



UITMCNS  
SEREMBAN

J E M U R

JOURNAL OF EXPLORATORY MATHEMATICAL UNDERGRADUATE RESEARCH

RECENT MATHEMATICAL PROJECTS AT UITM, SEREMBAN CAMPUS

Vol. 002

PREPARED BY: KPPIM, UiTM N.  
SEMILAN.

DATE: 05 OCT 2024

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## CAFFEINE CONSUMPTION: ARE YOU AWARE?

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### Abstract

Caffeine is found naturally in certain plants, such as coffee, tea, soft drinks, and energy beverages. Its effects, including increased heart rate, faster breathing, and heightened alertness, typically start within five to thirty minutes and vary in duration from person to person. This study aims to explore the awareness of caffeine's effects among students and the factors influencing this awareness. 397 randomly selected public university students in Negeri Sembilan participated in an email questionnaire. The analysis results indicate a notable association between daily caffeine consumption and gender. Additionally, 69.5% of the respondents are aware of the consequences of caffeine consumption. The findings from the logistic regression model demonstrate that knowledge and consumption significantly impact the level of awareness regarding the effects of caffeine consumption among students. It is essential to increase awareness among students and the community to ensure that all caffeine lovers can consume it more healthily.

**Keywords:** Caffeine, awareness, student, logistic.

### 1. Introduction

Caffeine beverage is not an unusual term among people nowadays. Caffeine is synonymous with any coffee product, whether it is a branded product like Starbucks and Coffee Bean and Tea Leave or an instant coffee product like Nescafe and Old Town White Coffee. However, caffeine cannot only be found in coffee drinks but also in other types of beverages. Caffeine is a stimulant in many plants, including coffee beans, tea leaves, and cacao beans. It is a central nervous system stimulant that can improve alertness and reduce fatigue. Caffeine can also be defined as a beverage containing stimulant drugs, widely used as a mental and physical stimulator (Aslam et al., 2013), or also known as an energy booster. Not many people acknowledge that other than coffee, beverages like tea, chocolate, and energy drinks, which are loved by people of many different levels of ages, also contain caffeine. Although those drinks do not have as much caffeine as coffee does, they still have those stimulant drugs (Aslam et al., 2013).

In today's market, many cafes supply caffeinated beverages, especially coffee, as their main beverage. Coffee shops and cafes have become popular meeting locations, and business coffee breaks are prevalent. Drinking coffee or tea can also create a sense of familiarity or comfort, making it a popular choice for people looking for familiarity or comfort. The local entrepreneur sees this business as an opportunity for a high income, as many people like coffee. It is already a trend and a lifestyle among people to drink coffee in their leisure time. Most people who consume caffeine are between 19 to 24 years old (Khan, 2019). This situation can be explained by the lifestyle of the youngster nowadays. Some do not love coffee but only want to show other people on social media to make an aesthetic post about drinking coffee in a fancy cafe.

Nevertheless, some youngsters need caffeine to do much work or study. However, teenagers from 19 to 24 years old and senior citizens over 60 are also not an exception when drinking coffee (Khan, 2019). However, these age levels are not pretending or need it as help for work. They are more likely to enjoy the taste of the coffee's uniqueness while chatting with their loved ones and friends (Pandey et al., 2021).

The after-effect of caffeine is that people can wake up for a long time, although sleepy, before consuming it. Caffeine's potential to improve mental and physical performance is one of its most significant advantages (Astorino & Roberson, 2010). Caffeine has been shown to boost cognitive performance, including memory, attention, and reaction time. It can also improve endurance and athletic performance. People who consume caffeine also have extra energy to use to do energy-consuming work after drinking caffeine. This energy booster is an advantage to human beings. People can do many jobs past their energy limit, consuming high productivity for someone who works. Caffeine can also boost mood and lessen fatigue. Caffeine boosts the release of dopamine, a neurotransmitter associated with pleasure and reward, which can make people feel more alert and energised.

Although caffeine is such a good thing as it brings advantages to people, it also brings disadvantages. Caffeine will be a huge problem for human health if it is consumed too frequently. Numerous studies, like the study by Rodda et al. (2020) and Aslam et al. (2013), have been conducted to investigate the relationship between caffeine consumption and various health outcomes, such as cardiovascular disease, cancer, and pregnancy outcomes. While some studies have found that caffeine benefits these outcomes, others have found a negative or no effect. A study by Rodda et al. (2020) has proved that caffeine brings many health issues, such as chronic headaches and an increase in blood pressure, sleep difficulties, anxiety, and irritability. Other signs of caffeine intoxication include gastrointestinal problems, shaky hands, and tachycardia (Rodda et al., 2020).

For the past few decades, the health issue brought on by the overdose of caffeine consumption has increased rapidly. An increase in systolic and diastolic blood pressure is most likely for those who overconsume caffeine (Celi et al., 2022). There are ways to solve the over-consuming caffeine issue, such as reducing caffeine intake or finding an acceptable caffeine replacement (Rodda et al., 2020). It will decrease the possibility of getting health problems. However, it is easy to say without any action. Caffeine addiction is a severe problem that cannot be repaired in just one day. When people drink caffeine as their daily routine, they cannot easily throw that habit away in the blink of an eye. For instance, a study by Juliano et al. (2012) showed that a treatment-seeking for caffeine dependence reported that 88% of participants had at least one failed serious attempt to reduce their daily use.

Consequently, this study was conducted to identify students who were aware of caffeine's side effects. The findings would benefit the researcher by revealing the level of awareness regarding caffeine consumption and giving information about the side effects of caffeine to the community. Thus, hitting two birds with one stone will benefit society by decreasing the percentage of health issues brought on by caffeine.

## 2. Methodology

This study used a descriptive research design. Students from a public university in Negeri Sembilan were the target population of 5594 students. Simple random sampling was used since the sampling frame of the students was available from the university's administrative. Using the formula from Cochran (1977) the sample size needed in this study was 397 students. The questionnaire was distributed by email to the selected students.

The questionnaire was constructed in five sections. Section A aimed to gather the respondents' demographic information such as gender and level of study; Section B assesses

the level of caffeine intake; Section C focused on the effects of caffeine consumption; Section D measured knowledge about the effects of caffeine; and Section E evaluated awareness of caffeine consumption effect. The questionnaire was adopted from the study by Ginting et al. (2022) and Arul Prakasam et al. (2022). The questionnaire in Sections A and B was measured using categorical variables, while Sections C to E were measured on a 5-likert scale.

The data analysis begins with the Chi-Square test of independence. This test determines the association between categories of daily caffeine drinkers and gender, as both variables are categorical. A crosstabulation table described the students' characteristics using descriptive statistics. A bar chart, a graphical technique, visualised the students' level of awareness of caffeine consumption. For data interpretation, mean values of 2.50 and above indicated awareness, whereas mean values below 2.50 were seen as reflecting unawareness. This benchmark was adopted from the study by Laurence et al. (2012).

Further analysis using Logistic Regression was conducted to find the significant factors influencing the level of awareness of caffeine consumption effects among students. Logistic regression analysis is appropriate for the binary classification, which includes two class values for the dependent variable, aware or not of caffeine consumption among the students. The general form of the logistic regression model is:

$$\log \left[ \frac{P(x)}{1-P(x)} \right] = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon \tag{1}$$

where,

- $p$  = probability of success dependent variable
- $\varepsilon$  = base of natural logarithms
- $\beta_0$  = constant of the equation
- $\beta_1, \beta_2, \beta_3, \beta_4$  = the coefficient of independent variable
- $X_1$  = Gender
- $X_2$  = Knowledge
- $X_3$  = Consumption Effect
- $X_4$  = Caffeine Consumption

Thus, this logistic regression analysis is fitted to the empirical data to identify the significant factors influencing the level of awareness of the effects of caffeine consumption on students.

### 3. Results and Discussion

As mentioned earlier, this study used 397 respondents from a public university student in Negeri Sembilan. The association between categories of daily caffeine drinkers and gender was analysed to capture the respondents' overall characteristics.

Table 1: Association between categories of Daily Caffeine Drinker and Genders

Gender	Drink Caffeinated Daily		Total
	Yes	No	
Male	109	58	167
Female	97	133	230
Total	206	191	397
Chi-square Test, p-value = 0.000			

According to Table 1, 109 male respondents reported drinking caffeine daily, compared to 97

female respondents. However, 133 female respondents claimed they did not drink caffeine daily, compared to 58 male respondents. Generally, it shows that most males consume caffeine daily compared to females. Additionally, the chi-square test of independence yielded a  $p$ -value less than the chosen significance level of 0.05, indicating sufficient evidence of an association in caffeine intake between genders. These findings align with Dillon et al. (2019) research, which also reported higher caffeine consumption among males than females, but contradict Khan's (2019) findings, which suggested that females consume more caffeine than males. This can be attributed to the biological and physiological differences between genders, with men metabolising caffeine more rapidly than women. As a result, men develop a higher tolerance and tend to consume larger quantities of caffeine (dePaula & Farah, 2019).

**3.1. Level of Awareness of Caffeine Consumption Effect**

The data in Figure 1 unequivocally proves that approximately 40.3% of respondents firmly believe that reducing their daily caffeine intake will make them happier. Furthermore, a decisive 33.5% of respondents firmly agree that cutting back on caffeine can incontrovertibly help them avoid headaches and anxiety. Additionally, 34.8% of respondents firmly believe that reducing caffeine will improve their health. Moreover, 36.5% of respondents firmly agreed that excessive caffeine consumption will unquestionably harm their health. Furthermore, a decisive 35.8% of respondents strongly agree that they will undeniably inform others about the effects of caffeine. 35.3% of respondents adamantly agree that they are resolutely considering lowering their caffeine intake for their health. Additionally, 39.6% of respondents firmly agree that caffeine can negatively affect their health. Moreover, 43.6% of respondents firmly agree that they fully understand the potential health risks of drinking caffeine. Finally, 44.3% of respondents are divided on whether they continue consuming caffeine daily. From the overall analysis, it can be conclusively stated that almost 50% of respondents agreed with the caffeine consumption effect highlighted.

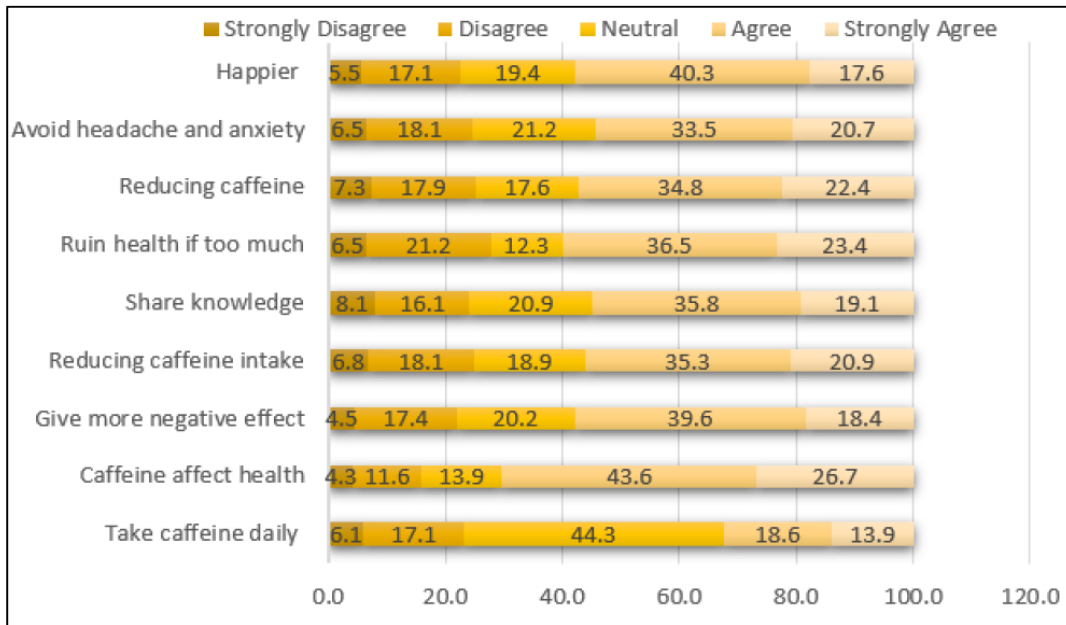


Figure 1: Level of agreement on the caffeine consumption effect

The respondents' awareness of the caffeine consumption effect is demonstrated in Table 2. Out of the 397 respondents involved in the study, 276 (69.5%) reported that they are aware of the effects of caffeine consumption on their health, while 121 (30.5%) of the respondents are not aware. This outcome suggests that individuals become aware of caffeine's side effects after experiencing them firsthand. As noted by Santos et al. (2017), individuals who consume large amounts of caffeine may experience systemic damage such as irregular heart rate, increased ventilation, and anxiety. Hazar (2019) mentioned that people tend to be aware of the side effects of caffeine when they consume it as part of their daily routine.

Table 2: Awareness of caffeine's consumption effect

Level of Awareness	Frequency	%
Aware	276	69.5
Not Aware	121	30.5
Total	397	100.0

However, it is important to note that some respondents who do not consume caffeine regularly may be less aware of its effects. This emphasizes the need for targeted education and awareness campaigns to bridge knowledge gaps and ensure a widespread understanding of caffeine-related health considerations. In this scenario, it is imperative for the responsible party, particularly the student representative, to spearhead an awareness campaign to enhance understanding of caffeine's effects.

### 3.2. Factor Contributing to Level of Awareness of Caffeine Consumption Effect

#### 3.2.1 Checking model adequacy

There are some assumptions to be satisfied when conducting logistic regression. The dependent variable must be a binary outcome, either aware or unaware of the effects of caffeine consumption. The independent variable can be measured by continuous variables such as knowledge, caffeine consumption, and consumption effect or categorical variables such as gender. Third, the observations should not be derived from many measurements of the same individual or be related to each other in any way. Since, in this study, observations were independent and unrelated to each other, the third assumption is fulfilled. Fourth, there should be no multicollinearity. As shown in Table 3, all variables exhibit tolerance values above 0.01 and VIF values under 10, indicating that multicollinearity is not a concern.

Table 3: Multicollinearity Test

Variable	Tolerance	VIF
Knowledge	0.965	1.036
Consumption Effect	0.883	1.132
Caffeine Consumption	0.902	1.109

Lastly, based on Table 4, the lowest probability value is 0.00192. This result indicates that there are no outliers in the dataset. In conclusion, as all the assumptions were met, the study proceeded to identify the significant variable using logistic regression.



Table 4: Mahalanobis Test

Mahalanobis Value	Probability
14.60134	0.00192
11.97205	0.00251
10.68081	0.00479

3.2.2 *Logistic regression analysis and model evaluation*

This study has identified several factors, such as gender, knowledge, consumption effect, and caffeine intake, as potential contributors to the level of awareness. However, there are only two statistically significant variables using the logistic regression model: knowledge and consumption effects (Table 5). This is because their *p*-values are 0.005 and 0.003, less than 0.05. Therefore, a significant relationship exists between knowledge and consumption effect and awareness of the effects of caffeine consumption. Knowledge and consumption effects are significant factors that influence the level of awareness of caffeine’s consumption effects. The other factors were deemed insignificant and have been removed from the model.

Table 5: Logistic Regression Model

Variable	Coefficient	p-value	Wald test	Odds Ratio
Constant	-3.383	0.003	8.755	0.034
Gender (1)	0.108	0.743	0.108	1.114
Knowledge	0.703	0.005	7.717	2.020
Consumption effect	0.805	0.003	8.710	2.236
Caffeine Consumption	-3.383	0.227	1.460	0.723

The odds ratio represents the likelihood that respondents will be aware of the effects of caffeine consumption. Odds reflect the chances that something will or will not happen. Based on the table above, respondents knowledgeable about caffeine’s consumption effects are 2.020 times more likely to be aware of these effects than those without knowledge. In addition, respondents who experience the consumption effect are 2.236 times more likely to be aware than respondents who do not experience the consumption effect.

Next, Wald statistics evaluate models based on a best-fit criterion. This approach assesses the statistical significance of each independent variable. The Wald statistics in Table 5 indicate that only the consumption effect and knowledge are significant to the model, as their *p*-value is less than the 0.05 cut-off point.

Additionally, students' knowledge of caffeine and the ingredients of their drinks can help them recognise its drawbacks.

The logit expressions for the full model are as below:

$$\log \left[ \frac{P(x)}{1-P(x)} \right] = -3.383 + 0.703 \text{ Knowledge} + 0.805 \text{ Consumption Effect} \tag{2}$$

#### 4. Conclusion and Recommendations

Caffeine, found in coffee, tea, and energy drinks, has benefits like reducing disease risk but can also lead to disrupted sleep, anxiety, and potential cardiovascular issues. It is important to be cautious about consumption. Understanding its effects can help people, especially students, live healthily.

Results have shown that men have been proven to consume more caffeine than women, and the majority of respondents are cognizant of the negative effects of caffeine. Encouragingly, 69.5% of our participants recognised that caffeine could impact their future health. However, it is vital to note that 30.5% of respondents appear to lack awareness of caffeine's side effects. It is encouraging that most respondents are aware of the effects. However, efforts should be made to increase awareness throughout the community about both the benefits and drawbacks of caffeine consumption. Furthermore, the logistic regression model indicates that the consumption effect and knowledge are the significant factors contributing to the level of awareness of the side effects of consuming caffeine. This finding indicates that students are more aware if they are knowledgeable about caffeine.

To truly understand the impact of caffeine consumption, the health ministry must embark on an education campaign. This can involve powerful tools like videos and posters to enlighten people about the harmful effects of excessive caffeine intake. Beginning at a smaller level, such as with a student representative initiating an awareness campaign, can significantly impact. Furthermore, it is important to encourage the community to share knowledge about the effects of caffeine consumption during gatherings and social circles.

Future research could potentially incorporate other factors that are perceived to be significant in relation to people's awareness of the effects of caffeine consumption. Examples of such factors may include environment, lifestyle, study background, and economic considerations, all of which are essential in emphasising and assessing individuals' comprehension of the adverse effects of caffeine. Since this study only identified one significant influencing factor on awareness of caffeine's side effects, it is important to consider these contextual factors. Doing so may lead to a more comprehensive understanding and determination of the most influential factor that can assist in raising awareness within the community.

#### Acknowledgment

We want to express our heartfelt gratitude to all team members for their unwavering encouragement and dedication, which led to the successful publication of this article.

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