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ORIGINAL RESEARCH

THE EFFECT OF COFFEE CONSUMPTION ON SLEEP QUALITY

Kimberly Fiona Retandy[1], Pricilla Yani Gunawan[2]

[1]*Medical Profession Program, Faculty of Medicine, Pelita Harapan University, Tangerang, Indonesia*
[2]*Department of Neurology, Faculty of Medicine, Pelita Harapan University, Tangerang, Indonesia*
***Correspondence**: kimberlyfiona2003@gmail.com; ORCID ID: 0009-0001-4256-3499

Abstract

Introduction: Faculty of Medicine students frequently experience academic pressure and commonly consume coffee to improve alertness. Excessive coffee consumption or consumption at inappropriate times can result in sleep difficulties, disrupt deep sleep stages, and negatively impact the overall quality of nightly rest.

Methods: This study investigates the impact of coffee consumption on sleep quality among students. This research employs a cross-sectional design utilizing categorical comparison. Medical students with no history of sleep disorders were included in the study. Data collected include demographic data, Perceived Stress Scale (PSS-10) questionnaire, Pittsburgh Sleep Quality Index (PSQI), and coffee consumption habits questionnaire.

Results: Analysis of 96 samples revealed that in the low coffee consumption group, 35 respondents (36.5%) exhibited mild sleep disturbance, while 17 respondents (17.7%) demonstrated moderate-heavy sleep disturbance. In the moderate-high coffee consumption group, 22 respondents (22.9%) presented with mild sleep disturbance, and an equal number showed moderate-heavy sleep disturbance. There were no association between coffee consumption and sleep quality ($p = 0.131$).

Conclusions: There were no significant association between coffee consumption and sleep quality in medical students

Keywords: Coffee consumption, sleep quality, medical students

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Introduction

Coffee comprises various chemical compounds that provide advantages to the human body, with caffeine being one of them.[1] Regular caffeine consumers frequently enjoy its benefits; however, some individuals may encounter side effects, particularly in relation to sleep quality.[2] The immediate impact of caffeine on sleep quality is mainly attributed to its capacity to diminish sleepiness and elevate heart rate via its hormonal and neurological stimulation.[3] Inadequate sleep quality correlates with mood disturbances, reduced productivity, and a heightened risk of chronic diseases.

The quality of sleep significantly influences an individual's overall quality of life, impacting daily activities and productivity levels.[4] Prior investigations into this subject have produced varied outcomes. A study conducted by Milasari (2022) identified a noteworthy correlation between coffee consumption and sleep

disturbances in young adults aged 17-25.[5] In contrast, a separate study conducted by Mette van der Linden (2024) indicated that women who abstained from coffee faced an increased risk of sleep disorders and averaged fewer than seven hours of sleep each night (OR = 2.26 [95% CI = 1.22–4.20]).[6] A study conducted by Budiyanti (2023) involving 386 medical students revealed that 21.5% experienced sleep disturbances, while 43.52% reported caffeine consumption, indicating a significant association (P<0.001).[7] In a similar vein, a study conducted by Anggraini (2018) revealed that 81.9% of 94 medical students reported experiencing sleep disturbances.[8] This study aims to investigate the impact of coffee consumption habits on the sleep quality of medical students, in light of the growing trend of coffee drinking among university students and the existing knowledge gap regarding its effects on sleep quality.

Materials and Methods

This is a cross-sectional prospective study. Medical students who gave their consent, were included in this study. Students with psychiatric disorder (i.e. Major Depressive Disorder, Post Traumatic Stress Disorder, Attention Deficit Hyperactivity Disorder), taking antidepressants, anti-psychotics, mood stabilizer, or beta-blocker, as well as patients that had a history of allergy or intolerance towards coffee were excluded.

Sample size needed for this study follows the equation to calculate minimum needed sample in non-paired categorical comparative analytical research, which is 96 subjects

Data is collected through non-probability convenience sampling. Demographic data, sleep quality using Pittsburgh Sleep Quality Index (PSQI), stress levels using Perceived Stress Scale (PSS-10), as well as coffee consumption questionnaire.[9-11] The study protocol was approved by the Pelita Harapan University Faculty of Medicine Ethics Committee (210/K-LKJ/ETIK/VI/ 2024).

The entire statistical analysis of the data was performed with the statistical programs SPSS V27 for Windows version 11, and values with p<0.05 were considered statistically significant.

Results

Table 1. Demographic characteristics

Variable	Frequency (n)	Percentage (%)
Gender		
Male	37	38.5
Female	59	61.5
Coffee Consumption		
Low	52	54.2
Moderate – High	44	45.8
Sleep Disturbance		
Yes	36	37.5
No	60	62.5
PSQI		
Mild disturbance	57	59.4
Moderate – Severe Disturbance	39	40.6
PSS-10		
Low Stress	14	14.6
Moderate – High Stress	82	85.4

The research data collection took place between March 2024 – May 2024. The demographic data of respondents can be seen on T**able 1**.

Among 96 respondents 62.5% exhibited no sleep disorders. Sleep quality, as measured by PSQI, indicated mild disturbances in 57 participants (59.4%) and moderate to severe disturbances in 39 participants (40.6%). Stress levels, as measured by the PSS-10, were low in 14 participants (14.6%) and moderate to high in 82 participants (85.4%). A total of 52 subjects had mild coffee consumption.

Bivariate analysis indicated no significant associations among gender, perceived stress level (PSS-10) and sleep quality (PSQI) **(Table 2)**. Gender did not seem to affect sleep quality (p = 0.153; OR 1.46, 95% CI: 0.62–3.40).

Table 2. Bivariate analysis of risk factors towards sleep quality

Variable		PSQI		P-value	OR [95% CI]
		Mild	Moderate – Severe		
Gender	Male	24 (25%)	13 (13.5%)	0.153	1.46 [0.62 – 3.4]
	Female	33 (34.4%)	26 (27.1%)		
PSS-10	Low	7 (7.3%)	7 (7.3%)	0.632	2.24 [0.44 – 11.47]
	Moderate – High	50 (52.1%)	32 (33.3%)		

Table 3. Effects of coffee consumption habits towards sleep quality

Variable		PSQI		P-value	Odds Ratio [95% CI]
		Mild	Moderate - Severe		
Coffee Consumption	Low	35 (36.5%)	17 (17.7%)	0.131	2.06 [0.9 – 4.71]
	Moderate – High	22 (22.9%)	22 (22.9%)		

Stress level was also not significantly associated with sleep quality (p = 0.632; OR 2.24, 95% CI: 0.44–11.47).

Table 3 presented the relationship between coffee consumption patterns and sleep quality, as measured by the PSQI. Although moderate-high coffee consumption showed a tendency towards moderate-severe sleep disturbances, analysis showed no significance (p = 0.131; OR 2.06; 95% CI 0.9–4.71).

Table 4 showed the association between coffee consumption and sleep quality, stratified by gender and stress level. There was a trend toward lower sleep quality in moderate-high coffee consumption. However, this association was not statistically significant.

Table 4. Stratified analysis of risk factors coffee consumption habits towards sleep quality

Variable	Coffee Consumption	PSQI		P-value	Odds Ratio [95% CI]
		Mild	Moderate - Severe		
Gender					
Female	Low	20 (33.9%)	13 (22.0%)	0.134	1.538 [0.54 – 4.34]
	Moderate – High	13 (22.0%)	13 (22.0%)		
Male	Low	15 (40.5%)	4 (10.8%)	0,582	3.75 [0.89 – 15.8]
	Moderate – High	9 (24.3%)	9 (24.3%)		
Stress levels (PSS-10)					
Low Stress	Low	3 (21.4%)	2 (14.3%)	1.000	1.875 [0.2 – 17.26]
	Moderate – High	4 (28.6%)	5 (35.7%)		
Moderate – high stress	Low	32 (39.0%)	15 (18.3%)	0.193	2.015 [0.87 – 4.97]
	Moderate – High	18 (22.0%)	17 (20.7%)		

Discussion

This study found no association between coffee consumption and sleep quality, as evaluated by the PSQI. This finding differs with study by Milasari (2022), who identified a significant relationship between coffee consumption and sleep disturbances in late adolescents aged 17-25 years.[5] In contrast, Veronica (2023) reported no significant correlation between coffee consumption and sleep quality among active medical students.[11] These differences may arise from possible confounding factors and different screening tools.

Stratified analysis for confounding risk indicated that female gender and elevated stress levels correlated with diminished sleep quality relative to male counterparts and individuals with lower stress levels. Age did not affect the relationship between coffee consumption and sleep quality. These stratified associations did not achieve statistical significance. This is consistent with prior research, including Concerto et al. (2017), which identified a correlation between perceived stress scores and coffee consumption with an increased risk of poor sleep, especially in predominantly female populations.[12] The discrepancy in the current study may be due to different population and different study design.

A randomized controlled trial conducted by Weibel et al. (2021) corroborates the present findings, indicating that regular daily caffeine consumption in young adult males has a negligible effect on sleep architecture and subjective sleep quality, with no significant differences observed in total sleep time or sleep latency between habitual and non-caffeine users.[13] The research indicates that prolonged coffee consumption may lead to tolerance to the stimulatory effects of caffeine, thereby reducing its influence on sleep disturbances in long-term users.

This study utilizes a pertinent sample of medical students, providing valuable insights into sleep-related behaviors within this demographic. The use of validated instruments like the PSQI enhances the reliability of sleep quality assessments. However, this study is limited

by the uniform subjects and study design through self-reported questionnaires, suggesting potential bias stemming from the subjective nature of self-administered evaluations. Thus, the data may have been affected by recall bias or social desirability, factors that must be taken into account when interpreting the results.

Conclusion

This study showed that coffee consumption habits, encompassing both frequency and quantity, did not show a significant association with sleep quality among Faculty of Medicine students, as assessed by validated instruments. A majority of participants demonstrated low coffee consumption (54.2%) and mild sleep disturbances (59.4%), whereas moderate to high coffee intake and moderate to severe sleep disturbances were noted in 45.8% and 40.6% of subjects, respectively. Additionally, individual factors including BMI, sex, and perceived stress levels did not exhibit statistically significant correlations with sleep quality in this population.

Conflict of Interest

The authors declared no conflicts of interest with respect to the authorship and/or publication of this article.

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