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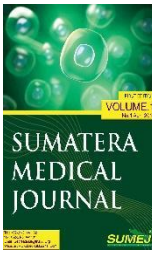

Research Article

The Relationship Between Body Mass Index (BMI) and the Occurrence of Gastroesophageal Reflux Disease (GERD) Among Students of the Faculty of Medicine, Universitas Sumatera Utara, Batch of 2021 and 2022

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ARTICLE INFO

Article history:
Received 03 December 2024
Revised 06 April 2025
Accepted 07 April 2025
Available online 01 May 2025

E-ISSN: 2622-1357
P-ISSN: 2622-9234

How to cite:
Dimas Zainuddin Amir, M. Aron Pase, Melvin Nova Gunawanto Barus, Adriansyah Lubis, "The Relationship Between Body Mass Index (BMI) and the Occurrence of Gastroesophageal Reflux Disease (GERD) Among Students of the Faculty of Medicine, Universitas Sumatera Utara, Batch of 2021 and 2022", SUMEJ, Vol. 08, No. 02, May 2025.

http://doi.org/10.32734/sumej.v8i2.19071.

ABSTRACT

Background: Gastroesophageal Reflux Disease (GERD) is a common digestive disorder, especially among young adults like college students. One factor linked to GERD is Body Mass Index (BMI). Although higher BMI is associated with a greater risk of GERD, limited data exists on this relationship in university populations, particularly at the Faculty of Medicine, Universitas Sumatera Utara. **Objective:** This study aims to analyze the relationship between BMI and GERD incidence in FK USU students from the 2021 and 2022 batches. **Methods**: An analytical, cross-sectional study was conducted using simple random sampling. The subjects were Medical Education students from the 2021 and 2022 batches. Data collection was done through direct distribution of the GERD-Q questionnaire. Statistical analysis included univariate and bivariate methods using chi-square tests. **Results**: Among 100 respondents, 52 (52.0%) had GERD. Among those with GERD, 43 (29.6%) were obese and 9 (22.4%) had normal BMI. Of those without GERD, 34 (20.6%) had normal BMI and 14 (27.4%) were obese. A significant relationship was found between BMI and GERD (p = 0.011). **Conclusion**: There is a significant relationship between BMI and GERD incidence among FK USU Medical Faculty students from the 2021–2022 batches.

Keywords: body mass index, chi-square, GERD, GERD-Q

1. Introduction

Gastroesophageal Reflux Disease (GERD), or acid reflux, is a condition that impacts the lives of millions worldwide [1]. Imagine experiencing the discomfort of heartburn, regurgitation, or chest pain on a daily basis, with the possibility of more severe complications such as chronic cough, asthma, or recurrent aspiration pneumonia [2]. While some degree of gastric reflux is considered normal, GERD occurs when this reflux

becomes excessive or when the body fails to clear stomach acid effectively [3]. A the core of this condition is the dysfunction of the Lower Esophageal Sphincter (LES), which fails to prevent stomach contents from flowing back into the esophagus, leading to symptoms that significantly reduce the quality of life and increase healthcare costs [4].

Globally, GERD has emerged as a significant public health issue. Prevalence estimates range from 8% to 33%, with notable variations between regions [5]. In Western countries such as the United States, Europe, and Australia, GERD affects approximately 10% to 30% of the population, whereas in East Asia, including Indonesia, the prevalence is reported to be below 10% [6]. Despite its relatively lower prevalence in Asia, GERD cases have been steadily increasing. For example, data from RS Dr. Ciptomangunkusumo revealed an alarming rise in GERD prevalence from 5.7% in 1997 to 25.18% in 2002, indicating that GERD is becoming a growing concern in Indonesia. The burden of GERD is particularly evident in North America and Europe, where it accounts for significant healthcare utilization and costs exceeding $10 billion annually [7].

Studies in Indonesia further highlight the role of specific lifestyle and physiological factors in the development of GERD. GERD is prevalent among individuals with certain habits, such as smoking (50%), regular coffee consumption (33.3%), and alcohol use (56.2%) [8]. Additionally, it is more common among women and individuals with a higher Body Mass Index (BMI), suggesting a multifactorial etiology [9]. Risk factors such as advanced age, smoking, anxiety, depression, and sedentary lifestyles also contribute significantly to GERD development. Dietary habits, including high-acid foods, large meal portions, and eating close to bedtime, have been shown to exacerbate symptoms [10].

Body mass index, calculated as weight in kilograms divided by height in meters squared (kg/m²), is a key metric for categorizing body weight [11]. According to WHO standards, BMI is classified into underweight (<18.5), normal weight (18.5–22.9), overweight (23–24.9), obesity I (25–29.9), and obesity II (>30) [12]. Obesity has been closely linked to GERD due to its impact on intra-abdominal pressure, gastric emptying, and LES dysfunction [13]. Increased abdominal pressure and the relaxation of the LES contribute to acid reflux, disrupting the delicate balance between esophageal defenses and gastric acid levels [14]. These physiological changes increase the likelihood of GERD symptoms and complications [15].

Despite the growing body of international research, limited studies in Indonesia specifically examine the relationship between BMI and GERD among young adults [16]. Medical students, for instance, often experience stress, irregular eating habits, and reduced physical activity, which may elevate their risk of GERD. A recent study by Srihartini et al. (2024) found a significant correlation between BMI and GERD in specific populations, underscoring the importance of targeted interventions [17].

This research aims to explore the association between BMI and GERD among medical students at the Faculty of Medicine, Universitas Sumatera Utara, cohorts 2021 and 2022. The findings are expected to provide valuable insights into GERD's prevalence and risk factors in this demographic, contributing to preventive strategies and healthcare planning for young adults in Indonesia. This study not only addresses a pressing health concern but also seeks to enhance awareness of GERD's risk factors, paving the way for evidence-based interventions and improved health outcomes.

2. Methods

This study employs an analytical design with a cross-sectional approach to analyze the relationship between Body Mass Index (BMI) and the occurrence of Gastroesophageal Reflux Disease (GERD) among medical students of the Faculty of Medicine, Universitas Sumatera Utara (FK USU), batch of 2021 and 2022. The cross-sectional approach allows the researchers to measure variables simultaneously at a specific point in time, providing an efficient overview of the relationship between BMI and GERD. The study is conducted at the Faculty of Medicine, Universitas Sumatera Utara, during the period of July to November 2024.

The study population consists of medical students from FK USU, batch of 2021 and 2022, with a total of 477 students. The sample was selected using a simple random sampling technique, ensuring each individual in the population had an equal chance of being chosen. The sample size was calculated using the Slovin formula with a 10% margin of error, resulting in a minimum estimated sample size of 100 respondents. Primary data were collected through GERD-Q questionnaires distributed directly to the respondents, while BMI was measured based on self-reported weight and height data from the participants.

The collected data will be processed through several steps, including editing, coding, entry, cleaning, and saving, to ensure data quality. Data analysis will be conducted using the Statistical Package for the Social Sciences (SPSS) software, with a univariate approach to describe demographic characteristics, GERD prevalence, and BMI distribution. Additionally, a bivariate analysis using the Chi-square test will be performed to identify the relationship between BMI and GERD, as well as other demographic characteristics. Results with a p-value < 0.05 will be considered statistically significant, with a 95% confidence interval. Ethical

considerations, such as maintaining the confidentiality of respondents' data and ensuring their use solely for research purposes, are strictly adhered to in this study.

3. Results

This study was conducted according to the research timeline, and based on data analysis, the results are as follows:

Table 1. Frequency distribution of respondents based on academic year

Academic Year	Number (n)	%
2021	52	52.0
2022	48	48.0
Total	100	100

Based on the table above, there are 100 samples meeting the criteria. The 100 samples consist of 52 respondents from the 2021 academic year (52.0%) and 48 respondents from the 2022 academic year (48.0%) (Tab 1). The total number of FK USU students from the 2021–2022 academic years is 477, with 226 students from 2021 and 251 students from 2022. Using the Slovin formula, a sample of 100 students completed the questionnaire.

Table 2. Frequency distribution of respondents based on age

Age (Years)	Number (n)	%
19	1	1.0
20	62	62.0
21	31	31.0
22	6	4.0
Total	100	100

Based on the table above, of the 100 study samples, 1 respondent is 19 years old (1.0%), 62 respondents are 20 years old (62.0%), 31 respondents are 21 years old (31.0%), and 6 respondents are 22 years old (4.0%). This study found that GERD was more prevalent among respondents aged 20-21 years compared to those aged 19 or 22 years. Research by Baklola et al. (2023) demonstrated a higher prevalence of GERD in individuals aged 20-23 years. This discrepancy may be attributed to differences in age group categorization and the sample size used in the studies [18].

Table 3. Frequency distribution of respondents based on gender

Gender	Number (n)	%
Male	32	32.0
Female	68	68.0
Total	100	100

Based on the table above, among the 100 study samples, the percentage of females is higher than males, with 68 female respondents (68.0%) compared to 32 male respondents (32.0%). This finding aligns with the research conducted by Kim Y et al. (2016), which revealed a higher prevalence of GERD among females compared to males [19]. Similarly, a study by Kim S et al. (2019) conducted at Ewha Womans University Mokdong Hospital in Seoul reported comparable results, indicating that females were more commonly affected by GERD than males [20].

Table 4. Frequency Distribution of Respondents Based on BMI

BMI	Number (n)	%
Underweight (<18.5)	4	4.0
Normal (18.5–22.9)	38	38.0
Overweight (23–24.9)	16	16.0
Obesity 1 (25–29.9)	39	39.0
Obesity 2 (>30)	3	3.0
Total	100	100

Based on the table above, among the 100 study samples, 4 respondents are underweight (4.0%), 38 respondents have normal BMI (38.0%), 16 respondents are overweight (16.0%), 39 respondents are classified as Obesity 1 (39.0%), and 3 respondents as Obesity 2 (3.0%) (Tab 4). In terms of Body Mass Index (BMI), this study identified that respondents with obesity had a higher prevalence of GERD. The findings are consistent with the research by Kim S (2019) [20], which stated that being overweight or obese increases the risk of GERD. Furthermore, Vaishnav et al. (2017) highlighted that the higher the BMI, the greater the risk of experiencing severe GERD symptoms [1].

Table 5. Frequency distribution of respondents based on family history of GERD

Family History of GERD	Number (n)	%
Present	56	56.0
Absent	44	44.0
Total	100	100

Based on the table above, among the 100 study samples, 56 respondents (56.0%) have a family history of GERD, while 44 respondents (44.0%) do not. This suggests that genetic or familial factors may play a significant role in the development of GERD. The result aligns with existing literature, such as the study conducted by Baklola et al. (2023), which demonstrated a significant correlation between GERD occurrence and family history. In that study, 53% of GERD patients also had a family history of the condition, supporting the notion that hereditary predisposition could influence susceptibility to GERD (Tab 5) [18].

Table 6. Frequency Distribution of Respondents Based on GERD Diagnosis

GERD Diagnosis	Number (n)	%
GERD Present	53	53.0
GERD Absent	47	47.0
Total	100	100

Based on the table above, among the 100 study samples, 53 respondents (53.0%) have GERD, while 47 respondents (47.0%) do not (Tab 6). The high percentage of GERD diagnoses may be attributed to lifestyle factors commonly associated with GERD, such as dietary habits, stress, smoking, and physical inactivity. The prevalence aligns with findings in other studies, such as Kim S (2019) [20], which reported that GERD is becoming increasingly common due to shifts in dietary patterns and lifestyle behaviors. Additionally, the substantial percentage of respondents without GERD suggests that there are protective factors or variations in individual susceptibility that warrant further exploration. These might include healthier eating patterns, effective stress management, or genetic differences in predisposition to GERD.

Table 7. Frequency distribution of GERD respondents by gender

Gender	Number (n)	%
Male	20	37.7
Female	33	62.3
Total	53	100

Among the 53 GERD respondents, 33 females (62.3%) experience GERD, compared to 20 males (37.7%). This finding aligns with the research conducted by Kim Y et al. (2016), which revealed a higher prevalence of GERD among females compared to males [19]. Similarly, a study by Kim S et al. (2019) conducted at Ewha Womans University Mokdong Hospital in Seoul reported comparable results, indicating that females were more commonly affected by GERD than males [20].

Table 8. Frequency distribution of GERD respondents by age

Age (Years)	Number (n)	%
19	1	1.9
20	31	58.4
21	17	32.1
22	4	7.6
Total	53	100

Among the 53 GERD respondents, 31 (58.4%) are 20 years old, 17 (32.1%) are 21 years old, 4 (7.6%) are 22 years old, and 1 (1.9%) is 19 years old. This study found that GERD was more prevalent among respondents aged 20-21 years compared to those aged 19 or 22 years. Research by Baklola et al. (2023) demonstrated a higher prevalence of GERD in individuals aged 20-23 years [18]. This discrepancy may be attributed to differences in age group categorization and the sample size used in the studies.

Table 9. Frequency distribution of GERD respondents by BMI

BMI	Number (n)	%
Underweight	2	3.8
Normal	7	13.2
Overweight	8	15.1
Obesity 1	33	62.2
Obesity 2	3	5.7
Total	53	100

Among the 53 GERD respondents, 33 (62.2%) are classified as Obesity 1, 3 (5.7%) as Obesity 2, 8 (15.1%) as overweight, 7 (13.2%) as normal BMI, and 2 (3.8%) as underweight. This finding supports existing research that links obesity to an increased risk of GERD, as excess weight can elevate intra-abdominal pressure, contributing to acid reflux and esophageal irritation [21]. The smaller proportions of respondents in the overweight (15.1%), normal (13.2%), and underweight (3.8%) categories suggest that while obesity remains the most significant risk factor, individuals with lower BMI are less likely to experience GERD, though it does not rule out other contributing factors such as diet or genetic predispositions (El-Serag, 2014). The results emphasize the importance of managing weight in GERD prevention and treatment strategies, highlighting a need for further research to explore the underlying mechanisms connecting obesity to GERD.

Table 10. Relationship Between BMI and GERD

BMI	GERD Present	GERD Absent	Total	p-Value
Normal	9 (21.4%)	33 (78.5%)	42	0.001
Obesity	44 (75.9%)	14 (24.1%)	58	
Total	53	47	100	

Based on the table above, of the 53 GERD respondents, 9 (21.4%) have normal BMI, and 44 (75.9%) are obese. The 47 non-GERD respondents include 33 individuals (78.5%) with normal BMI and 14 individuals (24.1%) classified as obese. Statistical analysis shows a p-value of 0.001, indicating a significant relationship between BMI and GERD ($p < 0.05$) (Tab 8-10).

4. Discussion

An increase in Body Mass Index (BMI) is associated with a higher risk of developing Gastroesophageal Reflux Disease (GERD). Obesity can impact the function of the Lower Esophageal Sphincter (LES), as a higher BMI may elevate intra-abdominal pressure, which in turn contributes to the reflux of stomach acid into the esophagus. In individuals with obesity, increased intra-abdominal pressure can directly weaken the lower esophageal sphincter (LES), the muscular valve that prevents stomach contents from flowing backward. This pressure makes it easier for stomach acid to reflux into the esophagus, leading to GERD symptoms. Additionally, lifestyle factors and diet commonly associated with obesity-such as high-fat intake and overeating—can further exacerbate the condition. A high-fat diet, which refers to the consumption of foods rich in fats such as fried foods, fatty meats, and full-fat dairy products, as well as carbonated beverages, caffeine, and alcohol intake, are all known to increase the risk of GERD by either relaxing the LES or increasing acid production. In addition, smoking and stress are other critical factors that exacerbate GERD, as smoking can reduce LES pressure, and stress may increase acid production or affect the functioning of the digestive system [22]. These findings suggest that both body weight management and lifestyle modifications are essential for preventing and managing GERD.

5. Conclusion

Based on the results and data analysis from a questionnaire survey with 100 respondents, it can be concluded that there is a significant relationship between Body Mass Index (BMI) and Gastroesophageal Reflux Disease (GERD). Furthermore, there was a higher incidence of GERD among respondents who reported a family history of the condition, suggesting a genetic or familial predisposition. These findings underline the importance of BMI management and the need to consider genetic and demographic factors in addressing GERD in this population.

5. Data Availability Statement

The datasets generated and analyzed during the current study are not publicly available due to privacy and ethical considerations but are available from the corresponding author upon reasonable request.

6. Ethical Statement

This study received ethical approval from the Health Research Ethics Committee of the Faculty of Medicine, Universitas Sumatera Utara, under approval number 810/KEPK/USU/2024.

7. Author Contributions

Each author has made substantial contributions to this study, including conceptualization, study design, implementation, data collection, analysis, and interpretation. All authors have participated in drafting, revising, and critically reviewing the manuscript. They have provided final approval of the version to be published and have been involved in the decision regarding the journal for submission. Furthermore, all authors agree to take full responsibility for every aspect of the work.

8. Funding

This research did not receive any external funding.

9. Acknowledgements

We would like to express our sincere gratitude to all the respondents who participated in this study, as well as to the faculty and staff at the Faculty of Medicine, Universitas Sumatera Utara for their support throughout the research process. Special thanks to dr. M. Aron Pase M.Ked (PD) Sp.PD, K-EMD, for their guidance and valuable insights during the study.

10. Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this research. All findings and conclusions presented in this study are independent of any commercial or financial relationships.

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