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Relationship of Caffeinated Beverage Intake with Sleep Quality of 2020 Students' Faculty of Medicine Tarumanagara University

Wendy Tan[1], Meilani Kumala[2]
[1,2]*Fakultas Kedokteran, Universitas Tarumanagara Jakarta, Indonesia*
wendy.405190019@stu.untar.ac.id, melkum58@yahoo.com

Abstract

Sleep is a condition in which a person becomes less aware of something. Short rest periods (<7 hours) can increase the risk of death and have been considered a major risk factor for damaging the endocrine system, immune system, nervous system, and cardiovascular system. Many factors affect sleep duration and sleep quality in adults and children, including the use of caffeinated beverages. The purpose of this study was to determine whether there was a relationship between the intake of caffeinated beverages and the sleep quality of the 2020 students of the Faculty of Medicine, Tarumanagara University. The research is a descriptive-analytic cross-sectional study. Data was collected by distributing g-form to respondents. The collected data were inputted and analyzed using SPSS with Chi-Square and Fisher's Exact as an alternative analysis for cells with an expected of less than five. The results of this study showed that 41.3% of respondents had good sleep quality, and 58.7% of respondents had poor sleep quality. There is a significant relationship between coffee intake and sleep quality (p-value = 0.044), and there is no significant relationship between intake of tea, chocolate drinks, soft drinks, and energy drinks with sleep quality. The value of the prevalence ratio of caffeinated beverages intake with sleep quality is greater than one, which indicates caffeinated beverages are a risk for poor sleep quality.

Keywords
caffeine intake; sleep quality

I. Introduction

Sleep is a condition in which a person becomes less aware of something. However, brain activity still plays an important role in regulating digestive system, cardiovascular system, and immune system. Sleep can increase the body's energy and intellectual processing, which includes the capacity and ability to associate, and read information stored in the brain, as well as receive information while awake. Most adults need between 7-9 hours of sleep per night. Short rest periods (under 7 hours) can increase the risk of death and have been considered a major risk factor for damaging the endocrine system, immune system, nervous system, and cardiovascular system. Many factors influence sleep duration and sleep quality in adults and children, including caffeine intake.

Caffeine is a naturally occurring central nervous system (CNS) stimulant in the methylxanthine group. It is the most widely consumed psychostimulant worldwide. In Indonesia, it is estimated that more than 50% and about 85 percent of the US population consume caffeinated beverages daily. Most caffeine comes from coffee beans, but it can also be found naturally in many kinds of tea and cocoa bean. Caffeine is also added in small amounts of softdrinks and energy drinks.

A study in the US found that caffeine consumption in young adults deserves special attention. About 75-98% of young adults reported that they consumed at least one caffeinated beverage daily, and 31% drank two or more per day. This figure is close to the level consumed by adults. Both school-age adolescents, boys and girls, age 12-21 years old, consume caffeine to increase their enthusiasm for homework and eliminate laziness during school hours. Adolescents showed improved performance and reported reduced "fatigue" after moderate caffeine intake.

Caffeine is generally believed to improve performance and mood; it is also generally available, widely marketed, and socially recognized among the young and adolescent population. Nevertheless, a descriptive study by Bawazeer and Alsobahi (2013) found that 34.3 percent of consumers of caffeinated energy drinks experienced side effects including heart palpitations, lack of sleep, headaches, tremors, restlessness, nausea, and vomiting. In addition, regular consumption of caffeine can lead to addiction.

Based on this description, it is necessary to research to determine the relationship of caffeinated beverages intake with sleep quality.

II. Research Method

The research design carried out in this study is a descriptive-analytic cross-sectional study to find the relationship between the independent variable (risk factor) and the dependent variable (effect). The sample in this study were students of the Faculty of Medicine, Tarumanagara University class of 2020, and they met the inclusion criteria of this study. The inclusion criteria for this study were 2020 students of the Faculty of Medicine, Tarumanagara University, and students of the Faculty of Medicine, Tarumanagara University, who were willing to fill out informed consent and questionnaires. Exclusion criteria for this study were respondents who did not fill out the questionnaire completely and respondents who were not willing to become research respondents. Calculation of the estimated sample size required is carried out using the Lemeshow. From the calculation, it is found that the estimated sample size required is 209 respondents.

The data collection for this research is primary data. Primary data is obtained directly from the sample using a previously prepared questionnaire. Data was collected by distributing g-form to respondents. In the g-form, there are two aspects of questions, including the frequency of caffeinated beverages and the PSQI to assess sleep quality. The measurement results of the frequency of caffeinated beverages were classified into never, rare, and often. The results of the PSQI measurement gave seven scores that correspond to sleep quality domains, where a score greater than five means poor sleep quality and vice versa.

The collected data will be inputted into the statistical program and analyzed. Data analysis was carried out using the Statistical Product for the Social Sciences (SPSS) version 26 program with Chi-Square and Fisher's Exact as an alternative analysis if there were cell statements with an expected of less than five.

III. Result and Discussion

Based on the calculation of the estimated sample size, the number of samples required in this study was 209 respondents. Due to not meeting the inclusion and exclusion criteria, so the respondents who were used as samples were only 184 people. Characteristics of the respondents obtained were distinguished by gender, intake of caffeinated beverages, and sleep quality.

Table 1. Distribution of Respondents by Gender

Gender	Total	Percentage (%)
Male	62	33.7
Female	122	66.3

Table 1 shows that of the 184 students studied, 62 (33.7%) respondents were male, and 122 (66.3%) respondents were female.

Table 2. Distribution of Respondents by Sleep Quality

Sleep Quality	Total	Percentage (%)
Good	76	41.3
Poor	108	58.7

Table 2 shows that of the 184 students studied, 76 (41.3%) respondents had good sleep quality, and 108 (58.7%) respondents had poor sleep quality.

Table 3. PSQI Score Distribution

Component	Category	Total	Percentage (%)
Subjective Sleep Quality	Very good	25	13.6
	Good enough	107	58.2
	Poor enough	44	23.9
	Very poor	8	4.3
Sleep latency	0	46	25
	1	81	44
	2	43	23.4
	3	14	7.6
Sleep duration	>7	25	13.6
	6-7	33	17.9
	5-6	99	53.8
	<5	27	14.7
Sleep efficiency	>85%	143	77.7
	75-84%	26	14.1
	65-74%	9	4.9
	<65%	6	3.3
Disruption sleep	0	13	7.1
	1	150	81.5
	2	21	11.4
	3	0	0
Use of sleeping pills	Never	176	95.7
	1x a week	5	2.7
	2x a week	2	1.1
	3x a week	1	0.5
Daytime dysfunction	0	51	27.7
	1	91	49.5
	2	30	16.3
	3	12	6.5

Table 3 shows that from the subjective sleep quality component, 25 (13.6%) respondents had very good subjective sleep quality, 107 (58.2%) respondents had quite good subjective sleep quality, 44 (23.9%) respondents had poor subjective sleep quality, and 8 (4.3%) respondents' subjective sleep quality was very poor. Based on the sleep latency component, 46 (25%) respondents had very good sleep latency, 81 (44%) respondents had good sleep latency, 43 (23.4%) respondents had quite bad sleep latency, and 14 (7.6%) respondents' sleep latency was very bad. Based on the sleep duration component, 25 (13.6%) respondents' sleep duration was more than 7 hours, 33 (17.9%) respondents slept 6-7 hours, 99 (53.8%) respondents slept 5-6 hours, and 27 (14.7%) respondents slept less than 6 hours. Based on the sleep efficiency component, 143 (77.7%) respondents' sleep efficiency exceeded 85%, 26 (14.1%) respondents' sleep efficiency was between 75-84%, 9 (4.9%) respondents' sleep efficiency was between 65-74% and 6 (3.3%) respondents' sleep efficiency was below 65%. Based on the components of sleep disorders, 13 (7.1%) respondents had no sleep disturbances, 150 (81.5%) respondents had mild sleep disturbances, and 21 (11.4%) respondents had moderate sleep disturbances. Based on the components of using sleeping pills, 176 (95.7%) respondents never took sleeping pills, 5 (2.7%) respondents took sleeping pills once a day, 2 (1.1%) respondents took sleeping pills two times a day and 1 (0.5%) respondents took sleeping pills three or more times a day. Based on the components of daytime dysfunction, 51 (27.7%) respondents had no dysfunction during the day, 91 (49.5%) respondents

had mild daytime dysfunction, 30 (16.3%) respondents had moderate dysfunction, and 12 (6.5%) respondents had severe dysfunction during the day.

Table 4. Distribution based on Respondents' Intake of Caffeinated Beverages

Frequency of Caffeinated Beverage Consumption	Total	Percentage (%)
Coffee		
• Often	29	15,8
• Rare	96	52,2
• Never	59	32,1
Tea		
• Often	22	12
• Rare	105	57
• Never	57	31
Chocolate Drinks		
• Often	9	4,9
• Rare	175	95,1
Soft Drinks		
• Often	3	1,6
• Rare	181	98,4
Energy Drinks		
• Rare	14	7,6
• Never	170	92,4

Table 4 shows that 96 (52.2%) respondents rarely drink coffee, 59 (32.1%) respondents never drink coffee, and only 29 (15.8%) respondents often drink coffee. Based on the consumption of tea, 105 (57%) respondents rarely drink tea, 57 (31%) respondents don't drink tea, and 22 (12%) respondents often drink tea. Based on the consumption of chocolate drinks, 175 (95.1%) respondents rarely consume chocolate drinks, and only 9 (4.9%) respondents often consume chocolate drinks. Based on the consumption of soft drinks, 181 (39.7%) respondents rarely consume soft drinks, and only 3 (1.6%) respondents often consume soft drinks. Based on the consumption of energy drinks, 14 (7.6%) respondents rarely consume energy drinks, and 170 (92.4%) respondents never consume energy drinks.

Table 5. Relationship of Caffeinated Beverages Intake with Sleep Quality

	Caffeinated Beverages		Sleep Quality		Total	*p-value*	RP
			Poor	Good			
1	Coffee	Often	20	9	29		
		Rare	61	35	96		
		Never	27	32	59	0,044	1,214
		Total	108	76	184		
2	Tea	Often	13	9	22		
		Rare	63	42	105		
		Never	32	25	57	0,892	1,007
		Total	108	76	184		
3	Chocolate Drinks	Often	6	3	9		
		Rare	102	73	175	0,738	1,143
		Total	108	76	184		
4	Soft Drinks	Often	3	0	3	0,269	1,723
		Rare	105	76	181		

		Total	108	76	184		
5	Energy Drinks	Rare	9	5	14	0,659	1,103
		Never	99	71	170		
		Total	108	76	184		

Statistical test Chi-Square regarding the relationship between coffee intake and sleep quality, a p-value of less than 0.05 (p = 0.044) showed a significant relationship. The relationship between tea intake and sleep quality was obtained p-value = 0.892. These results indicate no significant relationship between tea intake and sleep quality. The relationship between energy drink intake and sleep quality was p-value = 0.659. So it didn't show a significant relationship. Statistical test Chi-Square regarding the relationship between intake of chocolate and soft drinks with sleep quality contained a statement of cells with an expected of less than five so that the frequency of never and rarely was combined. Tests were performed with Fisher's Exact Text. The results of the significance test of the intake of chocolate drinks and soft drinks obtained a p-value > 0.05, which indicates that there is no significant relationship. The value of the rasio prevalence intake for all caffeinated beverages with sleep quality shows a number greater than one. This means that the intake of caffeinated beverages is a risk for the occurrence of poor sleep quality in respondents.

Based on the results of the questionnaire obtained by 88% (184) students of the Faculty of Medicine, University of Tarumanagara obtained, 62 respondents were male and 122 respondents were female. Based on the study's results, female respondents had better sleep quality than male. Based on the Pearson Chi-Square, it was found that coffee intake had a significant relationship with sleep quality (p-value = 0.044). This study is in line with research by Binti T. Daswin (2013) regarding the effect of coffee on the sleep quality of students of the Faculty of Medicine, University of North Sumatra. An experimental study found that 8 people (53.3%) consumed caffeinated coffee had moderate sleep quality, and 11 people (73.3%) who didn't consume caffeine had good sleep quality. After hypothesis testing, it was found that sleep quality was significantly reduced for those who consumed caffeinated coffee (p-value = 0.003).

This study shows that coffee consumption is directly related to sleep quality. This is because the main mechanism of action of caffeine found in coffee drinks is to block adenosine receptors which make a person unable to sleep. Adenosine is a nucleotide compound that decreases the activity of nerve cells when binding to them. Adenosine induces normal sleep, and caffeine blocks adenosine receptors in the brain to wake a sleepy person by eliminating the inhibitory effect of adenosine.

However, this study showed that intake of tea, chocolate drinks, soft drinks, and energy drinks had no significant relationship with sleep quality. This can happen because the composition of caffeine in caffeinated beverages is different. Every 180 ml of coffee or the equivalent of one cup contains an average of 100 mg of caffeine. Compared to the same volume, black tea contains 50 mg of caffeine. The same thing, the caffeine content in hot chocolate is around 10 mg in the same serving. Based on the analysis results, the composition of caffeine in coffee drinks is greater than other types of caffeinated beverages. This is following several studies which stated that the composition of caffeine affects sleep quality. In addition to caffeine composition, other factors that can affect sleep quality were also found, such as alcohol consumption, drugs, smoking, psychological disorders such as stress, anxiety, depression, health problems, and environmental factors such as noise, temperature that is too high or low, and lights that are too bright.

IV. Conclusion

Based on the results of research conducted at the Faculty of Medicine, Tarumanagara University, it can be concluded that:

1. 108 (58.7%) students had poor sleep quality, and 76 (41.3%) students had good sleep quality.
2. The most widely consumed caffeinated beverages by students were coffee and tea.

3. There was a significant relationship between coffee intake and sleep quality (p-value = 0.044). However, there was no significant relationship between intake of tea, chocolate drinks, soft drinks, and energy drinks with sleep quality.

For researchers, it is recommended to conduct qualitative research on changes in sleep quality related to the intake of caffeinated beverages. For respondents, it is recommended not to consume excessively caffeinated beverages in order to minimize the quality of poor sleep patterns.

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