

Quality of Sleep and Its Association with Fatigue Among Allied Health Science Students: A Cross-Sectional Study

(Calidad del sueño y su relación con la fatiga entre estudiantes de ciencias de la salud afines: un estudio transversal.)

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Abstract (english)

Students pursuing allied health sciences are often exposed to intensive academic and clinical demands, predisposing them to poor sleep and subsequent fatigue. Understanding this relationship is vital for promoting well-being and academic efficiency. To assess the quality of sleep and its association with fatigue among Allied Health Science students and the correlation between individual components of the Pittsburgh Sleep Quality Index (PSQI) and Fatigue Assessment Scale (FAS) scores. A cross-sectional study was conducted among 250 undergraduate Allied Health Science students . Data were collected using standardized questionnaires—the PSQI and FAS. Statistical analyses included descriptive statistics, Chi-square tests, Mann–Whitney U test, and Spearman’s correlation. A p-value < 0.05 was considered statistically significant. Of the 250 participants, 64.8% had poor sleep quality (PSQI > 5), and 52.4% reported mild to moderate fatigue. Students with poor sleep had significantly higher fatigue scores (U = 6142, p = 0.037). A moderate negative correlation was observed between PSQI and fatigue scores (r = −0.270, p < 0.001). Among the PSQI components, sleep duration (r = −0.218, p = 0.001), subjective sleep quality (r = −0.147, p = 0.020), and use of sleep medication (r = −0.325, p < 0.001) showed significant associations with fatigue. Poor sleep quality was highly prevalent among Allied Health Science students and showed a significant association with fatigue. Both quantitative and qualitative aspects of sleep influence daytime energy and performance. Educational programs on sleep hygiene and stress management are recommended to enhance student well-being and academic productivity.

Keywords(english)

Sleep quality, Fatigue, Allied health students, Pittsburgh Sleep Quality Index, Fatigue Assessment Scale, Cross-sectional study.

Resumen(español)

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Los estudiantes que cursan estudios de ciencias de la salud afines suelen estar expuestos a intensas exigencias académicas y clínicas, lo que los predispone a un sueño deficiente y, por consiguiente, a la fatiga. Comprender esta relación es fundamental para promover el bienestar y la eficiencia académica. El objetivo fue evaluar la calidad del sueño y su relación con la fatiga entre los estudiantes de ciencias de la salud afines, así como la correlación entre los componentes individuales del Índice de Calidad del Sueño de Pittsburgh (PSQI) y las puntuaciones de la Escala de Evaluación de la Fatiga (FAS). Se realizó un estudio transversal con 250 estudiantes de pregrado de ciencias de la salud afines. Los datos se recopilaron mediante cuestionarios estandarizados: el PSQI y la FAS. Los análisis estadísticos incluyeron estadística descriptiva, pruebas de chi-cuadrado, la prueba U de Mann-Whitney y la correlación de Spearman. Se consideró estadísticamente significativo un valor de $p < 0,05$. De los 250 participantes, el 64,8 % presentó una mala calidad del sueño ($PSQI > 5$) y el 52,4 % reportó fatiga leve a moderada. Los estudiantes con sueño deficiente presentaron puntuaciones de fatiga significativamente más altas ($U = 6142$, $p = 0,037$). Se observó una correlación negativa moderada entre el PSQI y las puntuaciones de fatiga ($r = -0,270$, $p < 0,001$). Entre los componentes del PSQI, la duración del sueño ($r = -0,218$, $p = 0,001$), la calidad subjetiva del sueño ($r = -0,147$, $p = 0,020$) y el uso de medicamentos para dormir ($r = -0,325$, $p < 0,001$) mostraron asociaciones significativas con la fatiga. La mala calidad del sueño fue muy prevalente entre los estudiantes de Ciencias de la Salud y mostró una asociación significativa con la fatiga. Tanto los aspectos cuantitativos como cualitativos del sueño influyen en la energía y el rendimiento diurno. Se recomiendan programas educativos sobre higiene del sueño y manejo del estrés para mejorar el bienestar y la productividad académica de los estudiantes.

Palabras clave(español)

Calidad del sueño, fatiga, estudiantes de ciencias de la salud, Índice de calidad del sueño de Pittsburgh, Escala de evaluación de la fatiga, estudio transversal.

Introduction

Sleep is a vital physiological process required for physical restoration, emotional regulation and cognitive performance. It plays a key role in maintaining good health and overall well-being, particularly among young adults engaged in academic pursuits [1]. Poor sleep quality and inadequate sleep duration are known to cause impaired attention, reduced memory, emotional instability and decreased physical efficiency, ultimately affecting academic performance [2].

Students of health sciences are often subjected to prolonged study hours, heavy coursework, clinical postings and irregular schedules, which predispose them to disturbed sleep patterns and chronic fatigue [3]. These factors, compounded by stress, poor time management and excessive use of electronic devices, contribute to poor sleep hygiene and reduced recovery time [4].

Recent studies have reported that a large proportion of health science students experience poor sleep quality and associated daytime fatigue [1,3,4]. Variations in academic discipline, gender and lifestyle factors also influence sleep patterns and fatigue levels [5]. The interaction between sleep, mental health and academic performance has been well documented, indicating that poor sleep can adversely affect concentration, motivation and learning capacity [6].

Although several studies have explored the association between sleep quality and fatigue among medical and nursing students, limited literature is

available on allied health science students, who experience comparable academic and clinical demands. In addition, most existing studies have been conducted in Western or Middle-Eastern populations [7], where lifestyle, academic schedules and living environments differ significantly from those in Indian institutions. Considering the distinct academic load, hostel environment and social patterns of Indian allied health students, there is a need for region-specific evidence to understand how sleep quality influences fatigue in this group. Hence, the present study was undertaken to assess the quality of sleep and its association with fatigue among allied health science students in a tertiary care teaching institution.

Materials and Methods

Study Design and Setting. This study employed a cross-sectional questionnaire-based design conducted among undergraduate Allied Health Science students of Sree Balaji Medical College and Hospital (SBMCH), Chennai, a tertiary care teaching institution in South India.

Study Duration. The study was carried out over a period of two months following approval from the Institutional Ethics Committee (IEC No: 002/SBMCH/IHEC/2025/2370)

Study Objectives. The objectives of the study were:

To assess the quality of sleep among Allied Health Science students using the Pittsburgh Sleep Quality Index (PSQI).

To evaluate the level of fatigue using the Fatigue Assessment Scale (FAS).

To find the correlation between different components of the Pittsburgh Sleep Quality Index and the Fatigue Assessment Score.

Study Population. The study population comprised students enrolled in various Allied Health Science courses under SBMCH. Participation was voluntary and restricted to those who fulfilled the inclusion criteria.

Sample Size Calculation. The required sample size for this cross-sectional study was estimated using **Dobson's formula** for prevalence studies:

$$n = \frac{4pq}{d^2}$$

where p is the anticipated prevalence, $q=1-p$, and d is the allowable margin of error.

We adopted $p=0.339$ (33.9%) based on an Indian study among undergraduate medical students that reported 33.9% poor sleep quality (PSQI > 5) [8].

To balance precision with feasibility, we set $d=0.068$ (6.8%).

Substituting values:

$$n = \frac{4(0.339)(0.661)}{(0.068)^2} = \frac{0.896}{0.004624} = 193.84 \approx 194$$

Thus, the minimum required sample size was 194 participants. To improve precision and enable subgroup/correlation analyses, we included a final sample of 250 students.

Inclusion Criteria.

Healthy students aged 18–20 years.

Both male and female participants.

Willingness to provide written informed consent.

Exclusion Criteria.

Students with any chronic illness.

Students taking medication known to affect sleep or alertness.

Unwilling or absent participants during data collection.

Study Tools.

Two standardized and validated self-administered questionnaires were used:

1. Pittsburgh Sleep Quality Index (PSQI): This instrument assesses subjective sleep quality over the previous month across seven domains — subjective sleep quality,

latency, duration, efficiency, disturbances, use of sleep medication, and daytime dysfunction. A global PSQI score > 5 indicates poor sleep quality, whereas a score ≤ 5 denotes good sleep quality.

2. Fatigue Assessment Scale (FAS): This 10-item scale measures the severity of both physical and mental fatigue. Each item is rated on a 5-point Likert scale (1-5), with higher total scores reflecting greater fatigue. A total score ≥ 22 was considered indicative of significant fatigue.

Data Collection Procedure. Prior to commencement, approval was obtained from the Institutional Ethics Committee. Students were approached in their classrooms, briefed about the study objectives, and informed consent was obtained. The questionnaires were distributed in English and explained in simple language. Participants were assured of anonymity and confidentiality. Completed questionnaires were collected immediately to ensure completeness and minimize data loss.

Operational Definitions. Sleep Quality: A subjective measure of sleep adequacy assessed using the PSQI global score.

Fatigue: A subjective feeling of tiredness, lack of energy, or exhaustion measured using the FAS score.

Outcome Measures.

Primary Outcome: Sleep quality (PSQI total score).

Secondary Outcome: Fatigue level (FAS total score).

Both were treated as continuous variables for analysis and dichotomized as good/poor and fatigued/non-fatigued for association testing. Additionally, the correlation between individual PSQI components and FAS scores was analyzed.

Data Management and Statistical Analysis.

Data were entered into Microsoft Excel 2019 and analyzed using descriptive and inferential statistics.

Descriptive data were expressed as frequency, percentage, and mean ± SD.

The association between categorical variables (e.g., gender, sleep quality, fatigue status) was tested using the Chi-square test (χ^2).

Pearson's correlation was applied to determine the relationship between PSQI component scores and FAS scores.

Odds ratios (OR) and 95% confidence intervals (CI) were calculated where applicable.

Table. 1. Distribution of sleep quality and fatigue among study participants (n = 250).

Variable	Category	Frequency	Percentage
Sleep Quality	Poor sleep	162	64.8%
	Good sleep	88	35.2%
Fatigue Status	Mild-moderate fatigue	131	52.4%
	No fatigue	119	47.6%

A p-value < 0.05 was considered statistically significant.

Ethical Considerations. Ethical clearance was obtained from the Institutional Ethics Committee of SBMCH prior to data collection. Participation was voluntary, and written informed consent was obtained from all participants. Data confidentiality was maintained throughout the study.

Results

A total of 250 participants were included in the analysis. Based on global PSQI scoring, 64.8% of the respondents had poor sleep quality, while 35.2% reported good sleep quality. Fatigue assessment using the Fatigue Assessment Scale (FAS) showed that 52.4% of participants had mild to moderate fatigue, and 47.6% had no fatigue. The distribution of sleep quality and fatigue status is shown in Table 1.

Tests of normality were conducted before assessing associations. Shapiro-Wilk and Kolmogorov-Smirnov tests revealed that fatigue scores were not normally distributed in both poor and good sleep categories ($p < 0.001$), hence non-parametric tests were applied.

A Mann-Whitney U test was used to compare fatigue scores across sleep quality categories. Participants with poor sleep quality had a higher mean rank of fatigue score (131.59) than those with good sleep quality (114.30). This difference was statistically significant ($U = 6142$, $Z = -2.087$, $p = 0.037$), indicating that poorer sleep was associated with greater fatigue. The comparison of fatigue scores by sleep quality is presented in Table 2.

To examine the strength of association, a Spearman's rank correlation analysis was conducted between global PSQI score and fatigue score. The results demonstrated a statistically significant negative

correlation ($r = -0.270$, $p < 0.001$), suggesting that worsening sleep quality was associated with higher levels of fatigue. The correlation findings are summarized in Table 3.

Further analysis was carried out to correlate the individual components of the PSQI with fatigue. Among the seven components, sleep duration (C3) and use of sleep medication (C6) showed the strongest significant correlations ($r = -0.218$, $p = 0.001$ and $r = -0.325$, $p < 0.001$ respectively). Subjective sleep quality (C1) also showed a mild significant association ($r = -0.147$, $p = 0.020$). Other components such as sleep latency, sleep efficiency, sleep disturbances, and daytime dysfunction did not show statistically significant correlations. These component-wise correlations are presented in Table 4.

Discussion

In this cross-sectional study involving 250 Allied Health Science students, 64.8% of participants were found to have poor sleep quality (global PSQI > 5), while 52.4% experienced mild to moderate fatigue. Poor sleep quality was significantly associated with higher fatigue scores ($U = 6142$, $p = 0.037$), and a moderate negative correlation was observed between global PSQI and fatigue scores ($r = -0.270$, $p < 0.001$). Among individual PSQI components, sleep duration, subjective sleep quality, and use of sleep medication showed significant associations with fatigue.

The prevalence of poor sleep quality observed in this study is slightly higher than that reported in previous Indian studies, which range from 33% to 55% among medical and health science students [8–10]. The slightly higher prevalence observed in this study may be attributed to the rigorous academic and clinical workload of allied-health students, irregular sleep schedules, and lifestyle factors such as extended screen

Table. 2. Comparison of fatigue scores among poor and good sleep quality groups using Mann-Whitney U test.

Variable	Sleep Quality	n	Mean Rank	p-value
Fatigue score	Poor Sleep	162	131.59	0.037
	Good Sleep	88	114.30	

Table. 3. Correlation between global PSQI score and fatigue score.

Variables	Spearman's rho (r)	p-value
Global PSQI vs. Fatigue Score	-0.270	< 0.001

time and hostel living, all of which have been previously associated with disturbed sleep patterns [1,4].

The observed moderate negative correlation between PSQI and fatigue ($r = -0.270$, $p < 0.001$) supports prior findings indicating that poor sleep quality is closely linked to increased fatigue, impaired attention, and reduced academic performance [3,6]. Similarly, the Mann-Whitney U test demonstrated significantly higher fatigue scores among students with poor sleep quality ($p = 0.037$), aligning with prior research that identified a significant relationship between sleep disturbances and fatigue levels among health science students [1].

Analysis of PSQI components revealed that shorter sleep duration was strongly associated with higher fatigue levels. Previous studies have shown that reduced sleep time compromises restorative rest, leading to daytime sleepiness and diminished cognitive performance [11–13]. The significant link between use of sleep medication and fatigue indicates that students relying on pharmacologic aids may be experiencing underlying anxiety, stress, or irregular sleep-wake patterns that contribute to non-restorative sleep [14]. The mild but significant association between subjective sleep quality and fatigue ($r = -0.147$, $p = 0.020$) suggests that the perception of poor sleep itself can influence daytime energy and motivation, even when objective sleep duration is adequate [15]. Together, these observations emphasize that both quantitative (sleep length) and qualitative (perceived restfulness, medication use) dimensions of sleep contribute meaningfully to the experience of fatigue among health-science students.

Interpretation of Findings. The findings of the present study fulfill all three stated objectives. The assessment of sleep quality revealed a high prevalence of poor sleep (64.8%), and evaluation of fatigue showed that more than half of the participants experienced mild

to moderate fatigue. Furthermore, correlation analyses confirmed significant relationships between global PSQI scores, individual PSQI components, and fatigue levels, thereby establishing the link between different dimensions of sleep and fatigue among Allied Health Science students.

Overall, the results reaffirm that poor sleep quality is significantly associated with fatigue, underscoring the need for proactive sleep-health initiatives in academic institutions. Structured interventions focusing on sleep hygiene education, stress management, and balanced academic scheduling may improve students' sleep quality, reduce fatigue, and ultimately enhance their academic performance and well-being.

Strengths. The present study is strengthened by its adequate sample size ($n = 250$) and the use of standardized, validated instruments-the Pittsburgh Sleep Quality Index (PSQI) and the Fatigue Assessment Scale (FAS)-which ensured reliable and comparable measurements. The study also uniquely focuses on Allied Health Science students, a group often underrepresented in sleep and fatigue research, thereby contributing novel data to the existing literature. In addition, the correlation analysis between individual PSQI components and fatigue adds valuable insights into the multidimensional relationship between sleep patterns and daytime functioning.

Limitations. Despite these strengths, certain limitations should be acknowledged. The cross-sectional design precludes the establishment of causal relationships between sleep quality and fatigue. Data collection relied on self-reported questionnaires, which may be subject to recall or social desirability bias. Furthermore, several potential confounding variables such as caffeine or energy drink intake, electronic device use before bedtime, mental health status, and physical activity levels were not controlled for and could

Table. 4. Spearman's correlation of PSQI components with fatigue score.

PSQI Component	Spearman's rho	p-value	Significance
C1 – Subjective sleep quality	-0.147	0.020	Significant
C2 – Sleep latency	0.060	0.341	Not significant
C3 – Sleep duration	-0.218	0.001	Significant
C4 – Sleep efficiency	-0.072	0.259	Not significant
C5 – Sleep disturbances	0.089	0.160	Not significant
C6 – Sleep medication use	-0.325	<0.001	Significant
C7 – Daytime dysfunction	0.052	0.413	Not significant

have influenced the observed associations. Future studies using longitudinal designs and objective sleep assessments (e.g., actigraphy or polysomnography) are recommended to confirm these findings.

In summary, the study demonstrated a high prevalence of poor sleep quality (64.8%) and a significant association between inadequate sleep and fatigue among Allied Health Science students. Both global and component-level analyses of the PSQI revealed that reduced sleep duration, lower subjective sleep satisfaction, and sleep medication use were key contributors to fatigue. These results highlight the urgent need for sleep-hygiene awareness, stress-

management programs, and institutional policies aimed at optimizing students' sleep health and academic well-being.

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