

Impact of COVID-19 on the mental health of Delta State University students, Nigeria

Ominde Beryl Shitandi, Jaiyeoba-Ojigho Jennifer Efe, Igbigbi Patrick Sunday

Department of Human Anatomy, Delta State University Abraka, Nigeria.

Abstract. *Background and aim of the work:* The coronavirus disease 2019 (COVID-19) pandemic has led to a substantial psychological burden among students. This study aimed at evaluating the impact of COVID-19 on the mental health of University Students and determining the prevalence of anxiety and depression. *Methods:* This cross-sectional descriptive study utilized an online questionnaire sent to students in the Faculty of Basic Medical Sciences, Delta State University after ethical approval. The Generalized Anxiety and Disorder Scale-7 (GAD-7) and Patient Health Questionnaire-9 (PHQ-9) scores were analyzed using Statistical Package of Social Sciences and expressed using descriptive statistics and percentages. An independent t-test was used to determine the gender differences in the GAD-7 and PHQ-9 scores while Pearson's correlation test was used to evaluate the association between these scores with age. *Results:* The 259 respondents comprised 118, 45.6% males and 141, 54.4% females with an average age of 21.50 ± 2.04 years. The majority (149, 57.5%) were aged 21-25 years. The GAD-7 and PHQ-9 scores did not show significant differences in age and gender. Moderate to severe anxiety and depression was established in 22.4% and 28.2% of the respondents respectively. *Conclusion:* This study has shown that the prevalence of anxiety and depression due to the pandemic bears no relationship with age and gender. This is however, different from previous reports perhaps due to the differences in the sample size, resource setting, timing of the study, and the courses the students studied.

Key words: COVID-19, mental health, Nigerian students.

Introduction

The first case of Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-COV-2) was reported in Wuhan, China in December 2019 (1). Later, COVID-19 (Coronavirus disease, 2019) was declared a public health emergency of international concern by the World Health Organization (W.H.O) on the 30th of January 2020 (2). The fast spread of this virus has caused excessive anxiety and distress in the general public including university students (3). Although mental health is important in managing the crisis and reconstructing the society after the pandemic, the focus of different authorities during the pandemic has been on preserving life through controlling the spread,

and developing treatment protocols and vaccines. This has led to the delay of mental health needs which are fundamental for survival (4). Subsequently, this causes a great psychosocial burden and economic impact (5).

Relentless fear caused by the uncertainty and unpredictability of the disease consequently causes moderate to severe stress, anxiety, and depression (6). The constant flow of information regarding the acceleration of new cases and fatalities through mass media, as well as negatively skewed misinformation on social media, have triggered mass hysteria, anxiety, depression, and panic (1). Those with higher education experience more distress due to high self-awareness and a better understanding of the magnitude of the

pandemic as portrayed by the media and public health authorities (7).

Lockdown measures and travel restrictions led to the closure of businesses with consequent unemployment and cutting of wages (8). The uncertainty of this negative economic effect has led to disruption in the mental health of all household members (9). Maintaining social distance through limited social gatherings has affected social interactions and this has led to fear, anxiety, grief, poor sleep habits, depression, and suicidal ideations (8). Mass quarantine or self-quarantine causes anxiety, distress, frustration, sadness, loneliness, denial, insomnia, depression, self-harm, and suicidal ideations (10). These are brought about by deprivation of liberty, separation from family, the uncertainty of disease progression, an insufficient supply of basic essentials, and disruption of normal daily life (11). It has been documented that after the quarantine period, individuals were faced with significant distress due to financial loss, stigma, societal rejection, and discrimination (1). The worsening of the socio-economic status and stigmatization were also reported in survivors of Ebola virus disease in Sierra Leone and Guinea (12,13). According to Dubey *et al.* (1), having a friend or relative infected by COVID-19 also raises fear and anxiety (1). Mohammed *et al.* (14) also reported symptoms of anxiety, depression and post-traumatic stress disorder (PTSD) in Ebola virus survivors and contacts taking care of severely ill patients as well as those that were bereaved.

Students in tertiary institutions especially those in the health professions are at a higher risk of mental illnesses such as depression and anxiety than the general population (15). Furthermore, the closure of learning institutions led to negative mental effects on students due to the improbability of reopening schools, change in daily routine, altered academic calendar, impact on academic progress, and restricted social connections (6,16). The substitution of classroom program with online classes was more stressful to the students due to reduced motivation to study and increased pressure to learn independently (6). The assessment and evaluation programmes have also been affected. All these cause emotional distress, depression, anxiety, maladaptive behaviour, and high dropout rates (6,17).

Psychological problems caused by the effects of the pandemic influence the academic achievement of

students, impacts negatively on their quality of life and may contribute to substance abuse. In view of the foregoing, this study aimed at evaluating the mental health of university students during the COVID-19 pandemic and determining the prevalence of anxiety and depression among the students in the Faculty of Basic Medical Sciences, Delta State University, Nigeria.

Methods

This cross-sectional descriptive study involved students from the Faculty of Basic Medical Sciences of Delta State University, Nigeria. This included undergraduate students enrolled in courses such as Human Anatomy and Cell Biology, Human Physiology, Medical Biochemistry, Pharmacology and Therapeutics, Nursing science as well as Medicine and Surgery. The sample size formula for prevalence studies by Naing *et al.* (18) was adopted for this study. The precision value was 5% with a 95% confidence interval. The study population included students aged between 18 and 30 years. The data collection began on the 1st of July and closed on the 15th of August 2020 when the students were still on the stay at home order following the recommendations by the Nigerian Government. This study was approved by the Research and Ethics Committee of Faculty of Basic Medical Sciences, Delta State University; REC/FBMS/DELSU/20/66 and the participants voluntarily gave their informed consent to participate in the study after being informed about the purpose of the study. The procedures of this study complied with the provisions of the declaration of Helsinki regarding research on Human participants.

An online self-reported anonymous questionnaire was designed by the investigators through a literature search. The questions were anonymous to ensure the confidentiality and reliability of the data. The aims of the study and the uses of the data obtained were explained at the beginning of the questionnaire. A pilot study was initially carried out on 30 participants to ensure that the draft questionnaire was comprehensible. All the participants reported ease of understanding of all items and response options. The link of the designed online google form of the questionnaire was thereafter, shared with the different groups of the students in the Faculty of Basic Medical Sciences on

the various social media platforms. The students were requested to answer all the questions in the questionnaire for research purposes.

The final questionnaire consisted of four sections. The first section contained the demographic characteristics of the participants (age, gender), course, and level of study. The second section contained questions about the stay at home order, online education, and financial status during the pandemic. The third section contained the Generalized Anxiety Disorder Scale -7 (GAD-7), an instrument that is widely used to diagnose, screen, and assess the severity of anxiety disorders such as panic disorders, post-traumatic stress disorders, and social phobias (19). It contains seven questions that assess generalized anxiety disorder by principally focusing on the occurrence of the symptoms in the preceding 2-week period. These include the degree to which the participant has been bothered by feeling nervous, anxious, not being able to stop or control worrying, having trouble relaxing, worrying too much about different things, being so restless and finding it hard to sit still, becoming easily annoyed and feeling afraid as if something might happen. This scoring tool requires approximately 3 minutes to administer for each symptom queried. The response options included “not at all”, “several days”, “over half the days” and “nearly every day” which were scored as 0,1,2 and 3 respectively. A total score ranging from 0-21 is expected from each participant. The cut-off scores for mild, moderate, and severe anxiety were taken as 5, 10, and 15 correspondingly. Therefore, scores with a range of 5-9 represented mild anxiety while a range of 10-14 and above 15 represented moderate and severe anxiety respectively (20).

The fourth section contained the Patient Health Questionnaire-9 (PHQ-9). This is a 9 item depression scale that aids in the diagnosis of depressive disorder and grading of the severity of symptoms. It contains statements that measure depressive symptoms such as

“little interest or pleasure in doing things”. These statements were rated from 0 (not at all) to 3 (nearly every day) by the respondents as applicable to them over the past 2 weeks. The total score can range from 0-27 whereby less than 4 represents minimal depression, 5-9 signifies mild depression, 10-14 denotes moderate depression while 15-19 and more than 20 imply moderately severe and severe depression respectively (2,17,20).

Data collection was done using a spreadsheet linked to the online google form questionnaire. A total of 275 responses were retrieved of which 16 were excluded from the study due to incomplete responses. Statistical Package of Social Sciences (SPSS) version 21.0 (IBM Corporation) was used to analyze the data. Continuous variables were expressed as means and standard deviations while categorical data were presented as frequencies and percentages. Independent t-test was used to determine the gender differences in the mean GAD-7 and PHQ- 9 scores while Pearson’s correlation test was used to establish the relationship between GAD-7 score, PHQ-9 score, and age. Chi-square was used to establish the gender differences between the various classes of anxiety and depression. A p-value of <0.05 was considered significant. Data were presented in tables.

Results

Two hundred and fifty-nine students fully responded to the survey questions. Of these, 118 (45.6%) were males and 141 (54.4%) were females (Table 1). The average age of the participants was 21.50±2.04 years ranging from 18 to 28 years. The majority (149, 57.5%) were aged between 21 and 25 years. Eighty-six (33.2%) were in the 18-20 years’ age group while the remaining 24(9.3%) aged between 26-30 years old (Table 2). Majority of the students (144, 55.6%)

Table 1. Age and Gender Composition of the Study Population

Age-group	Male		Female		Total	
18-20 years	23	8.9%	63	24.3%	86	33.2%
21-25 years	75	29.0%	74	28.6%	149	57.5%
26-30 years	20	7.7%	4	1.5%	24	9.3%
Total	118	45.6%	141	54.4%	259	100.0%

Table 2. Sample Questions in the Questionnaire

		Male		Female		Total	
1. Do you agree with stay at home order from public health authorities?	No	41	15.8%	49	18.9%	90	34.7%
	Yes	77	29.7%	92	35.5%	169	65.3%
	Total	118	45.6%	141	54.4%	259	100.0%
2. Are you on total or near total isolation at home?	No	61	23.6%	55	21.2%	116	44.8%
	Yes	57	22.0%	86	33.2%	143	55.2%
	Total	118	45.6%	141	54.4%	259	100.0%
3. Are you afraid of becoming infected by COVID-19 infection?	No	49	18.9%	54	20.8%	103	39.8%
	Yes	69	26.6%	87	33.6%	156	60.2%
	Total	118	45.6%	141	54.4%	259	100.0%
4. Are you satisfied with online classes?	No	98	37.8%	121	46.7%	219	84.6%
	Yes	10	3.9%	11	4.2%	21	8.1%
	Somehow	10	3.9%	9	3.5%	19	7.3%
	Total	118	45.6%	141	54.4%	259	100.0%
5. Is online schooling better or less than face-to-face classes?	No (Less than)	112	43.2%	130	50.2%	242	93.4%
	Yes (Better than)	6	2.3%	11	4.2%	17	6.6%
	Total	118	45.6%	141	54.4%	259	100.0%
6. Regarding the postponed educational activities at campus	Am in doubt about continuing or not continuing with the course	32	12.4%	41	15.8%	73	28.2%
	I prefer to continue with online education	37	14.3%	46	17.8%	83	32.0%
	I prefer to suspend the course	49	18.9%	54	20.8%	103	39.8%
	Total	118	45.6%	141	54.4%	259	100.0%
7. Online classes should continue whether stay at home status persists.	No	76	29.3%	95	36.7%	171	66.0%
	Yes	42	16.2%	46	17.8%	88	34.0%
	Total	118	45.6%	141	54.4%	259	100.0%
8. Stay at home order/ social distancing affects your financial status.	No	8	3.1%	15	5.8%	23	8.9%
	Yes	84	32.4%	100	38.6%	184	71.0%
	Partially	26	10.0%	26	10.0%	52	20.1%
	Total	118	45.6%	141	54.4%	259	100.0%
9. Stay at home order affect my continuity of course.	No	15	5.8%	25	9.7%	40	15.4%
	Yes	74	28.6%	73	28.2%	147	56.8%
	Partially	29	11.2%	43	16.6%	72	27.8%
	Total	118	45.6%	141	54.4%	259	100.0%

were in 200 level, followed by 53 (20.5%), 44(16.99%) and 18 (6.9%) in 300, 400 and 100 levels respectively. One hundred and sixty-nine students (65.3%) agreed with the stay at home order from the public health authorities. The remaining 90 (34.7%) disagreed

with this order. The majority declared to be on total or near-total isolation at home (143, 55.2%). When asked whether they are afraid of being infected by the COVID-19 virus, 156 (60.2%) responded certainly while the remaining 103 (39.8%) were not afraid.

Most of the participants (184, 71%) affirmed that the stay at home order affected their financial status fully while 52 (20.1%) students stated that this partially affected their financial status. The remaining 23 (8.9%) asserted that the stay at home order did not affect their financial status. One hundred and forty-seven (56.8%) students were of the popular opinion that the stay at home order compromised their continuity of course. Some felt that this partially affected their continuity (72,27.8%) while the remaining 40 (15.4%) responded that the stay at home order did not affect their continuity of course (Table 2).

Regarding the online classes during the pandemic, 219 (84.6%) participants confirmed their dissatisfaction while 21 (8.1%) declared their satisfaction with e-learning. The remaining 19 (7.3%) were somehow satisfied with virtual learning. Most students (242, 93.4%) found the quality of online schooling to be less than the face to face classes while only 17 (6.6%) specified that online schooling was better than the usual physical classes. Out of the total participants, only 83

(32%) preferred to continue with online education while 103 (39.8%) preferred to suspend their courses. The remaining 73 (28.2%) were in doubt about continuing or not continuing with their studies. Eighty-eight (34%) students preferred online classes to continue whether the stay at home status persisted or not while 171 (66%) did not agree with this (Table 2).

The evaluation of generalized anxiety disorder symptoms revealed a mean GAD-7 score of 6.0 ± 5.37 in the total population studied. The mean score was slightly lower in males 5.97 ± 5.47 than in females; 6.0 ± 5.30 , nonetheless, the gender difference was not statistically significant ($p=0.824$) (Table 3). The mean GAD-7 score was 5.87 ± 4.82 in the 18-20 year age group and slightly higher; 6.01 ± 5.54 and 6.42 ± 6.32 in the 21-25 year and 26-30-year age groups respectively (Table 4). We established a weak positive linear correlation between age and GAD-7 score although this was not statistically significant ($r=0.025$, $p=0.689$) (Table 5). Using a cut-off of 5-9, 77 (29.7%) students (36, 13.9% males and 41, 15.8% females) had mild

Table 3. Average Scores Based on Gender

	Gender	N	Mean	Std. Deviation	Independent t- test. P value
GAD-7 Score	Male	118	5.97	5.47	0.824
	Female	141	6.02	5.30	
PHQ-9 Score	Male	118	6.59	5.65	0.847
	Female	141	7.46	6.90	

Table 4: Comparison of Scores in the Different Age Groups.

	Salman et al. (20) (Pakistan)			Current study (Nigeria)		
	N	GAD-7 score	PHQ-9 score	N	GAD-7 score	PHQ-9 score
18-20 years	462	7.38 ± 5.57	9.82 ± 6.95	86	5.87 ± 4.82	7.84 ± 6.31
21-25 years	574	7.56 ± 5.72	9.35 ± 7.02	149	6.01 ± 5.54	6.61 ± 6.30
26-30 years	66	7.94 ± 5.72	8.64 ± 7.41	24	6.42 ± 6.32	7.13 ± 6.92
>31 years	32	6.53 ± 5.55	6.50 ± 5.55			
	1134			259		

Table 5. Pearson's Correlation Between Age and GAD-7/PHQ-9 Scores

Pearson's correlation	Pearson's coefficient (r)	P value
Age versus GAD-7 score	0.025	0.689
Age versus PHQ-9 score	-0.065	0.297

anxiety symptoms while a cut off of 10-14 revealed 34 (13.1%) students (12, 4.6% males and 22, 8.5% females) had moderate anxiety symptoms. Twenty-four (9.3%) students (14, 5.4% males and 10, 3.9% females) had GAD-scores of 15 and above and this suggested severe anxiety in this group. The majority of the respondents 124, (47.9%) were normal with a GAD-7 score of less than 4 (21.6% males and 26.3% females) (Table 6). Using Chi-square, we established that the gender differences in the various classes of anxiety were not statistically significant ($p=0.380$) (Table 6).

The mean PHQ-9 score in the population studied was 7.07 ± 6.36 . The females had a higher mean (7.46 ± 6.90) compared to their male counterparts (6.59 ± 5.65) however, the difference was not statistically significant ($p=0.847$) (Table 3). The 18-20-year-old students had the highest mean PHQ-9 score of 7.84 ± 6.31 . This was followed by 7.13 ± 6.92 and 6.61 ± 6.30 in the 26-30 years and 21-25 years' age groups correspondingly (Table 4). We established a very weak negative linear correlation between age and the PHQ-9 scores although this was not statistically significant ($r=-0.065$, $p=0.297$) (Table 5). Using a cut-off of less than 4, 115 (44.4%) students (52, 20.1% males and 63, 24.3% females) had minimal depression symptoms. Mild depression (PHQ-9 score 5-9) was diagnosed in 71 (27.4%) students (37, 14.3% males and 34, 13.1% females) while moderate depression (PHQ-9 score 10-14) was detected in 37 (14.3%)

students (18, 6.9% males and 19, 7.3% females). Using a cut off of 15-19, 20 (7.7%) students had moderately severe depression (2.7% males and 5% females). Sixteen students (1.5% males and 4.6% of females) had a PHQ-9 score above 20 signifying severe depression. The gender differences in the classes of depression were not statistically significant ($p=0.287$) (Table 6).

Discussion

This online survey involved 259 students of which 45.6% were males and 54.4% were females (Table 1). These frequencies compare to 47.9% and 52% male and female medical students in a Vietnamese study (21) and contrasted with Brazilian, Pakistani, and Chinese studies that had significantly higher female respondents compared to males (26.20% males, 73.80% females; 29.5% males, 70.5% females; and 30.35% males, 69.65% females respectively) (17,19,20). All the above mentioned were online surveys that aimed at establishing the psychological impact on COVID-19 pandemic on students of various tertiary institutions.

The average age of the participants in our study was 21.50 ± 2.04 years. This compares to 21.7 ± 3.5 years documented among Pakistani University students (20). The participants in our study were predominantly (149, 57.5%) aged between 20 and 25 years. Eighty-six (33.2%) were in the 18-20 years' age group while the

Table 6. Prevalence of the Different Levels of Anxiety and Depression

GAD-7 score (Anxiety)	Male		Female		Total		Chi square P value
< 4 Minimal anxiety	56	21.6%	68	26.3%	124	47.9%	
5 - 9 Mild anxiety	36	13.9%	41	15.8%	77	29.7%	
10 - 14 Mod anxiety	12	4.6%	22	8.5%	34	13.1%	
> 15 Severe anxiety	14	5.4%	10	3.9%	24	9.3%	
Total	118	45.6%	141	54.4%	259	100.0%	
PHQ-9 score (Depression)	Male		Female		Total		0.287
< 4 Minimal	52	20.1%	63	24.3%	115	44.4%	
5 - 9 Mild	37	14.3%	34	13.1%	71	27.4%	
10 - 14 Moderate	18	6.9%	19	7.3%	37	14.3%	
15 - 19 Moderately severe	7	2.7%	13	5.0%	20	7.7%	
> 20 Severe	4	1.5%	12	4.6%	16	6.2%	
Total	118	45.6%	141	54.4%	259	100.0%	

remaining 24(9.3%) aged between 25–30 years old. A study involving Brazilian medical students predominantly had participants within the 21–29-year age group (63.50%) followed by the 18–20 (32.40%) and 30 and above years (4.10%) respectively (17). The medical students in a study conducted in Vietnam by Nguyen *et al.* (21) were largely (58.3%) in the 19–22-year age group and the remaining 41.7% in the 23–26-year age group. In Pakistan, Salman *et al.* (20) mainly involved students in the 20–25 (50.6%), 18–20 (40.7%), 25–30 (5.8%) and >31 years (2.8%) age groups. Our study population, therefore, compares to the population in other studies stated above since most university undergraduate students world-wide are in the 18–25 years' age range.

The majority (169, 65.3%) of the students agreed with the stay at home order from the public health authorities. This was lower than 83.14% as reported in the study by Filho *et al.*, (17). Slightly more than half of the participants (55.2%) declared to be on total or near-total isolation at home and this compared to 57.82% of Medical students in Brazil (17). This could have negatively affected their mental health since humans are social beings and rely on social interactions for good mental health (22). Social distancing has been reported to cause fear, anxiety, grief, and poor sleep habits (8). The perceived social isolation/loneliness may cause depression and suicidal ideations (23).

Previous disease outbreaks such as Severe Acute Respiratory Syndrome (SARS) and Ebola virus have been reported to cause symptoms of anxiety, depression and post-traumatic stress disorder (14,24). Likewise, approximately 60% of the students in our study were afraid of being infected by the COVID-19 virus, and this was lower than 84.71% documented by Filho *et al.* (17). This difference is due to the dissimilarity in the study population whereby our study utilized students in Basic Medical sciences while Filho *et al.* (17) involved medical students who are more likely to be directly exposed to the virus during their clinical training. The immense fear may be due to the high transmissibility of the virus whose effective treatment and vaccine aren't available yet, as well as inadequate information regarding the risks and severity of the pandemic. The psychological effects of isolation or quarantine such as loneliness, depression, and stigma

also create additional distress (11). Hawryluck *et al.* (25) during the SARS outbreak in Toronto, Canada reported that quarantine was perceived as personalized trauma independent of exposure to disease. These scholars further documented that a long duration of quarantine was associated with high post-traumatic stress symptoms that may extend long after the pandemic has been contained.

Akin to the findings by Filho *et al.* (17), 71% and 20.1% of our respondents affirmed that the stay at home order affects their financial status fully and partially respectively. Similarly, Delamou *et al.* (13) documented high rates of unemployment in Guinea following the Ebola outbreak, with majority of the people within the low socioeconomic status. Furthermore, financial insecurity associated with the ongoing COVID-19 pandemic has been shown to cause depression, self-harm, and subsequently, suicide (26). More than half of the respondents (147, 56.8%) felt that the stay at home order compromised their continuity of course and will delay their graduation. This may perhaps cause emotional distress, depression, anxiety, maladaptive behaviour, and high dropout rates due to the uncertainty regarding their academic progress (6). Previous infectious disease outbreaks such as SARS and influenza have congruently been associated with negative psychological effects triggered by the qualms created in different aspects of life (27,28).

The closure of learning institutions led to innovative information technology and learning management systems for teaching and assessment to minimize the gaps created by the pandemic (29). Online distance learning also referred to as e-learning or virtual learning using accessible internet networks employing a laptop or mobile phone; has provided a means of learning with no physical interaction between the lecturers and students (30). Consistent with the findings by Abbasi *et al.* (29) (69%), we report dissatisfaction with online schooling during the pandemic by most of our respondents (219, 84.6%) and a lower percentage expressing their satisfaction (8.1%). However, most of the medical students (57.06%) in the study by Filho *et al.* (17) declared their satisfaction with e-learning probably due to the availability of better facilities such as accessible and speedy internet, high computer competency as well as availability and affordability of

digital means by the Brazilian study population. The dissatisfaction towards this mode of learning creates anxiety and deleteriously affects the students' academic performance (30, 31). Despite being flexible, virtual learning is limited by the lack of student-teacher interaction leading to low self-confidence. Most students (242, 93.4%) in our study found the quality of online schooling to be less than that of the traditional face to face classes and this was comparable to the findings by Filho *et al.* (17) (86.73%) and Abbasi *et al.* (29) (85%). This lack of poise in the new mode of learning creates apprehension and panic among students and adversely affects their academic performance.

In this vein, only 83 (32%) students preferred to continue with online education and this was lower than 43.24% documented by Filho *et al.* (17). More students (103, 39.8%) preferred to suspend their courses and this was slightly higher than 35.29% reported by Filho *et al.* (17). The remaining 73 (28.2%), comparable to 21.47% documented by Filho *et al.* (17), were in doubt about continuing or not continuing with their studies. Eighty-eight (34%) students preferred online classes to continue whether the stay at home status persisted or not while 171 (66%) did not agree with this. Abbasi *et al.* (29) similarly reported more students with a negative overall perception (77%) towards online schooling during the pandemic as well as an undesirable future preference. We attribute the negative attitude and dissatisfaction towards e-learning by our students to poor internet access and speed in Nigeria, lack of economic power and digital means, lack of electricity to charge the electronic gadgets, limited computer literacy/competency, lack of self-discipline and motivation, as well as limited student participation coupled with less teacher to student interaction. These factors

may create frustration, anxiety, and panic among students and these mental health symptoms undesirably influence their academic performance (30).

We evaluated the generalized anxiety disorder symptoms in the respondents and found a mean GAD-7 score of 6.0 ± 5.37 in the total population studied. This was lower than the scores among students of Pakistan University and medical students in Brazil (17,20) (Table 7). The mean score was slightly lower in males (5.97 ± 5.47) than in females (6.02 ± 5.30) although the difference between the two genders was not statistically significant ($p=0.824$) (Table 3). On the other hand, Filho *et al.* (17) and Salman *et al.* (20) documented a significantly lower GAD-7 score in males than in females (Table 7). Parallel to the findings of our study, scholars in China have demonstrated that females are at a greater risk of the negative psychological impact of COVID-19 and face a higher level of stress, anxiety, and depression (7, 16). Similarly, Secor *et al.* (32) documented higher anxiety scores in the female Ebola virus survivors compared to their male counterparts in Guinea and Sierra Leone.

Consonant with the reports by Salman *et al.* (20), the average GAD-7 score in our study increased with age, with the highest score of 6.42 ± 6.32 in the oldest age group (26-30 years) followed by 6.01 ± 5.54 in the 20-25 years' age group and lowest (5.87 ± 4.82) in the youngest students aged 18-20 years (Table 4). This shows that the severity of anxiety increases with age and this could be ascribed to a better understanding of the detrimental consequences of the pandemic in the older students. Nonetheless, we established a very weak positive correlation between age and GAD-7 score which was not statistically significant ($r=0.025$, $p=0.689$) (Table 5).

Table 7. Comparison of the Mean GAD-7 and PHQ-9 Scores in the Different Populations.

Author		Filho et al. (17)	Salman et al. (20)	Current study
Country		Brazil (N=340)	Pakistan (N=1134)	Nigeria (N=259)
Mean GAD-7 score	Male	8.15±4.41	6.62±5.70	5.97±5.47
	Female	9.55±4.82	7.84±5.60	6.02±5.30
	Total	9.18±4.75	7.48±5.65	6.0±5.37
Mean PHQ-9 score	Male	11.29±6.37	8.73±6.84	6.59±5.65
	Female	13.22±6.65	9.71±7.06	7.46±6.90
	Total	12.72±6.62	9.42±7.01	7.07±6.36

Most of the respondents 124, (47.9%) in the current study were normal with a GAD-7 score of less than 4. This was higher than 15.59% documented by Filho *et al.* (17) in Brazil and lower than 75.1% documented by Cao *et al.* (19) in the Chinese. We report mild anxiety in 29.7% of our participants and this was followed by 13.1% and 9.3% who had moderate and severe anxiety respectively. This trend was also observed in the study by Filho *et al.* (17) with corresponding frequencies of 46.18%, 25.88%, and 12.35% although these were higher than our findings. On the other hand, the prevalence of mild (21.3%), moderate (2.7%), and severe (0.9%) anxiety among the Chinese students reported by Cao *et al.* (19) were lower than our findings (Table 8). Conversely, the gender differences in the respective levels of anxiety in our study were not significant ($p=0.380$) (Table 6). Our findings are compatible with reports from previous infectious outbreaks such as the SARS outbreak in Hong Kong and H1N1 influenza where generalized anxiety disorder was reported (33,34). Following the Ebola virus outbreak, Secor *et al.* (32) documented frequencies of 10.7%, 9.9% and 4.2% of the evaluated survivors in Sierra Leone, Liberia and Guinea respectively that met the criteria for generalized anxiety disorder.

The mean PHQ-9 score for depression in our study population was 7.07 ± 6.36 . This was lower than the mean reported in Pakistan and Brazil university students (17, 20) (Table 7). The females had a higher mean (7.46 ± 6.90) compared to their male counterparts (6.53 ± 5.65) however the difference was not statistically significant ($p=0.847$) (Table 3). Filho *et al.* (17) and Salman *et al.* (20) documented a significantly lower mean PHQ-9 score in males than in

females (Table 7). These scores were, however, higher than the findings of our study. Likewise, Secor *et al.* (32) documented depression in 22%, 20.2% and 13% of Ebola Virus survivors in Sierra Leone, Liberia and Guinea respectively with higher depression scores in the females of Guinea and Sierra Leone compared to their male counterparts.

Congruent with the Pakistani population studied by Salman *et al.* (20), the youngest students (18-20years) in our study population had the highest mean PHQ- score (7.84 ± 6.31). This was followed by 26-30 and 21-25years age groups respectively ($7.13\pm 6.92, 6.61\pm 6.30$). On the contrary, Salman *et al.* (20) reported a second-highest score in the 20-25year age group, followed by the 25-30 and ≥ 31 years' age groups (Table 4). We established a very weak negative linear correlation between PHQ-9 score and age signifying a decreasing severity of depression with age, however, this was not statistically significant ($r=-0.065, p=0.297$) (Table 5). Salman *et al.* (20) similarly documented significantly lower depression scores in the oldest age group (above 31) compared to the younger population aged below 30.

We report minimal and mild depression in 115,44.4%, and 71,27.4%, of our respondents correspondingly. This was higher than as the reports by Salman *et al.* (20) and Filho *et al.* (17). However, the findings of this study reveal a lower prevalence of moderate (14.3%), moderately severe (7.7%) and severe depression (6.2%) compared to the reports by Salman *et al.* (20) and Filho *et al.* (17) (Table 9). Nonetheless, gender differences in the different levels of depression in the current study were not statistically significant ($p=0.287$) (Table 6). Most (71.8%) of

Table 8. Prevalence of the Grades of Anxiety in the Different Populations

Anxiety	GAD-7 score	Prevalence %		
		Cao et al. (19)	Filho et al. (17)	Current study
		China (N=7143)	Brazil (N=340)	Nigeria (N=259)
Minimal	<4	75.1	15.59	47.9
Mild	5-9	21.3	46.18	29.7
Moderate	10-14	2.7	25.88	13.1
Severe	>15	0.9	12.35	9.3
Minimal-Mild	<10	96.4	61.77	77.6
Moderate-severe	>10	3.6	38.23	22.4

Table 9. Prevalence of the Grades of Depression in the Different Populations

Depression	PHQ-9 score	Prevalence %		
		Salman <i>et al.</i> , (20)	Filho <i>et al.</i> (17)	Current study
		Pakistan (N=1134)	Brazil (N=340)	Nigeria (N=259)
Minimal	<4	30.5	10.29	44.4
Mild	5-9	24.5	25.29	27.4
Moderate	10-14	21	25.29	14.3
Moderately severe	15-19	3.6	18.53	7.7
Severe	>20	10.4	20.59	6.2
<i>Minimal-Mild</i>	<10	55	35.58	71.8
<i>Moderate-severe</i>	>10	45	64.41	28.2

our study population, therefore, had minimal to mild depression and this is higher than 55% and 35.58% as reported by Salman *et al.* (20) and Filho *et al.* (17) respectively (Table 9). This shows that the pandemic did not cause deleterious depressive effects on the greater percentage of our students hence, active treatment is not warranted in this group. However, psychological counselling is advised to avoid the deterioration of symptoms.

According to Salman *et al.* (20), depression and anxiety scores equal or above the cutoff of 10 is a 'yellow flag' which draws attention to a possible clinically relevant mental condition. GAD-7 and PHQ-9 scores of 15 and above function as a 'red flag' hence these individuals require further investigations and active management of depression and/or anxiety. Our study revealed 22.4% and 28.2% of participants had GAD-7 and PHQ-9 scores of 10 and above respectively. This was lower than 34% and 45% reported by Salman *et al.* (20). According to Filho *et al.* (17), 38.23% and 64.41% had moderate to severe anxiety and depression respectively (Tables 9). These frequencies were higher than our findings. Nguyen *et al.* (21) documented anxiety score of less than 8 in 92.3% and greater or equal to 8 in 7.7% of the medical students studied in Vietnam. According to an evaluation using the PHQ-9 scores by Secor *et al.* (32), 7.1%, 6.8% and 3.6% of Ebola virus survivors in Sierra Leone, Liberia and Guinea correspondingly had major depressive disorder. These frequencies were lower than our findings probably because these scholars collected their data more than four years after the 1st case of Ebola.

This contrasts with our study where data was collected seven months after the initial case. This timing of data collection may be considered as a fundamental component since coping strategies can change over the life course of a disease outbreak (35).

The differences in the prevalence of anxiety and depression as well as their severity in the different populations documented in literature could be attributed to the differences in the study population, sample size, age of the study population, courses studied, different cut-offs in the scoring, differences in the resource setting, and time in which the studies were carried out based on the course of the disease outbreak. Earlier during the beginning of the pandemic and its fast spread, there was heightened anxiety, panic, and uncertainty and this is reflected in the findings of a higher prevalence of severe anxiety and depression in the earlier studies. Students in the clinical units are faced with a higher mental health burden. This is due to the fear of being infected as well as panic due to lack of clinical skill training. Furthermore, the stringent social distance restrictions have led to e-learning and virtual consultations which have replaced physical interaction and physical examination of patients which many students were accustomed to. These factors may explain why the studies involving medical, dentistry and pharmacy students in their clinical years by Salman *et al.* (20), Filho *et al.* (17) and Nguyen *et al.* (21) documented a higher prevalence of moderate to severe anxiety and depression compared to our study that had mainly students in the Faculty of Basic Medical Sciences.

Conclusion

Female students had higher anxiety and depression scores than the male students. Less than a third of our respondents had moderate to severe anxiety and depression that warrant close follow-up and active management. The majority (>70%) with minimal and mild symptoms require psychological counselling to avoid deterioration of symptoms. The findings of this study are different from earlier reports by other scholars mainly due to the differences in the sample size, resource setting, timing of study and courses undertaken by the students.

Strength of the study

The study utilized standardized validated tools for the evaluation of depression and anxiety. This included the PHQ-9 and GAD-7 which are accepted widely in the diagnosis, screening and assessment of the severity of depression and anxiety disorders respectively. The data analysts also received a comprehensive training with regards to the interpretation of these tools.

Limitations of study

This study being a web based survey, selective participation and coverage of participants was limited to only one Nigerian University, focusing on the Faculty of Basic Medical Sciences. This implies that the findings of this study cannot be generalized. Additionally, the use of self-administered questionnaires introduces some aspect of response biasness. We also did not perform a clinical assessment for the accurate diagnosis of depression and anxiety disorders as per the Diagnostic and Statistical Manual of Mental Disorders (DSM-V) criteria.

Recommendations

We recommend that tertiary institutions should provide virtual psychological counselling to the students during the course of a disease outbreak in order to help mitigate the overall global mental health

burden. It is also important to explore the perception of Nigerian University Students and Faculties regarding their experience towards e-learning and e-teaching respectively during lockdown in a bid to improve on virtual learning and aim at its full adoption whether the pandemic persists or not.

Conflicts of interest: Each author declares that he or she has no commercial associations (e.g. consultancies, stock ownership, equity interest, patent/licensing arrangement etc.) that might pose a conflict of interest in connection with the submitted article.

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- Correspondence:**
 Received: 6 September 2020
 Accepted: 9 December 2020
 Ominde Beryl Shitandi,
 Department of Human Anatomy, Delta State University
 Abraka, Nigeria.
 Phone: +2347085458946
 E-mail: berylominde@gmail.com