Research Proposal

ANXIETY SYMPTOMS AND THEIR ASSOCIATION WITH SLEEP QUALITY AND ACADEMIC PERFORMANCE AMONG MEDICAL STUDENTS IN SUDAN

A Cross-Sectional Survey Study

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1. Introduction

1.1 Background and Rationale

University students represent a population at heightened risk for mental health difficulties, particularly anxiety disorders, owing to the convergence of academic pressures, social transitions, and reduced access to familial support (Auerbach et al., 2018). The World Health Organization estimates that approximately one in five young people globally will experience a mental health condition during their university years, with anxiety disorders constituting the most prevalent diagnostic category (WHO, 2022). Concurrently, sleep disturbances are reported by 27–60% of university students across diverse international contexts (Lund et al., 2010; Mirghani et al., 2015).

In Sudan, medical students face uniquely demanding academic environments characterised by intensive study loads, clinical placements, and high-stakes examinations. These structural demands are compounded by socioeconomic pressures and infrastructure limitations that collectively amplify psychological vulnerability (Ibrahim and Abdalla, 2021). Abdulghani et al. (2012) demonstrated in a landmark study of 2,304 Saudi medical students that sleep disorders were prevalent in 57.6% of the sample and were significantly associated with poor academic performance — establishing a foundational evidence base that the present study seeks to extend to the Sudanese context. Despite the growing literature, robust empirical data on the co-occurrence of anxiety, sleep disturbances, and academic performance specifically among Sudanese multi-institutional student samples remain scarce.

Anxiety and sleep disturbance are bidirectionally related. Anxiety activates the hypothalamic–pituitary–adrenal axis, elevating cortisol and producing physiological hyperarousal that impedes sleep onset (Harvey, 2002). Conversely, sleep deprivation amplifies amygdala reactivity to negative emotional stimuli, thereby exacerbating anxiety symptoms (Yoo et al., 2007). Within academic settings, both conditions independently and synergistically impair cognitive functions central to learning: working memory, sustained attention, problem-solving, and information retention (Pilcher and Huffcutt, 1996; Eysenck et al., 2007).

1.2 Study Objectives

This study aimed to:

- Describe sleep duration patterns and the prevalence of anxiety-related sleep disruption.
- Determine the prevalence of anxiety symptoms using adapted GAD-7 items.
- Explore the perceived association between sleep quality and academic performance.
- Conduct comprehensive statistical analysis including correlation, group comparison, and regression analyses.
- Provide evidence-based recommendations for institutional student support services.

1.3 Research Questions

- What is the distribution of sleep duration and anxiety-related sleep disruption in the sample?
- What is the prevalence of individual anxiety symptoms consistent with GAD?
- To what extent do students perceive poor sleep as negatively affecting their academic performance?
- After controlling for gender and academic year, does sleep disruption independently predict academic performance?

2. Literature Review

2.1 Sleep Quality Among University Students

Sleep is a fundamental neurobiological requirement underpinning memory consolidation, emotional regulation, immune function, and metabolic homeostasis (Walker, 2017). The National Sleep Foundation recommends 7–9 hours of nocturnal sleep for adults aged 18–25 (Hirshkowitz et al., 2015). However, extensive research documents that university students consistently fail to meet this guideline. Lund et al. (2010), in a large-scale study of 1,845 US students, found that over 70% were classified as poor sleepers according to the Pittsburgh Sleep Quality Index (PSQI).

In a landmark multi-institutional study, Abdulghani et al. (2012) surveyed 2,304 medical students at King Saud University and reported that 57.6% suffered from sleep disorders, with poor sleepers demonstrating significantly lower academic grades. Crucially, their logistic regression analysis identified sleep disorder as an independent predictor of academic performance after controlling for demographic variables — a methodological standard this study seeks to replicate in the Sudanese context. Okano et al. (2019) similarly demonstrated through objective actigraphy measurement that sleep regularity was the strongest sleep-related predictor of grade point average, independent of total sleep duration.

In the Sudanese context, Mirghani et al. (2015) conducted a case-control study among 165 medical students at two Sudanese universities using the PSQI and found a significant difference in sleep quality between excellent and average academic performers ($p<0.001$), with poor sleep quality, later bedtimes, and longer sleep latency all associated with lower academic achievement.

2.2 Anxiety Among University Students

Anxiety disorders represent the most prevalent class of mental health conditions in young adults globally (Auerbach et al., 2018). The GAD-7, developed and validated by Spitzer et al. (2006), is the gold-standard screening instrument for generalised anxiety disorder (GAD), with sensitivity of 89% and specificity of 82% at a threshold score of 10. Studies in university student populations have reported moderate-to-severe anxiety in 15–30% of samples across North America, Europe, and parts of Asia (Eisenberg et al., 2007; Storrie et al., 2010).

In Sudan, Ibrahim et al. (2024) conducted a cross-sectional study among 340 medical students using the GAD-2 and reported a 3.8% confirmed GAD prevalence with 29.1% of students screening as probable cases — figures suggesting that the majority of anxious students in Sudanese settings may go undiagnosed. This is consistent with global evidence that mental health literacy deficits and stigma around help-seeking significantly impede recognition of anxiety symptoms in student populations (Gulliver et al., 2010). Eysenck et al.'s (2007) Attentional Control Theory provides the cognitive mechanism: anxiety disrupts the central executive component of working memory, impairing the ability to inhibit irrelevant stimuli and shift attention between academic tasks.

2.3 Sleep, Anxiety, and Academic Performance — An Integrated Model

Harvey (2002) proposed a cognitive model of insomnia wherein intrusive pre-sleep worry and rumination constitute the primary mechanisms of sleep onset and maintenance difficulty — a process functionally overlapping with GAD phenomenology. Yoo et al. (2007) demonstrated via fMRI that sleep deprivation produced a 60% increase in amygdala reactivity to negative stimuli with concomitant prefrontal disconnection, suggesting shared neurobiological pathways between sleep loss and anxiety. Curcio et al. (2006) reviewed 56 studies concluding that sleep deprivation impairs the specific cognitive domains most critical to academic success: attention, memory encoding, and problem-solving. Zafar et al. (2020), in a study of 199 Sudanese medical students using logistic regression, found that sleep duration and use of sleep medication were significant independent predictors of poor academic performance, providing the closest methodological precedent for the regression analysis conducted in the present study.

3. Justification

Although anxiety and sleep disturbance have each been studied extensively among medical students internationally, and to a more limited extent within Sudan, existing Sudanese evidence remains fragmented across single-institution studies conducted several years ago (Mirghani et al., 2015; Zafar et al., 2020; Ibrahim et al., 2024), none of which jointly examined anxiety symptoms, sleep quality, and self-perceived academic performance within a single multi-institutional sample. No published study to date has surveyed medical and health-sciences students across several institutions in Northern State, Sudan, using a combined and comparable instrument for all three constructs.

This gap is significant for several reasons. First, medical education in Sudan is undergoing continued strain from resource constraints, economic instability, and disrupted academic calendars, all of which plausibly intensify the psychological and sleep-related burden on students beyond what earlier studies captured. Second, generalising findings from a single institution risks obscuring variation in student experience across differing curricula, class sizes, and clinical exposure; a multi-institutional sample allows more confident conclusions about the broader Sudanese medical-student population. Third, quantifying the independent contribution of sleep disruption to academic performance, after accounting for gender and academic year, provides a more rigorous evidentiary basis than descriptive prevalence estimates alone, and mirrors the methodological standard set internationally by Abdulghani et al. (2012).

The findings of this study are expected to generate locally relevant, up-to-date evidence that can inform the design of targeted student wellbeing interventions — such as sleep-hygiene education, anxiety-screening initiatives, and academic counselling services — within Sudanese medical colleges. By adopting validated instruments (an adapted GAD-7) alongside rigorous statistical methods, the study also aims to contribute methodologically transferable evidence that can be replicated in other resource-limited academic settings across the region.

4. Problem Statement

Medical education imposes a disproportionately heavy academic and psychological burden relative to other university disciplines, owing to dense curricula, frequent high-stakes assessment, and early clinical exposure. International evidence consistently links this burden to elevated rates of anxiety and poor sleep quality, both of which are, in turn, associated with reduced academic performance (Abdulghani et al., 2012; Auerbach et al., 2018). In Sudan, these pressures are compounded by broader structural challenges, including economic hardship, infrastructure limitations, and periods of institutional disruption, which may further elevate psychological vulnerability among students (Ibrahim and Abdalla, 2021).

Despite this, the true extent of the problem among Sudanese medical students remains poorly characterised. Existing Sudanese studies are limited in number, are largely confined to single institutions, and — with the exception of Ibrahim et al. (2024) — predate recent disruptions to the Sudanese higher-education sector. Consequently, academic administrators and student-support services in Sudan currently

lack multi-institutional, up-to-date data on how prevalent anxiety symptoms and sleep disruption are among medical students, and on whether sleep disruption independently predicts academic performance once gender and academic year are taken into account.

Without this evidence, institutions are poorly positioned to design, target, or justify investment in student mental-health and academic-support interventions. This study therefore addresses the following problem: the absence of robust, current, multi-institutional data on the prevalence and interrelationship of anxiety symptoms, sleep quality, and self-perceived academic performance among medical students in Sudan, and the consequent gap in evidence available to guide institutional policy and support services.

5. Methodology

5.1 Study Design

This study will employ a cross-sectional, descriptive-analytical survey design. Cross-sectional designs are appropriate for quantifying the prevalence of health behaviours and symptoms at a single point in time and for identifying statistical associations between variables (Levin, 2006). An online self-administered questionnaire will be used as the data collection instrument, consistent with best practices for reaching university student populations (Eysenbach, 2004).

5.2 Participants and Sampling

Participants will be students currently enrolled at one of five Sudanese higher education institutions: the Faculty of Tannob Technology, Sheikh Abdullah Al-Badri University, Dongola University, Abd al-Latif Al-Hamad Technological University, and Northern College. Sampling will be conducted via convenience sampling, with the survey link distributed through institutional social media networks and student communication channels during March 2026. Inclusion criteria will be current university enrolment and age of 18 years or above. A sample size of 176 will be taken, based on ……..

5.3 Study Instrument

Section 1 — Demographic Information: Gender, academic year (first through sixth), and self-rated academic performance on a five-point ordinal scale (Excellent=5, Very Good=4, Good=3, Average=2, Weak=1).

Section 2 — Sleep Behaviour: Habitual sleep duration assessed via four ordered categories (less than 4 hours; 4–5 hours; 6–7 hours; more than 7 hours). Two binary items assessed: (a) whether sleep was disrupted by anxiety or overthinking, and (b) whether poor sleep was perceived as negatively affecting academic performance (two independently worded items for reliability assessment).

Section 3 — Anxiety Screening (Adapted GAD-7): Six binary (yes/no) items adapted from the validated GAD-7 scale (Spitzer et al., 2006), assessing: feeling nervous/anxious/tense; persistent unexplained worry; inability to control worry; severe tension impeding relaxation; anxiety interfering with daily activities; and excessive worry about minor matters. Binary responses were scored 1 (yes) or 0 (no), yielding a GAD total score ranging from 0 to 6.

5.4 Data Collection and Analysis

Data will be collected via Google Forms in March 2026. All analyses will be conducted using Python (version 3.11; SciPy and Pandas libraries). The analytical plan will comprise: (1) descriptive statistics for all variables; (2) chi-square tests of independence with Yates correction for 2×2 tables, and Cramér's V as the effect size measure; (3) Spearman rank correlations for ordinal variables; (4) Mann-Whitney U tests for group comparisons with rank-biserial correlation as effect size; (5) Kruskal-Wallis H test for multi-group comparison; (6) multiple linear regression with Ordinary Least Squares estimation to identify independent

predictors of academic performance; and (7) Cronbach's alpha for internal consistency of the adapted GAD-6 instrument. All tests will be two-tailed with p-value of < 0.05 as significant.

5.5 Ethical Considerations

Ethical approval will be obtained from the Ethics Committee of the State Ministry of Health, Northern State, Sudan.

Participation in this study will be entirely voluntary. All participants will be fully informed about the specific purposes, scope, and objectives of the research before accessing and completing the questionnaire. Explicit digital informed consent will be obtained from each respondent prior to data entry, granting them the absolute right to decline participation or withdraw from the study at any stage without any negative consequences or academic penalties.

Confidentiality and Anonymity: Strict confidentiality and complete anonymity will be maintained throughout the entire data management and research process. The data collection instruments will be structured to ensure that no personally identifiable information — such as names, university IDs, or email addresses — is collected or stored.

Data Security and Utilization: All compiled electronic data sheets will be securely stored and password-protected, ensuring restricted access limited exclusively to the principal investigator. The collected datasets will be utilized solely for academic analysis and scientific research purposes. The study will be conducted in full accordance with the Declaration of Helsinki (World Medical Association, 2013).

6. Budget

No	Activity	Cost (SDG)
1	Proposal preparation, printing and approval	50,000
2	Data Analysis	250,000
3	Final draft writing, revision and publication	500,000
	TOTAL	**800,000**

7. Time Schedule

Activity	July	August	September	October	November
Proposal writing, ethical approval					
Data Collection					
Data Analysis					
Final Draft writing & Publication					

8. References

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