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Susceptibility of Gastroesophageal Reflux Disease Symptoms in Medical Students: A Formative Study

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ABSTRACT

Introduction: *Gastroesophageal Reflux Disease (GERD) is a common chronic health problem associated with decreased quality of life and high morbidity. Many factors, including lifestyle, eating habits, medication, and mental stress, can trigger gastroesophageal reflux disease. A medical student who experiences high pressure during their training may have a GERD issue.* ***Purpose:*** *This study aims to investigate the correlation between risk factors and the development of GERD in medical students.* ***Methods:*** *We used data from a cross-sectional study conducted at Soegijapranata Catholic University, Semarang, among medical students. Participants were recruited with inclusion criteria, namely all students aged over 18 years who were willing to fill out a questionnaire voluntarily, and were not undergoing treatment for gastric ulcers or mental disorders. Two questionnaires are used: a questionnaire developed to obtain demographic characteristics and a GERDQ questionnaire. A significant relationship is considered to occur if the p-value <0.05.* ***Results:*** *A total of 122 students were included. Among them, 23 students, consisting of 16 (13.11%) women and 7 (5.73%) men, suffered from GERD. It was found that nine people (7.4%) consumed NSAIDs, with a p-value of 0.014.* ***Conclusion:*** *The prevalence of GERD among medical students is relatively high, showing a significant link between the use of NSAIDs and GERD. Practical studies are needed to tackle the issue of uncontrolled NSAID use and to promote lifestyle modifications.*

1. INTRODUCTION

Gastroesophageal reflux disease (GERD) is a significant health problem because it is associated with decreased quality of life and considerable morbidity.[1,2] GERD is characterized by the abnormal reflux of stomach contents into the esophagus, causing sufferers to complain of heartburn —a burning sensation in the middle of the chest —and regurgitation, a sensation of stomach contents moving upwards.[3,4] Classic symptoms of GERD include "heartburn" (pyrosis) and regurgitation. Other symptoms of GERD include dysphagia, chest pain, excessive saliva, a sensation of something stuck in the throat, odynophagia, and extraesophageal symptoms (such as chronic cough, hoarseness, and wheezing), as well as nausea.[5]

Latest epidemiology reports indicate a rising prevalence of GERD worldwide. The estimated global prevalence of GERD ranges from 15% to 27.8%. In developed countries, the prevalence of GERD is higher, ranging from 10% to more than 30%, compared to Asia.[2,6] A lower prevalence was found in the East Asia region, ranging from 2.5% to 7.8%. Although the prevalence is low in Asian countries, several studies in hospitals in Indonesia found that 32.4% of patients with dyspepsia received endoscopic examinations.[4] The incidence of GERD is associated with several risk factors, including older age, high body mass index (BMI), anxiety, and depression.[7–9]

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Biologically, obesity can contribute to GERD by increasing intra-abdominal pressure, interfering with gastric emptying, reducing lower esophageal sphincter (LES) pressure, and promoting LES relaxation. These factors can increase acid exposure in the esophagus.[10]

People with smoking habits had a 1.2 times greater risk of developing GERD, while those who consumed alcohol had a 1.3 times greater risk.[11] The high prevalence of GERD is related to lifestyle factors such as smoking and lack of physical activity.[12] Eating habits, particularly the consumption of foods with a sour taste, insufficient sleep, and inadequate physical activity, can contribute to an increased prevalence of GERD in the population.[11,13] GERD symptoms can be triggered by spicy, salty, and fatty foods, as well as those with a high carbohydrate content.[14] Clinically, GERD is linked to sleep disorders, including shorter sleep duration, difficulty falling asleep, poor sleep quality, and early morning awakenings.[15]

Recent data indicate that the prevalence of GERD among adults in Indonesia has reached 49.0%. Several factors are known to increase the risk of GERD, including younger age, female sex, obesity, coffee consumption, smoking, high acid food intake, family history of GERD, alcoholism, and sleep duration.[16,17] Previous studies indicate that medical students have a high workload, engage in constant studying, and face frequent exams, which may potentially impact their psychological stress and lifestyle, including their eating habits.[4,18] Other studies show that 94.2% of participants with GERD reported experiencing higher levels of stress after enrollment in medical school.[18] Though the GERD event among medical students has not been clear, some studies reported unhealthy lifestyles such as lack of sleep, smoking, lack of exercise, and obesity among medical students that might be contributing to the GERD.[19] GERD can significantly impact one's quality of life, affecting daily activities, college attendance, and overall well-being.[18,19] Many medical students who experience GERD symptoms do not seek medical help, often considering their symptoms insignificant or opting for self-medication. Self-medication is the practice of purchasing medication from a pharmacy without consulting a doctor.[16] In Indonesia, there are limited studies on the prevalence and severity of GERD among medical students.[20] Therefore, this study aims to estimate the prevalence of GERD in Medical Students.

2. METHODS

This study applied descriptive approaches with a cross-sectional design at Soegijapranata Catholic University, Semarang, Indonesia. We used a total sampling method and involved 122 undergraduate medical students. The participants were recruited using inclusion criteria, such as all students over 18 years old who were willing to complete the questionnaire voluntarily. Students who were not participating in similar research were undergoing ulcer treatment and were being treated for mental disorders. The study has ethical approval from the Medical and Health Research Ethics Committee (MHREC), Faculty of Medicine, Public Health and Nursing, Universitas Gadjah Mada, with number KE/FK/0283/EC/2024.

The dependent variable was gastroesophageal reflux disease. The independent variable was socio-demographic data, including respondents' sex, age, smoking behaviors, NSAID treatment, history of GERD among family members, alcohol consumption, coffee drinking, consumption of acidic foods, self-medication, sleep duration, and body mass index (BMI). We category BMI following the WHO criteria, such as underweight (BMI< 18.5 kg/m^2), average (BMI 18.5–22.9 kg/m^2), overweight (BMI 23.0–24.9 kg/m^2), class I obesity (BMI 25.0–29.9 kg/m^2), and class II obesity (BMI ≥ 30.0 kg/m^2).[21]

We applied two types of questionnaires. The first was a developed questionnaire to gather demographic characteristics, including age, sex, height, weight, smoking behavior, lifestyle, health-seeking behavior, family history of GERD, and NSAID treatment. The second was GERDQ, a validated questionnaire comprising six questions with scores ranging from 0 1 2 to 3. Respondents with a GERDQ score <8 are not considered sick (non-GERD), and those with a score ≥ 8 were considered to have GERD. The questionnaire has a sensitivity of 65% and a specificity of 71%, respectively. The GERDQ questionnaire was developed from three validated questionnaires evaluated in the DIAMOND study. The questionnaire in Indonesian was designed to align with user perceptions, taking into account the diversity of ethnicities and local languages in Indonesia.

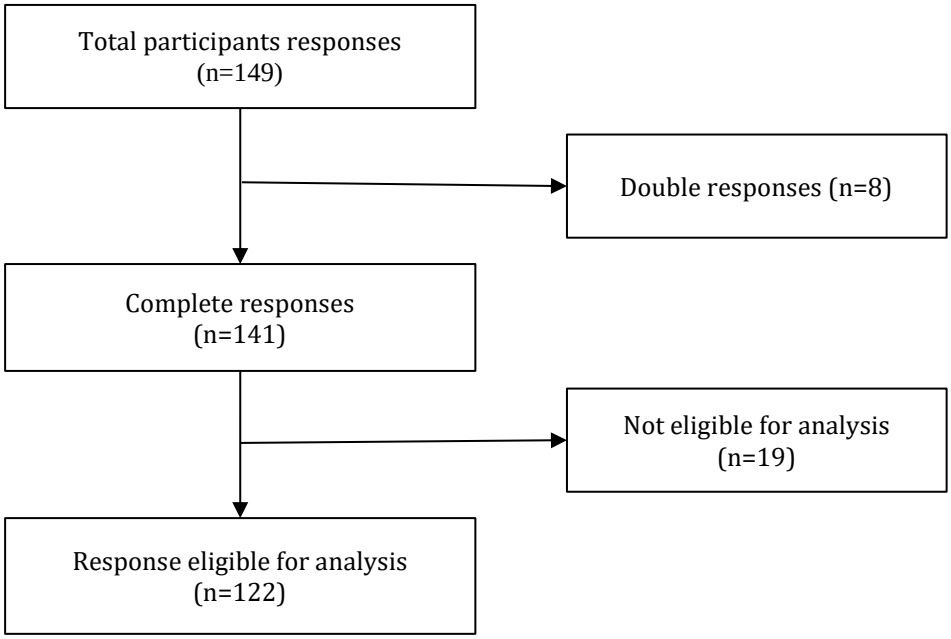
Since 2011, the Indonesian version of the GERDQ has been tested for validity and reliability. This study refers to the results of the validity and reliability tests conducted by Simadibrata et al. (2011), with a validity value of r = 0.26. These results indicate that all GERDQ items were deemed valid.[22]

The univariate analysis was presented in percentages for categorical data and as means with standard deviations for numerical data. An independent t-test was used as a bivariate analysis to assess the susceptibility factors for respondents' GERD. A significant association was considered where the p-value <0,05. All statistical testing was conducted using SPSS.

3. RESULTS

One hundred forty-nine students were responsible for this study invitation; 141 completed the questionnaire, and 122 were eligible for analysis.

Figure 1.
Flowchart of study participants' recruitment



The study found the prevalence of GERD symptoms among medical students was 18.8%. Of the 122 respondents surveyed, 77.05% were female, and 22.95% were male. Among the 94 female respondents, 16 reported gastroesophageal reflux disease, while 7 of the 28 male respondents also had GERD. The participants' body mass index (BMI) categories included 23 individuals classified as underweight, 59 as normal weight, 10 as overweight, and 30 as obese. Notably, those with a normal BMI reported a higher prevalence of GERD at 11.5%. In contrast, the incidence of GERD among individuals who were underweight, overweight, and obese ranged from 1.6% to 3.3%. The survey included 122 respondents, of whom 7 were smokers and 115 were non-smokers. Among smokers, the prevalence of GERD was 2.5%, while 16.3% of non-smokers reported experiencing GERD. Additionally, 13.3% of respondents who self-medicated and 7.4% of those taking nonsteroidal anti-inflammatory drugs (NSAIDs) reported GERD symptoms.

Furthermore, 69 respondents reported a family history of GERD, while 53 did not, resulting in a family history prevalence rate of 13.1% among participants. Regarding alcohol consumption, three respondents reported drinking alcohol, whereas 119 abstained. Among those who did not consume alcohol, the prevalence of GERD was 18.1%. Regarding dietary habits, two respondents consumed acidic foods more than four times a week, 15 consumed them two to four times a week, 43 once a week, and 62 did not consume acidic foods. The proportion of GERD among respondents

who did not consume acidic foods was 8.2%. Eight respondents reported drinking coffee more than four times a week, 12 consumed it two to four times a week, 56 had coffee once a week, and 46 did not drink coffee at all. The prevalence of GERD among respondents who did not drink coffee was 9.1%. Meanwhile, 112 respondents reported sleeping for less than 8 hours, while 10 reported sleeping for more than 8 hours. The prevalence of GERD among individuals with a sleep duration of less than 8 hours was 17.2%.

Table 1.
Association between respondents' characteristics and GERD (N= 122)

Respondents' Characteristics	Total		GERD		Non-GERD		*P*-value
	n	%	n	%	n	%	
Gender							
Female	94	77	16	13,1	78	63,9	0,343
Male	28	23	7	5,8	21	17,2	
BMI							
Underweight	23	18,9	4	3,3	19	15,6	0,374
Normal	59	48,4	14	11,5	45	36,9	
Overweight	10	8,1	2	1,6	8	6,5	
Obese	30	24,6	3	2,5	27	22,1	
Smoking							
Yes	7	5,8	3	2,5	4	3,3	0,094
No	115	94,2	20	16,3	95	77,9	
Self-medication							
Self-medication	78	63,9	17	13,9	61	50	0,269
Visit general practitioners	44	36,1	6	4,9	38	31,2	
NSAID use							
Yes	25	20,4	9	7,4	16	13	0,014 *)
No	97	79,6	14	11,5	83	68,1	
Family with GERD history							
Yes	69	56,5	16	13,1	53	43,4	0,162
No	53	43,5	7	5,8	46	37,7	
Alcohol consumption							
> 4 times/week	0	0	0	0	0	0	0,52
2-4 times/week	0	0	0	0	0	0	
Once/ week	3	2,4	1	0,8	2	1,6	
Never	119	97,6	22	18,1	97	79,5	
Acidic food consumption							
> 4 times/week	2	1,6	1	0,8	1	0,8	0,208
2-4 times/week	15	12,3	5	4,1	10	8,2	
Once/ week	43	35,3	7	5,7	36	29,6	
Never	62	50,8	10	8,2	52	42,6	
Coffee intake							
> 4 times/week	8	6,5	2	1,6	6	4,9	0,454
2-4 times/week	12	9,8	2	1,6	10	8,2	
Once/week	56	45,9	8	6,6	48	39,3	
Never	46	37,8	11	9,1	35	28,7	
Sleep duration							
< 8 hours	112	91,8	21	17,2	91	74,6	0,923
≥ 8 hours	10	8,2	2	1,6	8	6,6	

Table 1 shows the relationship between the demographic factors of respondents and the incidence of GERD. The bivariate tests revealed a significant association between the consumption of NSAIDs and the experience of GERD symptoms among the respondents (p-value < 0.05). However, factors such as gender, BMI, smoking behavior, self-medication, family history, alcohol

consumption, intake of acidic foods, coffee consumption, and sleep duration did not show any significant association with GERD.

4. DISCUSSION

The study found the prevalence of susceptible GERD among medical students to be relatively high (18.8%). Our study also indicated that the use of drugs such as NSAIDs is significantly associated with the occurrence of GERD symptoms among medical students. The findings support previous studies that declared the relationship between NSAID consumption and gastrointestinal disorders. NSAIDs can inhibit COX-1, reducing PGE2 production. It can increase gastric acid secretion and damage the mucous membrane in the gastrointestinal system. In many cases, NSAIDs can trigger the onset of GERD and worsen existing reflux symptoms. NSAIDs can contribute to GERD by causing direct mucosal damage, reducing lower esophageal sphincter (LESP) pressure, or affecting esophagogastric motility.[23,24]

Critically, our study respondents belonged to the young adult age group and showed relatively high consumption of NSAIDs (20.5%). It is aligned with previous epidemiological studies that revealed a significant increase in the use of both prescribed and over-the-counter analgesics among individuals.[25] Nonsteroidal anti-inflammatory drugs (NSAIDs) are currently one of the most widely used drugs because they contain antipyretic, anti-inflammatory, and analgesic effects. Young adults often use NSAIDs and paracetamol as self-therapy aimed at relieving various diseases, such as pain, fever, and inflammatory disorders. The NSAID use can increase the risk of GERD. A previous study showed that more than 50% of respondents who consume NSAIDs experience GERD.[25] Other sudy in Turkey show that the prevalence of gastroesophageal symptoms is 1.7 times greater in patients using NSAIDs regularly than in patients not using this drug.[24] Our study observed no significant association between BMI, family history of GERD, smoking, coffee consumption, consumption of acidic foods, and sleep duration and the experience of GERD symptoms. In gender, even female students tend to experience GERD symptoms more compared to males, but have no significant association. Opposite to the previous studies, the prevalence of GERD in females is relatively higher than in males.[26,27]

The prevalence of GERD symptoms is higher among respondents with a normal BMI category (48.3%), yet the prevalence of GERD among respondents with obesity is relatively high (24.5%). Previous studies have shown that the incidence of GERD increases with central obesity and obesity.[28,29] Despite the statistical test showing no significant association, the rising proportion of obesity among young adults suggests a need to modify lifestyle.[30] Coffee consumption shows no significant association with the experience of GERD symptoms, despite more than 60% of respondents being coffee drinkers. These findings are related to a study by Wei et al. that found no correlation between coffee consumption and GERD.[31] A possible reason is that coffee's chemical composition is rich in bioactive compounds, including chlorogenic acid, caffeoylquinic acids, feruloyl quinic acids, caffeine, diterpenes, melanoidin, and trigonelline.[32,33] The evidence suggests that bioactive compounds are associated with numerous health-promoting outcomes, including reduced risk for digestive disorders.[34,35] Smoking habits in this study did not have a significant association with the incidence of GERD. Our study showed that only 5.7% of respondents smoked, while 42.8% of respondents who smoked experienced GERD. The study findings align with those of Zein et al., who found no significant correlation between e-cigarettes and GERD.[36] In previous studies, eating quickly, overeating, and consuming spicy foods were associated with GERD; however, no association was found with acidic foods. Our findings support an earlier study that asserted no correlation between consuming acidic foods and GERD.[37] A possible reason is that the study respondents are in the young adult category; thus, they have good intrinsic factors and a healthy gastric structure. Our study also found that a family history of GERD and sleep duration, as observed, did not indicate a potential risk factor for GERD in students.

This study is the first to investigate a high-risk population in a university setting by examining the prevalence of various socio-demographic factors and exploring their potential association with gastroesophageal reflux disease (GERD) using standardized screening tools. However, several limitations should be considered. Firstly, the study employs formative methods, primarily

providing baseline data rather than comprehensive evidence for a more extensive or pragmatic study. Secondly, participants were recruited from a private university in Semarang, which limits the generalizability of the findings to other universities or regions. Thirdly, due to the cross-sectional design, the study can only describe the state of the variables of interest at a specific time and cannot establish causal associations between exposure and outcome. Therefore, further research is necessary to gather more evidence.

5. CONCLUSION

In conclusion, we found that the prevalence of gastroesophageal reflux disease (GERD) among medical students is relatively high. Our study indicates a significant association between the use of nonsteroidal anti-inflammatory drugs (NSAIDs) and GERD. However, gender, body mass index (BMI), smoking habits, self-medication, family history of GERD, alcohol consumption, coffee consumption, acidic food consumption, and sleep duration do not appear to increase the risk of developing GERD. Notably, the prevalence of GERD is higher among females, and obesity is significantly linked to an increased risk of GERD. These findings can inform the development of effective weight management strategies and promote healthy lifestyle choices among students. Further, pragmatic studies are needed to address the issue of uncontrolled NSAID use and to encourage lifestyle modifications.

6. ACKNOWLEDGMENTS

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