

ORIGINAL ARTICLE

Problematic Mobile Phone Use Among Undergraduate Medical Students and Its Impact on Sleep Quality and Sleep Pattern

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ABSTRACT

Introduction: Sleep deprivation is a concern in young adults and the use of mobile phone is very common in this population. This study aimed to measure and correlate the sleep quality, pattern of sleep and problematic mobile phone use in young medical students. **Methods:** A cross-sectional study was conducted using the Pittsburgh Sleep Quality Index (PSQI), Problematic Mobile Phone Use Scale (PMPUS) and Morningness-Eveningness Questionnaire (MEQ) among medical students in a Malaysian medical college. Correlation among the variables was done using bi-variate analysis followed by Pearson correlation coefficient and 2-tailed significance. A level for $p \leq 0.05$ was considered as statistically significant. **Results:** We found significant positive correlation between poor sleep quality and total problematic mobile phone use as well as its sub dimensions, namely deprivation, adverse outcomes and control disorder. PSQI score showed significant negative correlation with different patterns of MEQ like moderate evening, late sleepers, moderate morning and early risers. Positive correlation of the PSQI with sub dimension of PMPUS reflects unhealthy dependency on mobile phone in this population. **Conclusion:** Our study revealed that the unhealthy use of mobile phone adversely affected sleep quality in the cohort of young medical students. It is thus important for medical schools to formulate policies and create educational programs vis-a-vis sleep health and to increase awareness regarding controlled mobile phone usage.

Keywords: Sleep quality, Mobile phone use, Medical students, Sleep pattern, Sleep deprivation

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INTRODUCTION

Sleep is a keystone of adolescent development. The circadian rhythm is modulated by factors like physiological functions, light-dark cycle, activities, and work schedule among others (1). University students have variable sleep timings due to their rigorous academic schedule and social life. This, coupled with practices like consumption of alcohol and coffee result in poor sleep quality. Sleep habits; particularly wake-up time, accounts for variance in grade point averages (GPA) with later wake-up time associated with poor grades (2).

Brick et al. reported that medical students have poor sleep quality compared with a cohort of healthy, young adults (3). One of the studies reported that the

percentage of students expressing dissatisfaction with the quality of sleep, increased from 24% in the year 1978 to 71% by the year 2000 (4). A study conducted among students of Bachelor of Medicine & Bachelor of Surgery (MBBS) found that daytime sleepiness was prevalent in 35.5% students, with 16.1% students reporting poor sleep quality and 41.8% students having psychological distress owing to poor sleep (5). Sleep disorders and their detection among university students are public health issues that are seldom paid attention (6).

Sleep quality, though subjective, was defined based on the qualitative features of sleep of an individual. Wherein the duration of sleep, latency of sleep, number of arousals after commencement of sleep, sleep disturbances, sleep medication usage, usual bedtime and participant satisfaction of sleep were measured using the Pittsburgh Sleep Quality Index (PSQI) questionnaire (7-9). The PSQI is a self-reported 19-item questionnaire which has seven components: Sleep quality (C1), sleep latency (C2) – time duration to fall asleep, sleep duration (C3) – hours of proper sleep per day, Habitual

sleep efficiency (C4) - number of hours of actual sleep to the hours spent in bed, Sleep disturbances (C5) - due to bad dreams or pain or snoring and so on, Usage of sleep medication (C6) – intake of sleep medication over the past month and Daytime dysfunction (C7) – trouble staying awake during social activities during the day. These seven components are scored from 0 to 3 and the total global score ranges from 0 to 21 and has 5 as its cut-off score. A higher global score of PSQI is indicative of inferior sleep quality (2, 7).

Peak alertness is the time span of the day in which the individual's daily temporal activity tends to be maximally active (10). The morningness–eveningness questionnaire (MEQ) is a 19-item self-reported questionnaire, which was developed specifically to measure whether a person's circadian rhythm produces peak alertness in the morning, evening or the time in-between. The MEQ classifies individuals into five categories, namely definite evening (Sleep onset = 2:00 am-3:00 am; Wake up time = 10.00 am-11.30 am), moderate evening (Sleep onset = 12:45 am-02:00 am; Wake up time = 08.30 am-10.00 am), intermediate (Sleep onset = 10:45 pm-12:45 am; Wake up time = 06.30 am-08.30 am), moderate morning (Sleep onset = 09.30 pm-10:45 pm; Wake up time = 05.00 am-06.30 am) and definite morning (Sleep onset = 09.00 pm-09:30 pm; Wake up time = 04.00 am-05.00 am) (11). Sleep pattern was defined as the sleep time and wake up time as per the individual's day and night cycles, based on their particular sleep time, sleep duration and waking hours (12). The morningness-eveningness pattern of an individual is affected by factors like delayed sleep onset, napping during daytime, insufficient sleep duration. Student performance in academics is affected by their morningness-eveningness which plays an important role in the sleep-wake cycle (13).

Problematic mobile phone use was defined as the addiction to mobile phone usage, where the individual either was in an emotional state when then the mobile phone was unavailable and/or used the mobile phone as the specific mode of communication and/or the inability to control usage and/or internet addiction (14). The problematic mobile phone use scale (PMPUS), is a 26-item self-reported questionnaire having four sub dimensions: Deprivation – which deals with emotional state of the person when the mobile phone is unavailable or is unusable, adverse outcomes (AO) – the undesirable effects of mobile phone usage on daily lives of the individuals, control problem (CP) – the inability or ability to control the usage of mobile phones and Interaction avoidance (IA) – the preference of communication through mobile phone instead of face-to-face conversation (14). A high total score of PMPUS indicates that the level of mobile phone usage is high. With an exponential rise in mobile phone usage among youth and its addiction in university students, its correlation with depression, anxiety, daytime dysfunction and worsening sleep quality has been reported (15,

16). However, there are not many studies which have correlated problematic mobile phone usage and sleep quality in a cohort of medical students. Though various instruments are there to assess sleep quality, sleep pattern and problematic mobile phone use, we chose PSQI questionnaire, MEQ and PMPUS as they have been reported to be valid and have good internal consistency in previous studies (6-8, 11, 14). Hence, the aim of this study was to measure and correlate the quality, pattern of sleep and problematic mobile phone use among 1st and 2nd year undergraduate medical students of a Malaysian medical college.

MATERIALS AND METHODS

This cross-sectional study was carried out among 1st and 2nd year medical students of a Malaysian medical college having twin campuses in India and Malaysia. These students study their pre- and para- clinical phase of MBBS in India and complete their clinical phase in Malaysia. By using convenient sampling, 167 students were recruited from first year and 161 students from second year, comprising a total of 328 study participants in the Indian campus of this medical college. Students included in the study were in the age between 18 to 25 years. Written informed consent was obtained from all the participants and students who did not wish to participate in the study were excluded. Ethics permission was acquired from Institutional Ethics Committee (IEC), Kasturba Hospital, Manipal Academy of Higher Education, Manipal, Karnataka (India) (Reference number- IEC 436/2017).

Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS 16.0). Data was expressed as percentage and mean \pm standard deviation. Reliability analysis of scale psychometrics was done using Cronbach's alpha. The validity of the questionnaires used in the study was conducted using Pearson Product Moment Correlations, where each item questionnaire scores were correlated with the total score. Item-item questionnaire that significantly correlated with total score was considered valid. Correlation among the variables was done using bi-variate analysis followed by Pearson correlation coefficient and 2-tailed significance. A level for $p \leq 0.05$ was considered as statistically significant. The internal consistency test for PMPUS, PSQI and MEQ yielded values of 0.93, 0.74 and 0.67, respectively. The validity analysis of the three questionnaires showed that the items were valid (2-tailed significance; $p < 0.05$).

RESULTS

Of the 328 study participants, there were 60.5% females, 39.5% males and their mean age was 20.16 years and 19.68 years respectively. While 328 students responded to the self-reporting questionnaires on PSQI and PMPUS, 157 students answered the MEQ. The global PSQI score (poor sleep quality ≥ 5) for the study population was

found to be 6.26 ± 2.50 . We found a significant positive correlation for total PMPUS with PSQI ($p = 0.001$) and components of PSQI i.e., subjective sleep quality ($p = 0.014$) and daytime dysfunction ($p = 0.014$), as presented in figure 1.

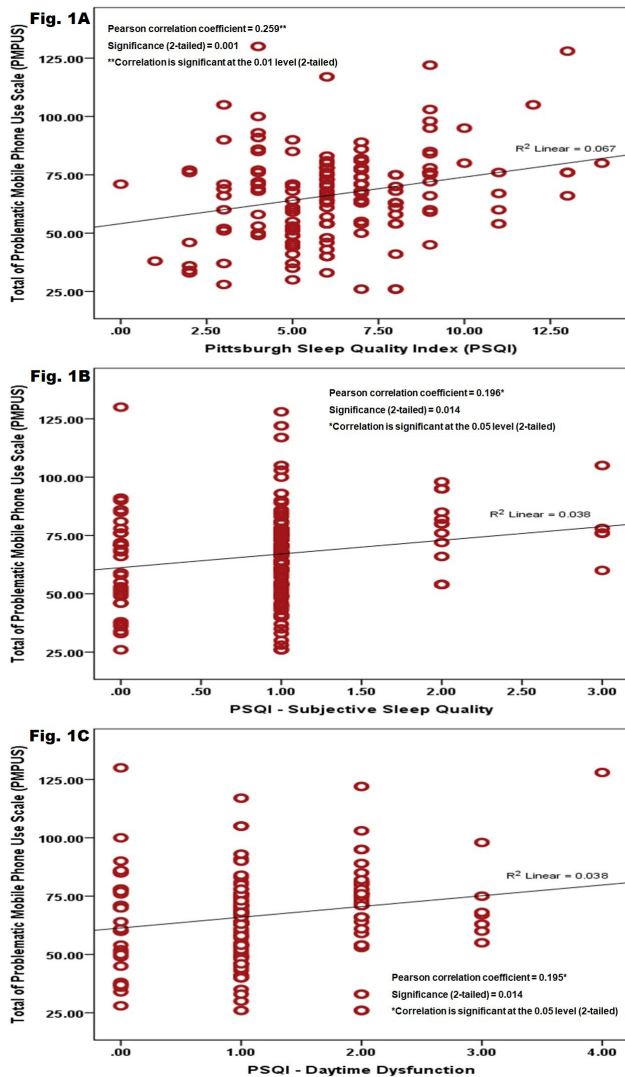


Figure 1: Correlation of problematic mobile phone usage scale (PMPUS) with Pittsburgh sleep quality index (PSQI) and its different components. Total PMPUS versus PSQI (A). Total PMPUS versus Subjective sleep quality (B). Total PMPUS versus Day time dysfunction (C).

Our study established a significant positive correlation for the deprivation sub dimension of PMPUS with PSQI ($p = 0.001$) and components of PSQI i.e., subjective sleep quality ($p = 0.033$) and daytime dysfunction ($p = 0.020$), as shown in figure 2.

There was a significant positive correlation for the adverse outcome sub dimension of PMPUS with PSQI ($p = 0.022$) and components of PSQI i.e., subjective sleep quality ($p = 0.045$) and daytime dysfunction ($p = 0.018$), as revealed in figure 3.

A significant positive correlation was established for the

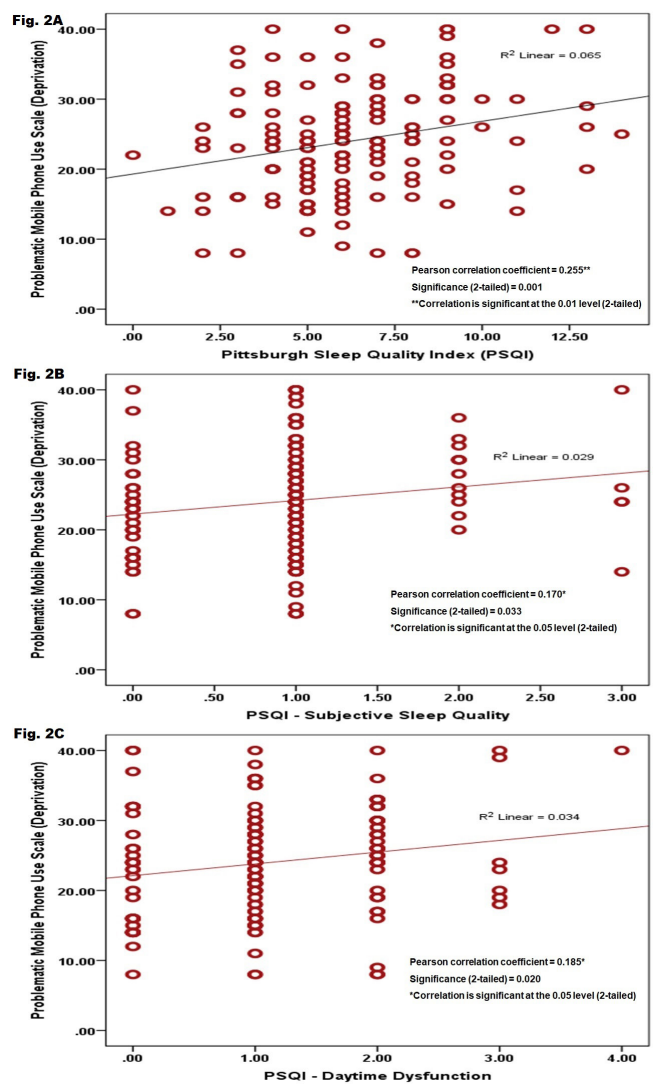


Figure 2: Correlation of Deprivation sub dimension of PMPUS with PSQI and its different components. Deprivation sub dimension of PMPUS versus PSQI (A). Deprivation sub dimension of PMPUS versus Subjective sleep quality (B). Deprivation sub dimension of PMPUS versus Day time dysfunction (C).

control problem sub dimension of PMPUS with PSQI ($p = 0.002$) and components of PSQI i.e., subjective sleep quality ($p = 0.027$) and sleep duration ($p = 0.009$), as shown in figure 4.

The sleep pattern analysis using the Morningness-Eveningness scale ($n=157$) revealed that 105 (66.9%) students reported sleep onset time of 10:45 pm – 12:45 am and wake up time range of 6:30 am – 8:30 am (intermediate). Twenty-one (13.4%) students reported waking up time range of 8:30 am – 11:30 am and 31 (19.7%) students reported sleep onset time of 9:30 pm – 10:45 pm (moderate and definite evening) and wake up time of 5:00 am – 6:30 am (moderate morning). Our study showed a significant negative correlation when PSQI was compared with moderate evening ($p = 0.008$) and moderate morning ($p = 0.036$). There was no significant correlation ($p > 0.05$) found between sleep pattern and problematic mobile phone use.

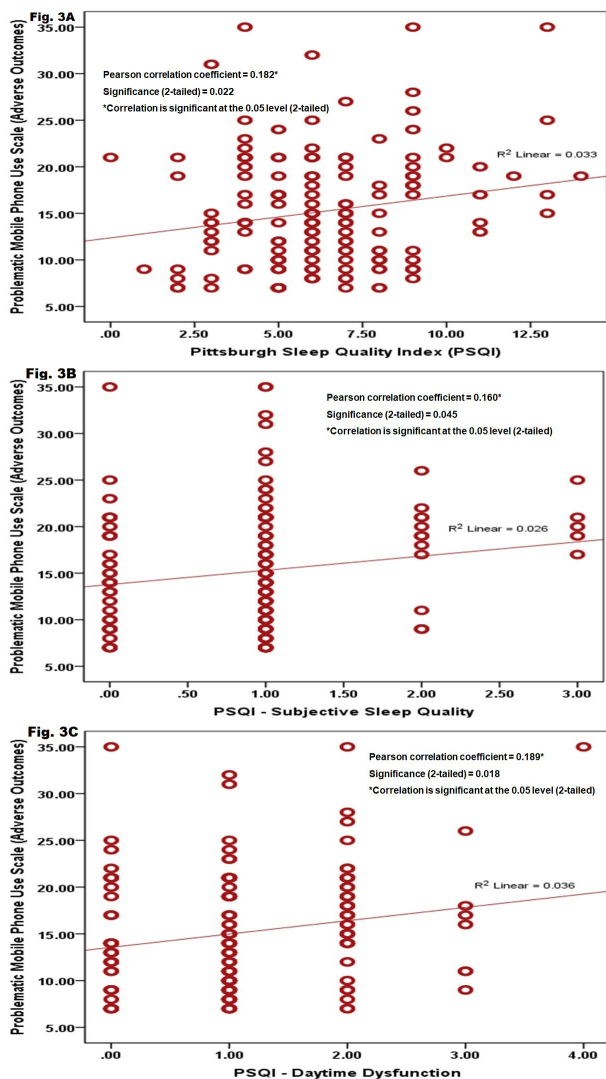


Figure 3: Correlation of Adverse outcome sub dimension of PMPUS with PSQI and its different components. Adverse outcome sub dimension of PMPUS versus PSQI (A). Adverse outcome sub dimension of PMPUS versus Subjective sleep quality (B). Adverse outcome sub dimension of PMPUS versus Day time dysfunction (C).

DISCUSSION

The global PSQI score of 6.26 obtained in our study indicates 'poor' quality of sleep among MBBS students. Owing to large academic load, rigorous work timings and lifestyle choices, medical students are particularly vulnerable to inferior sleep quality that then influences academics. This has been linked with increased cynicism and burnout, which are important public health issues that medical schools need to address (17). In an earlier study, we have reported short sleep duration (< 6 hours/day) among pre- and para-clinical Malaysian students of our institution (18).

In our study population, poor sleep quality and mobile phone usage showed a positive correlation. This finding is in congruence with an earlier study conducted among university students on the same issue (15). Blakey et

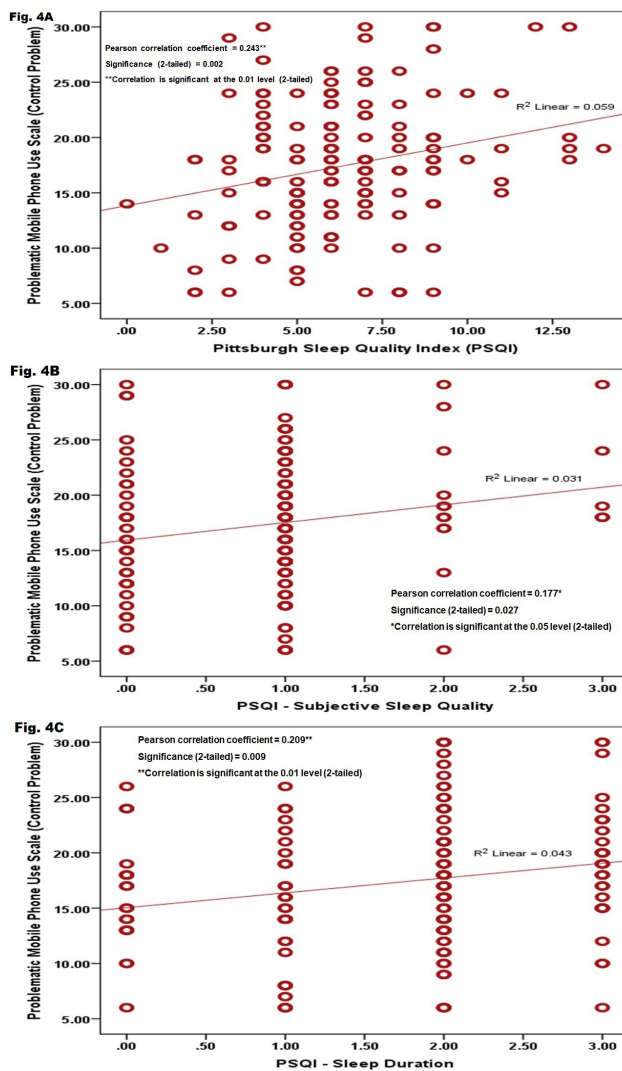


Figure 4: Correlation of Control problem sub dimension of PMPUS with PSQI and its different components. Control problem sub dimension of PMPUS versus PSQI (A). Control problem sub dimension of PMPUS versus Subjective sleep quality (B). Control problem sub dimension of PMPUS versus Sleep duration (C).

al. suggest that medical students are socially exclusive compared to economics students (19). In our setting too, medical students face rigorous academic workload and increased number of contact hours. The total PMPUS also correlated positively with subjective sleep quality and daytime dysfunction component of PSQI. This is a worrying trend as harmful use of mobile phone causing poor sleep quality, leading to daytime dysfunction can even lead to anxiety and depression (15). These traits would be undesirable in medical students and can hinder their academic and personal growth.

The positive correlation of adverse outcome sub dimension of PMPUS with total PSQI, subjective sleep quality and daytime dysfunction component of the PSQI suggests that problematic mobile phone usage increases daytime dysfunction of students, possibly either due to poor sleep quality of daytime sleepiness, and ultimately

results in poor sleep quality. Earlier studies in a cohort of medical students have associated poor sleep quality and daytime dysfunction with increased mobile phone usage in the evening (20).

The positive correlation of the deprivation sub dimension of PMPUS with total PSQI, and with two components of the PSQI namely subjective sleep quality and daytime dysfunction tells us that the emotional state of being incapable of using the mobile phone or its absence results in poor sleep quality and sub optimal daytime functioning. Since our institution's policy does not allow the use of mobile phones in classrooms, staying away from the phones for a large part of the day might contribute to the feeling of deprivation.

The positive correlation of control problem sub-dimension of PMPUS with total PSQI suggests that a lack of self-control overuse of mobile phones is adversely affecting sleep quality indicating anxiety and other psychological issues. In addition, its correlation with sleep duration component of PSQI points to reduction in sleep duration in students, which can lead to daytime dysfunction. A lack of enthusiasm, which is a result of daytime dysfunction, can interfere with optimal functioning of a medical student.

Poor sleep quality caused by unhealthy use of mobile phones, can lead to poor physical and psychological health outcomes (5). Mood disturbances and lowered cognitive performances are linked with the inferior sleep quality and these may be detrimental to a medical students' career (5).

The results of our study demonstrated that students in moderate evening and moderate morning category had a poor sleep quality index, whereas the students in the intermediate category of MEQ had a good sleep quality index. Our study results were comparable to a study, which reported that medical students who were in the evening or the moderate evening category showed poor sleep quality (21). A recent study from China Medical University concurs with our finding that intermediate-type students had good sleep quality and suggests shifting evening-type to early morning hours to improve sleep quality (22).

The Morningness-eveningness pattern of students coupled with class schedule affects both duration and quality of sleep. Easy adaptability of morning-types with early classes and the reverse with evening-types can affect their cognitive and psychomotor abilities. Student engagement in forms of didactic lectures, PBL, SDL and practical sessions in our institution begins at 8:00 am in the morning and with a lunch break from 12:20 pm to 2:00 pm, continue till a maximum of 5:00 pm. In that light, our finding that 13.7% students have wake up timings of 8:30 am to 11:30 am is concerning. Depressive symptoms in medical students have been

associated with "eveningness" in medical students and this aspect needs further evaluation (23).

Neurocognitive and psychomotor skills, two most important features of a physician are best expressed with a good quality sleep. Since sleep and mental health are related, it is important that sleep problems be diagnosed and addressed both from an individual and from the overall health care system's point of view (24). Al-Naggar et al. reported poor knowledge of sleep medicine in medical students and increased awareness on sleep health and sleep hygiene can address many of the negative effects that poor sleep quality risks (25).

Good internal consistency of the questionnaires in this study was one of its strength, which was able to establish a link between aspects of poor sleep quality and extensive use of mobile phone. A limitation of this study was the sampling method, which limits generalisability of the study findings. Meanwhile, high drop-out rate for the MEQ could have reduced the study power to detect a significant correlation between sleep pattern and problematic mobile phone use. Our study included only self-reported questionnaires which are bound by limitations of recall bias. Polysomnographic studies can be used in future studies to explore the link between these variables.

CONCLUSION

Our study revealed that the unhealthy use of mobile phone adversely affected sleep quality in the cohort of future medical doctors. The sleep quality, daytime dysfunction and sleep duration were all affected by factors like overall use of mobile phone, inability to control its use, feeling of deprivation in using it and day-to-day functioning getting affected by it. Psychological and physical health stands to be affected by poor sleep quality and thus awareness and practice of sleep hygiene is essential in budding future doctors for them to operate as competent professionals. It is thus important for medical schools to formulate policies and create educational programs vis-a-vis sleep health and to increase awareness regarding the harm and benefit of controlled mobile phone usage.

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