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Original article

Association between Sleep Quality and Perceived Stress Responses Among Medical University Students

Rudhuway Mtawil

Physiology Department, Faculty of Medicine, Tobruk University, Tobruk, Libya
Corresponding Email. *rudhway.mtawil@tu.edu.ly*

Abstract
Medical education is associated with a heavy academic workload, irregular schedules, and chronic psychological pressure, all of which place medical students at high risk of poor sleep quality and elevated stress. Understanding the relationship between these two variables is essential for designing effective student-well-being interventions. This study aimed to assess sleep quality using the Pittsburgh Sleep Quality Index (PSQI) and to examine its correlation with perceived stress level among undergraduate medical students. A cross-sectional study was conducted among 106 medical students at the Faculty of Medicine, Tobruk, Libya. Sleep quality was assessed using the seven components and global score of the PSQI, and stress was measured using a validated stress assessment scale. Descriptive statistics (mean ± standard deviation) were calculated for each PSQI component and for PSQI-based sleep-quality categories. Pearson correlation was used to examine the relationship between the total PSQI score and stress level. The mean global PSQI score indicated a generally poor sleep profile, with sleep latency (2.02 ± 0.98) and sleep disturbances (1.38 ± 0.65) being the most affected components. Only 28 students (26.4%) had good sleep quality (PSQI 0–5), while 47 (44.3%) had poor sleep quality (PSQI 6–10) and 31 (29.2%) had very poor sleep quality (PSQI ≥ 11). A strong, statistically significant positive correlation was found between PSQI score and stress level ($r = 0.807$, $r^2 = 0.651$, $p < .001$). Poor sleep quality is highly prevalent among the medical students studied and strongly associated with elevated stress levels.
Keywords. Sleep Quality, Pittsburgh Sleep Quality Index, Stress, Medical Students, Cross-sectional Study.

Introduction

Sleep is a fundamental physiological process necessary for cognitive functioning, emotional regulation, memory consolidation, and overall health [1]. Among university populations, medical students represent a particularly vulnerable group, as they are routinely exposed to demanding curricula, frequent examinations, long study hours, and, during clinical years, irregular shift patterns [2,3]. These pressures often translate into substantial psychological stress, which in turn has been repeatedly linked to disrupted sleep patterns [2].

The Pittsburgh Sleep Quality Index (PSQI), developed by Buysse and colleagues in 1989, remains the most widely used self-report instrument for assessing subjective sleep quality over a one-month period [1]. It evaluates seven components: subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction, which are summed into a global score ranging from 0 to 21, with higher scores indicating poorer sleep [1,4]. The instrument has demonstrated good reliability and validity across diverse clinical and non-clinical populations worldwide [3,5].

Numerous studies conducted among medical students across different countries have reported a consistently high prevalence of poor sleep quality, often exceeding 60–80% of surveyed samples [6-11]. For example, studies from Egypt have reported the prevalence of poor sleep quality ranging from 58.5% to over 70% among medical students [10,11], while studies from Saudi Arabia have reported similarly elevated rates, frequently linked to academic year, caffeine intake, and psychological distress [7,8,12]. Comparable findings have been reported in Vietnam, India, and the Philippines, where strong associations between stress indices and PSQI scores have consistently emerged [6,9,13].

Mechanistically, the relationship between stress and sleep is thought to be bidirectional and is partly explained by activation of the hypothalamic–pituitary–adrenal (HPA) axis. Psychological stress stimulates the release of corticotropin-releasing hormone and cortisol, which can delay sleep onset, fragment sleep architecture, and reduce slow-wave sleep, while poor or insufficient sleep can, in turn, further dysregulate HPA axis activity and amplify the perceived stress response [14-18]. This feedback loop may be especially relevant for medical students, who simultaneously face elevated academic stress and frequently report compromised sleep [8,19]. The present study, therefore, aimed to (1) describe the sleep quality profile of medical students at the Faculty of Human Medicine, University of Tobruk, using the seven PSQI components and (2) examine the correlation between PSQI score and perceived stress level in this population.

Methods

Study Design and Setting

This was a cross-sectional, questionnaire-based study conducted among undergraduate medical students with different academic levels at the Faculty of Human Medicine, University of Tobruk, Libya.

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Study Population and Sampling

A total of 106 medical students participated in the study. Participants were recruited from different academic years of the medical program. Inclusion criteria were being a currently enrolled medical student who provided informed consent to participate; students with diagnosed primary sleep disorders, severe chronic illness, or who declined consent were excluded.

Data Collection Tools

Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI), a 19-item self-administered questionnaire that yields seven component scores: subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction, each scored from 0 (no difficulty) to 3 (severe difficulty) [1,4]. The seven component scores were summed to generate a global PSQI score (range 0–21), with higher scores reflecting poorer sleep quality. Based on established cut-offs, participants were classified into good sleep quality (PSQI 0–5), poor sleep quality (PSQI 6–10), and very poor sleep quality (PSQI ≥ 11) [1,12]. Perceived stress was assessed using the 10-item Perceived Stress Scale (PSS-10), a validated stress assessment scale administered alongside the PSQI.

Statistical Analysis

Data were summarized as means ± standard deviations (SD) for each PSQI component and for each PSQI-based sleep-quality category. The Pearson correlation coefficient (r) was calculated to examine the association between total PSQI score and stress level, and the corresponding coefficient of determination (r^2) was reported. A two-tailed p-value < 0.05 was considered statistically significant.

Ethical Considerations

The study was conducted in accordance with the ethical principles of the Declaration of Helsinki. Participation was voluntary, and confidentiality of responses was maintained throughout data collection and analysis.

Results

A total of 106 medical students completed the questionnaire. (Table 1) presents the mean ± SD for each of the seven PSQI components. Sleep latency had the highest mean score (2.02 ± 0.98), followed by sleep disturbances (1.38 ± 0.65) and subjective sleep quality (1.26 ± 0.77). Use of sleep medication had the lowest mean score (0.21 ± 0.61), indicating that most participants did not rely on sleep medication.

Table 1. Mean ± SD for the Seven Components of the PSQI (N = 106)

PSQI Component	Mean ± SD
Subjective sleep quality	1.26 ± 0.77
Sleep latency	2.02 ± 0.98
Sleep duration	1.21 ± 1.11
Sleep efficiency	0.95 ± 0.94
Sleep disturbances	1.38 ± 0.65
Use of sleep medication	0.21 ± 0.61
Daytime dysfunction	1.21 ± 0.69

Based on global PSQI scores, participants were classified into three sleep-quality categories (Table 2). Only 28 students (26.4%) demonstrated good sleep quality (mean PSQI = 4.21 ± 1.03). The largest proportion, 47 students (44.3%), had poor sleep quality (mean PSQI = 8.02 ± 1.39), and 31 students (29.2%) had very poor sleep quality (mean PSQI = 12.45 ± 1.39). Overall, 73.6% of participants fell into the poor or very poor sleep-quality categories.

Table 2. Mean ± SD of PSQI Total Score by Sleep Quality Level

PSQI Level	Score Range	N	%	Mean ± SD
Good sleep quality	0–5	28	26.4%	4.21 ± 1.03
Poor sleep quality	6–10	47	44.3%	8.02 ± 1.39
Very poor sleep quality	≥11	31	29.2%	12.45 ± 1.39
Total	—	106	100%	—

(Table 3) presents the correlation between a total PSQI score and a stress level. A strong, positive, and statistically significant correlation was observed ($r = 0.807$, $r^2 = 0.651$, $p < .001$), indicating that approximately 65.1% of the variance in stress level could be statistically accounted for by sleep quality (or vice versa).

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Table 3. Correlation Between PSQI Score and Stress Level

Variable 1	Variable 2	N	Pearson r	r^2	p-value
PSQI total score	Stress level	106	0.807	0.651	< .001

Discussion

The findings of this study indicate that poor sleep quality is highly prevalent among medical students at the Faculty of Human Medicine, University of Tobruk, with nearly three-quarters of participants (73.6%) classified as having poor or very poor sleep quality. This prevalence is broadly consistent with previous reports from medical schools across the Middle East and North Africa, where poor sleep quality has been reported in 58.5–96.7% of medical student samples [10-12,20]. Such consistency across diverse settings suggests that the academic and lifestyle pressures inherent to medical education exert a uniform negative effect on sleep, independent of geographic or institutional context.

Among the seven PSQI components, sleep latency emerged as the most affected domain, followed by sleep disturbances and subjective sleep quality. This pattern mirrors findings from Saudi Arabian and Egyptian cohorts, where delayed sleep onset and frequent nighttime awakenings were similarly identified as the leading contributors to poor global PSQI scores [7,8,12]. The comparatively low score for use of sleep medication suggests that most students manage sleep difficulties without pharmacological intervention, which is a generally reassuring finding, although it does not rule out under-recognition or under-treatment of clinically significant sleep disturbance.

The strong positive correlation between PSQI score and stress level ($r = 0.807$, $p < .001$) observed in the present study is considerably stronger than correlations reported in several comparable studies, which have generally ranged from moderate ($r \approx 0.39–0.50$) to moderately strong ($\rho \approx 0.44–0.57$) [6,9,21]. This may reflect differences in the specific stress measurement tool used, sample characteristics, or the particular academic pressures faced by this cohort. Nonetheless, the direction and statistical significance of the association are consistent with the broader literature, which robustly supports a close relationship between psychological stress and impaired sleep quality among medical students [6,8,9,13,19].

A plausible biological explanation for this association lies in the bidirectional relationship between psychological stress and hypothalamic–pituitary–adrenal (HPA) axis activity. Stress-induced elevation of cortisol and corticotropin-releasing hormone can delay sleep onset, increase nighttime arousals, and reduce slow-wave sleep, while sleep loss itself can further dysregulate HPA axis function, creating a self-reinforcing cycle of poor sleep and heightened stress [14-18,22,23]. In the context of medical education, this cycle may be intensified by examination pressure, heavy clinical workloads, and reduced opportunities for restorative leisure time [8,19,20].

These findings carry practical implications for medical education and student support services. Given the strength of the observed association, interventions that address psychological stress—such as structured stress-management programs, peer support systems, and curriculum-load adjustments—may yield secondary benefits for sleep quality, and vice versa. Embedding sleep hygiene education within orientation and wellbeing programs, as recommended in several previous studies [10-12], may be a low-cost, high-yield strategy for improving both outcomes simultaneously.

Limitations

This study has several limitations. First, its cross-sectional design precludes any causal inference regarding the direction of the relationship between sleep quality and stress. Second, both PSQI and stress measures were self-reported, introducing potential recall and social-desirability bias.

Conclusion

This study demonstrates that poor sleep quality is highly prevalent among the surveyed medical students, with sleep latency and sleep disturbances being the most affected PSQI components. A strong, statistically significant positive correlation was found between PSQI score and stress level, supporting the well-documented link between psychological stress and impaired sleep-in medical student populations. Future studies using longitudinal designs and larger, multi-center samples are recommended to clarify the temporal and potentially causal relationship between stress and sleep quality among medical students.

***Conflict of interest*.** Nil

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