Research Article

The Incidence of Anxiety and Depression Among Adolescents (Age 15-18 years old) After 1 year of Online Learning

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ABSTRACT

Background: Mental health has been a major concern among the pediatric population during this pandemic. Isolation, contact restrictions, absence of social interactions among friends could be a possible factor to anxiety and depression. Sudden shift of academic curriculum from traditional approach to online learning is also a major concern not only among the students but to parents and academes as well. Thus, identifying, screening and early intervention is a must to maintain mental wellness.
Objective: Aims to identify the incidence of anxiety and depression among adolescents aged 15-18 years old after 1 year of online learning.

Methodology: This is a descriptive analytical study which comprises of 171 participants grades 11 and 12, aged 15-18 years old enrolled in a public school in Ermita, Manila who are currently on online learning. The study was conducted from November 6,2021 until January 31,2022. All eligible participants were given consent via e-mail and were oriented virtually via zoom. Eligible participants were surveyed online using the general data collection tool, PHQ-9 (patient health questionnaire 9) and GAD-7 (Generalized Anxiety Disorder 7. Those who are not enrolled on online learning, >18 years old, those with pre-existing psychological disorder were excluded in the study. There were no medical records found to those with pre-existing psychological disorders. Those who garnered a score of >9 in PHQ- 9 and > 11 in GAD-7 were referred to Adolescent medicine specialist for further evaluation and management.

Results: Baseline demographic profile and level of depression was insignificant (p-value > 0.05). Educational level had no effect on anxiety severity. However, it was observed that females are more anxious compared to males during this pandemic (p-value 0.007). Factors affecting the level of anxiety and depression level such as prolonged virtual learning and physical presence of parents during online class were statistically significant. Similarly, feeling lonely and absence of social interaction were contributory stressors to anxiety and depression.

Conclusion: This pandemic affected the lives of the pediatric population wholistically. The results of the investigation reminded us that a strong student support program among the adolescents during the time of crisis should be develop and implemented to avoid further dilemma. Parents, relatives, academes and medical practitioners should work hand in hand and the help them live, cope up and function normally during public health crisis.

Keywords: Online learning, mental health, anxiety, depression

INTRODUCTION

The mental health of the pediatric population is greatly affected during public health crisis. The family members together with the academe and local government should collaborate to provide a crisis oriented psychological service.[1]

The coronavirus disease 2019 (COVID-19) affected the world negatively. There are many factors that brought change in the psychosocial environment like prolong isolation, absence of social interactions and fear of being infected were some of the measures that threatened the mental health of children and adolescents significantly.

It has been a major challenge to maintain an accessible emergency child and adolescent psychiatric treatment during this pandemic.[3]

The World Health Organization stated that adolescence is a unique and formative time wherein physical, emotional, intellectual and social changes occur. These changes and struggles make them vulnerable to mental health problems.[4]

During adolescence, friends or peer groups provide an important context for social and emotional support but during health crisis social interactions are restricted. Concerns about maintaining close relationship with peers and the consequences of isolation for social status and peer belonging may be strikingly observed in adolescents. Due to absence of social interactions and different factors teenagers are likely to experience the same stressors as adults during the pandemic.[4]

Lockdowns and school closures disrupted the lives of children and adolescents leading to limited and restricted freedom of movement, online learning and sudden absence of physical and social interactions with peer groups. This pandemic had a huge impact, not only on the mental health of children and adolescents, but also on their caregivers, families and communities. [5]

Schools for more than 168 million children globally have been completely closed for almost an entire year due to COVID-19 lockdown. School closures have devastating consequences for children's learning and wellbeing. The most vulnerable children and those unable to access remote learning are at an increased risk of never returning to the classroom, and even being forced into child marriage or child labor. According to latest data by UNESCO, more than 888 million children worldwide continue to face disruptions to their education due to full and partial school closures.[2] The impact of school closures to the mental health of the students during the pandemic lacks empirical evidences and is yet to be identify.

School closure is one of the community interventions made by the government to mitigate the transmission of the virus in the school, community and to the household hence the government and the academes were forced to shift the traditional curriculum to online learning.

Online Distance Education" or 'E-learning" utilizes the advent of virtual technology to maintain interactive learning among students. E-learning during the COVID-19 pandemic was the most sustainable and feasible way to continue studies as per the academic calendar. Thus, almost all countries implemented this type of learning at all levels to prevent the spread of Covifd-19 in the community and household.   However, the academes, teachers and students faced multiple challenges in terms of execution and quick adaptation to e-learning during the early phase of the pandemic.[7] Moreover, in a cross-sectional survey of university students of Saudi Arabia reported academic stress, anxiety and depression, insomnia and low levels of resilience during the pandemic.[7] Currently, there are only limited studies regarding the immediate and long-term effects of online learning to the physical, mental, social and emotional health of the students brought about by the Covid-19 pandemic.

During the Covid-19 pandemic, the sudden shift of the academic curriculum affected the lives of the students and the academes as well. Also, we need to assess parental beliefs and attitudes concerning online learning.

METHODOLOGY

Study Design and Participants

This descriptive analytical study registered senior high school students in grades 11 and 12, aged 15-18 years old who are enrolled on online learning in a public school in Ermita, Manila for Academic Year 2021-2022. The survey was conducted from November 6, 2021 until January 31, 2022.

ETHICAL CONSIDERATION

Prior to initiation, the study was reviewed and approved by the ManilaMed Ethical Review Committee.

A permit was secured from school administrators prior to the implementation of the study. Upon approval, a google form link containing the informed consent and assent form was then given to the teachers and they randomly distributed it to the participants. Those who voluntarily agreed to join the study were oriented virtually via google meet. During the orientation, the purpose and procedure of the study were discussed to the participants, together with their parents. After the orientation, the participants were surveyed online using the 22-item general data collection tool, PHQ-9 and GAD-7. To be considered an eligible participant, the student should meet the following criteria: Currently a senior high school student aged 15-18 years old on online learning, currently enrolled in a public school in Ermita, Manila; signed parental consent and assent form for those age 15-17 years old and lastly signed informed consent form to those 18 years old. Those who were > 18 years old; with pre-existing psychological disorders; >18 years old with concomitant pre-existing psychological disorder were excluded in the study. The school medical records of those who answered with pre-existing psychological disorders on the general screening tool were verified and found out that they don't have any record that they were diagnosed with pre-existing psychological disorder hence were excluded to avoid bias and confounder (see flow study diagram). Those who were screened with PHQ-9 score > 11 or GAD score >10 were referred to adolescent medicine specialist for further evaluation and management.

The participants had the freedom to withdraw anytime from the study and will not be penalized. To secure the participants privacy, any information given by the participants was known to the researchers only. Details such as participants' names, addresses were anonymized in the accordance to the guidelines for privacy and confidentiality as per Data Privacy act of 2012 and 2017 National Guidelines for Health-Related Research (NGHRR).

DATA PROTECTION PLAN

No data were used for any purpose other than what was intended for this study. The principal investigator accomplished data collection forms to ensure that only data needed by the study was collected while refraining from collecting confidential data that are unrelated to the study objectives.

The co-investigator and content adviser have reviewed the scientific and ethical soundness of the study and reviewed the interim report and final results. Data were protected by keeping the electronic files in an encrypted password protected external hard drive. Only the principal investigator had accessed to these records. The participants were randomly coded and that code served as their identity during the duration of the study. A master list was kept thru a separate password protected hard drive which will was only known to the researcher. The google form and the master list will be deleted 1 year after completion of the study and the electronic files will be erased by reformatting the hard drive 5 years after completion of the study.
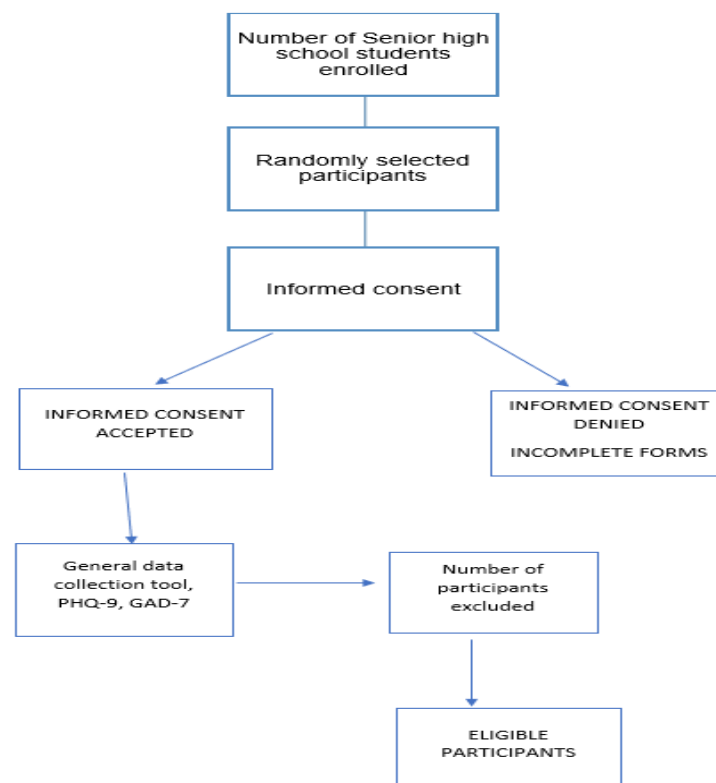
Figure 1: Flow study diagram

Measurement

1) General Data Collection Tool - includes the general information such as age, gender, educational level, time spent online before and during the pandemic, activities prior and during the pandemic and possible trigger factors of anxiety and depression.

2) Patient Health Questionnaire-9 (PHQ-9) - consist of 9 questions that assess the severity of depression symptoms (DSM- 5). The individual will rate the severity of his or her symptoms over the past 2 weeks. Response includes "not at all", "more than half the days", "nearly every day". A PHQ-9 score >11 or answered 1,2 or 3 on item 9 is considered significant.

3) Generalized Anxiety Depression Scale 7 (GAD-7) - is a 7-item questionnaire used to assess the severity of generalized anxiety disorder. The individual will rate the severity of his or her symptoms over the past 2 weeks. Similar to PHQ-9, the response includes "not at all", "several days "," more than half the days" and "nearly every day". A GAD-7 score of >10 is considered significant.

STATISTICAL ANALYSIS

Data were analyzed using Microsoft excel. The socio-demographic characteristics of participants were recorded and summarized using applicable descriptive statistics. Numerical data were summarized as mean, median standard deviation. Minimum and maximum values were also reported. Categorical data were presented as frequencies and percentages.

Anxiety and depression were determined using the patient health questionnaire 9 (PHQ-9) and generalized anxiety disorder 7 (GAD-7), respectively.

For this study, the minimum number of patients is calculated based on the prevalence of anxiety and depression among college students in Metro Manila (Cleofas, 2019) using the formula:

$$n = \frac{N * \frac{(Z_{\alpha/2})^2 * p(1-p)}{E^2}}{\frac{(Z_{\alpha/2})^2 * p(1-p)}{E^2} + N - 1}$$

where $Z\alpha/2$ is the critical value of the Normal distribution at $\alpha/2$ (e.g. for a confidence level of 95%, α is 0.05 and the critical value is 1.96), E is the margin of error, p is the sample proportion, and N is the population size. Assuming N = 10,000 , p = 55%, α = 0.05 and E = 8%, the recommended minimum sample size is 130.

The above sample size is also sufficient for logistic regression according to the study of Peduzzi et al. (1996) using the formula:

$$n = 10 \, k \, / \, p$$

 The groups mean, median, and standard deviation were calculated and compared using analysis of variance and independent t-test. Based on the scoring systems, the participants were classified as normal, minimal, moderate, moderate-to-severe, and severe anxiety and depression. A Multivariate analysis was used to assess the relationship of the identified factors to the level of anxiety and depression. Association of depression and

anxiety with socio-demographic factors triggers such as prolonged online used were tested using Chi square or Fisher exact test.

RESULTS

Out of two hundred twenty students, 171 (77.73%) agreed to join the study, 40 (18.18%) declined and 9 (4.09%) with incomplete data. The responses were validated individually. Of the 171 respondents, 18 (10.52%) were more than 18 years old, 24 (14.03%) answered to have pre-existing psychological disorders and 4 (1.81%) were more than 18 years old and with pre-existing psychological disorder were excluded in the study having a total of 133 (75.14%) responses (minimum target = 130). A total of 77 (57.8%) of the respondents had a PHQ-9 score of >10, while 56 (42.1%) had a PHQ-9 score <10. Moreover, 72 (54.1%) of the respondents had a GAD-7 score > 11 while 61 (45.86%) garnered a GAD-7 score < 11. (See flow diagram 2).
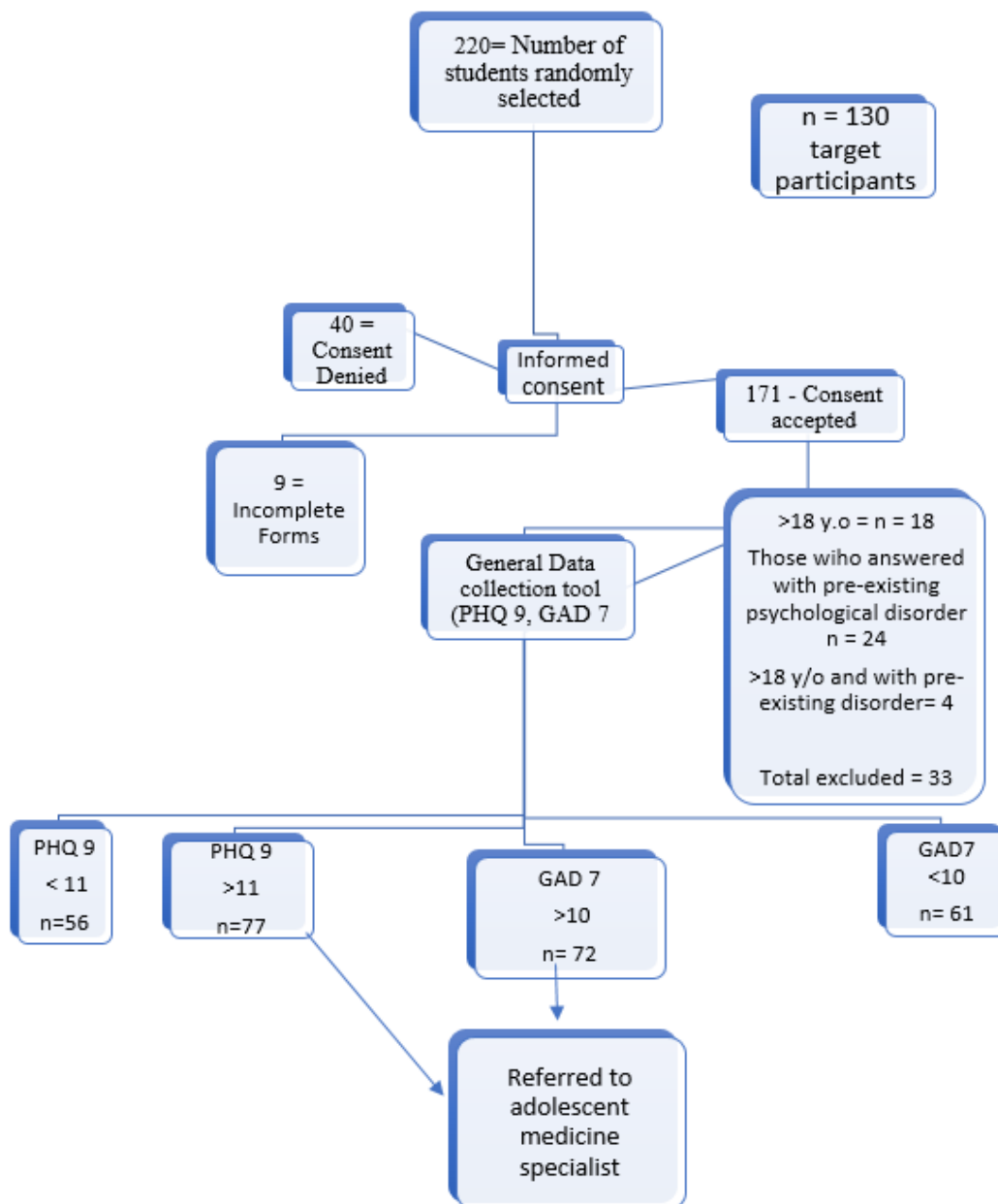
Flow Diagram- 2

The demographic characteristics of the surveyed participants (n = 133) are shown in Tables 1 and 2. The mean age of the participants is 17.3 years. 79 (59.4%) of the total respondents were female while 54 (40.6%) were male and with a female to male ratio of 3:2. Majority were grade 12 students with 132 (99.2%) participants. Based on GAD-7 scores, minimal, mild, moderate and severe anxiety levels were observed among 22.6%, 23.3%, 24.8% and 29.3% of the students, respectively. PHQ-9 score was 21.1% for minimal depression, 21.1% for mild, 33.8% for moderate, 15.8% moderately-severe and 3.8% for severe (tables 1 and 2). The results demonstrated that there was no association between the age of the student and level of anxiety (p-value 0.127). There were more male respondents having minimal and mild anxiety (53.3% and 58.1%, respectively) as compared to female (46.7% and 41.9%, respectively). As anxiety level increases to moderate and severe, the percentage of female students also increases (78.8% and 66.7%, respectively). Thus, there is a significant association between sex and anxiety level (p-value = 0.007). Grade level and anxiety level were not significantly associated (p-value = 0.707) (table 1). In comparison to the anxiety levels of the participants, there were no significant association observed for the age, sex, grade level and depression severity (p-value > 0.05) (table 2).

Characteristics	All (n = 133)	Minimal (n = 30)	Mild (n = 31)	Moderate (n = 33)	Severe (n = 39)	P-value
Age, years	17.3 ± 0.6	17.4 ± 0.6	17.3 ± 0.5	17.4 ± 0.6	17.1 ± 0.6	0.127
Sex						
Female	79 (59.4)	14 (46.7)	13 (41.9)	26 (78.8)	26 (66.7)	0.007
Male	54 (40.6)	16 (53.3)	18 (58.1)	7 (21.2)	13 (33.3)	
Grade level						
Grade 11	1 (0.8)	0 (0.0)	0 (0.0)	1 (3.0)	0 (0.0)	0.707
Grade 12	132 (99.2)	30 (100.0)	31 (100.0)	32 (97.0)	39 (100.0)	

Table 1: Demographic characteristics versus anxiety (GAD-7)

The results also showed that 53 (39.8%) were very concerned, 59 (44.4%) were concerned, 21 (15.8%) shows average concern during Covid-19 pandemic (table 3). Moreover, 105 (78.9%) of the total participants owned an electronic gadget independently. Also, majority of the participants started to own a gadget between the age of 13-15 years old (53 or 39.6%).

In addition, the following characteristics were also identified to determine the possible contributing factors to anxiety and depression (table 4). Learning of the participants was significantly affected during the pandemic compared to the pre-pandemic period (100 vs 48 or 75.2% vs 36.1%). Prior to pandemic, 4 (3%) of the participants spent 5-30 minutes, 18 (13.5%) spent 30-45 minutes, 28 (21.1%) spent 1 hour, 65 (48.9%) spent 1-5 hours and 18 (13.5%) spent more than 5 hours online. In comparison, 84 (64.3%) of the participants spent more

than 5 hours online during the pandemic. Moreover, the results revealed that studying is the primary reason for internet use with 115 (86.5%) pre-pandemic and 126 (94.7%) during the pandemic.

Characteristics	Minimal (n = 28)	Mild (n = 28)	Moderate (n = 45)	Moderately Severe (n = 21)	Severe (n = 11)	P-value
Age	17.4 ± 0.6	17.3 ± 0.5	17.3 ± 0.5	17.2 ± 0.7	17.0± 0.8	0.437
Sex						
Female	14 (50.0)	15 (53.6)	27 (60.0)	16 (76.2)	7 (63.6)	0.408
Male	14 (50.0)	13 (46.4)	18 (40.0)	5 (23.8)	4 (36.4)	
Grade level						
Grade 11	0 (0.0)	0 (0.0)	1 (2.2)	0 (0.0)	0 (0.0)	0.999
Grade 12	28 (100.0)	28 (100.0)	44 (97.8)	21 (100.0)	11 (100.0)	

Table 2: Demographic Characteristics versus depression (PHQ-9)

One hundred (87.2%) of the total participants were stressed due to more time spent on online learning. The other reasons for stress were feeling lonely at 52 (39.1%), absence of social interactions at 61 (45.9%) and staying at home during the community quarantine at 85 (63.9%). The study also revealed that 51 (38.3%) believed that they felt more anxious when their parents were around during online learning. The study also shows that lack of social interactions, feeling tired, staying at home, feeling lonely, can't focus on online learning and disturbed sleep were some reasons for being anxious during the pandemic at 82 (61.7%), 83 (62.4%), 91 (68.4%), 69 (51.9%), 88 (66.2%), 78 (58.6%) respectively (table 6). Prior to the pandemic, 78 (58.6%) of the participants spent their time with friends by going to the mall, 66 (49.6%) watched movies together, 26 (19.5%) played basketball with friends, 30 (22.6%) went shopping, and 95 (71.4%) chatted on their social media account. Their activities were significantly affected by the pandemic and this study has shown that 129 (97%) of the respondents use their social media account for chatting.

Items	Frequency (%)
Degree of concern during the COVID-19 Pandemic	
Very Concerned	53 (39.8)
Concerned	59 (44.4)
Average concern	21 (15.8)
Not concerned	0 (0.0)

Table 3: Degree of concern during COVID-19 Pandemic

Lastly, 125 (95.5%) of the participants did not feel disappointed if they forgot to submit their modules on time. (Table 4-2).

Items	Frequency (%)
Electronic gadget	
Independent owner	105 (78.9)
Shared	27 (20.3)
None	1 (0.8)
Age started owning a gadget	
< 5 years old	2 (1.5)
5 -12 years old	42 (31.6)
13 – 15 years old	53 (39.8)
16 – 18 years old	36 (27.1)
Learning affected prior the COVID-19 Pandemic	
No	44 (33.1)
Sometimes	41 (30.8)
Yes	48 (36.1)
Learning affected during COVID-19 Pandemic	
No	8 (6.0)
Sometimes	25 (18.8)
Yes	100 (75.2)
Time spent online before the COVID-19 Pandemic	
5-30 minutes	4 (3.0)
30 minutes-45 minutes	18 (13.5)
1 hour	28 (21.1)
1-5 hours	65 (48.9)
> 5 hours	18 (13.5)
Time spent online during the COVID-19 Pandemic	
5-30 minutes	3 (2.3)
30 minutes-45 minutes	7 (5.3)
1 hour	6 (4.5)
1-5 hours	33 (24.8)
> 5 hours	84 (63.2)
Reason for internet use prior the COVID-19 pandemic	
Study	115 (86.5)
Research	106 (79.7)
Online gaming	66 (49.6)
Business	7 (5.3)
Socials	103 (77.4)
Entertainment	83 (62.4)
Reason for internet use during the COVID-19 pandemic	
Study	126 (94.7)
Research	115 (86.5)
Online gaming	65 (48.9)
Business	16 (12.0)
Socials	109 (82.0)
Entertainment	90 (67.7)

Table 4-1: Possible Contributing factors to anxiety and depression

Items	Frequency %
Stress due to a longer time spent on online learning	116 (87.2)
Reason for stress aside from prolonged online use	
Feeling lonely	52 (39.1)
Absence of social interactions to friends	61 (45.9)
Staying at home for during the quarantine period	85 (63.9)
Others	50 (37.6)
More stress and anxious because parents are around during online class	51 (38.3)
Reasons for feeling anxious during the COVID-19 pandemic	
Lack of social interaction with friends	82 (61.7)
Just staying at home	91 (68.4)
Can't go the mall	21 (15.8)
Being with parents during my online class	24 (18.0)
Can't smoke	2 (1.5)
Liquor Ban	2 (1.5)
Feeling lonely	69 (51.9)
Feeling tired	83 (62.4)
Can't focus on online learning	88 (66.2)
Disturb sleep	78 (58.6)
Other reasons	35 (26.3)
Activities with friends prior COVID-19 Pandemic	
Going to the mall	78 (58.6)
Watching movie	66 (49.6)
Playing basketball	26 (19.5)
Going shopping	30 (22.6)
Chatting in social media account	95 (71.4)
Others	63 (47.4)
Activities with friends during COVID-19 Pandemic	
Chatting in social media account	129 (97.0)
Watching *Netflix* together	27 (20.3)
Playing basketball	4 (3.0)
Going shopping	4 (3.0)
Others	30 (22.6)
Do you feel disappointed when you forgot to submit your module on time?	
Yes	6 (4.5)
No	127 (95.5)

Table 4-2: Possible Contributing factors to anxiety and depression

Fischer tests were applied and nine contributing factors to those who were screened with anxiety were identified (table 5). There was significant association between the level of anxiety and the effect of the pandemic to learning (p-value = 0.025). In the minimal anxiety group, 17 (56.7%) believed that learning was affected during the pandemic. Percentage of students who believed learning was affected during pandemic had an increased anxiety level, 74.1% for mild, 81.8% for moderate and 84.6% for severe anxiety. Longer time spent on online learning and level of anxiety were also significantly associated with the students' responses of feeling stressed (p-value < 0.001). The percentage of students who felt stress had an increasing anxiety level, 66.7% for minimal, 87.1% for mild, 90.9% for moderate and 100.0% for severe. Feeling lonely and absence of social interactions among friends were reasons of stress during online learning were significantly associated with the level of anxiety (p-value < 0.001). Parents being around during online learning also showed significant association to the level of anxiety (p-value = 0.005). Higher percentage of students were more stressed and anxious with parents during

online class in moderate (48.5%) to severe levels (53.8%) than in minimal (16.7%) and mild (29.0%) anxiety levels.

Trigger factors	Minimal (n = 30)	Mild (n = 31)	Moderate (n = 33)	Severe (n = 39)	P-value
Learning during pandemic					
No	6 (20.0)	0 (0.0)	1 (3.0)	1 (2.6)	
Sometimes	7 (23.3)	8 (25.8)	5 (15.2)	5 (12.8)	
Yes	17 (56.7)	23 (74.2)	27 (81.8)	33 (84.6)	0.025
Longer time e-learning	20 (66.7)	27 (87.1)	30 (90.9)	39 (100.0)	< 0.001
Lonely as stressor due to prolonged online used	4 (13.3)	12 (38.7)	11 (33.3)	25 (64.1)	< 0.001
Absence of social interaction	9 (30.0)	17 (54.8)	12 (36.4)	23 (59.0)	0.048
Presence of parents during online learning	5 (16.7)	9 (29.0)	16 (48.5)	21 (53.8)	0.005
Lonely as factor for anxiety	7 (23.3)	20 (64.5)	14 (42.4)	28 (71.8)	< 0.001
Tired	11 (36.7)	18 (58.1)	21 (63.6)	33 (84.6)	< 0.001
Focus of e-learning	10 (33.3)	21 (67.7)	26 (78.8)	31 (79.5)	< 0.001
Sleep	6 (20.0)	17 (54.8)	21 (63.6)	34 (87.2)	< 0.001

Table 5: Identified factors to anxiety (GAD-7)

Feeling lonely and tired, unable to focus on online learning and disturbed sleep were the mentioned possible reasons for feeling anxious during pandemic were significantly associated with anxiety severity (p-value < 0.001). In general, higher percentage of students who answered the above reasons were in the higher anxiety levels.

Trigger factors	Minimal (n = 28)	Mild (n = 28)	Moderate (n = 45)	Moderately Severe (n = 21)	Severe (n = 11)	P-value
Learning during pandemic						
No	6 (21.4)	0 (0.0)	2 (4.4)	0 (0.0)	0 (0.0)	
Sometimes	8 (28.6)	9 (32.1)	5 (11.1)	2 (9.5)	1 (9.1)	
Yes	14 (50.0)	19 (67.9)	38 (84.4)	19 (90.5)	10 (90.9)	0.003
Longer time e-learning	17 (60.7)	23 (82.1)	44 (97.8)	21 (100.0)	11 (100.0)	< 0.001
Lonely as stressor due to prolonged online used	6 (21.4)	10 (35.7)	16 (35.6)	13 (61.9)	7 (63.6)	0.023
Isolation	8 (28.6)	11 (39.3)	24 (53.3)	10 (47.6)	8 (72.7)	0.050
Absence of social interaction	12 (42.9)	15 (53.6)	33 (73.3)	16 (76.2)	9 (81.8)	0.029
Presence of parents during online learning	5 (17.9)	7 (25.0)	18 (40.0)	15 (71.4)	6 (54.5)	0.046
Lonely as factor for anxiety	9 (32.1)	13 (46.4)	25 (55.6)	13 (61.9)	9 (81.8)	0.034
Tired	12 (42.9)	16 (57.1)	29 (64.4)	16 (76.2)	10 (90.9)	< 0.001
Focus of e-learning	8 (28.6)	18 (64.3)	34 (75.6)	19 (90.5)	9 (81.8)	< 0.001
Sleep	6 (21.4)	18 (64.3)	26 (57.8)	17 (81.0)	11 (100.0)	0.001

Table 6: Identified factors to depression (PHQ-9)

Fischer test analysis were applied and 10 contributing factors to those who were screened with depression were identified (table 6). Results showed that the level of depression was also significantly associated to the effect of

the pandemic in learning (p-value= 0.003). In the minimal depression group, 14 (50%) believed that learning is affected during the pandemic. Percentage of students affected during the pandemic had an increasing depression level, 67.9% mild, 84.4% moderate, 90.5% for moderate to severe and 100% for severe depression. There was significant association between depression and stress due to longer time spent on online learning (p-value < 0.001). Absence of social interactions among friends and feeling lonely which were some of the reasons of stress during online learning were significantly associated with the level of depression (p-value < 0.029 and 0.023). Presence of parents during online learning also presented with significant association to the level of depression (p-value 0.046). Results also showed that there is a higher percentage of students who felt more stressed and depressed with their parents' presence during online class in the moderate (40%), moderate to severe (71.4%), and severe (54.5 %) as compared to the minimal (17.9%) and mild (25%) depression levels.

Characteristics	B coefficient	Adjusted Odds ratio	P-value
Longer time e-learning	1.444	4.239	0.029
Lonely	1.656	5.238	0.011
Focus of e learning	1.204	3.335	0.027
Disturbed Sleep	1.626	5.086	0.001

Table 7. Relationship of anxiety and identified factors by logistic regression

Feeling lonely, tired, unable to focus on online learning and disturbed sleep were mentioned as possible reasons for feeling depressed during pandemic were significantly associated to the level of depression (p-value 0.034, <0.001 and < 0.001 respectively).

Characteristics	B coefficient	Adjusted Odds ratio	P-value
Learning during pandemic	0.777	2.176	0.035
Longer time e-learning	1.523	4.585	0.030
Focus of e learning	1.327	3.769	0.017
Disturbed Sleep	1.497	4.470	0.011

Table 8. Relationship of depression and identified factors by logistics regression.

Items	Frequency (%)
In GAD7, if you checked any of the problems, how difficult have these problems made it for you to do your work, take care of things at home, or get along with people?	
Not difficult	22 (16.5)
Somewhat difficult	70 (52.6)
Very difficult	27 (20.3)
Extremely difficult	14 (10.5)
In PHQ9, if you checked any of the problems, how difficult have these problems made it for you to do your work, take care of things at home, or get along with people?	
Not difficult	18 (13.5)
Somewhat difficult	72 (54.1)
Very Difficult	31 (23.3)
Extremely difficult	12 (9.0)

Table 9. Difficulty

In general, higher percentage of students who answered the above reasons were in the higher depression levels. Furthermore, logistic regression analysis indicated only four factors as being significantly associated with increased levels of students' anxiety symptoms (mild, moderate or severe) as follows: longer time on e-learning (AOR = 4.239), feeling lonely being a possible reason for stress during the COVID-19 pandemic (AOR = 5.238) and unable to focus on online learning and disturbed sleep as reasons for feeling anxious (AOR = 3.335 and 5.086, respectively).

In GAD-7 and PHQ-9, majority of the respondents believed that it is somewhat difficult for them to do their daily activities and get along with people at 52.6% and 54.1% respectively.

DISCUSSION

Covid-19 pandemic presented many challenges which holistically affected the lives of children and adolescents. This study will give a brief overview regarding the impact of Covid-19, online learning and related factors in the mental health of adolescents.

According to Li Duan et al (2020) reported that the pandemic has affected their learning and graduation. Students spent longer time on using the internet for studying as compared to the pre-pandemic period. It has also been revealed that the clinical depressive symptoms among children and adolescents were higher than the pre-pandemic period. Our study revealed that the level of anxiety and the effect of pandemic to learning was significant (p value = 0.025). The level of depression and the effect of pandemic to learning is also statistically significant (p-value= 0.003). In addition to our review, it has been reported that students spent > 5 hours online, which could be a risk factor to internet or smart phone addiction. Internet or smart phone addiction can lead to behavioural or mental health problems causing poor academic performance, mood and behavioural problems. In relation to our study, logistic regression has shown that longer time spent on online learning is a significant risk factor to anxiety and depression (p value= 0.029 and 0.035).

In our literature review, a local study by Tee et al (2020) revealed that the pandemic has a huge impact on the mental health of the general population wherein mostly had moderate-severe depressive, anxiety and stress level. Also, the study revealed that female sex, prolong isolation, fear of a family member to be infected and discrimination were some of the factors associated with greater psychological impact.[9] Similarly, our study also showed that being female had more predisposition to be anxious but not necessarily depressed (see tables 1 and 2). Moreover, logistic regression analysis of our study has shown that longer time spent on online learning, feeling lonely during the pandemic, can't focus on online learning and disturbed sleep were significant risk factors to anxiety and depression (p value= 0.029, 0.11, 0.027, 0.001) (p value= 0.035, 0.030, 0.017, 0.011) respectively.

According to a systematic review made by UNICEF, they found out that the prevalence rates for general depression is 12% to 44% across studies compared with pre-pandemic prevalence of 17 % prior to 2018.

Moreover, 37 % of the sample population reported with anxiety symptoms. Also, in a Brazilian study found anxiety reports in 19 % of children, and more for those whose parents had essential jobs 31 % or who physically distanced without parents 36 %. The study reported that there were no changes in national child and adolescent suicide rates in Japan. There was an overall decrease in suicidal behavior among children and adolescents presenting for emergency services in the context of Covid-19. Moreover, the study also reported that 14% of students of aged 13- 20 years old reported difficulty in eating, 19% with difficulty in heartbeat and 34% were crying frequently. Those symptoms were observed more significantly among females and adolescents living in areas with strict lockdown.   In addition, the study also reported that 14 % of young people age 14-35 years old had PTSD symptoms and 40% reported with psychological problems. Also, this report showed that 73% and 51 % were showing signs of increased irritation and anger. These symptoms worsen by changes in sleep patterns, diet, routines, weight and increase used of electronic screen. In an Italian study, 36 % and 42 % of sampled children of all ages were showcasing more intense and more frequent behavior problems respectively, with a high association among those with pre-existing behavior issues. In summary, the results of this literature review and our study showed almost similar results.[6]

Also, in a systematic review done by Rusell et al, showed that 53.3 % of girls and 44 % of boys aged 13-18 years old showed signs of anxiety and trauma. In addition, 47.4 % of girls and 59.6% of boys reported with anxiety symptoms while depressive symptoms were reported in   19.4 % of girls and 21.9 % of boys. Our study showed similar results and it is evident that females are more predisposed to being anxious than males. However, in comparison to the anxiety levels of the participants, there were no significant association observed for the age, grade level and anxiety level severity (p-value > 0.05). Moreover, Spanish study found that mean daily screen time rose by 2.9 hours per day with 245% increase, greatest among teenagers, while an Indian study found mean screen time was 5.1 hours during lockdown, more than 70% higher than previous national data and our study identified that 63.2% of the participants spent more than 5 hours online during the pandemic as compared to 13.5 % during the pre-pandemic period. [10]

In a study done by Sehar-un et al, revealed that students with average academic performance experience emotional symptoms of stress and females were more vulnerable to emotional stress. The relationship of academic performance to anxiety and depression was not measured in our study.

Our study demonstrated that learning has been significantly affected and recognized as one of the significant factors to depression during the Covid-19 pandemic. In contrast to our study, Svan Hammerstein et al (2021) found out that school closure brought by Covid-19 has both positive and negative effects to the academic performance of students. This systematic review had mixed findings, the literature identified that students who were on online learning showed improvement on mathematics and reading, while the other studies revealed that Covid-19 had a negative impact on math, science and reading. [11] Our research was not able to identify the specific academic areas affected by online learning in relation to Covid-19 and mental health.

Our study determined that online learning is not the sole reason for the incidence of anxiety and depression among adolescents during the pandemic but rather caused by multiple factors. In a study by Sehar-un et al stated that prolonged closure of any institutions brought psychological consequences among the students. Reliance to distance learning deprived them from direct learning experiences which generates stress among students. Also, the literature recommends appropriate public health intervention to prevent the negative psychological impacts of increased exposure to digital devices, extended home confinement and social isolation, which are associated with e-learning exposure.

CONCLUSION

In conclusion, we examined the incidence of anxiety and depression among adolescents after 1 year of online learning and identified some factors that could possibly contribute to their anxiety and depressive symptoms. Also, this study has shown that female adolescents were more predisposed to being anxious than males. Age and grade level have no significant relationship to the level of anxiety and depression. Moreover, longer time spent on online learning, feeling lonely, disturbed sleep and effect of the pandemic to learning were identified as a contributing factor and have significant relationship to the level of anxiety and depression. Though learning has been significantly affected, our research was not able to determine the specific academic areas affected by prolong online learning and Covid-19.

RECOMMENDATIONS

A multicenter study is recommended to check the incidence of anxiety and depression in the general pediatric population. A validated tool regarding the compensatory mechanisms of adolescents in handling stress, anxiety and depression should be made to determine their coping strategies during crisis. Another study should also be made among children <15 years old to identify or determine their mental health status a year after online learning or during the COVID-19 pandemic. Also, this research recommend to do a study regarding the effect of prolong online learning to academic performance of students during the Covid-19 pandemic.

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