Psychological factors related to professional examinations and their association with sleep quality among Medical students

Shahzaib Maqbool[1], Omaima Sundus[2], Muhammad Sarfraz Khan[3], Arham Ihtesham[4], Waleed Inayat Mohamed[5], Rabia Arshad[6]

[1,2,3,4,5] Final Year MBBS, Rawalpindi Medical University, Rawalpindi.
[6] Senior Registrar, Medical ICU, Holy Family Hoapital, Rawalpindi.

Author's Contribution	**Corresponding Author**	**Article Processing**
[1] *Conception of study*	*Mr. Shahzaib Maqbool,*	*Received:* 29/11/2020
[2] *Experimentation/Study conduction*	*Final Year MBBS,*	*Accepted:* 30/04/2021
[3] *Analysis/Interpretation/Discussion*	*Rawalpindi Medical University,*	
[4] *Manuscript Writing*	*Rawalpindi*	
[5] *Critical Review*	*Email: hasanshahzaib299@gmail.com*	
[6] *Facilitation and Material analysis*		

Abstract

Background: In our country, medical education is considered a challenging, tough, and stressful process, which is significantly associated with depression, anxiety, and stress, particularly during exam seasons, adversely affecting the sleep quality of medical students. The objective of our study is to evaluate the depression, anxiety and stress levels, and determine their impact on sleep quality of medical students during exams.

Materials and Methods: It was a descriptive cross-sectional study involving 391 students of Rawalpindi Medical University. Data were collected through a questionnaire. The questionnaire consisted of (1) socio-demographic details, (2) Depression, Anxiety and Stress Scale-21(DASS-21), (3) The Pittsburgh Sleep Quality Index (PSQI). Chi-square and t-tests were applied taking P<0.05 as significant. Spearman rho test was applied to measure the strength of association. Data analysis was done via (SPSS) v.23.0.

Results: Out of 391 students, 197 (50.4%) were female while 194 (49.6%) were male. The mean age was 21.63 years (SD=1.59). Fourth-year students (n=117, 29.9%) formed the majority of the participants followed by final-year 108(27.6%), second-year 94 (24%), and third-year 72 (18.4%). 167(42.71%) students suffered from depression, 50.4% from anxiety and 351(89.8%) from stress. Quality of sleep was poorest (PSQI>5) in second-year students with a mean value of 9.72 for global sleep quality. Quality of sleep was significantly associated with anxiety and depression.

Conclusion: Depression, anxiety, and stress are common among second as well as third-year students. Second-year students have the poorest quality of sleep. The sleep quality is significantly associated with anxiety and depression.

Keywords: Medical undergraduates, Professional exams, Psychological Factors, Sleep quality.

Introduction

Medical education is considered as the most stressful and challenging task in our country in comparison with other forms of higher education.[1] The prevalence of psychological illnesses such as depression, anxiety, and sleep deprivation is on rise among medical undergraduates in almost every country.[2] Different studies demonstrate that depression is an emerging health-related issue in university students as compared to the general population.[3,4] There is no doubt about increasing stress, depression, and anxiety level among medical students due to the complex nature of medical studies.[5] The pressure of being a competent future doctor, academic pressure, work-overload, and lack of sleep are the major factors toward stress.[6] Depression and anxiety symptoms not only affect the academic performance and exam results but also force the medical students to unhealthy and un-professional activities like smoking, alcoholism, and suicidal ideas as well.[7,8]

Depression, anxiety, and stress levels are part and parcel of medical education but their level reaches its peak during exams season.[9] The time-consuming nature and intricate pattern of medical education also interfere with physical activity, sleep quality, nutritional habits, and time management leading to anxiety among students during exams.[10,11] Medical education is taken as a challenging, tough, and stressful process that is associated significantly with emotional, mental, intellectual changes among medical undergraduates.[12] The tough and demanding system of our medical education is creating a competition and lack of a cooperative environment.[13] The increasing level of stress in medical students during exams also has a positive impact in terms of stress coping capabilities because higher stress levels eventually help them find the ways to get rid of stress by using several strategies called stress coping skills.[14] Extensive course load, lack of preparation, lack of organized study plans, and the practice of studying the whole night before the exam are major contributors to exam anxiety and stress.[15]

Sleep plays a pivotal role in maintaining good mental health, high-level learning, and general wellbeing.[16] Medical students are considered as quite a vulnerable population to sleep-related problems due to the increasing level of stress and strain of maintaining grade point averages. But the high time demanding curve of medical education affects the quality of sleep, leading to sleep deprivation and excessive daytime sleepiness.[17] Having a sound sleep should be an essential component for a medical student but many students give much priority to academic achievements rather than a sound sleep and spend much of their time in study and very little on sleep that adversely affect their exams performance and causes poor sleep habits as well.[18] The detrimental effect of these factors on the physical and psychological health of students may, in turn, have adverse consequences on the quality of patient care in the future. The hours of the sleep acquired before exams are reported as a good predictor of exam outcomes among medical students.[19] Studies show that good sleep is associated with excellent exam performance and lack of sleep is associated with loss of cognitive learning and memory impairment that can affect the performance of the exam directly or indirectly.[20]

Most of the studies have been conducted to assess the levels of depression, anxiety and stress among medical students but up-to what extent these psychological factors are impacting the sleep quality of medical students, has not been extensively researched. The purpose of conducting this study was to assess how much depressed, anxious and stressed medical students are during their exams and how these psychological factors affect their overall sleep quality during exams period. This assessment may help us to make possible interventions to reduce the increasing levels of depression, anxiety and stress, and ultimately improve the sleep quality of medical students during exams with a positive outcome of improving their overall progress in exams in terms of grades and scores.

The main objective of this study was to assess the levels of depression, anxiety, and stress, and their effects on the quality of sleep among medical students of Rawalpindi medical university who were appearing in conventional type of professional exams.

Materials and Methods

It was a descriptive cross-sectional study conducted from September to December 2019 during professional exams (conventional type). A total of 391 students of Rawalpindi Medical University from second-year MBBS to final year MBBS were included in the study. First year MBBS students who were appearing in a modular type of exam and all the detained students were excluded from our study. Consecutive sampling technique was used, and sample size was calculated with the level of confidence taken as 95% and margin

of error as 5% with population proportion of 0.5 or 50%. Sample size came out to be 385 but we intentionally took 391 students as our study population so that responses with missing details could be discarded. Data were collected through printed questionnaire and each participant was interviewed directly. Only those students who were willing to participate were included. Confidentiality of each participant was maintained and no one other than authors was allowed to get access to collected data. The questionnaire consisted of three sub-sections as given below:

1) Socio-demographic details (Age, Gender, Year of study, Boarders, Non-boarders).
2) Depression, anxiety, and stress scale-21 (DASS-21)[21]
3) Pittsburgh Sleep Quality Index (PSQI)[22]

Measures:
Depression-Anxiety-Stress scale-21
The DASS-21 is an abbreviated version of the empirically developed Depression Anxiety Stress Scales with excellent validity and reliability having Cronbach's alpha value of 0.81, 0.89, and 0.78 for subscales of depression, anxiety, and stress respectively. The DASS-21 is divided into 3 subsections of 7 questions, about depression (DASS-D), anxiety (DASS-A), and stress (DASS-S). The DASS-D measures hopelessness, low self-esteem, and low positive affect. DASS-A measures autonomic arousal, physiological hyperarousal, and the subjective feeling of fear whereas DASS-S measures stress through the reported frequency of symptoms relating to tension, agitation, and negative affect. Each of these constructs is interrelated and their combined score can be used to screen for general psychological distress.[21] To classify distress, we created a dichotomized score, based on whether patients met case criteria for at least moderate distress in either one or more of the depressions, anxiety, and stress subscales of the DASS-21. According to the DASS-21 interpretation manual, scores of DASS-D ≥ 7, DASS-A ≥ 5, or DASS-S > 9 were classified as at least moderate distress.[23] Students who did not meet these criteria were classed as having "normal-mild" levels of distress.

Pittsburgh Sleep Quality Index:
To measure the quality of sleep, the Pittsburgh Sleep Quality Index (PSQI) was used. Pittsburgh Sleep Quality Index (PSQI) is an effective instrument for measuring sleep quality with a sensitivity of 89.6%

and specificity of 86.5% (kappa-value = 0.75, P-value <0.05). In scoring the PSQI, seven component scores were derived, each scored 0 (no difficulty) to 3 (severe difficulty). The component scores were summed to produce a global score (range 0 to 21). Higher scores indicated worse sleep quality. A PSQI score >5 was taken as a poor quality of sleep.[22]

Continuous variables were described as mean (standard deviation) and median (interquartile range), while categorical variables were presented as counts (frequencies and percentages). Sociodemographic characteristics were described in terms of frequencies and percentages. Continuous variables were compared by the Mann–Whitney U test and t-tests while enumeration variables were compared by Pearson $\chi2$ or Fisher exact test, where appropriate. MANOVA was applied to compare PSQI scores among academic years A two-tailed $p < .05$ was considered statistically significant. Chi-square and t-tests were applied taking P<0.05 as significant. Spearman rho test was applied to measure the strength of association. The analysis was carried out using the Statistical Package for Social Sciences (SPSS) v.23.0 (IBM, Armonk, US).

Results

The mean age was 21.63 (SD=1.59) years, ranging from 18 to 27 years. Out of 391 students, females were 197(50.4%) while males were 194 (49.6%). Fourth-year students 117 (29.9%) formed the majority followed by the final year 108(27.6%), second-year 94 (24%), and third-year 72 (18.4%). There were 215 (55%) non-boarders and 176 (45%) boarders. The percentage distribution of stress in the second year, fourth year, and Final year was 95.7%, 90.6%, and 76.9% respectively. All the third year students were having distress in professional examinations. The prevalence of depression (DASS-D ≥ 7), anxiety (DASS-A ≥ 5), and stress (DASS-S > 9) were found to be 167 (42.71%), 197 (50.39%), and 351 (89.8%) respectively. Table-I shows median DASS-21 and DASS-A, DASS-D, and DASS-S subscale scores.

Table-I Median DASS-21 and DASS-A, DASS-D, and DASS-S subscale scores

Median Score	2nd year	3rd year	4th year	Final year	P-value
		Year of study			
DASS-S	12(7,15.25)	11(8,14.7)	11(7.5,16)	9(6,13.75)	<0.01*
DASS-A	10.28(6,14)	8(5,11)	8(5,12)	6(2,10)	.002*
DASS-D	13(9,17)	11(8,16)	11(7,14)	9(5.25,12.75)	<.001*
DASS-21	35(25,45)	29.5(21,40.5)	29(21,44)	23(14.25,34.75)	<.001*

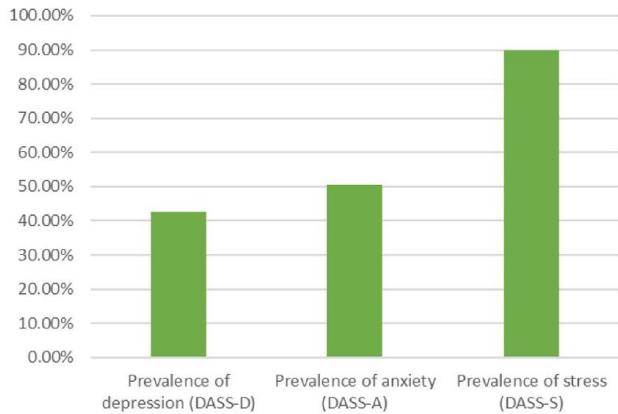*Note: IQR: Interquartile range; DASS: Depression Anxiety Stress Scales; * P<0.01*

Figure-1 Overall prevalence of depression, anxiety, and stress in medical students during their professional exams

In our study, the prevalence of poor sleep quality (PSQI >5) was 81.1% (n=317) with a mean score of 8.44(SD=2.58). Out of the seven components, habitual sleep efficiency and use of sleeping medication had mean scores less than 1, which shows their least contribution towards high PSQI score. A MANOVA was conducted comparing the outcome of seven domains of quality of sleep and Global Sleep Quality for students with varying levels of education. A significant result was found for sleep duration, habitual sleep efficiency, sleep disturbances, and daytime dysfunction, indicating that the groups differed from each other. Follow-up pairwise comparisons indicated that long sleep duration, sleep disturbances, and daytime dysfunction were more common in second-year medical students while final year students had better habitual sleep efficiency as compared to other classes. Table II shows the means of seven domains of quality of sleep and Global Sleep Quality.

Table-II Showing the mean values of seven domains of quality of sleep and Global Sleep Quality

Components	2nd year		3rd year		4th year		Final year		P-value
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Subjective sleep quality	1.76	.81	1.57	.84	1.59	.86	1.42	.83	.058
Sleep latency	1.77	.91	2.68	.84	1.74	.99	1.69	.94	.902
Sleep duration	2.11	.91	2.08	.92	2.04	1.08	1.76	1.09	.013*
Habitual sleep efficiency	0.48	.63	.57	.67	.68	.73	.76	.71	.011*
Sleep disturbances	1.44	.67	1.25	.60	1.31	.65	1.21	.67	.048*
Use of sleeping medication	.38	.72	.33	.81	.48	.92	.42	.78	.667
Daytime dysfunction	1.80	.87	1.54	.90	1.62	.85	1.32	.92	.002*
Global Sleep Quality (0-21)									

*Note: * P<0.05*

Global Sleep Quality Mean values

Figure-2 Mean values of global sleep quality among different years of study

A spearman rho test was applied between seven domains of quality of sleep and Global Sleep Quality, and moderate-severe distress (defined as DA23SS D ≥7, DASS-A ≥5, DASS-S > 9). It was found that there was a positive correlation between moderate distress and subjective sleep quality, sleep latency, sleep duration, sleep disturbances, daytime dysfunction over the last month, and global sleep quality. Table III shows correlation between quality of sleep and moderate-severe distress.

Table-III Correlation between quality of sleep and moderate-severe distress

	Moderate severe distress	*Subjective sleep quality*	*Sleep latency*	*Sleep duration*	*Habitual sleep efficiency*	*Sleep disturbances*	*Use of sleeping medication*	*Daytime dysfunction*	*Global Sleep Quality (0-21)*
Moderate severe distress	-								
Subjective sleep quality	.289**	-							
Sleep latency	.186**	.381**	-						
Sleep duration	.115*	.391**	.078	-					
Habitual sleep efficiency	.021	.082	.003	.046	-				
Sleep disturbances	.196**	.406**	.387**	.079	.066	-			
Use of sleeping medication	.058								
Daytime dysfunction		.178**	.212**	-.014	-.011	.366**	-		
Global Sleep Quality (0-21)	.318**	.503**	.263**	.131**	.027	.386**	.163**	-	

Discussion

Depression, anxiety, and stress are nowadays considered as the paramount psychological parameters of medical studies. However, there is another component of psychological well being that is also severely affected and has an adverse outcome on the performance of medical students. It is called sleep quality. Our study results are depicting the association of the above given measured parameters and medical education.

According to our study, the prevalence of depression, anxiety, and stress was 42.7%, 50.39%, and 89.8% respectively, while another study in Pakistan showed the prevalence of depression and anxiety to be 71% and 72% respectively which is much higher than our study. However, the stress level in our study is much high (89.9%) as compared to 35% in another study conducted in Pakistan.[24] Similarly, the prevalence of

depression (14-24%) in the western world is much less as compared to our study.[25] In our study, the prevalence of anxiety was (50.39%) but similar studies conducted in Malaysia, Britain, and Egypt showed the prevalence rate of 41.9%, 31.2%, and 43% respectively.[26,27,28]

In this study, depression, anxiety, and stress levels were higher among students of the second year as compared to third, fourth and final year, while final year students showed least DASS-21 score. The possible reason could be that with the advancing year of study, the students learn to adapt the depressive and stressful environment of medical education and effectively develop stress coping abilities as compared to early years.[29] However, some studies contradict our findings, showing that the students of senior classes have a high level of depression and anxiety as compared to junior classes. This could be because of increased theoretical as well as clinical workload.[30] However, some studies depict no difference in depression and anxiety prevalence among students of different years of study.[4]

The variable of interest in our study is the quality of sleep among medical students during their exams. Though medical education is itself tough enough to interrupt the sleep pattern, the prevalence of poor sleep quality (PSQI >5) comes out to be 81.1% (n=317) with a mean value of 8.44 (SD=2.58) during exams. Similarly, different studies in Pakistan showed the prevalence rate of just 40% measured by using the same instrument (PSQI questionnaire).[31] A study conducted in Saudi Arabia showed similar results as ours, recording the poor sleep quality prevalence rate of about 76%.[32] The average sleep hours per night came out to be 5.26 hours which is in concordance with a similar study recording the average sleep hours per night to be 5.8 hours.[33]

The relationship between the year of study and four out of seven components of sleep quality that include (sleep duration, habitual sleep efficiency, sleep disturbance, and lastly daytime dysfunction) showed significant association with p-values of .013, .011, .048, .002 respectively. As far as the year of study stratification is concerned, second-year students showed preponderance towards long sleep duration, sleep disturbances, and daytime dysfunction as compared to the final year with more preponderance towards habitual sleep efficiency. However, the overall global sleep quality was found to be poor with a mean value of 9.72 (SD=3.31) in second-year students as compared to other classes, which is in contrast to other study results showing poor sleep quality in clinical years as compared to non-clinical classes.[33] The possible reason for poor sleep quality among students of non-clinical years could be ongoing efforts of adaptation between the new environment of medical education, social life changes, poor dietary habits, and excessive use of the internet at night. However, the difference between the year of study and global sleep quality is not statistically significant (P-value=0.086).

Another significant finding of this study is a positive correlation between moderate-severe distress and components of sleep quality (subjective sleep quality, sleep latency, sleep duration, sleep disturbance, and daytime dysfunction) over the last month and global sleep quality as well. This is consistent with a study carried out in Estonia that showed that psychological parameters like depression, anxiety, and stress levels either due to academic stress or exam stress affected the sleep quality of medical students.[34] Poor sleep quality among second-year students as compared to other classes is of grave concern. Significant association between moderate-severe distress and quality of sleep depicts that moderate-severe distress levels are significantly affecting the different domains of sleep quality that include subjective sleep quality, sleep latency, sleep duration, sleep disturbance, and daytime dysfunction respectively.

In light of the above-given description, it is the need of time to evaluate the mental health problems of medical students with full capacity and to rectify the various psychological implications to produce physically and psychologically active doctors for the present community.

Limitations

Though the data were collected with full accuracy, still there is a chance of bias. The first limitation is the collection of data with questionnaires that could have limited objectivity because depression, anxiety and stress level was assessed through questionnaires rather than by a trained psychologist. Similarly, sleep quality was also assessed through questionnaires. Another limitation is that the present study is carried out on university students and more specifically those students who were undergoing a conventional variety of professional exams. Students enrolled in a modular type of curriculum were excluded which opens the gates for further research.

Conclusion

The levels of depression, anxiety, and stress are found to be more among second-year students as compared to other classes, with final year class showing the least scores for depression, anxiety, and stress as measured by DASS-21. The prevalence of poor sleep quality is also high among medical students which worsens during exams.

References

1. Park KH, Kim DH, Kim SK, Yi YH, Jeong JH, Chae J, Hwang J, Roh H. The relationships between empathy, stress and social support among medical students. Int J Med Educ. 2015 Sep 5(6):103-8.
2. Puthran R, Zhang MW, Tam WW, Ho RC. Prevalence of depression amongst medical students: a meta-analysis. Med Educ. 2016 Apr;50(4):456-68.
3. Kumar B, Shah MAA, Kumari R, Kumar A, Kumar J, Tahir A. Depression, Anxiety, and Stress Among Final-year Medical Students. Cureus. 2019 Mar 16;11(3): e4257.
4. Brenneisen Mayer F, Souza Santos I, Silveira PSP, Itaqui Lopes MH, de Souza ARND, Campos EP, et al. Factors associated with depression and anxiety in medical students: a multicenter study. BMC Med Educ. 2016 Oct;16(1):282.
5. Quek TT, Tam WW, Tran BX, Zhang M, Zhang Z, Ho CS, Ho RC. The Global Prevalence of Anxiety Among Medical Students: A Meta-Analysis. Int J Environ Res Public Health. 2019 Jul 31;16(15):2735.
6. Fawzy M, Hamed SA. Prevalence of psychological stress, depression and anxiety among medical students in Egypt. Psychiatry Res. 2017 Sep;255: 18694.
7. Mirghni HO, Elnour MAA. The perceived stress and approach to learning effects on academic performance among Sudanese medical students. Electron Physician. 2017 Apr 25;9(4):4072-4076.
8. Bahorik AL, Sterling SA, Campbell CI, Weisner C, Ramo D, Satre DD. Medical and non-medical marijuana use in depression: Longitudinal associations with suicidal ideation, everyday functioning, and psychiatry service utilization. J Affect Disord. 2018 Dec 1;241: 8-14.
9. Moreira de Sousa J, Moreira CA, Telles-Correia D. Anxiety, Depression and Academic Performance: A Study Amongst Portuguese Medical Students Versus Non-Medical Students. Acta Med Port. 2018 Sep 28;31(9):454-462.
10. Roskoden FC, Krüger J, Vogt LJ, Gärtner S, Hannich HJ, Steveling A, Lerch MM, Aghdassi AA. Physical Activity, Energy Expenditure, Nutritional Habits, Quality of Sleep and Stress Levels in Shift-Working Health Care Personnel. PLoS One. 2017 Jan 12;12(1):e0169983.
11. Shaikh BM, Doke PP, Gothankar JS. Depression, anxiety, stress, and stressors among rural adolescents studying in Pune and a rural block of Nanded district of Maharashtra, India. Indian J Public Health. 2018 Oct-Dec;62(4):311-314.
12. Iqbal S, Gupta S, Venkatarao E. Stress, anxiety and depression among medical undergraduate students and their socio-demographic correlates. Indian J Med Res. 2015 Mar;141(3):354-7.
13. Houpy JC, Lee WW, Woodruff JN, Pincavage AT. Medical student resilience and stressful clinical events during clinical training. Med Educ Online. 2017;22(1):1320187.

14. Rosa-Rojas G, Chang-Grozo S, Delgado-Flores L, Oliveros-Lijap L, Murillo-Pérez D, Ortiz-Lozada R, et al. Level of stress and coping strategy in medical students compared with students of other careers. Gac Med Mex. 2015 Jul 1;151: 4439.
15. Klausenitz C, Hacker H, Hesse T, Kohlmann T, Endlich K, Hahnenkamp K, Usichenko T. Auricular Acupuncture for Exam Anxiety in Medical Students-A Randomized Crossover Investigation. PLoS One. 2016 Dec 29;11(12): e0168338.
16. Milojevich HM, Lukowski AF. Sleep and Mental Health in Undergraduate Students with Generally Healthy Sleep Habits. PLoS One. 2016 Jun 9;11(6): e0156372.
17. Becker SP, Dvorsky MR, Holdaway AS, Luebbe AM. Sleep problems and suicidal behaviors in college students. J Psychiatr Res. 2018 Apr;99: 122-128.
18. Barahona-Correa JE, Aristizabal-Mayor JD, Lasalvia P, Ruiz ÁJ, Hidalgo-Martínez P. Sleep disturbances, academic performance, depressive symptoms and substance use among medical students in Bogota, Colombia. Sleep Sci. 2018 Jul-Aug;11(4):260-268.
19. Sitticharoon C, Srisuma S, Kanavitoon S, Summachiwakij S. Exploratory study of factors related to educational scores of first preclinical year medical students. Adv Physiol Educ. 2014 Mar;38(1):2533.
20. Fortier-Brochu E, Beaulieu-Bonneau S, Ivers H, Morin CM. Insomnia and daytime cognitive performance: a meta-analysis. Sleep Med Rev. 2012 Feb;16(1):8394.
21. Martin Antony, Peter Bieling, Brian Cox, Murray Enns, Richard Swinson. Psychometric Properties of the 42-Item and 21-Item Versions of the Depression Anxiety Stress Scales in Clinical Groups and a Community Sample. Psychological Assessment. 1998 June;10(2):176–181.
22. Buysse DJ, Reynolds CF 3rd, Monk TH, Berman SR, Kupfer DJ. The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. Psychiatry Res. 1989 May;28(2):193213.
23. Lovibond PF, Lovibond SH. The structure of negative emotional states: comparison of the Depression Anxiety Stress Scales (DASS) with the Beck Depression and Anxiety Inventories. Behav Res Ther. 1995 Mar;33(3):335-43.
24. Azim SR, Baig M. Frequency and perceived causes of depression, anxiety and stress among medical students of a private medical institute in Karachi: a mixed method study. J Pak Med Assoc. 2019 Jun;69(6):840-845.
25. Tjia J, Givens JL, Shea JA. Factors associated with undertreatment of medical student depression. J Am Coll Heal. 2005 16;53(5):21924.
26. Chowdhury R, Mukherjee A, Mitra K, Naskar S, Karmakar PR, Lahiri SK. Perceived psychological stress among undergraduate medical students: Role of academic factors. Indian J Public Health. 2017 Jan-Mar;61(1):55-57.
27. Firth J. Levels and Sources of Stress in Medical Students. Br Med J. 1986 May 3;292(6529):117780.
28. Niemi PM, Vainiomäki PT. Medical students distress - Quality, continuity and gender differences during a six-year medical programme. Med Teach. 2006 Mar;28(2):13641.
29. 29. Melaku L, Mossie A, Negash A. Stress among Medical Students and Its Association with Substance Use and Academic Performance. J Biomed Educ. 2015 Dec 2;2015: 19.
30. Baldassin S, Alves TCDTF, De Andrade AG, Nogueira Martins LA. The characteristics of depressive symptoms in medical students during medical education and training: A cross-sectional study. BMC Med Educ. 2008 Dec 11;8(1):60.
31. Surani AA, Zahid S, Surani A, Ali S, Mubeen M, Khan RH. Sleep quality among medical students of Karachi, Pakistan. J Pak Med Assoc. 2015;65(4):3802.
32. Almojali AI, Almalki SA, Alothman AS, Masuadi EM, Alaqeel MK. The prevalence and association of stress with sleep quality

among medical students. J Epidemiol Glob Health. 2017 Sep 1;7(3):16974.

33. Alsaggaf MA, Wali SO, Merdad RA, Merdad LA. Sleep quantity, quality, and insomnia symptoms of medical students during clinical years: Relationship with stress and academic performance. Saudi Med J. 2016;37(2):17382.

34. Eller T, Aluoja A, Vasar V, Veldi M. Symptoms of anxiety and depression in Estonian medical students with sleep problems. Depress Anxiety. 2006;23(4):2506.