



## CORRELATION BETWEEN CAFFEINE CONSUMPTION PATTERNS AND DYSPEPSIA SYNDROME IN STUDENTS

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### Abstract

Students often consume caffeine to help concentrate, but excessive consumption is at risk of triggering digestive disorders. This study examines the relationship between caffeine consumption patterns and dyspepsia syndrome in Public Health undergraduate students at the Muhammadiyah University of East Kalimantan. The study used a quantitative method with a cross-sectional design and involved 208 respondents selected through stratified random sampling. Caffeine consumption patterns were measured using the Food Frequency Questionnaire (FFQ), while dyspepsia syndrome was assessed using the Rome IV criteria. The analysis was carried out using the Chi-Square test. The results showed that 58.2% of students had high caffeine consumption and 88.9% experienced dyspepsia syndrome. There is a significant relationship between caffeine consumption and dyspepsia syndrome ( $p$ -value = 0.000) with an Odds Ratio (OR) of 0.736, indicating an increased risk of dyspepsia in students with high caffeine consumption. The conclusion of the results of this study is that high caffeine consumption is closely related to the occurrence of dyspepsia syndrome. Therefore, students are advised to regulate their caffeine consumption in order to maintain digestive health. Further research is advised to consider other factors such as diet, stress, and physical activity which can also affect the occurrence of dyspepsia.

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### Introduction

Dyspepsia is a disorder or discomfort of the upper gastrointestinal tract, such as pain in the epigastrium, bloating, nausea, or a feeling of satiety, which is often found in clinical practice and is one of the main causes of visits to healthcare facilities (Arini & Malik, 2019). Based on global reports, the prevalence of *caffeinated energy drink consumption* by adolescents has been a topic of

interest over the past decade, with prevalence reported in 2021 in Australia with a value of 51.2% in adolescents on the grounds that consumption is in the form of attractive tastes, increases energy levels, sports performance and improves focus on learning (Puupponen et al., 2021). Data from the East Kalimantan Provincial Health Office shows an increasing trend in dyspepsia cases, especially in Samarinda City, which is marked by an increase in

the number of inpatients and outpatients during the 2021-2023 period. Dyspepsia is multifactorial, influenced by lifestyle, stress, food, and consumption of irritating substances such as caffeine (Sidhu & Triadafilopoulos, 2008). Caffeine, which is contained in coffee, tea, and chocolate, has a stimulant effect that students often use to improve concentration. However, excessive consumption can stimulate stomach acid production and weaken the lower esophageal sphincter, potentially worsening the symptoms of dyspepsia (Yusuf et al., 2024). Studies show that college students are a group that is prone to indigestion due to high caffeine consumption and irregular lifestyles (Liu et al., 2023). The results of preliminary interviews at the University of Muhammadiyah East Kalimantan show that most students do not have an understanding of dyspepsia and do not get access to education related to this condition. There has been no study that specifically analyzes the relationship between caffeine consumption patterns and dyspepsia syndrome using the Rome IV criteria in students in East Kalimantan. Based on this background, this study aims to determine the relationship between caffeine consumption patterns and dyspepsia syndrome in students of the S1 Public Health Study Program, University of Muhammadiyah East Kalimantan.

### Method

This study uses a quantitative approach with a *Cross-Sectional design* which aims to determine the relationship between caffeine consumption patterns and dyspepsia syndrome in students of the S1 Public Health Study Program, University of Muhammadiyah East Kalimantan. The sample totaled 208 respondents from the 2022 and 2023 batches with inclusion and exclusion criteria, determined using *the Lemeshow formula* and stratified random sampling techniques. Data were collected in February-March 2025 through online and offline questionnaires, consisting of a *Food Frequency Questionnaire* (FFQ) to assess caffeine consumption patterns with the measurement result categories differentiated into rare (mean <48) and frequent (mean  $\geq$  48) and a Rome IV-based questionnaire to assess dyspepsia syndrome. Primary data comes from students, while secondary data is obtained from related institutional documents. The analysis was performed using SPSS with a univariate approach to the distribution of characteristics and bivariate using *the Chi-Square test* to test the relationship between independent and related variables at a significance level of 5%. This research also follows the ethical principles of the research, including honesty, objectivity, and *informed consent* of the respondents.

### Results and Discussion

This research was carried out in the S1 Public Health Study Program, University of Muhammadiyah East Kalimantan from February 26 to March 6, 2025 with a *cross-sectional study design*. The purpose of the study was to determine the relationship between caffeine consumption patterns and dyspepsia syndrome in college students. Respondents were selected using *the Stratified Random Sampling method* for 208 respondents from the 2022 and 2023 batches who met the inclusion and exclusion criteria.

The instrument used consisted of a *Food Frequency Questionnaire* (FFQ) questionnaire. To measure caffeine consumption patterns and dyspepsia syndrome questionnaires based on Rome IV diagnostic criteria. The FFQ includes 11 *question items* that group caffeine sources into four categories: tea, coffee, chocolate, and soft drinks. Meanwhile, the Rome IV questionnaire consists of 6 *question items* used to identify dyspepsia syndrome.

Data collection was carried out independently by respondents through filling out online and offline questionnaires using *the Goolge Form* to increase efficiency and accuracy. Bivariate analysis is used to test the relationship between independent and dependent variables.

**Table 1.** Frequency Distribution of Respondents by Gender

Gender	Frequency	Percent (%)
Male	37	17,8
Women	171	82,2
<b>Total</b>	<b>208</b>	<b>100</b>

*Source: Primary Data*

Based on Table 1. It shows that for gender, the highest proportion in women is 82.2% (n=171).

**Table 2.** Distribution of Respondent Frequencies Based on Age

Age	Frequency	Percent (%)
19 years old	49	23,6
20 years	95	45,7
22 years old	11	5,3
23 years old	3	1,4
24 years	2	1,0
25 years	1	0,5
30 years	1	0,5
<b>Total</b>	<b>208</b>	<b>100</b>

*Source: Primary Data*

Based on Table 2. It shows that for age, the highest proportion is in 20-year-old college students (45.7%).

**Table 3.** Distribution of Caffeine Consumption Patterns

Consumption Categories	Frequency	Percent (%)
Rare	87	41,8
Frequent	121	82,2
<b>Total</b>	<b>208</b>	<b>100</b>

Source: Primary Data

Based on Table 3. It shows that most respondents have high caffeine consumption patterns. This can be seen in the frequency of beverage consumption with a frequent category of 82.2% (n=121).

**Table 4.** Distribution of Dyspepsia Syndrome

Categories of Dyspepsia Syndrome	Frequency	Percent (%)
Yes	185	88,9
No	23	11,1
<b>Total</b>	<b>208</b>	<b>100</b>

Source: Primary Data

Based on Table 4. Dyspepsia syndrome was reported by the majority of respondents, with symptoms matching the Rome IV criteria.

**Table 5.** Chi-Square Test Results of Caffeine Consumption Patterns and Dyspepsia Syndrome

Consumption Patterns	Dyspepsia (Yes)	Dyspepsia (No)	Total	p-value	OR
Frequent	121	0	121	0,000	0,736
Rare	64	23	87		

Source: Primary Data

Based on Table 5. The results of the Chi-Square test showed that there was a significant relationship between caffeine consumption patterns and dyspepsia syndrome (p-value = 0.000).

The results of this study show that there is a significant relationship between caffeine consumption patterns and the incidence of dyspepsia syndrome in students of the S1 Public Health Study Program, University of Muhammadiyah East Kalimantan. As many as 58.2% of respondents are known to have high caffeine consumption patterns, and as many as 88.9% of them have dyspepsia syndrome. These findings are in line with the Chi-Square test which produces a significance value of  $p = 0.000$ , and an Odds Ratio (OR) value of 0.736 which shows that students with high caffeine consumption have a 0.736 times smaller chance of experiencing dyspepsia syndrome than students who rarely consume caffeine, so high caffeine consumption is protective against the incidence of dyspepsia and there is a relationship between caffeine consumption patterns and dyspepsia syndrome. Meanwhile, in Nehlig's research (2022) stated that

caffeine can increase stomach acid production and relaxation of the esophageal muscles at the bottom (Nehlig, 2022), and in the study of Madisch et al., (2018) explained that increased stomach acid production leads to reduced secretion *prostaglandins* which functions as a stomach protector and stimulates smooth muscle contraction, resulting in increased sensitivity and impaired motility *gastroduodenal* (Madisch et al., 2018)

These results are consistent with previous research by (Santoso et al., 2023), which shows that students with high intensity of coffee consumption experience symptoms of dyspepsia more often compared to those who do not consume coffee regularly. Excessive caffeine consumption is known to increase stomach acid secretion as well as cause relaxation of the lower esophageal sphincter (LES) (Sidney & H., 1975), which can trigger symptoms such as nausea, flatulence, or heartburn (Sidhu & Triadafilopoulos, 2008). Different types of caffeine products that can be found by the public in coffee, tea, soft drinks, chocolate, analgesics, and dietary supplements (Addicott et al., 2009).

Excessive caffeine consumption can cause negative effects on the body such as irregular heartbeat, headaches, feelings of anxiety and restlessness, trembling, anxiety, decreased memory, insomnia, and disorders of the stomach and digestive system (ÖZPALAS & ÖZER, 2017).

College students are a vulnerable group to indigestion, mainly due to irregular lifestyles, high levels of academic stress, and the habit of relying on caffeinated beverages to stay awake in completing assignments (Bistara & Kartini, 2018). This is reinforced by the results of preliminary interviews in this study which indicate a lack of student knowledge about dyspepsia syndrome, as well as a lack of education or information media regarding the prevention of indigestion in the campus environment.

Based on the criteria of the Rome IV questionnaire, dyspepsia is classified as complaints of epigastric pain, rapid satiety, and a feeling of fullness after eating, which lasts for a minimum of three months. Caffeine consumption can exacerbate these symptoms due to its stimulating effect on the digestive system, especially in increasing gastric acidity (Yusuf et al., 2024). In addition, unrestricted caffeine consumption has the potential to cause other gastrointestinal symptoms such as *Reflux* and gastric irritation, which strengthens the causal link with the incidence of dyspepsia.

This research also underlines the need for promotive and preventive interventions in the university environment, such as the provision of information through campus media and health education that emphasizes the risk of excessive caffeine consumption. In addition, it is necessary to carry out education related to stress management and healthy eating patterns, considering that

dyspepsia is also influenced by psychological factors such as anxiety and stress (Darwin et al., 2017).

These findings contribute to the development of knowledge about the importance of healthy caffeinated beverage consumption patterns. This research can also be a foundation for the development of health promotion programs aimed at reducing the prevalence of indigestion among students.

### Conclusion

Based on the results of the research that has been conducted, it can be concluded that there is a significant relationship between caffeine consumption patterns and dyspepsia syndrome in students of the S1 Public Health Study Program, University of Muhammadiyah East Kalimantan. The majority of respondents who have high caffeine consumption patterns tend to experience symptoms of dyspepsia. The results of the analysis showed that the more often students consumed caffeine, the greater the risk of experiencing indigestion. Therefore, regulating caffeine consumption is important as a preventive measure against dyspepsia syndrome among college students.

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