

# Association Between Academic Stress and Sleep Quality Among Undergraduate Medical Students

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## Abstract

Medicine is one of the toughest education fields that require immense scholastic performance. Therefore, students reserve more time improving their academic performance which lead students to undergo mental and academic stress with compromise in sleep quality. We aimed to determine the level of academic stress and sleep quality, sources of academic stress, and association of academic stress and other factors associated with sleep quality disturbances. A cross sectional study was conducted among undergraduate clinical year medical students of Melaka Manipal Medical College. An online questionnaire which consisted PSQI (Pittsburgh sleep quality index) scale and the PAS (perception of academic stress) scale, was distributed and 178 responses were collected. The data was statistically analysed using chi square test and simple linear regression in Epi info version 7.0 software. From the data analysed 34.8% have very high stress, 38.8% have high stress, 18.5% have moderate stress, 4.5% have low stress and 3.4% have very low stress. The examination and workload subscale were the highest contributor to academic stress with mean score of 25.2 followed by academic self-perception with mean of 18.7 and academic expectation with mean of 10.5. Furthermore, 57.9% of medical students have poor sleep quality and among them 70.6% students had poor sleep due to noise disturbance making them 1.96 times more likely to have poor sleep quality due to noise disturbance and it showed significant positive association. (OR=1.96, 95% CI=1.13-0.34, chi square=5.558, p-value <0.016). We also found that there is significant positive association between sleep quality and academic stress (correlation coefficient  $r=0.264$ , p-value<0.001) where when the perception of academic score increases the PSQI score also increased showing that there is a poor sleep quality among medical students with high academic stress. However, there were no significant associations found between sleep quality and other factors associated with sleep quality. In summary, most students are found to have sleep disturbances due to academic stress and noise disturbances which lead to poor sleep quality. Thus, we recommend students involve themselves in physical activities, consume healthy diet, keep themselves organized, and seek for help from reliable source like counsellors to help them cope with their stress in a better manner. We would also recommend institutes to have a flexible academic schedule as it may reduce the workload and as well encourage students to participate in cocurricular activities that may help students to overcome the academic stress and poor sleep quality.

## Keywords

Academic Stress, Sleep Quality, Cross Sectional Study, Medical Student, Malaysia

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## 1. Introduction

Medicine is one of the toughest educational fields due to its profoundly demanding proficient and scholastic prerequisites. Mental pressure, academic stress and disturbances in the sleep quality are exceptionally predominant among medical students. [1] A high pervasiveness of stress is one of the major issues revealed among the medical students all around the world. [2] A comparative study of stress amongst students conducted by Behere, et al defines stress as the “wear and tear” the body encounters as a result of adapting to the changing environment. Stress can have both positive impact and negative impact. Stress aids us to complete a work as a fruitful outcome and at the same time it bears negative outcomes such as mental and physical health issues. [3] Broad clinical educational plans, continuous assessments and fear of failure are wellsprings of anxiety and consistent pressure for medical students. [1]

Medical students may not contemplate sleep as a main concern in the setting of their scholarly necessities as they lessen their dozing time to have additional hours for learning and acquiring knowledge. Therefore, they develop sleeping habits which are deficient, particularly in the weeks going before an assessment [2]. Studies done in India, United States of America and Australia have observed that students with a decreased sleep standard have poor scores on their assessments and were more discouraged than their other classmates [4-6].

Medical school can contribute to stress among students due to extensive curricula, academic expectations followed by frequent and difficult examinations. High levels of stress have been reported among medical students in various countries, such as, Pakistan [1], Thailand [7], Malaysia [8], and the United States [9]. Moreover, medical students may not consider sleep as a priority when it comes to academics, therefore they tend to reduce their sleeping hours and reserve it for their academic excellence. [2]

Other than academic stress there are many other factors causing reduced sleep quality, those include delayed circadian rhythm which happens during examination periods. Caffeine could also alter the performance and mental state by loss of sleep and impact sleep patterns causing daytime sleepiness. [2]

A study illustrated that twelve weeks of workout increased sleep duration and the sleep quality among young people. The different levels of exercise intensity have varying effects on sleep quality. Moderate intensity workout has 65-70% of maximal heart rate. Results from a study showed, raised intensity, from mild to moderate beyond 4 weeks improves

sleep quality [10].

Moreover, a study was conducted among college students in china where noise disturbances have contributed to sleep disturbances. It was found that sleep was mostly disturbed by roommate conversation, and also noise from roommate sleep-related activities, which was the most common source of noise leading to sleep disturbances. This happens especially with four-person bedrooms and even six-person bedrooms, where the sound from roommates has affected their sleep. Before sleep, noises from roommates’ conversation and study and entertainment activities have a significant effect on sleep duration [11].

According to a survey done in Brazil during 2004, the relation between stress and gender reveals that females encounter higher stress symptoms compared to male which was the cause of poor sleep quality in females. This article proved that sleep quality is connected to emotional changes [12].

Meditation reduces stress and produces a tranquil mind. A study proposes that the act of yoga by undergraduates may build their nature of rest by diminishing day time lethargy and rest dormancy which altogether impacts the subjective sleep quality [13]. Undergraduates with poor sleep quality are found to drink more frequently and excessively [14].

A focused study between academic stress and sleep quality has not been substantial in Malaysian context. Unlike other studies, our study mainly concentrates on sleep quality among clinical year medical students of medicine and dentistry courses and to analyze the association between sleep quality and academic stress. This study also aims to find out the association between other variables and sleep quality.

## 2. Methods

### 2.1. Study Design and Study Time

A cross sectional study was conducted in our college Melaka Manipal Medical College, Malaysia from December 2020 to January 2021.

### 2.2. Study setting and Study Population

The college offers the classes in two different campuses, one is in Muar and the other is in Melaka. The Muar campus offers clinical phase of MBBS (Bachelor of Medicine, Bachelor of Surgery) of semester 6 and 7 while the Melaka campus offers clinical phase of MBBS semester 8, 9 and 10, BDS (Bachelor of Dental Surgery) and Foundation in Science (FIS) of which only the clinical phase MBBS students of semester 6, 7, 8, 9 and 10 and BDS students are selected to participate in the study. The study is aimed to

assess the level of academic stress for medical students and if its present, has a disruptive effect on sleep among the undergraduate medical students.

### 2.3. Sample Size

Based on a previous research done in Saudi Arabia, it is

found that there is an increased incidence of poor sleep quality of 76% among medical students. [2] Based on the application software “Epi Info” version 7.0 and with our population size 825, expected frequency 76%, confidence limit (margin of error) of 6.5% and with a confidence level of 95%, our sample size is 138 (Figure 1).

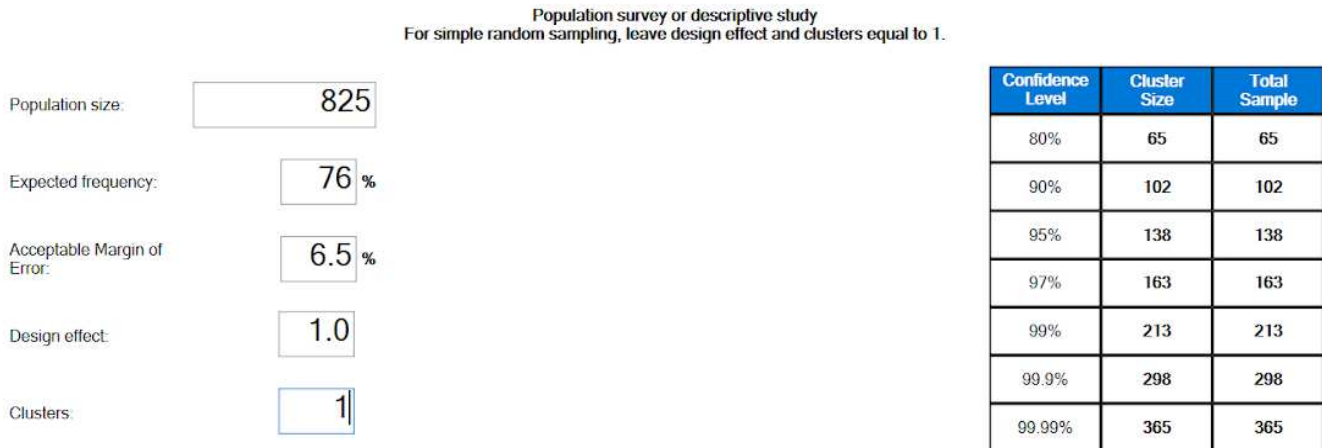


Figure 1. Sample size calculation based on “Epi Info” version 7.0 application.

Upon calculating the sample size (n) using formula application software “Epi Info” version 7.0, we then chose to allow non-response of 20% and calculation is as below:

$$\begin{aligned}
 n_{\text{final}} &= n_{\text{calculated}} / 1 - \text{nonresponse\%} \\
 &= 138 / 1 - 0.2 (20\%) \\
 &= 173
 \end{aligned}$$

### 2.4. Sampling Method

The sampling method used is a non-probability sampling method called purposive sampling. Clinical phase MBBS students of semester 6 and 7 studying in Muar campus and semester 8, 9, 10 studying in Melaka campus and year 3, 4 & 5 BDS students studying in Melaka campus from Melaka Manipal Medical College were selected to participate in this study.

The inclusion criteria included undergraduate medical students from Melaka Manipal Medical College, studying MBBS and BDS clinical year students who voluntarily agreed to participate in the study and the questionnaires were considered valid only if it is completed with a filled informed consent. Meanwhile the exclusion criteria included students who did not give informed consent to participate in the study and those students who failed to complete all the questions.

### 2.5. Data Collection

The data was collected by using an electronic survey, Google Form The independent variables of this study were academic stress, exercise, caffeinated substances, alcohol, meditation, noise disturbances, illness, medication, relationship status,

age, ethnicity, gender and sleeping difficulties. The dependent variable was sleep quality.

The questionnaire consisted of four sections. The first section contained the informed consent (a brief note on the study with the participant's willingness to participate in the study). The second section had questions pertaining to demographic data such as the age, gender and ethnicity. The third section consisted of questions obtained from the Pittsburgh Sleep Quality Index Scale (PSQI scale). The questions aimed at assessing the sleep quality where the questions were related to the participants usual sleep habits during the past month only. A total of 9 questions were asked under this section, one of which had 10 sub questions to be answered. The Pittsburgh Sleep Quality Index Scale (PSQI scale) consists of 19 self-rated questions which was combined to form 7 components such as subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication and daytime dysfunction. The seven component scores are added to obtain the global PSQI score in a range of “0 to 21” points where higher the point is, higher the severity of sleeping difficulty. A total of  $\leq 5$  points is interpreted as associated with good sleep quality and a total of  $>5$  points is interpreted as associated with poor sleep quality. The PSQI scale was used only after obtaining permission from University of Pittsburgh who owned the copyright of the form [15]. The fourth section aimed at assessing the academic stress of the undergraduate medical students, where a part of the section had questions obtained from the Perception of Academic Stress Scale (PAS scale). Questions regarding stresses related to academic expectations (four items), related to faculty work and examinations (eight items) and

related to students’ academic self-perceptions (six items) were asked. Participants were asked to answer on a five-point Likert-type scale (from = strongly disagree, 2=disagree, 3=neutral, 4=agree to 5=strongly agree) based on their experiences and impression about each item measuring sources of academic stresses. The total score was obtained by adding up the points and were categorized into very high (>62), high (50-55), moderate (42-49), low (36-41) and very low (>32) according to the total score obtained [16]. The PAS scale was also used only after obtaining permission from the developer and owner of the instrument [17]. The fourth section also contained few other questions related to other factors contributing to academic stresses.

### 2.6. Data processing & Data Analysis

The collected data was fed into Microsoft Excel and it was analysed using Epi Info version 7.0. In the study qualitative data such as gender, ethnicity, questions on sleep quality, questions of perception of academic stress were analysed to derive the frequency and percentage. For quantitative data, like age, questions on the duration of sleep, the questions on frequency of troubles encountered during sleep were analysed to derive mean and standard deviation. Statistical tests used for the hypothesis testing were determined based on the independent and the dependent variable and the details are tabulated as follows.

**Table 1.** Variables and statistical tests used in data analysis.

Independent variable	Dependant variable	Statistical test
Gender (Male, Female)	Sleep Quality	Chi Square Test
Ethnicity (Chines, Indian, Malay, Others)	Sleep Quality	Chi Square Test
Caffeine (Yes, No)	Sleep Quality	Chi Square Test
Relationship status (Yes, No)	Sleep Quality	Chi Square Test
Physical health issues	Sleep Quality	Chi Square Test
Medication/yoga/tai-chi/aromatherapy	Sleep Quality	Chi Square Test
Noise disturbance (Present, Absent)	Sleep Quality	Chi Square Test
Meditation (Yes, No)	Sleep Quality	Chi Square Test
Exercise (Yes, No)	Sleep Quality	Chi Square Test
Academic stress (total PAS Score)	Sleep Quality (total PSQI Score)	Correlation

### 2.7. Ethical Consideration

Participants were assured that they voluntarily participated in this study after informing them about the study. An informed consent was obtained before the start of study as an indication of voluntary participation. The confidentiality of all the data obtained from the participants were maintained. Furthermore, the study was conducted ethically after obtaining approval from the Research Ethics committee, Melaka Manipal Medical College.

## 3. Results

**Table 2.** Frequency (%) of age, gender and ethnicity.

Variables	Frequency (%)
age	
≥22	108 (60.7)
< 22	70 (39.3)
gender	
Male	52 (29.2)
Female	126 (70.8)
ethnicity	
Chinese	40 (22.5)
Indian	68 (38.2)
Malay	26 (14.6)
Others	44 (24.7)

Table 2 shows the demographic data from 178 respondents. A total of 178 clinical year medical students were involved in the study. 70.8% were female students and 29.2% were male students. Whereas, among them 60.7% were ≥ 22

years and 39.3% of them were < 22 years. Based on this descriptive study 22.5% were Chinese, 38.2% were Indian, 24.7% others and 14.6% were Malay participants.

**Table 3.** Frequency (%) of exercise, meditation/yoga/tai-chi/aromatherapy, alcohol consumption, caffeine consumption, relationship status and medication consumption.

Variables	Frequency (%)
Exercise	
Yes	124 (69.7)
No	54 (30.3)
Frequency of exercise	
Daily	21 (11.8)
Once or twice a week	62 (34.3)
More than 3 times a week	45 (25.3)
Meditation/yoga/tai-chi/aromatherapy	
Yes	36 (20.2)
No	96 (53.9)
Frequency of meditation/yoga/tai-chi/aromatherapy	
Daily	13 (7.3)
Once or twice a week	18 (10.1)
More than 3 times a week	12 (6.7)
Alcohol consumption	
Yes	61 (34.3)
No	117 (65.7)
Frequency of alcohol consumption	
Daily	1 (0.6)
1 to 2 days a week	6 (3.4)
Less than weekly	55 (30.9)
Never	30 (16.9)
Caffeine consumption	
Yes	121 (68.0)
No	57 (32.0)
Frequency of caffeine	
Daily	43 (24.2)

Variables	Frequency (%)
More than thrice a week	21 (11.8)
Once or twice a week	36 (20.2)
Once or twice a month	14 (7.9)
Rarely	12 (6.7)
Relationship status	
No	116 (65.2)
Yes	62 (34.8)
Medication consumption	
Yes	62 (34.8)
No	116 (65.2)

Table 3 shows, 69.7% of students exercise. Students who exercise once or twice a week are the most which is about 34.3%, more than three times a week is 25.3% and daily is 11.8%. Other than that, table 2 shows that students who do not meditate is about 53.9%. 10.1% students meditate once or twice a week, 7.3% meditate daily and 6.7% students meditate more than three times a week. Based on table 2, we can also conclude that 65.7% students do not consume alcohol. Of the students who consume alcohol, 30.9% consumes alcohol less than weekly, 16.9% never consumes alcohol, 3.4% consumes one to two days a week and 0.6% consumes daily.

**Table 4.** Frequency (%) of noise disturbances and causes of sleep disturbances.

Variables	Frequency (%)
noise disturbance	
Alarms	41 (23.0)
Sirens	16 (9.0)
Music	17 (9.6)
Laughing	19 (10.7)
Screaming	14 (9.0)
None	118 (66.3)
Causes of sleep disturbances	
blocked nose	54 (30.3)
headache	49 (27.5)
pain	24 (13.5)
cough	14 (7.9)
itching	27 (15.1)
sneeze	16 (9.0)
urge to micturate	23 (12.9)
none of the above	76 (42.7)

In table 4, 68.0% of students do consume caffeine while 32.0% of students do not consume any caffeine. Of the students who do consume caffeinated drinks, the majority of 24.2% consume caffeine daily, followed by a faction of 20.2% consuming it once or twice a week, 11.8% consuming more than thrice a week, 7.9% only consuming once or twice a month and finally a small percentage of 6.7% who rarely consume caffeine. As shown in table 2, 65.2% of students are currently not in a relationship while 34.8% of students are in a relationship. It is also shown that 65.2% of students do not consume medication while 34.8% of students do.

According to the bar graph plotted on causes of sleep disturbances, 42.7% stated that it is due to other reasons that

are not listed as options. 30.3% is due to blocked nose, 27.5% is due to headaches, 15.1% is due to itching, 13.5% suggests it is due to pain, followed by 12.9% caused by the urge to micturate, 9.0% due to sneezing and finally 7.9% is due to coughing.

Based on the bar graph plotted on frequency of noise disturbances, the majority 66.3% of students agree that there are no noise disturbances. A faction of 23.0% voted for alarms, 10.7% voted for laughing, followed by 9.6% voted for music. Finally, 9.0% of students voted for sirens & screaming.

**Table 5.** Sleep Quality and Academic Stress.

Variables	Frequency (%)
Sleep quality	
Poor	103 (57.9)
Good	75 (42.1)
Global PSQI Score	
Mean (SD)	5.6 (3.0)
Minimum - Maximum	0.0-13.0
Category of PAS	Frequency (%)
Very high	62 (34.8)
High	69 (38.8)
Moderate	33 (18.5)
Low	8 (4.5)
Very Low	6 (3.4)
Academic stress (PAS)	Mean (SD)
The academic expectation	10.6 (3.7)
Workload and Examination	25.2 (5.4)
Students' academic Self Perception	18.7 (4.0)
Total PAS	54.4 (9.8)

In table 5, 57.9% of students have poor sleep quality while 42.1% of students have good sleep quality. The mean score of the global Pittsburgh Sleep Quality Index Score scale is 5.6 with a minimum of 0.0 and maximum of 13.0. The Perceived Academic Stress scale score was calculated and categorized according to their stress level where 34.8% had very high stress, 38.8% had high stress, 18.5% had moderate stress, 4.5% had low stress and 3.4% had very low stress. The mean of the total Perceived Academic Stress scale was 54.4. Perceived Academic Stress subscales' mean was also calculated, where mean of workload and examination was 25.2 and it was the highest. The mean of other subscales such as students' academic self-perception and academic expectation were 18.7 and 10.6.

**Table 6.** Association between Sleep Quality and Academic Stress\*.

Independent Variable	Dependent Variable	Correlation Coefficient (r)	P value
Academic Stress	Sleep Quality	0.264	<0.001

\*Table 6 has been constructed using Correlation statistical test.

The table 6, shows the association between sleep quality and academic stress. The academic stress has a significant

association with the sleep quality as the p value is <0.001 which is <0.05 (significant). The correlation coefficient (r) is 0.264, thereby there is a little correlation present. When the

academic score is high the PSQI score increases showing that there is a poor sleep quality among medical students.

**Table 7.** Association Between Demographic and Sleep Quality \*.

Independent variable	Poor n(%)	Good n(%)	Odds Ratio (95%CI)	Chi-square	P value
Gender					
Male	32 (61.5)	20 (38.5)	1.24 (0.64-2.40)	0.407	0.525
Female	71 (56.4)	55 (43.7)	Reference	Reference	Reference
Ethnicity					
Chinese	20 (50.0)	20 (50.0)	1.36 (0.50-3.69)	0.374	0.540
Indian	43 (63.2)	25 (36.8)	2.35 (0.93-5.89)	3.370	0.066
Others	29 (65.9)	15 (34.1)	2.64 (0.97-7.14)	3.717	0.053
Malay	11 (42.3)	15 (57.7)	Reference	Reference	Reference
Caffeine					
Yes	71 (58.7)	50 (41.3)	1.11 (0.59-2.10)	0.102	0.749
No	32 (56.1)	25 (43.9)	Reference	Reference	Reference
Relationship status					
Yes	35 (56.5)	27 (43.6)	0.92 (0.49-1.71)	0.078	0.781
No	68 (58.6)	48 (41.4)	Reference	Reference	Reference
Sleep disturbance					
Yes	155 (87.1)	52 (29.2)	4.3 (2.5-7.5)	28.677	<0.001
No	31 (17.4)	45 (25.3)	Reference	Reference	Reference
Medication					
Yes	4 (57.1)	3 (42.9)	Reference	Reference	Reference
No	99 (57.8)	72 (42.1)	0.97 (0.2-4.4)	0.002	0.969
Noise disturbance					
Present	77 (70.6)	32 (29.4)	1.96 (1.13-3.40)	5.855	0.016
Absent	65 (55.1)	53 (44.9)	Reference	Reference	Reference
Meditation					
Yes	22 (61.1)	14 (38.9)	1.71 (0.78-3.73)	1.825	0.178
No	46 (47.9)	50 (52.1)	Reference	Reference	Reference
Exercise					
Yes	66 (53.2)	58 (46.8)	0.52 (0.27-1.03)	3.608	0.058
No	37 (68.5)	17 (31.5)	Reference	Reference	Reference
Alcohol consumption					
Yes	37 (60.66)	24 (39.34)	1.19 (0.63-2.24)	0.296	0.586
No	66 (56.41)	51 (43.59)	Reference	Reference	Reference

\* Table 7 uses Chi-square test.

61.5% of male students and 56.4% of female students have poor sleep quality. Thereby male students are 1.24 times more likely to have poor sleep quality compared to female students. Also, P value is 0.525 which is > 0.05 (level of significance), hence there is no significant association between the gender and sleep quality of a student.

65.9% of students who are from other ethnicities have poor sleep quality when compared to students from Malay ethnicity. Other ethnicity students are 2.64 times more likely to have poor sleep quality compared to Malay students. Also, P value is 0.053 which is > 0.05 (level of significance) hence it is not significant. 63.2% of Indian students have poor sleep quality when compared to students from Malay ethnicity. Indian students are 2.35 times more likely to have poor sleep quality compared to Malay students. Also, P value is 0.06 which is > 0.05 (level of significance) hence it is not significant. 50.0% of Chinese students have poor sleep quality when compared to students from Malay ethnicity. Chinese students are 1.36 times more likely to have poor

sleep quality compared to Malay students. P value is 0.540 which is > 0.05 (level of significance) hence it is not significant. Hence there is no association between ethnicity and sleep quality of a student.

58.7% of students who consume caffeinated substances, have poor sleep quality and 58.6% of students who do not consume caffeinated substances, have poor sleep quality. There by, students who consume caffeine are 1.11 times more likely to have poor sleep quality. P value is 0.749 which is > 0.05 (level of significance). Hence there is no significant association between consumption of caffeinated substances and sleep quality.

56.5% of students in relationship have poor sleep quality and 58.6% of students not in relationship have poor sleep quality. There by students in a relationship are 0.92 times more likely to have poor sleep quality. P value is 0.781 which is > 0.05 (level of significance), hence there is no significant association between relationship status of a student and sleep quality.



87.1% of students who faced sleep disturbances due to physical health issues and 17.4% of students who did not face any sleep disturbances due to physical health issues have poor sleep quality. There is a positive association between sleep disturbances and poor sleep quality. Students with sleep disturbances are 4.3 times more likely to have poor sleep quality. The P value is 0.001 which is  $< 0.05$  (level of significance), therefore there is significant association between sleep disturbances and sleep quality.

57.1% of students who consume medication and 57.8% of students who do not consume any medication have poor sleep quality. There by, students who are not on medication are 0.97 times more likely to have poor sleep quality compared to those who are on medication. P value is 0.969 which is  $> 0.05$  (level of significance) hence there is no significant association between medication consumption and sleep quality.

70.6% of students who experience noise disturbances have poor sleep quality than 55.1% of whom do not experience any noise disturbances. There is positive association between students who experience noise disturbances and poor sleep quality. Students with noise disturbances are 1.96 times more likely to have poor sleep quality. P value is 0.016 which is  $< 0.05$  (level of significance), therefore there is significant association between noise disturbances and sleep quality.

61.1% of students who do meditation or yoga or tai chi or aromatherapy have poor sleep quality while 47.9% of students who do not practice have poor sleep quality. Thereby, students who practice meditation or yoga or tai chi or aromatherapy are 1.71 times more likely to have poor sleep quality. The P value is 0.178 which is  $> 0.05$  (level of significance), therefore there is no significant association between practising meditation or yoga or tai chi or aromatherapy and sleep quality.

53.2% of students who do exercise have poor sleep quality, while 68.5% who do not perform exercise have poor sleep quality. Students who exercise are 0.52 times more likely to have poor sleep quality. The P value is 0.058 which is  $> 0.05$  (level of significance), therefore there is no significant association between exercise and sleep quality.

60.66% of students who consume alcohol have poor sleep quality, while 56.41% who do not consume alcohol have poor sleep quality. Students who consume alcohol are 1.19 times more likely to have poor sleep quality. The P value is 0.586 which is  $> 0.05$  (level of significance), therefore there is no significant association between exercise and sleep quality.

## 4. Discussion

The study we conducted was a cross sectional study with the

purpose of studying the association between the level of academic stress and sleep quality among clinical year undergraduate medical students. Furthermore, we set out to analyse the various sources of academic stress contributing to decrease in sleep quality among clinical year medical students and to find out the level of academic stress and sleep quality among undergraduate clinical year medical students.

The total perceived stress scale score was calculated and categorized into very high, high, moderate, low and very low. In our study, we found that 34.8% have very high stress, 38.8% have high stress, 18.5% have moderate stress, 4.5% have low stress and 3.4% have very low stress levels. In a previous research conducted among education, economic, social sciences and law students in Indonesia they have found that 5% has very high academic stress, 20% has high academic stress, 54% has moderate academic stress, 17% has low academic stress and 4% has very low academic stress. [16]

The perceived academic stress subscale consisted of three aspects: academic expectations, workload and examination and students' academic self-perception.

In our study we concluded that the highest mean of 25.2 was evident in students who attributed their perceived stress due to workload and examination. Lower stress sources were attributed to students' academic self-perception, resulting in a mean of 18.7. This study proved that a smaller portion of students linked their stress to their academic self-confidence and their intrinsic belief in success causing most of the students to be confident in their academic decisions and their repercussions. The final subscale academic expectations represent the pressures evoked by teachers and parents alike and the pressure students feel to compete and please those around them. For the students of this study, this category attributed to a mean of 10.6 therein making it the lowest stress evoking factor of the three subscales. These findings are inverse to the cross-sectional study done on university students by the psychiatry & health sciences departments, University of Calgary, Canada. This study produced results which included 18% of students attributing their stress to 'academic expectations', 10% to 'perceptions of workload' and the least students 9% to academic self-perceptions. [17] Another cross-sectional study which produced results that are inverse to ours, was done on undergraduate medical students by Melaka Manipal Medical College, Malaysia. The study concluded that a mean of 16.3 reported pressure to perform. A mean of 14.2 and 13.4 were reported for perceptions of workload and academic self-perceptions, respectively. [18]

The measure of sleep quality was classified into poor and good sleep. This study shows that 57.9% of medical students report to have poor sleep quality & a mean score of 5.6 from the global Pittsburgh Sleep Quality Index Score (PSQI) scale

[maximum=13]. This can be supported by a previous cross-sectional study conducted by researchers from the College of Medicine, King Saud bin Abdul-Aziz University for Health Science in Riyadh, Saudi Arabia reported a high prevalence of poor sleep quality (76%) among the students and the mean PSQI score of 7.11 [maximum=21] [2]. Another cross-sectional survey done by the researchers from CMH Lahore Medical College & Institute of Dentistry in Lahore Cantt, Pakistan shared similar reports of high prevalence of poor sleep quality (77%) among the students with a mean PSQI score of 8.1 [1].

According to our study there is a significant association between academic stress and poor sleep quality. Therefore, when the perception of academic score increases the PSQI score also increases showing that there is a poor sleep quality among medical students of those with high academic stress. This association is supported by previous cross sectional survey on the association of academic stress with sleeping difficulties among medical students in Pakistani indicated that those whom experienced academic stressors were 2.5 times as likely to suffer from poor sleep quality [19], followed another study done in Germany on the interaction between sleep quality and academic performance also showed that those whom undergoing examination which is part of an academic stress exhibited clinically relevant sleep disturbances [2].

Based on our study, physical health issues and types of noise disturbances shows significant association with poor sleep quality. Noise disturbances include alarms, laughing, music, sirens and laughing in which alarm has the highest percentage. As for noise disturbance, our study suggests significant findings. Students who had poor sleep due to noise disturbance were 70.6%. Undergraduate students are 1.96 times more likely to have poor sleep quality due to noise disturbance compared to normal sleep. Previous study which includes questionnaire-based study on Chinese students indicates indoor noises like roommate's conversation and snores and outdoor noises like wind, rain and construction noises have significant effect on sleep duration which indirectly affects sleep quality [11].

Physical health issues are categorised due to blocked nose, headache, pain, cough, itching, sneeze, urge to micturate, and others. 87.1% of students agreed to have poor sleep quality due to sleep disturbance. Based on our study, these undergraduate students are 28.67 times likely to experience poor sleep quality because of sleep disturbance compared to good sleep quality. An earlier cross-sectional study with questionnaires was done in sub-Saharan African [20] where 60.5% of participants had poor sleep quality due to sleep disturbance, thereby supporting our findings.

Few variables that are not significant from our study include gender, ethnicity, caffeine consumption, relationship status, medication, meditation, exercise and alcohol consumption. As seen in our study, gender has no correlation with sleep quality, thereby not significant. However, that is not noticed in a previous general population-based study conducted in Hunan province of China of where positive association [21] is seen. There is no association seen in ethnicity. This can be established from a previous cross-sectional study done in the USA. In this study, it shows that 6.5% have poor sleep quality [19]. According to our study, caffeine has no significance to sleep quality. A prior cross-sectional study was done among Australian adults, which presented with positive significant [22]. Following this study, relationship status has no significance with sleep quality.

Our study states that medication has no significant association with sleep quality. Previously, observational cross-sectional research was done among medical undergraduates in district of Bihar, which states that there is a high association between prevalence of analgesic usage among undergraduates with sleep quality [23]. In this study, we also concluded that meditation had no association with poor sleep quality. Based on our reference article, a questionnaire-based study was conducted among first year medical students at J N Medical college and yogic students from S-VYASA, it showed better sleep quality among yogic students and increased sleep latency in medical students [13]. Other variables include exercise. There is no association between exercise and sleep quality. Based on previous research, quasi-experimental study which was done among female students of dormitory residents showed improvement in sleep quality and reduced fatigue after aerobic exercise [10]. Based on our study, alcohol consumption has no association with poor sleep quality. Looking into previous research, a questionnaire-based study was done among first year postgraduates in faculty of medicine in Nis, Serbia. The study shows that there is association between alcohol consumption and sleep quality but does not affect sleep duration [24].

We had few limitations in our study. The study was conducted only for a period of six weeks and since our study was a cross sectional study, we got to observe the participants at one point of time. Academic stress of clinical year undergraduate medical students and their sleep quality throughout the course of their study was not able to be observed. Furthermore, our study was conducted among clinical year undergraduate medical students of a private medical institution; hence the findings cannot be generalized to other settings. Also, we had lesser responses from the final year medical students compared to the junior counterparts. This might affect the results as final year medical students



might have increased academic stress which would influence their sleep quality.

From our study we would recommend researchers to explore more about the source of academic stress and its influence towards other important aspects of their lifestyle. Furthermore, due to the current covid-19 pandemic, clinical year medical students are having more stress when compared to preclinical medical students. Medical students are now facing academic stress especially during these days where curriculum have changed from face to face to online setting. Therefore, to overcome these dilemmas, students should involve themselves in physical activity and breathing exercises as it will relax the mind and muscle which can reduce stress level and improve sleep quality. Moreover, consuming a healthy diet will help improve body response to stress and promote good sleep. Students should also practice in organizing their daily activities which help students to reduce the workload they have and help them overcome their stress. Students should also learn to share their problems regarding their stress which they are unable to overcome by themselves to a teacher, parent, trusted adult or even their institution counselling support team and talk on how to overcome the stress. Furthermore, we would also recommend Institutes to have a flexible academic schedule for students as it may reduce the workload and as well encourage students to participate in other physical activities that may help students to overcome the academic stress and poor sleep quality.

## 5. Conclusion

In conclusion, undergraduate students of MMMC have poor sleep quality due to academic stress and other variables which include gender, ethnicity, caffeine, relationship status, sleep disturbance, medication, meditation, noise disturbance, exercise and alcohol intake. Regardless of other variables, noise and sleep disturbance shows significant association with poor sleep quality. Based on our results, sleep disturbances like blocked nose and headache are the most common cause for poor sleep quality. Whereas for noise disturbance, alarm is the major cause for poor sleep quality in students.

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