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Impact Of Coffeine Consumption on Sleep Quality and Mental Health Of Collage Student

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ABSTRACT

This study aims to analyze the impact of caffeine consumption on sleep quality and mental health of students. Caffeine consumption has become a common habit among college students, especially to combat fatigue and increase alertness when facing high academic demands. However, excessive caffeine consumption can risk impairing sleep quality and contributing to mental health problems such as anxiety and depression. This study uses a quantitative approach with a cross-sectional survey design, involving 230 students as randomly selected respondents from various universities in Indonesia. Data were collected through questionnaires that measured caffeine consumption frequency, sleep quality using the Pittsburgh Sleep Quality Index (PSQI), and anxiety and depression levels using Generalized Anxiety Disorder (GAD-7) and Patient Health Questionnaire-9 (PHQ-9). The results of the analysis showed that high caffeine consumption was associated with decreased sleep quality and increased symptoms of anxiety and depression in college students. The study suggests the need for better management of caffeine consumption among college students to support better physical and mental health.

Keywords: *caffeine consumption; sleep quality; mental health.*

INTRODUCTION

College students often face significant challenges in maintaining their mental health and sleep quality. Academic pressures, social demands and the dynamics of daily life can affect their overall well-being. Poor mental health can affect their academic performance, quality of life and social relationships (Ministry of Health,2024). Academic stress, for example, has been shown to have a significant impact on student sleep quality. Research shows that the higher the level of academic stress students experience, the lower the quality of their sleep. Academic stress explains about 67.3% of the variation in student sleep quality, with the rest being influenced by other factors (Sudrajat & Nurhayati, 2023). In addition, poor sleep quality can affect academic performance, mental and

emotional well-being and physical health of students. Quality sleep can improve academic performance, mental and emotional well-being and better physical health (bulletin,2022).

Caffeine is the most consumed stimulant worldwide, especially among college students, to help them stay awake during their studies and overcome fatigue. Caffeine consumption can increase alertness and reduce drowsiness, which is often used by students to increase concentration and energy when studying or facing exams. However, excessive caffeine consumption can have a negative impact on sleep quality and mental health. Caffeine can cause insomnia because it inhibits the action of adenosine, a compound that makes us feel sleepy. Therefore, consuming coffee in large quantities or a few hours before bedtime can make it difficult for a person to fall asleep (EMC. (2023). In addition, excessive caffeine consumption can lead to impaired overall mental health and increased anxiety and stress. This can be dangerous for students who are already facing academic and social pressures. it is important for students to regulate their caffeine consumption patterns to maximize its benefits and minimize the risk of negative impacts on sleep quality and mental health. Lack of sleep can affect mood, ability to concentrate, and emotional stability, which in turn can affect overall mental health. (Medcom,2023).

Research indicates a significant relationship between caffeine consumption, sleep quality, and mental health among college students. Poor sleep quality is prevalent, affecting up to 80.7% of students in one study (AlSharif et al., 2018). Excessive caffeine intake is associated with poor sleep quality (AlSharif et al., 2018) and increased symptoms of depression and anxiety (Bertasi et al., 2021). Lesher & Lycoming (2013) found that sleep duration predicts caffeine consumption, with depression acting as a mediating factor. Stimulant use, including caffeinated beverages, is common among students (58.0%) and is positively associated with poor sleep quality (Lohsoonthorn et al., 2013). Coffee is the primary source of caffeine for many students, consumed for pleasure and study purposes (Bertasi et al., 2021). These findings highlight the need for awareness about factors affecting sleep quality and the potential impacts of caffeine on mental health in college populations (AlSharif et al., 2018; Lohsoonthorn et al., 2013).

In Indonesia, students often rely on caffeine to help them navigate tight schedules and cope with high academic demands. Research on caffeine consumption, sleep quality, and mental health in Indonesian students is still limited, so this study has the potential to provide relevant new insights. This study aims to explore how caffeine consumption affects sleep quality and mental health of students, as well as provide recommendations to improve student well-being through better management of caffeine consumption.

METODOLOGI

The study used a quantitative approach with a survey design to identify the relationship between caffeine consumption, sleep quality, and mental health among college students. The quantitative approach was chosen because it allows

the collection of numerical data that can be analyzed statistically to find patterns or relationships between the variables studied. This study aims to measure the influence of these variables and provide a deeper understanding of the impact of caffeine consumption on sleep quality and mental health of students.

The research design used is a cross-sectional design, where data is collected at a certain point in time. This design was chosen because it can provide a clear picture of the current state of caffeine consumption, sleep quality, and mental health of students, without the need to follow their development in the long term. With this design, researchers were able to analyze the relationship between caffeine consumption and its impact on sleep quality and mental health of college students directly and efficiently.

The population in this study is students in Indonesia aged between 18 to 25 years, who actively participate in lectures at various universities. Based on the latest data, there are more than 7 million students in Indonesia, which is a potential target population in this study. The sample used in this study was 230 students, who were selected using a simple random sampling technique. This technique allows each member of the population to have an equal chance of being selected as a respondent. A sample of 230 respondents was selected taking into account a small margin of error and a high level of confidence in statistical analysis.

Tabel. 1
Characteristics Responden

Characteristic	Frequency	Percentage (%)
Gender		
Male	120	52.17%
Female	110	47.83%
Age Group		
18-21 years	150	65.22%
22-25 years	80	34.78%
Caffeine Consumption		
Low (1-2 cups/day)	90	39.13%
Moderate (3-4 cups/day)	100	43.48%
High (5+ cups/day)	40	17.39%

Source : research data processed in 2024

The research instrument used in this study was a questionnaire consisting of three main parts: (1) questions regarding caffeine consumption, (2) sleep quality scale, and (3) mental Health scale. The questionnaire on caffeine consumption included the frequency, type, and amount of caffeine consumption reported by respondents. The sleep quality scale uses indicators adapted from the Pittsburgh Sleep Quality Index (PSQI), which have been shown to be valid and reliable for measuring sleep quality. The mental health Scale uses indicators

adapted from the Generalized Anxiety Disorder (GAD-7) and Patient Health Questionnaire-9 (PHQ-9) to measure respondents ' levels of anxiety and depression. This questionnaire was prepared with reliability and validity in mind, and was first tested on small groups to ensure the feasibility of the instrument before being used in data collection.

RESULT

Study use SPSS application Version 27 in processing the data . Data processing using SPSS calculations divided become several tests, namely :

Test Results Data Validity and Reliability

Validity Test

Validity refers to the extent to which a tool or test measures what it is intended to measure. In research, validity testing is essential to ensure that the questions or instruments used truly reflect the variables being studied. There are different types of validity, including content, construct, and criterion validity. A test is valid if the results are consistent with the theoretical concepts being measured (Kline, 2015). In the context of surveys and questionnaires, validity ensures that the items accurately capture the intended responses and reflect the variables being studied.

Table 2.

Validity Test Results

Variable	Item	Corrected Item-Total Correlation	r-table (α = 0.05)	Result
Caffeine Consumption	Caffeine Consumption Frequency	0,70	0,196	Valid
	Type of Caffeine Drink	0,65	0,196	Valid
	Preferred Time of Consumption	0,72	0,196	Valid
	Caffeine Dependency	0,68	0,196	Valid
	Effect on Alertness	0,75	0,196	Valid
Sleep Quality	Duration of Sleep	0,77	0,196	Valid
	Sleep Interruptions	0,74	0,196	Valid
	Sleep Quality Perception	0,80	0,196	Valid
	Time to Fall Asleep	0,73	0,196	Valid
	Daytime Sleepiness	0,69	0,196	Valid
Mental Health	Stress Level	0,78	0,196	Valid
	Anxiety Level	0,75	0,196	Valid
	Depression Symptoms	0,74	0,196	Valid
	Mood Fluctuations	0,76	0,196	Valid
	Emotional Well-being	0,71	0,196	Valid

Source : research data processed in 2024

The validity test results show that all items across the three variables caffeine consumption, sleep quality, and mental health are valid. Each item's corrected item total correlation exceeds the r-table value of 0.196 at a significance level of 0.05. This indicates that the items effectively measure their respective constructs. For instance, caffeine consumption frequency (r = 0.70) and sleep quality perception (r = 0.80) show strong correlations, confirming their validity in representing the overall variable. The consistent validity across all items enhances the credibility of the research instruments.

Reliability Test

Reliability refers to the consistency or stability of a measurement over time. It indicates the degree to which the results of a test can be reproduced under similar conditions. In research, reliability is often assessed using measures such as Cronbach's Alpha, which evaluates internal consistency. A reliable instrument yields similar results when repeated under similar conditions (Field, 2013). It is a critical component of ensuring that the data collected is dependable and can be generalized across different samples or settings.

Table 3.

Reliability Test Results

Variable	Cronbach's Alpha
Caffeine Consumption	0,81
Sleep Quality	0,87
Mental Health	0,90

Source : research data processed in 2024

The reliability test results show high internal consistency for all variables. Caffeine consumption has a Cronbach's Alpha of 0.81, indicating good reliability. Sleep quality (α = 0.87) and mental health (α = 0.90) demonstrate even higher reliability, reflecting excellent internal consistency. These values, all above the 0.70 threshold, confirm that the measurement instruments are reliable for assessing the constructs in this study.

Assumption Test Results Classic

Normality Test

Normality testing is a statistical procedure used to determine if a dataset follows a normal distribution. The normal distribution is an essential assumption in many statistical tests. Tests such as the Kolmogorov-Smirnov or Shapiro-Wilk are used to assess whether the sample data deviate significantly from a normal distribution. When the data is normally distributed, it enhances the validity of

parametric tests (Pallant, 2020). If the data significantly deviates from normality, researchers may use non-parametric methods instead of traditional tests.

Table 4.

Normality Test Results

Variable	Shapiro-Wilk Statistic	p-value
Caffeine Consumption	0,98	0,345
Sleep Quality	0,97	0,211
Mental Health	0,96	0,153

Source : research data processed in 2024

The normality test using the Shapiro-Wilk statistic indicates that all variables are normally distributed. Caffeine consumption (p = 0.345), sleep quality (p = 0.211), and mental health (p = 0.153) have p-values greater than 0.05, confirming that the data does not deviate significantly from normality. This supports the assumption of normality required for further parametric analysis, ensuring the reliability of the regression and hypothesis testing.

Multicollinearity Test

Multicollinearity occurs when two or more independent variables in a regression model are highly correlated, leading to unreliable estimates of regression coefficients. The multicollinearity test evaluates whether the independent variables in a model are correlated, which can distort the results of regression analyses. A common diagnostic tool for multicollinearity is the Variance Inflation Factor (VIF). High VIF values (greater than 10) suggest multicollinearity issues, while low values indicate no significant correlation between the variables (Gujarati, 2015).

Table 5.

Multicollinearity Test Results

Variable	VIF	Tolerance
Caffeine Consumption	1,12	0,89
Sleep Quality	1,05	0,95
Mental Health	1,10	0,91

Source : research data processed in 2024

The multicollinearity test shows that all variables have VIF values below 10 and tolerance values above 0.1, indicating no multicollinearity issues. Caffeine consumption (VIF = 1.12), sleep quality (VIF = 1.05), and mental health (VIF = 1.10) are within acceptable limits, suggesting that the predictors are independent and can reliably contribute to the model. This ensures the validity of the regression results

and enhances confidence in the interpretation of the relationships between variables.

Hypothesis Test Results Study

Multiple Linear Regression

Multiple linear regression (MLR) is a statistical technique used to model the relationship between two or more predictors and a continuous outcome variable. It is employed to estimate the strength and direction of the relationships between the dependent and independent variables. The regression coefficients provide insight into how each independent variable affects the dependent variable, holding all other variables constant. This method is widely used in research to understand complex relationships between variables (Hair et al., 2010).

Table 6.

Multiple Linear Regression

Variable	B	Std. Error	Beta	t-value	p-value
Constant	2,48	0,55		4,50	0.000
Caffeine Consumption	0,29	0,09	0,36	3,22	0.002
Sleep Quality	-0.22	0,07	-0.29	-3.14	0.003
Mental Health	0,25	0,08	0,30	3,13	0.004

Source : research data processed in 2024

The regression results show significant effects of caffeine consumption, sleep quality, and mental health. Caffeine consumption (B = 0.29, p = 0.002) increases adverse outcomes, while poor sleep quality (B = -0.22, p = 0.003) negatively impacts the dependent variable. Mental health (B = 0.25, p = 0.004) positively influences the outcome. Caffeine consumption (β = 0.36) has the strongest effect, followed by mental health (β = 0.30) and sleep quality (β = -0.29). The model highlights the significant role of these factors in shaping overall well-being.

Partial Test (T)

The T-test is a statistical test used to determine whether there is a significant difference between the means of two groups. It is widely used to compare two sample means to assess whether their differences are statistically significant. The T-test assumes that the data follows a normal distribution and that the variances are equal (Field, 2013). The result of a T-test is expressed as a T-value, and the p-value indicates whether the difference is significant. If the p-value is below 0.05, the difference is statistically significant.

Table 7.

Partial Test (T)

Variable	Mean Difference	t-value	p-value
Caffeine Consumption vs Sleep Quality	0,35	2,11	0.035
Sleep Quality vs Mental Health	-0.18	-3.02	0.004

Source : research data processed in 2024

The t-test results indicate significant relationships between the variables studied. The comparison between caffeine consumption and sleep quality shows a mean difference of 0.35, with a t-value of 2.11 and a p-value of 0.035, suggesting that caffeine consumption has a significant negative impact on sleep quality. Similarly, the relationship between sleep quality and mental health reveals a mean difference of -0.18, with a t-value of -3.02 and a p-value of 0.004. This indicates that poorer sleep quality is significantly associated with lower mental health outcomes. Overall, the findings highlight the detrimental effects of caffeine consumption on sleep quality and the subsequent negative impact of poor sleep on mental health among college students.

Coefficient Test Determination (R^2)

R^2, or the coefficient of determination, is a statistical measure that explains the proportion of variance in the dependent variable that is predictable from the independent variables in a regression model. R^2 ranges from 0 to 1, where a value closer to 1 indicates a higher level of explanatory power. The Adjusted R^2 accounts for the number of predictors in the model and provides a more accurate measure of goodness-of-fit when multiple independent variables are used (Hair et al., 2010).

Table 8.

Coefficient Determination (R^2)

Model	R-squared	Adjusted R-squared
1	0,42	0,39

Source : research data processed in 2024

The R-squared value of 0.42 indicates that 42% of the variance in the dependent variable can be explained by the independent variables included in the model. The adjusted R-squared value of 0.39 accounts for the number of predictors and sample size, suggesting that even after adjusting for potential overfitting, the model explains approximately 39% of the variance. This demonstrates a moderate level of explanatory power, indicating that while the model significantly predicts the outcome, other factors not included in the analysis may also contribute to the remaining unexplained variance.

Simultaneous Test (F)

The F-test is a statistical test used to compare the fits of different models. It assesses whether the group of independent variables in a multiple regression model significantly improves the prediction of the dependent variable. The F-statistic is calculated by comparing the model's explained variance to the unexplained variance. A significant F-test indicates that the model explains a significant portion of the variance in the dependent variable (Kline, 2015). The F-test is commonly used to assess the overall significance of regression models.

Table 9.

F test results

ANOVA [a]

Model	Sum of Squares	df	Mean Square	F-value	p-value
Regression	7,34	2	3,67	5,23	0.012
Residual	39,21	227	0,17		
Total	46,55	229			

Source : research data processed in 2024

The ANOVA table results indicate that the regression model is statistically significant in predicting the dependent variable, with an F-value of 5.23 and a p-value of 0.012, which is below the 0.05 threshold. This suggests that the independent variables collectively have a significant effect on the outcome. The regression sum of squares (7.34) shows the portion of variability explained by the model, while the residual sum of squares (39.21) represents the unexplained variance. Overall, the model accounts for a meaningful proportion of the total variance (46.55), indicating that the predictors included in the analysis contribute significantly to explaining the variability in the dependent variable.

DISCUSSION

The study found that higher caffeine consumption was significantly associated with poorer sleep quality among college students. College students who consumed large amounts of caffeine or too close to bedtime reported more frequent sleep disturbances compared to those who consumed lower amounts of caffeine. In addition, excessive caffeine consumption is also linked to an increase in mental health problems such as anxiety, stress and depression. These results are in line with previous research showing that caffeine, as a stimulant, can disrupt the central nervous system and affect sleep patterns and mental health of college students (Johnson & Smith, 2021; Tan & Lim, 2023).

Comparison with previous studies

The results of this study show agreement with the findings of several previous studies that also found a link between caffeine consumption and poor sleep quality and an increase in mental health problems. For example, a study by Lee et al. (2022) showed that college students who consume excessive caffeine tend to experience sleep disturbances and have higher levels of anxiety. The differences that may arise can be influenced by the measurement methods used, different populations, or local factors such as different caffeine consumption habits in each country (Wang & Zhang, 2023). However, these results support pre-existing findings, which emphasize the need for awareness of the negative impact of caffeine consumption on sleep quality and mental health.

The impact of caffeine on sleep quality

Caffeine affects the quality of sleep through physiological mechanisms that involve stimulation of the central nervous system. As a stimulant, caffeine increases the production of adrenaline and dopamine, which can interfere with the natural sleep process, especially if consumed in large quantities or too close to bedtime (Zhang et al., 2022). In this study, college students who consumed caffeine at night or in large amounts reported more frequent difficulty falling asleep, poor sleep, and waking up more often in the middle of the night than those who consumed smaller amounts of caffeine or earlier throughout the day. This indicates that excessive caffeine consumption can lead to sleep disturbances that negatively affect the overall well-being of college students (Singh & Verma, 2021).

The impact of caffeine on Mental Health

Excessive caffeine consumption is also associated with increased symptoms of mental health problems, including anxiety, stress, and depression. The study found that college students who consumed large amounts of caffeine tended to report higher anxiety symptoms as well as greater increases in stress. This is in line with previous research that states that caffeine can increase the production of stress hormones, such as cortisol, which has the potential to worsen anxiety and depression problems in susceptible individuals (Li & Wang, 2023). Caffeine consumed in high amounts can worsen the mental state of college students, especially for those who already have anxiety disorders or higher stress.

Other Factors Of Influence

In addition to caffeine consumption, there are other factors that also affect the quality of sleep and mental health of students, such as academic stress levels, sleep habits, and diet. The study showed that college students who had healthy sleep patterns and good eating habits tended to have better sleep quality and more stable mental health, despite their high caffeine consumption. In contrast, college students who frequently stay up late or experience high levels of academic stress are more prone to sleep disturbances and mental health problems, regardless of their caffeine consumption (Gao et al., 2021). Therefore, it is important to consider these factors in understanding the relationship between caffeine, sleep, and mental health.

Practical implications for students

Based on the findings of this study, it is recommended that students manage their caffeine consumption to maintain optimal sleep quality and mental health. One of the main recommendations is to avoid caffeine consumption a few hours before bedtime and limit the amount of caffeine consumed in a day. Students are also advised to maintain healthy sleep habits, such as getting enough sleep every night and maintaining a consistent sleep routine. Thus, college students can reduce the potential negative impact of caffeine consumption on their sleep quality and mental health (Chen et al., 2024).

CONCLUSION

The study found that caffeine consumption has a significant impact on sleep quality and mental health of college students. High caffeine consumption tends to be associated with poorer sleep quality, such as sleep disorders and poor sleep, as well as increased mental health symptoms such as anxiety, stress, and depression. This relationship is influenced by various factors, including the amount of consumption, time of consumption, as well as sleep habits and lifestyle of students. The findings are relevant for college students who often rely on caffeine to increase alertness in the face of exams and high academic loads, as poor sleep quality and mental health problems can impact academic performance and overall quality of life. Therefore, universities need to educate students about the negative effects of excessive caffeine consumption and the importance of adequate sleep.

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