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Original Article

The Correlation between Stress, Social Media Usage, Sleep Quality, and Insomnia among University Students: A Cross-Sectional Study

N Juni Triastuti*, Tevy Helgavania

Department of Medical Education, Universitas Muhammadiyah Surakarta, Indonesia

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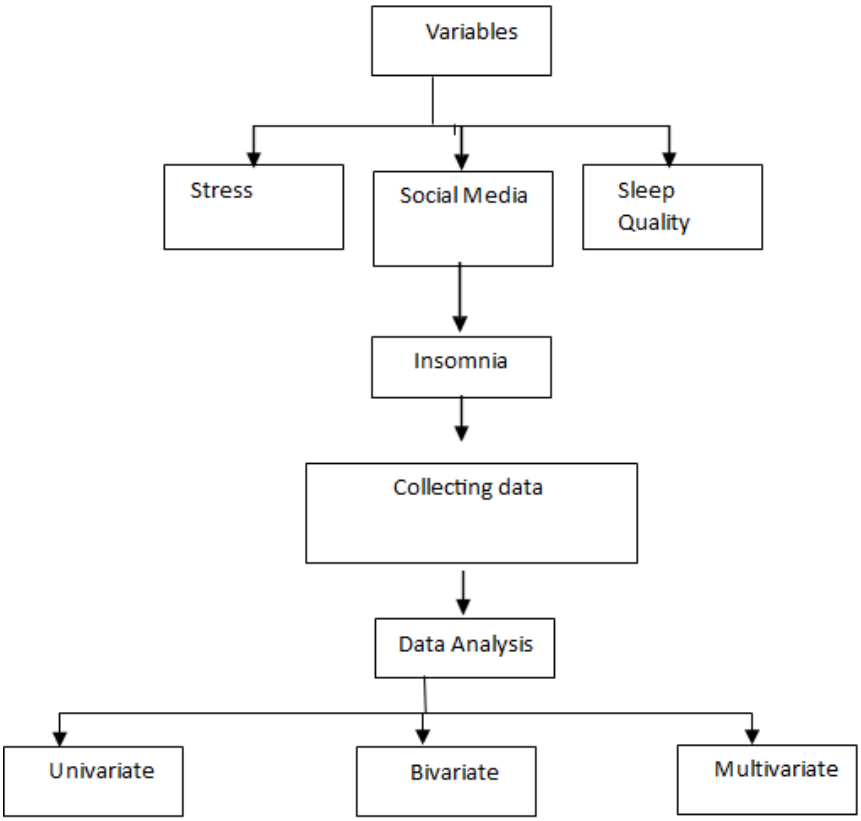
ABSTRACT

Background: Insomnia is a frequent clinical sign of various psychopathological disorders and affects millions of people worldwide. Although stress is recognized as the primary factor of insomnia, the relationship between social media and sleep quality among students remains unclear. Such relationships can have significant implications on the public sleep health that clinicians and researchers have to understand better. This study aimed to explore the relationship between stress, social media usage, sleep quality, and insomnia among university students.
Methods: This study was conducted through an observational analysis while using a cross-sectional design of the study which was conducted in 2023. Purposive sampling techniques were used to select 311 students as respondents of the study. The questionnaires used were DASS 42 questionnaire, Intensity of Social Media Usage questionnaire, Pittsburgh Sleep Quality Index (PSQI), and Insomnia Severity Index (ISI). This study used Chi-Square analysis to examine the associations between stress, social media activity, sleep quality, and insomnia using SPSS version 26.
Results: The average age of the students were ranging from 17 years to 22 years. There was a lack of significant association between stress and insomnia ($p = 0.876$) and between social media activity and insomnia ($p = 0.402$). Sleep quality demonstrated a highly significant relationship with insomnia ($p < 0.001$), highlighting its importance as a contributing factor to insomnia occurrences among university students.
Conclusion: These results highlight the importance of improving sleep quality to reduce insomnia among university students.

* Corresponding author: N Juni Triastuti
✉ E-mail: njt140@ums.ac.id

GRAPHICAL ABSTRACT



Introduction

Insomnia is a common symptom of psychiatric disorders, characterized by difficulty falling asleep or obtaining restful sleep, leading to stress and daily functional impairments [1, 2]. The prevalence of insomnia among older adults worldwide reaches 75% [3]. In Indonesia, the prevalence of insomnia among adolescents is 10% of the population or approximately 28 million people [4]. Insomnia can be a symptom or consequence of high levels of stress. Stress is a subjective experience based on an individual's perception of the situations they encounter. Stress is associated with discrepancies between reality and expectations and environments that are pressure-filled. Prolonged stress can affect various aspects and systems of an individual's body, leading to anxiety, anger, and frustration. The impact of emotional stress includes anxiety, emotions, depression, as well as physical and psychological stress can have detrimental effect to the overall body's health and quality of life [5, 6]. The prevalence of mental and emotional disorders with symptoms of depression and stress among individuals aged 15 and over reaches approximately 14 million people or 9.8% of the total population of Indonesia. Globally, 38-71% of students experience stress, with 39.6-61.3% in Asia experiencing stress. However, in Indonesia, the level of stress among students is 36.7-71.6% [7]. Insomnia can be one of the outcomes of excessive social media use, especially before bedtime. in 2014, the number of social media users in Indonesia has surpassed 82 million and ranks as the 8th largest in the world. Its penetration rate reaches 24.23%, a figure significantly high compared to users in Southeast Asia or Australia [8]. Levels of stress and social media usage have an impact on sleep quality. Most students are heavily involved in their daily routines and are highly susceptible to poor sleep quality [9].

In Indonesia, the prevalence of sleep disorders among adolescents is high, with 62.9% of adolescents aged 12-15 experiencing sleep disturbances, with wake-sleep transition disorder being the most common type [10]. Many adolescents complain of insufficient sleep time, difficulty waking up in the morning, and feeling tired and sleepy during the day. The multitude of activities and challenges faced by adolescents puts them at a high risk of sleep disturbances, particularly insomnia [4, 10]. Stress has been identified as a significant factor contributing to insomnia. The pressures of academic deadlines, social responsibilities, and future uncertainties often lead to heightened stress levels among students, impacting their ability to relax and fall asleep. Furthermore, the pervasive influence of social media in modern society has impacted new challenges to sleep health. Excessive use of social media platforms, particularly before bedtime, has been related with disrupted sleep patterns, delayed sleep onset, and decreased sleep quality. The massive exposure to stimulating content and blue light emitted by screens can influence the body's natural circadian rhythms, exacerbating the difficulties for individuals to maintain restorative sleep [11, 12].

Sleep is a vital process that allows the mind and body to rest. However, crucial organs such as the heart, lungs, liver, blood circulation, and other internal organs continue to function, unlike some other organs that cease their activities. The depth of sleep is not always consistent throughout the sleep period, influenced by factors such as age, daily activities, health conditions, and other elements [13]. This dynamic nature of sleep underscores its importance in maintaining overall health and well-being. As such, understanding the mechanisms of sleep and its relationship with various factors such as stress, social media usage, and sleep quality is essential for addressing sleep disorders like insomnia effectively [13].

In addition, the quality of sleep contributes to the one's susceptibility to insomnia. Poor sleep hygiene behaviour, such as irregular sleep schedules, inadequate sleep duration, and disruptive bedtime routines, can exacerbate sleep difficulties and increase the risk of insomnia. Implementing targeted interventions that address stress management techniques, promote healthy social media habits, and improve sleep hygiene practices might enhance the overall well-being of students [6, 13].

Stress exerts its influence on the functioning of the Raphe nucleus, a region regulating emotional processes, which in turn impacts the hypothalamic area of the brain, specifically the Supra Chiasmatic Nucleus (SCN), where the sleep process occurs. This heightened activity in the SCN disrupts the sleep process. Furthermore, stress inhibits the pineal gland's ability to release melatonin, a hormone crucial for normal sleep [11, 14]. These intricate neurobiological mechanisms illustrate how stress can significantly disturb the delicate balance of the sleep-wake cycle, leading to sleep disturbances such as insomnia. Understanding the neurophysiological pathways underlying the interaction between stress and sleep can inform to mitigate the negative effects of stress on sleep quality and overall well-being [6, 14].

Stressors are situations or triggers that cause individuals to feel pressured or threatened. The same stressor may be evaluated differently by each individual. An individual's assessment of stressors will affect their ability to take preventive action against stressors that cause stress. Stressors are factors in human life that trigger stress responses; they can originate from various sources, including physical, psychological, and social conditions, and can arise in work situations, at home, in school, and in other external environments. Understanding the diverse nature of stressors and their subjective impact on individuals is crucial for developing effective stress management strategies and interventions. By identifying and addressing stressors effectively, individuals can enhance their resilience and well-being in the face of challenging circumstances [5, 14].

Effective time management in social media usage is crucial, particularly for students who need to ensure adequate rest and sleep. In addition, the blue light emitted by devices used to access social media can also play a role in sleep disturbances. This light can affect the production of melatonin, a hormone responsible for regulating the sleep-

wake cycle. Melatonin is typically produced by the pineal gland at night, triggering drowsiness. However, this hormone is also sensitive to light, so melatonin levels are low when exposed to light during the day. Therefore, implementing strategies to manage screen time, especially before bedtime, and minimizing exposure to blue light can maintain healthy sleep habits [5, 6]. The central pacemaker of the circadian rhythm that regulates sleep patterns is controlled by the suprachiasmatic nucleus within the hypothalamus. The neuroanatomical structures underlying Non-Rapid Eye Movement (NREM) sleep are primarily located in the ventrolateral preoptic nucleus of the hypothalamus, while Rapid Eye Movement (REM) sleep is cantered in the pontine regions. This process is significantly influenced by light. In dark environments, the secretion of the hormone melatonin increases, whereas during periods of light, melatonin levels remain low. However, emotional pressure or stress can lead to a decrease in melatonin levels, which in turn stimulates sympathetic nervous system activity and maintains levels of alertness [13, 15].

The relationship between the central nervous system and environmental cues, such as light and darkness, underscores the balance of sleep-wake cycles. Disruptions to this equilibrium, whether due to external factors like exposure to light-emitting devices or internal factors like emotional stress, can perturb the finely tuned mechanisms governing sleep. The melatonin secretion was usually decreased caused by stress which might influence the natural onset of sleep, thus, making it challenging for individuals to attain restorative rest. Understanding the neurobiological underpinnings of these processes highlighting the influence of the emotional states, environmental stimuli, and sleep regulation to insomnia. By addressing factors that disrupt this delicate balance, individuals can optimize their sleep quality [5, 6, 15].

The prevalence of insomnia among students has been a growing concern due to its detrimental effects on academic performance, mental well-being, and overall quality of life. Understanding the influence of stress, social media habits, sleep quality to insomnia is crucial for promoting mental health and quality of life among students. Therefore, this study investigates how stress and social media usage affect sleep quality and insomnia among students [4].

Materials and Methods

Study design

This study used a quantitative cross-sectional design, wherein observations of variables were collected at a single point in time without any further follow-up. This approach was chosen to elucidate the relationships between independent and dependent variables (Figure 1) [16].

Participant Recruitment

The study targeted university students enrolled at the Faculty of Medicine and Faculty of Health Sciences. Students were recruited using purposive sampling techniques. Informed consent was obtained from all students prior to their inclusion in the study.

Inclusion criteria: Students enrolled in the Faculty of Medicine and Health Sciences, aged 17-23.

Exclusion criteria: The exclusion criteria include history of acute or chronic illnesses and unwillingness to complete the questionnaire.

Data collection

Structured questionnaires were employed to assess various variables of interest, including stress levels, social media usage patterns, sleep quality, and symptoms of insomnia. Data collection was conducted from November-December 2023. In this study context, the utilized instrument was a questionnaire.

Stress level instrument

The DASS-42 questionnaire was used to assess stress levels. The reliability was high (Cronbach's alpha = 0.963). This indicates an exceptionally high level of reliability (perfect) as the Cronbach's alpha value exceeds 0.9 (5). However, for the purpose of this study, only the 14 items related to stress levels from the DASS 42 questionnaires were extracted. Students responded to these items using a Likert scale, with the options: 0: Never, 1: Sometimes, 2: Often,

and 3: Almost always. Based on the scoring system, the final score from the questionnaire was categorized as stress: > 14 and Not stress: < 14. This categorization facilitated the interpretation of students' stress levels, enabling a clearer understanding of the impact of stress on various variables under investigation.

Social media usage instrument

For assessing social media usage, the Intensity of Social Media Usage questionnaire was employed. This scale comprises both favourable and unfavourable questions encompassing various aspects such as attention (content), engagement (features), duration, frequency, and types of social media platforms utilized. The questionnaire consists of 25 statements designed to gauge students' social media engagement with correlation coefficients ranging from 0.500 to 0.654. This process ensured that the questionnaire items effectively measured the intended constructs of social media usage among students [5, 17]. Furthermore, to ascertain the reliability of the instrument, a reliability test was conducted subsequent to the validity assessment. The reliability analysis provided crucial insights into the stability and consistency of the questionnaire, enhancing the confidence in using it as a tool to measure social media usage intensity in the current study.

Sleep quality instrument

This study utilized The Pittsburgh Sleep Quality Index (PSQI) to assess students' sleep quality. This questionnaire encompasses various components scored on a scale of 0 to 3. To gauge the reliability of the Indonesian version of the PSQI questionnaire, item discrimination was evaluated using corrected item-total correlation, while internal consistency was assessed through Cronbach's alpha coefficient. Corrected item-total correlation values below 0.3 indicate less valid components, whereas Cronbach's alpha values exceeding 0.7 are considered indicative of a reliable instrument [13, 18].

Insomnia instrument

This study employed the Insomnia Severity Index (ISI) to evaluate insomnia. The ISI consists of seven items that evaluate sleep onset, sleep maintenance, early morning awakening, daily functioning impairment due to sleep problems, perception of sleep problem severity, worries about sleep, and satisfaction with sleep patterns. Students rate the perceived severity of each item on a scale of 0 to 5. The total score of the instrument ranges from 0 to 35. Higher scores indicate more severe insomnia symptoms [1]. These instruments were chosen for their reliability and validity in measuring sleep quality and insomnia severity, ensuring the accuracy and comprehensiveness of data collection in the study.

Ethical considerations

Ethical approval was obtained for this study with No.: 2.172/XII/HREC/2023 prior to the commencement of data collection. The study adhered to ethical guidelines and principles, ensuring the confidentiality, anonymity, and voluntary participation of all students.

Data analysis

This study employed univariate, bivariate, and multivariate analysis (Figure 1). The univariate descriptive analysis was used to summarize the demographic characteristics of the study students, including age, gender, and residential type. Bivariate analysis of the Chi-square tests was utilized to examine the relationships between stress, social media usage, sleep quality, and insomnia. Statistical significance was set at $p < 0.05$. Data analysis was conducted using SPSS version 26.

Results and Discussion

Students' demographics

Based on the Table 1, 311 students were participated in this study that comprising from the Faculty of Medicine and the Faculty of Health Sciences, among whom 167 students were from the Faculty of Medicine, while 144 were enrolled in the Faculty of Health Sciences. The average age of the students were ranging from 17 years to 22 years.

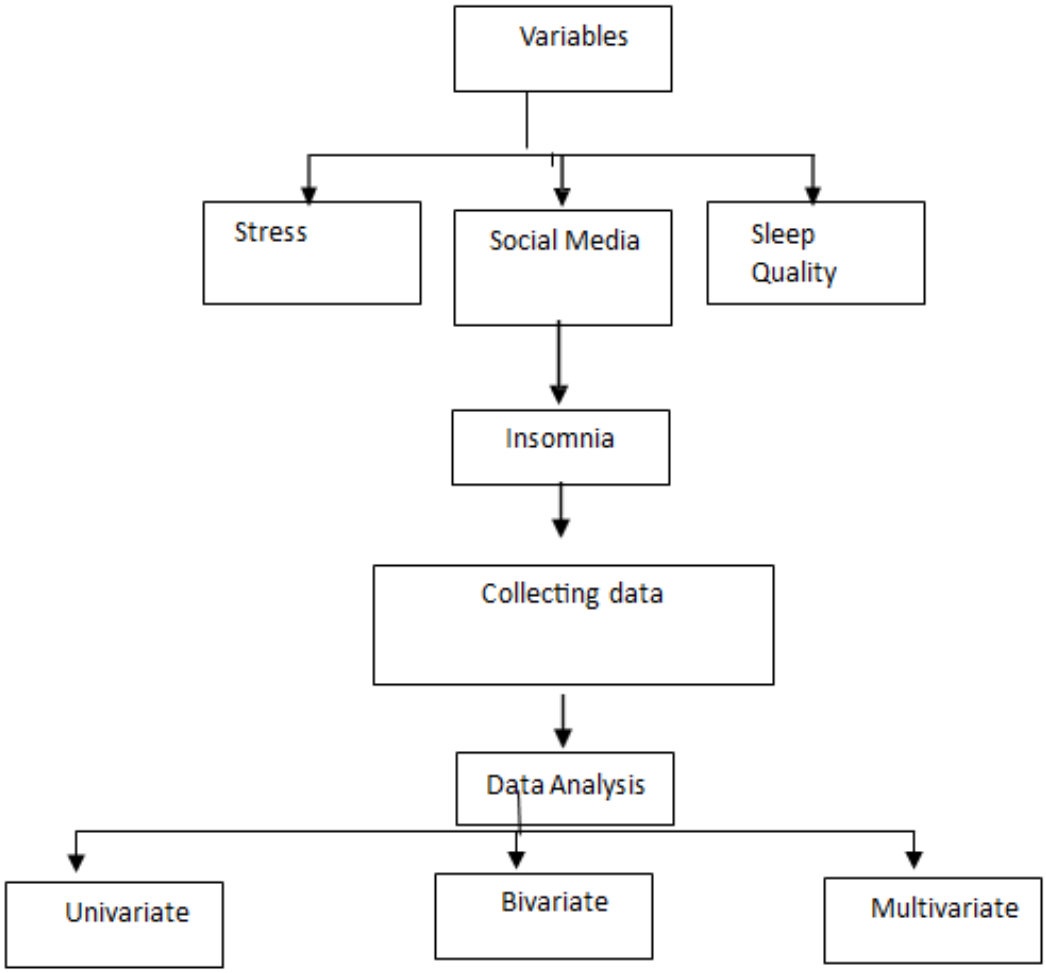


Figure 1: Research flowchart

Table 1: Students' demographics characteristics

Variable	N	Mean±std.dev	Frequency	Percentage
Age				
Faculty of Medicine	(167)	19.05±1.396		
Faculty of Health Science	(144)	19.27±1.497		
Gender				
Faculty of Medicine	(167)			
Male			58	34.7%
Female			109	65.3%
Faculty of Health Science	(144)			
Male			67	46.5%
Female			77	53.5%
Residential				
Faculty of Medicine	(167)			
Own house			21	12.6%
Rental house			146	87.4%
Faculty of Health Science	(144)			
Own house			14	9.7%
Rental house			130	90.3%

Source: Primary source

Regarding gender distribution, the majority of students were female, constituting 65.3% (109) of students from the Faculty of Medicine and 53.5% (77) of students from the Faculty of Health Sciences. Male students accounted for 34.7% (58) and 46.5% (67) from the Faculty of Medicine and the Faculty of Health Sciences, respectively. In terms of residential status during the study period, the majority of students resided in rented accommodations, with 87.4% (146) from the Faculty of Medicine and 90.3% (130) from the Faculty of Health Sciences. In contrast, a smaller proportion of students lived in their own homes, comprising 12.6% (21) from the Faculty of Medicine and 9.7% (14) from the Faculty of Health Sciences. These demographic characteristics provide insight into the composition of the study sample, facilitating a better understanding of the participant profile and potential implications for the research findings.

Stress levels and social media usage

Based on Table 2, among students from the Faculty of Medicine, 39 (23.4%) were found to experience stress, while 128 (76.6%) reported not being stressed. Similarly, in the Faculty of Health Sciences, 34 (23.6%) students experienced stress, with 110 (76.4%) reporting no stress. Regarding social media activity, 146 (87.4%) students from the Faculty of Medicine were active users, compared to 127 (88.2%) from the Faculty of Health Sciences. In contrast, 21 (12.6%) students from the Faculty of Medicine and 17 (11.8%) from the Faculty of Health Sciences were not active on social media.

Sleep quality and insomnia

The data revealed that 132 (79.0%) students from the Faculty of Medicine and 118 (81.9%) from the Faculty of Health Sciences reported poor sleep quality. However, 35 (21.0%) students from the Faculty of Medicine and 26 (18.1%) from the Faculty of Health Sciences reported good sleep quality. Regarding insomnia, 118 (70.7%) students from the Faculty of Medicine and 110 (76.4%) from the Faculty of Health Sciences were identified as experiencing initial insomnia or non-insomnia status. Furthermore, 49 (29.3%) students from the Faculty of Medicine and 34 (23.6%) from the Faculty of Health Sciences were classified as truly experiencing insomnia.

Relationship between stress, social media activity, sleep quality, and insomnia

Based on Tables 3, 4, and 5 which based on Chi-Square analysis, no significant association was found between stress and insomnia ($p = 0.876$) and between social media activity and insomnia ($p = 0.402$). However, sleep quality was significantly related to insomnia ($p < 0.001$).

The results of this study that was conducted among students of the Faculty of Medicine and Faculty of Health Sciences, spanning cohorts from 2020 to 2023, indicate that a substantial proportion, comprising 73.5% respondents, did not report significant stress levels and did not experience insomnia or only experienced mild insomnia. Factors such as coping mechanisms, stress tolerance, and individual characteristics contribute to variations in how stress affects sleep, thereby explaining why many respondents did not suffer from stress-related insomnia or experienced only mild symptoms. Furthermore, the study underscores that 26.5% of the total students, did not experience stress but still reported insomnia. This phenomenon might be attributed to respondents' ability to employ supportive coping mechanisms while still struggling to regulate their sleep patterns effectively. In addition, 72.6% of the total students, experienced mild insomnia despite experiencing stress. This result implies that although respondents may not have mastered coping mechanisms effectively, they could still manage their sleep patterns and adopt lifestyle habits conducive to healthy sleep [5, 19, 20].

The study indicated that there was a correlation between stress and insomnia which yielded a p-value of 0.876, indicating a lack of significant relationship between the two variables. Stress is a subjective phenomenon rooted in an individual's perception of their circumstances, characterized by a disjunction between reality and personal achievements, as well as an environment fraught with pressure.

Table 2: Research variables characteristics

Variable	N	Frequency	Percentage
Stress			
Faculty of Medicine	(167)		
Not Stress		128	76.6%
Stress		39	23.4%
Faculty of Health Science	(144)		
Not Stress		110	76.4%
Stress		34	23.6%
Social Media Activity			
Faculty of Medicine	(167)		
Not active		21	12.6%
Active		146	87.4%
Faculty of Health Science	(144)		
Not active		17	11.8%
Active		127	88.2%
Sleep Quality			
Faculty of Medicine	(167)		
Good		35	21.0%
Not Good		132	79.0%
Faculty of Health Science	(144)		
Good		26	18.1%
Not Good		118	81.9%
Insomnia			
Faculty of Medicine	(167)		
Insomnia		49	29.3%
Not Insomnia		118	70.7%
Faculty of Health Science	(144)		
Insomnia		34	23.6%
Not Insomnia		110	76.4%

Table 3: Relationship of stress and insomnia

			Insomnia		P-value
		Not Insomnia		Insomnia	
		n	%	n	%
Stress	Not stress	175	73.5	63	26.5
					0.876 (Less significant))
	Stress	53	72.6	20	27.4
Total		228	73.3	83	26.7

Table 4: Relationship of social media activity and insomnia

	Insomnia			*P*-value	
	Not Insomnia			Insomnia	
		n	%	n	%
Social Media	Not active	30	78.9	8	21.1
					0.402 (Less significant)
	Active	198	72.5	75	27.5
Total		228	73.3	83	26.7

Hence, this relationship does not appear to be mutually reciprocal [1, 2].

The outcomes of the study revealed that there was a less significant correlation between social media usage and insomnia with a p-value yielded $p > 0.05$. Among the respondents, 30 individuals, representing 78.9%, reported minimal or no engagement with social media platforms and did not experience insomnia or only experienced mild symptoms. In contrast, 8 respondents, comprising 21.1%, reported minimal social media activity but struggled with insomnia.

Moreover, this study unveils that a majority of respondents (72.5%), actively used social media yet did not encounter insomnia or faced only mild symptoms. This trend could be attributed to the respondents' adherence to particular practice of limitation use of the social media usage, such as refraining from engaging with social media before bedtime, reducing excessive exercise which leading to the sleep disturbances [1, 21]. However, this study also indicated that 27.5% of the sample, experienced insomnia despite their active social media usage. This phenomenon underscores the detrimental effects of excessive social media engagement on sleep quality, particularly when such usage disrupts established sleep patterns [13, 18].

The outcomes of the research analysis investigating the association between social media activity and insomnia among students yield a p-value of 0.402, suggesting a lack of significant relationship. However, this result underscores the considerable influence of social media usage on sleep quality. Given the demanding nature of their daily routines, most students find themselves deeply engrossed in various activities, rendering them highly prone to experiencing poor sleep quality [13, 18].

In Indonesia, the prevalence of sleep disorders among adolescents is alarmingly high, with a staggering 62.9% of adolescents aged 12-15 grappling with sleep disturbances. Among various types of disorders, wake-sleep transition disorder emerges as the most prevalent. Adolescents often lament inadequate sleep duration, struggle with morning awakenings, and battle feelings of fatigue and drowsiness throughout the day. The myriad of activities and challenges characteristic of adolescence renders this demographic particularly vulnerable to sleep disorders, notably insomnia [18, 22].

Relationship between sleep quality and insomnia

The results indicated that among the respondents (95.1%) reported having good sleep quality without experiencing insomnia or only experiencing mild insomnia. In contrast, 4.9% of the respondents, reported good sleep quality but struggled with insomnia. This phenomenon can be attributed to the influences of other factors such as stress and excessive use of social media, both of which are known to contribute to insomnia [1, 5, 23, 24].

Furthermore, the study highlights that 68.0% of the students, exhibited poor sleep quality but did not suffer from insomnia or experienced only mild symptoms. This discrepancy might be attributed to certain respondents having favourable medical conditions, mitigating the risk of insomnia despite poor sleep quality. However, 26.7% of the sample reported experiencing poor sleep quality alongside insomnia. The data analysis yielded a significant relationship between sleep quality and insomnia with a notable p-value of 0.000. This finding underscores the important of maintaining sleep quality, which in turn can reduce insomnia [5].

Table 5: Relationship of sleep quality and insomnia

			Insomnia		P-value
		Not Insomnia		Insomnia	
		n	%	n	%
Sleep Quality	Good	58	95.1	3	4.9
					0.000
	Not Good	170	68.0	80	32.0 (Significant)
Total		228	73.3	83	26.7

Insomnia often stems from disruptions in circadian sleep rhythms, irregular sleep patterns, and late-night social media engagement and the implementation of educational strategies can mitigate the impact of such disruption [1 ,25, 26]. This study found no significant relationship between stress and insomnia, which contrasts with some previous research. However, the significant relationship between poor sleep quality and insomnia highlights the need for interventions aimed at improving sleep hygiene among students.

Study limitations

This work is investigating the prevalence of insomnia among students enrolled in the Health Program at the Faculty of Medicine and Faculty of Health Sciences. One notable limitation is the limited sample due to restricted time. Due to the utilization of a cross-sectional research design, the study is unable to track longitudinal changes in the occurrence of insomnia among students over an extended period. Therefore, the use of different instruments and different study design could benefit for the forthcoming study. Furthermore, this study's cross-sectional design limits causal inferences. Additionally, self-reported data might be subject to response biases.

Conclusion

This study suggests that while stress and insomnia may often coexist, they do not necessarily have a causal relationship within this particular student population. Furthermore, despite concerns about the potential impact of excessive social media engagement on sleep quality, this study did not find evidence to support such a relationship among the surveyed students. However, a notable finding is the significant relationship observed between sleep quality and insomnia among students and highlighting the importance of addressing sleep disturbances to mitigate the risk of insomnia. These findings suggest that improving sleep quality should be a focus in reducing insomnia among university students.

The scope of this study was only limited to investigating the influence of stress, social media usage, and sleep quality on insomnia. Future studies could explore additional factors that may contribute to or exacerbate insomnia among students and enhancing the developmental model by focusing on delving deeper into the underlying causes of insomnia reported by students. By identifying specific triggers or patterns associated with insomnia occurrences, targeted interventions can be developed to address these issues effectively.

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Authors' Contributions

All authors contributed to data analysis, drafting, and revising of the paper and agreed to be responsible for all the aspects of this work.

ORCID

N Juni Triastuti
https://orcid.org/0000-0003-3460-3961

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