Computational Impact Analysis of Mental Health and Stress Coping of University Students amid COVID-19 Pandemic

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Abstract

Objectives: To compare the levels of anxiety on GAD-7 scale among undergraduates of dental, medical and engineering students during COVID-19. The secondary objectives were to correlate the factors influencing level of anxiety and to assess the coping strategies practiced by undergraduates' students of Karachi duri.ng COVID-19 outbreak.

Methodology: The cross-sectional based survey was conducted online among the medical, dental and engineering undergraduates' university students of private sector in Karachi through purposive sampling technique during COVID-19 lock down period. The GAD-7 validated tool was used along with the demographic variables, related stress factors and the coping skills practiced during this outbreak. Total 571 questionnaires were found completed in all sections. The data was analyzed on SPSS version 23. P-value <0.05 was considered as statistically significant.

Results: The mental health of the students was assessed on GADS-7 scale as normal, mild, moderate and severe levels. From the total (n=18-3.2%) were normal, (n=132-23.1%) had mild, (n=343-60.1%) had moderate and (n=78-13.7%) had severe anxiety level on GADS-7. The levels of anxiety on GAD-7 scale were all positively associated with the related stressors at p-value of 0.000. Moreover the results depicted that there was a moderate and positive correlation found (0.456, 0.447, 0.512 and 0.452) for all related stressors and GAD-7 scale. Taking breaks from watching, reading news regarding the outbreak of COVID-19, meditation and engaging in some other activities were the most frequently used coping strategies for all levels of anxiety among three cohorts of undergraduates'.

Conclusion: Undergraduates has shown 96.9% drastically increased level of anxiety during the outbreak of COVID 19 pandemic. Taking breaks from watching, reading news regarding the outbreak of COVID-19 was the most frequent behavior practiced by the students.

Keywords:
Coping Skills, COVID-19, Dental Undergraduates, Medical Undergraduate, Mental Health.

1. Introduction

The COVID-19 termed as novel COVID-19 has aggressively expanded in entire world from China in Dec 2019 [1] and in Pakistan from Feb 28th, 2020 [2]. The COVID-19 expressed as acute pneumonic infections [1]. It is termed as novel due to its typical features of previously unknown MERS (Middle East respiratory syndrome in 2011 and SARS-COV-2 (severe acute respiratory syndrome coronavirus 2) in 2002-2003. The WHO declared public health emergency on January 30-2020 of international concerns [3].

Worldwide; COVID-19 causes 355461 fatalities till May 28-2020 [2] and placed a huge burden on healthcare system worldwide including Pakistan [4]. There were total 1260 deaths, 61,227 confirmed cases, 20,231 recovered cases of COVID-19 in Pakistan till May-28-2020 [2]. The development of vaccination or treatment against the pandemic of COVID-19 is formidable challenge for developed and developing countries. Strict precautionary measures are enforced in majority of countries where case incidences and case fatalities are increasing not on daily basis but on hourly basis.

The precautionary measures includes closure of educational institutes, social distancing, frequent hand washing for 20 seconds ,wearing mask , social isolation and lock down is been enforced worldwide. The COVID-19 pandemic has dreadful consequences on every aspect of human life such as economical, healthcare, educational, social and cultural.

In Pakistan the educational institutes were closed from March 18-2020 to implement social distancing and to prevent the local transmission of COVID-19 among students. All these preventive measures especially social distancing, self isolation, lock down and closure of educational institutes posed a huge burden on psychological health on every individual on this earth. People all around the world are facing various mental disorders during this COVID-19 outbreak such as anxiety, post traumatic disorder during self isolation and quarantine because of the uncertain consequences of this outbreak [5].

Recent studies have been conducted in China to assess the impact of COVID-19 pandemic on the psychological health of healthcare workers, patients, older people, children and college students in which 24.9% of college students were experiencing anxiety during the COVID-19 crisis [4][6][7][8]. According to the literature; studies have been conducted in Pakistan to assess the psychological impacts of COVID-19 on front line workers, adults [9]. However; the impact of COVID-19 on psychological health of undergraduates students and the coping skills practiced

during this pandemic in Karachi Pakistan is unattended in literature to date and indeed it was the rationale of this study.

Though; delaying in reopening of the educational institutes due to the increasing COVID-19 cases; have the frightful impact on the psychological health of the undergraduate students.   There are various anxiety assessment tools used in literature to assess the psychological health of dental undergraduates [10][11].

The GAD-7 (Generalized Anxiety Disorder Scale) is 7 item validated tool used for screening and diagnosis of anxiety disorders. The GAD-7 is a modified version of "Patient Health Questionnaire-PHQ" (1999 Spitzer et al) which was the first developed self reported questionnaire to screen the general anxiety disorders in primary health care settings [12]. The GAD-7 tool is easy to score and takes approximately less than 3 minutes [13]. Now; GAD-7 is widely used in research and in clinical practice to screen anxiety disorders because of its efficiency and diagnostic reliability [14]. According to Moreno et al. 2019; the GAD-7 is used for diagnosis and evaluation of severity of anxiety disorders, panic disorders, post-traumatic stress disorders and social phobia [15]. For undergraduate college and universities students it is significantly important to address their psychological health during public health emergencies such as COVID-19 pandemic. This study will assist to evade the emotional losses and find the appropriate strategies to regulate the behavior during the crisis of COVID-19.

Therefore; the primary objective of this study was to compare the levels of anxiety on GAD-7 scale among undergraduates of dental, medical and engineering students during COVID-19. The secondary objectives were to correlate the factors influencing level of anxiety among undergraduate of dental, medical and engineering students and to assess the coping strategies practiced by undergraduates' students of Karachi during COVID-19.

2. Methodology

The cross-sectional based survey was conducted online among the medical, dental and engineering undergraduates' university students of private sector in Karachi through purposive sampling technique. This study was executed from 5th to 25th May -2020 after obtaining the ERC approval from Bahria University Medical and Dental College numbered 50-2020. The questionnaire comprised of five sections; in first section the consent was obtained from participants by providing the rationale of the study and anonymity of the subjects was assured.

The second section comprised of the demographic parameters such as age, gender, undergraduate course, steady family income, live with parents and any relative infected with COVID-19. The third section was regarding the psychological assessment based on GAD-7 questionnaire. The GADS-7 is a validated tool and has established internal consistency of Cronbach's $\alpha = 0.911$) [4].

The psychological assessment was rated as levels of anxiety among undergraduates as normal, mild, moderate and severe. The minimum and maximum score was 0 and 21. The 0 score is rated as normal, and 1-7, 8-14 and 15-21 were rated as mild, moderate and severe respectively. The fourth section was regarding the stress coping strategies during COVID-19 and nine options were provided as take breaks from watching, reading or listening to news/stories regarding pandemic, take deep breaths and stretch, meditate, exercise regularly, get plenty of sleep, try to do some other activities you enjoy, connect with others and any other coping skills apart from the mentioned options. The last section was inquired about the factors influencing stress during this pandemic and the responses were on four point likert scale as 0-3 same as the responses of GAD-7 tool. Participants were rated the responses as experienced during last two weeks.

The content validity of the study tool was reviewed by the five public health experts of the institutes and the corrections was incorporated before conducting the pilot studies among fifteen students of physiotherapy. The results of the pilot study were not included in the final data analysis.

The sample size was calculated by standard formula for sample size calculation by keeping the prevalence of 24.9% [5]. The calculated sample size was 288 but as to bring more significant results and keeping in mind the 20% wastage; the augmented sample size was 600. Total 600 questionnaires were distributed in three undergraduates' institutes of medical, dental and engineering. The administrative permission was obtained verbally before executing the study in engineering institute. Total 571 questionnaires were found completed in all sections. The data was analyzed on SPSS version 23. Mean was calculated for age, frequency was calculated for gender, undergraduate course, steady family income, lived with parents and any relative infected with COVID-19.

Kolmogorov-Smirnov and Shapiro-Wilk test were used to check the normality of data. Association of demographic variables in three cohorts of students was analyzed with chi square. The inferential statistics was performed for quantitative variables such as Kruskal Wallis and Mann Whitney U Test. The spearman correlation coefficient analysis was performed for the related stressors of COVID-19 such as economic, academic, daily life influences and social support during COVID-19 among students of three programs. Spearman's correlation coefficient, r, will be used to evaluate the association between COVID-19-related

stressors, including economic and daily-life related stressors, as well as stressors related to delays in academic activities, and anxiety level. P-value <0.05 was considered as statistically significant.

3. Results

There were total (n=203-35.5%) medical, (n=228-39.9%) dental and (n=140-24.5%) engineering undergraduates. There were total 154 (27%) male and 417 (73%) female undergraduates. The mean age of the students was 21.75+ 2.39. From the total subjects (n=453-79.3%) lived in urban areas, (n=87-15.2%) belonged to urban rural areas and (n=31-5.4%) from rural areas. Total (n=401-70.2%) undergraduates have steady family income, (n=501-87.7%) lived with parents and (n=120-21%) students' relative or acquaintance were infected with COVID-19 (Table-2).

3.1 Levels of Anxiety on GADS-7

The mental health of the students was assessed on GADS-7 scale as normal, mild, moderate and severe levels. From the total (n=18-3.2%) were normal, (n=132-23.1%) had mild, (n=343-60.1%) had moderate and (n=78-13.7%) had severe anxiety level on GADS-7 scale-Table-1.

Table-1. Undergraduates Students with Levels of Anxiety on GAD-7

Levels of Anxiety	N	%
Normal	18	3.2
Mild	132	23.1
Moderate	343	60.1
Severe	78	13.7

Table-2 revealed the demographic factors which can influence the levels of anxiety of during COVID-19 outbreak. Female students were found to have greater levels of anxiety as compare to male students. There was statistically significant difference showed among students lived in urban areas, steady family income, lived with parents and were found to have mild levels of anxiety at (88.6%, 84%,95.4%) respectively. Those students whose relative or acquaintance got infected with COVID-19 were experiencing severe (28.2%) level of anxiety and calculated p-value was 0.001. There was statistically significant difference found in levels of anxiety and students' residential place, steady family income and lived with parents during COVID-19 on GAD-7 scale at p-value of 0.016, 0.000 and 0.002 respectively-Table-2.

Table-3 revealed the comparison of mean ranks of levels of anxiety of three undergraduates cohorts; there was statistically significant difference found between mild and

Table-2. Univariate Analysis of Levels of Anxiety and influencing demographic factors of Undergraduates Students during COVID-19 pandemic.

Demographic Variables		Total = 571		Normal n = 18		Mild n = 132		Moderate n = 343		Severe n = 78		P-Value	
		N	%	N	%	N	%	N	%	N	%		
Gender	Male	154	27	5	27.7	28	21.2	101	29.4	20	25.6	0.089	Mann Whitney U-Test
	Female	417	73	13	72.2	104	78.7	242	70.5	58	74.3		
Residential Place	Urban	453	79.3	17	94.4	117	88.6	260	75.8	59	75.6	0.016	Kruskal-Wallis Test
	Urban-Rural	87	15.2	1	5.5	11	8.3	62	18	13	16.6		
	Rural	31	5.4	0	0	4	3	21	6.1	6	7.6		
Steady Family Income	Yes	401	70.2	16	88.8	111	84	219	63.8	56	71	0.000	Mann Whitney U-Test
	No	170	29.7	2	11.1	21	16	124	36.1	23	29		
Live with Parents	Yes	501	87.7	16	88.8	126	95.4	292	85.1	67	85.8	0.002	Mann Whitney U-Test
	No	70	12.2	2	11.1	6	4.5	61	17.7	11	14.1		
Relative or Family got COVID-19	Yes	120	21	2	11.1	8	6	88	25.6	22	28.2	0.001	Fischer Exact Test
	No	451	78.9	16	88.8	124	94	255	74.3	56	71.7		

Table-3. Comparing the mean ranks of levels of Anxiety on GAD-7 scale among three undergraduate Programs

Level of Anxiety GAD-7	Medical $n = 203$ Mean Rank	Dental $n = 228$ Mean Rank	Engineering $n = 140$ Mean Rank	P-Value Kruskal Wallis Test
Normal	289.37	279.97	290.92	0.061
Mild	266.21	283.13	319.37	0.000
Moderate	304.20	302.23	233.18	0.000
Severe	284.21	278.67	300.53	0.110

moderate levels of anxiety at p-value=0.000 on GAD-7 scale. (Table-3)

3.2 Interpretation

The correlation analysis of related stressors of COVID-19 included economic influence, academic delays, influence on daily life and social support for levels of anxiety among three cohorts of students.

The levels of anxiety on GAD-7 scale were all positively associated with the related stressors at p-value of 0.000. Moreover the results depicted that there was a moderate and positive correlation found (0.456, 0.447, 0.512 and 0.452) for all related stressors and GAD-7 score-Table-4.

Fig.1. depicted that taking breaks from watching, reading news regarding the outbreak of COVID-19 was the most frequent coping strategy used by (n=268) of students followed by engaging in some other activities (n=241).

On the other hand meditation and get plenty of sleep was the second most equally used coping strategy by all the students (n=156) during this outbreak of COVID-19.

Table-4. Spearman Correlation Analysis of GAD-7 Score and the related stressors of COVID-19

Related Stressors	GAD-7 Score "R"	P-Value
Worried about economic influences	0.456	0.000
Worried about academic delays	0.447	0.000
Influence on daily life	0.512	0.000
Social Support	0.452	0.000

R = Spearman Correlation Coefficient

3.3 Coping Strategies

Graph 1 depicted that taking breaks from watching, reading news regarding the outbreak of COVID-19, meditation and engaging in some other activities were the most frequently used coping strategies in all levels of anxiety among three cohorts of undergraduates'.

4. Discussion

There were ample studies proposed the effects of public health emergencies on mental health of undergraduate students expressed as psychological distress, depression, high level of anxiety and stress due to routine challenges of teaching and assessment [16][17][18][19][20][21][22][23][24]. This study was aimed to assess the impact of COVID-19 outbreak on mental health of undergraduate students, the factors influenced the stress and the coping skills practiced by the students. Though, our study has shown 96.9% level of anxiety during COVID-19 outbreak. The drastically
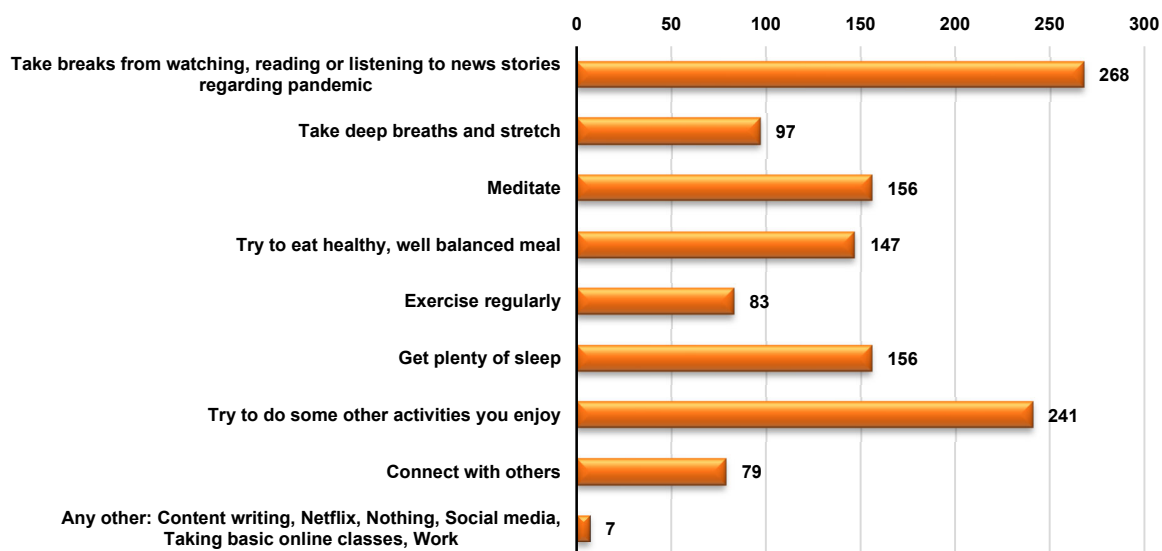

Fig.1. Coping Strategies during COVID-19 outbreak among undergraduates students of Karachi

increased level of anxiety in our study might be related to closure of educational institutes and lock down period and social distancing. Interpersonal communication is increased in this social distancing phase which is one of the important reason to deteriorate the mental health of the students [4]. Though emergency remote teaching has been executed in various educational institutes but it is difficult to conduct clinical content on virtual student environment which might be the reason of increase level of anxiety and fear of future employment [4]. The similar levels of stress were reported by Soma Gupta et al in which academic workload was the reason of 91.1% stress in majority of students [25]. In our study female students were found to be more affected with this pandemic situation comparing to male students as increased in overall level of anxiety reflecting compromised psychological health and analogous results were revealed from the various studies conducted worldwide on undergraduate medical students in which female students have been more affected psychologically as compared to male students [20][21][22][23]. However, Sat Pal et al reported increase mild to moderate anxiety levels in males then in female students [24] and in contrast Choi's in his overall findings, reported male students had higher levels of depression than female student's [26]. However no significant gender difference was found in our study as COVID-19 outbreak has similar psychological effects on general population irrespective to gender [4].

It is indicated in our study that demographic factors such as living in urban areas, steady family income , live with parents and any relative or acquaintance got infected with COVID-19 were associated with levels of anxiety; as living in urban areas have conducive effects on students anxiety level due to available resources. Living with parents and sound family finance has a positive effects on the stress level. These results were comparable to the study of Wenjun et al conducted in China [4]. The findings of our study regarding stress and anxiety in dental students as compare to engineering students are in agreement with the studies of Mane Abhay et al [27] and Chevvan R. et al [28] which have revealed that dental students reported more stress than students of engineering [29] and when compared with medical students, they have increase mild to moderate anxiety and stress then dental and engineering students agreeing with an study of Dutta AP et al published in 2005 [30] however recent studies reported engineering and dental students have experienced more stress then medical students [31][32][33].

Our study findings demonstrated positive and significant correlation between related stressors during COVID-19 (economic influence, academic delays, influence on daily life and social support) and scores of levels of anxiety among undergraduate students. The influence on daily life influenced higher than other stressors during the pandemic as people are isolated in their homes and social distancing is enforced. However studies reported that the most usual effecting stressor were academic concerns [34][35] fear of poor performance in examination, lack of recreation,

loneliness, living in hostel or rental houses and family problem [36][37] in contrast one of the recent studies of Ethopia reported the related stresses increasing stress in engineering students are "Facing financial problem, poor social support, lack of interest in their field of study and unresolved conflict with roommate [38].

To get rid of these stressors is really very essential for mental health, one of the studies showed that how much it is crucial to empower undergraduate students training to cope with a stressful life by different adaptive strategies and skills, if not then will lead to depression which ends up in "increased utilization of maladaptive (dysfunctional) coping methods" [39].

The coping strategies commonly used by students in our study were taking breaks from watching news and television along with getting engaged in activities they enjoy. As the alarming sensational headline regarding COVID-19 pandemic have multiply the stress level [4]. However in a non-pandemic conditions positive reframing [39], praying or spiritual activity, followed by watching movies, communication with friends and family support was commonly approached strategies [35]. Two recent studies, Steiner-Hofbauer, V et al, [40] reported that spiritual activity affects negatively and positive thinking helps them to decrease stress and surprisingly the strong coping strategy reported was social support and second by Lee and Goldstein [41] suggested that social support from friends or love partner is buffering stress related problems in young adults but not family support. The limitation of the study included the subjective nature of the coping skills section used in the study. Therefore, it is recommended to start online counseling sessions so that the students can solicit assistance from professional counselors which should be easily accessible for students in need of psychological care or support. Additionally, universities should work on the curriculum modification during COVID-19 crisis and assess stressful academic content and try to implement necessary changes.

As there is a change in learning environment, new engaging strategies of assessment, teaching and learning should be incorporated and a multidimensional approach could be appropriate and fruitful.

5. Conclusion

Undergraduates has shown 96.9% drastically increased level of anxiety during the outbreak of COVID 19 pandemic. Taking breaks from watching, reading news regarding the outbreak of COVID-19 was the most frequent behavior practiced by the students.

References

[1] Yang C, Qiu X, Fan H, Jiang M, Lao X, Zeng Y, Zhang Z. Coronavirus disease 2019: reassembly attack of coronavirus. International Journal of Environmental Health Research. 2020 Apr 23:1-9.

[2] http://covid.gov.pk/stats/global

[3] Wu F, Zhao S, Yu B, Chen YM, Wang W, Song ZG, Hu Y, Tao ZW, Tian JH, Pei YY, Yuan ML. A new coronavirus associated with human respiratory disease in China. Nature. 2020 Mar;579(7798):265-9.

[4] Cao W, Fang Z, Hou G, Han M, Xu X, Dong J, Zheng J. The psychological impact of the COVID-19 epidemic on college students in China. Psychiatry research. 2020 Mar 20:112934.CP

[5] Banerjee D. The COVID-19 outbreak: Crucial role the psychiatrists can play. Asian J. Psychiatr. 2020 doi: 10.1016/j.ajp.2020.102014

[6] Chen Q, Liang M, Li Y, Guo J, Fei D, Wang L, He L, Sheng C, Cai Y, Li X, Wang J. Mental health care for medical staff in China during the COVID-19 outbreak. The Lancet Psychiatry. 2020 Apr 1;7(4):e15-6.

[7] Yang Y, Li W, Zhang Q, Zhang L, Cheung T, Xiang YT. Mental health services for older adults in China during the COVID-19 outbreak. The Lancet Psychiatry. 2020 Apr 1;7(4):e19.

[8] Li SW, Wang Y, Yang YY, Lei XM, Yang YF. Analysis of influencing factors of anxiety and emotional disorders in children and adolescents during home isolation during the epidemic of novel coronavirus pneumonia. Chinese Journal of Child Health. 2020:1-9.

[9] Haider II, Tiwana F, Tahir SM. Impact of the COVID-19 Pandemic on Adult Mental Health. Pakistan Journal of Medical Sciences. 2020 Apr 29;36(COVID19-S4).

[10] Ali KF, Fatima A, Ilyas BF. Impact of Anxiety and Depression on Temporomandibular Joint Disorders among Sample of Dental Undergraduates of Karachi. JPDA. 2016 Oct;25(04):144.

[11] Sufia S. Burnout among Undergraduate Dental Students at a Public Academic Institution in Lahore, Pakistan. JPDA. 2016 Oct;25(04):132.

[12] Toussaint, A., Hüsing, P., Gumz, A., Wingenfeld, K., Härter, M., Schramm, E., Löwe, B., 2020. Sensitivity to change and minimal clinically important difference of the 7-item generalized anxiety disorder questionnaire (GAD-7). J Affect Disord 265, 395–401.

[13] Budikayanti A, Larasari A, Malik K, Syeban Z, Indrawati LA, Octaviana F. Screening of Generalized Anxiety Disorder in Patients with Epilepsy: Using a Valid and Reliable Indonesian Version of Generalized Anxiety Disorder-7 (GAD-7). Neurology research international. 2019;2019.

[14] Johnson, S.U., Ulvenes, P.G., Øktedalen, T., 2019. Psychometric properties of the general anxiety disorder 7-Item (GAD-7) scale in a heterogeneous psychiatric sample. Frontiers in psychology. 10, 1713.

[15] Moreno, E., Muñoz-Navarro, R., Medrano, L.A., González-Blanch, C., Ruiz-Rodríguez, P.,Limonero, J.T., Moretti, L.S., Cano-Vindel, A., Moriana, J.A., 2019. Factorial invariance of a computerized version of the GAD-7 across various demographic groups and over time in primary care patients. J. Affect Disord. 252, 114–121.

[16] Sarkar S, Gupta R, Menon V. A systematic review of depression, anxiety, and stress among medical students in India. J Mental Health Hum Behav 2017;22:88-96.

[17] Yusoff MS, Abdul Rahim AF, Baba AA, Ismail SB, Mat Pa MN, Esa AR. Prevalence and associated factors of stress, anxiety and depression among medical Fayoum University students. Alexandria J Med 2017;53:77-84.

[18] Ibrahim N, Al-Kharboush D, El-Khatib L, Al-Habib A, Asali D.Prevalence and predictors of anxiety and depression among female medical students in King Abdulaziz University, Jeddah, Saudi Arabia. Iran J Public Health 2013;42:726-36.

[19] Alkot M. Depression among medical versus non- medical students in Umm Al-Qura University, Makkah Al-Mukaramah, Saudi Arabia. Am J Psychiatry Neurosci 2017;5:1.

[20] Stallman HM. Prevalence of psychological distress in university students – Implications for service delivery. Aust Fam Physician 2008;37:673-7. 20.

[21] Yusoff MS, Abdul Rahim AF, Baba AA, Ismail SB, Mat Pa MN, Esa AR. Prevalence and associated factors of stress, anxiety and depression among medical Fayoum University students. Alexandria J Med 2017;53:77-84. 21.

[22] Amr M, Amin TT, Saddichha S. Depression and anxiety among Saudi university students: Prevalence and correlates. Arab J Psychiatry 2013;24:1-7.

[23] Basnet B, Jaiswal M, Adhikari B, Shyangwa PM. Depression Among Undergraduate Medical Students. Kathmandu Univ med J 2012;39(3):74-

[24] Pal S, Prashant P, Rohilla R. Psychological Distress in Undergraduate Medical Students. International Journal of Physiology. 2019;7(3):178-82.

[25] Gupta S, Choudhury S, Das M, Mondol A, Pradhan R. Factors causing stress among students of a medical college in Kolkata, India. Education for Health. 2015 Jan 1;28(1):92.

[26] Choi IJ. he Inluence of parent-adolescent communication types on adolescent`s self-diferentiation, depression and anxiety. he Korean Journal of Clinical Psychology. Poster proceeding. 2006. p. 682–83.

[27] Mane Abhay B, Krishnakumar MK, Niranjan Paul C, Hiremath SG. Differences in perceived stress and its correlates among students in professional courses. J Clin Diagnostic Res 2011;5:1228 33.

[28] Chevvuri R, Naveen N, Yunus GY, Tiwari R, Sharma H, Verma S. Professional environmental stress among dental and engineering students in Bhilai, Chhattisgarh, Central India: A comparative cross-sectional study. Journal of Indian Association of Public Health Dentistry. 2019 Jan 1;17(1):25.

[29] Chenganakkattil S, Jibinbabu K, Hyder S. Comparison of psychological stress, depression and anxiety among medical and engineering students. Int J Res Med Sci. 2017 Apr;5(4):1213-6.

[30] Dutta AP, Pyles MA, Miederhoff PA. Stress in health professions students: myth or reality? A review of the existing literature. J Natl Black Nurses Assoc 2005; 16(1):63-8

[31] Naseem S, Munaf S. Suicidal ideation, depression, anxiety, stress, and life satisfaction of medical, engineering, and social sciences students. Journal of Ayub Medical College Abbottabad. 2017 Jul 30;29(3):422-7.

[32] Schmitter M, Liedl M, Beck J, Rammelsberg P. Chronic stress in medical and dental education. Medical teacher. 2008 Jan 1;30(1):97-9.

[33] Chilukuri H, Bachali S, Naidu JN, Basha AS, Selvam VS. Perceived stress amongst medical and dental students. AP J Psychol Med. 2012 Jul 1;13(2):104-7.

[34] Imran, N., Tariq, K.F., Pervez, M.I. et al. Medical Students' Stress, Psychological Morbidity, and Coping Strategies: a Cross-Sectional Study from Pakistan. Acad Psychiatry 40, 92–96 (2016).

[35] Alhamadi L, Mohamed A, Wahdan A, Hibatulla A. Perceived sources and coping mechanisms of stress among undergraduate dental students in Aden University. Int J of Sci and Res. 2016;5(4):740-4.

[36] Kunwar D, Risal A, Koirala S. Study of depression, anxiety and stress among the medical students in two medical colleges of Nepal. Kathmandu Univ Med J. 2016 Jan;53(1):22-6.

[37] Anuradha R, Dutta R, Raja JD, Sivaprakasam P, Patil AB. Stress and stressors among medical undergraduate students: A cross-sectional study in a private medical college in Tamil Nadu. Indian journal of community medicine: official publication of Indian Association of Preventive & Social Medicine. 2017 Oct;42(4):222.

[38] Reta Y, Samuel T, Mekonnen M. Mental Distress and Associated Factors Among Undergraduate Engineering Students of Hawassa University, Ethiopia. Journal of Multidisciplinary Healthcare. 2020;13:99.

[39] Zhang Z, Tian Y, Zhong F, Li CF, Dong SM, Huang Y, Liu XE, Huang C. Association between oral health-related quality of life and depressive symptoms in Chinese college students: Fitness Improvement Tactics in Youths (FITYou) project. Health and quality of life outcomes. 2019 Dec;17(1):96.

[40] Steiner-Hofbauer, V., Holzinger, A. How to Cope with the Challenges of Medical Education? Stress, Depression, and Coping in Undergraduate Medical Students. Acad Psychiatry (2020).

[41] Lee C-YS, Goldstein SE. Loneliness, stress, and social support in young adulthood: does the source of support matter? J Youth Adolesc. 2016;45(3):568–80. 30.