adopting appropriate online-based teaching and learning methodologies during the COVID-19 pandemic to ensure timely academic achievement and professional progress among engineering students of CST. Further, COVID-19 imposed digital transformation among university students where students studying in developing countries faced difficulty in such transition due to limited infrastructure as reported in the previous study [33]. As reported in the previous study, most universities lack enough resources or infrastructure to facilitate online-based teaching immediately [34]. Similarly, not being able to facilitate appropriate online-based teaching with immediate effect due to scarcity of infrastructure and resources at CST could have triggered greater psychological distress among students who are academically behind. Our study showed that depression and anxiety were not associated with the monthly income of family. On contrary, both depression and anxiety were associated with the low economic level of the family in the previous study [35]. This could be attributed to the majority (82.4%) of our respondents pursuing their studies under government scholarship unlike students in developed countries.

Additionally, respondents having their family members as front-line workers during the COVID-19 pandemic reported a significantly higher level of anxiety in the study ($p = 0.028$). This indicates that front-line workers being at increased risk of acquiring COVID-19 infection precipitated a high level of anxiety among their family members. A similar finding was reported in China [36].

Cross-sectional study design, failure to include other university students in Bhutan during the COVID-19 pandemic as a comparison group, not being able to establish a causal relationship of depression and anxiety with academically lagging and failure to use specific instruments for COVID-19 such as coronavirus anxiety scale (CAS) are some of the major limitations of the study.

Conclusion

Despite limitations, our study was the first of a kind to assess the psychological impact among college-going students during the COVID-19 pandemic in Bhutan. A large percentage of students studying at CST reported depression and anxiety. Findings from the study underscore the importance of adopting appropriate online-based teaching and learning methods focused

on timely academic achievements for students of CST during the COVID-19 pandemic. In addition, the relevant stakeholders should put mental health services in place to support college students in fighting against psychological distress during the COVID-19 pandemic. Further, parents should avoid imposing academic pressure among college students unless the students are comfortable with the new teaching and learning environment during the current pandemic.

Supporting information

S1 Dataset.
(XLSX)

Acknowledgments

We would like to thank all our study participants for completing the questionnaire.

Author Contributions

Conceptualization: Kezang Tshering, Kezang Dema.

Data curation: Kezang Tshering.

Formal analysis: Kezang Tshering.

Funding acquisition: Kezang Tshering.

Investigation: Kezang Tshering, Kezang Dema.

Methodology: Kezang Tshering.

Project administration: Kezang Tshering, Kezang Dema.

Resources: Kezang Tshering.

Software: Kezang Tshering.

Supervision: Kezang Tshering, Kezang Dema.

Validation: Kezang Tshering.

Visualization: Kezang Tshering.

Writing – original draft: Kezang Tshering.

Writing – review & editing: Kezang Tshering, Kezang Dema.

References

1. Wang C, Horby PW, Hayden FG, Gao GF. A novel coronavirus outbreak of global health concern. The Lancet. 2020; 395(10223):470–3. https://doi.org/10.1016/S0140-6736(20)30185-9 PMID: 31986257

2. Meo SA, Alhowikan AM, Khlaiwi TAL, Meo IM, Halepoto DM, Iqbal M, et al. Novel coronavirus 2019-nCoV: Prevalence, biological and clinical characteristics comparison with SARS-CoV and MERS-CoV. Eur Rev Med Pharmacol Sci. 2020; 24(4):2012–9. https://doi.org/10.26355/eurrev_202002_20379 PMID: 32141570

3. Mahase E. Covid-19: WHO declares pandemic because of "alarming levels" of spread, severity, and inaction. BMJ. 2020; 368:0.

4. Coronavirus Diseas 2019 (COVID-19) Situation Report; Weekly Epidemiological Update. World Health Organization. 2020;(August):1–22. Available from: https://www.who.int/publications/m/item/weekly-epidemiological-update—31-august-2020.

5. Duan L, Zhu G. Psychological interventions for people affected by the COVID-19 epidemic. The Lancet Psychiatry. 2020; 7(4):300–2. https://doi.org/10.1016/S2215-0366(20)30073-0 PMID: 32085840

6. Xiao C. A novel approach of consultation on 2019 novel coronavirus (COVID-19)-related psychological and mental problems: Structured letter therapy. Psychiatry Investig. 2020; 17(2):175–6. https://doi.org/10.30773/pi.2020.0047 PMID: 32093461

7. Chen Q, Liang M, Li Y, Guo J, Fei D, Wang L, et al. Mental health care for medical staff in China during the COVID-19 outbreak. The Lancet Psychiatry. 2020; 7(4):e15–6. https://doi.org/10.1016/S2215-0366(20)30078-X PMID: 32085839

8. Yang Y, Li W, Zhang Q, Zhang L, Cheung T, Xiang YT. Mental health services for older adults in China during the COVID-19 outbreak. The Lancet Psychiatry. 2020; 7(4):e19. https://doi.org/10.1016/S2215-0366(20)30079-1 PMID: 32085843

9. Qin Z, Shi L, Xue Y, Lin H, Zhang J, Liang P, et al. Prevalence and risk factors associated with self-reported psychological distress among children and adolescents during the COVID-19 pandemic in China. JAMA Netw open. 2021; 4(1):e2035487. https://doi.org/10.1001/jamanetworkopen.2020.35487 PMID: 33496797

10. Olashore AA, Akanni OO, Fela-Thomas AL, Khutsafalo K. The psychological impact of COVID-19 on health-care workers in African Countries: A systematic review. Asian J Soc Health Behav. 2021; 4 (3):85.

11. Lu MY, Ahorsu DK, Kukreti S, Strong C, Lin YH, Kuo YJ, et al. The prevalence of post-traumatic stress disorder symptoms, sleep problems, and psychological distress among COVID-19 frontline healthcare workers in Taiwan. Frontiers in Psychiatry. 2021; 12.

12. Hasannia E, Mohammadzadeh F, Tavakolizadeh M, Davoudian N, Bay M. Assessment of the anxiety level and trust in information resources among iranian health-care workers during the pandemic of coronavirus disease 2019. Asian J Soc Health Behav. 2021; 4(4):163.

13. Aristovnik A, Keržič D, Ravšelj D, Tomaževič N, Umek L. Impacts of the COVID-19 pandemic on life of higher education students: A global perspective. Sustainability. 2020; 12 (20):8438.

14. LeVine S, Dhakal GP, Penjor T, Chuki P, Namgyal K, Tshokey, et al. Case report: The first case of COVID-19 in Bhutan. Am J Trop Med Hyg. 2020; 102(6):1205–7. https://doi.org/10.4269/ajtmh.20-0259 PMID: 32314685

15. Royal Government of Bhutan. National preparedness and response plan for outbreak of novel coronavirus (COVID-19). 2020 [cited 2020 Aug 10]. Available from: https://www.cabinet.gov.bt/wp-content/uploads/2020/03/National-Preparedness-and-Response-Plan-3rd-ed-1-1.pdf.

16. Wang ZH, Yang HL, Yang YQ, Liu D, Li ZH, Zhang XR, et al. Prevalence of anxiety and depression symptom, and the demands for psychological knowledge and interventions in college students during COVID-19 epidemic: A large cross-sectional study. J Affect Disord. 2020; 275:188–93. https://doi.org/10.1016/j.jad.2020.06.034 PMID: 32734907

17. Chi X, Becker B, Yu Q, Willeit P, Jiao C, Huang L, et al. Prevalence and psychosocial correlates of mental health outcomes among Chinese college students during the coronavirus disease (COVID-19) pandemic. Front Psychiatry. 2020; 11:1–9. https://doi.org/10.3389/fpsyt.2020.00001 PMID: 32116830

18. Akhtarul Islam M, Barna SD, Raihan H, Nafiul Alam Khan M, Tanvir Hossain M. Depression and anxiety among university students during the COVID-19 pandemic in Bangladesh: A web-based cross-sectional survey. PLoS One. 2020; 15(8):e0238162. https://doi.org/10.1371/journal.pone.0238162 PMID: 32845928

19. Pramukti I, Strong C, Sitthimongkol Y, Setiawan A, Pandin MG, Yen CF, et al. Anxiety and suicidal thoughts during the COVID-19 pandemic: cross-country comparative study among Indonesian, Taiwanese, and Thai University students. J Med Internet Res. 2020; 22(12):e24487. https://doi.org/10.2196/24487 PMID: 33296867

20. Kroenke K, Spitzer RL, Williams JBW. The PHQ-9. Validity of a brief depression severity measure. Journal of General Internal Medicine. 2001; 16(9):606–613. https://doi.org/10.1046/j.1525-1497.2001.016009606.x PMID: 11556941

21. Martin A, Rief W, Klaiberg A, Braehler E. Validity of the brief Patient Health Questionnaire Mood Scale (PHQ-9) in the general population. Gen Hosp Psychiatry. 2006; 28(1):71–7. https://doi.org/10.1016/j.genhosppsych.2005.07.003 PMID: 16377369

22. Manea L, Gilbody S, McMillan D. Optimal cut-off score for diagnosing depression with the Patient Health Questionnaire (PHQ-9): a meta-analysis. CMAJ. 2012; 184(3):E191–E196. https://doi.org/10.1503/cmaj.110829 PMID: 22184363

23. Spitzer RL, Kroenke K, Williams JBW, Löwe B. A brief measure for assessing generalized anxiety disorder: The GAD-7. Arch Intern Med. 2006; 166(10):1092–7. https://doi.org/10.1001/archinte.166.10.1092 PMID: 16717171

24. D'Hondt F, Wathelet M, Duhem S, Vaiva G, Baubet T, Habran E, et al. Factors associated with mental health disorders among university students in France confined during the COVID-19 pandemic. JAMA Netw Open. 2020; 3(10):1–13. https://doi.org/10.1001/jamanetworkopen.2020.25591 PMID: 33095252

25. Huckins JF, da Silva AW, Wang W, Hedlund E, Rogers C, Nepal SK, et al. Mental health and behavior of college students during the early phases of the COVID-19 pandemic: Longitudinal smartphone and ecological momentary assessment study. J Med Internet Res. 2020; 22(6):e20185. https://doi.org/10.2196/20185 PMID: 32519963

26. Salman M, Asif N, Mustafa ZU, Khan TM, Shehzadi N, Hussain K, et al. Psychological impact of COVID-19 on Pakistani university students and how they are coping. Medrxiv. 2020.

27. Sun S, Goldberg SB, Lin D, Qiao S, Operario D. Psychiatric symptoms, risk, and protective factors among university students in quarantine during the COVID-19 pandemic in China. Globalization and Health. 2021; 17(1):1–4. https://doi.org/10.1186/s12992-020-00651-7 PMID: 33397377

28. Ghazawy ER, Ewis AA, Mahfouz EM, Khalil DM, Arafa A, Mohammed Z, et al. Psychological impacts of COVID-19 pandemic on the university students in Egypt. Health Promot Int. 2021; 36(4):1116–25. https://doi.org/10.1093/heapro/daaa147 PMID: 33367587

29. Odriozola-González P, Planchuelo-Gómez Á, Jesús Irurtia M, Luis-Garcia R. Psychological effects of the COVID-19 outbreak and lockdown among students. Psychiatry Res. 2020; 290:113180. https://doi.org/10.1016/j.psychres.2020.113108 PMID: 32450409

30. Bayram N, Bilgel N. The prevalence and socio-demographic correlations of depression, anxiety and stress among a group of university students. Soc Psychiatry Psychiatr Epidemiol. 2008; 43(8):667–72. https://doi.org/10.1007/s00127-008-0345-x PMID: 18398558

31. Wenjun C, Ziwei F, Guoqiang H, Mei H, Xinrong X, Jiaxin D, et al. The psychological impact of the COVID-19 epidemic on college students in China. Psychiatry Research. 2020; 287:112934. https://doi.org/10.1016/j.psychres.2020.112934 PMID: 32229390

32. Lai AY kwan, Lee L, Wang MP, Feng Y, Lai TT kwan, Ho LM, et al. Mental health impacts of the COVID-19 pandemic on international university students, related stressors, and coping strategies. Front Psychiatry. 2020;11. https://doi.org/10.3389/fpsyt.2020.00011 PMID: 32116834

33. Simbulan N. COVID-19 and its impact on higher education in the Philippines. Higher Education in Southeast Asia and beyond. 2020; 8: 15–18.

34. Dill E, Fischer K, McMurtrie B, Supiano B. As coronavirus spreads, the decision to move classes online is the first step. What comes next. The Chronicle of Higher Education. Available from: https://www.chronicle.com/article/As-Coronavirus Spreads-the/248200.

35. Radwan E, Radwan A, Radwan W, Pandey D. Prevalence of depression, anxiety and stress during the COVID-19 pandemic: a cross-sectional study among Palestinian students (10–18 years). BMC psychology. 2021; 9(1): 1–2. https://doi.org/10.1186/s40359-020-00492-4 PMID: 33388086

36. Cuiyan W, Riyu P, Xiaoyang W, Yilin T, Linkang X, Cyrus SH, et al. Immediate psychological responses and associated factors during the initial stage of the 2019 coronavirus disease (COVID-19) epidemic among the general population in China. Int J Environ Res Public Health. 2020; 17(5):1729.