

Prevalence of sleep disorders and its association with Obesity and academic performance among medical undergraduate students in North Karnataka

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Abstract

Background: Medical education is known to be a very arduous journey and medical students are expected to assimilate an enormous amount of knowledge during this period leaving very little amount time for rest. Therefore, their sleep is affected in terms of onset, amount and basic pattern and in turn the likelihood of napping episodes during the day also increases. Poor quality of sleep and excessive daytime sleepiness (SED) alter the cognitive ability and psychomotor performance of medical students as well as physical and mental health which usually reflect as poor academic performance.

Objective: To determine the relationship between the sleep disorders and its association with the Obesity and Academic Performance among medical undergraduates in North Karnataka.

Methodology: After obtaining the permission from Institutional Ethical committee, A cross-sectional study was conducted in May-June 2018. A total of 157 students studying in the pre-final and final years were considered for the study after taking informed consent. A self-administered questionnaire based on the Pittsburgh Sleep Quality Index and Epworth Daytime Sleepiness Score were handed over to the individuals. Data regarding their age, year of medical school, basic socio-demographic details, weight and Height were also recorded. The academic scores of their previous exams were obtained from the Academic section. Data was tabulated and analysed.

Results: A Total of 157 medical undergraduate students participated in the study. Out of which 61(38.8%) students had sleeping disorders. Out of them, 26 had normal BMI, and 35 students were overweight students (obese included) had some sort of sleep disorder. This shows a positive correlation between increased BMI and an increased propensity to sleep disorders ($p=0.04$). Comparing academic scores with PSQI scores, students who claimed to have no sleep disorders ($PSQI \leq 5$) scored better than those who had sleep disorders ($PSQI \geq 6$) with $p=0.021$.

Conclusion: Sleep disorders are more prevalent among the medical undergraduates, and this would get exaggerated with obesity. Higher BMI values are associated with poor sleep quality and excessive daytime sleeping and these factors in turn adversely affect academic performance in medical school. Hence healthy life style and maintenance of normal BMI is very important, along with adopting relaxation techniques such as Yoga and Meditation, to face the stress of the medical curriculum.

Keywords: Sleep disorders, academic performance, Pittsburgh Sleep Quality Index, Epworth Daytime Sleepiness Scale.

Introduction

Medical education is known to be a very arduous journey and medical students are expected to assimilate an enormous amount of knowledge during this period leaving very little amount time for rest. Added strains include frequent tests, personal issues,

drug abuse, mental illnesses^[1]. Therefore, their sleep is affected in terms of onset, amount and basic pattern and in turn the likelihood of napping episodes during the day also increases^[2]. Poor quality of sleep and excessive daytime sleepiness (SED) alter the cognitive ability^[3] and psychomotor performance of medical

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students as well as physical and mental health which usually reflects as poor academic performance^[4]. Sleep quality may in turn be worsened by other factors such as obesity measured in terms of the Body Mass Index (BMI)^[5]. Hence the present study was conducted to study the prevalence of the sleep disorders and its association with the Obesity and Academic Performance among medical undergraduates.

Objective: To estimate the prevalence of sleep disorders and its association with the obesity and academic performance among medical undergraduate students.

Materials and Methods

A cross-sectional study was conducted in May-June 2018. A total of 200 students studying in the pre-final and final years were considered for the study after taking consent. A self-administered questionnaire based on the Pittsburgh Sleep Quality Index (PSQI)^[6] and Epworth Sleepiness Score (ESS)^[7] were handed over to the individuals. The PSQI questionnaire has nineteen individual items which are used to generate seven composite scores. The results give numbers in seven categories: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. Rating is on a 4-point scale ranging from 0 to 3 for each question. A total score of or over 5 indicates poor sleep quality^[6]. The ESS is a self-administered questionnaire with 8 questions. Respondents are asked to rate, on a 4-point scale (0-3), their usual chances of dozing off or falling asleep while engaged in eight different activities. The ESS score (the sum of 8 item scores, 0-3) can range from 0 to 24. The higher the ESS score, the higher that person's average sleep propensity in daily life (ASP), or their 'daytime sleepiness'. The reference range of 'normal' ESS scores is zero to 10. That is the same as the range defined by the 2.5 and 97.5 percentiles. While ESS scores of 11-24 represent increasing levels of 'excessive daytime sleepiness' (EDS)^[7]. A total of 157 students returned the questionnaires. Data regarding their age, year of medical school, basic socio-demographic details, height and weight were also recorded. The academic scores of their previous exams conducted in the last one year were obtained from the Academic section to calculate every individual's average score.

Statistical analysis: The sample size was calculated using OpenEpi Software version 2.3.1. Taking prevalence^[8] of sleep disorders to be 40, at 95% confidence limits and 20% Relative precision,

minimum sample size calculated was 145. Data entry was done in Microsoft Excel and was analysed using the SPSS Trial version 19. Chi square and Fischer Exact test were used qualitative variables to find the association. Anova and post-hoc dunnett's test was done to compare academic performance in the various groups. Pearson's correlation test was used for quantitative data. $P < 0.05$ is considered significant.

Results

A total of 200 pre-final and final year students were invited to participate in the study and 157 students reverted, out of which there were 76(48.4%) male students and 81 (51.6%) female students. In the present study 61 (38.8%) of them had PSQI score of >6 , which implies that they had sleep disorder, out of which 20 were males and 41 were females. By applying EPSS, 27 students had excessive day time sleepiness with scores ranging from 11-24, out of which 7 were males and 20 were females, suggesting females students had more preponderance for sleep disorders.

It was also noticed that 96 students out of which 57 students with normal BMI and 39 overweight students (obese included) were not having any sleep disorders (PSQI score equal to less than 5). 61(38.8%) students out of which 26 had normal BMI had sleep disorders and 35 overweight students (obese included) had some sort of sleep disorder. (Table 1). This shows a association between increased BMI and an increased propensity to sleep disorders ($p=0.04$).

Comparing BMI values with napping episodes/daytime sleepiness, the following results were obtained. Out of 91 students having no daytime sleepiness, 40 were overweight; out of 39 having mild daytime sleepiness, 37 were overweight; out of 27 having excessive daytime sleepiness 25 were overweight. These results clearly show that there is a relationship between increased BMI and increased predisposition to daytime sleepiness ($p<0.0001$). This observation was found to be highly significant. (Table 2)

Table 1: Association between sleep disorders (PSQI score) and Body Mass Index.

BMI	≤ 5 (No Sleep Disorder)	≥ 6 (sleep Disorder present)
Normal	57	26
Overweight	28	30
Obese	11	5
Total	96	61
Chisquare=6.41, $p=0.04$		

Table 2: Association between sleep disorders (EPSS score) and Body Mass Index.

BMI	EPSS Score		
	1-6 (Having enough sleep)	7-8 (Average sleep)	≥9 (sleep problem present)
Normal	51	2	2
Overweight	25	29	15
Obese	15	8	10
Total	91	39	27
Chisquare=46.25P=<0.001			

Table 3: Comparison of PSQI Scores and Academic Performance.

PSQI Score	Percentage scored Mean±SD	t	p
≤5 (No Sleep Disorder)	66.608±1.1	4.6673	0.021(Significant)
≥6 (sleep Disorder present)	60.200±1.6		

Table 4: Comparison EPSS Scores With Academic Performance

EPSS Scale	Percentage score Mean±SD	ANOVA F Value	p
1-6 (Having enough sleep)	69.892±3.005	209	0.0001 HS
7-8 (Average sleep)	61.171±2.0909		
≥9 (sleep problem present)	60.481±2.5091**		

** Post-hoc Dunnetts comparison with first group, p=0.0001

Table 5: Correlation between the PSQI score, EPSS score, BMI with Academic Performance.

Scale	Academic performance Correlation coefficient(r)	p
PSQI	-0.19	0.01 Significant
EPSS	-0.20	0.01 Significant
BMI	-0.17	0.03 Significant

Comparing academic scores with PSQI scores, students who claimed to have no sleep disorders (PSQI ≤5) scored better than those who had sleep disorders (PSQI ≥6) (p=0.021). Significant difference in the academic performances between those who had sleep disorders and those who didn't is evident (Table3).

Comparing the academic scores with the EPSS scores, students who claimed to have no napping episodes during the day (with EPSS score between 1 and 5) scored 69.892±3.005% in their tests. Those who claimed to have moderate episodes of daytime sleepiness with an EPSS score between 6 to 10 had scored 61.171±2.09 in their tests on an average and finally those who did have severe daytime sleepiness and increased number of napping episodes during the day scored 60.481±2.5 on an average. Statistically, the F ratio (ANOVA) turned out to be 209 and the p value was 0.0001 which is highly significant. Thus, this study

shows that there is a considerable and significant difference in the academic performances between those who had no/mild daytime sleepiness and severe daytime sleepiness as assessed by the EPSS scale. (Table 4)

It was found that PSQI and EPSS scores had a negative correlation with academic performances (r= -0.19 and -0.20 respectively) meaning that higher the PSQI and EPSS scores, poorer the academic performance. There was also a negative correlation between BMI and academic performance (r= -0.17). Thus higher BMI values meant lower academic performance. (Table 5).

Discussion

From the study, it was found out that at least 38.8% had sleeping disorders. and about half of them who did have sleeping disorders were females which is consistent with the studies of *Krishnan and Collop,2006*^[8]. A study conducted by *Mallampalli and Carter* in 2014 also suggests that there exists a considerable difference when it comes to sleep quality with females having a poorer quality as compared to males^[9]. Another Hong-Kong based study conducted by *Zhang and Wing* also reveals that females are at least at 40% increased risk for developing insomnia compared with males^[10]. A lot of contributing factors may be attributed to this- such as hormonal changes and transitions during the entire day^[9], mental health

issues such as depression and insomnia especially after puberty^[11] and menstrual cycles have also been related to the disruption in sleep in some women^[12].

As far as daytime sleepiness is concerned, in this study it is found that females have greater preponderance for daytime sleepiness. The results of this study align with that of another study conducted in Saudi Arabia by *Fatani A1, Al-Rouqi, Al Towairky et al., 2015* especially in females lesser than 29 years^[13].

Also overweight and obesity (measured in terms of BMI) has been found to be associated with increased risk for sleep disorders ($p=0.04$) which coincides with the findings of a study conducted in Rhode Island and Ohio by *Galioto et al^[5]* in 2015. Another Chilean based study conducted by Vargas, Flores and Robles in 2014^[14] also state that increased BMI poses as a risk factor for increased amount of sleep disorders in college students. According to another meta-analysis, it is known that BMI is a risk factor for at least 20 comorbidities and sleep disturbances (apnoea) is one of them^[15] It is known that increased BMI is a risk factor for the onset and further progression of obstructive sleep apnea^[16,17,18,19] and sleep apnea is itself a cause for disturbed sleep. Thus it can be asserted that overweight and obesity is linked to a greater rate of sleep problems^[20].

Our study also showed significant negative correlation between high BMI values and better academic performance ($r= -0.17$) which is consistent with the studies conducted by Anderson and Good which reveals a positive relation between 'healthy BMI scores' and better academic performance^[21]. Few other studies also reckon that being overweight or obese is associated with lower performance in students although this has been proven to be true only in school children^[22]. Therefore, such ambiguous results call for a deeper probe and further research especially among medical and other university level students to find the relationship between BMI scores and academic performance.

It is known that poor sleep affects cognition appreciably^[23] and this study showed that the higher the rate of sleep disorders and excessive daytime sleepiness, the poorer the academic performance which concur with the findings of a Saudi based study conducted by Alsaggaf, Wali, Merdad and Merdad^[24] on medical students in clinical years. The result outcomes also align with those of another Sudan based study on medical students conducted in 2015^[25]. An Italian based study conducted by Curcio, Ferrara and De Gennaro also cite that loss of good quality and quantity

of sleep affects the functioning of the pre-frontal cortex which in turn will have a detrimental effect on neurocognition and thereby is reflected as poor performance in college^[26]. Another study conducted in Riyadh in 2012 also states that decreased amount of nocturnal sleep and increased daytime sleepiness/napping episodes are negatively associated with academic scores in medical students^[27]. A Hong-Kong based study also suggested that students who slept later than usual and those who had poorer sleep quality were at a greater risk of poorer academic performance^[28]. However, there were intriguing results seen in another study conducted in Germany by the University of Munich which found out that the timing of onset of sleep was more important than the duration of sleep for academic performance in medical students^[29]. A similar study conducted in Germany shows interesting results which states that not only poor sleep quality affects academic performances but vice versa holds true as well wherein students who perform poorly in exams tend to be more stressed and in turn have poor sleep quality so as to perform better in the future exams creating a vicious "poor sleep-poor performance" cycle^[30].

Overall, it can be said that studies showed that medical students who sleep properly at night do academically better. Furthermore, the timing of onset of sleep might be more cardinal than duration of sleep. These could be co-dependent on many other key external factors such as occurrence of frequent examinations and the timing of classes. This also gives lesser time for wellness interventions such as physical exercise which is also implicated in better performance, academically^[31]

Thus, for those who are consistently getting average and below average scores perhaps can be selected for further counselling which is targeted towards motivating them to have timely sleep along with fixed timetables and helping them regularize it.

However, there are considerable limitations in the study as aspects like substance abuse^[32], personal and family problems, psychological conditions and mental health which appears to be very common in medical students (which also varies significantly by gender and year of study)^[33], health issues such as menstrual irregularities^[34] and other predicaments were not taken into consideration and they may interfere in the interpretation of the results.

Conclusion

Sleep disorders are more prevalent among the medical undergraduates, and this would get exaggerated

with obesity. Higher BMI values are associated with poor sleep quality and excessive daytime sleeping and these factors in turn adversely affect academic performance in medical school. Hence healthy life style and maintenance of normal BMI is very important, along with adopting relaxation techniques such as Yoga and Meditation, to face the stress of the medical curriculum.

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Date received: December 11th 2018

Date accepted: December 26th 2018

Conflict of interest: Nil

Source of funding: Nil