

## **An Inquiry into the Quality of Sleep in Medical Students and Their Perceived Stress Level in General**

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### **Abstract**

Medical students belong to one of the most psychologically distressed categories with high rates of stress, depression and anxiety. Cutting down their sleep duration to cope with academic stress and deadlines can negatively impact their mental health in several ways. The study was aimed at exploring the prevalence of poor sleep quality among these students, its association with level of perceived stress. We also proposed to measure prevalence of possible stressors and correlate them with the perceived stress level. A total of 195 participants, first year medical students of a private institute were included in this cross-sectional study. The study tools used were Perceived Stress Scale-14 and Pittsburgh Sleep Quality Index to measure the perceived stress level and sleep quality respectively. A list of plausible stressors with a Likert scale was used. Statistical analysis revealed that majority of the students (64.1%) belonged to the stressed category. About three-quarters of the students had poor sleep quality. Among the various potential stressors evaluated, Academic stressors were the highest rated followed by psychosocial stressors. This is in accordance with the findings of previous studies. It is important to address this issue due to its deleterious effects not only on the health of medical students, but also the compromising impact on quality of health care provided by them in future. However, when compared to other studies, a greater number of stressors showed a positive correlation with perceived stress level.

### **Keywords:**

Sleep quality, academic stress, medical education, mental health.

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## **1. INTRODUCTION**

University life brings with it a lot of challenges and thereby stress. Stress has as a constructive impact at low levels and motivates the students to keep going. However, when the level of stress exceeds the coping threshold, it can be detrimental to one's health and overall sense of well-being. It is especially true of medical students who undergo rigorous training by means of lectures, seminars, laboratories, demonstrations and tightly scheduled clinical postings.

Multiple studies across the world have reported alarmingly high level of stress and stress related disorders among students in medical schools. Saudi Arabia (59.2% and 53%) (Abdel Rahman et al. 2013; Gazzaz et al. 2018) Malaysia (41.9%) (Sherina, Rampal & Kaneson 2004) Pakistan (59.7%) (Waqas et al. 2015) and Zimbabwe (64.5%) (Vaz, Mbajjorgu and Acunda 1998) report high level of stress in medical students across the world. A study in India by Gupta et al. (2015) reports prevalence of stress as high as 91.1%. According to a systematic review published in 2006, several studies conducted in the US and Canada have shown that the level of overall psychological distress in medical students were found to be consistently higher than the general population matched with their peers' age by the later years of training. (Dyrbye, Thomas and Shanafelt 2006)

Stress is positively related to sleep disturbances and sleep disorders. (Lemma et al. 2012) (Dahlin, Joneborg and Runeson 2005) It can trigger insomnia and is associated bidirectionally with poor sleep quality. (Suchecki, Machado and Tiba 2009) Chronic stress can cause increased awakening from sleep and decreased

relative duration of REM sleep. (Kim and Dimsdale 2007) Sleep problems are not just an epiphenomenon of depression. It is a predictive prodromal symptom and can pave way to psychological morbidity. Proper sleep architecture, especially that of REM sleep is believed to play a crucial role in helping individuals cope with aversive life events. It is essential for favourable emotional response to difficult situations of life. (Fang et al. 2019; Suchecki, Machado and Tiba 2009)

According to a review article by Fang et al. (2019), several studies report that insomnia was strongly related to subsequent depression in young adults. High level of stress is associated with other deleterious consequences. Poor academic performance (Stewart et al. 1999), alcohol and substance abuse (Melaku, Mossie and Negash 2015), depression and anxiety (Dahlin, Joneborg and Runeson 2005; Dyrbye, Thomas and Shanafelt 2006) are reported frequently. Overall, it can lead to poor mental health.

Another important finding of a systematic review shows a significant decline in self-perceived empathy. A study conducted by Neumann et al. (2011) revealed that trainee distress is a key cause of empathy decline during the course of medical school and residency.

The purpose of the study is to evaluate the quality of sleep in first year medical students and assess their stress levels. We also aim to correlate the level of perceived stress with sleep quality and a list of potential stressors.

## **2. METHODS**

### *Study design and setting*

We conducted this cross-sectional study in a private medical institute in south India. Ethical clearance was obtained from the Institutional Ethics Committee. The individual identity of students was kept confidential at all times in the study.

### *Sample size and Data collection*

The calculated sample size was 207 with an assumption of 33.8% having Perceived stress scale score >28 (Rebello, Kallingappa and Hegde 2018) for 95% confidence interval, 20% relative precision and adding 10% non-response error. To ensure adequate response rate, all 250 students were invited to take part in the study. This included the entire batch of students pursuing their first year in the course Bachelor of Medicine and Bachelor of Surgery (MBBS). The study was conducted in November 2019. We explained the purpose of the study to the students and gave them ample opportunity to place their queries, if any. We obtained consent and confirmed anonymity to the participants.

### *Questionnaire*

The questionnaire consisted of four parts- a form for students' personal details, Pittsburgh Sleep Quality Index (PSQI), Perceived Stress Scale-14 (PSS-14) and a list of Potential stressors.

The Pittsburgh sleep quality Index (PSQI) is a standard self-administered questionnaire to measure sleep quality. It consists of 19 self-rated question and some additional questions rated by a roommate. The seven component scores are obtained by combining the scores of self-rated questions. The component scores can range from 0-3 points. A global score (ranging from 0 to 21) is then obtained by adding the component scores. (Buysse et al. 1989) Global score  $\geq 5$  indicates poor sleep quality in the past month. Reliability of PSQI is explained by Cronbach's  $\alpha$  of 0.83. The questionnaire has been validated for use in India, Cronbach's  $\alpha$  of 0.736. (Manzar et al. 2015)

The PSS-14 is a questionnaire used to measure an individual's perceived stress. It consists of 14 questions in total with 7 positive (scored straight) and 7 negatively stated items (scored reversed). Higher the total score, higher is the level of perceived stress. Scores on this scale can range from 0 through 56 and the

score to qualify into the stressed category is 28. The internal consistency of this questionnaire is Cronbach's  $\alpha$  0.85. (Cohen, Kamarck and Mermelstein 1983)

The possible sources of stress in medical students were compiled from a previously conducted study in Nepal. The stressors are categorized into Academic (factors associated with the curriculum, classes, examinations, etc), Psychosocial (associated with family, peers and daily needs) and Health-related stressors (e.g. nutrition, exercise). The questionnaire is provided with a 5-score Likert scale. (Shah et al. 2010; Sreeramreddy et al. 2007) 1 indicates the least perceived stress and 5 indicates the most.

#### *Statistical analysis*

We collected the data and compiled it in Microsoft Excel 2016 and analysed it using the software IBM Statistical Package for Social Sciences (SPSS) Version-25. To compare between the subgroups, Student's unpaired t-test was applied. Spearman's rank correlation test was applied for correlation between the PSS-14 and PSQI scores as well as the stressors and PSS-14 scores. For each subgroup, data is presented as frequency distribution table, mean and standard deviation. A p value of  $< 0.05$  test was considered to be statistically significant.

### **3. RESULTS**

#### *Demography*

A total of 250 students all of who are pursuing first year MBBS professional course were invited to fill the questionnaire. 208 volunteers responded of which 195 (94.2% of 207, the calculated sample size) responses were included in the study. 13 responses were excluded due to incomplete details in the questionnaire (08), Asthmatics (02), students suffering from thyroid dysfunction (03). The age of the study group ranged from 17-28. Mean age was  $18.64 \pm 1.10$  years.

#### *Sleep Quality*

The mean Global PSQI score in the study population was  $7.06 \pm 3.26$ . 77.94% (152) were poor sleepers (Global PSQI Score  $\geq 5$ ). The average rated value for the components Subjective sleep quality, Sleep duration and Daytime dysfunction was  $>1$  while those of Sleep latency, Sleep efficiency, Sleep disturbance, use of sleep medication was  $<1$ . In the study group, 79.48% (155) of the students went to bed after midnight. The most frequently reported bed time were 2:00 AM (23.07%;45) and 12:00 AM (19%;37). Notably, majority of the participants (73.85% ;144) have rated their perceived sleep quality as 'Very Good' or 'Fairly good' and only a quarter (26.15%;51) as 'Very Bad' or 'Fairly Bad'. This however, contrasts with the actual results. Most of the students (70.77%) reported that they fell asleep within 20 minutes of going to bed (average time taken to fall asleep was  $21.50 \pm 30.09$  minutes).

#### *Perceived Stress Levels*

Mean stress score as measured by PSS-14 in the study population, males and females is given in Table 2. 64.1% of the students included our study have a PSS-14 score  $>28$  and belonged to the 'stressed' category. However, the difference between the gender groups was found to be statistically insignificant.

#### *Correlation of Components of PSQI and Stress scores*

Poor sleep quality showed significant association with incidence of higher stress levels (Table 3). Positive correlation of Stress Scores is seen with 5 out of 7 components of PSQI and Global PSQI Score.

Subjective sleep quality, Sleep latency, Sleep duration, Sleep Disturbance and Daytime dysfunction, all were significant at the 0.01 level.

*Potential stressors*

The frequency and percentage of students who rated stress severity score 4 or 5 for each of the stressors on Likert scale and the median severity scores of the same are given in Table 5. The top 5 stressors which were reported very frequently with stress severity score 4 or 5 were Performance in examination (101, 51.8%), Academic curriculum (98, 50.3%), Frequency of examinations (93, 47.7%), Quality of food in mess (72, 36.9%), Lack of time for recreation (69, 35.4%), Competition with peers (69, 35.4%). 4 out of the top 5 most frequently reported stressors belonged to the category of Academic stressors.

*Correlation of perceived stress scores with stressors*

The correlation of stress severity with various academic, psychosocial and health related stressors is shown in Table 6. There was a positive correlation between various stressors of the listed categories, some at 0.01 level and others at 0.05 level. Political situation in the country and Alcohol/ drug abuse/ smoking didn't seem contribute to stress severity in the study population.

**Table 1:** Global PSQI scores of good sleepers, poor sleepers and mean stress score of each category (n=195)

Global PSQI Score	Frequency	Percentage (%)	Mean PSQI score	Mean Stress score
PSQI Score <5	43	22.05	3.09±1.06	27.44±8.64
PSQI Score ≥5	152	77.94	8.18±2.76	32.55±8.08
	195	100	7.06±3.26	31.43± 8.45

Student's unpaired t-test between the groups Global PSQI Score and Mean Stress score gives p=0.011 i.e. significant.

**Table 2:** Stress Scores (Perceived Stress Scale-14; PSS-14; n=195)

PSS-14 Score	Total (195)		Male (64)		Female (131)	
	n	(%)	n	(%)	n	(%)
≤ 28 (Not stressed)	70	(35.9)	28	(43.75)	42	(32.06)
> 28 (Stressed)	125	(64.1)	36	(56.25)	89	(67.93)
Mean PSS Score	31.43± 8.45		30.01±8.75		32.11±2.24	

Student's unpaired t-test for the two genders, p=0.12, i.e. statistically insignificant

**Table 3:** Correlation between Components of Pittsburgh Sleep Quality Index and Stress scores in the study group (n=195)

PSQI Components	Spearman's rank correlation coefficient(r)
Subjective sleep quality	0.293**
Sleep latency	0.268**
Sleep duration	0.232**
Sleep efficiency	0.134
Sleep disturbance	0.373**
Use of sleep medication	0.014
Daytime dysfunction	0.483**
Global PSQI Score	0.428**

\*\* Correlation is significant at the 0.01 level (2-tailed)

**Table 4:** Self-rated severity 4 or 5 for each stressor (n=195)

Stressor	Severity Score 4 or 5		Median score
	Frequency	Percentage	
<b>Academic Stressors</b>			
Frequency of examinations	93	47.7	3
Performance in examination	101	51.8	4
Academic curriculum	98	50.3	4
Dissatisfaction with class lectures	50	25.6	3
Non-availability of adequate learning materials	28	14.3	2
Becoming a doctor	61	31.2	3
Lack of time for recreation	69	35.4	3
Competition with peers	69	35.4	3
Lack of special guidance from faculty	38	19.5	2
Class attendance	60	30.8	2
Difficulty reading textbooks	66	33.8	3
<b>Psychosocial Stressors</b>			
High parental expectations	60	30.8	2
Loneliness	57	29.2	2
Family problems	23	11.8	2
Accommodation away from home	32	16.4	2
Political situation in the country	16	8.2	1
Relations with opposite sex	28	14.4	1
Lack of entertainment in the institution	44	22.6	2
Difficulty getting back home	34	17.4	1
Quality of food in mess	72	36.9	3
Financial strain	34	17.5	2
Inability to socialize with peers	28	14.4	2
Living conditions in hostel	28	14.4	2
Lack of personal interest in medicine	21	10.7	1
Adjustment to roommate(s)	23	11.8	1
<b>Health related stressors</b>			
Sleeping difficulties	31	15.9	2
Nutrition	38	19.5	2
Lack of exercise	43	22	2
Alcohol / drug abuse/ smoking	7	3.6	1

**Table 5:** Correlation of severity of stress felt due to each stressor and Stress scores in the study group

Stressor	Spearman's rank correlation coefficient(r)
<b>Academic Stressors</b>	
Frequency of examinations	0.382**
Performance in examination	0.321**
Academic curriculum	0.305**
Dissatisfaction with class lectures	0.196**
Non-availability of adequate learning materials	0.175*
Becoming a doctor	0.303**
Lack of time for recreation	0.399**
Competition with peers	0.378**
Lack of special guidance from faculty	0.368**
Class attendance	0.292**
Difficulty reading textbooks	0.273**
<b>Psychosocial Stressors</b>	
High parental expectations	0.284**
Loneliness	0.585**
Family problems	0.287**
Accommodation away from home	0.217**
Political situation in the country	0.062
Relations with opposite sex	0.196**
Lack of entertainment in the institution	0.330**
Difficulty getting back home	0.282**
Quality of food in mess	0.228** <b>Error! Bookmark not defined.</b>
Financial strain	0.230**
Inability to socialize with peers	0.461**
Living conditions in hostel	0.238**
Lack of personal interest in medicine	0.301**
Adjustment to roommate(s)	0.176*
<b>Health related stressors</b>	
Sleeping difficulties	0.372**
Nutrition	0.271**
Lack of exercise	0.304**
Alcohol / drug abuse/ smoking	0.122

\*\* Correlation is significant at the 0.01 level (2-tailed) \* Correlation is significant at the 0.05 level (2-tailed)

#### 4. DISCUSSION

Here, we report the stress levels in medical students to be at 64.1%. The prevalence of stress is lower than that reported by some studies in India ranging from 96.5% (Gupta et al. 2015) to 78.19% (Sreedevi et al. 2016; Reang and Bhattacharjya 2013; Solanky et al. 2012) The difference in the results may be attributed to the difference in the questionnaires used to measure stress levels, categorization of stress groups and inclusion of students from multiple semesters or first year's alone. It could also depend on the date of approaching

examination. The fraction is close to that reported in a study conducted by Vaz, Mbajjorgu and Acunda (1998), among first year medical students in Zimbabwe (64.5%). While some studies report that females have significantly higher stress levels (Fawzy and Hamed 2017; Shah et al. 2010) some studies reported that gender was not a significant predictor of stress (Rebello, Kallingappa and Hegde 2018; Sherina, Rampal and Kaneson 2004; Sreedevi et al. 2016). Despite higher stress level among females, the gender difference observed in our study is insignificant.

We report an alarming 77.94 percentage of students being poor sleepers. Indeed, the proportion seems to be consistent with the findings of a study conducted by Veldi, Aluoja and Vasar (2005) reporting that sleep disturbances are very common in young medical students. The prevalence rates in medical courses are higher than that compared to previous studies in conducted in engineering and paramedical courses. (Sarita, Sukhwant and Modi 2016; Waghachavare et al. 2013)

Performance in examination, Academic curriculum, Frequency of examinations, Quality of food in mess, Lack of time for recreation, Competition with peers were the most commonly reported stressors. The results are similar to previously observed studies conducted in different parts of the subcontinent. (Anuradha et al. 2017; Panchu, Bahuleyan and Vijayan 2017; Rebello, Kallingappa and Hegde 2018; Shah et al. 2010; Sreeramareddy et al. 2007) Like in case of other studies, most stressors are academics related followed by psychosocial factors.

Students and residents face long working hours coupled with lack of adequate leisure hours ultimately resulting in poor sleep quality. Poor sleep quality is shown to be associated with mediocre academic performance. Short et al. (2013) have reported that poor sleepers tend to be more depressed than their counterparts. In order to meet the deadlines, medical students sacrifice their sleep thus underrate the importance of ample sleep. In a randomized control trial conducted by Ratcliff and Van Dongen (2009) it was shown that sleep deprivation can negatively impact normal cognitive processes. Consequently, the result of sleep deprivation is poor performance contrary to the anticipated outcome.

Both the domains (interest of students and patient care) need to be considered equally important. Students with high levels of stress need to be identified in order to avoid complications like depression, anxiety, suicidal tendencies and insomnia as a result of academic regress and increased failure rates. The mental health of healthcare workers can have an impact on the empathy towards their patients. In fact, empathy which is an essential pre requisite for effective patient care (Hojat et al. 2011) may be compromised due to distress among medical students and residents. (Neumann et al. 2011) Empathy is an essential factor linked to clinical competence and outcomes of patient care. A study conducted by Hojat et al. (2011) revealed a positive relationship between physicians' empathy and patients' clinical result. This perspective gives us all the more motivation to direct our efforts towards making the course less hectic for them. In the current COVID-19 crisis, mental health issues on the rise. (Rajkumar 2020) The clinical and paraclinical workers are likely to develop or suffer an aggravation of already existing mental health issues. Online education has commenced now, However, once the lockdown ends, medical colleges resume in the previous fashion. There could be added apprehension when the students enter higher semesters and begin clinical postings. Increased exposure to individuals carrying the novel coronavirus (SARS-CoV-2) and the added precautions that need to be taken may contribute to existing burden.

Judging academic achievement based on test scores and grade points is a common culture in most Indian schools. Efforts need to be put to orient the focus from a 'grade-centred judgement', to 'in-depth learning', 'skill acquirement' and 'effective communication' as the core idea of the professional course. This will improve their adaptability to ever changing updates as well as newer diagnostic and therapeutic modalities in the future. Sensitization about personalized and appropriate learning methods based on students' relative proficiency in reading, kinesthesia and audio-visual learning should be encouraged to cover the inevitable vast academic curriculum with the least burden. The recently implemented curriculum- Competency Based Medical Education (CBME) should take care of these aspects. Importance of adequate quantity and quality of sleep may be emphasised in case of sleep deprivation. Also, mindfulness practices and meditation may be introduced to the students to improve health and create a general sense of well-being.

## **5. LIMITATIONS OF THE STUDY**



The present study is of cross-sectional design and it does not establish cause-effect hypothesis. Since a questionnaire was used, recall bias could be a source of error. The sample size may be a limitation as well. Similar studies may have to be conducted in other colleges in different parts of the country to assess region specific stressors. For example, in our study, the stressor Political situation in the country did not seem to play a role in perceived stress which may not be the case in regions of political unrest; Difficulty getting back home, for instance, may be among the top five stressors for students studying in poorly connected areas and so on. Since the stressors in a given region at a given time cannot be same as that of another, actions need to be tailored the needs and resources into account. The questionnaires used in the study do not measure or indicate presence of any psychological morbidity and hence further efforts are needed to assess the likelihood of such complications.

## 6. CONCLUSION

Our study complements previously published results. This study has revealed high prevalence of stress, mostly attributed to academics and psychosocial factors. The sleep quality in majority of these students is poor. Studies have shown that stress is shown to affect empathy of doctors and hence its influence on patient care cannot be ignored. Active efforts need to be taken to limit further complications and to improve mental health as discussed previously. These efforts may reflect positively as better patient outcomes. Authors feel that clinical posting in the background of COVID-19 pandemic may add to the existing burden of the medical students which, depending on the magnitude needs to be addressed with appropriate solutions acceptable to them.

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