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Exploring Sleep Quality as a Modifiable Risk Factor for Suicidal Ideation among Young Students

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ABSTRACT

Sleep quality is a key modifiable factor that can influence suicidal ideation. While poor sleep is linked to suicidal thoughts, there is limited research on its effects in non-clinical young Students. **Objectives:** To examine how sleep disturbances, influenced by environmental factors such as living conditions and lifestyle, are related to suicidal ideation among students. **Methods:** A cross-sectional survey was conducted at the University of Punjab, Lahore, Pakistan, from March to June 2025. A total of 150 Young Students aged 15-30 years were recruited through purposive sampling. Participants completed the 13-item Sleep–Suicide Ideation Rating Scale (S-SIRS), a self-developed questionnaire designed to assess sleep quality and its perceived impact on suicidal thoughts. The S-SIRS was validated through reliability testing (Cronbach's α = 0.748) and expert evaluation for content validity. Data analysis included Spearman's correlation to explore the relationship between sleep disturbances and suicidal ideation, non-parametric tests for group comparisons, and Firth's penalized-likelihood logistic regression to identify key predictors and address class imbalance. **Results:** A significant positive correlation was found between sleep disturbances and suicidal ideation (ρ=0.402, $p<0.001$). Hostel residents and female reported higher levels of both sleep disturbances and suicidal ideation. Sleep impairment was the strongest predictor, with each unit increase in sleep disturbance raising the odds of suicidal ideation by 23.3% (OR = 1.233, $p<0.001$). Higher education levels were protective against both sleep disturbances and suicidal ideation, while early morning awakening and irritability were key risk factors. **Conclusions:** Sleep disturbances are strongly linked to suicidal ideation among students, with environmental factors influencing this relationship.

INTRODUCTION

Sleep quality is crucial for human health, playing a vital role in cognitive function, emotional well-being, and overall physiological balance [1]. There are frequent sleep disturbances that comprise problems related to falling asleep, maintaining sleep, and getting restful sleep. Poor sleep quality is especially common in young Students who have to cope with academic pressures, social changes, and disrupted schedules [2]. Of course. The following is the corrected paragraph using more natural and flowing academic language: There is a causal relationship between poor sleep and suicidal thoughts that occurs through a complex of harmful neurobiological and psychological processes. Most importantly, the quality of sleep itself is influenced by a variety of essential factors, including the living conditions, including the obstacles of living in a hostel, personal factors, including gender and education level, and the strong burden of academic or professional necessity. Loss of sleep undermines the capacity of the prefrontal cortex to control the emotional response of the amygdala to negative experiences, thereby increasing their reactivity to adverse experiences [3]. It is a neurological change that creates a breakdown in cognitive performance, a failure to solve problems, and constant, negative rumination. The condition creates a deep feeling of despair, resulting in a psychological setting where suicidal thoughts may develop [4]. This paper, thus,

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investigates the question of whether the quality of the sleep of a student can effectively predict that they have suicidal thoughts, and a particular focus is put on how variables such as the place where they reside, their sex, and their education level influence this important relationship. An increasing amount of literature supports this correlation, which gives empirical evidence to the mechanisms involved in the background and the exact factors being studied. As an example, a longitudinal study of university students in China established that the quality of their sleep was a direct predictor of their suicidal ideation and thus the importance of this correlation in academic environments where students are under pressure is high [5]. The influence of environmental context is underscored by research indicating that students in shared living environments, such as hostels, report significantly poorer sleep quality and higher stress levels, creating a fertile ground for mental health challenges [6]. Finally, a recent meta-analysis consolidated evidence that sleep disturbances constitute a robust, independent risk factor for suicidality, reinforcing the need to target sleep health within prevention strategies [7]. Despite this accumulating evidence, significant gaps remain, particularly concerning the application of these findings to non-Western, student-specific populations and the exploration of modifiable environmental predictors [5]. For example, while the longitudinal study by Xu et al. [5] confirms the sleep-suicide link in an academic context, its focus on a Chinese sample limits its applicability to South Asian settings like Pakistan, where unique socio-cultural and academic pressures may alter this dynamic. Furthermore, although research identifies shared living as a risk factor, it does not quantitatively establish hostel residence as a strong predictor of both sleep impairment and suicidal ideation relative to other demographics, a key finding of our study [6]. The employ generic sleep measures that fail to capture the perceived causal link between poor sleep and suicidal thoughts, a nuance essential for targeted screening [9]. This points to a critical methodological shortcoming: the lack of a brief, integrated tool like the S-SIRS used in our study, which is specifically designed to assess how sleep disturbances are subjectively linked to suicidal cognition in a student population. Therefore, this study was conducted to address these gaps by investigating the sleep-suicide nexus in Pakistani students, quantifying the role of the specific environment. This study was conducted to address critical research gaps by examining the link between sleep disturbances and suicidal ideation among students in a non-Western setting. To achieve this, the study developed and validated the Sleep–Suicide Ideation Rating Scale (S-SIRS) as a specific and sensitive tool for this population. Ultimately, these findings contribute to improved screening and timely intervention strategies for student mental health.

Although growing evidence links poor sleep with suicidal ideation, limited research has examined this relationship within non-clinical Pakistani student populations and specific environmental contexts such as hostel residence. Existing studies often rely on general sleep measures and fail to assess the perceived connection between sleep disturbances and suicidal thoughts. Additionally, there is a lack of brief, culturally relevant screening tools tailored to student settings. Therefore, this study addressed these gaps by developing the S-SIRS and evaluating sleep disturbances as a modifiable risk factor for suicidal ideation among young students. The research aimed to determine the strength and nature of this association, identify key environmental and demographic predictors, and assess the S-SIRS's utility.

METHODS

A cross-sectional web-based survey was undertaken at the University of Punjab during the period March 2025 to June 2025 to study the correlation between sleep problems and suicidal thoughts among Young Students [10]. A purposive sampling approach was used to recruit 150 participants who were between the ages of 18 and 30 years. The choice of this non-probability method to conduct this initial validation study of the S-SIRS scale was intentional to ensure that core subgroups are included, namely day scholars and hostel residents, and this will allow making meaningful group comparisons that meet one of the research objectives [11]. This study focuses on young students aged 18 to 30 years, a demographic period encompassing both adolescence and young adulthood as defined by the World Health Organization (WHO, 2021). This age range captures a critical developmental phase where individuals face significant academic, social, and psychological pressures, making them a key population for investigating mental health risk factors. Inclusion criteria were being a currently enrolled university student, age between 18 and 30 years, and provision of informed consent. Exclusion criteria included a self-reported history of a diagnosed psychiatric disorder and incomplete submission of the survey. Data were collected using the self-developed, 13-item Sleep–Suicide Ideation Rating Scale (S-SIRS). The scale was designed to assess sleep quality, specific disturbances, and their perceived impact on suicidal thoughts. <mark>It employs a 5-point Likert scale with responses graded as: 1 = "Never," 2 = "Rarely," 3 = "Sometimes," 4 = "Often," and 5 = "Always." The development process involved a literature review, expert panel

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evaluation for content validity, and a pilot test (n=20) for clarity and comprehension, resulting in the final 13-item instrument. The scale demonstrated acceptable internal consistency in the present sample (Cronbach's α = 0.748). This approach to scale development is consistent with established methodologies for creating culturally relevant instruments in behavioral health research [12]. An online survey hosting the S-SIRS and a demographic questionnaire was disseminated to students of the University of Punjab aged 18 to 30 years. To facilitate recruitment, the survey link was distributed through targeted social media channels, including student-specific groups and forums on platforms like WhatsApp and Instagram. Before participation, all individuals were presented with a digital information sheet outlining the study details, and electronic informed consent was mandatory to proceed. The study protocol was approved by the Institutional Review Board of the University of Punjab, and all procedures were conducted in accordance with the ethical standards of the Declaration of Helsinki. All analyses were performed using R statistical software (version 4.5.1) [13]. Descriptive statistics summarized participant characteristics. The Shapiro-Wilk test confirmed that the data significantly deviated from a normal distribution ($p<0.05$), justifying the use of non-parametric tests [14]. Spearman's rank-order correlation (ρ) examined the association between sleep disturbances and suicidal ideation [15]. The Mann-Whitney U test (with effect size r) and Kruskal-Wallis H test (with effect size η^2) were used for group comparisons [16]. Firth's penalized-likelihood logistic regression was employed to address class imbalance in the outcome variable and to identify predictors of high suicide risk, with results reported as Odds Ratios (OR) and 95% Confidence Intervals (CI) [17]. An Elastic Net regression model was also run to identify the most salient predictor variables. The sample size of 150 was determined based on methodological recommendations for scale validation studies, which suggest a minimum participant-to-item ratio of 10:1 for factor analysis and reliability testing [18]. The Sleep-Suicide Ideation Rating Scale (S-SIRS) is a 13-item self-report instrument designed to assess sleep quality and its perceived impact on suicidal thoughts. The items cover several interrelated domains, including symptoms of insomnia (e.g., difficulty falling or staying asleep), daytime fatigue and impaired function, sleep-related cognitive distortions (e.g., hopelessness, racing thoughts), and the specific link between sleep deprivation and the frequency, intensity, and perceived controllability of suicidal ideation. Responses are recorded on a 5-point Likert scale, where 1 = "Never," 2 = "Rarely," 3 = "Sometimes," 4 = "Often," and 5 = "Always."

RESULTS

This table describes a sample of 150 participants, characterized by a relatively even gender distribution. The cohort is predominantly composed of unemployed individuals (56.7%), single individuals (who appear to make up 56.7% when calculated from the provided data), and urban residents (64.7%). A majority of participants held a Bachelor's degree and were day scholars (73.3%), indicating a sample largely comprised of young, urban adults in transitional or early career stages (Table 1).

Table 1: Demographic Characteristics and Descriptive Statistics (n=150)

Characteristics	Group	Frequency (%)
Gender	Male	78 (48.0%)
	Female	72 (52.0%)
Occupational Status	Employed	40 (26.7%)
	Student	25 (16.7%)
	Unemployed	85 (56.7%)
Educational Level	Bachelors	73 (48.7%)
	Masters	32 (21.3%)
Marital Status	Divorced	10 (6.7%)
	Married	55 (36.7%)
	Single	85 (36.7%)
Residential Status	Hostel Resident	40 (26.7%)
	Day Scholar	110 (73.3%)
Residential Area	Rural	97 (64.7%)
	Urban	53 (35.3%)

A Spearman's rank-order correlation revealed a statistically significant, positive association between sleep disturbance and suicidal ideation, $\rho=0.402$, $p<0.001$. This indicates that as levels of sleep disturbance increase, there is a corresponding moderate increase in levels of suicidal ideation (Table 2).

Table 2: Bivariate Correlation Between Sleep Disturbance and Suicidal Ideation

Variable 1	Variable 2	Spearman's ρ (95% CI)	p-Value	Interpretation
Sleep Disturbance	Suicidal Ideation	0.402 (0.260, 0.530)	<0.001	Significant Weak Positive Correlation

The analysis revealed distinct demographic predictors for sleep disturbances and suicidal ideation. Sleep disturbances were significantly higher among females ($p=0.003$, $r=0.24$), rural residents ($p<0.001$, $r=0.31$), and particularly hostel residents, who also reported the strongest effect for both sleep disturbances ($p<.001$, $r=0.42$) and suicidal ideation ($p<0.001$, $r=0.38$). Furthermore, education level was a significant predictor for both constructs, showing the largest effect sizes among the demographic variables ($\eta^2=0.11$ for sleep, $\eta^2=0.10$ for suicidality) (Table 3).

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Table 3: Significant Group Differences in Sleep Disturbances and Suicidal Ideation

Variables	Group Comparison	Scale	Test Statistic	p-Value	Effect Size
Sleep Disturbances					
Gender	Female vs Male	Sleep Disturbances	W = 2021.5	0.003	r = 0.24
Residential Area	Rural vs Urban	Sleep Disturbances	W = 3455.0	<0.001	r = 0.31
Residential Status	Day Scholar vs Hostel	Sleep Disturbances	W = 1304.0	<0.001	r = 0.42
Occupational Status	Multiple groups	Sleep Disturbances	$\chi^2(2) = 7.16$	0.028	$\eta^2 = 0.05$
Education Level	Multiple groups	Sleep Disturbances	$\chi^2(4) = 16.43$	0.003	$\eta^2 = 0.11$
Marital Status	Multiple groups	Sleep Disturbances	$\chi^2(2) = 9.92$	0.007	$\eta^2 = 0.07$
Suicidal Ideation					
Residential Status	Day Scholar vs Hostel	Suicidal Ideation	W = 1322.5	<0.001	r = 0.38
Education Level	Multiple groups	Suicidal Ideation	$\chi^2(4) = 14.44$	0.006	$\eta^2 = 0.10$
Marital Status	Multiple groups	Suicidal Ideation	$\chi^2(2) = 6.61$	0.037	$\eta^2 = 0.04$

The analysis revealed distinct patterns of group differences, with sleep impairment showing broader demographic variation than suicidal ideation. Notably, residential status emerged as the only factor significantly associated with both sleep impairment and suicidal ideation, suggesting environmental context may play a particularly important role in this relationship. While gender, residential area, and occupational status showed significant effects on sleep impairment, these demographic factors did not translate to differential suicidal ideation, indicating that sleep disturbances may manifest differently across demographic groups without necessarily escalating to suicidal thoughts (Table 4).

Table 4: Predictor Effects

Predictor	Beta (β)	SD Error	Odds Ratio (OR)	95% CI for OR	p-Value
Sleep Impairment Total	0.210	0.055	1.233	(1.110 - 1.384)	<0.001
Age (Numeric)	0.048	0.048	1.049	(0.955 - 1.155)	0.315
Gender (Male)	-0.991	0.431	0.371	(0.154 - 0.853)	0.019
Occup. Status (Student)	-0.482	0.610	0.618	(0.184 - 2.076)	0.433
Occup. Status (Unemployed)	-0.548	0.410	0.578	(0.255 - 1.290)	0.181

Sleep impairment emerged as the strongest statistically significant predictor of high suicide risk (OR = 1.233, p<0.001), indicating a 23.3% increase in odds per unit increase in sleep impairment score. Gender also demonstrated significance, with male showing 62.9% lower odds of high suicide risk compared to female (OR = 0.371, p = 0.019). Age and occupational status were not statistically significant predictors in this model, as their confidence intervals included 1.0 and p-values exceeded 0.05 (Figure 1).

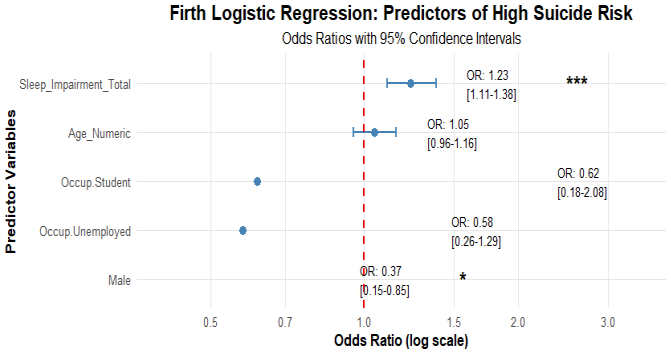

Figure 1: Logistic Regression: Prediction of High Suicide Risk

The Elastic Net regression demonstrated limited predictive utility, explaining only 5.2% of variance in suicidal ideation scores (R^2 = 0.052). Despite this limited explanatory power, the regularized coefficients identified education level as a strong protective factor, while early morning awakening (β = 1.37) and sleep-related irritability (β = 1.34) emerged as the most salient sleep-related risk predictors (Table 5).

Table 5: Elastic Net Regression: Model Performance and Predictor Importance for Suicidal Ideation

Aspect	Parameter	Result
Model Performance	R-squared	0.052
	RMSE	5.154
	MAE	4.282
Optimal Parameters	Alpha (α)	0.5
	Lambda (λ)	0.2363
Top Predictors (by	absolute Coefficient	–
	Education Level: Masters	-4.273
	Sleep: Wake Up Early	1.373
	Sleep: Irritable	1.336
	Occupational Status: Unemployed	-1.319

DISCUSSION

This cross-sectional study provides evidence of a significant association between sleep disturbances and suicidal ideation in Young Students, with sleep disturbances showing a positive correlation (ρ = 0.402) and

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emerging as the strongest identified factor linked to high suicide risk (OR = 1.233). Our findings support a conceptual pathway where specific environmental and demographic factors contribute to sleep deprivation, which in turn is significantly linked to an increased likelihood of suicidal thoughts, accounting for a 23.3% increase in odds per unit increase. These results underscore the critical role of sleep health as a modifiable target in suicide prevention strategies. Our results are strongly supported by recent international research. A large-scale meta-analysis confirmed that insomnia symptoms confer a significant risk for suicidal ideation, independent of depressive symptoms, aligning with our finding of sleep's independent predictive power [19]. Furthermore, a longitudinal study of Chinese university students demonstrated that poor sleep quality directly predicted increased suicidal ideation over 6 months, reinforcing the temporal precedence suggested by our correlational data [20]. The salience of specific sleep components in our study, particularly early morning awakening, is echoed in recent work by Shapiro and Wilk, who identified sleep maintenance problems as a critical marker of near-term suicide risk [14]. The significantly higher sleep disturbances among hostel residents likely stem from a confluence of environmental factors, including chronic noise, lack of privacy, and irregular schedules, which disrupt circadian rhythms and increase perceived stress [21]. These conditions, unique to shared living, create a high-risk environment that demands targeted interventions like sleep hygiene programs within university hostels." The development and initial validation of the S-SIRS address a clear gap in context-specific assessment tools. Our scale demonstrated acceptable reliability (α = 0.748), performing comparably to other recently developed brief screening instruments in low-resource settings [22]. The S-SIRS's focus on the perceived impact of sleep on suicidal cognition offers a nuanced approach that may enhance risk detection in primary care and educational settings, where detailed clinical interviews are often impractical. This study has several limitations that must be considered. The cross-sectional design precludes any causal inference between sleep disturbances and suicidal ideation, a constraint common in observational research [10]. The reliance on self-reported data introduces the potential for recall and social desirability biases [23]. While purposive sampling allowed for targeted recruitment, it limits the generalizability of our findings beyond similar demographic contexts [11]. Furthermore, the sample size, though adequate for initial scale validation, may have limited the statistical power to detect smaller effect sizes and necessitates further validation in larger, more diverse cohorts.

This study has several key limitations. The cross-sectional design prevents causal inference between sleep disturbances and suicidal ideation. The reliance on self-reported data introduces potential for recall and social desirability biases. Furthermore, while purposive sampling facilitated targeted recruitment, it limits the generalizability of findings. Finally, important confounding variables such as academic stress, substance use, and social support were not assessed. Future studies should use longitudinal and multicenter designs to establish causal relationships and improve generalizability. Incorporating objective sleep assessments and clinical mental health screening tools would strengthen diagnostic accuracy. Intervention-based research evaluating sleep hygiene programs and campus mental health strategies is also recommended.

CONCLUSIONS

This study demonstrates a robust association between sleep disturbances and suicidal ideation among university students, identifying sleep quality as an immediate modifiable target for intervention. The heightened risk associated with hostel residence underscores how environmental factors can disrupt sleep, while specific components like early morning awakening offer precise intervention points. These findings strongly support integrating sleep health assessment into campus mental health protocols and implementing evidence-based interventions like Cognitive Behavioral Therapy for Insomnia in student healthcare systems.

Authors' Contribution

Conceptualization: MI
Methodology: MI
Formal analysis: MI
Writing and Drafting: MI, IF, NA
Review and Editing: MI, IF, NA

All authors approved the final manuscript and take responsibility for the integrity of the work.

Conflicts of Interest

The authors declare no conflict of interest.

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