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Determinants of Mental Health during and after COVID-19 Lockdown among University Students in Malaysia

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Abstract: Objectives: Young adults, particularly university students might be at greater risk of developing psychological distress, and exhibiting symptoms of anxiety and depression during the COVID-19 pandemic. The primary objective of this study was to explore and compare the determinants and predictors of mental health (anxiety and depression) during and after COVID-19 lockdown among university students. **Methods:** This was an observational, cross-sectional study with a sample size of 417 students. An online survey utilizing International Physical Activity Questionnaire-Short Form (IPAQ-SF), General Anxiety Disorder-7 (GAD-7) and Patient Health Questionnaire-9 (PHQ-9) was distributed to Universiti Tunku Abdul Rahman students via Google forms. **Results:** During lockdown, family income [χ^2 (1, n=124) = 5.155, p=0.023], and physical activity [χ^2 (1, n=134) = 6.366, p=0.012] were associated with anxiety, while depression was associated with gender [χ^2 (1, n=75) = 4.655, p=0.031]. After lockdown, family income was found to be associated with both anxiety [χ^2 (1, n=111) = 8.089, p=0.004], and depression [χ^2 (1, n=115) = 9.305, p=0.002]. During lockdown, family income (OR=1.60, p=0.018), and physical activity (OR=0.59, p=0.011) were predictors for anxiety, and gender (OR=0.65, p=0.046) being the only predictor for depression. After lockdown, family income was a predictor for both anxiety (OR=1.67, p=0.011), and depression (OR=1.70, p=0.009). **Conclusion:** Significant negative effects attributed to the COVID-19 lockdown, and certain factors predisposed to the worsening of mental health status in university students. Family income, physical activity level, and gender were some of the major determinants that influenced the anxiety and depression.

Keywords: COVID-19 lockdown; anxiety; depression; family income; physical activity

1. Introduction

The COVID-19 pandemic has affected the entire globe for the past 2 years on a major scale, causing unprecedented effects, and possibly altering the way we live in the near future. This ongoing catastrophe has solidified itself as one of the worst crises that has ever existed in human history, one that not only affects an individual's health, but also disrupts the social and economic harmony of the society. COVID-19 in essence is a respiratory disease, with common infection symptoms such as fever, chills, cough, fatigue, etc. (CDC, 2022), which is airborne and highly contagious. To curb the rates of infection, various public health measures were implemented including the Movement Control Order (MCO) where social and religious gatherings, outdoor recreational activities, operation of learning institution of all levels were prohibited, and only essential goods store and health care facility centres allowed to operate (Hashim et al., 2021; Tang, 2022).

Previous studies have shown that quarantine brought adverse mental health effects to the people even after the lockdown period. The aftereffects of quarantine was observed

during the SARS outbreak (Bai et al., 2004; Hawryluck et al., 2004) and it was suggested that worrying negative consequences may prolong even after it was lifted. Young adults, particularly university students have been suggested to be at greater risk of psychological distress in case of a health emergency as supported by findings where approximately 36% and 73% of sample exhibited symptoms of anxiety and depression respectively during COVID-19 pandemic (Villani et al., 2021). This seems consistent with findings from French (Husky et al., 2020), British (Savage et al., 2020), and American (Browning et al., 2021) studies conducted among university students during the COVID-19 lockdown.

Being in a phase where these students are transitioning into adulthood, it is essential for them to have the optimum mental health which allows them to be effective contributor towards the society in the future (Villani et al., 2021). As future leaders of the society, the well-being of the university students should be sought after and taken care of. With the current circumstances, it is essential to assess the determinants of mental health of this particular population so that the appropriate counter measures can be implemented for those vulnerable in sub-optimal levels. In Asian culture especially, showing emotions and revealing vulnerabilities are rarely done and students would opt for maladaptive coping strategies when they are faced with stress and anxiety which does not improve the underlying problem and would only worsen the situation with time (Kamaludin et al., 2020). Therefore, the objective of this study was to explore and compare the determinants and predictors of mental health (anxiety and depression) during and after COVID-19 lockdown among university students.

2. Methods

2.1. Study design and participants

A cross-sectional design was used for this study. The participants of focus were Universiti Tunku Abdul Rahman (UTAR) students, who were invited through university portal and Microsoft Teams subscribed under institutional emails. An online survey was prepared through Google Forms as face-to-face interaction with participants was not possible during the pandemic period. The sampling method used was convenience sampling. The inclusion criteria were that the students must be active UTAR student, aged 18-26 years old, and both genders, while the exclusion criteria were participants who has had any prior history of anxiety and depression before the COVID-19 pandemic. Sample size was calculated based on the 20158 number of UTAR students quoted by the Division of Admissions and Credit Evaluation of UTAR, and using the Krejcie and Morgan table (Krejcie & Morgan, 1970), a sample size of 379 with an additional 38 people to account for the 10% attrition rate, resulted in the final sample size to be 417.

This study was registered prospectively in clinicaltrials.org with the ID NTC05031988 and data was collected from 18 October 2021 to 16 December 2021. All the respondents were required to give their informed consent and provide digital signature before answering the questionnaire through Google forms. The study was conducted in accordance with the declaration of Helsinki and was approved by the Scientific and Ethical Review Committees (SERC) of UTAR under ethical approval no. U/SERC/127/2021.

2.2. Variables

The variables of focus were age, gender, race, living area and condition during and after COVID-19 lockdown, current restriction level and restriction level during COVID-19 lockdown, family income level, and pre-lockdown habits. Living area was whether the students were living in urban or rural regions and living condition was asking if the students were living with their family members or living with others (friends or alone). Restriction level was complete restriction (practicing complete social distancing measure and not going out for any activity) or partial and no restriction (practicing social distancing measure but only going out for essential activities or not practicing any social distancing measures). Family income level was based on the B40, M40 and T20 categories with B40 group pertaining to those reporting below RM4850 family income per month; M40

between RM4851 and RM10971 family income per month; T20 more than RM10971 family income per month (Rebecca, 2021). The students were categorized into B40 group (low income) or M40/T20 group (high income). Pre-lockdown habits was a yes or no question, whether the students engaged in active lifestyle prior to the lockdown. Presence of chronic disease was an open-ended question regarding any health conditions that has persisted for more than a month to be filled if relevant.

2.3. Outcome measures

Outcome measures including physical activity level (PA) and mental health of the participants were assessed during and after the COVID-19 lockdown. PA were assessed through the short form version of International Physical Activity Questionnaire (IPAQ-SF) featured 7 questions on frequency and duration spends in various forms/intensity of PA over a period of one week, which were categorized into (i) minimally active characterized by (a) 3 or more days of vigorous activity of at least 20 minutes per day OR (b) 5 or more days of moderate-intensity activity or walking of at least 30 minutes per day OR (c) 5 or more days of any combination of walking, moderate-intensity or vigorous intensity activities achieving a minimum of at least 600 MET-min/week; (ii) HEPA characterized by a) vigorous-intensity activity on at least 3 days achieving a minimum of at least 1500 MET-minutes/week OR b) 7 or more days of any combination of walking, moderate-intensity or vigorous intensity activities achieving a minimum of at least 3000 MET-minutes/week, or (iii) inactive characterized by those that doesn't fulfil any of the above-mentioned criteria. A spreadsheet developed (Cheng, 2016) was used to automatically process and group the data based on the criteria for each group. While for mental health, anxiety was assessed using General Anxiety Disorder-7 (GAD-7), depression and using Patient Health Questionnaire-9 (PHQ-9). GAD-7 and PHQ-9 features 7 and 9 questions respectively each with scoring based on the 4-point Likert scale. Participants were required to place a score of 0-3 on each statement, and the total score of each scale calculated and categorized the students into yes or no groups.

2.4. Statistical analysis

Data analysis was carried out with IBM SPSS software statistics version 20. Descriptive analysis was done on the depression and anxiety scores of both timelines. McNemar's test was carried out to assess the difference in scores of anxiety and depression during and after the lockdown. The assumptions were met which included i) one dichotomous dependent variable and one dichotomous independent variable, ii) mutually exclusive dependent variable, iii) sample is random. Chi-square test was carried out to assess the association between each demographic characteristic on the levels of anxiety and depression among the students. Logistic regression analysis was used to analyse the predictors of anxiety and depression.

2.5. Role of funders

No funder was associated with this study.

3. Results

3.1. Demographics

A total of 442 responses were collected. However, upon further screening, there were 8 duplicates found, 1 participant did not give consent, and 1 participants' data did not tally with the requirement of the questions. So, these 10 data sets were removed from the analysis process and only 432 responses were processed.

Most of the participants were aged between 18-21 years old (79.6%) and 69% of them were female. 97% were Chinese, most of them were living with family members during (92.1%) and after (89.1%) the COVID-19 lockdown, and in the city area during (78.9%) and after (81%) the lockdown as well. More than half of the students practiced complete restriction (53.7%) during the lockdown, but the majority shifted to practicing partial/no

restriction (88.9%) after the lockdown was lifted. Almost half of the participants were in the B40 income group (48.4%) and more than half of them had pre-lockdown habits (59.7%) of living an active lifestyle (Table 1).

Table 1. Demographics of participants.

Demographic data	Frequency (%)
Age	
18-21	344 (79.6)
22-26	88 (20.4)
Gender	
Male	134 (31.0)
Female	298 (69.0)
Living condition during COVID-19 Lockdown	
Living with friends/alone	34 (7.9)
Living with family members	398 (92.1)
Current Living condition	
Living with family members	47 (10.9)
Living with friends/alone	385 (89.1)
Living area during COVID-19 Lockdown	
Rural area	91 (21.1)
City area	341 (78.9)
Current Living area	
Rural area	82 (19.0)
City area	350 (81.0)
Restriction level during COVID-19 lockdown	
Complete restriction	232 (53.7)
Partial/No restriction	200 (46.3)
Current restriction level	
Complete restriction	48 (11.1)
Partial/No restriction	384 (88.9)
Family income level	
B40	209 (48.4)
M40/T20	223 (51.6)
Pre-lockdown habits	
No	174 (40.3)
Yes	258 (59.7)
Presence of chronic disease	
None	418 (96.8)
Asthma	3 (0.7)
Ankylosing spondylitis	1 (0.2)
Diabetes	1 (0.2)
Headache	1 (0.2)
Tetralogy of Fallout	1 (0.2)
Hyperthyroidism	2 (0.5)
Irritable bowel syndrome	1 (0.2)
Scoliosis	1 (0.2)
Sinusitis	2 (0.5)
Thalassemia	1 (0.2)

3.2. Association of anxiety and depression with participants' demographics

To evaluate the effect of lockdown on the mental health of students, McNemar's test was ran to assess the differences during and after the lockdown. As shown in Table 2, both outcome measures showed a significant improvement from during lockdown to after lockdown (anxiety, $p < 0.001$ & depression, $p < 0.001$). Anxiety during COVID-19 lockdown (53.7%) has improved post-lockdown (46.1%). Depression has also decreased from during the COVID-19 lockdown (63.4%) to post-lockdown (47.5%).

Table 2. Difference in anxiety and depression level before and after COVID-19 lockdown.

	During Lockdown n (%)	Post-Lockdown n (%)	McNemar's Test p-value
Anxiety			<0.001**
Yes	232 (53.7)	199 (46.1)	
No	200 (46.3)	233 (53.9)	
Depression			<0.001**
Yes	274 (63.4)	205 (47.5)	
No	158 (36.6)	227 (52.5)	

McNemar's Test, level of significance <0.05

3.3. Determinants of anxiety and depression

Pearson's Chi-square test (Table 3) was conducted to identify the association of participant's characteristics with determinants of anxiety and depression. During lockdown, family income [χ^2 (1, n=124) = 5.155, p=0.023], and PA [χ^2 (1, n=134) = 6.366, p=0.012] was found to be significantly associated with anxiety. Students with family income in the B40 group (59%) were found to have higher anxiety than students in the higher income group (48%), and inactive students (49%) were less likely to be anxious than active students (62%). Depression was found to be significantly associated with gender [χ^2 (1, n=75) = 4.655, p=0.031], where male students (56%) were less likely to be depressed when compared to female students (69%).

Table 3. Association of anxiety and depression with participants' characteristics.

	During Lockdown		After lockdown	
	Yes n (%)	None n (%)	Yes n (%)	None n (%)
Age				
18-21	181 (52.6)	163 (47.4)	156 (45.3)	188 (54.7)
22-26	51 (58.0)	37 (42.0)	43 (48.9)	45 (51.1)
χ^2	0.803		0.348	
p-value	0.370		0.555	
Gender				
Male	73 (54.5)	61 (45.5)	57 (42.5)	77 (57.5)
Female	159 (53.4)	139 (46.6)	142 (47.7)	156 (52.3)
χ^2	0.0472		0.973	
p-value	0.829		0.324	
Living condition				
Living W Others	21 (61.8)	13 (38.2)	22 (46.8)	25 (53.2)
Living W Family	211 (53.0)	187 (47.0)	177 (46.0)	208 (54.0)
χ^2	0.965		0.012	
p-value	0.326		0.914	
Living Area				
Rural	49 (53.8)	42 (46.2)	39 (47.6)	43 (52.4)
Urban	183 (53.7)	158 (46.3)	160 (45.7)	199 (54.3)
χ^2	0.001		0.091	
p-value	0.976		0.763	
Restriction level				
Complete restriction	132 (56.9)	100 (43.1)	27 (56.2)	21 (43.8)
Other restriction	100 (50.0)	100 (50.0)	172 (44.8)	212 (55.2)
χ^2	2.055		2.255	

p-value	0.153		0.133	
Family income				
B40	124 (59.3)	85 (40.7)	111 (53.1)	98 (46.9)
M40/T20	108 (48.4)	115 (51.6)	88 (39.5)	135 (60.5)
χ^2	5.155		8.089	
p-value	0.023**		0.004**	
Pre-lockdown habits				
No	92 (52.9)	82 (47.1)	86 (49.4)	88 (50.6)
Yes	140 (54.3)	118 (46.3)	113 (43.8)	233 (53.9)
χ^2	0.081		1.324	
p-value	0.776		0.250	
IPAQ-SF				
Inactive	134 (49.1)	139 (50.9)	103 (45.0)	126 (55.0)
Active	98 (61.6)	61 (38.4)	96 (47.3)	107 (52.7)
χ^2	6.366		0.232	
p-value	0.012**		0.630	
		Depression		
	Yes	None	Yes	None
	n (%)	n (%)	n (%)	n (%)
Age				
18-21	216 (62.8)	128 (37.2)	159 (46.2)	185 (53.8)
22-26	58 (65.9)	30 (34.1)	46 (52.3)	42 (47.7)
χ^2	0.294		1.029	
p-value	0.588		0.310	
Gender				
Male	75 (56.0)	59 (44.0)	58 (43.3)	76 (56.7)
Female	199 (66.8)	99 (33.2)	147 (49.3)	151 (50.7)
χ^2	4.655		1.355	
p-value	0.031**		0.244	
Living condition				
Living W Others	26 (76.5)	8 (23.5)	27 (57.4)	20 (42.6)
Living W Family	248 (62.3)	150 (37.7)	178 (46.2)	207 (53.8)
χ^2	2.707		2.112	
p-value	0.100		0.146	
Living Area				
Rural	55 (60.4)	36 (39.6)	41 (50.0)	41 (50.0)
Urban	219 (64.2)	122 (35.8)	164 (46.9)	186 (53.1)
χ^2	0.443		0.263	
p-value	0.506		0.608	
Restriction level				
Complete restriction	152 (65.5)	80 (34.5)	28 (58.3)	20 (41.7)
Other restriction	122 (61.0)	78 (39.0)	177 (46.1)	207 (53.9)
χ^2	0.945		2.563	
p-value	0.331		0.109	
Family income				
B40	135 (64.6)	74 (35.4)	115 (55.0)	94 (45.0)
M40/T20	139 (62.3)	84 (37.7)	90 (40.4)	133 (59.6)
χ^2	0.238		9.305	
p-value	0.626		0.002**	
Pre-lockdown habits				
No	111 (63.8)	63 (36.2)	90 (51.7)	84 (48.3)
Yes	163 (63.2)	95 (36.8)	115 (44.6)	143 (55.4)
χ^2	0.017		2.131	
p-value	0.896		0.144	
IPAQ-SF				
Inactive	172 (63.0)	101 (37.0)	111 (48.5)	118 (51.5)
Active	102 (64.2)	57 (35.8)	94 (46.3)	109 (53.7)

χ^2	0.057	0.203
p-value	0.811	0.653

Chi-square test, level of significance <0.05

After the COVID-19 lockdown, family income [χ^2 (1, n=111) = 8.089, p=0.004] was found to be significantly associated with anxiety, where students with family income in the B40 group (53%) had more odds of being anxious than students with higher family income (40%). Depression was found to be significantly associated with family income [χ^2 (1, n=115) =9.305, p=0.002] and students with lower family (55%) were at higher risk of being depressed than students in families with higher income (40%).

3.4. Predictors of anxiety and depression during and after COVID-19 lockdown

To further assess the predictors of anxiety and depression, logistic regression was conducted (Table 4). During the lockdown, family income and PA were found to be significant predictors of anxiety in the model $\chi^2(9) = 18.255$, P=0.032, variance 5.5% (Nagelkerke R Square). Students in the lower family income group were 1.61 times more likely to be anxious and inactive students were 0.59 times less likely to become anxious. For depression, the model was found to be statistically insignificant $\chi^2(9) = 8.987$, P=0.438, variance 2.8% (Nagelkerke R Square), with gender being the only predictor detected, in which male students were at 0.65 times lesser to become depressed than females.

Table 4. The predictors of anxiety and depression during and after the lockdown.

	During Lockdown				After lockdown			
	OR	p-value	95% CI for OR		OR	p-value	95% CI for OR	
			Lower	Upper			Lower	Upper
Anxiety								
Age	0.909	0.706	0.554	1.492	0.889	0.642	0.543	1.458
Gender	1.080	0.722	0.706	1.652	0.831	0.392	0.543	1.270
Living condition	1.438	0.349	0.672	3.077	1.068	0.841	0.559	2.040
Living Area	0.943	0.813	0.582	1.528	0.965	0.890	0.584	1.595
Restriction level	1.363	0.124	0.918	2.025	1.453	0.245	0.774	2.727
Family income	1.611	0.018**	1.084	2.393	1.671	0.011**	1.126	2.480
Pre-lockdown habits	1.018	0.930	0.682	1.520	1.264	0.254	0.847	1.886
Physical Activity	0.589	0.011**	1.084	2.393	0.845	0.411	0.565	1.263
Depression								
Age	0.934	0.794	0.561	1.557	0.845	0.508	0.514	1.390
Gender	0.648	0.046**	0.422	0.993	0.780	0.256	0.509	1.197
Living condition	1.935	0.125	0.832	4.501	1.797	0.080	0.933	3.462
Living Area	0.875	0.592	0.536	1.427	1.063	0.814	0.641	1.761
Restriction level	1.204	0.368	0.804	1.803	1.514	0.200	0.803	2.855
Family income	1.100	0.645	0.734	1.647	1.702	0.009**	1.145	2.529
Pre-lockdown habits	0.990	0.961	0.657	1.492	1.299	0.203	0.868	1.942
Physical Activity	0.937	0.761	0.618	1.421	1.079	0.711	0.720	1.617

Logistic Regression: Reference for Age (18-21 years old), Gender (Male), Living condition (Living with others), Living Area (Rural), Restriction level (Complete restriction), Family income (B40), Pre-lockdown habits (None), Anxiety (Yes), Depression (Yes), Physical Activity (Inactive) are as indicated.

**Statistics are significant at p<0.05

After the lockdown, the model was found to be statistically insignificant $\chi^2(9) = 13.223$, P=0.153, variance 4% (Nagelkerke R Square) for anxiety, with family income being the only predictor where students in the lower family income group were 1.67 times more likely to be anxious. For depression, family income was detected to be the only significant

predictor in the model $\chi^2(9) = 19.808$, $P=0.019$, variance 6% (Nagelkerke R Square). Students in the lower family income group had 1.702 more odds of being depressed.

4. Discussion

The primary objective of this study was to explore and compare the determinants and predictors of mental health (anxiety and depression) during and after COVID-19 lockdown among university students. To our knowledge, this is the first study that compared the determinants of mental health during and after COVID-19 lockdown among university students. Participants' characteristics that were found to be associated with anxiety were family income and PA; for depression, it was gender and family income. During lockdown, students from low-income family had higher anxiety than the higher income, and inactive students were less likely to be anxious than active students, whilst female students were more likely to be depressed when compared to male students. After lockdown, students from low-income family had more odds of being anxious and depressed than the higher income family. As expected, anxiety and depression improved in the post-lockdown period. We found that predictors of anxiety were family income and PA, while depression were gender and family income. During lockdown, for anxiety, low family income and being inactive were the predictors, while for depression, females were the predictors. After lockdown, low family income was a predictor for both anxiety and depression.

Family income would affect the stability of the household which leads to drastic consequences, hence, students in the low-income group scored worse than those in the higher income group. Among the stressors, financial constraint was highlighted as keeping students worrying about their ability to commit to the requirements of their education because of fear of family loss of income (Sundarasan et al., 2020a). Abrupt interruption in their studies would contribute to worsening of anxiety and depression as they would then be exposed to COVID-related information for most of the time and result in accumulation of unsettling thoughts (Lipert et al., 2021). PA level was found to be associated with and a predictor of anxiety during the lockdown where inactive students were less likely to be anxious. Although exercise in general has optimal effect on the mental health of an individual, it has also been suggested that the type, duration, and intensity of exercises elicit different ranges of response (Chekroud et al., 2018). It is observed that duration of exercise between 30-60 minutes, reaps highest benefits in lowering mental health burden and this slowly declines with more duration of exercise and even worsen the mental state when it exceeds 3 hours (Chekroud et al., 2018). This could mean that participants in our study may have been participating in longer duration of exercise, which may have elicited a negative impact on their anxiety and depression level. Our study demonstrated that females was associated and a predictors of becoming depressed during and after lockdown compared to males, and this finding was similar to other studies, where authors found that females face such mental health issues during health emergencies and mandatory quarantine (Rodríguez-Hidalgo et al., 2020; Villani et al., 2021). In addition, females capacity for uncertainty is suggested to be lower than males, and this may have led to increase in the mental health scores (Sundarasan et al., 2020b). We hypothesize this uncertainty among female university students probably comes from being more fearful of COVID-19 than male students as demonstrated by some other studies (Huang & Zhao, 2020; Sandin et al., 2020) and this relatively new researched area would have more insights to uncover with time.

Surprisingly, age, living area, living condition and restriction level were not associated with either outcome. Age was not a significant determinant of anxiety or depression both during and after lockdown. This may be due to the fact that students were utilizing electronic gadgets for the online classes, so there were no discrepancies between the younger and older student groups as they were exposed to social media for similar periods of time. For living area i.e. rural or city area and living condition i.e. living with or without their families, were not statistically associated with anxiety or depression, which

could be attributed to the fact that this was not the first lockdown imposed by the government. It has been around 2 years ever since the first MCO was implemented, and it could be that the students were already accustomed to living with MCO. When it comes to the restriction level that students were practicing, there was no association to either anxiety or depression similar to a study in Germany where higher restriction levels only lead to increased feelings of loneliness and not contribute to anxiety or depression symptomatology (Benke et al., 2020). This suggests for future programs to help mitigate feelings of loneliness which could assist in combatting anxiety and depression. Pre-lockdown habits were not associated with anxiety and depression of students both during and after the lockdown. No changes were observed in the PA level of 60% of Chinese adults in China and this could explain the insignificant differences in scores of the anxiety and depression as their routine were probably similar to that before the lockdown (Wang et al., 2011). Students who have practiced PA prior to lockdown would continue to do so entering lockdown and their mental health status would remain the same and vice versa.

We found that there were improvement in anxiety and depression during compared to after the lockdown signifies that the lockdown has had a significant negative impact on the mental health of university students similar to a study in Italy where the ill-effects of the lockdown quickly vanished after it was lifted (Meda et al., 2021). Anxiety showed a significant reduction after the lockdown (Meda et al., 2021) and this should not be a surprise, as with the lifting of quarantine/lockdown, students are no longer confined to limited spaces, activities and entertainment. Social distancing is no longer necessary; gyms, swimming pools, theme parks and local recreations parks are no longer prohibited, and students are now able to develop and maintain interpersonal contact and relationships (Lipert et al., 2021). Positive effect was seen in people who leave their home three or more times per week compared to those leaving less often and this was attributed to the increased variation in the routine of the people (Gloster et al., 2020). Being able to be free, meeting people, and experiencing the novel certainly brings positivity and excitement and improves the mental health of the students. Our study demonstrated that compared to lockdown period, mental health of students improved after lifting of the lockdown, which was promising.

Limitations of study

Data was collected online through Google form using self-reporting questionnaire, so there might be possibility of biasness arising from social desirability. We would suggest conducting future studies in face-to-face fashion which could increase the credibility of the response. There is also recall bias which we have to admit is unavoidable however, as when obtaining the data for during COVID-19 lockdown, it was done in a recalling fashion since the data collection process started when the lockdown had already been lifted. We would suggest for future studies to be conducted in a longitudinal method to account for the recall bias in future studies on global emergencies.

5. Conclusion

During lockdown, students from low-income family have higher anxiety than the higher income, and inactive students were less likely to be anxious than active students, whilst female students were more likely to be depressed when compared to male students. After lockdown, students from low-income family had more odds of being anxious and depressed than the higher income family. As expected, anxiety and depression improved post-lockdown highlighting lockdown negatively affected the mental health of university students. In regards the predictors, during lockdown, for anxiety, low family income and being inactive were the predictors, while for depression, females was the predictors. In short, certain groups of students were found to be more vulnerable than the others during and after lockdown, thus, there is a strong need in implementation of public health measures in the future that these group of be given more consideration so that they are able to cope better including financial support and promoting active lifestyle.

Conflicts of Interest: All co-authors have seen and agree with the contents of this manuscript and there is no financial or any other interest to report.

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