Title: Perception of Medical Students on the Effect of COVID-19 on Medical Education in Nigeria

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Authors Contribution Statement:

Contributor Role	Role Definition	Authors 1	2	3	4	5	6	7
Conceptualization	Ideas; formulation or evolution of overarching research goals and aims.	X	X	X	X	X	X	
Data Curation	Management activities to annotate (produce metadata), scrub data and maintain research data (including software code, where it is necessary for interpreting the data itself) for initial use and later reuse.	X						
Formal Analysis	Application of statistical, mathematical, computational, or other formal techniques to analyze or synthesize study data.	X			X			
Funding Acquisition	Acquisition of the financial support for the project leading to this publication.	X	X	X	X	X	X	
Investigation	Conducting a research and investigation process, specifically performing the experiments, or data/evidence collection.	X	X	X	X	X	X	
Methodology	Development or design of methodology; creation of models		X		X			
Project Administration	Management and coordination responsibility for the research activity planning and execution.	X						
Resources	Provision of study materials, reagents, materials, patients, laboratory samples, animals, instrumentation, computing resources, or other analysis tools.	X	X	X	X	X	X	X
Software	Programming, software development; designing computer programs; implementation of the computer code and supporting algorithms; testing of existing code components.							
Supervision	Oversight and leadership responsibility for the research activity planning and execution, including mentorship external to the core team.	X						X
Validation	Verification, whether as a part of the activity or separate, of the overall replication/reproducibility of results/experiments and other research outputs.							X
Visualization	Preparation, creation and/or presentation of the published work, specifically visualization/data presentation.	X						
Writing – Original Draft Preparation	Creation and/or presentation of the published work, specifically writing the initial draft (including substantive translation).	X	X	X	X	X	X	X
Writing – Review & Editing	Preparation, creation and/or presentation of the published work by those from the original research group, specifically critical review, commentary or revision – including pre- or post-publication stages.	X	X	X	X	X	X	X

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Discussion Points:

1. What is the effect of COVID-19 on medical student learning in Nigeria?
2. How has COVID-19 affected the mental wellbeing of Nigerian medical students?
3. How have medical students in Nigeria been engaged in learning during this pandemic?
4. What interventions are being carried out among medical institutions in Nigeria to reduce the lockdown consequence on learning?
5. How have the medical students in Nigeria responded to the disruption of their studies?

ABSTRACT.

Background: The lockdown due to the COVID-19 pandemic disrupted normal activities including undergraduate medical education in Nigeria, similar to the rest of the world. Nigeria as a low- and middle-income country had peculiar challenges in adjusting to the new norm. This study aimed to assess Nigerian medical student's perception of the effect of COVID-19 on their learning.

Methods: A semi-structured, pre-tested online questionnaire was administered to consenting medical students from thirty-three medical schools in Nigeria. Questions assessed the effect of COVID-19 on study and wellbeing, as well as the perception of interventions from institutions and student organizations to reduce the lockdown consequence on learning. Data was analyzed using (SPSS) version 25.

Results: A total of 623 students from 33 institutions participated. All private institutions and 25% of public institutions had commenced online lectures/tutorials, 92% of students in private institutions and 21% in public institutions had attended online lectures/tutorials. Of those who did not attend institution-organized classes, 30.5% were opposed to online lectures, the main reasons stated being internet cost/availability and inefficiency. About 65% of the participants were aware of student-organized online tutorials/seminars. Eighty percent did not feel motivated to study and perceived their personal study to be less effective.

Conclusion: Nigerian medical student's perception of the effect of COVID-19 on their medical education was largely negative. Private institutions fared better in coping with the challenges of the pandemic. Proper planning will be needed to curb the effect of COVID-19 on students' health and wellbeing.

Key Words: Medical Education, Medical Student, Coronavirus, COVID-19, Nigeria (Source: MeSH-NLM).

INTRODUCTION.

On the 11th of March 2020, World Health Organization (WHO) declared Coronavirus Disease 19 (COVID-19) a pandemic.[1] Every level of education was challenged, including undergraduate medical education. Many countries resorted to the use of technology to ensure continuity in learning, as online education seemed to be the only logical alternative during this lockdown.[2–5] Studies have also shown that online education holds some merit over traditional methods of learning.[6] However, with online education, peculiarities in undergraduate medical training such as the need for clinical and laboratory activities, which play a pivotal role in learning, cannot be carried out. These have been replaced with clinical scenarios and alternatives to practical experiences.

The experiences of medical students in these times have varied depending on individual and location-based situations. While some final year students received an accelerated graduation,[7] others were asked to stay home until further notice with lectures and training moved online[8], and alternatively, some were allowed to participate in relief efforts during the pandemic.[9] Many students experienced increased psychological pressure from uncertainties regarding future practice and how the pandemic might disrupt it.[10] In addition, some students were not favorably disposed to the online learning environment.[5] An Italian medical student described his online experience as “troubled”,[11] and an Indian medical student described his experience of transitioning to online learning as “rough”, citing poor internet connection and poor video quality as some of the reasons that influenced his experience.[12] A pharmacy student in Nigeria stated in his experience that the education of many of his colleagues had been put to a halt and that the transition to online learning was affected by the lack of infrastructure, with only a few institutions commencing online learning.[13]

In Nigeria, medical undergraduate education (MBBS or MBChB) is a six-year program with a one-year compulsory internship. Like all other countries, medical colleges in Nigeria were closed due to the pandemic and one could assume that learning would have moved from the traditional method of face-to-face lecture to an online platform. However, being a low- and middle-income country, many Nigerians lack stable electricity supply, reliable network, and internet coverage. Many students also may not be able to afford the extra costs and equipment needed to utilize online learning to its full potential, if used at all. All of the aforementioned factors may impair the learning of undergraduate medical students during this pandemic.

This study, therefore, assessed Nigerian medical student’s perception of the effect of COVID-19 on their medical education. It is expected that findings from this study may inform interventions aimed at improving medical students learning during the pandemic, especially as the country experiences the second wave of the COVID-19 outbreak.

MATERIALS AND METHODS.

STUDY DESIGN AND PARTICIPANTS

A descriptive cross-sectional study was conducted using Google Forms. A semi-structured questionnaire comprising of 47 questions was created by the authors. The survey was validated by pre-testing it with 10% of the study sample size for content and structure, and the internal consistency of scales used was done using Cronbach's alpha with a score of 0.689. A sample size of 661 was determined using Fisher's formula for estimating sample size of a single proportion with prevalence assumed to be 50%, degree of accuracy desired set at 4%, and non-response rate of 10%. Students from all six years of undergraduate medical education in 33 medical institutions across the country, 7 private and 26 public, were included in the study. Non-proportionate stratified random sampling was used to select each participant.

QUESTIONNAIRE

A semi-structured pre-tested questionnaire was administered among consenting medical students in the English language. Links to the online Google Forms (Google LLC, CA, U.S.A.) Questionnaire were shared via the official class/Medical Student Association WhatsApp (WhatsApp Inc, CA, U.S.A.) groups and via text messages. The questionnaire was available online for 50 days. A restriction on the number of survey responses from a single email limited duplicate responses and all respondents were given information on the aims and risks of the study. The questionnaire consisted of four sections; Section one captured information about population demographics; Section two measured participants awareness of online activities organized by institutions and student bodies in response to COVID-19, as an indirect measure of the response of these organizations in ensuring continued education during the pandemic; Section three measured the impact of COVID-19 on personal studying and learning, based on participants' perspective; and Section four measured participants perceived effect of the pandemic on their general day-to-day life and their educational progress. The questionnaire was expected to take an average of 15 minutes to complete.

DATA COLLECTION & ANALYSIS

The data for the study was collected anonymously using a pre-tested, semi-structured, and self-administered questionnaire. Data was exported from Google Forms to Excel (Microsoft Corp, WA, U.S.A.) and coded and analyzed using SPSS version 25 (Statistical Package for the Social Sciences, SPSS Inc, U.S.A). Categorical variables were summarized using frequencies and percentages while quantitative variables were summarized using means and standard deviation. Chi-square was used for the measure of association between categorical variables. All results are presented using tables and charts.

ETHICAL CONSIDERATION

Formal approval for the study was obtained from the Health Research and Ethics Committee of the Institute of Public Health, Obafemi Awolowo University, Ile-Ife, Nigeria (HREC No: IPHOAU/12/1588). All students were invited to participate after providing informed consent. Confidentiality was maintained as no identifying information was collected during the survey.

RESULTS.

Demographics

A total of 623 responses were analyzed with a response rate of 94%, from 33 Medical Institutions in Nigeria spanning the six geo-political zones of the country, with the highest response from the South-West at 45.4% and the lowest from the South-East at 7.2%. A total of 55.7% were males and 44.3% were females. The majority of responders (64.2%) were in their clinical years. 88.4% of participants were from public universities (60.2% Federal, 28.3% State) and 11.6% from private universities. Other socio-demographic characteristics can be seen in **Table 1** (n=623 for all percentages).

Integrative Learning Responses of Medical Institutions and Student Bodies to COVID-19 Disruption of Medical Education.

At the time of the questionnaire, most institutions had yet to switch to online teaching. Of the 33 institutions included in this study, only 25% of public institutions had commenced online lectures as reported by their students, and all private institutions had commenced online lectures (P=<0.001) **(Figure 1A)**. 92% of the participants in private institutions participated in online classes organized by their institution, however, participation was only 21% for those in public institutions (P=<0.001) **(Figure 1B)**. Similar awareness levels were seen among participants in both public and private institutions when it came to awareness of student-led initiatives towards online learning and seminar organization at institution level (63% for public institution and 76% for private institutions); (P=0.059) **(Figure 1C);** and regional/national level (58% for public institution and 66% for private institutions); (P=0.455) **(Figure 1D)**. Among the students who are currently not attending any online lectures organized by their institution, 44.6% wanted their institution to commence online teaching, while 30.5% were opposed (n= 623 for the above percentages), citing reasons such as internet cost and availability (32%), lack of effectiveness (23%), and unstable electricity supply (15%) as to the main factors that influenced their decision (n=191).

Impact of COVID-19 on Students' Self-Learning (Table 2)

Students were asked about their self-study during the pandemic. The majority of the respondents (82%) said they still engaged in self-study, and 45% engaged in group learning/discussion (females were more likely to have participated in group learning/discussion; (P=0.006)). However only 19.9% felt motivated to study, 82.4% perceived their study and learning was less effective when compared to the pre-pandemic period, and 68.9% would rather their institution resume despite the ongoing pandemic. There was essentially no statistical difference between responses based on gender (n= 623 for the above percentages).

Impact of COVID-19 on Students' Environment and Wellbeing (Table 3)

When asked about their perception of the impact of COVID-19 on their environment and general wellbeing – physical, social and mental health - the majority of the respondents indicated that the effect has been largely negative. Many of the students (56.3%, n=623) would rather have served as medical assistants under supervision instead of staying at home. Only 13% (n=623) indicated that the effect of the pandemic will spur improvement in medical education in the country.

DISCUSSION.

The COVID-19 pandemic has significantly affected medical education in Nigeria like in the rest of the world. Before the pandemic, the medical education system in Nigeria had faced with many unresolved challenges such as inadequate funding and poor infrastructure.[14] Therefore, this pandemic provided unique problems that were difficult to handle for these institutions. This was revealed in the fact only 25% of the 26 included public institutions had commenced some form of online classes as organized by the institution management, with only 21% of their students participating in these online lectures. This is different from a study done in Saudi Arabia, in which all medical institutions switched to online learning.[15]

The reason for this poor response and adjustment may be because most publicly owned medical institutions, which constitute nearly 80% of total medical institutions in Nigeria, have been poorly funded in the past by the government and as such, lacked the necessary resources and management drive to properly handle the change brought about by the pandemic.[16] Notwithstanding the historical lack of funding, additionally the revised national budget also included a reduction in the budgetary allocation to the health and education sector. This in turn may translate to a possible reduction in salaries for medical educators and also further limit funding towards infrastructure needed to improve learning both now and in the near future.[17] All of these have contributed to the lack of proper response by most public institutions who rely on the government for funding. Ossai (2020) in his publication on the readiness of Nigeria to tackle the impact of COVID-19 on medical education also shared similar sentiments, stating further that the lack of funding and infrastructure not only made Nigeria ill-equipped to handle the challenges that arose for undergraduate medical education, but also for postgraduate medical education including residency training.[17]

Many students attending these public institutions also felt that a quick transition from traditional lectures to online learning would prove difficult and ineffective as many claimed that lack of regular electricity supply and cost of internet subscription would hinder many students from attending online classes, the same reasons given in a publication by Oladipo et al. (2020) addressing the challenges of medical education in the pandemic era.[18] Similar challenges were also stated in a study done in India[5] and a write up from Brazil[19] concerning the implementation of online learning in public institutions in the respective countries, which are both middle income countries like Nigeria. However, this was not the case for higher income countries such as the United States,[2] China,[3] and others[20], who already had the infrastructure and systems for online learning and thus easily adapted even to the peculiar challenges of medical education. Private institutions, which constituted only 15% of the institutions included in this study, fared better in transiting to online lectures (100%), most likely due to the availability of more resources and proper planning. In addition, the majority of students in private institutions come from relatively wealthy families who have the means to provide the funds and resources to adjust seamlessly to this change.

Despite the lack of response and motivation from the management of most medical institutions in Nigeria, student-led initiatives have been the major route for organized seminars during this pandemic period. Almost three-fifths (59.4%) of the respondents claimed that their local student body has organized online learning programs during this time, also the majority of respondents affirmed that similar learning programs were also

being carried out at regional or national levels. This shows the commitment of the medical students towards improving their learning; however, more can still be done to ensure that every student can participate and benefit.

Self-study has always been an important part of medical education, as it is difficult to teach everything in detail during lectures and this is reflected in our study, as a majority of the respondents (82%) still engaged in personal study despite the prolonged disruption of face-to-face learning activities. Nonetheless, lectures and clinical activities have always been a motivating factor for students towards learning and skill acquisition and this became clearly evident as a majority of the students (80.1%) indicated that they lacked the motivation to study and also affirmed that their study was less effective now than before the pandemic when schools were in session. The importance of lectures and clinical activities mattered to the respondent so much so that 68.9% of the respondents preferred that medical institutions resume despite the current pandemic still surging both globally and locally. This may be attributed to the fact that medical training cannot be easily learnt in isolation or relying on personal study alone; a large part of medical training requires learning from experts and adequate guidance to properly understand clinical concepts.

Every student needs to be in proper health both physically, mentally, and socially to be up to the task and this appears difficult to achieve in this period of uncertainty and fear, as described in a study by Brodeur et al. (2021), which also reported that the pandemic may have severely affected peoples mental health.[21] A slight majority of the respondents (54.9%) agreed that this pandemic has affected their welfare negatively, which is in line with the result of a study carried out by Knepple et al. (2021) which recorded higher level of stress and negative effect of the pandemic in the young.[22] A similar number of respondents also claimed that there has been an increase in their cost of living, which may have led most of the respondents (80.3%) to engage in more extra-curricular activities outside of medicine than they normally would, such as work or other courses/training to help support their living expenses. This may further worsen the ability of the students to focus on learning and improving their skills even when the pandemic recedes.

Apart from the burden of the disease itself in terms of incidence, prevalence, and complications, there has been much concern about how the pandemic has affected various facets of life, especially as it pertains to education. Many students worry about their health, safety, education, and the well-being of their families,[23] and this may cause a lot of mental stress and its related mental health consequences. Concerning the effect of the pandemic on mental health, some students (43.6%) believed that they experienced constant anxiety and fear during this pandemic, which agrees with the finding by Brodeur et al. (2021) and Knepple et al. (2021). A study by Dawel et al. (2020) suggested that the negative effects themselves may be attributed to the social, professional, and financial disruptions induced by the pandemic rather than the stress of being exposed to the virus.[21,22,24] All of these issues surrounding mental well-being will need to be addressed properly moving forward to ensure that students get back to a healthy state of mind before institutional activities resume in the near future.

Despite the challenges facing medical students in Nigeria today and their concerns about the Nigerian medical education system's response to COVID-19, they still have a desire to contribute to the fight against COVID-19 and to the health and wellbeing their community. Some medical students were involved in a campaign or activity

to help curb the spread of the virus and many more are taking to social media to provide regular information about the outbreak.

Strengths

This study examined Nigerian medical student's perception of the effect of COVID-19 on their medical education and is perhaps one of the few studies conducted on this subject in Nigeria. In addition, the study used a nationally representative data with a considerable sample size from many medical schools in the country across public and private universities.

Limitation

First, the sample population was not evenly distributed across all geo-political zones and levels of training, which may introduce some bias. Secondly, the study was cross-sectional and did not measure the effect over time and how students adjusted accordingly. Thirdly, the effect of the pandemic on student's mental health was based purely on the participants own perception and not on objective questioning and analysis, therefore it may be difficult to validate if the effects were due to the pandemic alone, especially because medical education alone is mentally challenging.

Conclusion

COVID-19 has affected all areas of medical education and student wellbeing in Nigeria. The degree of effect was especially influenced by the type of institution attended. Student-led initiatives have been the major drive for continued student education during this pandemic, as many public institutions have failed to meet the learning challenges of the present time. Proper planning and adequate rehabilitation will be needed to curb and possibly reverse the effects of COVID-19 on students' health and wellbeing when things return to normal. Further studies may look in-depth at the effect in specific areas such as the effects on mental health.

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FIGURES AND TABLES.

Figure 1. Response of Participants to Questions about **(A)** Commencement of Online Lectures in Institutions, **(B)** Participation in Online Lectures, and **(C)** Awareness of Online Programs Organized by Student Body at Institution Level and **(D)** National Level. (For A, n=33; B-D, n=623)

Fig 1A Commencement of Online Lectures in Institutions (n=33; Private=7 Public=26)

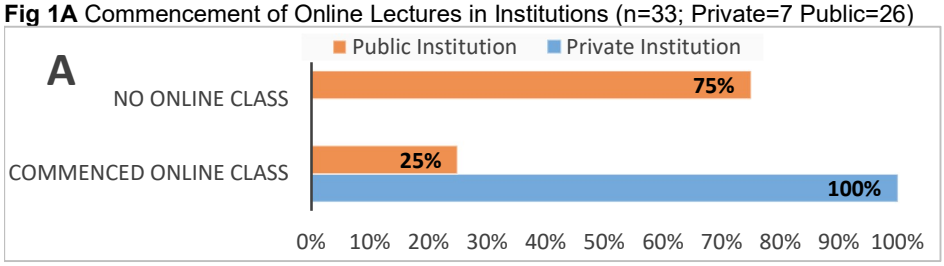

Fig 1B Participation in Online Lectures (n=623; Private=72 Public=551)

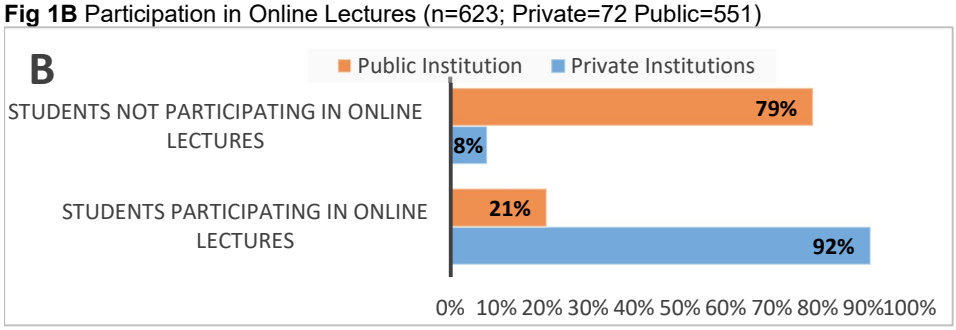

Fig 1C Awareness of Online Programs Organized by Student Body at Institution Level (n=623; Private=72 Public=551)

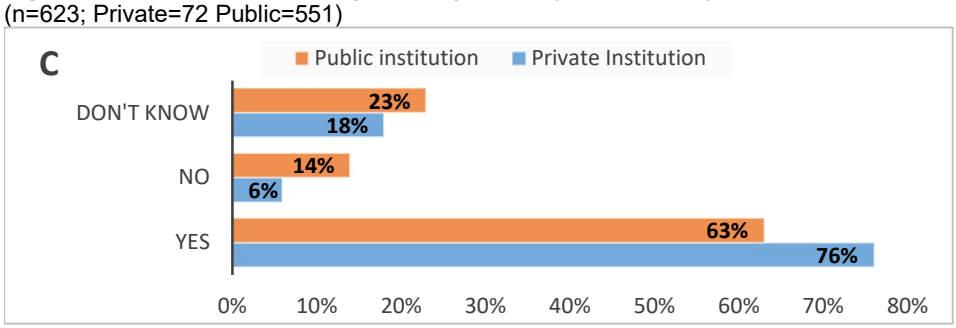

Fig 1D Awareness of Online Programs Organized by Student Body at National Level (n=623; Private=72 Public=551)

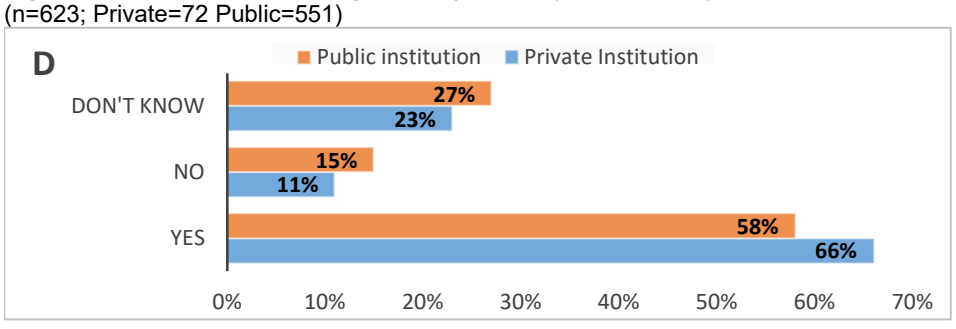

Table 1: Demographic Characteristics of Sample Population

Characteristics	Frequency (%) n= 623
Mean age(years)	
Total	22.2 ± 3.3
≤ 20	19.1 ± 1.1
21-25	22.8 ± 1.4
26-30	27.3 ± 1.4
>30	36.0 ± 5.4
Male	23.1 ± 3.7
Female	20.9 ± 2.4
Gender	
Male	347(55.7%)
Female	276(44.3%)
Marital Status	
Single	607(97.4%)
Married	12(1.9%)
Would rather not say	4(0.6%)
Educational Year	
1st	26(4.2%)
2nd	97(15.6%)
3rd	100(16.1%)
4th	184(29.5%)
5th	144(23.1%)
6th	72(11.6%)
Geopolitical Zone of Institution	
North-Central	48(7.7%)
North-East	71(11.4%)
North-West	113(18.1%)
South-East	45(7.2%)
South-South	63(10.1%)
South-West	283(45.4%)
Institution	
Private	72(11.6%)
Public	551(88.4%)
Access to stable electricity	248(39.8%)
Possession of internet-capable device	623(100.0%)
Ready access to the internet	424(68.1%)

Table 2: Participants' Perceived Effect of Covid-19 on Self-Learning.

Characteristics	Frequency (%) (n= 623)			
	Total	Male	Female	P-value
Engagement in self-study during this pandemic	511 (82.0)	286 (45.9)	225 (36.1)	0.426
Participation in group discussion/learning with colleagues	280 (45.0)	140 (22.5)	140 (22.5)	0.006
I have been motivated to study	124 (19.9)	77 (12.4)	47 (7.5)	0.066
There was more time available for me to study during this pandemic	181 (29.0)	95 (15.2)	86 (13.8)	0.173
My study was more effective when compared to pre-pandemic period	87 (14.0)	53 (8.5)	34 (5.5)	0.230
I was engaged in extracurricular activities during the pandemic to support myself	500 (80.2)	275 (44.1)	225 (36.1)	0.273

Table 3: Participants' Perception on the Effect of Covid-19 on Health and Wellbeing.

Question	Frequency (%) n=623				
	SA	A	N	D	SD
COVID-19 has negatively influenced the following					
Physical health	89 (14.3)	180 (28.9)	141 (22.6)	143 (23.0)	70 (11.2)
Mental health	139 (22.3)	201 (32.3)	115 (18.5)	112 (18.0)	56 (9.0)
Social health	133 (21.3)	219 (35.2)	148 (23.8)	85 (13.6)	38 (6.1)
The lockdown and restrictions have affected my welfare negatively	178 (28.6)	164 (26.3)	137 (22.0)	86 (13.8)	58 (9.3)
My cost of living has increased	177 (28.4)	167 (26.8)	132 (21.2)	92 (14.8)	55 (8.8)
I have had minimal social interactions with others	180 (28.9)	223 (35.8)	106 (17.0)	75 (12.0)	39 (6.3)
I have been having difficulties studying	297 (47.7)	195 (31.3)	69 (11.1)	43 (6.9)	19 (3.0)
My focus is less compared to when the disease wasn't yet in the country	262 (42.1)	183 (29.4)	68 (10.9)	79 (12.7)	31 (5.0)
I've been having constant anxiety about the possibility of I or my family contracting the virus	116 (18.6)	153 (24.6)	131 (21.0)	137 (22.0)	86 (13.8)

(Where SA= Strongly Agree, A= Agree, N= Neutral, D= Disagree, SD= Strongly Disagree)