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Association between Body Mass Index and Sleep Quality among Undergraduate Medical Students of Pakistan

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ABSTRACT

Overweight and obese undergraduate medical students have been noted to have a greater frequency of poor sleep. This has been postulated to be largely due to stress. Whilst ample literature on the subject matter exists for medical students in later year of study, there is scant research on 1st year medical students who arguably experience the greatest amount of stress due to the novel setting. 225 first year medical students from Bachelor of Medicine and Bachelor of Surgery (MBBS) and Bachelor of Dental Sciences (BDS) were invited to partake in the study. The questionnaire included a Demographics section that included BMI categories established on WHO's guidelines. The second part included the Pakistani version of the PSQI questionnaire to assess sleep quality. Data analysis was done using SPSS 25.0 There was a questionnaire completion rate of 97.8%. The mean BMI was calculated to be 21.404 +/- 2.916. The mean PSQI was 7.59 +/- 2.77. There was no statistically significant correlation between PSQI score and BMI (p value > 0.05). However, the BMI was found to be positively correlated with a difficulty falling asleep because of feeling 'hot' (p value = 0.015). Our study whilst does not report a positive correlation between BMI and PSQI score, does shed light on inadequate sleep obtained by obese and overweight subjects. This could be due to difficulty falling asleep because of metabolic derangements in obesity causing them to feel 'hot'. Further research is required to corroborate on this hypothesis.
Key Words: *Body mass index, Sleep Quality, Medical Students, PSQI*

INTRODUCTION

An anthropometric gold standard utilized widely today is the body mass index (BMI); infact over 63% of studies conducted from 2000 to 2015 relying solely on BMI to define obesity [1]. According to the World Health Organization (WHO), a man is deemed 'overweight' if he has a body mass index of 27.8 or greater, whereas a woman is deemed 'overweight' if she has a body mass index of 27.3, whilst a body mass index of 30 denotes 'obesity', irrespective of the gender [2]. This was however until 2002, whereby these values were revised for Asian populations because Asian Populations were discovered to have a higher percentage of body fat and body mass index than European populations, as well as the presence of still several risk factors for cardiovascular and metabolic diseases even when their body mass index values were below 25kg/m2[3,4]. Pakistan too is on the incline in obesity, with a World Health Organization (WHO) 2016 study reporting 4.8% and 20.8% of the population to be 'obese' and 'overweight' respectively [5]. Whilst used perhaps interchangeable in literature, there is rather a clear distinction between obesity and overweight with the former pertaining to excess body fat, and the latter to body weight [6].

A high body mass index is harmful in that it predisposes one to in the long term to cardiovascular diseases, type 2 diabetes, premature death, and certain types of cancers [7]. There is also profound evidence in literature about sleep's role in both glucose metabolism and other neuroendocrine function and how sleep loss thus results in metabolic and endocrine alterations involving also metabolic hormones

such as ghrelin and leptin[8]. Various reasons have been proposed and investigated for the high body mass index are dietary and lifestyle factors, physical inactivity, prolonged screen time, and perhaps most pertinent to this study; sleep duration [7].

A study conducted on U.S Adults, concluded that on average, short sleepers were 1.7kg/m2 heavier and were more likely to be obese than people who had a longer sleep duration [9]. Influenced by the various metabolic changes brought about by sleep loss, Perla A. Vargas's study concluded that young adults who had sleep disturbances were associated with a 66% increase in the chances of being overweight. There was found to be no such role of sleep duration however [10]. This was supported also by the findings conducted at Qassim University, Saudi Arabia, where overweight and obese undergraduate medical students were found to have a greater frequency of poor sleep among the general population which was not correlated with sleep pattern [11]. A study conducted on medical students of Karachi discovered that the percentage of students who were overweight and obese was greater than the nationwide percentage, and postulated one of the pre-disposing factors to obesity to be 'stress-eating', discovering that among students who indulged in 'stress-eating', 59.6% were overweight and obese [12].Thus the aim of this study is to find out association between sleep quality and body mass index in first year medical students.

MATERIAL AND METHODS
Participants and Procedures
The setting of this study was CMH Lahore Medical and Dental College. The participants included were both Bachelor of Medicine and Bachelor of Surgery (MBBS) and Bachelor of Dental Sciences (BDS) students who were currently in their first year of medical study. The Ethical Review Committee, CMH Lahore Medical College and Institute of Dentistry, Lahore, Pakistan approved the conduction of this study The sample size was calculated to be 221 students; thereby 225 students in total were taken in to the study, comprising the entire strength of both MBBS and BDS; 150 and 75 respectively. Students who were already diagnosed with a sleep disorder, or students medicating themselves for a sleep disorder were excluded.

After taking informed written consent, Pre-tested, self-administered questionnaires designed in English were administered to the students to be solved and then returned.

Questionnaires
The second part of the questionnaire was the "Demographics" section consisting of 12 questions such as their smoking habits, caffeine intake, as well as their height and weight to calculate their "Body Mass Index", which was calculated by dividing the weight of the students in kilograms with the square of the height measured in meters. The following categories were established accordingly; BMI <17.50 = underweight, BMI (17.50 – 22.99) = Normal Weight, BMI (23.00 – 27.99) = Overweight, and BMI (> 28.00) = Obese.

The next portion of the questionnaire included the PSQI [13]; a self-reported questionnaire that makes use of 18 items or questions to assess the sleep quality of subjects over the past month [13]. The Pakistani version of this questionnaire was utilized in this study in lieu of the cultural ethical dilemma with asking subjects the question "Do you have a bed partner?" This question does not contribute to the global PSQI score so its omission bears no consequences. From the response of the questionnaire, the PSQI obtains seven component scores; the sum of which is the global PSQI score that can lie in a range between 0 and 21, with ascending severity indicative of successively poor sleep quality. The subject is termed to have a 'good sleep quality' if their global PSQI score is below 5; however, a global PSQI score greater than or equal to 5 labels their sleep quality as 'poor sleep quality [13]. The PSQI questionnaire has a diagnostic specificity of 86.5% and a sensitivity of 89.5% (kappa = 0.75, p<0.001).

Data Analysis
The data obtained from this study was entered and analyzed using the software SPSS 25. For quantitative variables, Mean, standard deviation and mode of the various variables were obtained and t-test performed. For qualitative variables, frequency and percentages were obtained. A 'p value' < 0.05 was taken in consideration to be significant.

RESULTS
Out of 221, 146of these students hailed from MBBS (64.6%), and the remaining 75/221 students hailed from BDS (33.2%). The range of age of subjects was 18-21; mean = 19.5 +/- 0.98. More females (140/221, 61.9%) than males (81/221, 35.8%) participated in this study. Table 1

There were an approximately equal number of day scholars (42.0%) and hostelites (42.5%), [Table 1] most students belonged to an urban social background (77.0%), studied F.Sc pre-med (73.5%), selected medicine as a profession by choice (88.1%), were non-smokers (95.1%), and had a BMI in the "Normal

Weight" (between 17.50 – 22.99) category. 9.9% of the population were underweight, 64.25% were normal weight, 20.81% were overweight, and 4.9% were obese. (Figure 1) The mean BMI was 21.404 +/- 2.916.

Table I: Basic characteristics of study participants

Characteristic	Participants (n=221) No. (%)
Sex	
Male	81 (36.7%)
Female	140 (63.3%)
Age (years)	
18	55 (24.9%)
19	110 (49.8%)
20	51 (23.1%)
21	5 (2.3%)
Discipline	
MBBS	146 (66.1%)
BDS	75 (33.9%)
Social Background	
Rural	11 (5%)
Semi-Urban	36 (16.3%)
Urban	174 (78.7%)
Hostelite/Day Scholar/Medical Cadet	
Hostelite	96(43.4%)
Day Scholar	95 (43.0%)
Medical Cadet	30 (13.6%)

Figure 1: Grouping of participants on the basis of Body mass index
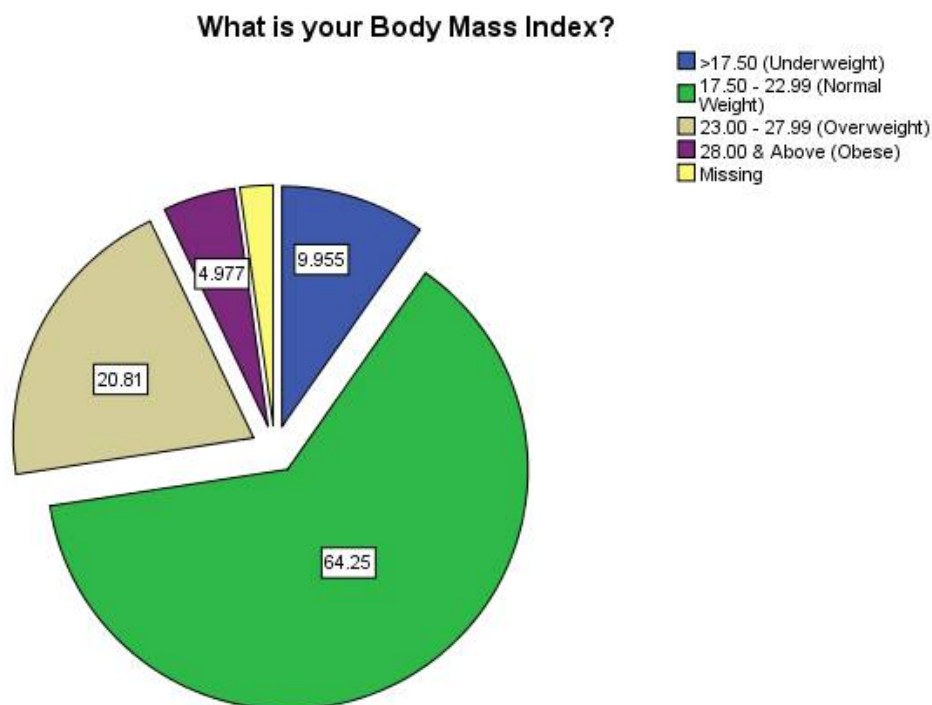
The mean PSQI was 7.59 +/- 2.77. There was no correlation between the PSQI score and BMI (0.400).Table 2. A greater percentage of Obese subjects went to bed after midnight and much later than their counterparts (90.1%), although there was no statistical correlation between the BMI and time of going to bed (p value = 0.555). A majority of obese and overweight subjects reported receiving only 5 hours of sleep every night, although this was not statistically significant. There was no correlation

between the BMI and difficult going to sleep (time taken to go to sleep; p value = 0.154) (cannot go to sleep within 30 minutes; p value = 0.106).

Table 2: Association of BMI with PSQI score

		Global PSQI Score
Body Mass Index?	Pearson Correlation	.057
	Sig. (2-tailed)	.400
	N	221

The BMI was found to be positively correlated with a difficulty falling asleep because of feeling 'hot' (p value = 0.015), and almost half of obese subjects (45.5%) responding once or twice a week to this question.

DISCUSSION
Our study has definitively shown that there is no correlation between sleep duration and BMI. The results of our study were consistent with the findings of other studies. In their study on medical students in Karachi had very similar BMI values (21.1717 =/- 4.33kg/m²) to our study (21.404 +/- 2.916) [12]. However, the proportion of pre-obese and obese subjects (25.8%) in our study was less than the respective proportion in their study (33.2%). Their study attempts to explain this by studying various pre-disposing lifestyle habits and explains how among students who indulged in to binge eating when stressed, 56.9% were pre-obese to obese [12], attempting to establish a correlation with stress. Our study however, does not take in to account variables such as stress that could account for obesity. It might also be possible that perhaps binge-eating would not be applicable to subjects in our study given that the percentage of subjects who were pre-obese and obese was smaller than the respective proportion in their study. This is supported by the fact that a study conducted in a medical college in Bengaluru, India where the incidence of overweight and obese students was 74.5% revealed that 56% of medical students reported to stress eat particularly during exams [14].
Our study's findings are also consistent with the fact that sleep duration specifically is not correlated positively with BMI as depicted in other studies [10][15]. This was in contraindication to a study conducted on both US and South Korean university students, where obese college going students were reported to be more likely to have inappropriate sleep duration as well as sleep quality [16]. Also there was shown to exist a positive correlation between both short (< 7 hours) and long sleep duration (> 9 hours) and BMI [16]. The findings conducted on 2100 university going students in Croatia also revealed similar results; both short and long time spent in bed and poor sleep quality were found to be associated with overweight/obesity status in young adults [17]. This could perhaps be attributed to the culture of the subcontinent where napping in the afternoon is a common practice. This could also explain why subjects who were pre-obese and obese in our study reported going to bed much later than the other body-type subgroups. Whilst, the PSQI does report the number of hours slept, it asks so specifically the number of hours slept in a night. Subjects perhaps simply did not take in account the number of hours slept in the afternoon too.
Universities should offer counselling to such students, and initiate a greater degree of physical activity too in their curriculum. The vast majority of students at a medical university in Lahore reported only fairly healthy lifestyles [18]. Most students believe it is the university life that has affected their health for worse (39.4%) and the greatest barrier to their eating a healthier diet and practicing regular exercise is indeed a 'lack of time' [19]. Thus in lieu of these findings, in addition to counselling students, there stands a need to reform the medical syllabus and classes, ensuring students are provided adequate time apart from studies to focus and work on their health. The majority of our students who were pre-obese or obese also went to bed after midnight, thereby increasing the propensity and risk for metabolic syndrome risk factors [20]; implying thus a sense of urgency in the need for action as even so the above risk could still not be reduced through changing the bedtime during that one year of study [20].

LIMITATIONS
Whilst this study was directed specifically towards the first year students and the effects of medical studies, the inclusion of all students from various years of study could lead to a more stratified data, where correlations between the various years could also be inspected. Our study also only takes place in

one medical school. To generalize our findings, a greater sample size from multiple colleges from both the private and public sector is required.

CONCLUSION
Our study whilst does not report a positive correlation between BMI and PSQI score, does shed light on inadequate sleep obtained by obese and overweight subjects. This could be due to difficulty falling asleep because of metabolic derangements in obesity causing them to feel 'hot'. Further research is required to validate on this hypothesis.

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