Psychological Impact of COVID-19 Pandemic on Students at the University of Ibadan in Nigeria

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Authors' contributions

*This study was carried out with collaboration among all authors. Authors BAA, YCA, OEO and PSA
conceived the study. All authors participated in study design and data collection. Authors BAA and
YCA carried out the analysis. All authors participated in writing the first draft, authors BAA and YCA
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ABSTRACT

Introduction: The novel coronavirus (COVID-19) pandemic has necessitated the implementation
of public health measures including social distancing, quarantine, and lockdown. Nigerian public
universities have been closed since March 2020 after the viral outbreak. This study was carried out
in order to investigate the psychological impact of COVID-19 on undergraduate students.

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Methods: The study was carried out among students of the College of Medicine, University of Ibadan. Study participants were recruited by snowballing sampling technique and data collection was via online self-administered questionnaires. The questionnaire was adapted from the Depression, Anxiety and Stress Scale (DASS-21) and the Revised Impact of Event Scale (IES-R) to determine scores for depression, anxiety, stress and post-traumatic stress disorder (PTSD).
Results: There were 322 participants with a median age of 22.4 (IQR = 20.5-24.2) years. Psychological impact was mild to moderate in 20.2%, and severe in 19.6%. Depression was mild to moderate in 19.3%, severe to extremely severe in 5.3%. Anxiety was mild to moderate in 10.3%, severe to extremely severe in 7.5%. Stress was mild to moderate in 16.4%, severe to extremely severe in 2.2%. Factors associated ($p < 0.05$) with increased levels of depression, anxiety, stress and PTSD include increase in time spent on social media, TV and movies, sleep duration, and decrease in physical activity.
Conclusion: The COVID-19 pandemic has resulted in significant changes for Nigerian university students. Two-fifth of them reported PTSD symptoms; one-fourth reported depression; about one-fifth reported anxiety and stress. Students need psychosocial support to help them cope with and to effectively adapt to the changes caused by the pandemic.

1. INTRODUCTION

The Chinese public health authorities first reported cases of the acute respiratory syndrome in Wuhan City, Hubei Province, China at the end of December 2019 [1]. This fatal disease is now referred to as the Coronavirus Disease 2019 (COVID-19) and the causative agent is a new strain of Coronavirus called the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) which has not been previously recognized in humans [2].

The COVID-19 outbreak was declared a pandemic on 11 March 2020. And in order to prevent the spread of the virus, the World Health Organization recommends regular hand washing with soap and water, use of alcohol-based hand sanitizers and social distancing. The strategies of social distancing include closure of educational institutions, cancellation of mass gatherings and stay-at-home recommendations [3,4]. Other public health measures put in place include quarantine – movement restriction of close contacts of infected patients during the incubation period – and isolation, which is the separation of ill people from non-infected people, especially in hospital settings.

Not only is quarantine associated with stressors and negative psychological effects during and after the period [5], school closure and disruption of academic progress also have devastating effects of varying sizes on young people. Students with mental health challenges could experience worsening of conditions. Moreover, disturbance to the impact of peer bonding and school routine may have mental health effects on adolescents. Lee (2020) noted that final year students are categorically affected by school closures due to closure of hall residence leading to inability to access the usual amenities, cancellation of their graduation and induction for professional students [6]. In addition, students are often negatively hurt by anything that constitutes a delay to achieving their academic pursuits and prospective career goals [6]. In a study conducted by Cao et al. [7], about 24.9% of college students had experienced various level of anxiety during this COVID-19 pandemic due to its effects on their studies, graduation and future employment [7].

Most of the research on the impact of COVID-19 on students have been from China, USA and Europe while there is paucity of data from the African continent. As part of the measures put in place in order to curtail the spread of SARS-CoV-2, Nigerian public universities have been shut down since March 2020 after the COVID-19 outbreak was declared in the country. Students at different levels of training were made to suspend academic activities abruptly and vacate their respective campuses nationwide. We therefore set out to investigate the impact of the pandemic on the psychological well-being of students from one of the foremost public university in South-West Nigeria.

2. METHODS

This study was a cross-sectional study conducted among undergraduate students of the College of Medicine, University of Ibadan in

Nigeria. The College of Medicine was established alongside the university in 1948, as Faculty of Medicine and has graduated many students over the years. It currently has 9 departments with undergraduate training. All the departments participated in the study.

2.1 Sample Size Calculation

We estimated the minimum sample size using the Cochran formula [8] at 95% confidence interval and based on the information from a previous study [7]; given that Z) =1.96, p (proportion of students with psychological problems) =0.25, q (1-p) = 0.75 and e (margin of error) =0.05, using these values, an estimated sample size of 287 was estimated. An anticipated 10% attrition rate was added to make a total of 315 participants.

2.2 Data Collection

The contacts of students of the college were obtained from the students' representatives of the different departments within the College of Medicine, University of Ibadan. A convenience sampling method was adopted through a web-based questionnaire designed using Google Forms. An online approach was adopted to get a quick response and to ensure compliance with the preventive measures of COVID-19, especially physical distancing. The survey questionnaires were shared on electronic platforms and online social media like emails and WhatsApp with the students. . Study participants will also be encouraged to share the link to the survey with other students and research team members were assigned to follow up on the respondents.

The questionnaires assessed respondents' sociodemographic characteristics, psychological impact of COVID-19, their mental state and level of changes in their daily routine during the pandemic. Psychological distress experienced by study participants as a result of COVID-19 was assessed using the Impact of Event Scale - Revised (IES-R) scale while mental state was assessed using the Depression, Anxiety and Stress Scale (DASS-21). DASS-21 has been previously validated among Nigerian students [9] with good psychometric properties. IES-R also offers a good assessment of post-traumatic stress symptoms [10,11] and has been used within Nigeria (11) and outside Nigerian population to study the psychological impact of COVID-19 [12,13].

2.3 Measures

Data was collected with the following instruments

1. Sociodemographic Questionnaire
2. IES-R score was classified as follows: 0-23 (normal), 24-32 (mild physiological impact), 33-36 (moderate physiological impact), ≥37 (severe psychological impact).
3. The Depression, Anxiety and Stress Scale (DASS-21) is a 21-item questionnaire made up of 3 subscales – depression, anxiety and stress. Questions 3, 5, 10, 13, 16, 17 and 21 make up the depression subscale which is interpreted as follows: 0-9 (normal), 10-12 (mild depression), 13-20 (moderate depression), 21-27 (severe depression), 28-42 (extremely severe depression). Questions 2, 4, 7, 9, 15, 19 and 20 make up the anxiety subscale which is interpreted as follows: 0-6 (normal), 7-9 (mild anxiety), 10-14 (moderate anxiety), 15-19 (severe anxiety), 20-42 (extremely severe anxiety). Questions 1, 6, 8, 11, 12, 14 and 18 make up the stress subscale which is interpreted as follows: 0-10 (normal), 11-18 (mild stress), 19-26 (moderate stress), 27-34 (severe stress), 35-42 (extremely severe stress).

2.4 Data Management

Collected data was exported into statistical package SPSS version 23 for analysis. Frequencies and proportions were computed for the sociodemographic characteristics, knowledge, perceptions and changes and physical and social activities. The IES-R and DASS-21 subscales scores were expressed as means and standard deviations. Linear regression analysis was used to calculate associations between sociodemographic characteristics, changes in activities, and the IES-R and DASS-21 scores. Significance level was set at 0.05.

The aim and objectives of the study were clearly written at the beginning of the survey. Confidentiality, voluntariness and the estimated time it will take to complete the questionnaire were explained to potential respondents on the survey. Respondents were also informed that by choosing to access the survey link, they are providing their consent to participate and were given the option to opt out, if they choose to.

3. RESULTS

Three hundred and twenty-two participants completed the online survey. The distribution of the respondents across sociodemographic characteristics are presented in Table 1. The faculty of Clinical Science constituted the largest percentage of respondents (61.8%) followed by the faculty of Basic Medical Science (20.8%), Dentistry (9.6%) and Public Health (7.8%). The modal year of study was 5th year and the modal age group was 21-25 years. The median age is 22.4 years (interquartile range (IQR): 20.5 - 24.2 years). There were only two respondents above the age of 31. Married respondents were very few, making up 1.9% of the respondents.

Table 2 shows the psychological impact and mental health status of the respondents on the IES-R and DASS-21. The mean IES-R score was 21.44 (SD = 16.34). There was minimal psychological impact in 194 (60.2%) of the respondents, mild psychological impact in 47 (14.6%) respondents, moderate psychological impact in 18 (5.6%) respondents, and severe in 63 (19.6%) of the respondents. Mean depression score was 5.70 (SD = 7.59). Of all respondents, 243 (75.5%) are considered to have normal depression scores, 35 (10.9%) have mild depression scores, 27 (8.4%) have moderate depression scores, 7 (2.2%) have severe depression scores, and 10 (3.1%) have extremely severe depression scores. Mean anxiety score was 3.32 (SD = 5.94). Two hundred and seventy (83.9%) respondents have normal anxiety scores, 15 (4.7%) have mild anxiety scores, 18 (5.6%) have moderate anxiety scores, 6 (1.9%) have severe anxiety scores, and 13 (5.6%) have extremely severe anxiety scores. Mean stress score was 5.47 (SD = 7.13).

The faculty of Basic Medical Science had significantly higher IESR (B = 4.96, 95% CI: 0.44 – 9.44), depression (B = 3.33, 95% CI: 1.25 – 5.41), anxiety (B = 2.51, 95% CI: 0.88 – 4.14) and stress (B = 3.36, 95% CI: 1.41 – 5.31) scores then the faculty of Clinical Science. The psychological impact was significantly higher (IESR B = 6.89, 95% CI: 0.10 – 13.68) in the faculty of Public Health than Clinical Science. Age, marital status and gender were not significantly associated with psychological impact, depression, anxiety and stress. Fourth year students had significantly higher IESR, depression, anxiety and stress scores than 6th year students. Students in their 3rd year of study had significantly higher IESR, depression and

stress scores than 6th year students. There was no statistically significant difference between 1st year students, 5th year students and 6th year students [Table 3 and Table 3 (Suite)].

One hundred and thirty-three (41.3%) respondents consider the time they have spent on social media to have extremely increased, 97 (30.1%) report a moderate increase, 47 (14.6%) report a slight increase, 18 (5.6%) considered their time usage on social media to be the same. Twenty-seven respondents consider their time usage on social media to have decreased; 9 (2.8%) rate a slight decrease, 9 (2.8%) rate a moderate decrease and 9 (2.8%) rate an extreme decrease (Table 4). Majority of the respondents consider their food intake to have increased. Eighty-eight (27.3%) report a slight increase in food intake, 80 (24.8%) report a moderate increase while 66 (20.5%) consider their food intake to be the similar to the pre-pandemic period. Extreme increase in time spent on social media was significantly associated with higher IESR (B = 17.35, 95% CI: 9.58 – 25.12), depression (B = 5.52, 95% CI: 1.85 – 9.18), anxiety (B = 3.65, 95% CI: 0.73 – 6.57) and stress (B = 5.24, 95% CI: 1.79 – 8.70) scores than those whose time on social media had not changed. (Table 4). Extreme increase in food intake was significantly associated with higher degrees of psychological impact (B = 7.49, 95% CI: 0.63 – 14.34). There was no significant association between food intake and depression, anxiety and stress (Table 4).

There was no significant association found between changes in time spent studying and IESR, depression, anxiety and stress scores (Table 4).

Majority of respondents had an increase in the time spent sleeping. Ninety-five (29.5%) considered their sleeping time to have slightly increased; 88 (27.3%) had their sleeping time moderately increased; 65 (20.2%) had extremely increased their sleeping time. [Table 4 (Suite)].

Table 4 (suite) shows that eighty (24.8%) respondents report a slight increase in the level of their physical activity, 79 (24.5%) have not changed in the level of physical activity they engage in; 42 (13%) have extremely decreased level of physical exercise; 41 (12.7%) have moderately increased in their levels of physical exercise; slight decrease among 34 (10.6%); moderate decrease among 31 (9.6%); and extreme increase among 15 (4.7%).

Table 1. Sociodemographic characteristics of respondents (N = 322)

Characteristics	Frequency (%)
Faculty	
Basic Medical Science	67 (20.8)
Clinical Science	199 (61.8)
Dentistry	31 (9.6)
Public Health	25 (7.8)
Course of study	
Biochemistry	19 (5.9)
Biomedical Laboratory Science	30 (9.3)
Dentistry	31 (9.6)
Environmental Health Science	10 (3.1)
Human Nutrition	14 (4.3)
Medicine and Surgery	126 (39.1)
Nursing	56 (17.4)
Physiology	11 (3.4)
Physiotherapy	25 (7.8)
Year of study	
1st	10 (3.1)
2nd	35 (10.9)
3rd	53 (16.5)
4th	91 (28.3)
5th	114 (35.4)
6th	19 (5.9)
Age	
16-20	81 (25.2)
21-25	215 (66.8)
26-30	24 (7.5)
31 and above	2 (0.6)
Gender	
Female	184 (57.1)
Male	138 (42.9)
Marital status	
Married	6 (1.9)
Single	316 (98.1)

Most students had increased the time spent on watching movies and TV. The time has moderately increased in 78 (24.2%); slightly increased in 74 (23%); extremely increased in 65 (20.2%); remained the same in 62 (19.3%); slightly decreased in 21 (6.5%); moderately decreased in 13 (4%); extremely decreased in 9 (2.8%) [Table 4 (suite)].

Table 4 (suite) shows that students who reported a change in their sleep time had significantly higher IESR scores than those whose sleep time had remained the same. Students whose sleep time had extremely increased had significantly higher IESR, depression anxiety and stress scores.

Those who had extreme decrease in their levels of physical exercise had significantly higher IESR (B = 11.00, 95% CI: 5.02 – 16.98), depression (B = 5.63, 95% CI: 2.90 – 8.85) and

stress scores (B = 3.40, 95% CI: 0.74 – 6.05) than those whose levels of exercise had not changed [Table 4 (suite)].

Changes in time spent on watching movies and television were not significantly associated with psychological distress, anxiety and stress scores. Extremely increased time devoted to movies and TV was associated with higher depression scores (B = 3.01, 95% CI: 0.41 – 5.62) relative to those who experienced no change in time spent on TV and movies [Table 4 (Suite)].

4. DISCUSSION

Psychological impact was minimal in majority of the study participants during the COVID-19 pandemic as the mean IES-R score was normal. Depression, anxiety and stress subscale scores were also generally within normal limits in

majority of the population. According to the DASS-21 instrument used, 24.5% of the study population have symptoms of depression, 16.1% have symptoms of anxiety, 18.6% are stressed, and 39.8% have symptoms of post-traumatic stress disorder (PTSD). The proportion of people with depression is comparable to the pre-COVID-19 prevalence that was obtained (25.2%) among university students in Western Nigeria, where our study participants are located [14]. Another study conducted in Lagos, Nigeria in the pre-pandemic era had found the prevalence of depression, anxiety and stress among Nigerian students to be 6.3%, 9.5% and 61.6% respectively [15]. This study suggests that more students are depressed and anxious, while fewer are stressed during the COVID-19 period compared to the period before the pandemic. This study however, found a higher prevalence of PTSD compared to a study done before the pandemic among students in Jos, Nigeria. The foregoing suggests that the COVID-19 pandemic results in a higher prevalence of PTSD than what was obtainable among students in Jos – a city with a high prevalence of childhood trauma from religious conflicts and terrorism [16]. This could suggest that COVID-19 appears to have same, or even worse,

psychological impact as other traumatic life events like war and terrorism. Notwithstanding, caution must be exercised in interpreting our findings in this manner as homogeneity of both student populations cannot be ascertained.

In another study conducted among health care workers in Singapore during the COVID-19 pandemic, 14.5% of participants had symptoms of anxiety, 8.9% depression, 6.6% stress, and 7.7% PTSD [13]. The prevalence of depression and anxiety reported in this study is very high compared to the World Health Organization (WHO) national estimates (3.9% depression prevalence and 2.9% anxiety prevalence in Nigeria). Interestingly, the proportion of study participants with extremely severe depression (3.1%) scores mirrors closely what obtains in the Nigerian population (3.9%) before the pandemic [17]. One is left to wonder whether this numbers represent the proportion of those with baseline depression. However, compared with the results of a meta-analysis of studies conducted among the general population during the pandemic (prevalence of depression, anxiety and stress was 33.7%, 31.9% and 29.6% respectively), the psychological impact appears somewhat lesser among students [18].

Table 2. Psychological impact of COVID-19 and mental health status of respondents

Variable	N	%
Impact of Event - Revised (IES-R) scale (Mean Score = 21.44 ± 16.34)		
Minimal Impact	194	60.2
Mild Impact	47	14.6
Moderate Impact	18	5.6
Severe Impact	63	19.6
Depression, Anxiety and Stress Scale (DASS-21)		
Depression Subscale (Mean Score = 5.70 ± 7.59)		
Normal	243	75.5
Mild	35	10.9
Moderate	27	8.4
Severe	7	2.2
Extreme Severe	10	3.1
Anxiety Subscale (Mean Score = 3.32 ± 5.94)		
Normal	270	83.9
Mild	15	4.7
Moderate	6	1.9
Severe	13	5.6
Stress Subscale (Mean Score = 5.47±7.13)		
Normal	262	81.4
Mild	41	12.4
Moderate	12	3.7
Severe	6	1.9
Extreme Severe	1	0.3

Table 3. Association between sociodemographic characteristics and the psychological impact of COVID-19 and the mental health status of respondents (N = 322)

Variables	n (%)	Impact of event Beta (95% Confidence Interval B (95% CI)	Depression B (95%CI)	Anxiety B (95% CI)	Stress B (95% CI)
Faculty					
Dentistry	31 (9.6)	3.32 (-2.86 to 9.50)	2.69 (-0.20 to 5.48)	1.37 (-0.86 to 3.60)	2.43 (-0.23 to 5.10)
Public Health	25 (7.8)	6.89* (0.10 to 13.68)	2.92 (-0.20 to 6.04)	2.14 (-0.31 to 4.59)	2.46 (-0.47 to 5.39)
Basic Medical Sciences	67 (20.8)	4.96* (0.44 to 9.47)	3.33* (1.25 to 5.41)	2.51* (0.88 to 4.14)	3.36* (1.41 to 5.31)
Clinical Sciences	199 (61.8)	19.55** (17.29 to 21.82)	4.52** (3.48 to 5.57)	2.50** (1.69 to 3.32)	4.34** (3.36 to 5.32)
Course of study					
Physiotherapy	25 (7.8)	9.09* (2.16 to 16.03)	1.36 (-1.84 to 4.57)	0.71 (-1.82 to 3.23)	1.79 (-1.22 to 4.80)
Environmental health science	10 (3.1)	3.81 (-6.60 to 14.22)	0.52 (-4.28 to 5.33)	0.91 (-2.89 to 4.69)	1.11 (-3.41 to 5.63)
Physiology	11 (3.4)	6.79 (-3.17 to 16.75)	8.07* (3.47 to 12.67)	4.81** (1.19 to 8.44)	6.66* (2.33 to 10.98)
Human nutrition	14 (4.3)	14.18** (5.26 to 23.11)	5.24* (1.12 to 9.36)	4.05* (0.80 to 7.30)	4.68* (0.81 to 8.56)
Biochemistry	19 (5.9)	7.51 (-0.29 to 15.30)	0.26 (-3.34 to 3.86)	1.48 (-1.36 to 4.32)	0.64 (-2.75 to 4.02)
Biomedical laboratory science	30 (9.3)	7.94* (1.51 to 14.38)	3.32* (0.35 to 6.29)	2.97* (0.63 to 5.31)	4.311* (1.52 to 7.11)
Dentistry	31 (9.6)	5.48 (-0.87 to 11.83)	2.69 (-0.25 to 5.62)	1.78 (-0.54 to 4.09)	2.89* (0.13 to 5.64)
Nursing	56 (17.4)	3.83 (-1.26 to 8.91)	0.06 (-2.29 to 2.41)	1.55 (-0.31 to 3.40)	1.47 (-0.74 to 3.68)
Medicine and Surgery	126 (39.1)	17.39** (14.57 to 20.21)	4.48** (3.17 to 5.78)	2.10** (1.07 to 3.12)	3.89** (2.66 to 5.11)
Year of study					
1st	10 (3.1)	10.24 (-2.17 to 22.65)	3.08 (-2.60 to 8.77)	4.25 (-0.15 to 8.65)	3.074 (-2.27 to 8.42)
2nd	35 (10.9)	8.41 (-0.64 to 17.46)	6.48* (2.34 to 10.63)	5.74* (2.53 to 8.95)	5.59** (1.69 to 9.49)
3rd	53 (16.5)	11.77** (3.27 to 20.26)	3.99* (0.09 to 7.88)	2.68 (-0.38 to 5.65)	4.15* (0.50 to 7.81)
4th	91 (28.3)	9.39* (1.38 to 17.40)	4.96** (1.29 to 8.63)	3.34* (0.50 to 6.18)	4.22* (0.77 to 7.67)
5th	114 (35.4)	4.11 (-3.76 to 11.98)	1.47 (-2.13 to 5.08)	0.68 (-2.11 to 3.48)	1.02 (-2.37 to 4.41)
6th	19 (5.9)	14.16** (6.87 to 21.44)	2.32 (-1.02 to 5.66)	0.95 (-1.64 to 3.53)	2.53 (-0.61 to 5.66)

*$p < .05$, **$p < .01$*
B values and 95% CI of reference groups (in bold) represent the mean scores in that category
B values of other groups represent the mean difference between the group and the reference group

Table 3. Continue (suite): Association between sociodemographic characteristics and the psychological impact of COVID-19 and the mental health status of respondents (N = 322)

Variables	n (%)	Impact of event Beta (95% Confidence Interval) B (95% CI)	Depression B (95%CI)	Anxiety B (95% CI)	Stress B (95% CI)
Gender					
Male	138 (42.9)	-1.02 (-4.65 to 2.61)	-0.20 (-1.89 to 1.48)	-0.03 (-1.35 to 1.29)	-0.36 (-1.94 to 1.22)
Female	184 (57.1)	21.88** (19.50 to 24.25)	5.78** (4.68 to 6.89)	3.34** (2.48 to 4.20)	5.62** (4.58 to 6.66)
Age					
16-20	81 (25.2)	-4.73 (-27.79 to 18.33)	-2.27 (-12.99 to 8.44)	6.00 (-2.26 to 14.26)	-0.30 (-3.92 to 15.92)
21-25	215 (66.8)	-2.63 (-25.52 to 20.25)	-2.13 (12.77 to 8.50)	-2.87 (-11.16 to 5.43)	-0.36 (-10.34 to 9.78)
26-30	24 (7.5)	-8.25 (-31.96 to 15.46)	-4.17 (-15.18 to 6.85)	-3.83 (-12.43 to 4.76)	-2.92 (-13.24 to 7.41)
31 and above	2 (0.6)	25.00* (2.22 to 47.78)	8.00 (-2.59 to 18.59)	6.00 (-2.26 to 14.26)	6.00 (-3.92 to 15.92)
Marital status					
Single	316 (98.1)	1.64 (-11.66 to 14.93)	2.07 (-4.10 to 8.23)	0.67 (-4.15 to 5.49)	2.85 (-2.93 to 8.64)
Married	6 (1.9)	19.83** (6.66 to 33.01)	3.67 (-2.44 to 9.77)	2.67 (-2.11 to 7.44)	2.67 (-3.06 to 8.40)

*p < .05, **p < .01*
B values and 95% CI of reference groups (in bold) represent the mean scores in that category
B values of other groups represent the mean difference between the group and the reference group

Table 4. Association between the self-reported changes in daily activities of respondents and the psychological impact of COVID-19 and the mental health status of respondents (N = 322)

Variables	Extent of change	n (%)	Impact of event Beta (95% Confidence Interval) B (95% CI)	Depression B (95%CI)	Anxiety B (95% CI)	Stress B (95% CI)
Time spent on social media	Extremely decreased	9 (2.8)	12.67 (0.04 to 25.29)*	2.78 (-3.18 to 8.74)	4.00 (-0.74 to 8.74)	1.89 (-3.72 to 7.50)
	Moderately decreased	9 (2.8)	8.56 (-4.07 to 21.18)	3.44 (-2.51 to 9.40)	2.89 (-1.85 to 7.63)	4.33 (-1.28 to 9.95)
	Slightly decreased	9 (2.8)	9.11 (-3.52 to 21.74)	0.56 (-5.40 to 6.51)	2.22 (-2.52 to 6.96)	1.89 (-3.72 to 7.50)
	No change (Reference)	18 (5.6)	9.56 (2.27 to 16.85)*	2.33 (-1.11 to 5.77)	0.67 (-2.07 to 3.40)	2.11 (-1.13 to 5.35)
	Slightly increased	47 (14.6)	7.72 (-0.85 to 16.29)	2.52 (-1.53 to 6.56)	1.89 (-1.33 to 5.11)	2.53 (-1.28 to 6.34)
	Moderately increased	97 (30.1)	9.10 (1.17 to 17.04)*	1.75 (-2.00 to 5.49)	2.06 (-0.93 to 5.04)	1.97 (-1.56 to 5.50)
	Extremely increased	133 (41.3)	17.35 (9.58 to 25.12)**	5.52 (1.85 to 9.18)**	3.65 (0.73 to 6.57)*	5.24 (1.79 to 8.70)**
Food intake	Extremely decreased	5 (1.6)	11.32 (-3.60 to 26.23)	4.21 (-2.71 to 11.12)	1.93 (-3.94 to 7.35)	4.04 (-2.47 to 10.54)
	Moderately decreased	22 (6.8)	2.56 (-5.36 to 10.48)	-1.58 (-5.24 to 2.09)	0.36 (-2.51 to 3.24)	0.18 (-3.27 to 3.63)
	Slightly decreased	28 (8.7)	-0.13 (-7.38 to 7.21)	-1.47 (-4.83 to 1.90)	-1.20 (-3.84 to 1.43)	-0.58 (-3.74 to 2.58)
	No change (Reference)	66 (20.5)	18.49 (14.53 to 22.44)**	5.39 (3.56 to 7.23)**	3.27 (1.84 to 4.71)**	4.36 (2.64 to 6.09)**
	Slightly increased	88 (27.3)	4.03 (-1.21 to 9.26)	024 (-2.18 to 2.67)	-0.73 (-2.63 to 1.175)	1.25 (-1.03 to 3.53)
	Moderately increased	80 (24.8)	3.00 (-2.34 to 8.35)	0.51 (-1.97 to 2.98)	0.58 (-1.37 to 2.52)	1.96 (-0.37 to 4.29)
	Extremely increased	33 (10.2)	7.49 (0.63 to 14.34)*	2.73 (-0.45 to 5.90)	1.52 (-0.98 to 4.01)	2.42 (-0.56 to 5.41)
Time spent studying	Extremely decreased	128 (39.8)	3.19 (-4.43 to 10.81)	1.34 (-2.18 to 4.85)	1.75 (-1.00 to 4.51)	2.09 (-1.22 to 5.40)
	Moderately decreased	61 (18.9)	2.71 (-5.48 to 10.90)	-0.16 (-3.79 to 3.76)	1.50 (-1.46 to 4.46)	1.02 (-2.53 to 4.58)
	Slightly decreased	58 (18.0)	3.10 (-5.15 to 11.34)	-1.04 (-4.84 to 2.76)	1.88 (-1.10 to 4.86)	0.57 (-3.01 to 4.15)
	No change (Reference)	21 (6.5)	18.71 (11.65 to 25.78)**	5.52 (2.27 to 8.78)**	1.81 (-0.74 to 4.361)	4.19 (1.12 to 7.26)**
	Slightly increased	30 (9.3)	2.62 (-6.59 to 11.83)	-0.99 (-5.24 to 3.25)	0.52 (-2.80 to 3.85)	0.81 (-3.19 to 4.81)
	Moderately increased	18 (5.6)	4.90 (-5.50 to 15.29)	-0.08 (-4.87 to 4.71)	3.08 (-0.68 to 6.84)	2.14 (-2.37 to 6.66)
	Extremely increased	6 (1.9)	-7.21 (-22.20 to 7.77)	-3.86 (-10.76 to 3.05)	-1.48 (-6.89 to 3.94)	-2.52 (-9.03 to 3.98)

*p < .05, **p < .01
B values and 95% CI of reference groups (in bold) represent the mean scores in that category
B values of other groups represent the mean difference between the group and the reference group

Table 4 continue (suite): Association between the self-reported changes in daily activities of respondents and the psychological impact of COVID-19 and the mental health status of respondents (N = 322)

Variables	Extent of change	n (%)	Impact of event Beta (95% Confidence Interval) B (95% CI)	Depression B (95%CI)	Anxiety B (95% CI)	Stress B (95% CI)
Time spent sleeping	Extremely decreased	4 (12)	21.75* (5.22 to 38.28)	7.20 (-0.51 to 14.91)	2.95 (-3.15 to 9.05)	4.40 (-2.92 to 11.72)
	Moderately decreased	13 (4.0)	11.90* (1.84 to 21.97)	3.09 (-1.61 to 7.78)	0.53 (-3.18 to 4.24)	2.25 (-2.21 to 6.70)
	Slightly decreased	17 (5.3)	9.34* (0.21 to 18.46)	2.64 (-1.62 to 6.90)	1.69 (-1.68 to 5.05)	3.46 (-0.58 to 7.50)
	No change (Reference)	40 (12.4)	**13.25** (8.27 to 18.23)**	**4.30** (1.98 to 6.63)**	**2.55** (0.71 to 4.39)**	**3.60** (1.39 to 5.81)**
	Slightly increased	95 (29.5)	7.10* (1.16 to 13.04)	0.50 (-2.27 to 3.27)	0.19 (-2.00 to 2.38)	1.31 (-1.33 to 3.94)
	Moderately increased	88 (27.3)	8.11** (2.10 to 14.12)	0.29 (-2.51 to 3.10)	0.22 (-1.99 to 2.44)	1.47 (-1.19 to 4.13)
	Extremely increased	65 (20.2)	13.04* (6.71 to 19.38)	4.04** (1.08 to 6.99)	2.53* (0.19 to 4.86)	3.72** (0.92 to 6.53)
Physical exercise	Extremely decreased	42 (13.0)	11.00** (5.02 to 16.98)	5.63** (2.90 to 8.85)	2.00 (-0.2 to 4.23)	3.40* (0.74 to 6.05)
	Moderately decreased	31 (9.6)	-4.21 (-10.84 to 2.42)	0.56 (-2.54 to 3.65)	-0.11 (-2.58 to 2.36)	0.23 (-2.71 to 3.18)
	Slightly decreased	34 (10.6)	2.68 (-3.74 to 9.10)	0.56 (-2.44 to 3.56)	1.45 (-0.94 to 3.84)	0.21 (-2.64 to 3.06)
	No change (Reference)	79 (24.5)	**20.41** (16.88 to 23.93)**	**4.73** (3.09 to 6.38)**	**3.14** (1.83 to 4.45)**	**5.32** (3.75 to 6.88)**
	Slightly increased	80 (24.8)	-1.86 (-6.82 to 3.11)	-0.01 (-2.33 to 2.31)	-0.31 (-2.16 to 1.53)	-0.72 (-2.92 to 1.49)
	Moderately increased	41 (12.7)	2.91 (-3.11 to 8.94)	0.97 (-1.84 to 3.79)	-0.60 (-2.84 to 1.64)	-0.39 (-3.06 to 2.29)
	Extremely increased	15 (4.7)	-4.07 (-12.89 to 4.74)	-0.33 (-4.45 to 3.78)	-1.41 (-4.69 to 1.87)	-2.38 (-6.30 to 1.53)
Time spent on movies and TV	Extremely decreased	9 (2.8)	1.62 (-9.80 to 13.04)	-0.79 (-6.02 to 4.45)	0.66 (-4.76 to 3.44)	-1.48 (-6.38 to 3.42)
	Moderately decreased	13 (4.0)	1.99 (-7.78 to 11.75)	2.09 (-2.39 to 6.56)	1.76 (-1.71 to 5.27)	3.20 (-0.98 to 7.39)
	Slightly decreased	21 (6.5)	2.59 (-5.49 to 10.67)	2.45 (-1.25 to 6.16)	1.65 (-1.25 to 4.56)	3.31 (-0.98 to 7.39)
	No change (Reference)	62 (19.3)	**21.94** (17.87 to 26.00)**	**5.45** (3.59 to 7.32)**	**3.77** (2.32 to 5.23)**	**5.26** (3.52 to 7.00)**
	Slightly increased	74 (23.0)	-2.65 (-8.16 to 2.86)	-1.21 (-3.74 to 1.32)	-1.59 (-3.56 to 0.39)	-1.31 (-3.68 to 1.05)
	Moderately increased	78 (24.2)	-3.88 (-9.33 to 1.56)	-1.27 (-3.77 to 1.22)	-1.88 (-3.83 to 0.08)	-1.18 (-3.52 to 1.15)
	Extremely increased	65 (20.2)	3.76 (-1.93 to 9.44)	3.01* (0.41 to 5.62)	1.03 (-1.01 to 3.07)	2.43 (-0.00 to 4.87)

*p < .05, **p < .01
B values and 95% CI of reference groups (in bold) represent the mean scores in that category
B values of other groups represent the mean difference between the group and the reference group

The gender disparity in the global prevalence of depression [19] is reflected in this study. Several studies have reported higher prevalence of depression in females [20,21]. Marital status and age were also statistically significant in their association with IES-R and DASS-21 scores.

Students' engagement with social media and television had increased for most participants relative to the pre-pandemic period. This can be attributed to the restriction of movement, reduced academic assignments, and unemployment status of the respondents. Moreover, there has been an increase in the spread of information, including fake news and fear mongering via internet and social media since the beginning of the pandemic [22]. This may explain the link between extremely increased social media use and depression, anxiety, stress and post-traumatic stress symptoms. This has been demonstrated in a large US study in which media consumption predicts acute stress and depression during the pandemic [23]. On the other hand, the use of social media and binge-watching of television series could also have served as means of coping with the psychological impact of COVID-19 and providing social support during the lockdown [24].

Decrease in time spent in school and other school-related activities may also play a role in the increased food intake reported by majority of the students. In the absence of lectures and clinical rotations, students now have more time to pay attention to their diet and eat more than they were doing when school was still in session. Other reasons for this outcome could be that the feeding pattern in school differs significantly from home where there are other determining factors (parents, siblings, financial status, family values and routines, etc.) than the respondents themselves. We expect feeding within family to be more regular compared to the hostel where student may choose to skip meals. However, it cannot be ascertained whether they were eating healthier than prior to the pandemic as extremely increased food intake was linked to higher IES-R scores. Students may actually be overeating or binge-eating to cope with stress during this period. Meanwhile, as shown in a recent systematic review that there is a weak link between diet and depression, our findings also reveal nonsignificant association between food intake and depression during the pandemic [25].

Students are expected to have a considerable amount of free time, yet there has been a general decrease in the time they spend studying during the pandemic. All academic activities have been put on hold, many students probably did not feel the need to study as hard as before.

With respect to sleep duration, the increase in majority of participants can be related to the students having no need to wake up early or disrupt their sleep for academic purposes as was the case when schools were in session. Marelli et al. [26] also observed a similar trend among university students and staff in Italy during the COVID-19 pandemic. We observed a significantly higher psychological impact among respondents who had experienced some changes in their sleep duration than those who reported no changes to their sleep duration. Those who claimed to have experienced an extreme increase in sleeping duration appear to be more depressed, anxious and psychologically distressed than those whose sleeping time remained the same. Generally, hypersomnia is a rare feature of depression, it is however commoner among young depressed individuals. It has a 40% prevalence among patients below the age of 30 and 10% among patients in their 50s. The age range of our study participants may therefore offer some explanation for the relationship that suggests "atypical depression" during the pandemic [27,28].

About 1 in 4 study participants maintained a level of physical activity similar to what they had before the pandemic. Three in 10 respondents experienced a decrease while 4 in 10 had increased their level of physical activity. Fewer respondents reported any increase in their physical inactivity than others who had no change or decreased levels of physical activity. The absence of lectures, clinical rotations, extracurricular activities and lockdown order causes students to adopt a sedentary lifestyle. Those who get their motivation to exercise and "stay fit" from fellow students are likely to renege on their "fitness goals" in the wake of the physical distancing measures. Anhedonia – loss of interest in previously enjoyed activities – is a symptom of depression and may be responsible for our findings on the association between extreme decrease in physical activities and depression. However, this is inconsistent with our observation that students who were spending more time on movies and television – activities widely enjoyed by young people – were more depressed than those with no change in their time commitment to media entertainment. A better explanation for this observation is that depressed students are using entertainment as a means of coping with the psychological distress

they are experiencing during the COVID-19 pandemic.

There are however limits to the interpretation and generalisability of these findings. Being a cross-sectional study, it only gives a snapshot of the mental state of respondents. Thus, causal relationships are difficult to establish. A qualitative study would complement our findings by revealing the underlying causes of the prevalence of depression, anxiety, stress and post-traumatic stress symptoms observed. DASS-21 and IES-R are self-report tools which may introduce a subjective bias to the assessment of mental state and psychological impact of the pandemic. Our assessment of changes in social and physical activities is also very subjective as there were no pre-pandemic baseline measurements to compare against. The small sample size used in this study limits the generalisability to the entire university student population in Nigeria. The sample population also limits the generalisability across all age groups in the Nigerian population.

5. CONCLUSION

University students have undergone major changes in their physical and social activities experienced during the pandemic. Also, a substantial number of them have symptoms of depression, anxiety, stress and post-traumatic stress disorder during the COVID-19 pandemic. The COVID-19 pandemic has resulted in the disruption of the academic calendar of many students in tertiary institutions of learning in Nigeria for over 6 months. Without any support from the government or alternative means of continuing their education, many students are having to adjust to life outside of school and coping with the psychological distress that stems from the pandemic. The government, academic and health stakeholders should pay attention to the social and psychological needs of the students, provide support and alternative ways of engagement in light of the prevailing situation.

CONSENT

As per international standard or university standard, respondents' written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

Ethical approval was obtained from the UI/UCH Ethics Committee with assigned number UI/EC/20/0245.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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