

STRESS LEVEL, SLEEP QUALITY, AND VITAL SIGNS AMONG FIRST-YEAR DENTAL STUDENTS

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ABSTRACT

Stress and sleep quality are very important factors in determining health. First-year dental students often experience stress and inadequate sleep due to changes in the campus environment and academic demands. Stress and sleep quality in students can affect academic performance and physical health. The body's vital signs are important indicators that show the body's basic functions and are used to identify health problems. The aim of this study was to determine the relationship between stress levels and sleep quality on the body's vital signs (blood pressure, heart frequency and respiration rate). This research was conducted using a cross sectional method. The sample for this research was first year dental students at Universitas Jenderal Soedirman with a sample size of 50. Data was collected using observation sheets and questionnaires (PSS and PSQI). Data analysis was carried out using Spearman correlation. The results showed that the majority of students had normal vital signs but experienced moderate levels of stress and poor sleep quality. Stress and sleep quality had no relation on blood pressure, pulse frequency or respiration rate ($p > 0.05$), but the majority of individuals who experienced pre-hypertension and tachycardia had moderate levels of stress and poor sleep quality. In addition, there is a significant relationship between stress levels and sleep quality ($p < 0.05$). The conclusion of this study is that stress levels and sleep quality are not related to the body vital signs of first year dental students. However, there is a relationship between stress levels and sleep quality.

Keywords: Stress Level, Sleep Quality, Blood Pressure, Heart Rate, Respiratory Rate

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INTRODUCTION

First-year dental students experience a complex academic transition phase compared with students in other study programs. During the transition from secondary education to higher education, dental students encounter a significant increase in cognitive workload, rigorous academic demands, and exposure to a complex clinical learning environment. The combination of academic pressure and early clinical experiences makes dental students a highly vulnerable population to stress. Various factors, including academic deadlines, performance expectations, and adaptation to a demanding curriculum, represent major contributors to stress among this population.

Several studies have demonstrated a high prevalence of stress among medical students in Indonesia. Kusumadewi et al. (2022) reported that 83.6% of first-year medical students experienced moderate stress levels, while Agusman et al. (2019) found that 70% of medical students experienced varying degrees of stress. Among dental students specifically, academic demands involving intensive theoretical learning, laboratory training, and preparation for clinical practice create an environment conducive to the development of chronic stress.

Demographically, first-year dental students are generally categorized as late adolescents to young adults, with an average age of approximately 20 years and a higher proportion of female students compared with male students. Jahan et al. (2022) reported that the mean age of preclinical dental students was 20.73 ± 1.24 years, with a distribution of 59% females and 41% males. These characteristics indicate that most students are still in the early stage of adulthood, during which they must adapt to changes in the academic environment and increasing professional demands.

First-year dental students are generally in the preclinical phase, which focuses on fundamental medical sciences, biomedical sciences, and introductory dental concepts before entering clinical training. During this phase, students encounter a substantial academic workload characterized by intensive theoretical learning, the need to master extensive learning materials, and adaptation to university-based learning methods. The large volume of curriculum content and fear of examination failure are among the primary sources of academic stress experienced by first-year students.

Prolonged academic stress may induce multisystem effects on students' health. In this study, physiological parameter changes, including blood pressure, pulse rate, and respiratory rate, were analyzed as primary indicators to describe the body's response to stress and sleep quality. These three parameters represent vital signs reflecting alterations in physiological homeostasis regulation and are known to be affected by stress responses and sleep disturbances. Physiologically, prolonged stress exposure can activate the hypothalamic–pituitary–adrenal (HPA) axis and the sympathetic nervous system, resulting in the release of stress hormones such as cortisol, epinephrine, and norepinephrine. These mechanisms may enhance cardiovascular and respiratory activity through increased heart rate, vascular constriction, and elevated respiratory frequency, which can subsequently be observed through changes in blood pressure, pulse rate, and respiratory rate. Poor sleep quality may further impair physiological regulation through disruption of stress hormone balance and increased sympathetic nervous system activity, potentially affecting these physiological parameters (Sen & Baruah, 2019; Yuliadi, 2021).

One of the health aspects most significantly affected by stress is sleep quality. The bidirectional relationship between stress and sleep disturbances has been well documented

in scientific literature. Stress can contribute to sleep disruption, whereas poor sleep may exacerbate stress levels and reduce stress tolerance (Muttaqin et al., 2021; Sulana et al., 2020; Rasmun, 2004). Several studies have indicated concerning prevalence rates of sleep disturbances among medical students. Hutagalung et al. (2021) reported that 72.3% of first-year students experienced poor sleep quality, with major contributing factors including unfavorable environments, academic stress, and lifestyle changes. Djamalilleil et al. (2021) identified additional factors, such as late-night gadget use and accumulated academic assignments, as contributors to sleep disturbances among early-stage medical students.

Sen and Baruah (2019) reported significant increases in blood pressure and heart rate among medical students experiencing examination-related stress. Similarly, Halawa et al. (2023) identified a significant association between stress levels and prehypertension among young adults. Chronic sleep disturbances have also been associated with cardiovascular system dysregulation, potentially increasing the long-term risk of hypertension and cardiovascular disorders. Although the relationship between stress, sleep quality, and physiological parameters has been explored in various populations, studies specifically investigating the interrelationship among these three variables in first-year dental students in Indonesia remain limited. This research gap is important considering the unique characteristics of dental education programs, which combine intensive theoretical academic requirements with preparation for practical clinical skills. A comprehensive understanding of how stress and sleep quality interact with physiological parameters in this population may provide a scientific foundation for developing targeted preventive interventions.

Early identification of physiological consequences associated with academic stress and sleep disturbances has significant practical implications for dental education institutions. Evidence-based intervention programs can be developed to assist students in implementing effective stress management strategies, improving sleep quality, and minimizing the risk of long-term health problems. Such efforts may contribute not only to improving student well-being but also to optimizing academic performance and professional preparation in dentistry.

Based on this background, this study aims to analyze the relationship between stress levels and sleep quality with vital signs (blood pressure, pulse rate, and respiratory rate) among first-year dental students. The findings of this study are expected to contribute to the scientific understanding of psychological and physiological interactions among dental students and provide evidence for the development of comprehensive and effective student health programs.

RESEARCH METHODS

This study was conducted from October to December 2023. An observational analytical study with a cross-sectional design was performed among first-year dental students at the Faculty of Medicine, Universitas Jenderal Soedirman. The study population consisted of all first-year dental students, and samples were selected using a total sampling technique, involving all 50 first-year dental students. The physiological parameters analyzed in this study included blood pressure, pulse rate, and respiratory rate. Blood pressure was measured based on systolic and diastolic values (mmHg), pulse rate was assessed based on heartbeats per minute (beats/minute), and respiratory rate was

determined by the number of breaths per minute. The obtained physiological parameters were compared with normal physiological ranges in healthy adults, including blood pressure <120/80 mmHg, pulse rate 60–100 beats/minute, and respiratory rate 12–20 breaths/minute. Stress levels were assessed using the Perceived Stress Scale (PSS), while sleep quality was evaluated using the Pittsburgh Sleep Quality Index (PSQI). The instruments used in this study included an aneroid sphygmomanometer, stethoscope, timer, the Perceived Stress Scale (PSS) questionnaire, and the Pittsburgh Sleep Quality Index (PSQI) questionnaire.

Pulse rate was measured using the palpation method on the radial artery. Respondents were instructed to sit in a comfortable position with their arms relaxed and freely positioned. The radial artery pulse was assessed by placing the index and middle fingers, or three fingers (index, middle, and ring fingers), over the radial artery and palpating until a strong pulsation was detected. If the pulse rhythm was regular and the pulse frequency appeared within the normal range, the pulse was counted for 30 seconds and multiplied by two to determine the beats per minute value. The results were classified into three categories: normal pulse rate, bradycardia, and tachycardia (Sulistiyowati, 2018).

Respiratory rate was measured without informing the respondents to minimize conscious modification of breathing patterns. The measurement was performed for one minute using a timer while observing the respondents' overall respiratory movements. During inspiration, observations included lateral rib movement, widening of the epigastric angle, the presence of chest wall retractions (supraclavicular, suprasternal, intercostal, and epigastric), the use of accessory respiratory muscles, and increased anteroposterior chest diameter. During expiration, observations included inward movement of the ribs, narrowing of the epigastric angle, and reduction of the anteroposterior chest diameter. The results were classified into two categories: normal respiratory rate and tachypnea (Sulistiyowati, 2018).

Blood pressure was measured using the auscultatory method with an aneroid sphygmomanometer and stethoscope. Respondents were instructed to sit with their feet flat on the floor and their arms relaxed. The respondent's arm was positioned on a table or flat surface, and the cuff was placed approximately 2–3 finger widths above the elbow, ensuring that the cuff was positioned at the same level as the heart. The stethoscope diaphragm was placed over the respondent's brachial artery. The cuff was inflated until the palpatory systolic pressure was reached and then increased by an additional 30 mmHg. The pressure was subsequently released slowly at approximately 2–3 mmHg/second while auscultating Korotkoff sounds. Korotkoff phase I was recorded as systolic blood pressure, while Korotkoff phase V was recorded as diastolic blood pressure (Sulistiyowati, 2018).

The obtained systolic and diastolic blood pressure values were subsequently classified into four categories: normal blood pressure, prehypertension, stage I hypertension, and stage II hypertension according to the Joint National Committee VII (JNC VII) classification (P2PTM Ministry of Health Republic of Indonesia, 2018). Stress levels were assessed using the Perceived Stress Scale (PSS) questionnaire with a scoring range of 0–4. A score of 0 indicated "never," a score of 1 indicated "almost never," a score of 2 indicated "sometimes," a score of 3 indicated "often," and a score of 4 indicated "very often." The total score obtained from the questionnaire was calculated and used to categorize stress levels into three groups: mild stress (score 0–13), moderate stress (score 14–26), and severe stress (score 27–40) (Muttaqin et al., 2021).

Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI) questionnaire. The PSQI questionnaire evaluates seven components of sleep quality, including subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction. The total PSQI score was subsequently categorized into two groups: good sleep quality (<6) and poor sleep quality (6–21) (Sukmawati & Putra, 2019).

Vital signs, sleep quality, and stress level data were analyzed using the Spearman correlation test with a 95% confidence level to identify associations between variables. This analysis was conducted to evaluate the association between stress levels and sleep quality with changes in physiological parameters without implying a causal relationship. The Spearman correlation test was selected because the data did not entirely meet the assumptions of normal distribution and because this analysis was intended to determine the strength and direction of relationships between variables. This study did not perform multivariate analysis to adjust for potential confounding factors, such as sex, body mass index (BMI), physical activity, or other lifestyle-related factors. Therefore, the interpretation of the findings was limited to the observed associations among the studied variables.

RESULT AND DISCUSSION

This study involved 50 first-year dental students at Universitas Jenderal Soedirman, with demographic characteristics presented in Table 1. The age distribution of respondents showed that the majority were 18 years old (60%), followed by respondents aged 17 and 19 years (18% each), and 20 years old (4%). The mean age of respondents was 18.1 ± 0.8 years, indicating a relatively homogeneous age distribution within the first-year student population. The predominance of respondents in the 18-year-old group reflects the common pattern of new university student recruitment, in which most students directly continue higher education after graduating from secondary school. This age homogeneity provides a methodological advantage by reducing variability in vital signs associated with age differences.

The sex distribution showed a significant predominance of female respondents (84%) compared with male respondents (16%). This finding is consistent with Makiyyah et al. (2019), who reported that over the past decade, the number of female students in medical faculties has generally exceeded the number of male students. However, the high proportion of female respondents (84%) represents an important limitation regarding the generalizability of the findings. Physiological differences between males and females, particularly regarding blood pressure and heart rate, may influence the interpretation of the results. Kusumadewi et al. (2020) reported that young females tend to have lower blood pressure compared with males due to hormonal differences and vascular characteristics. Nevertheless, this proportion remains representative of the general dental student population, which is commonly characterized by a higher proportion of female students.

Table 1. Demographic Characteristics of Respondents

Characteristics	Frequency (N)	Percentage (%)
Age (Year)		
17	9	18
18	30	60

	19	9	18
	20	2	4
Sex			
Male		8	16
Female		42	84

The results of vital sign measurements showed that the majority of respondents had physiological parameters within the normal range (Table 2). The findings indicated that 72% of respondents had normal blood pressure, 24% had prehypertension, and 4% had stage I hypertension. The mean systolic blood pressure was 106.8 ± 12.4 mmHg, while the mean diastolic blood pressure was 73.6 ± 8.9 mmHg. The distribution of pulse rate showed that 74% of respondents had a normal pulse rate (60–100 beats/minute), 14% experienced bradycardia (<60 beats/minute), and 12% experienced tachycardia (>100 beats/minute). The mean pulse rate was 79.4 ± 11.7 beats/minute. Regarding respiratory rate, 78% of respondents had a normal respiratory frequency (12–20 breaths/minute), while 22% experienced tachypnea (>20 breaths/minute), with a mean respiratory rate of 18.4 ± 3.2 breaths/minute.

Table 2. Distribution of Respondents' Vital Signs

Vital Signs	Frequency (N)	Percentage (%)
Blood Pressure (mmHg)		
Normal (SBP <120 and DBP <80)	36	72
Prehypertension (SBP 120–139 or DBP 80–89)	12	24
Stage I hypertension (SBP 140–159 or DBP 90–99)	2	4
Pulse Rate (beats/minute)		
Normal (60–100 beats/minute)	37	74
Bradycardia (<60 beats/minute)	7	14
Tachycardia (>100 beats/minute)	6	12
Respiratory Rate (breaths/minute)		
Normal (12–20 breaths/minute)	39	78
Tachypnea (>20 breaths/minute)	11	22

The findings of this study demonstrated that most respondents had normal vital signs (Table 2). The predominance of normal vital signs in this population is consistent with findings reported by Budhyanti (2018). One possible factor contributing to this finding is the age characteristics of the respondents. The relatively young adult age range of participants suggests that their cardiovascular and respiratory systems remain physiologically optimal. The influence of age on vital signs is closely associated with physiological and pathological changes that occur throughout the aging process. Chester and Rudolph (2012) stated that increasing age is accompanied by various physiological and pathological alterations that may reduce organ system capacity, particularly among older adults. These changes include molecular alterations, organ-level changes, systemic modifications, and compensatory responses to stressors. Such processes may subsequently affect vital signs, including pulse rate, blood pressure, respiratory rate, and body temperature (Churpek *et al.*, 2015; Chester & Rudolph, 2012).

The respondents in this study were predominantly within the young adult age range, which may explain why their vital signs remained within normal physiological limits. Fleming *et al.* (2011) reported that individuals within this age range generally have efficient cardiac function and effective pulmonary gas exchange capacity, contributing to stable vital signs within the normal range. Furthermore, the predominance of female respondents may have influenced the findings, particularly regarding the high proportion of individuals with normal blood pressure. Armilawaty *et al.* (2007) suggested that young females generally exhibit more favorable cardiovascular profiles compared with males, characterized by lower cholesterol levels, lower blood pressure, and reduced risk of coronary heart disease. These differences are partly influenced by estrogen, which possesses natural antioxidant and vascular protective effects.

However, an important finding that requires attention is the proportion of respondents with prehypertension (24%) and tachycardia (12%). Although these conditions remain within borderline categories, their prevalence is relatively high among young adults and may indicate the presence of underlying risk factors requiring further investigation. The proportion of respondents experiencing bradycardia (14%) may be associated with adequate physical activity levels among some participants. Bradycardia can represent a physiological adaptation in individuals with optimal cardiovascular fitness and is commonly observed among young athletes (Sidhu & Marine, 2021). Nevertheless, further evaluation is required to exclude potential underlying pathological conditions.

Stress levels in this study were assessed using the Perceived Stress Scale (PSS) questionnaire, and the results were categorized into three levels: mild, moderate, and severe stress. The findings demonstrated that the highest proportion of respondents was observed in the moderate stress category (66%), while the lowest proportion was found in the severe stress category (4%).

Table 3. Distribution of Stress Levels

Stress Level	Frequency (N)	Percentage (%)
Mild	15	30
Moderate	33	66
Severe	2	4

The high prevalence of moderate stress (66%) observed in this study is consistent with previous findings among medical student populations. Kusumadewi *et al.* (2022) reported a prevalence of moderate stress of 83.6% among first-year medical students, while Agusman *et al.* (2019) found that 60% of medical students experienced moderate stress. The consistency of these findings suggests that stress represents a common phenomenon experienced by first-year medical and dental students in Indonesia. The high prevalence of stress in this population may be associated with the unique characteristics of the academic transition experienced by first-year students. First-year dental students encounter substantial increases in academic workload, complexity of learning materials, and high performance expectations. Erindana *et al.* (2021) stated that increased academic demands and responsibilities are among the major factors contributing to stress among first-year university students.

In addition to academic factors, psychosocial aspects also contribute significantly to stress development. According to Agusman *et al.* (2019), first-year students are more

vulnerable to stress because many students must adapt to new environments, live away from their families, and establish new social networks. Wahyudi et al. (2015) reported that learning dynamics and adaptation to educational systems that differ from secondary school represent additional sources of stress among early-stage medical students. A notable finding in this study was the low prevalence of severe stress (4%), suggesting that although most students experienced stress, the majority remained within a manageable range. However, persistent moderate stress without appropriate management strategies may progress into severe stress and potentially affect mental health and academic performance (Oktariani et al., 2021).

Sleep quality data in this study were obtained using the Pittsburgh Sleep Quality Index (PSQI) questionnaire and categorized into two groups: good sleep quality and poor sleep quality (Table 3). The results demonstrated that the majority of respondents experienced poor sleep quality (72%), while the remaining respondents (28%) had good sleep quality.

Tabel 4. Distribution of Sleep Quality

Sleep Quality	Frequency (N)	Percentage (%)
Good	14	28
Poor	36	72

The prevalence of poor sleep quality reaching 72% in this study is consistent with the findings reported by Hutagalung *et al.* (2021), who found that 72.3% of first-year medical students experienced poor sleep quality. The consistency of these findings across various medical education institutions in Indonesia suggests that sleep disturbances represent a significant issue among dental and medical student populations. Several factors may contribute to poor sleep quality among first-year dental students. Djamililleil *et al.* (2021) identified factors such as late-night gadget use, unfavorable sleeping environments, and accumulated stress from examinations and academic assignments as major contributors to sleep disturbances. Environmental factors may be particularly relevant among students living in dormitories or rented accommodations, where control over optimal sleeping conditions is often limited.

Behavioral aspects also play an important role in determining sleep quality. Sastrawan and Griadhi (2017) reported that first-year university students are generally within the age range of 18–19 years. At this developmental stage, individuals often exhibit tendencies toward delayed sleep schedules and emotional instability, which may increase susceptibility to sleep disturbances. Irregular sleep patterns, excessive caffeine consumption to overcome daytime sleepiness, and academic performance-related anxiety may create a cycle that further deteriorates sleep quality. The consequences of poor sleep quality extend beyond physical health aspects and may also affect cognitive function, concentration ability, and learning capacity. Azzulfa *et al.* (2019) reported that poor sleep quality may contribute to physiological and psychological disturbances, including depression, anxiety, and impaired concentration, which may interfere with the learning process.

Stress Level and Respondents' Vital Signs

Spearman correlation analysis demonstrated that there were no statistically significant associations between stress levels and the three measured vital sign parameters

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(Table 4). The correlation between stress level and systolic blood pressure showed a correlation coefficient of $r = -0.078$ ($p = 0.592$), diastolic blood pressure showed $r = -0.045$ ($p = 0.754$), pulse rate showed $r = -0.056$ ($p = 0.699$), and respiratory rate showed $r = 0.222$ ($p = 0.122$). Although no statistically significant correlations were identified, descriptive analysis revealed several notable patterns. Among the 12 respondents with prehypertension, 58% (7 respondents) had moderate stress levels. Furthermore, among the six respondents with tachycardia, 83% (5 respondents) experienced moderate stress levels.

Table 5. Stress Level and Respondents' Vital Signs

Vital Signs	Stress Level			Correlation Coefficient (r)	P Value
	Mild	Moderate	Severe		
Blood Pressure (mmHg)					
Normal (SBP <120 and DBP <80)	9	26	1	-0,078	0,592
Prehypertension (SBP 120–139 or DBP 80–89)	4	7	1		
Stage I hypertension (SBP 140–159 or DBP 90–99)	2	0	0		
Pulse Rate (beats/minute)					
Normal (60–100 beats/minute)	11	24	2	-0,056	0,699
Bradycardia (<60 beats/minute)	3	4	0		
Tachycardia (>100 beats/minute)	1	5	0		
Respiratory Rate (breaths/minute)					
Normal (12–20 breaths/minute)	9	28	2	0,222	0,122
Takipnea (>20x/menit)	6	5	0		

The findings of this study demonstrated no significant correlation between stress levels and vital signs. This finding contrasts with several previous studies that reported positive associations between psychological stress and physiological responses. Sen and Baruah (2019) reported significant increases in blood pressure and heart rate among medical students experiencing examination-related stress, while Halawa et al. (2023) found a significant association between stress levels and prehypertension among young adults.

Several factors may explain the differences between these findings. The first potential factor is age. The respondents in this study were predominantly young adults, with a mean age of 18.1 ± 0.8 years, a period characterized by relatively optimal physiological compensatory capacity. The cardiovascular system in this age group generally maintains effective autoregulatory mechanisms, allowing the body to preserve homeostasis despite psychological stress exposure. Chester and Rudolph (2011) suggested that the physiological effects of stress on vital signs are more prominent among older individuals, in whom compensatory capacity may gradually decline.

The second possible factor is that first-year dental students may have developed adaptive mechanisms in response to academic stress. Relatively chronic exposure to stress may induce neuroendocrine adaptation through a process known as allostatic adaptation, in which the body adjusts physiological set points to accommodate persistent stressors (McEwen, 2005). This adaptation may reduce the observable physiological effects of stress during routine vital sign measurements. However, comprehensive evaluation of chronic

stress effects requires additional assessments, including neuroendocrine, immunological, and metabolic biomarkers (Juster et al., 2020). Another possible explanation is the presence of a threshold effect, in which the physiological impact of stress becomes more apparent after reaching a certain intensity or duration of exposure. In this study, the majority of respondents experienced moderate stress (66%), which may not have been sufficient to induce measurable alterations in vital signs.

Although no statistically significant correlation was identified, descriptive analysis revealed patterns that were consistent with the proposed hypothesis. Among respondents with prehypertension, 58% had moderate stress levels, while 83% of respondents with tachycardia also experienced moderate stress levels. These descriptive findings suggest that although the statistical association was not significant, the observed trend remains biologically plausible. Halawa et al. (2023) reported that prolonged stress exposure may contribute to increased cardiovascular risk, including hypertension and cardiovascular disease. Therefore, stress management strategies and healthy lifestyle practices are important among young adults to reduce potential cardiovascular risks in the future (Susanti, 2017).

Sleep Quality and Respondents' Vital Signs

Similar to stress levels, sleep quality did not demonstrate a statistically significant association with respondents' vital signs (Table V). The correlation between sleep quality (PSQI score) and systolic blood pressure was $r = -0.114$ ($p = 0.429$), diastolic blood pressure was $r = -0.089$ ($p = 0.538$), pulse rate was $r = 0.100$ ($p = 0.488$), and respiratory rate was $r = 0.048$ ($p = 0.953$). However, descriptive analysis revealed several notable patterns. All respondents with tachycardia (100%) had poor sleep quality, and among respondents with prehypertension, 67% had poor sleep quality, as presented in Table 6.

Table 6. Association Between Sleep Quality and Respondents' Vital Signs

Vital Signs	Sleep Quality		Correlation Coefficient (r)	P Value
	Good	Poor		
Blood Pressure (mmHg)				
Normal (SBP <120 and DBP <80)	9	27	-0,114	0,429
Prehypertension (SBP 120–139 or DBP 80–89)	4	8		
Stage I hypertension (SBP 140–159 or DBP 90–99)	1	1		
Pulse Rate (beats/minute)				
Normal (60–100 beats/minute)	11	26	0,100	0,488
Bradycardia (<60 beats/minute)	3	4		
Tachycardia (>100 beats/minute)	0	6		
Respiratory Rate (breaths/minute)				
Normal (12–20 breaths/minute)	11	28	0,488	0,953
Takipnea (>20x/minute)	3	8		

The findings of this study are consistent with Lontoh and Gunawan (2020), who reported that sleep quality was not significantly associated with blood pressure among medical students. Several factors may explain the absence of a significant association in

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the present study. First, the respondents were predominantly young adults with relatively optimal cardiovascular function. In this age group, lower peripheral vascular resistance and adequate cardiac output may contribute to maintaining blood pressure within the normal range despite the presence of sleep disturbances. Compared with older populations, young adults generally have better physiological adaptability, which may reduce the observable cardiovascular impact of poor sleep quality. Second, the measurement of vital signs at a single time point in this study may have been insufficient to capture the long-term physiological effects of sleep disturbances. Sleep quality and cardiovascular responses exhibit temporal variability, requiring long-term monitoring to identify persistent physiological changes. Chalmers *et al.* (2022) reported that the cardiovascular effects of sleep disturbances are more apparent through changes in heart rate variability, which generally require continuous monitoring methods for accurate assessment.

Descriptive analysis revealed an interesting pattern. All respondents with tachycardia (100%) experienced poor sleep quality, and 67% of respondents with prehypertension also had poor sleep quality. Although these findings were not statistically significant, the observed pattern is consistent with Sujana (2022), who reported no significant association between tachycardia and sleep quality among medical students at Universitas Pelita Harapan. However, individuals with tachycardia were predominantly found among those with poor sleep quality and active daily activities. These descriptive findings support the hypothesis that poor sleep quality may not significantly influence vital signs among healthy young adults, but individuals with abnormal physiological parameters may tend to exhibit poorer sleep profiles. These findings highlight the importance of longitudinal monitoring and the implementation of sleep hygiene programs as preventive strategies to maintain long-term health..

Stress Level and Sleep Quality

Correlation analysis between stress level and sleep quality demonstrated a statistically significant positive association ($r = 0.318$; $p = 0.024$). This finding indicates that higher stress levels were associated with poorer sleep quality among respondents. Based on Cohen's interpretation, the effect size of this correlation was classified as moderate.

Table 7. Association Between Stress Level and Sleep Quality

Stress Level	Sleep Quality		Correlation Coefficient (r)	P Value
	Good	Poor		
Mild	7	7	0,318	0,024*
Moderate	7	27		
Severe	0	2		

The findings of this study confirm the high prevalence of moderate stress (66%) and poor sleep quality (72%) among first-year dental students, which is consistent with previous studies. Kusumadewi *et al.* (2022) reported a prevalence of moderate stress of 83.6% among first-year medical students, while Hutagalung *et al.* (2021) found that 72.3% of medical students experienced poor sleep quality.

Poor sleep quality experienced by the majority of respondents reflects the potential negative impact of academic stress on students' sleep patterns. The correlation analysis between stress level and sleep quality demonstrated a statistically significant positive association ($r = 0.318$; $p = 0.024$). This finding indicates that higher stress levels were associated with poorer sleep quality. According to Cohen's interpretation, the effect size of this correlation was categorized as moderate. Similar findings were reported by Muttaqin *et al.* (2021), who found that most medical students at Universitas Mulawarman experienced poor sleep quality and moderate stress levels, with a significant association between sleep quality and stress level. Azzulfa *et al.* (2019) reported that insufficient sleep and poor sleep quality may contribute to physiological and psychological disturbances. Psychological consequences associated with poor sleep quality include depression, anxiety, and impaired concentration, which may interfere with the learning process. Furthermore, Muttaqin *et al.* (2021) suggested that poor sleep quality may disrupt neuroendocrine regulation of the stress response, potentially contributing to stress-related disorders such as depression and mood disturbances.

The relationship between sleep quality and stress may occur bidirectionally. Rasmun (2004) stated that sleep quality can influence an individual's psychological condition. Conversely, individuals experiencing stress, particularly moderate stress, may develop sleep disturbances, gastrointestinal symptoms such as dyspepsia, irregular bowel movements, muscle tension, menstrual cycle changes, and reduced concentration and memory capacity. The significant association between stress and sleep quality observed in this study has important practical implications for student health programs. These findings support the development of integrated interventions, in which stress management programs may simultaneously contribute to improved sleep quality and vice versa. A holistic approach combining stress management techniques, sleep hygiene programs, and cognitive behavioral strategies may be more effective than interventions targeting only a single aspect.

Study Limitations

This study has several important methodological limitations that should be acknowledged. The cross-sectional design limits the ability to determine causal relationships between variables. To better understand the temporal dynamics between stress, sleep quality, and vital signs, longitudinal studies are required to capture changes in physiological parameters over time, particularly during periods of increased academic stress, such as examination periods. Furthermore, the relatively small sample size ($n = 50$) may have limited the statistical power to detect significant associations between variables. Another potential limitation is the predominance of female respondents, which may restrict the generalizability of the findings to populations with different sex distributions. Future studies are recommended to implement longitudinal designs with larger sample sizes and more balanced sex distributions. The application of wearable technology for continuous monitoring of heart rate, sleep patterns, and physical activity may also provide more comprehensive and objective physiological data.

CONCLUSION

This study concludes that there were no statistically significant associations between sleep quality or stress levels and pulse rate, respiratory rate, or blood pressure.

among first-year dental students. However, individuals experiencing moderate stress levels and poor sleep quality demonstrated higher values of blood pressure and pulse rate based on descriptive findings. The significant association between stress levels and sleep quality reinforces previous evidence regarding the importance of stress management in improving overall quality of life. Further studies using longitudinal designs or larger sample sizes are recommended to explore potential causal relationships between psychological factors and physiological responses.

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