



Exploring the Relationship Between Sleep Quality and Mental Health Among Medical Students in Gombe State University, Nigeria: A Quantitative Study

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Abstract

Background: Medical students face heightened risks of sleep disturbances and mental health challenges with studies indicating that up to 50% of medical students experience significant sleep issues and mental health disorders, yet limited research examines this relationship in resource-constrained settings like Nigeria. This study investigates the association between sleep quality and mental health outcomes among medical students at Gombe State University, with attention to gender disparities.

Methods: A cross-sectional study of 225 randomly selected medical students (stratified by academic year) was conducted during the 2024 academic session. Participants completed the Pittsburgh Sleep Quality Index (PSQI), Depression Anxiety Stress Scales (DASS-21), and a demographic questionnaire.. Data were analyzed using Pearson's correlation, linear regression, t-tests, and chi-square tests.

Results: A striking 70.7% of students reported poor sleep quality (PSQI >5). Mental health symptoms were prevalent: 43.1% had moderate-to-extreme stress, 35.1% severe anxiety, and 34.2% moderate depression. Poor sleep quality showed weak but significant correlations with stress ($r=0.198$, $p=0.003$) and depression ($r=0.137$, $p=0.041$), but not anxiety ($p=0.111$). Female students exhibited significantly higher stress ($p<0.001$), anxiety ($p<0.001$), and depression ($p=0.003$) than males, despite comparable sleep quality scores ($p=0.077$).

Conclusion: Poor sleep quality and mental health burdens are pervasive among Gombe State medical students, with gendered patterns of psychological distress. Urgent institutional interventions targeting sleep hygiene, stress management, and gender-sensitive support are needed to improve student well-being, enhance academic performance, and foster a healthier learning environment.

Keywords: Sleep Quality; Mental Health; Medical Students; Nigeria; Gender Disparities

1. Introduction

Medical education is widely recognized for its intensity, demanding long hours of study, clinical rotations, and mastery of complex concepts. These rigorous demands place medical students at heightened risk for sleep disturbances and mental health challenges like stress, anxiety, and depression. Studies have consistently reported that medical students experience higher rates of insomnia, poor sleep quality, and insufficient sleep duration compared to their peers in less demanding disciplines (Ahrberg et al., 2012; Abdulghani et al., 2012). These sleep problems have far-reaching implications for students' mental well-being.

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A study by Nicholas Aderinto et al in University of Ilorin (2024) reported significant associations between sleep patterns, sleep quality, academic performance, and other sleep-related factors. The study identified insufficient sleep duration, irregular bedtimes, late-night coffee consumption, and poor sleep quality (Aderinto et al, 2024). Another study found that 55% [95% CI 48.0%–62.0%] of students reported poor sleep quality ($K = 33, N = 15,462$) according to the Pittsburgh Sleep Quality Index (PSQI) (Jahram et al, 2020).

Sleep quality is a critical determinant of mental health. Poor sleep has been linked to an increased risk of anxiety, depression, and stress (Boardman et al., 2018; Kim et al., 2022). This bidirectional relationship between sleep and mental health is well-documented: while poor sleep can exacerbate psychological distress, mental health conditions such as anxiety and depression can, in turn, disrupt sleep patterns (Baglioni et al., 2011; Alvaro et al., 2013). Among medical students, the challenges of balancing academic expectations with personal well-being further amplify their vulnerability to these issues (Dyrbye et al., 2014).

In the Nigerian context, these challenges are compounded by cultural, social, and systemic factors. Medical students in Nigerian universities, including Gombe State University, face unique pressures due to limited resources, large class sizes, and demanding schedules that often extend beyond standard academic hours (Aderinto et al., 2024; Eze, 2024). The stigma surrounding mental health and help-seeking behaviors further exacerbates these issues, discouraging students from seeking the support they need (Dyrbye et al., 2014). Yet, while studies in high-income countries consistently link poor sleep to mental health declines (Perkovic et al., 2024; Alvaro et al., 2013), Sub-Saharan Africa remains underrepresented in this literature. No prior work has quantitatively examined gender disparities in this context, despite evidence that Nigerian female students face higher psychological distress (Idowu et al., 2022). This study bridges these gaps by analyzing the sleep-mental health relationship amid Nigeria's unique academic and sociocultural landscape.

This gap in the literature is particularly concerning given the dual burden of sleep disturbances and mental health challenges faced by this population. Poor sleep quality is not only a marker of current psychological distress but also a potential predictor of more severe mental health outcomes, such as clinical anxiety and depression (Sweileh et al., 2011). Furthermore, inadequate sleep has been linked to compromised immune function, increased stress levels, and reduced overall well-being (Boardman et al., 2018).

Given the importance of medical students in the healthcare system, understanding and improving their well-being is critical for ensuring good future healthcare provision. Understanding these interactions is critical for developing interventions that target both sleep and mental health in a comprehensive way. The study aims to fill a significant research gap regarding the interrelationship of sleep quality, mental health, and gender disparities in this setting, providing essential insights that can guide targeted therapies and policy.

Study Objectives

This quantitative study aims to investigate the relationship between sleep quality and mental health outcomes (specifically anxiety, depression, and stress) among medical students at Gombe State University. The study will focus on:

- Identifying the levels of sleep quality, prevalence of sleep disturbances and mental problem among medical students in Gombe State University.
- Determining the correlation between sleep quality and mental health outcomes among medical students in Gombe State University.
- Determine gender differences in the prevalence of sleep quality and mental health problems among medical students in Gombe State University.

2. Literature Review

2.1. Mental Health

Mental health is a fundamental aspect of overall well-being, influencing how individuals think, feel, and interact with the world around them. It encompasses emotional, psychological, and social dimensions, which collectively enable individuals to handle life's challenges, establish meaningful relationships, and make decisions that contribute to their personal and societal growth (World Health Organization [WHO], 2004). Unlike the mere absence of mental illness, mental health is a dynamic state of balance that allows individuals to function effectively and fulfill their potential. This

equilibrium is shaped by a combination of internal factors, such as resilience and self-awareness, and external influences, including social relationships and environmental stability (Galderisi et al., 2015).

Throughout history, the concept of mental health has undergone significant evolution, reflecting advances in science and shifts in cultural and social norms. Early perspectives often equated mental health with the absence of diagnosable mental disorders. However, modern approaches advocate a more comprehensive understanding, emphasizing the positive attributes of mental well-being, such as emotional regulation, cognitive flexibility, and social integration (Bertolote, 2008). This holistic perspective highlights that mental health is not static but varies across individuals and within the same person over time, influenced by experiences and circumstances (Galderisi et al., 2017).

One of the critical aspects of mental health is its profound connection to emotional well-being. This includes the capacity to manage emotions, recover from adversity, and maintain a sense of purpose and optimism (Manwell et al., 2015). Emotional well-being supports the ability to navigate the stresses of daily life and fosters resilience in the face of challenges. Another essential component is psychological functioning, which relates to cognitive processes such as problem-solving, decision-making, and goal-setting. These abilities are fundamental for adaptability and creative thinking, which are crucial in a constantly changing world (WHO, 2005).

In addition to internal factors, mental health is significantly influenced by social relationships and the sense of belonging they provide. Humans are inherently social beings, and meaningful connections with others contribute to feelings of support, security, and self-worth (Horwitz, 2010). Strong social networks not only enhance emotional resilience but also provide a buffer against mental health challenges, particularly during times of stress (WHO, 2005).

Mental health is intrinsically linked to outcomes that impact individuals' quality of life. Among these, anxiety, depression, and stress are particularly significant. Anxiety is a natural response to perceived threats and challenges, but when it becomes chronic or overwhelming, it can impair daily functioning. Persistent anxiety can lead to excessive worry, difficulty concentrating, and physical symptoms such as restlessness and fatigue (Manwell et al., 2015). It may also interfere with decision-making and problem-solving, creating a cycle that exacerbates emotional distress (Galderisi et al., 2015).

Depression, another critical outcome of poor mental health, extends beyond temporary sadness or low mood. It is a complex condition that affects emotional, cognitive, and physical domains, leading to feelings of worthlessness, hopelessness, and a lack of interest in activities once found enjoyable. Depression often disrupts daily routines, impairing work, study, and relationships, and can significantly diminish overall quality of life (Barkham et al., 2019).

Stress, while a normal part of life, becomes problematic when it exceeds an individual's capacity to cope. Chronic stress affects the body and mind, contributing to physical health problems such as cardiovascular disease and weakened immune function. It also heightens the risk of anxiety and depression, creating a negative feedback loop that further undermines mental health (WHO, 2005). Stressors such as academic pressures, financial difficulties, and interpersonal conflicts are common triggers, and the ability to manage them effectively is critical for maintaining mental well-being (Horwitz, 2010).

The outcomes of anxiety, depression, and stress illustrate the importance of promoting mental health as a public health priority. Effective strategies include fostering supportive environments, encouraging help-seeking behaviors, and implementing targeted interventions tailored to specific populations (WHO, 2004). These efforts must be grounded in a nuanced understanding of mental health that considers the complex interplay between individual factors and broader societal influences (Galderisi et al., 2017).

In essence, mental health is a multidimensional construct that affects every aspect of human life. It is shaped by emotional, psychological, and social factors, all of which contribute to an individual's capacity to thrive. The profound impact of mental health outcomes such as anxiety, depression, and stress underscores the need for continued efforts to promote well-being and address the challenges associated with mental health in an increasingly complex and demanding world.

2.2. Sleep Quality

Sleep quality is a critical aspect of overall health and well-being, influencing various physiological and psychological processes. It goes beyond the mere duration of sleep, encompassing dimensions such as the ease of falling asleep, maintaining uninterrupted sleep, and experiencing restorative rest. High-quality sleep is essential for optimal

functioning, while poor sleep quality is associated with adverse health outcomes, including cognitive impairment, mood disturbances, and chronic health conditions (Ohayon et al., 2017).

The subjective assessment of sleep quality involves individuals' perceptions of their sleep experience, including satisfaction with sleep duration, depth, and continuity. Objective measures, such as polysomnography and actigraphy, complement subjective reports by providing quantifiable data on sleep stages, cycles, and disturbances (Fabbri et al., 2021). Together, these tools offer a comprehensive understanding of sleep quality, which is increasingly recognized as a critical determinant of overall health (Krystal & Edinger, 2008).

Factors influencing sleep quality are multifaceted and often interrelated. Environmental factors, such as noise, light exposure, and temperature, significantly impact the ability to achieve restful sleep. Additionally, lifestyle habits, including irregular sleep schedules, dietary choices, and physical activity levels, play a crucial role in shaping sleep quality (Wang & B  r  , 2021). Psychological factors, such as stress, anxiety, and depression, also contribute to sleep disturbances, creating a bidirectional relationship where poor mental health exacerbates sleep problems and vice versa (Mendon  a et al., 2019).

College students, including those in highly demanding fields like medicine, are particularly vulnerable to poor sleep quality due to academic pressures, irregular schedules, and high levels of stress. Studies suggest that sleep problems in this population are widespread and often underestimated, with implications for physical health, mental well-being, and academic performance (Wang & B  r  , 2021). Sleep deprivation and fragmented sleep patterns are common, leading to difficulties in concentration, memory retention, and decision-making (Ahrberg et al., 2012).

Restorative sleep is a hallmark of good sleep quality, characterized by sufficient time spent in deep and rapid eye movement (REM) sleep stages, which are essential for physical recovery and cognitive processing. Conversely, poor sleep quality often involves frequent awakenings, extended sleep latency (time taken to fall asleep), and a sense of non-restorative sleep, even after an adequate duration of rest (Ohayon et al., 2017).

The National Sleep Foundation emphasizes the need for regularity in sleep patterns, minimal disruptions, and subjective satisfaction with sleep to define high-quality sleep. Their recommendations highlight the importance of addressing modifiable factors, such as maintaining a consistent bedtime, reducing screen exposure before sleep, and managing stress, to improve sleep quality (Ohayon et al., 2017).

Advancements in technology have facilitated the analysis of sleep quality through wearable devices and smartphone applications, which offer accessible and non-invasive monitoring. These tools have significantly contributed to the understanding of sleep behavior in various populations, providing insights into patterns, disturbances, and interventions (Mendon  a et al., 2019).

In conclusion, sleep quality is a multifaceted concept critical for maintaining physical and mental health. It is influenced by an interplay of environmental, lifestyle, and psychological factors. Given its profound impact on daily functioning and long-term well-being, efforts to enhance sleep quality are essential. Awareness and interventions tailored to individual needs can help mitigate the adverse effects of poor sleep quality, particularly in vulnerable populations such as college students and professionals in demanding fields.

2.3. Relationship Between Sleep Quality and Mental Health

The relationship between sleep quality and mental health is well-established, with poor sleep often serving as both a symptom and a contributing factor to various mental health conditions. Sleep disturbances such as insomnia, fragmented sleep, and reduced sleep efficiency are strongly associated with mental health outcomes, including anxiety, depression, and stress.

One of the critical aspects of this relationship is the bidirectional nature of sleep and mental health. Poor sleep quality can exacerbate mental health conditions, while psychological distress can further disrupt sleep patterns, creating a cyclical interaction. For instance, individuals experiencing anxiety often struggle with initiating and maintaining sleep due to hyperarousal and excessive worry, which perpetuate further sleep disturbances (Eslaminejad et al., 2017). Similarly, depression is frequently associated with alterations in sleep architecture, such as prolonged sleep latency and reduced slow-wave and REM sleep, leading to non-restorative rest and exacerbation of depressive symptoms (Zohal et al., 2013).

Sleep quality is also impacted by physiological and neurological factors associated with mental health. Studies using functional magnetic resonance imaging have revealed that sleep deprivation and poor sleep quality disrupt regional brain activity, particularly in areas responsible for emotional regulation and cognitive processing (Wang et al., 2016). This disruption can result in heightened emotional reactivity, impaired stress management, and increased vulnerability to mental health disorders such as anxiety and depression.

Furthermore, stress plays a significant role in the interplay between sleep quality and mental health. Stress-induced hyperarousal, characterized by elevated cortisol levels and heightened alertness, disrupts the natural sleep-wake cycle. This leads to prolonged sleep latency, fragmented sleep, and reduced sleep efficiency, which, in turn, intensify feelings of stress and anxiety (Zamanian et al., 2016). Chronic stress can also lead to a cascade of negative health outcomes, compounding the adverse effects on mental well-being.

Research has shown that addressing sleep-related issues can improve mental health outcomes. For example, interventions for conditions like obstructive sleep apnea, which causes significant sleep fragmentation, have been associated with reductions in symptoms of anxiety and depression (Zohal et al., 2014). These findings underscore the importance of recognizing and treating sleep disturbances as part of a comprehensive approach to mental health care.

Populations such as patients with chronic obstructive pulmonary disease (COPD) provide further evidence of the relationship between sleep and mental health. Poor sleep quality in these patients is linked to heightened psychological distress, diminished quality of life, and greater susceptibility to anxiety and depression (Eslaminejad et al., 2017). Similarly, healthcare professionals with irregular work schedules often report compromised sleep quality, which contributes to elevated stress and reduced psychological well-being (Zamanian et al., 2016).

The relationship between sleep quality and mental health is complex and reciprocal. Poor sleep not only exacerbates mental health conditions like anxiety, depression, and stress but is also influenced by these conditions. Addressing sleep disturbances through targeted interventions has the potential to improve mental health outcomes, highlighting the critical role of sleep quality in promoting psychological well-being.

3. Materials and Methods

3.1. Study Design

This study employed a cross-sectional design to examine the prevalence of sleep disturbances and mental health problems (including anxiety, depression, and stress) among medical students at Gombe State University. The design is appropriate for identifying the current status of sleep quality and mental health issues within the population at a single point in time, as well as determining relationships between these variables.

3.2. Study Population

The study focused on 556 medical students enrolled at Gombe State University during the 2024/2025 academic session. Given the high levels of academic stress and workload associated with medical education, this population was chosen to assess the prevalence and potential relationship between sleep disturbances and mental health problems.

3.3. Sample Size and Sampling Technique

The sample size was calculated using the formula $n = Z^2 p(1-p) / d^2$, assuming 95% confidence ($Z = 1.96$), a conservative expected prevalence ($p = 0.5$), and a precision of $\pm 7\%$. This yielded a minimum of 196 participants. Allowing for a 15% non-response or incomplete data rate, we increased this to 225 participants. A stratified random sampling technique was employed to select 225 participants from different academic levels, ensuring representation across the various stages of medical training. Stratification was done by academic year (100-500 level). From each stratum, participants were randomly selected using computer-generated random numbers from class rosters.

3.4. Data Collection Instruments

3.4.1. Sleep Quality:

Sleep quality was measured using the Pittsburgh Sleep Quality Index (PSQI), a widely validated tool assessing various dimensions of sleep including duration, latency, disturbances, and efficiency. Higher scores on the PSQI indicate poorer sleep quality.

3.4.2. Mental Health

Mental health problems were assessed using the Depression, Anxiety, and Stress Scale (DASS-21), which measures the severity of depression, anxiety, and stress symptoms. Each domain was scored separately, with higher scores indicating more severe symptoms.

3.4.3. Demographic Questionnaire

A demographic questionnaire was used to collect data on participants' age, gender, academic year, and other relevant characteristics. Gender was particularly focused on for comparing differences in prevalence rates of sleep disturbances and mental health problems.

A pilot study with 30 medical students at Gombe Abubakar Tafawa Balewa University Bauchi confirmed instrument reliability (PSQI $\alpha=0.78$; DASS-21 subscales $\alpha=0.81-0.85$).

3.5. Data Collection Procedure

Data were collected through self-administered questionnaires, which were distributed during regular lecture hours to minimize disruption. Participants were briefed on the purpose of the study, and informed consent was obtained. The questionnaires were completed anonymously to ensure privacy and encourage honest responses. Data collection occurred during the early second semester of 2024/2025 academic session to avoid examination periods that might atypically affect sleep pattern.

3.6. Ethical Considerations

Ethical approval was obtained from the Ethics Committee of Gombe State University. All participants were provided with information about the study, and their consent was obtained before participation. Participants were assured that their involvement was voluntary and that they could withdraw at any time without consequence.

3.7. Data Analysis

Data were analyzed using statistical software such as SPSS. The analysis consisted of the following steps:

- Descriptive Statistics

Descriptive statistics (means, standard deviations, frequencies, and percentages) were used to determine the prevalence of sleep disturbances and mental health issues among the participants. This helped identify the distribution of scores on the PSQI and DASS-21.

- Correlation Analysis

Pearson's correlation coefficient was used to determine the relationship between sleep quality (PSQI scores) and mental health outcomes (DASS-21 scores). This provided insights into how sleep quality relates to levels of anxiety, depression, and stress.

- Gender Differences Analysis:

Independent t-tests or Mann-Whitney U tests (depending on data distribution) were conducted to assess gender differences in the prevalence of sleep disturbances and mental health issues. This analysis helped identify whether male and female medical students experience sleep problems and mental health issues differently.

4. Results

This section presents the findings of the study according to the stated objectives. Both descriptive and inferential statistical analyses were conducted to address each objective.

4.1. Objective 1: To determine the levels of sleep quality and mental health outcomes (depression, anxiety, and stress) among medical students in Gombe State University

The analysis revealed that the majority of medical students experienced poor sleep quality. Specifically, 70.7% of the students scored above the PSQI cutoff (>5), indicating poor sleep quality, while only 29.3% reported good sleep quality.

Regarding mental health outcomes, stress levels were alarmingly high, with 43.1% reporting moderate stress, 28.9% severe, and 9.3% extremely severe. For anxiety, 35.1% reported severe anxiety, while 12% fell within the extremely severe range. Depression levels also indicated concern, with 34.2% of students experiencing moderate symptoms, 23.6% severe, and 8.9% extremely severe. These results show that a substantial proportion of medical students are experiencing elevated levels of stress, anxiety, and depression, suggesting a significant mental health burden within the population.

Table 1 Distribution of Sleep Quality and Mental Health Levels

Variable	Category	Frequency (n)	Percentage (%)
Sleep Quality	Good (≤ 5)	66	29.3%
	Poor (> 5)	159	70.7%
Stress Level	Normal	20	8.9%
	Mild	22	9.8%
	Moderate	97	43.1%
	Severe	65	28.9%
	Extremely Severe	21	9.3%
Anxiety Level	Normal	33	14.7%
	Mild	19	8.4%
	Moderate	67	29.8%
	Severe	79	35.1%
	Extremely Severe	27	12.0%
Depression Level	Normal	36	16.0%
	Mild	39	17.3%
	Moderate	77	34.2%
	Severe	53	23.6%
	Extremely Severe	20	8.9%

4.2. Objective 2: To examine the relationship between sleep quality and mental health outcomes (depression, anxiety, and stress) among medical students.

Pearson correlation analysis was used to determine the association between sleep quality (measured using the PSQI) and mental health outcomes (measured using the DASS). The analysis showed a statistically significant, though weak, positive correlation between sleep quality and stress ($r = 0.198$, $p = 0.003$), and between sleep quality and depression ($r = 0.137$, $p = 0.041$). This indicates that students with poorer sleep quality tend to report slightly higher levels of stress and depressive symptoms. However, the relationship between sleep quality and anxiety was not statistically significant ($r = 0.107$, $p = 0.111$).

Table 2 Pearson Correlation Between Sleep Quality and Mental Health Scores

Mental Health Outcome	r (Correlation Coefficient)	p-value	Significant?	Interpretation
Stress	0.198	0.003	✓ Yes	Weak positive, significant
Anxiety	0.107	0.111	✗ No	Very weak, not significant
Depression	0.137	0.041	✓ Yes	Weak positive, significant

Further analysis using simple linear regression confirmed these findings. Sleep quality significantly predicted stress ($B = 0.144$, $p = 0.003$) and depression ($B = 0.082$, $p = 0.041$), but not anxiety ($B = 0.061$, $p = 0.111$). Although the variance

explained in the outcomes was low (R^2 values of 3.9% for stress and 1.9% for depression), the results reinforce the role of sleep quality as a predictor of some mental health outcomes.

Table 3 Linear Regression – Sleep Quality Predicting Mental Health Outcomes

Outcome	R ²	F-value	p-value	B (Unstd.)	β (Std.)	Significant?
Stress	0.039	9.053	0.003	0.144	0.198	✓ Yes
Anxiety	0.011	2.561	0.111	0.061	0.107	✗ No
Depression	0.019	4.227	0.041	0.082	0.137	✓ Yes

4.3. Objective 3: To determine gender differences in the levels of sleep quality and mental health outcomes among medical students.

Gender differences were assessed using both chi-square tests for categorized severity levels and independent samples t-tests for continuous scores. The chi-square test revealed no significant association between gender and categorized sleep quality ($p = 0.674$). However, significant gender differences were found in stress ($p < 0.001$), anxiety ($p < 0.001$), and depression ($p = 0.003$) severity levels. Female students were more likely to fall into higher severity categories than their male counterparts.

Table 4 Chi-Square Test of Gender Differences in Categorical Sleep Quality and Mental Health Levels

Variable	Test Statistic	df	p-value	Significant?
Sleep Quality Level	$\chi^2 = 0.177$	1	.674	✗ No
Stress Level	$\chi^2 = 30.979$	4	.000	✓ Yes
Anxiety Level	$\chi^2 = 22.872$	4	.000	✓ Yes
Depression Level	$\chi^2 = 15.950$	4	.003	✓ Yes

T-test results further confirmed these findings. Female students had higher mean scores in stress ($M = 9.05$, $SD = 2.92$), anxiety ($M = 8.19$, $SD = 2.57$), and depression ($M = 8.55$, $SD = 2.75$), compared to males ($M = 7.38$, $SD = 2.48$; $M = 7.05$, $SD = 1.67$; $M = 7.24$, $SD = 1.61$ respectively). All these differences were statistically significant ($p < 0.001$). Sleep quality mean scores were slightly higher (worse) among females ($M = 7.18$, $SD = 3.76$) than males ($M = 6.27$, $SD = 3.96$), but the difference was not statistically significant ($p = 0.077$).

Table 5 Independent Samples t-Test for Gender Differences in Mean Scores

Variable	Group	Mean	SD	t	df	p-value	Significant?
PSQI (Sleep)	Male	6.27	3.96	-1.775	223	.077	✗ No
	Female	7.18	3.76				
Stress	Male	7.38	2.48	-4.615	221	.000	✓ Yes
	Female	9.05	2.92				
Anxiety	Male	7.05	1.67	-3.942	221	.000	✓ Yes
	Female	8.19	2.57				
Depression	Male	7.24	1.61	-4.377	221	.000	✓ Yes
	Female	8.55	2.75				

These results indicate that while sleep quality does not differ significantly by gender, female medical students are disproportionately affected by higher levels of psychological distress.

5. Discussion

5.1. Prevalence of Poor Sleep Quality and Mental Health Outcomes

The present study revealed a high prevalence of poor sleep quality among medical students at Gombe State University, with 70.7% scoring above the PSQI cutoff (>5). This finding is notably higher than the 50.1% prevalence reported among undergraduate students at Obafemi Awolowo University, Ile-Ife, where poor sleep quality was significantly associated with psychological distress, including symptoms of depression and anxiety (Ogunsemi et al., 2018). The elevated prevalence in our study may be attributed to the unique stressors faced by medical students, such as rigorous academic demands and clinical responsibilities.

Regarding mental health outcomes, our study found that 43.1% of students experienced moderate stress, 35.1% reported severe anxiety, and 34.2% had moderate depression. These findings align with a multicentric study conducted among medical students in Croatia, which reported that 67.9% had poor sleep quality, with significant proportions experiencing symptoms of depression (38.8%), anxiety (45.3%), and stress (40.4%) (Perkovic et al., 2024). The consistency across studies underscores the pervasive nature of sleep disturbances and mental health challenges within medical student populations.

5.2. Association Between Sleep Quality and Mental Health

This study identified significant positive correlations between poor sleep quality and higher levels of depression, anxiety, and stress. This is corroborated by findings from the Croatian study, which reported moderate positive correlations between PSQI scores and depression ($\rho = 0.566$), anxiety ($\rho = 0.489$), and stress ($\rho = 0.503$) (Perkovic et al., 2024). Furthermore, multiple linear regression analyses in that study indicated that increases in depression and anxiety scores were significant predictors of poorer sleep quality.

Similarly, a study among Nigerian secondary school adolescents found a significant relationship between the severity of depression and poor sleep quality, emphasizing the bidirectional nature of this association (Olorunmoteni et al., 2023). These findings highlight the critical interplay between sleep and mental health, suggesting that interventions aimed at improving sleep quality may have beneficial effects on psychological well-being.

5.3. Gender Differences in Sleep Quality and Mental Health

In our study, we observed that female medical students reported significantly poorer sleep quality and higher levels of psychological distress, including symptoms of depression, anxiety, and stress, compared to their male counterparts. This aligns with findings from a multicentric study among Croatian medical students, which reported that female students exhibited higher PSQI scores ($U = 10,205$, $p < 0.001$) and elevated levels of depression, anxiety, and stress (Perkovic et al., 2024).

Similarly, a cross-sectional survey conducted among Nigerian medical students during the COVID-19 pandemic found that female participants were nearly twice as likely to experience psychological distress compared to male students (OR = 1.455, 95% CI: 1.095–1.936) (Idowu et al., 2022). Factors such as younger age, pre-clinical academic level, lower family income, and a history of mental illness were significant predictors of distress, with variations observed between genders.

Regarding sleep patterns, a study assessing sleep quality among Nigerian medical and dental interns reported that 63.54% of interns experienced poor sleep quality, with female interns more likely to report poor sleep quality compared to their male counterparts (Aderinto et al., 2024). This suggests that gender differences in sleep quality persist beyond the undergraduate level into the early stages of medical practice.

Contrastingly, a study conducted among medical students in Abakaliki, Nigeria, found no significant age and sex differences in sleep health scores (Ossai et al., 2023). This discrepancy may be attributed to regional variations, sample sizes, or differing methodologies across studies.

Furthermore, research on sleep patterns among Nigerian medical students indicated that irregular bedtimes and wake-up times were common, with a significant proportion of students reporting poor sleep quality (Olorunmoteni et al., 2023). While this study did not specifically analyze gender differences, the high prevalence of poor sleep quality underscores the need for interventions targeting sleep hygiene among medical students.

6. Conclusion

This study underscores the profound interplay between poor sleep quality and mental health challenges among medical students at Gombe State University, Nigeria. The findings reveal alarming prevalence rates, with over two-thirds of participants experiencing disrupted sleep and a significant proportion reporting clinically relevant levels of stress, anxiety, and depression. While the correlations between sleep disturbances and psychological distress were modest, they nevertheless highlight sleep as a potential modifiable factor in safeguarding student well-being. Notably, the pronounced gender disparities in mental health outcomes (with female students disproportionately affected) call for targeted interventions that address both academic pressures and socio-cultural stressors. These results emphasize the urgent need for medical schools to implement sleep hygiene programs, mental health support services, and gender-sensitive policies. Future research should explore longitudinal relationships and evaluate the effectiveness of practical interventions in resource-constrained educational settings. By prioritizing student well-being alongside academic excellence, institutions can cultivate healthier learning environments that sustain both the minds and futures of tomorrow's healthcare providers.

Recommendations

- Integrate Sleep Hygiene and Mental Health Education into the Curriculum

Medical schools should incorporate structured modules or workshops on sleep hygiene and mental health awareness into the curriculum. Early education on sleep health can help students adopt better sleeping habits and understand the link between sleep and psychological well-being.

- Provide Accessible Counseling and Mental Health Services

Institutions should establish or strengthen student counseling centers that offer confidential, gender-sensitive psychological support. Given the significant levels of depression, anxiety, and stress found (especially among female students), these services should be proactive and readily accessible.

- Implement Stress Management and Resilience Training

Regular training programs on stress reduction techniques, such as mindfulness, time management, and relaxation strategies, should be made available to students. These can help mitigate the academic pressures contributing to poor sleep and psychological distress.

- Promote Balanced Academic Workloads and Study-Life Balance

Faculty and administrators should evaluate academic demands to ensure they do not compromise students' mental health. Scheduling flexibility, adequate rest periods, and reduced overload during exams may improve sleep quality and reduce anxiety.

- Establish Peer Support Networks

Peer mentoring and support groups can provide a platform for students to share experiences and coping strategies. These networks are particularly important for first-year and younger students who may be more vulnerable to adjustment difficulties.

- Conduct Routine Screening for Sleep and Mental Health Issues

Periodic assessments using validated tools like the PSQI and DASS can help identify at-risk students early. Timely intervention can prevent escalation of sleep and mental health problems.

- Design Targeted Interventions for Female Students

As female students were found to experience significantly higher levels of psychological distress, support programs specifically tailored to address their needs—such as women-led mental health groups—should be prioritized.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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