ASSOCIATION BETWEEN SLEEP QUALITY AND ANXIETY AMONG HIGH SCHOOL STUDENTS: A CROSS-SECTIONAL STUDY

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ABSTRACT

Objective: To examine the association between sleep quality and anxiety levels among high school students.

Subjects and Methods: The cross-sectional descriptive study was conducted among students aged 15 to 17 years from Hoa Vang High School who met the eligibility criteria. Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI), while generalized anxiety levels were measured using the Generalized Anxiety Disorder-7 (GAD-7) scale.

Results: To determine the relationship between sleep quality and anxiety, a total of 737 high school students were surveyed (62.7% female; mean age 15.7 ± 0.87 years). The mean PSQI score was 5.9 ± 3.4, indicating relatively poor sleep quality, with female students reporting significantly poorer sleep than males ($p < 0.001$). Anxiety levels were also higher in females (mean GAD-7 score: 8.3 ± 4.6 vs. 5.8 ± 4.3 in males; $p < 0.001$). Additionally, 31.2% of students reported going to bed after midnight. Correlation analysis revealed a moderately strong, statistically significant positive association between sleep quality (PSQI) and anxiety ($r = 0.543$; $p < 0.001$), negative association between sleep duration per day and general anxiety ($r=0.276$, $p<0.001$). This two-way relationship appeared comparable between males and females.

Conclusion: The study identified a bidirectional association between sleep quality, sleep duration, and anxiety levels among high school students .

Keywords: Sleep quality, anxiety, high school students, Hoa Vang High School.

1. INTRODUCTION

Sleep is a vital behavioral process that plays an essential role in supporting cognitive functioning and maintaining mental health [1], particularly during adolescence a develomental stage characterized by marked physiological and psychological changes [2]. Numerous studies have shown that adequate sleep not only enhances cognition, memory, and academic performance but also has a direct impact on emotional well-being and psychological stability. It is recommended that adolescents obtain regular sleep of 8–10 hours per night to maintain optimal health [3]. However, sleep deprivation and poor sleep quality are becoming increasingly common among high school students, leading to negative outcomes such as anxiety disorders, heightened stress levels, and reduced academic performance [4].

Anxiety disorders are among the most prevalent mental health problems in youth, significantly affecting quality of life and the ability to adapt socially [5]. The relationship between sleep quality and anxiety is widely recognized as bidirectional: poor sleep may exacerbate anxiety, while elevated anxiety levels can disrupt sleep patterns, creating a complex and self-perpetuating cycle [3]. While global research has consistently reported strong associations between sleep disturbances and anxiety in adolescents, there remains a notable lack of empirical data on this issue within the Vietnamese context. Instead, high school students are often subjected to intense academic expectations and exam pressures, particularly in the context of university entrance exams.

This study focuses on evaluating the relationship among high school students, thereby providing a basis for

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proposing early intervention strategies to improve mental health and enhance quality of school life. In the context of increasing academic pressure, sleep and mental health play a crucial role in the holistic development of students.

Understanding the connection between these two factors not only helps identify potential risks but also contributes to the development of effective and practical school-based psychological support programs.

2. RESEARCH SUBJECT AND METHODS

2.1. Sttudy design: This study was designed as a cross-sectional descriptive study.

2.2. Research location and time:

The research was conducted at Hoa Vang High School (Da Nang, Vietnam) from April 2024 to October 2024.

2.3. Paricipants

- Inclusion Criteria: Students aged 15–17 years, regardless of gender, who voluntarily agreed to participate after being informed of the study objectives and met the following criteria:

+ Resided in Da Nang for at least 6 months;

+ Obtained consent to participate from a parent or legal guardian.

- Exclusion Criteria: Students were excluded if they met any of the following conditions:

+ Inability to hear or comprehend the questionnaire;

+ Presence of acute medical conditions requiring surgical intervention;

+ Presence of chronic illnesses that impair daily functioning (e.g., heart failure, renal failure, cirrhosis, tuberculosis);

+ Incomplete or intentionally falsified responses in the sleep quality or anxiety questionnaires.

2.4. Sample Size: The minimum required sample size was calculated using the formula for estimating a single proportion:

$$n = Z^2_{1-\alpha/2} \frac{1 - p}{p.\varepsilon^2}$$

(with α=0,05; ε=0,09; P=0,4) = 712

- Results: The study collected 737 eligible subjects to participate in the study.

- Sampling Method: Simple random sampling.

2.5. Variables and Indicators

The study evaluated sleep quality using the Pittsburgh Sleep Quality Index (PSQI), with a score of 5 or higher indicating poor sleep quality. In addition to PSQI scores, data on sleep habits and total sleep duration were also collected. Levels of generalized anxiety were assessed using the Generalized Anxiety Disorder-7 (GAD-7) scale.

2.6. Data Collection Procedure

After obtaining the full list of students from Hoa Vang High School, each student was assigned a code. Simple random sampling was used to select participants until the minimum sample size was met. Researchers then approached selected students, explained the study objectives, and obtained informed consent. Data were collected using a pre-designed questionnaire.

2.7. Data Processing and Analysis

Data were collected using KoboToolbox, exported to Excel format, and analyzed using R language version 4.1.0. The study used correlation analysis (Pearson correlation coefficient - r) to determine the relationship between sleep quality and anxiety.

2.8. Research Ethics

Participants were informed about the study objectives and content before participation. Only students who gave informed assent and had parental or guardian consent were included. The study protocol was reviewed and approved by the Scientific and Ethical Committee of Hoa Vang High School.

3. RESULTS

A total of 737 high school students participated in the study, of whom 62.7% were female and 37.3% were male. The mean age of participants was 15.7 years (SD = 0.87).

Table 1. Participant's Baseline Characteristics

Characteristic	Overall N = 737[1]	Male N = 275[1]	Female N = 462[1]	p-value[2]
Age (years)	15.7 (0.865)	15.7 (0.817)	15.6 (0.893)	0.627
Total hour sleep per day (hour)	6.40 (1.10)	6.48 (1.06)	6.35 (1.11)	0.106
PSQI	5.9 (3.4)	5.2 (3.5)	6.3 (3.2)	<0.001

Character-istic	Overall N = 737[1]	Male N = 275[1]	Female N = 462[1]	p-value[2]
Sleep quality				
Good	387.0 (52.5%)	173.0 (62.9%)	214.0 (46.3%)	<0.001
Poor	350.0 (47.5%)	102.0 (37.1%)	248.0 (53.7%)	
Bedtime habits				
Before 24h	507.0 (68.8%)	189.0 (68.7%)	318.0 (68.8%)	0.98
After 24h	230.0 (31.2%)	86.0 (31.3%)	144.0 (31.2%)	
GAD 7	7.4 (4.6)	5.8 (4.3)	8.3 (4.6)	<0.001
Anxiety classification				
Normal	270.0 (36.6%)	140.0 (50.9%)	130.0 (28.1%)	<0.001
Mild	272.0 (36.9%)	90.0 (32.7%)	182.0 (39.4%)	
Moderate	128.0 (17.4%)	32.0 (11.6%)	96.0 (20.8%)	
Severe	67.0 (9.1%)	13.0 (4.7%)	54.0 (11.7%)	

1: n (%) or Mean (SD); 2: Wilcoxon rank sum test; Pearson's Chi-squared test

The findings revealed that students had relatively poor sleep quality, with an average PSQI score of 5.9 (SD = 3.4). Female students had significantly higher PSQI scores compared to males (6.3 ± 3.2 vs. 5.2 ± 3.5; p < 0.001), indicating poorer sleep quality, although there was no significant difference in average sleep duration between the two groups (Table 1).

Similarly, levels of generalized anxiety were higher among female students. The mean GAD-7 score for females was 8.3 (SD = 4.6), compared to 5.8 (SD = 4.3) in males. Categorically, 39.4% of female students reported mild anxiety, 20.8% moderate, and 11.7% severe. In contrast, male students reported mild (32.7%), moderate (11.6%), and severe (4.7%) levels of anxiety. The difference in anxiety levels between genders was statistically significant (p < 0.001). In addition, a considerable proportion of students (31.2%) reported going to bed after midnight (Table 1).

The analysis revealed a moderately strong positive correlation between sleep quality and generalized anxiety levels among high school students, with a Pearson correlation coefficient of r = 0.543, which was statistically significant (p < 0.001). In addition, the study found a negative correlation between average sleep duration and anxiety, which was statistically significant (r = 0.276, p < 0.001) (Figure 1).

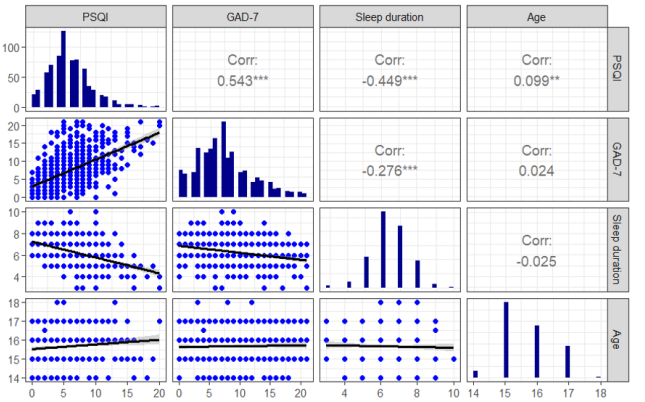

Figure 1. Correlation between Sleep Quality and Generalized Anxiety among High School Students (*: p<0.001)**

After controlling for gender, the bidirectional relationship between sleep quality and anxiety remained, with minimal change in the Pearson correlation coefficient (Figure 2).

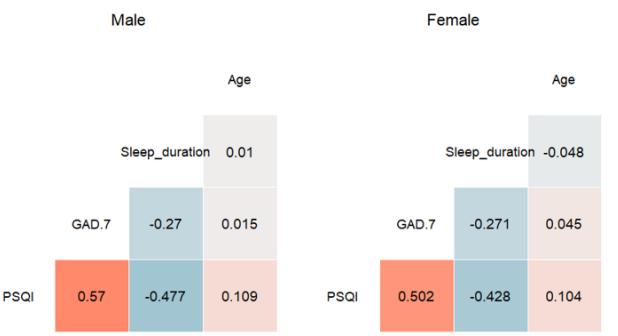

Figure 2. The gender-adjusted association between sleep quality and anxiety

4. DISCUSSION

There is growing evidence supporting a bidirectional relationship between anxiety disorders and sleep disturbances in adolescents. However, in Vietnam - a country with deeply rooted cultural traditions- sleep quality and mental health among high school students remain underrecognized and understudied. To better understand the link between sleep quality and anxiety, this study collected data from a cohort of high school students. In addition, the study explored whether these associations differed by gender or age group.

A key finding of this study is the identification of a bidirectional relationship between sleep quality and generalized anxiety among high school students. Specifically, sleep quality and anxiety levels (GAD-7) were positively correlated, with a moderately strong and statistically significant correlation (PSQI: r = 0.543, Sleep duration per day: r = -0.276). These findings are consistent with previous studies. For instance, a study conducted in China found a positive correlation between sleep quality and anxiety even after adjusting for physical activity (r = 0.538, p < 0.01) [6]. Similarly, research from the

Netherlands reported a linear association between sleep problems and anxiety symptoms ($\beta = 0.60$, $p < 0.001$) [7]. Other studies have also confirmed the existence of a bidirectional relationship between sleep quality and anxiety symptoms [8]. Sleep is a complex physiological process consisting of multiple stages that contribute to stress regulation, memory consolidation, and physical recovery [9]. Alarmingly, the prevalence of sleep disturbances among high school students has been reported to range from 26% to 75% [10], [11]. This relationship may be mediated by neurobiological mechanisms, such as dysregulation of cortisol levels [12]. Studies suggest that poor sleep quality in adolescents may impair myelination in the prefrontal white matter and disrupt connectivity within fronto-limbic circuits-regions critical for processing negative emotions-thereby increasing vulnerability to anxiety disorders [13]. Poor sleep health may both result from and contribute to deteriorating mental health, creating a pathological feedback loop that threatens physical and emotional development in adolescents. The present study reinforces the need to recognize and address this relationship, emphasizing the importance of sleep care in promoting both mental health and overall development.

Nevertheless, several limitations of this study should be noted. First, the limited sample size and single-site design restrict the generalizability of the findings. Second, the analysis did not account for potential confounding factors such as psychosocial stressors or medical history. Lastly, the reliance on self-reported data introduces potential bias, and the lack of objective biological measures (e.g., biomarkers or neuroimaging) limits the depth of inference. Future research should consider using multimodal assessment methods, including actigraphy, biological markers, or neuroimaging techniques, to better elucidate the causal mechanisms linking sleep quality and anxiety.

5. CONCLUSION

There is a moderately strong, positive correlation between sleep quality (PSQI) and generalized anxiety symptoms among high school students.

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AUTHOR CONTRIBUTIONS

Conceptualization, TDT Thinh; Methodology, TDT Thinh; Formal Analysis, Data Curation, TDT Thinh, LTT Hà, NN Ngoc; Writing Original Draft Preparation, all authors; Writing Review & Editing, Visualization, TDT Thinh, LTT Hà, NTM Phuong; Project Administration, TDT Thinh; All authors have read and agreed to the published version of the manuscript.

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REFERENCES

[1] Tarokh L, Saletin JM, Carskadon MA. (2016). Sleep in adolescence: Physiology, cognition and mental health. Neuroscience & Biobehavioral Reviews. 70, 182–8.

[2] Ernst M, Pine DS, Hardin M. (2006). Triadic model of the neurobiology of motivated behavior in adolescence. Psychological medicine. 36(3), 299–312.

[3] Paruthi S, Brooks LJ, D'Ambrosio C, Hall WA, Kotagal S, Lloyd RM, et al. (2016). Consensus statement of the American Academy of Sleep Medicine on the recommended amount of sleep for healthy children: methodology and discussion. Journal of clinical sleep medicine. 12(11), 1549–61.

[4] Chattu VK, Manzar MD, Kumary S, Burman D, Spence DW, Pandi-Perumal SR. (2018). The global problem of insufficient sleep and its serious public health implications. InHealthcare. MDPI, p. 1.

[5] Dickson SJ, Oar EL, Kangas M, Johnco CJ, Lavell CH, Seaton AH, et al. (2024). A systematic review and meta-analysis of impairment and quality of life in children and adolescents with anxiety disorders. Clinical Child and Family Psychology Review. 27(2), 342–56.

[6] Chen X, Yang Y, Zhong C, Zeng X, Qiu X, Zhou X, et al. (2025). The effect of physical activity on anxiety through sleep quality among Chinese high school students: evidence from cross-sectional study and longitudinal study. BMC psychiatry. 25(1), 495.

[7] Narmandakh A, Roest AM, de Jonge P, Oldehinkel AJ. (2020). The bidirectional association between sleep problems and anxiety symptoms in adolescents: a TRAILS report. Sleep Medicine. 67, 39–46.

[8] Geng F, Liu X, Liang Y, Shi X, Chen S, Fan F. (2018). Prospective associations between sleep problems and subtypes of anxiety symptoms among disaster-exposed adolescents. Sleep Medicine. 50, 7–13.

[9] Xie L, Kang H, Xu Q, Chen MJ, Liao Y, Thiyagarajan M, et al. (2013). Sleep drives metabolite clearance from the adult brain. science. 342(6156), 373–7.

[10] Tâm NM, Nhân NPT, Hằng NTT. (2017). Mối liên quan giữa mức độ sử dụng điện thoại thông minh và các rối loạn giấc ngủ, rối loạn tâm lý ở học sinh trung học phổ thông và sinh viên. Tạp chí Y Dược học-Trường Đại học Y Dược Huế. 7(4), 125–30.

[11] Liang M, Guo L, Huo J, Zhou G. (2021). Prevalence of sleep disturbances in Chinese adolescents: A systematic review and meta-analysis. Plos one. 16(3), e0247333.
[12] Riemann D, Krone LB, Wulff K, Nissen C. (2020). Sleep, insomnia, and depression. Neuropsychopharmacology. 45(1), 74–89.
[13] Jamieson D, Shan Z, Lagopoulos J, Hermens DF. (2021). The role of adolescent sleep quality in the development of anxiety disorders: A neurobiologically-informed model. Sleep Medicine Reviews. 59, 101450.