



THE RELATIONSHIP BETWEEN COFFEE CONSUMPTION AND GERD SYMPTOMS IN UINSU SCIENCE AND TECHNOLOGY STUDENTS

Seri Rosidah Hasibuan, Nuri Khaira, Atikah Pratiwi, Muhammad Faiz Panjaitan,
Wahyudi *

Ilmu Kesehatan Masyarakat, Fakultas Kesehatan Masyarakat, Universitas Islam Negeri Sumatera Utara
Jl. Lap. Golf No.120, Kp. Tengah, Kec. Pancur Batu, Kabupaten Deli Serdang, Sumatera Utara 20353,
Indonesia

Email: apt.wahyudi@uinsu.ac.id

Abstract

Gastroesophageal Reflux Disease (GERD) is a common gastrointestinal disorder that occurs in productive age, especially among university students. One lifestyle factor that is thought to contribute to the incidence of GERD is coffee consumption habits. This study aims to analyze the relationship between coffee consumption and the incidence of GERD in students of the Faculty of Science and Technology, State Islamic University of North Sumatra. This study used a case control design with a retrospective approach. The sample amounted to 82 people, consisting of 41 cases and 41 controls, selected using accidental sampling technique. Data were collected through GERD-Q questionnaire and food frequency questionnaire, then analyzed using chi-square test. The results showed that regular coffee consumption was significantly associated with the incidence of GERD ($p = 0,001$) with an OR of 6.86 (95% CI: 2,5-19,1). In contrast, frequency of consumption per day and type of coffee did not show a statistically significant association with the incidence of GERD ($p > 0,05$). This study concluded that regular coffee consumption is a significant risk factor for the incidence of GERD in university students. Health education regarding wise coffee consumption is needed to prevent gastrointestinal disorders in the student population.

Keywords : Coffee Consumption, GERD, College Students

Introduction

Gastroesophageal Reflux Disease (GERD) is a chronic digestive disorder characterized by the backflow (reflux) of stomach acid into the esophagus, which causes various clinical symptoms such as heartburn, acid regurgitation, and chest discomfort. This condition is increasingly common in productive age groups, including among university students. This is inseparable from the influence of modern lifestyles that tend to be less healthy, consumption of foods high in acid and fat, and the habit of consuming caffeinated drinks such as coffee (1).

Coffee is one of the most popular drinks among college students, especially because it is considered to increase concentration and stamina in facing the academic load. However, behind these benefits, the caffeine content in coffee is known to have a negative impact on the digestive system. Caffeine can cause relaxation of the lower esophageal sphincter muscle, which acts as a natural barrier to prevent stomach acid from rising back up the esophagus. In addition, caffeine can also stimulate increased gastric acid secretion and slow down the process of gastric emptying, which can overall worsen the symptoms of GERD (2).

Gastroesophageal reflux disease (GERD) affects approximately 20% of the world's population every year (3). In Indonesia, the prevalence of GERD reaches 9,35% (4). Studies at the

Faculty of Medicine of Syiah Kuala University show the prevalence varies between 8,8% to 25,9% (5), while a recent report from the same institution recorded a rate of 17,9% (6). Among students of the Faculty of Medicine of UPN Veteran Jakarta, the prevalence rate was recorded at 25,18% (7). A preliminary survey conducted online via google form at the State Islamic University of North Sumatera (UINSU) revealed that 56,67% of respondents experienced GERD symptoms. These findings suggest that GERD is a prominent health issue among university students, with potential impacts on their well-being.

Gastroesophageal reflux disease (GERD) can have serious consequences if not properly treated. Persistent symptoms such as chest pain, burning sensation in the chest, and sleep disturbances have been shown to impair quality of life, including cognitive aspects and academic performance. A study by Teimouri and Amra showed that medical students with GERD symptoms experienced a significant decrease in sleep quality, which resulted in daytime fatigue, decreased concentration, and impaired memory (8).

Several factors have been identified as having a significant association with the incidence of Gastroesophageal Reflux Disease (GERD) in university students, including stress levels, diet, as well as alcohol and coffee consumption. Research by Simanjuntak showed that stress is the dominant factor affecting the incidence of GERD in university students, with a relative risk (PR) of 11,750. An irregular diet also contributed significantly to the incidence of GERD, with a PR of 3,294. In addition, coffee consumption has a significant relationship with the incidence of GERD, with a PR of 3,549 (9). Another study by Puspitasari found that eating habits, including consumption of spicy and fatty foods, had a significant association with the incidence of GERD in university students. Stress was also found to be a contributing factor to the incidence of GERD (10). In addition, a study by Nuralam identified that coffee consumption had a significant association with the incidence of GERD in university students (11).

The habit of consuming caffeinated beverages, such as coffee, is part of a common lifestyle among students, including students of the State Islamic University of North Sumatera (UINSU) Faculty of Science and Technology. This drink is often used as an option to accompany study activities, especially when facing high academic loads such as assignments, exams, and group projects. Students tend to stay up late to complete their academic responsibilities, and in the process, coffee is thought to help maintain focus and reduce drowsiness. However, this habit, if practiced excessively and in the long term, can have a negative impact on health, one of which is increasing the risk of gastrointestinal disorders such as gastroesophageal reflux disease (GERD) (12).

Previous studies have shown inconsistencies in findings regarding the association between coffee consumption and the incidence of gastroesophageal reflux disease (GERD). Some studies reported a significant association between coffee consumption and GERD incidence, while others found no significant association. For example, a study by Kanzulli et al. found that coffee consumption had a significant association with the incidence of GERD in adolescents (13). However, another study by Hafiedz et al. on Mulawarman University students found no significant association between coffee consumption and GERD symptoms (14). Similarly, a study by Saraswati et al. found no significant association between coffee consumption and GERD symptoms in students of the Faculty of Medicine, Hang Tuah University Surabaya (4).

The study by Saraswati et al. examined students from the Faculty of Medicine at Hang Tuah University as the main subject. Students from a medical background generally have a better understanding of health aspects (4), including the impact of caffeine consumption, so the results may not necessarily reflect conditions in student groups from other disciplines. Until now, there are still limited studies that highlight the relationship between coffee consumption and the incidence of GERD in students in the field of Science and Technology, especially at the State Islamic University of North Sumatera. The inconsistency of previous findings, coupled with the high prevalence of GERD

symptoms based on an initial survey of students at the Faculty of Science and Technology, suggests the need for further study. This study is expected to provide a more representative picture of the relationship between coffee consumption and the incidence of GERD in this population group.

Methods

This study uses quantitative methods with a case control design and retrospective approach. It was conducted at the Faculty of Science and Technology State Islamic University of North Sumatera in April-May 2025. The population consisted of 456 students of class 2022, of which 82 people were selected as samples using the Slovin formula ($e = 0,1$) and the sampling method used accidental sampling technique with a case-control ratio of 1:1 (41 cases and 41 controls). Cases were defined as students who had GERD (GERD Q score ≥ 8), while controls had GERD Q score < 8 . Inclusion criteria included active student status, willingness to complete the questionnaire, and no history of chronic gastrointestinal disorders, while exclusion criteria included confirmed GERD diagnosis with intensive therapy and heavy smoking (≥ 10 cigarettes/day). Data were collected through an online questionnaire that included identification of GERD (GERD Q) and coffee consumption (food frequency questionnaire: frequency, number of cups, type, time, and mixture). The coffee instrument was tested for validity and reliability (Cronbach's alpha = 0,75). Data were analyzed using IBM SPSS Statistics v.27.0, with univariate analysis presenting frequencies and percentages of respondent characteristics, and bivariate analysis using the chi square test to test the association between coffee consumption and GERD incidence at a significance level of $p < 0,05$.

Results

Table 1. Frequency Distribution of Respondents' Characteristics and Research Variables

| Respondent Characteristics | Case | | Control | | Total |
|----------------------------|------|-------|---------|-------|------------|
| | n | % | n | % | n (%) |
| Age | | | | | |
| ≤20 | 24 | 50,0 | 24 | 50,0 | 48 (58,5) |
| >20 | 17 | 50,0 | 17 | 50,0 | 34 (41,5) |
| Gender | | | | | |
| Male | 11 | 26,8 | 10 | 24,4 | 21 (25,6) |
| Female | 30 | 73,2 | 31 | 75,6 | 61 (74,4) |
| Study Program | | | | | |
| Computer Science | 12 | 29,3 | 14 | 34,1 | 26 (31,7) |
| Information System | 11 | 26,8 | 12 | 29,3 | 23 (38) |
| Biology | 14 | 34,1 | 7 | 17,1 | 21 (25,6) |
| Math | 3 | 7,3 | 7 | 17,1 | 10 (12,2) |
| Physics | 1 | 2,4 | 1 | 2,4 | 2 (2,4) |
| Coffee Consumption | | | | | |
| Routine | 24 | 58,5 | 7 | 17,1 | 31 (37,8) |
| Not Routine | 17 | 41,5 | 34 | 82,9 | 51 (62,2) |
| Total | 41 | 100,0 | 41 | 100,0 | 82 (100,0) |

Table 1 shows that this study involved 82 respondents consisting of 41 people in the case group and 41 people in the control group. Based on age group, the majority of respondents were ≤ 20 years old with 48 people (58,5%), while the remaining 34 people (41,5%) were >20 years old, and the distribution was evenly distributed between case and control groups. The gender of the respondents

was dominated by women with 61 people (74,4%), while men were 21 people (25,6%). Based on the study program, the most respondents came from Computer Science with 26 people (31,7%), followed by Information Systems 23 people (28%), Biology 21 people (25,6%), Mathematics 10 people (12,2%), and Physics 2 people (2,4%). Regarding coffee consumption habits, 31 respondents (37,8%) were known to consume coffee regularly, with a dominance in the case group of 58,5%, while in the control group it was only 17,1%. In contrast, 51 respondents (62,2%) did not consume coffee regularly, which was more prevalent in the control group at 82,9%, compared to the case group at 41,5%.

Table 2. Bivariate Analysis of Coffee Consumption on the Incidence of GERD in Students of the Faculty of Science and Technology UINSU

| Variables | GERD | | | | P Value | OR | 95 % CI | |
|--|------|-------|---------|-------|---------|-------|---------|-------|
| | Case | | Control | | | | Lower | Upper |
| | n | % | N | % | | | | |
| Coffee Consumption | | | | | | | | |
| Routine | 24 | 58,5 | 7 | 17,1 | 0,001 | 6,86 | 2,5 | 19,1 |
| Not Routine | 17 | 41,5 | 34 | 82,9 | | | | |
| Frequency of Coffee cups (last 3 months) | | | | | | | | |
| ≤ 1 cup/day | 11 | 28,9 | 18 | 45,0 | 0,166 | 2,008 | 0.8 | 5,1 |
| ≥ 2 cups/day | 27 | 71,1 | 22 | 55,0 | | | | |
| Type of Coffee | | | | | | | | |
| Black coffee | 9 | 18,0 | 5 | 12,5 | 0,379 | 2,02 | 0,6 | 6,8 |
| Kopi coffee (Sugar) | 4 | 8,0 | 3 | 7,5 | 1 | 1,37 | 0,3 | 6,5 |
| Instant coffee | 20 | 40,0 | 16 | 40,0 | 0,505 | 1,49 | 0,6 | 3,6 |
| Milk/latte coffee | 17 | 34,0 | 15 | 37,5 | 0,821 | 1,23 | 0,5 | 3,0 |
| Decaf coffee | 0 | 0,0 | 1 | 2,5 | 1 | - | - | - |
| Total | 41 | 100,0 | 41 | 100,0 | | | | |

Table 2 shows that there is a significant relationship between regular coffee consumption and the incidence of GERD among students of the Faculty of Science and Technology UINSU. Respondents who consumed coffee regularly had a 6,86 times greater chance of developing GERD compared to those who did not regularly consume coffee (OR = 6,86; 95% CI: 2,5-19,1; p = 0,001). This finding suggests that regular coffee consumption is a factor that potentially increases the risk of developing GERD in the student population studied.

The variables of frequency of coffee consumption per day and type of coffee consumed did not show a significant association with the incidence of GERD. The frequency of consumption ≥ 2 cups per day was recorded more in the case group (71,1%) than the control group (55,0%), but the statistical test results were not significant (p = 0,166; OR = 2,008; 95% CI: 0,8-5,1). The type of coffee consumed was also not significantly associated with the incidence of GERD. Black coffee consumption had an OR of 2,02 (p = 0,379), black coffee with sugar OR = 1,37 (p = 1), instant coffee OR = 1,49 (p = 0,505), and milk/latte coffee OR = 1,23 (p = 0,821). Only one person from the control group consumed decaf coffee, while there was no consumption of this type of coffee in the case group.

Discussion

The results of this study indicate that there is a significant relationship between routine coffee consumption and the incidence of Gastroesophageal Reflux Disease (GERD) in students of the Faculty of Science and Technology, State Islamic University of North Sumatra with a p value of 0,001. Students who regularly consume coffee have a 6,86 times greater chance of experiencing GERD symptoms compared to those who do not regularly consume it. This finding indicates that routine coffee consumption is a strong risk factor for gastrointestinal disorders among university students. The mechanism involved may be explained through the effects of caffeine on the gastrointestinal system. This reinforces the urgency to consider coffee consumption as a determinant in the gastrointestinal health of university students.

Physiologically, caffeine plays a role in decreasing lower esophageal sphincter (LES) tone, which allows reflux of gastric contents into the esophagus. This decrease in LES pressure is a major mechanism in the pathogenesis of GERD. In addition, caffeine also stimulates gastric acid secretion and slows gastric emptying, which contributes to increased acidity and irritation of the oesophageal mucosa. These findings are supported by Mehta et al. study that traced the stimulatory effects of caffeine on the stomach and enteric nervous system as a whole (15).

This result is in line with the prospective study of Mehta et al. which showed that coffee consumption ≥ 6 cups/day significantly increased the risk of GERD (HR = 1,34; 95% CI= 1,13-1,59) (15). The study emphasized that reducing coffee consumption and replacing it with water may reduce the risk of GERD, especially in women of reproductive age. The high data validity of the cohort study strengthens the generalizability of the results of this study to college students with high academic stress and increased caffeine consumption.

Hartoyo et al.'s study in Jakarta reinforced these findings, stating that as many as 84,6% of GERD sufferers in the study sample consumed coffee in moderate to high frequency, and the association was significant ($p = 0,006$) (16). This study used a cross-sectional design and included respondents from an urban environment with a similar lifestyle to university students. The similarity in consumption patterns reinforces the contextual fit between that study and the population studied in this study.

AlHussaini et al.'s study conducted in Saudi Arabia also showed a significant association between the consumption of caffeinated beverages, including coffee, and the incidence of GERD (17). The study noted that adolescents and young adults who frequently consumed coffee had a higher risk of reflux symptoms, regardless of other factors such as diet or obesity. This suggests that coffee itself may play a role in worsening LES function and increasing the risk of acid reflux.

However, not all studies found a significant association. Hafiedz et al. in their study of Mulawarman University students stated that coffee consumption was not significantly associated with the incidence of GERD ($p = 0,571$) (14). It is likely that this result was influenced by variations in the educational background of the respondents, as well as other protective factors such as a healthy diet and lower stress levels. This difference suggests that the relationship between coffee and GERD is multifactorial and may be influenced by overall lifestyle.

Saraswati's study also found no significant relationship between coffee consumption and GERD symptoms in Hang Tuah University medical students (4). This study mentioned that students from medical backgrounds tend to have a better understanding of the effect of caffeine on digestion so that they can manage the time and frequency of coffee consumption wisely. These behavioral differences may explain the inconsistent results between studies.

In addition to observational studies, a meta-analysis by Kim et al. of 15 studies concluded that the association between coffee consumption and GERD was inconsistent (pooled OR = 1,06; 95% CI: 0,94-1,19) (18). These results indicate that although there is a trend toward increased risk, not all studies found evidence strong enough to establish a causal relationship. Therefore, the results

of studies related to coffee consumption and GERD need to be interpreted in the context of the characteristics of the population studied.

In this study, coffee type did not show a significant association with the incidence of GERD. Both black coffee, black coffee with sugar, instant coffee, and milk/latte coffee had p values > 0.05 , with ORs that varied but were not significant. These results are in line with the findings of Arsanti et al. who found no significant difference between the effects of black coffee and mixed coffee on GERD symptoms among university students in Bekasi ($p = 0,790$) (19). Therefore, caffeine concentration and acidity are likely to influence physiological effects more than the type of coffee itself.

The frequency of coffee consumption ≥ 2 cups per day was higher in the case group, but showed no statistically significant association ($p = 0,166$). However, this high proportion indicates an increased risk. The Saygili et al. study suggested that daily consumption of large amounts of coffee leads to increased gastric acid secretion and impaired gastric motility, which aggravates reflux symptoms (20). Therefore, the frequency of consumption still needs to be controlled as a preventive measure against GERD.

The timing of coffee consumption also plays an important role in the risk of GERD. Kim et al. mentioned that coffee consumption on an empty stomach or at night can significantly increase the intensity of GERD symptoms (18). College students tend to consume coffee while staying up late or before exams, thus increasing their exposure to caffeine at non-ideal times. This is a potential factor that needs to be included in the development of predictive models of GERD incidence in the future.

Based on all these findings, it is recommended that students limit their regular coffee consumption and pay attention to the type and time of consumption. Alternatives such as decaf coffee, milk coffee, or cold brew brewing methods can be chosen to lower acidity and caffeine levels. Nehlig's research shows that cold brew and coffee consumption after meals help reduce GERD symptoms in acid-sensitive individuals (1). These recommendations can be used as a basis for education in campus health promotion.

Conclusion

This study concluded that there is a significant relationship between routine coffee consumption habits and the incidence of GERD symptoms in students of the Faculty of Science and Technology, State Islamic University of North Sumatra. It is recommended that higher education institutions provide digestive health education in various forms of student development activities and support the availability of regular nutritional screening and counseling services. Further research is recommended to be conducted on a multi-campus basis, involving a wider population and a qualitative approach to explore student perceptions of coffee consumption and its impact on health, so as to produce more effective behavior-based interventions.

References

- [1] Nehlig A. Effects of Coffee on the Gastro-Intestinal Tract: A Narrative Review and Literature Update. *Nutrients*. 2022 Jan 17;14(2):399.
- [2] Chen Y, Sun X, Fan W, Yu J, Wang P, Liu D, et al. Differences in Dietary and Lifestyle Triggers between Non-Erosive Reflux Disease and Reflux Esophagitis—A Multicenter Cross-Sectional Survey in China. *Nutrients*. 2023 Jul 31;15(15):3400.
- [3] Patria AC. Hubungan Antara Konsumsi Kopi dan Merokok Terhadap Kejadian Gastroesophageal Reflux Disease (GERD) pada Mahasiswa Preklinik Angkatan 2019-2021 Fakultas Kedokteran Universitas Islam Negeri Syarif Hidayatullah Jakarta [Skripsi Sarjana]. [Jakarta]: Universitas Islam Negeri Syarif Hidayatullah ; 2023.
- [4] Saraswati AP, Gariato E, Mulyarjo. Hubungan antara Konsumsi Kopi dengan Gejala Gastroesophageal Reflux Disease (GERD). *CoMPHI Journal: Community Medicine and Public Health of Indonesia Journal*. 2021 Mar 7;1(3):177–84.
- [5] Ajjah BFF, Mamfaluti T, Putra TRI. Hubungan Pola Makan Dengan Terjadinya Gastroesophageal Reflux Disease (GERD). *Journal of Nutrition College*. 2020 Sep 15;9(3):169–79.
- [6] Ardhan FR, Budyono C, Cholidah R. Hubungan Pola Makan Dengan Kejadian Gastroesophageal Reflux Disease Pada Mahasiswa Fakultas Kedokteran Universitas Mataram. *Unram Medical Journal*. 2022 Mar 31;11(1):806–11.
- [7] Syah EAH. Prevalensi Gerd Dan Faktor-Faktor yang Mempengaruhi Pada Mahasiswa Fakultas Kedokteran UPN Veteran Jakarta. [Skripsi]. [Jakarta]: Universitas Pembangunan Nasional Veteran Jakarta; 2023.
- [8] Teimouri A, Amra B. Association between Sleep Quality and Gastroesophageal Reflux in Medical Students. *Middle East J Dig Dis*. 2021 May 29;13(2):139–44.
- [9] Simanjuntak SM. Faktor Risiko Gastroesophageal Reflux Disease (GERD) pada Mahasiswa Kedokteran Universitas Jambi tahun 2024 [Skripsi]. [Jambi]: Universitas Jambi; 2024.
- [10] Puspitasari A. Hubungan Antara Stres dan Kebiasaan Makan dengan Gastroesophageal Reflux Disease pada Mahasiswa Fakultas Kedokteran Universitas Sebelas Maret Angkatan 2020-2022 [Skripsi]. [Surakarta]: Universitas Sebelas Maret; 2024.
- [11] Nuralam MF. Hubungan Antara Konsumsi Kopi dan Teh terhadap Kejadian Gastroesophageal Reflux Disease (GERD) pada Mahasiswa [Skripsi]. [Surakarta]: Universitas Muhammadiyah Surakarta; 2024.
- [12] Ou H, Huang H, Ye X, Lin H, Wang X. The Relationship between Dietary Habits and Gastroesophageal Reflux Disease: A Two-Sample Mendelian Randomization Study. *Curr Med Chem*. 2024 Jun 27;31.
- [13] Kanzulli MH, Suharmanto S, Rudiyanto W. Hubungan Konsumsi Kopi dengan Kejadian Gastroesophageal Reflux Disease (GERD) pada Remaja. *Journal of Language and Health*. 2024;5(3):1073–80.
- [14] Hafiedz AFO, Iskandar A, Murti IS. Hubungan Konsumsi Kopi dengan Gejala Gastroesophageal Reflux Disease pada Mahasiswa Universitas Mulawarman. *Jurnal Medika: Karya Ilmiah Kesehatan*. 2024;9(2).
- [15] Mehta RS, Song M, Staller K, Chan AT. Association Between Beverage Intake and Incidence of Gastroesophageal Reflux Symptoms. *Clinical Gastroenterology and Hepatology*. 2020 Sep;18(10):2226-2233.e4.
- [16] Hartoyo FZ, Tandarto K, Sidharta V, Tenggara R. The Correlation Between Coffee Consumption and Gastroesophageal Reflux Disease. *The Indonesian Journal of Gastroenterology, Hepatology, and Digestive Endoscopy*. 2022 May 15;23(1):11–6.

- [17] AlHussaini KI, Bin Abbas FB, Aljabri SF, Bayamin RA, Alfraih YA, Alsarar SA. Prevalence and Risk Factors for Gastroesophageal Reflux Disease (GERD) Among Visitors to the Health Center of Imam Mohammad Ibn Saud Islamic University. *Cureus*. 2023 Aug 22;
- [18] Kim J, Oh SW, Myung SK, Kwon H, Lee C, Yun JM, et al. Association between coffee intake and gastroesophageal reflux disease: a meta-analysis. *Diseases of the Esophagus*. 2014 May;27(4):311–7.
- [19] Arsanti NM, Dewi R, Tenggara R, Rensa A. The Effects Between Black Coffee and Mixed Coffee Consumption Towards Gastroesophageal Reflux Disease (GERD) Symptoms. *The Indonesian Journal of Gastroenterology, Hepatology, and Digestive Endoscopy*. 2024 Jul 23;25(2):107–13.
- [20] Saygili S, Hegde S, Shi XZ. Effects of Coffee on Gut Microbiota and Bowel Functions in Health and Diseases: A Literature Review. *Nutrients*. 2024 Sep 18;16(18):3155.