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PREVALENCE OF ANXIETY AND DEPRESSION AMONG PAKISTANI UNIVERSITY STUDENTS DURING COVID-19

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ABSTRACT

University students are a vulnerable population for a range of mental health conditions, but primarily for anxiety and depression. In the light of existing literature, we have reasons to believe that the COVID-19 pandemic has further exacerbated the mental health of university students, especially in terms of anxiety and depression. Hence, this study sets out to investigate the prevalence of anxiety and depression among university students of Pakistan during the COVID-19 pandemic and explore the related risk factors. To achieve this, a standardized survey questionnaire employing Generalized Anxiety Disorder questionnaire (GAD-7) and Patient Health Questionnaire (PHQ-9) to assess the symptoms of anxiety and depression respectively was generated with Google Forms and was spread among students via social media platforms. A total of 205 participants studying in Pakistan completed the survey. 50% of the respondents reported moderate to severe levels of anxiety and 60% reported moderate to very severe levels of depression. Pearson's Correlation revealed risk factors as being a female, lack of exercise, unstable sleep schedule, living alone, being home quarantined, following the news about COVID-19, and future academic concerns. This study is proof that anxiety and depression are an alarming threat to university students during the COVID-19 pandemic. In these unprecedented times, it is important that the mental health of university students be monitored, and they be provided with psychosocial support, psychological services, and psychoeducation to help mitigate the mental health implication of the COVID-19 pandemic.

KEYWORDS: COVID-19, Coronavirus, University students, Pakistan, Depression, Anxiety, Mental Health, GAD-7, PHQ-9

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1. INTRODUCTION

In the December of 2019, pneumonia with unknown etiology was reported in a large number of patients in Wuhan, a city of China. The novel coronavirus, termed as the COVID-19 was found responsible for this viral respiratory infection (Chowdhury & Oommen, 2020). Soon the COVID-19 evolved to become what is, undoubtedly the biggest pandemic of the millennium. It took the virus barely four months to spread across the globe claiming thousands of lives in the process. In the January of 2020, the World Health Organization (WHO) declared the coronavirus outbreak as a Public Health Emergency, followed by its declaration as a Global Pandemic in March 2020 (Anand et al., 2020).

Fear and chaos took over the world as countries struggled to find ways to battle this highly transmissible virus. The rapid spread of the COVID-19 and the dramatic death toll consequently led to the shutting down of all public places, educational institutions, and offices. The lives of people worldwide were drastically altered as countries took extreme measures of curfews and lockdowns for unspecified periods. On an individual level, people struggled to adapt to this new radical lifestyle, whilst experiencing the fear and grief of losing loved ones, financial instability, confusion regarding the virus, and uncertainty about the future. All these factors combined with the prevalence of an epidemic carry the potential to wreak havoc on an individual's mental health. A systematic review revealed that there is a relatively high rate of anxiety, depression, post-traumatic stress disorder, psychological distress, and stress among the general population of China, Spain, Italy, Iran, US, Turkey, Nepal, and Denmark during the COVID-19 (Xiong et al., 2020). A significantly wide range of psychological consequences is being observed in almost every group and strata of the society.

One such group is the university students. There is extensive research that establishes how young adults, especially those that are university students, are more susceptible to certain mental health issues. "Even in the pre-pandemic period, more than one-third of students experienced mental health problems" (Zivin et al., 2009). The most prevalent mental health disorders among university students are found to be anxiety followed by depression (Blanco et al., 2008). Many factors may be held accountable for this, one of them being that "most mental health disorders have their peak onset during young adulthood" (Pedrelli et al., 2015). A review of the recent literature shows that 75% of all lifetime mental disorders start by the early twenties (Kessler et al., 2007). In addition to the general vulnerability during this age, university-related factors such as academic stress, career building, social life difficulties, and interpersonal issues heighten the chances for developing mental health issues. Consequently, most people with mental health disorders have their first onset during their years of university. Considering that the lives of university students have been significantly changed due to the COVID-19, as they switched to distance learning; ceased all social activities; struggled to keep up with the academics, and tried to make sense of future goals, it is only befitting that this vulnerable group be evaluated, especially for depression and anxiety.

China was the first country to carry out a cross-sectional survey to measure the prevalence of anxiety among their university students during the epidemic. The study revealed that the university students were a high-risk group (Cao et al., 2020). Soon, other countries replicated the research and found alarmingly similar results. This led to a number of cross-sectional surveys being conducted across countries, incorporating various anxiety and depression scales and gauging the prevalence of anxiety and depression among the university students. The objective was an attempt to gain an insight into how prevalent depression and anxiety are as well as narrow down potential risk factors so that better healthcare policies may be designed, and the needs of the high-risk group may be catered to efficiently. In the current study, we aim to achieve similar objectives for the Pakistani university students.

The focus of this study is to investigate the prevalence of depression and anxiety among the Pakistani university students during the COVID-19 pandemic and determine the potential risk factors associated so that we may have sufficient knowledge about if and how much the COVID-19 has affected the mental health of Pakistani university students. There is hitherto a huge vacuum when it comes to the research on the psychological effects of COVID-19 in general, and on Pakistanis in particular. This study aims towards filling in this gap. Previous studies done in Pakistan regarding the mental health impacts of COVID-19 have mostly targeted the general population. There is a gap in our knowledge about the nature and severity of mental health implications the COVID-19 has had on university students. Lack of knowledge implies that we are yet ill-equipped to cater to the needs of this group. Thus, it is essential to carry out research on this vulnerable group and evaluate their mental state.

This research study deals with anxiety and depression to address the following research question: What is the prevalence of anxiety and depression among the university students of Pakistan during the COVID-19? Anxiety is best defined as *"An emotion characterized by feelings of tension, worried thoughts and physical changes like increased blood pressure."* (Anxiety, 2000). Whereas depression is defined as *"A mental disorder that presents with depressed mood, loss of interest/pleasure, decreased energy, feelings of guilt/low self-worth, disturbed sleep or appetite, and poor concentration."* (Marcus et al., 2012). In addition to that, this study will also investigate if the following variables are potential risk factors for anxiety and depression among the target group: gender, unstable sleep schedule, lack of regular exercise, having a friend or family member as a healthcare worker, being quarantined, living with family, following news about COVID-19, and future academic concerns.

The significance of this study lies not only in the fact that it investigates the prevalence and risk factors among a vulnerable group for the most prevalent disorders (anxiety and depression) but also in the harsh reality that only a few more comparable studies have been conducted in Pakistan before. The objective is also to contribute to the body of similar growing research being done worldwide.

This shall help us in getting a more holistic and inclusive view of the effects of COVID-19 on students around the globe. Lastly, the findings of this study shall provide us with a clearer profile of students who are more likely to suffer the implications of this pandemic.

The subsequent sections are organized as follows: section two comprises of a literature review of the existing research on the effects of COVID-19 on the mental health of university students in different countries. Section three discusses the methodology and research design utilized for this research. Section four reveals the research findings of this study. Fifth section analyzes and discusses these findings by drawing out comparisons of these results with the results from similar studies. This section then proceeds to point out the limitations of this research along with recommendations for future studies. Finally, the last section summarizes the key points of this paper in the form of a conclusion.

2. LITERATURE REVIEW

Even though the amount of research done on COVID-19 has bypassed that of other pandemics, there remains a huge gap in our knowledge, especially regarding the mental health implications of the COVID-19. Many countries are striving to bridge this gap by evaluating the mental health of different groups in their population. University students is one such group that is under investigation mainly for anxiety and depression since it is at a higher risk for these disorders than the general population (Odriozola-González et al., 2020). We shall skim through the most relevant and profound research that has been conducted on university students around the world during the COVID-19.

As mentioned earlier, the study done in China to evaluate the anxiety of university students was the first of its kind and paved the way for other countries to carry out similar research. It involved 7143 university students and utilized an online questionnaire that consisted of GAD-7 along with certain demographical questions. Results revealed that in total 24.9% of college students were experiencing anxiety. 0.9% had severe, 2.7% had moderate, and 21.3% had mild anxiety (Cao et al., 2020). The correlational analysis showed stable family income, social support, and living with family as protective factors; whereas, disruptions in daily life, economic difficulties, and delays in academics were the risk factors. The most significant risk factors, however, were found to be living alone and having a family member or friend as a healthcare worker. This is precisely why these two factors were included in our research. Whereas gender and region were found to hold no significance.

The research done by Islam et al. (2020) took one step further and evaluated the prevalence of depression alongside anxiety in the Bangladeshi university students. Through a web-based cross-sectional survey, data was collected from 476 participants. The GAD-7 and PHQ-9 were used for gauging anxiety and depression respectively. The results showed that 82.4% of the participants had mild to severe depressive symptoms and 87.7% of students exhibited mild to severe anxiety symptoms (Islam et al., 2020). Surprisingly, in this study gender was found to be significant since

male students had higher levels of depression and anxiety as compared to their female counterparts. Also, contrary to the previous research, living with the family was found to be the risk factor for depression and anxiety. Lastly, students that did not do physical exercise had more prevalent depression. Thus, we included both living with family and exercise in our research to explore these factors further.

AlHadi and Alhuwaydi (2021) conducted cross-sectional research, among the university students of Saudi Arabia, utilizing the GAD-7, PHQ-9, and an additional Perceived Stress Scale. The results from the 5,140 participants revealed that 40.8% of students had significant symptoms of anxiety. Approximately half of the students (48.8%) had significant symptoms of depression and 86.7% had moderate to high perceived stress (AlHadi & Alhuwaydi, 2021). This research interestingly, found the female gender to be a risk factor. Having a friend or family member as a healthcare worker was again found to be in high correlation with anxiety and depressive symptoms, along with previously being diagnosed with a physical or psychological health issue. The last item on PHQ-9 also indicated that one-fifth of the students thought about death or suicide at least once during the past two weeks. This was undoubtedly an alarming finding, which is why we deemed it necessary to use PHQ-9 in our research.

Karing (2021) carried out research on the university students in Germany during the first lockdown. The prevalence of anxiety, depression, and stress was found using the German versions of the GAD-7, PHQ-8, and Perceived Stress Scale (PSS). The findings from the 2548 participants showed that 35.9%, 27.7%, and 25.1% of the students had moderate to severe depression, anxiety, and stress respectively. The risk factors were categorized into two groups: COVID-19 related stressors, and personal characteristics. From the personal characteristic group neuroticism, being older, and being female surfaced as significant risk factors. From the COVID-19 group academic struggles, financial difficulties, concern for the health of loved ones, and quarantine experience were found to be significant. The results also detected media exposure regarding the COVID-19 to be an important risk factor. This finding is consistent with the results of the research on the COVID-19 related risk factors in the Israeli and Ukrainian university students (Schiff et al., 2020) and the reason why we added following the news about COVID-19 as a potential risk factor in our study.

A cross-sectional survey study was conducted in the US university students in the September of 2020. The research used GAD-7 and PHQ-9 for anxiety and depression along with some open-ended questions regarding the COVID-19 specific risk factors (Wang et al., 2020). The results reported that 48% of students experienced moderate to severe level depression and 38% experienced moderate to severe anxiety. The last item on PHQ-9 detected that 18% of students had suicidal or self-harm thoughts. Furthermore, two-third of the participants indicated that their anxiety and stress levels had increased considerably during the COVID-19 pandemic. Out of the 2031 participants, 1360 elaborated on the reasons for the increase in stress/anxiety. The biggest contributor towards

stress/anxiety was shown to be academic concerns such as delayed graduation, job search, and future goals. This was followed by health concerns namely the well-being of friends and family, as well as trouble sleeping. The female gender once again surfaced as a prominent risk factor for both depression and anxiety. All of the stated risk factors and stressors are consistent with the findings of an interview study conducted among US university students on the effects of COVID-19 (Son et al., 2020).

A study with a localized student sample was conducted in Pakistan. This study targeted only medical students and gathered participants from five Medical Colleges in the province of Punjab. It comprised of GAD-7, PHQ-9, and Risk Assessment Suicidality Scale along with demographical information and past history of mental illness. The results showed that 46.7% of the participants admitted that their mental health and emotional state had gotten worse ever since the COVID-19 pandemic started. 48.1% of the participants experienced depressive symptoms and 48% had anxiety. Furthermore, "one in five medical students (approximately 20%) thought that it would be better if they were dead and 8% admitted to often thinking of committing suicide if they have the chance during 2-week period." (Imran et al., 2021). The highest prevalence of depression, anxiety, and suicidality were found among female, preclinical students with a psychiatric history. Even though past mental health diagnosis appeared as a prominent risk factor we chose not to include it in our study because such a question had a high likelihood of making participants feel uncomfortable leading to inaccurate responses or even non-submission of the survey.

3. METHODOLOGY

The research design for this study was created with the objective of evaluating the prevalence and risk factors of anxiety and depression among Pakistani university students during the COVID-19. Thus, the independent variable was COVID-19 and anxiety and depression were treated as the dependent variables. Furthermore, gender, sleep, exercise, having a friend or family member as a healthcare worker, being quarantined, living with family, following news about COVID-19, and future academic concerns were investigated as risk factors.

This was a quantitative research study that aimed at collecting real-time data regarding the prevalence of anxiety and depression among Pakistani university students during the COVID-19. The study utilized an online questionnaire survey. The snow-ball sampling technique was used to collect data for this study.

The questionnaire developed for this study was aimed at assessing anxiety, depression, and their potential risk factors and thus, was divided into three sections. The first two sections are comprised of standardized and validated psychometric scales. The third section, however, was developed by bringing together the most significant risk factors from existing literature.

The anxiety symptoms were gauged through the Generalized Anxiety Scale (GAD-7). Comprising of only 7 questions, the GAD-7 is an easy and quick tool with powerful psychometric properties for the screening and severity of anxiety in the general population. Not only has it demonstrated good reliability but it also possesses "criterion, construct, factorial, and procedural validity" (Spitzer, Kroenke, Williams , & Löwe , 2006). Furthermore, the cutoff score defined for the GAD-7 optimizes its sensitivity to 89% and specificity to 82% (Spitzer, Kroenke, Williams , & Löwe , 2006). Participants answered questions such as "Not being able to stop or control worrying?" based on their experiences in the last two weeks. All items on the scale are rated on a four-point Likert scale with 0 being not at all and 3 being nearly every day. The total score ranges from 0 to 21. Higher scores indicate higher severity of anxiety and functional impairment. The interpretation of the total score is: "Normal/ minimal (0–4), Mild (5–9), Moderate (10–14) and Severe anxiety (15–20)" (Spitzer, Kroenke, Williams , & Löwe , 2006).

To gauge depression, Patient Health Questionnaire 9 (PHQ-9) was used. The PHQ-9 is an easier, self-administered version of the PRIME-MD diagnostic instrument for common mental disorders. Comprising of just 9 items, the PHQ-9 is considerably shorter than other measures with comparable sensitivity and specificity. What further distinguishes PHQ-9 from other measures is the fact that it scores each of the nine DSM-IV criteria for depression (Kroenke & Spitzer, 2002). Thus, this dual-purpose instrument is used to make a tentative diagnosis of depression in at-risk populations and grade the severity of depressive symptoms. The respondents answer questions such as "Little interest or pleasure in doing things" and "Little interest or pleasure in doing things". All 9 items are rated on a four-point Likert scale with 0 being not at all and 3 being nearly every day. The total score ranges from 0 to 24. "The total score can be categorized into the following groups: no/ minimal (0–4), mild (5–9), moderate (10–14), severe (15–19), and very severe (20-27) depression." (Kroenke & Spitzer, 2002).

The third section included the following potential risk factor questions about gender, sleep schedule, regular exercise, having a friend or family member as a healthcare worker, being quarantined, living with family, following news about COVID-19, and future academic concerns.

The target population for this research study was university students, including both undergraduate and graduate students. The questionnaire was opened by 214 participants out of which 210 wished to participate and proceeded towards the eligibility section and 205 were eligible to start the first section of the questionnaire and submit the complete survey. There was no restriction of age, field, and region. The survey was open to anyone residing and studying in Pakistan.

The inclusion criteria set were current university students who live in Pakistan. Anyone who was not residing and studying in Pakistan was excluded. Bachelors, Masters, and PhD students from any

faculty/department were all welcomed to participate. Furthermore, every university from every province of Pakistan was included.

This was an online questionnaire created through Google forms and distributed to university students through social media platforms such as WhatsApp and Instagram. The questionnaire was sent out to university students studying at different universities across Pakistan along with a request to spread it among friends and fellows on 16th November. The data was collected till 6th December. Data from 205 complete surveys was utilized. The questionnaire was accessed easily through a link which upon clicking opened the first page of the survey. On this page, it was explicitly stated that this questionnaire is aimed only towards Pakistani university students. On the third page of the survey, an eligibility question was created that stated, "Are you a university student studying in Pakistan?" If the answer was 'yes', the first section of the questionnaire would open and in the case of 'no' the survey would open the "Not Eligible to Participate" page.

To optimize the validity of this research, standardized and well-established psychometric measures with strong validity were chosen. It was ensured that the measures being used comprised of comprehensive and well-crafted items which cover the major symptoms of the disorders under exploration thoroughly. It was also made sure that they were concise and easy to interpret. Both measures used were rated on Likert scales with four options so that the respondents may report their experiences as accurately as possible and thus, provide valid and reliable data.

Withdrawal and survey fatigue are major issues that need to be tackled when it comes to ensuring the reliability of a questionnaire. This is why the risk factor questions were kept minimal. Risk factors such as the level of study (Bachelors/Masters/PhD), the field of study, and region which were not found to be significant in the existing literature were not included. Furthermore, sensitive questions such as psychiatric history, chronic illnesses were also excluded to prevent any distress in the respondents which might have resulted in inaccurate responses or withdrawal.

3.1 Ethical Considerations

The Ethical Approval for this research was obtained from the International Open University. Complete anonymity was ensured since no information that can identify the participant was obtained. The first page of the Questionnaire described the aim of the study briefly. This was followed by an Informed Consent section that explicitly stated that the participation in this survey is completely voluntary and that the participants are free to withdraw from the survey at any point without any consequences. Furthermore, it was also stated that the participants would remain anonymous and the information provided by them in this survey is and will remain completely confidential. The informed consent section ended with the question "Do you wish to participate?" An affirmative reply would lead to the Eligibility section, whereas a negative response would end

the survey. Lastly, a responsive email address was provided to answer any queries regarding the survey and data collection procedure.

This was quantitative research and the methods used to treat the data were also quantitative. To evaluate the prevalence of depression and anxiety, the scores of each respondent were calculated. These scores were then categorized according to the severity level (normal, mild, moderate, and severe) they qualified. Then the total percentage for each severity level was calculated. Since we aimed to find out the potential risk factors for anxiety and depression by evaluating the statistical association between them and selected variables, Pearson Correlation was used. Microsoft Excel was used both for the descriptive statistics of the first two sections and the Pearson Correlation for the third section.

4. RESULTS

4.1 The prevalence of anxiety

Calculating the total anxiety scores for all respondents and categorizing them according to the severity level they qualified for, it was uncovered that out of the 205 participants 168 displayed symptoms of anxiety. Further dissection showed that 32% (66) participants reported mild levels of anxiety, 31% (64) reported moderate levels, and 19% (38) reported severe levels of anxiety. In total, 82% of the participants reported mild to severe levels of anxiety.

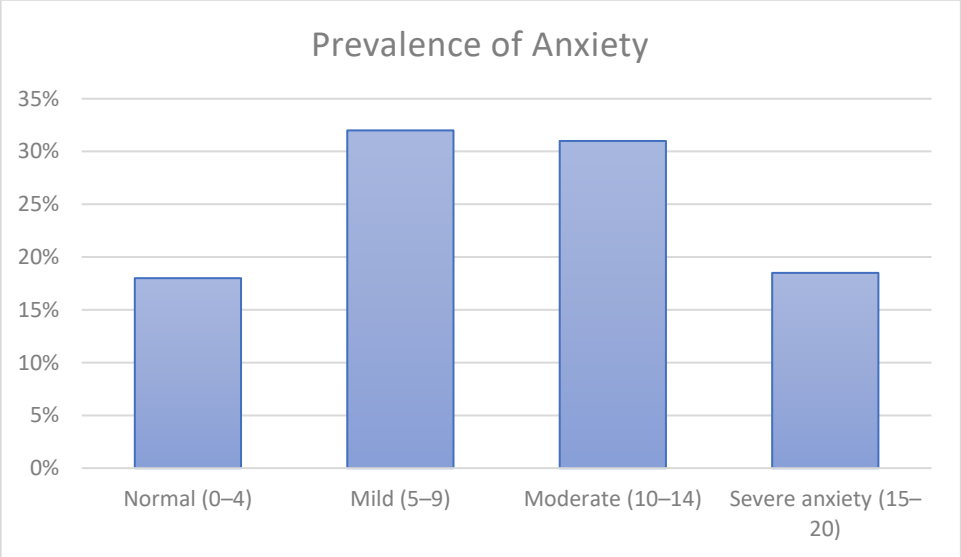

Figure 1. Prevalence of anxiety according to the severity level cutoffs

4.2 The prevalence of depression

The calculation and categorization of the total depression scores of participants into the severity levels of depression showed that a vast majority (81%) of participants experienced mild to very severe levels of depressive symptoms. Out of the 205 participants, 21% (43) had mild depression,

29% (60) had moderate depression, 16% (33) had severe depression, and 15% (30) had very severe depression. Furthermore, the response to the last item on the PHQ-9 revealed that 50% of the participants reported suicidal or self-harm thoughts. 23.4% reported having these thoughts several days, 10.7% more than half days, and 16% reported having these thoughts every day.

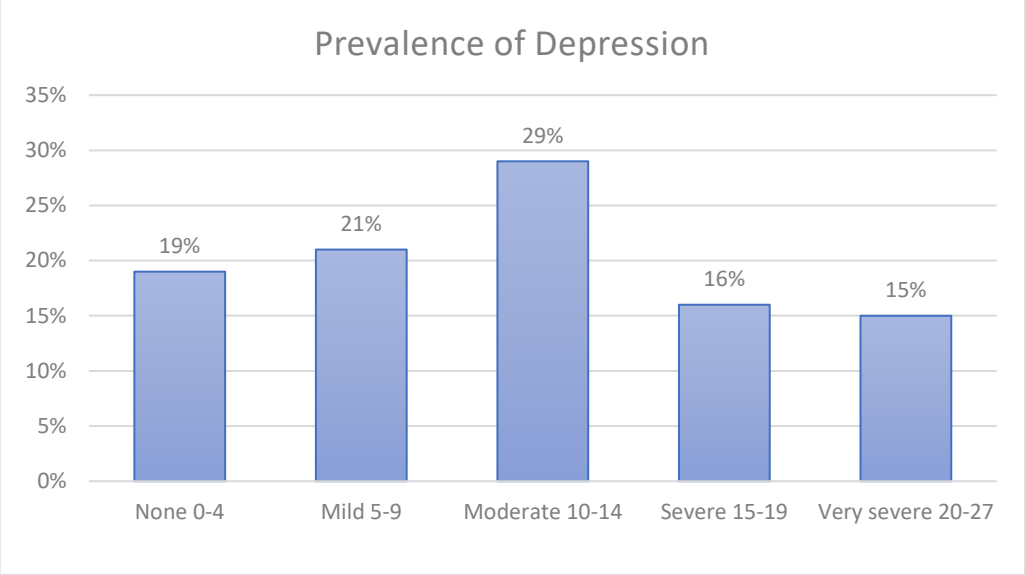

Figure 2. Prevalence of depression according to the severity level cutoffs

4.3 Gender as a risk factor

Out of the participants were 65% (133) were females and 35% (72) were males. The administration of Pearson's correlation between the overall anxiety scores from the GAD-7 and overall depression scores from PHQ-9 respectively and the gender of participants revealed that a positive correlation existed among these variables. For anxiety, the correlation coefficient (r) was found to be 0.35 $p<0.05$ whereas, for depression, it was found to be r=0.31 $p<0.05$ indicating a moderately significant positive correlation between gender and anxiety levels.

4.4 Lack of regular exercise as a risk factor

The majority of participants (77%) reported that they did not exercise regularly, and the rest (23%) said that they did. The Pearson's correlation between overall anxiety scores and regular exercise found the correlation coefficient to be r=0.18 $p<0.05$ showing a positive correlation. The correlation coefficient for the correlation between depression scores and exercise was found to be r=0.17 $p<0.05$. Both correlations qualify as weak in terms of significance.

4.5 Unstable sleep schedule as a risk factor

60% (123) of the participants admitted that they did not have a stable eight-hour sleep schedule. The correlation coefficient after conducting Pearson's correlation for a stable sleep schedule was found to be r=0.30 $p<0.05$ with overall anxiety scores and r=0.26 $p<0.05$ with overall depression scores. Both correlations are positive and moderately significant.

4.6 Living with family as a risk factor

A vast majority of participants (79%) stated that they live with their families. Conducting Pearson's correlation led to the correlation coefficient of r=0.03 $p>0.05$ for overall anxiety scores and living with family, and r=0.06 $p>0.05$ for depression scores and living with family. Both correlations, despite being positive are very weak in terms of significance. Since p>0.05 for both variables, we cannot reject the null hypothesis.

4.7 Having a friend or family member as a healthcare worker as a risk factor

Almost half of (51%) the participants reported having a friend or family member as a healthcare worker. The correlation coefficient after conducting Pearson's correlation for having a friend or family member as a healthcare worker was found to be r=0.08 $p>0.05$ with overall anxiety scores and r=0.10 $p>0.05$ with overall depression scores. Both correlations are positive with the correlation of depression being slightly more significant than that for anxiety. Since $p>0.05$ for both variables, we cannot reject the null hypothesis.

4.8 Being home quarantined as a risk factor

53% of the participants stated that they had been home quarantined. The Pearson's correlation between overall anxiety scores and home quarantine found the correlation coefficient to be r=0.13 $p<0.05$ showing a positive correlation. The correlation coefficient for the correlation between depression scores and home quarantine was found to be r=0.21 $p<0.05$. Both correlations are moderately significant.

4.9 Following news about COVID-19 as a risk factor

The majority (71%) of participants acknowledged that they kept up with the news about COVID-19. The Pearson's correlation between overall anxiety scores and keeping up with the news about COVID-19 found the correlation coefficient to be r=0.07 $p>0.05$ showing a positive yet statistically weak correlation. Furthermore, since $p>0.05$ we cannot reject the null hypothesis. The correlation coefficient for the correlation between depression scores and keeping up with the news about COVID-19 was found to be r=0.13 $p<0.05$ which is a positive yet weak correlation.

4.10 Future academic concerns as a risk factor

More than half of the participants (73%) reported that they think their career goals and aspirations have been affected by COVID-19. The correlation coefficient after conducting Pearson's correlation for concerns about future academic concerns was found to be r=0.03 p>0.05 with overall anxiety scores and r=0.03 p>0.05 with overall depression scores. Both correlations however positive, are extremely weak in terms of significance. Also, since p>0.05 for both variables, we cannot reject the null hypothesis.

5. DISCUSSION

The present study aimed at evaluating the prevalence of anxiety and depression among the university students of Pakistan during the COVID-19 pandemic and investigating the related risk factors. The findings of our research show that 50% of the participants displayed moderate to severe levels of anxiety and 60% displayed moderate to very severe depressive symptoms. A similar prevalence was found in the research done in: Turkey, where 52% and 63% students reported moderate to severe anxiety and depression levels respectively (Aslan, Ochnik, & Çınar, 2020); Bangladesh, where moderate to severe anxiety and depression levels were found in 43% and 53% of students respectively (Islam et al., 2020); and Saudi Arabia, where the prevalence of anxiety and depression was 40.8% and 48.8% respectively (AlHadi & Alhuwaydi, 2021). However, these levels are higher than those reported in: Germany, where 27.7% and 35.9% of the students had moderate to severe anxiety and depression respectively (Karing, 2021); America, where 38% and 48% of students reported moderate to severe anxiety and depression respectively (Wang, et al., 2020); Spain, where 21% and 34% of students reported moderate to severe anxiety and depression respectively (Odriozola-González et al., 2020); Croatia, where 28.8% and 19.48% of students reported moderate to severe anxiety and depression respectively (Vulic-Prtoric, Sturnela, & Selak, 2020); China, where 21% and 11% of a large student sample displayed moderate to severe anxiety and depressive symptoms (Ma, et al., 2020); Russia, where 33% and 41% students reported moderate to severe anxiety and depression respectively (Ochnik, et al., 2021); and Czech students, who reported anxiety and depression levels of 13% and 21% respectively (Ochnik, et al., 2021). Furthermore, 50% of respondents indicated that they had suicidal/self-harm thoughts through the last item on PHQ-9 which is much higher than what we have observed in the aforementioned studies and in the research done on Pakistani medical students (Imran et al., 2021).

The risk factors included being a female, lack of regular exercise, unstable sleep, living alone, being quarantined, following the news about COVID-19, and future academic concerns. All of these are consistent with the risk factors found in the existing literature. However, the correlations are significantly lower than the ones found in the studies by Karing (2021), Arënliu et al. (2020), and Son et al. (2020). Having a friend or family member as a healthcare worker was not found to be a

risk factor contrary to the findings of similar studies (Cao, et al., 2020; Schiff et al., 2020; AlHadi & Alhuwaydi, 2021; Karing, 2021). The differences in the levels of anxiety and depression and weak correlations may be attributed to the considerably larger sample sizes that were used in all of the above-mentioned studies. Furthermore, these variations may also be due to the fact that almost all the studies that have produced different results were conducted in 2020 during the first or second wave of COVID-19 whereas, this study was conducted during the fourth wave of COVID-19.

An important trend has also been brought into attention by this study and that is, the levels of anxiety and depression are increasing as the pandemic persists. This implies that students are even more at risk for mental health issues than they were last year. Hence, it is crucial that we pay more attention towards catering to the mental health issues of university students. It is suggested that universities provide psychoeducation to their students by conducting seminars/workshops. Coping strategies should be taught to provide psychosocial support to students and lower the impacts of the pandemic. Furthermore, mindfulness-based exercises and mediations should be introduced to the students since they have been proven to lower the psychological impacts of the pandemic (Morr et al., 2020). Lastly, it is high time that universities collaborate and invest in mental health professionals that are easily accessible to all students and provide services such as counseling and stress-management training.

There are several limitations to the present study. The primary limitation is the sample size. Since the sample size for this study is markedly small, it is not fully representative of the target group. This implies that we cannot generalize these results completely. The majority of participants were females which is also a hindrance in the generalization of these results. The cross-sectional design of this study is another limitation since without any longitudinal data we cannot establish any cause-and-effect relationship. In addition to that, we do not have any baseline data from a similar pre-pandemic study to compare this data with since, most past studies were localized and took university students from a specific university or city as a sample. Another limitation is that the data was collected by the snowball sampling technique and there are high chances that it reached a certain social class from certain universities more than others. Furthermore, the universities have recently opened up after a long time of being shut and the students are getting used to the change which may or may not have had an effect on their responses. Lastly, the current study did not take into account the mental health history of the respondents.

We highly recommend that research with similar designs be conducted with larger sample sizes to get a better representation of the mental health of university students. These studies should also be more localized to narrow down any region and department-related risk factors. Furthermore, future studies should also have a distinction between Bachelors, Masters, and PhD students. Vaccination should also be incorporated in future studies to investigate if being vaccinated is a source of decrease in the anxiety and depression levels. Lastly, it would be ideal if upcoming studies collected

longitudinal data by following up with the students to get an insight into the changes in their mental health over time.

6. CONCLUSION

In the light of the findings from this study, it is fair to conclude that there is an alarmingly high prevalence of anxiety and depression among university students of Pakistan. The levels of anxiety and depression found in this study are considerably higher than the ones found in comparable research studies done last year. Thus, it is evident that university students are now more vulnerable than ever as they continue to bear the mental health implications of COVID-19. Certain pandemic and psycho-social factors namely being a female, lack of exercise, unstable sleep, living alone, being quarantined, following the news about COVID-19, and future academic concerns have surfaced as risk factors for increased anxiety and depression. This has helped us in getting more clarity on the profile of students who are most vulnerable to the mental health implications of this pandemic. In addition to that, the findings of this research demand immediate mental health services and better policies for this group. It is imperative now that the mental health of this group be monitored and they be provided with psychological services (counseling, stress-management training, etc.) to buffer the distress caused by the pandemic.

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APPENDICES

Appendix 1: Scatterplots

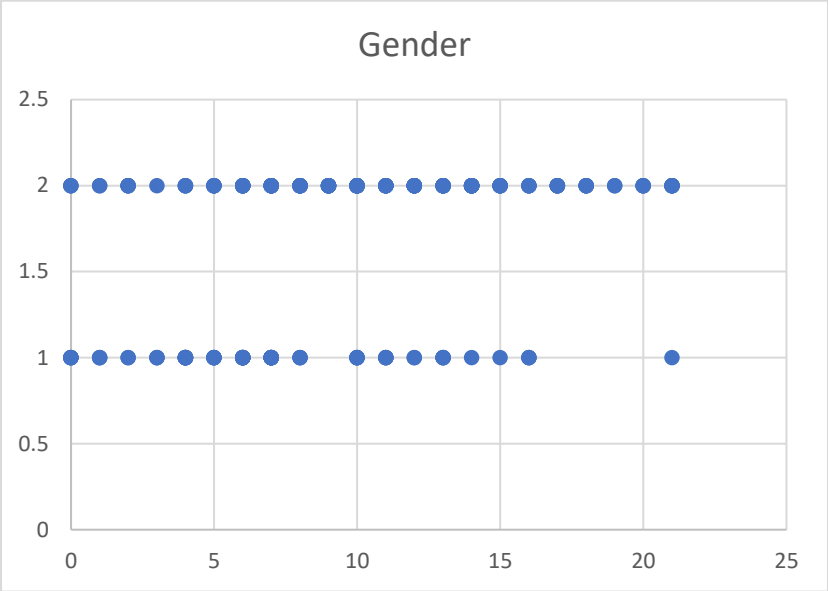

Figure 3. The scatterplot between anxiety scores and gender

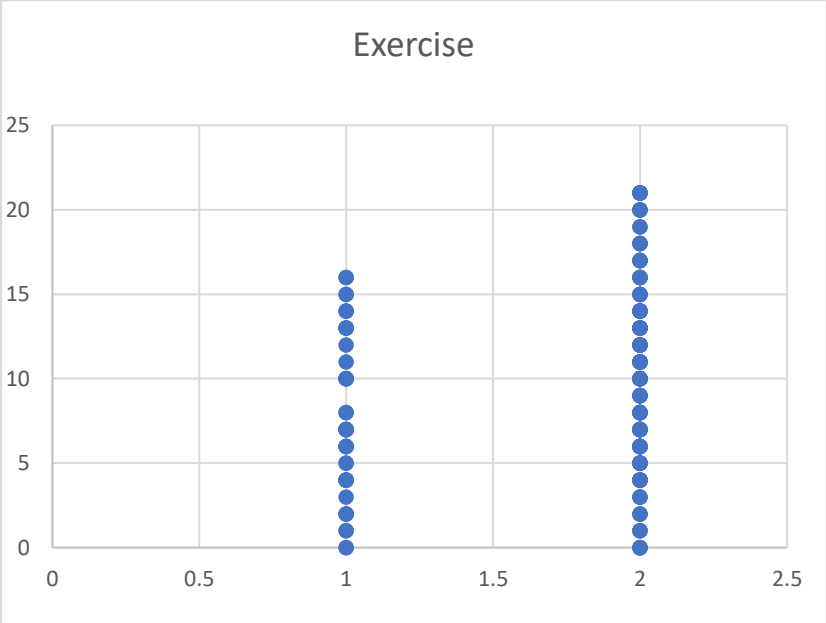

Figure 4. The scatterplot between anxiety scores and regular exercise

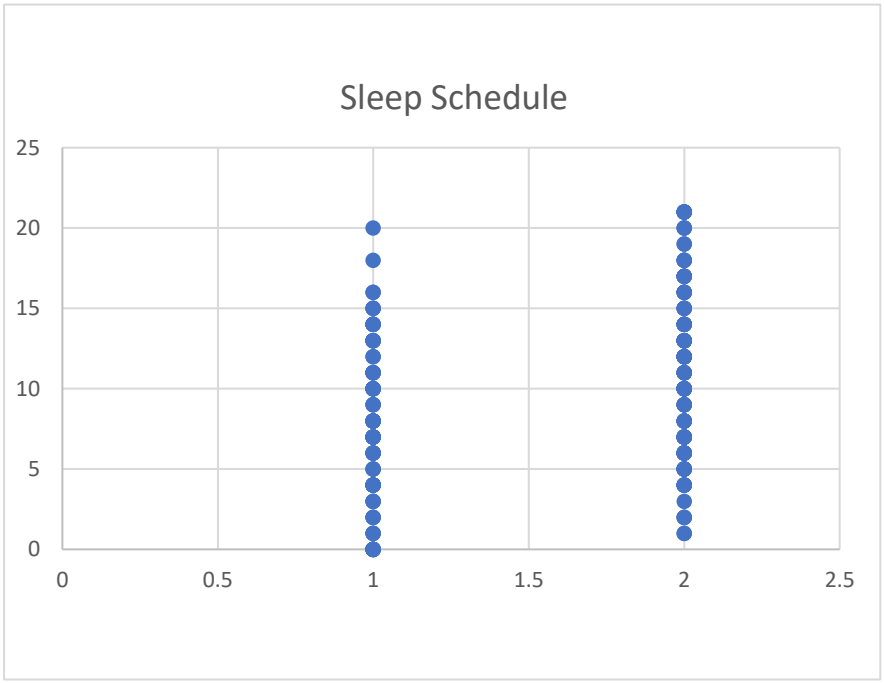

Figure 5. The scatterplot between anxiety scores and sleep schedule

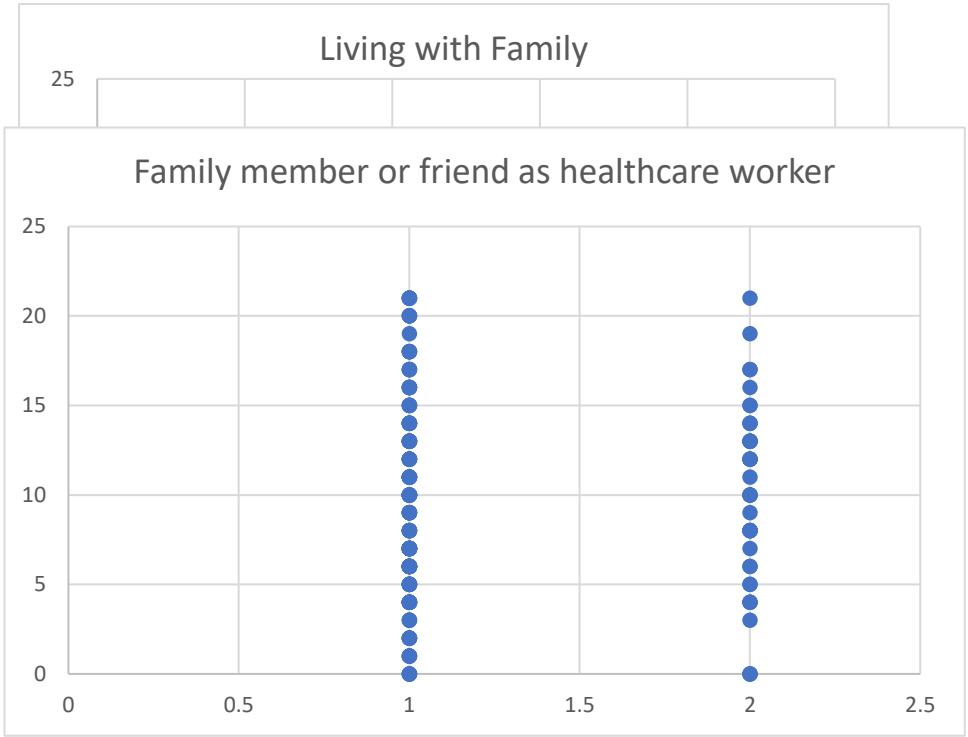

Figure 6. The scatterplot between anxiety scores and living with family

Figure 7. The scatterplot between anxiety scores and having a friend or family member as a healthcare worker

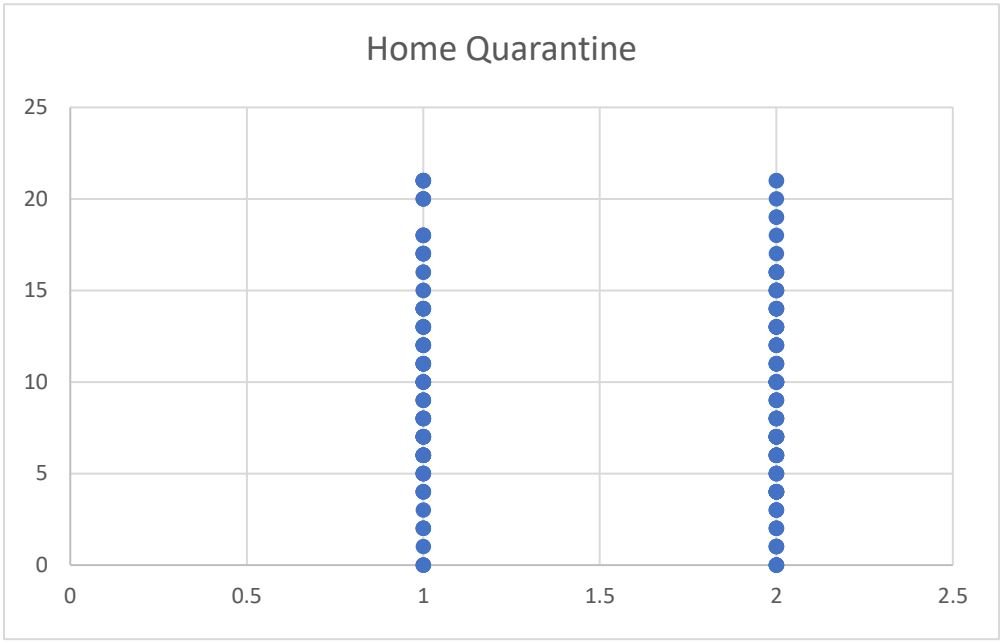

Figure 8. The scatterplot between anxiety scores and being home quarantined

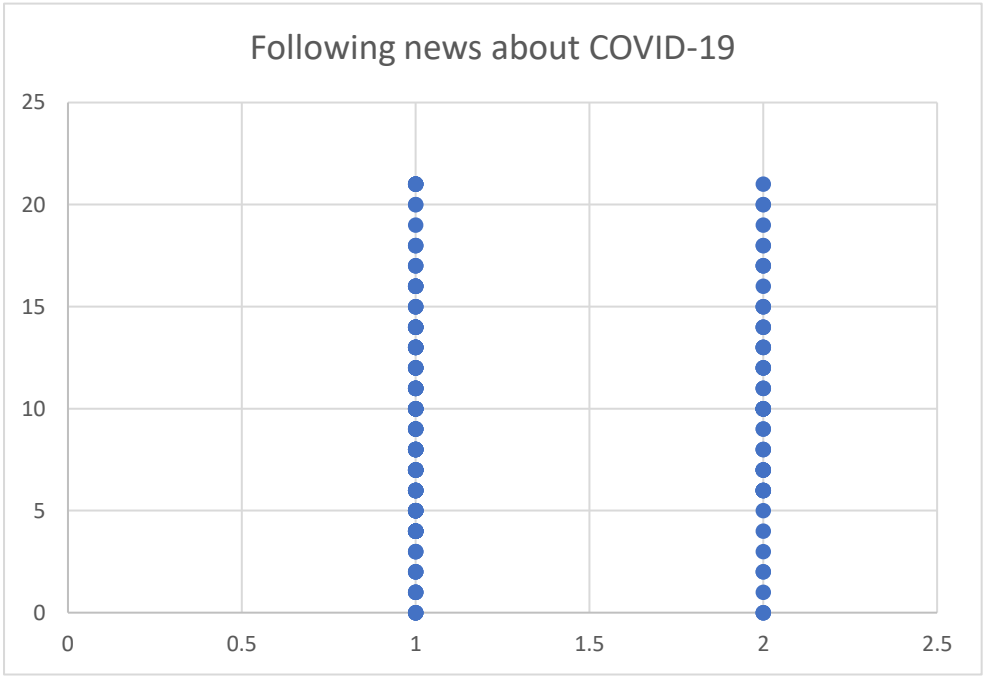

Figure 9. The scatterplot between anxiety scores and following the news about COVID-19

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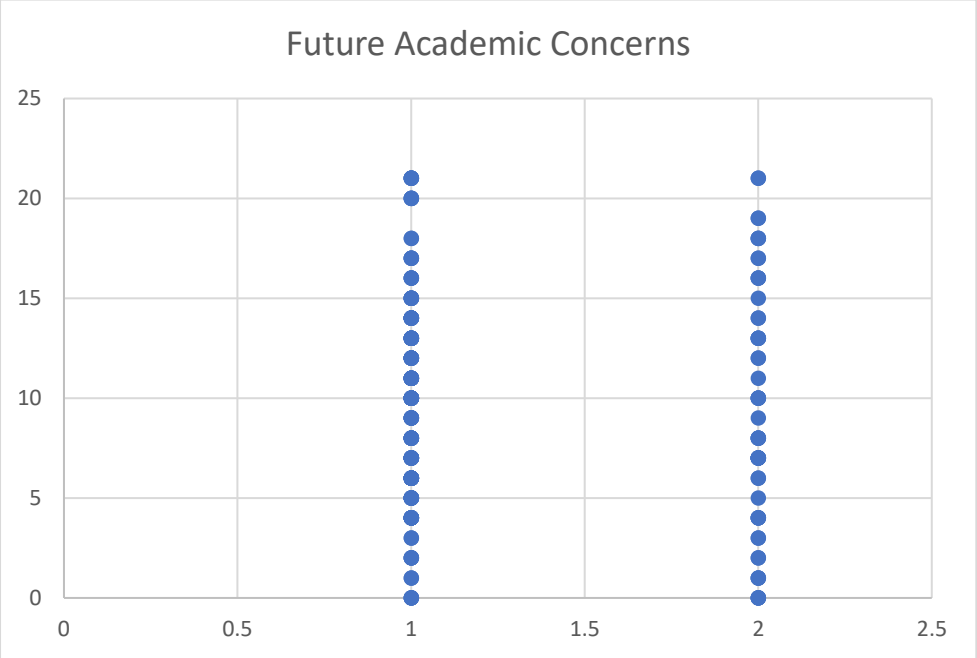

Figure 10. The scatterplot between anxiety scores and future academic concerns

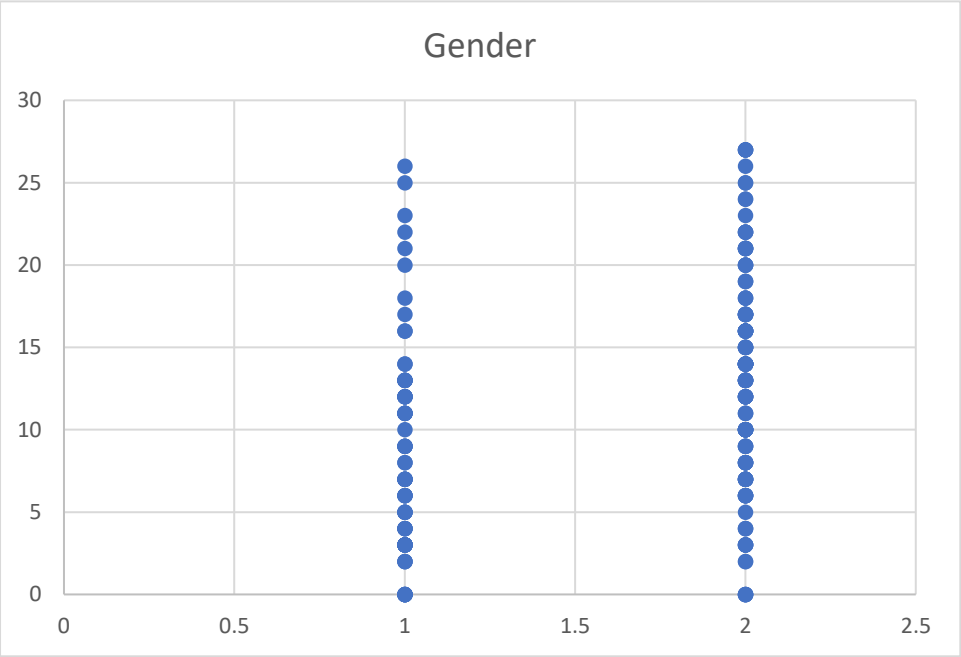

Figure 11. The scatterplot between depression scores and gender

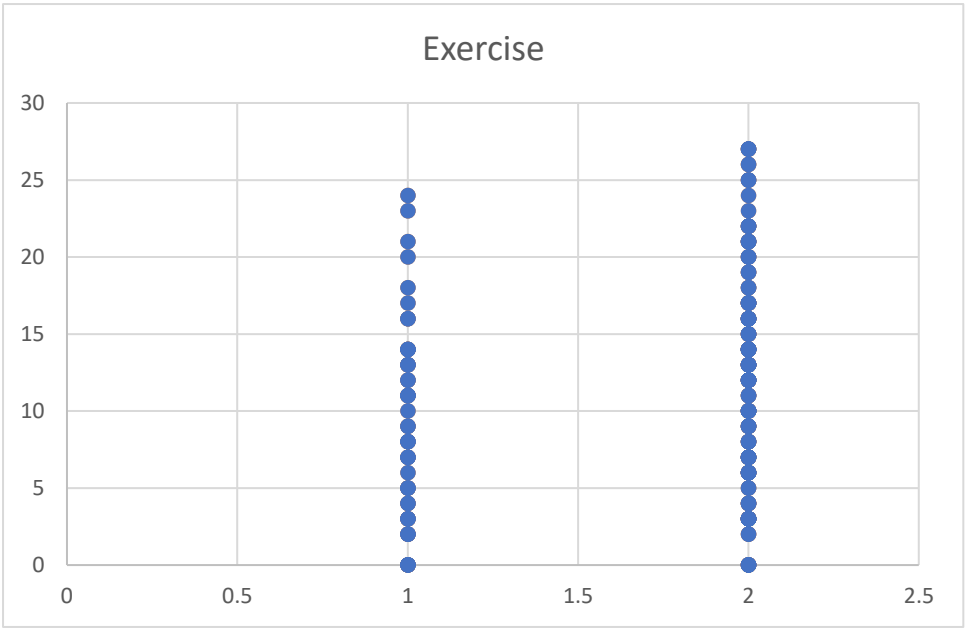

Figure 12. The scatterplot between depression scores and exercise

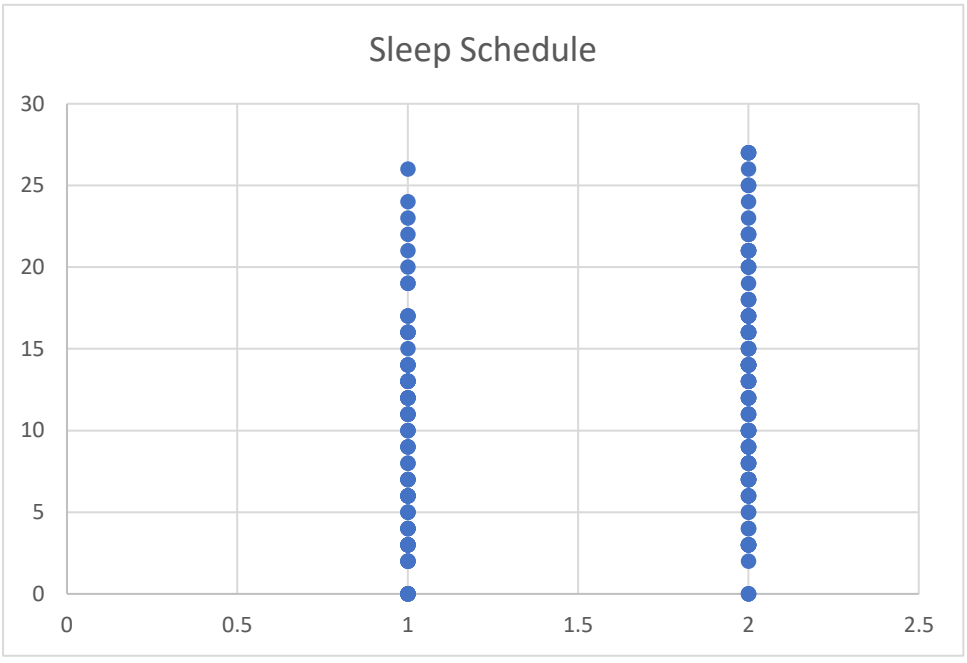

Figure 13. The scatterplot between depression scores and sleep schedule

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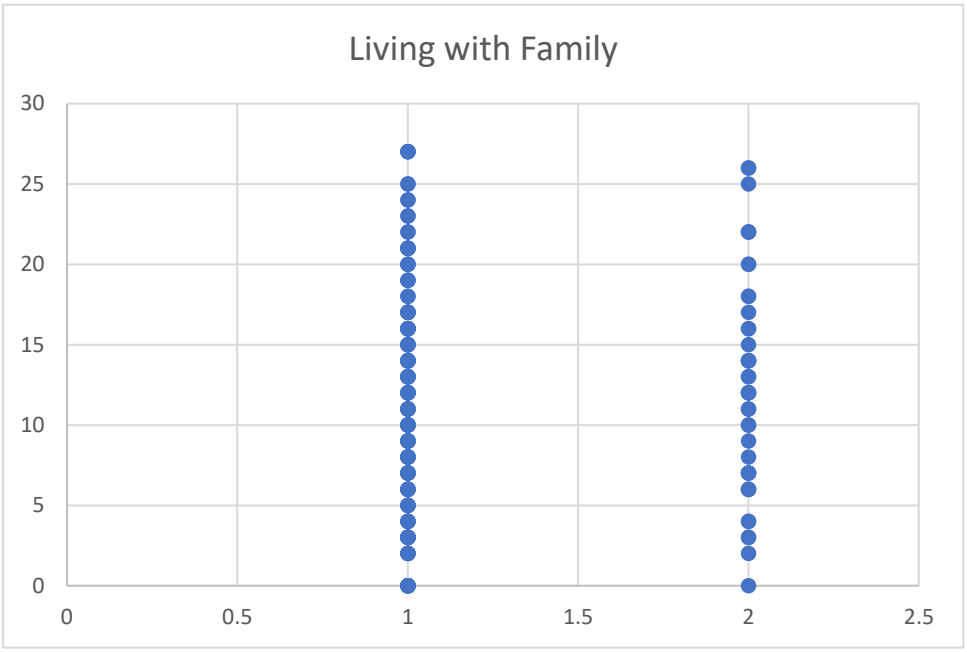

Figure 14. The scatterplot between depression scores and living with family

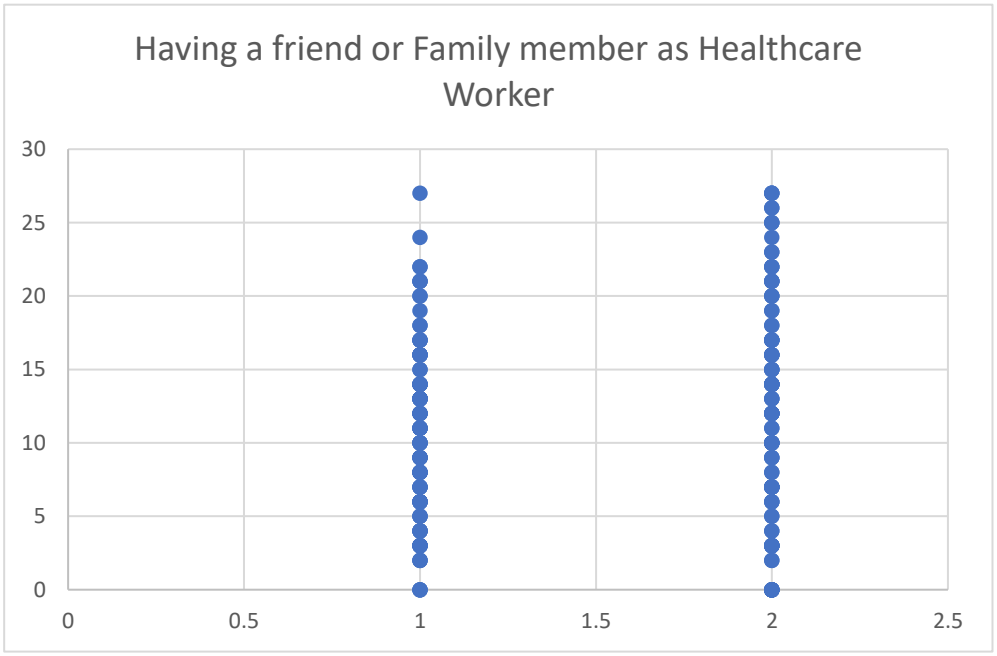

Figure 15. The scatterplot between depression scores and having a friend or family member as a healthcare worker

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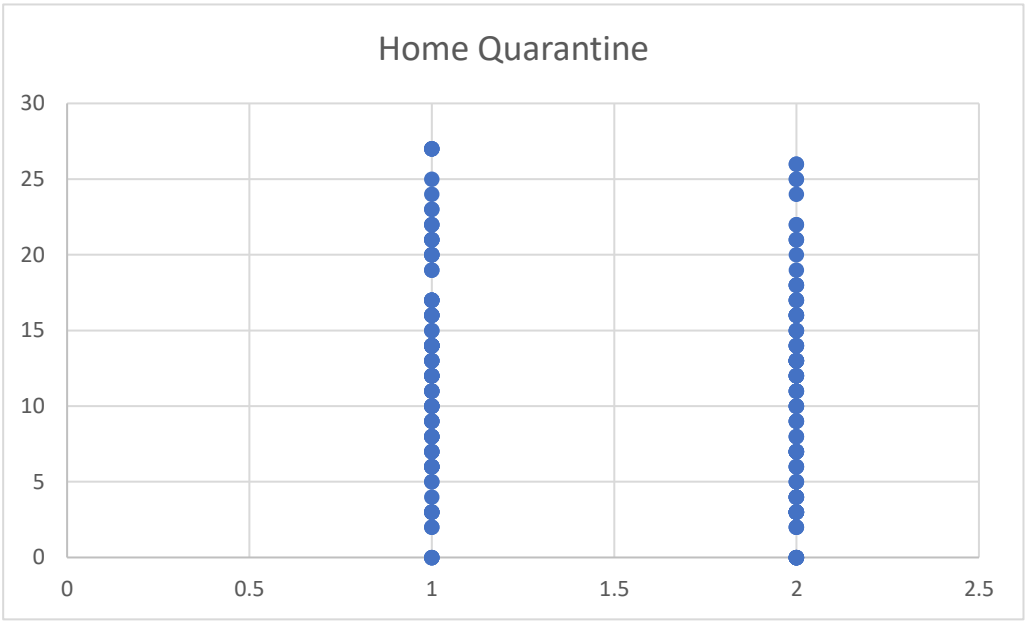

Figure 16. The scatterplot between depression scores and being home quarantined

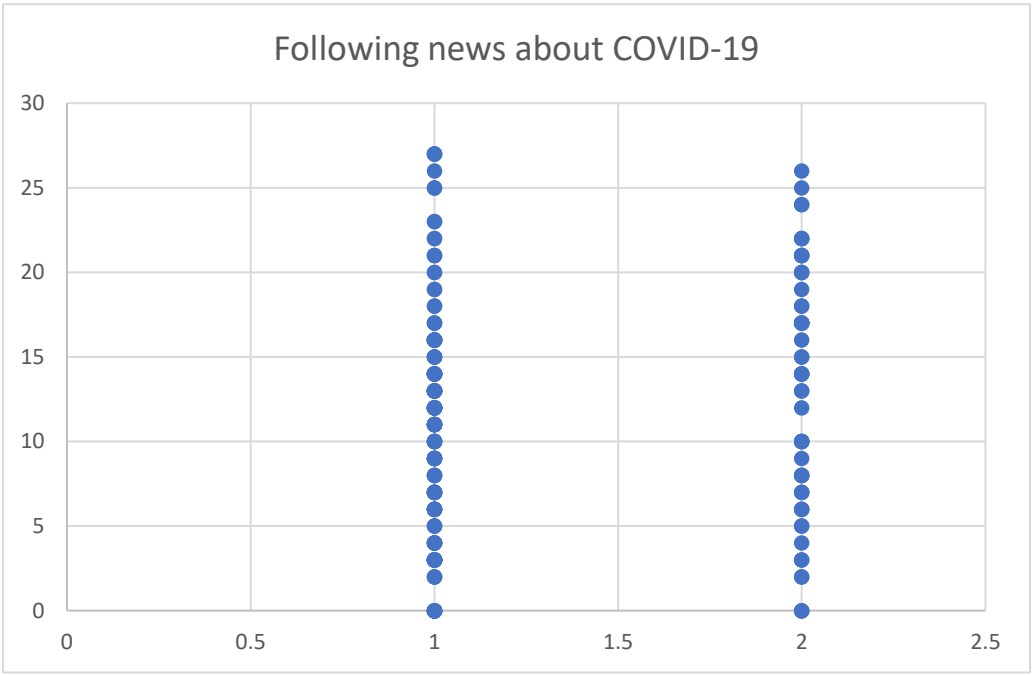

Figure 17. The scatterplot between depression scores and following the news about COVID-19

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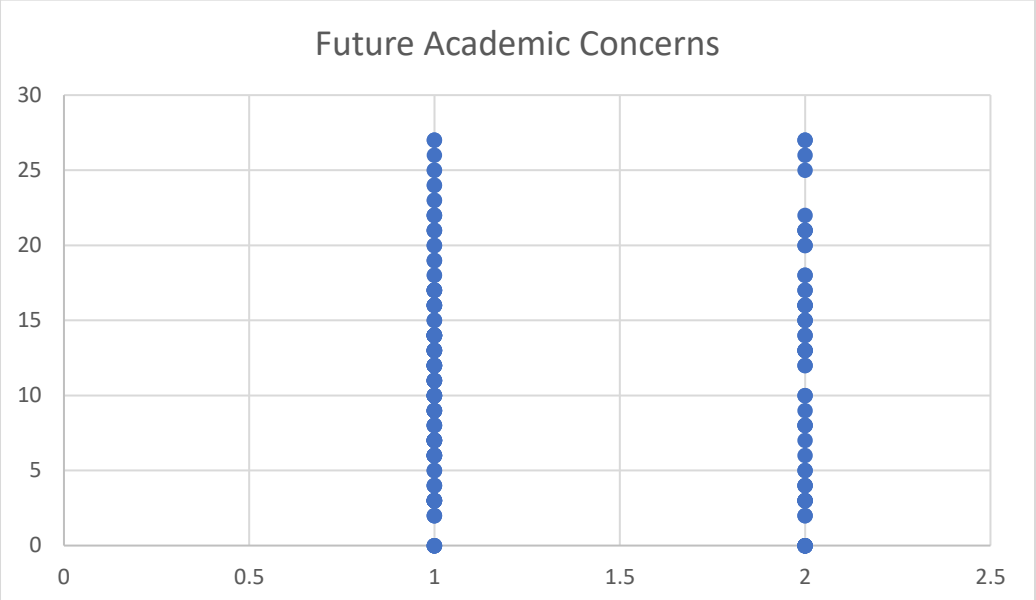

Figure 18. The scatterplot between depression scores and future academic concerns

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Appendix 2: Tables

Risk Factors for Anxiety	Coefficient r	*p* value
What is your gender ?	0.357363416	0.00000014
Do you regularly exercise ?	0.180444494	0.009623787
Do you have a stable 8 hour sleep schedule ?	0.300339157	0.000003
Do you live with your family ?	0.031060343	0.658414088
Do you have a family member or friend who is a healthcare worker ?	0.089178778	0.203524776
Have you been home quarantined ?	0.137577902	0.049167657
Do you keep up with the news about COVID-19 ?	0.073442883	0.295318175
Do you think your career goals and aspirations have been affected by the COVID-19 ?	0.0332522	0.635985785

Figure 19. The correlation coefficient and p value for risk factors and anxiety

Risk Factors for Depression	Coefficient r	*p* value
What is your gender ?	0.317675688	0.0000034
Do you regularly exercise ?	0.179313815	0.0100947
Do you have a stable 8 hour sleep schedule ?	0.261047146	0.0001565
Do you live with your family ?	0.069577346	0.321536
Do you have a family member or friend who is a healthcare worker ?	0.101939084	0.145832
Have you been home quarantined ?	0.214741251	0.0301554
Do you keep up with the news about COVID-19 ?	0.132277668	0.0586693
Do you think your career goals and aspirations have been affected by the COVID-19 ?	0.038305078	0.5855528

Figure 20. The correlation coefficient and p value for risk factors and depression

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Appendix 3: Survey Questionnaire

Prevalence and Risk Factors for Anxiety and Depression in Pakistani Students during COVID-19 Pandemic:

You are invited to participate in a web-based online survey on "The prevalence and risk factors of anxiety and depression in Pakistani

University students during COVID-19 Pandemic". This is a research project being conducted by Zunera Rehan. It will hardly take 5 to 7 minutes to complete.

PLEASE NOTE:

You must be a Pakistani university student to participate in this survey.

---

* Required

Informed Consent

Your participation in this survey is completely voluntary.

The information you will share with us will be kept completely confidential. Therefore, your responses will remain anonymous. No one will be able to identify you or your answers, and no one will know whether or not you participated in the study.

Participating in this study may not benefit you directly, but it will provide us valuable information about the prevalence of anxiety and depressive symptoms among our university students.

If at any point you wish, you may exit the survey by closing the browser.

If you have questions at any time about the study or the procedures, you may contact me at zunera.rhn@gmail.com

1. Do you wish to participate? *

Mark only one.

- o Yes
- o No

Eligibility

2. Are you a university student studying in Pakistan ? *

Yes Skip to question 3

No Skip to section 3 (Non-eligible)

Non- eligible

We regret to inform you that this study is targeted only towards university students of Pakistan, therefore you are not eligible to participate in this survey.

Anxiety Questionnaire (GAD-7)

Over the last 2 weeks, how often have you been bothered by any of the following problems?

1. Feeling nervous, anxious or on edge? *

- o Not at all
- o Several days
- o More than half the days
- o Nearly every day

2. Not being able to stop or control worrying? *

- o Not at all
- o Several days
- o More than half the days
- o Nearly every day

3. Worrying too much about different things? *

- o Not at all
- o Several days
- o More than half the days
- o Nearly every day

4. Trouble relaxing? *

- o Not at all
- o Several days
- o More than half the days
- o Nearly every day

5. Being so restless that it is hard to sit still? *

- o Not at all
- o Several days
- o More than half the days
- o Nearly every day

6. Becoming easily annoyed or irritable? *

- o Not at all
- o Several days
- o More than half the days
- o Nearly every day

7. Feeling afraid as if something awful might happen? *

- o Not at all
- o Several days
- o More than half the days
- o Nearly every day

Depression Questionnaire (PHQ-9)

Over the last 2 weeks, how often have you been bothered by any of the following problems?

1. Feeling down, depressed, or hopeless? *

- o Not at all
- o Several days
- o More than half the days
- o Nearly every day

2. Little interest or pleasure in doing things? *

- o Not at all
- o Several days
- o More than half the days
- o Nearly every day

3. Trouble falling or staying asleep, or sleeping too much? *

- o Not at all
- o Several days
- o More than half the days
- o Nearly every day

4. Feeling tired or having little energy?

- o Not at all
- o Several days
- o More than half the days
- o Nearly every day

5. Poor appetite or overeating? *

- Not at all
- Several days
- More than half the days
- Nearly every day

6. Feeling bad about yourself - or that you are a failure or have let yourself or your family down? *

- Not at all
- Several days
- More than half the days
- Nearly every day

7. Trouble concentrating on things, such as reading the newspaper or watching television? *

- Not at all
- Several days
- More than half the days
- Nearly every day

8. Moving or speaking so slowly that other people could have noticed? Or so fidgety or restless that you have been moving a lot more than usual? *

- Not at all
- Several days
- More than half the days
- Nearly every day

9. Thoughts that you would be better off dead, or of hurting yourself in some way? *

- Not at all
- Several days
- More than half the days
- Nearly every day

Potential Risk Factors

1. What is your gender? *

- Male
- Female

2. Do you regularly exercise? *

- Yes
- No

3. Do you have a stable 8-hour sleep schedule? *

- Yes
- No

4. Do you live with your family? *

- Yes
- No

5. Do you have a family member or friend who is a healthcare worker? *

- Yes
- No

6. Have you been home quarantined? *

- Yes
- No

7. Do you keep up with the news about COVID-19? *

- Yes
- No

8. Do you think your career goals and aspirations have been affected by the COVID-19 ? *

- Yes
- No

Survey Submission

Thank you so much for taking out the time to fill out this survey and contribute towards my research.