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ORIGINAL ARTICLE

The association between anxiety, daily behaviors, and insomnia among university students

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ABSTRACT

Background: Insomnia is a common problem among university students and is often associated with psychological factors such as anxiety and modifiable daily behaviors. This study aimed to examine the relationships between anxiety levels, specific daily habits (including caffeine consumption, physical activity, and academic stress), and the occurrence of insomnia among students aged 20 to 25 years at Universitas Prima Indonesia.
Methods: An observational analytic study with a cross-sectional design was conducted in May 2025. A total of 94 students participated as respondents. Data were collected using structured questionnaires, including the Hamilton Anxiety Rating Scale (HAM-A) and the Insomnia Severity Index (ISI). The chi-square test was applied to analyze the associations between variables.
Results: Most respondents were female (61.7%) with a mean age of 21.21 years. Descriptive analysis showed trends suggesting that higher anxiety and physical activity levels were associated with increased insomnia rates. However, statistical analysis revealed no significant relationship between anxiety and insomnia ($p = 0.203$) or between physical activity and insomnia ($p = 0.190$). In contrast, caffeine consumption showed a statistically significant association with insomnia severity ($p = 0.006$).
Conclusion: Although anxiety and physical activity were not significantly related to insomnia in this study, caffeine consumption was identified as a significant modifiable risk factor. These findings emphasize the need for targeted health education programs to improve sleep hygiene among students, particularly by addressing caffeine intake to enhance sleep quality.

Keywords: insomnia, anxiety, caffeine, students, sleep disorders

Introduction

Sleep disturbances, particularly insomnia, constitute a significant public health concern among university populations worldwide. Insomnia is characterized by persistent difficulty with sleep initiation, duration, consolidation, or quality and negatively impacts daytime functioning, academic performance, and overall well-being.[1] Its etiology is multifactorial, often involving a complex interaction between psychological predispositions and behavioral patterns.[2]

Anxiety is one of the most frequently cited psychological correlates of insomnia. The global burden of anxiety disorders increased substantially following the COVID-19 pandemic, with the highest surge observed among young adults aged 20 to 24 years.[3,4] Anxiety induces a state of hyperarousal by activating the sympathetic nervous system and elevating metabolic rate, conditions fundamentally incompatible with the physiological state necessary for sleep onset and maintenance. According to the hyperarousal model,

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individuals with insomnia sustain elevated levels of cognitive and physiological alertness both during the day and at night.[5,6]

Daily behaviors also play a critical role in shaping sleep architecture. Excessive caffeine consumption, sedentary lifestyles, and poor sleep hygiene are modifiable risk factors commonly observed among university students. Caffeine, a central nervous system stimulant, antagonizes adenosine receptors, delaying sleep onset and reducing sleep depth. Moreover, academic stress—a pervasive aspect of student life—can exacerbate both anxiety and maladaptive coping behaviors, creating a self-perpetuating cycle that further disrupts sleep.[7–9]

In Indonesia, the prevalence of insomnia is reported to be high; however, few studies have examined the combined effects of anxiety and specific daily behaviors in undergraduate populations.[10,11] Building on this foundation, further investigation is warranted. Therefore, this study aims to comprehensively assess the associations between anxiety levels, key daily behaviors (including caffeine consumption, physical activity, and perceived academic stress), and the incidence of insomnia among students aged 20 to 25 years at Universitas Prima Indonesia.

Method

This study employed an observational analytic design with a cross-sectional approach. It was conducted at Universitas Prima Indonesia in May 2025. The target population consisted of all undergraduate students aged 20 to 25 years enrolled at the university, and a total of 94 students were recruited. The inclusion criteria were active enrollment as a student aged 20 to 25 years, voluntary willingness to participate, and completion of the entire research questionnaire. The exclusion criteria were a known history of major psychiatric disorders such as major depressive disorder, bipolar disorder, or schizophrenia; serious physical health conditions known to affect sleep or anxiety, such as chronic pain or severe cardiopulmonary disease; and incomplete questionnaire responses.

Data were collected using a structured self-administered questionnaire that included several sections. Demographic data covered age and gender. The independent variable, anxiety level, was measured using the Hamilton Anxiety Rating Scale (HAM-A), a 14-item instrument that employs a 0–4 Likert scale. Total scores were categorized as no anxiety (0–14), mild (15–20), moderate (21–27), and severe (28–56) (Reski et al., 2022). The dependent variable, insomnia severity, was assessed using the Insomnia Severity Index (ISI), a 7-item scale also rated from 0 to 4. Total scores were interpreted as no clinical insomnia (0–7), subthreshold insomnia (8–14), moderate clinical insomnia (15–21), and severe clinical insomnia (22–28) (Ardiatama, Widyana, and Budiyani, 2021).

Modifiable behavioral variables were also examined. Caffeine consumption was determined by asking respondents whether they consumed coffee, tea, or energy drinks daily, with responses recorded as yes or no. Physical activity level was classified according to self-reported exercise frequency and intensity during the previous week as light, moderate, or heavy. Academic stress was evaluated using a customized questionnaire assessing perceived workload from assignments, examinations, and deadlines during the past month, categorized as low, moderate, or high.

Data analysis was performed using SPSS software. Descriptive statistics, including frequency, percentage, and mean, were used to summarize demographic characteristics and the distribution of study variables. The association between categorical independent variables (anxiety level, physical activity, caffeine consumption, and academic stress) and the ordinal dependent variable (insomnia severity) was tested using the Pearson Chi-Square test. A p-value of less than 0.05 was considered statistically significant.

Results

The study included 94 respondents with a mean age of 21.21 years (range 20–23 years). Most participants were 21 years old (33.0%), followed by those aged 22 years (29.8%) and 20 years (27.7%). Female respondents formed the majority (61.7%). Regarding anxiety, 29.8% of respondents reported mild anxiety, 28.7% had moderate anxiety, 23.4% reported no anxiety, and 18.1% reported severe anxiety. For insomnia, 27.7% experienced subthreshold insomnia, 26.6% reported no insomnia, 23.4% had moderate insomnia, and 22.3% reported severe insomnia. More than half of the respondents consumed caffeine (57.4%) and reported engaging in moderate physical activity (47.9%). Additionally, 54.3% experienced a moderate level of academic stress (Table 1).

Table 1. Distribution of respondent characteristics (n = 94)

Characteristic	Category	n	%
Age (years)	20	26	27.7
	21	31	33.0
	22	28	29.8
	23	9	9.6
	Mean (SD)	*21.21*	—
Gender	Female	58	61.7
	Male	36	38.3
Anxiety level (HAM-A)	None (0–14)	22	23.4
	Mild (15–20)	28	29.8
	Moderate (21–27)	27	28.7
	Severe (28–56)	17	18.1
Insomnia severity (ISI)	None (0–7)	25	26.6
	Subthreshold (8–14)	26	27.7
	Moderate (15–21)	22	23.4
	Severe (22–28)	21	22.3
Caffeine consumption	Yes	54	57.4
	No	40	42.6
Physical activity level	Light	22	23.4
	Moderate	45	47.9
	Heavy	27	28.7
Academic stress exposure	Low	30	31.9
	Moderate	51	54.3
	High	13	13.8

The associations between the independent variables and insomnia severity are summarized in Table 2. Cross-tabulation of anxiety level and insomnia severity indicated a descriptive trend, with the proportion of respondents experiencing moderate insomnia increasing from 27.3% in the no-anxiety group to 44.6% in the moderate-anxiety group. However, the Pearson Chi-square test did not show a statistically significant association ($\chi^2 = 5.945$, df = 4, p = 0.203). Similarly, for physical activity, respondents with heavy activity reported the highest proportion of moderate insomnia (51.9%), yet this association was not statistically significant ($\chi^2 = 6.127$, df = 4, p = 0.190).

Table 2. Association between independent variables and insomnia severity

Variable	Insomnia Severity, n (%)	Statistical Test
Anxiety level		
None (n = 22)	9 (40.9)	7 (31.8)
Mild (n = 28)	7 (25.0)	9 (32.1)
Moderate/Severe (n = 44)	9 (20.5)	10 (22.7)
Physical activity		
Light (n = 22)	10 (45.5)	6 (27.3)
Moderate (n = 45)	10 (22.2)	12 (26.7)
Heavy (n = 27)	5 (18.5)	8 (29.6)
Caffeine consumption		
No (n = 40)	17 (42.5)	11 (27.5)
Yes (n = 54)	8 (14.8)	15 (27.8)

In contrast, caffeine consumption demonstrated a significant association with insomnia severity. Among caffeine consumers, 57.4% experienced moderate or severe insomnia compared to 30.0% among non-consumers. This association was statistically significant ($\chi^2 = 10.396$, df = 2, p = 0.006). Academic stress did not show a significant direct association in the final model.

Discussion

This study examined the multifaceted relationships among anxiety, selected daily behaviors, and insomnia in young adult university students. The primary finding was the identification of caffeine consumption as a significant behavioral factor associated with greater insomnia severity, whereas anxiety levels and physical activity, despite showing descriptive trends, did not demonstrate statistically significant direct associations in this sample.

The absence of a significant association between anxiety and insomnia (p = 0.203) contrasts with several previous studies. For example, Paendong et al.[12] reported a significant relationship between anxiety

and insomnia among final-year medical students. This discrepancy may reflect differences in sample characteristics and coping mechanisms. The current study included a general undergraduate population aged 20–25 years, who may possess more varied or resilient stress-adaptation strategies that buffer the direct psychophysiological effects of anxiety on sleep architecture. Additionally, variations in measurement tools and the potential influence of unmeasured confounding factors, such as social support or academic pressures at different stages of study, may contribute to the differing findings. These results suggest that the anxiety–insomnia relationship may be more pronounced in populations exposed to acute or sustained academic stress, such as final-year students, rather than across a broader student cohort.

Similarly, the non-significant association between physical activity and insomnia ($p = 0.190$) diverges from prior research that linked regular exercise with improved sleep quality.[13] This finding may be explained by the nature and timing of the reported physical activity. Exercise intensity, duration, and proximity to bedtime are critical moderators of its impact on sleep. Vigorous exercise performed too close to bedtime may elevate core body temperature and sympathetic nervous system activity, counteracting the sleep-enhancing effects of moderate exercise. Because this study measured general activity levels rather than their temporal relationship to sleep, it may have overlooked more nuanced associations.

The most robust finding in this study was the significant positive association between caffeine consumption and insomnia severity ($p = 0.006$). This result aligns with the known pharmacodynamics of caffeine as an adenosine receptor antagonist. Adenosine, a neuromodulator that accumulates during wakefulness, promotes sleep drive. By blocking adenosine signaling, caffeine reduces sleepiness, delays sleep onset, and decreases deep sleep duration.[9,14] Students frequently consume caffeine to manage academic demands and fatigue, often during the afternoon or evening, directly interfering with nocturnal sleep initiation.[8,15] Given that caffeine intake is a modifiable behavior, this finding is particularly actionable. It underscores the importance of integrating sleep hygiene education—specifically addressing caffeine timing and dosage—into university health promotion programs.

Descriptive data indicated that most respondents experienced moderate academic stress; however, this did not translate into a direct statistical association with insomnia in the final analysis. This pattern suggests that academic stress may exert an indirect effect, potentially by increasing anxiety or promoting caffeine use as a coping mechanism, rather than serving as an independent predictor of sleep disturbance.

Conclusion

Among the variables examined, caffeine consumption emerged as a significant and modifiable behavioral risk factor associated with increased insomnia severity in university students aged 20–25 years. Although anxiety and physical activity demonstrated expected descriptive trends, they were not statistically significant predictors in this cohort, suggesting the presence of other mediating or moderating influences. These findings identify a clear target for intervention. University health initiatives should prioritize educational strategies to raise awareness of caffeine's effects on sleep and promote more mindful consumption, particularly in the hours preceding bedtime. Future longitudinal studies are warranted to clarify causal pathways and explore the interactions among academic stress, coping behaviors such as caffeine use, and sleep outcomes over time.

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