

Prevalence and Determinants of Gastroesophageal Reflux Disease in a Regional Indonesian Hospital

Gastroesophageal Reflux Disease: Patterns and Risk Factors in a West Java Hospital Setting

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ABSTRACT

Background: Gastroesophageal reflux disease (GERD) is increasing prevalent in Indonesia. However, epidemiology data remain limited, particularly in developing regions such as Karawang. Therefore, this study aims to examine the prevalence, risk factors, and clinical characteristics of GERD within the population of Karawang, West Java.

Methods: This study employed a cross-sectional design. Patients aged >18 years who visited the Karawang Regional Public Hospital, were recruited sequentially. Data were collected using a standardized questionnaire. Univariable and multivariable analyses were performed, with a p -value <0.05 considered statistically significant.

Results: The prevalence of GERD was 55.6%, with a higher prevalence in women compared to men (58% vs. 42%, $p = 0.263$). Significant factors associated with GERD included age <40 years (OR = 0.126; 95% CI: 0.043-0.369; $p = <0.001$), frequent consumption of spicy foods (OR = 5.002; 95% CI: 2.534-9.877; $p = <0.001$); and NSAIDs consumption (OR = 2.002; 95% CI = 1.049-3.821; $p = 0.035$).

Conclusion: GERD is prevalent in the Karawang region. Key factors associated with its occurrence include younger age, frequent consumption of spicy foods, and the use NSAIDs.

Keywords: gastroesophageal reflux disease, gastroesophageal reflux disease questionnaire, prevalence, risk factor

ABSTRAK

Latar Belakang: Penyakit refluks gastroesofageal (GERD) semakin meningkat prevalensinya di Indonesia namun data epidemiologi masih terbatas di daerah berkembang tertentu di Indonesia termasuk Karawang, oleh karena itu penelitian ini bertujuan untuk prevalensi, faktor risiko, serta karakteristik klinis GERD pada populasi di wilayah Karawang, Jawa barat.

Metode: Dengan menggunakan desain cross-sectional, pasien berusia >18 tahun yang berobat ke RSUD Karawang, satu-satunya rumah sakit di Karawang, direkrut secara berurutan (consecutive sampling). Data dikumpulkan dengan menggunakan kuesioner standar. Analisis univariabel dan multivariabel dilakukan dengan $p < 0,05$ sebagai signifikan.

Hasil: Prevalensi GERD pada penelitian ini sebesar 55.6% dan ditemukan lebih banyak pada wanita dibanding pada laki-laki (58% vs. 42%, $p = 0.263$) walaupun tidak signifikan. Analisis faktor risiko menunjukkan bahwa faktor yang berpengaruh signifikan terhadap kejadian GERD pada penelitian ini yaitu faktor usia, dengan usia <40 tahun ditemukan bersifat protektif terhadap GERD (OR = 0.126 ; IK 95%: 0.043–0.369; $p = <0.001$), kebiasaan makan pedas (OR= 5.002; IK 95%: 2.534–9.877 ; $p = <0.001$) dan konsumsi NSAID (OR = 2.002 ; IK 95% = 1.049–3.821; $p = 0,035$).

Kesimpulan: GERD banyak terjadi di Karawang dan faktor penyebabnya adalah usia, kebiasaan makan pedas, dan konsumsi NSAID.

Kata kunci: penyakit refluks gastroesofageal, kuesioner penyakit refluks gastroesofageal, prevalensi, faktor risiko

INTRODUCTION

Gastroesophageal reflux disease (GERD) is a condition characterized by the backward flow of gastric acid into the esophagus. Because it can affect multiple organs—including the esophagus, larynx, and even the respiratory tract—GERD may present with a wide range of symptoms.^{1,2} Common complaints include a burning sensation in the epigastric area and regurgitation, often described as the feeling of stomach contents rising into the esophagus. Additional symptoms may include bloating, nausea, early satiety, belching, excessive salivation, dysphagia, and odynophagia.^{3,4} Extra esophageal signs and symptoms of GERD may include chronic cough, wheezing, laryngitis, and dental problems.⁵ According to the 2013 Indonesian National Consensus on the Management of Gastroesophageal Reflux Disease, individuals with GERD typically present with classic symptoms such as heartburn, regurgitation, or both, often occurring shortly after meals (particularly following the consumption of fatty foods or large portions).⁶ GERD represents one of the most common gastrointestinal disorders worldwide. Li et al. published a 2023 study examining the global burden of GERD, reporting age-standardized prevalence rate of GERD (per 100,000 persons) ranging from 8,190.07 to 10,614.97 in high-income North America, 14,319.22 to 17,944.65 in tropical South America, 7,182.45 to 9,250.17 in Europe, 7,566.16 to 9,881.92 in Australia, 10,898.84 to 13,766.4 in North Africa and Middle East, and 3,912.03 to 5,149.59 in East Asia.⁷ In Indonesia, the prevalence of GERD has increased recently, largely attributed to lifestyle changes that increase individual exposure to GERD.⁶ A study conducted by Syam et al. revealed the prevalence of GERD at Dr. Cipto Mangunkusumo General Hospital in Jakarta, increasing from 5.7% in 1997 to 25.18% in 2002.^{1,8} In West Java, several studies have also reported on the prevalence of GERD. A cross-sectional study conducted in Depok found that 9.35% of 278 participants were diagnosed with GERD based on the GERD-Q questionnaire.⁹ Similarly, a study in Cirebon, West Java, reported that 22.6% of 168 respondents had GERD.¹⁰

A study conducted in the Asia-Pacific region evaluated several factors associated with GERD, including older age, male gender, ethnicity, family history of GERD, higher socioeconomic status, elevated body mass index (BMI), and tobacco use. Among these, elevated BMI has the strongest supporting evidence, with more than 25 clinical studies citing its association with GERD.^{6,9} Lifestyle-related

risk factors for GERD include analgesic consumption, particularly non-steroidal anti-inflammatory drugs (NSAIDs), as well as the consumption of certain foods (such as spicy, sour, and salty items) and beverages (including tea, coffee, herbal remedies, and alcohol). Additional contributing factors include tobacco use, a family history of GERD, elevated body mass index (BMI), and levels of physical activity.^{11,12,14}

Karawang Regency, located in West Java, Indonesia, is a developing region with distinct cultural and lifestyle characteristics. One notable habit among its predominantly Sundanese population is the frequent consumption of spicy foods, which is deeply rooted in local culinary traditions. Lifestyle patterns in Karawang are also shaped by the socio-economic conditions of the community. In this study, most participants were farmers engaged in physically demanding work. Many of those seeking medical treatment were elderly individuals who reported muscle pain and regularly consumed NSAIDs. Additionally, common habits such as drinking herbal medicine, coffee, and smoking were observed. These lifestyle factors may contribute to an increased risk of GERD within this population.^{11,12}

The diagnosis of GERD can be established based on the presence of classic symptoms as a result of anamnesis and questionnaire completion, along with the results of a proton-pump inhibitor (PPI) therapy trial and the findings of gastrointestinal endoscopy. One commonly used tool is the GERD-Q questionnaire, which consists of six items assessing classic GERD symptoms, the impact of the condition on quality of life, and the effect of medication use over the past seven days. A GERD-Q score of 8 or higher indicates a high probability of GERD and warrants further evaluation. The GERD-Q has been internationally validated through the DIAMOND study and has also been translated and validated for use in the Indonesian population.⁶ The objective of this research was to identify lifestyle-related risk factors for GERD among the population of Karawang, including dietary habits, smoking, alcohol consumption, body mass index (BMI), and other behavioral patterns. Recognizing these factors is essential for developing effective prevention strategies and raising awareness about GERD in developing regions. By examining the epidemiological profile and associated lifestyle risks within this specific community, the study aims to generate baseline data that can inform future public health initiatives and help reduce the burden of GERD in Karawang and similar settings across Indonesia.

METHODS

Study Design and Research Subjects

This study used a cross-sectional design. Data were collected through interviews with patients seeking treatment at the Internal Medicine Clinic and Emergency Room of Karawang Regional Public Hospital between July and September 2023. Karawang Regional Public Hospital, a referral center for West Java Province, has a capacity of 400 beds and receives approximately 6,186 internal medicine clinic visits annually. Participant recruitment was conducted using a sequential sampling method, targeting individuals who met the eligibility criteria. Inclusion criteria included patients aged 18 years or older who were seeking treatment at Karawang Regional Public Hospital and provided informed consent to participate in the

Data Collection

Participants were interviewed using standardized questionnaires, including the Indonesian-validated GERD-Q questionnaire. Subjects with a GERD-Q score below 8 were classified as the GERD-negative group, while those with a score of 8 or higher were considered to have a high probability of GERD and were included in the GERD-positive group. Exclusion criteria included patients with renal or liver disease, those currently taking proton-pump inhibitors (PPIs) for any reason, and pregnant women. In addition to GERD symptoms, participants were also interviewed regarding potential lifestyle-related risk factors, such as smoking, consumption of herbal medicine, alcohol, coffee, NSAIDs, and spicy foods.

Statistical Analysis

Data analysis was carried out using IBM SPSS Statistics for Windows, version 22.0 (SPSS Inc., Chicago, USA). Univariable and multivariable analyses were conducted to assess risk factors, with a significance level set at $p < 0.05$. This study was approved by the Ethics Committee of Karawang Regional Public Hospital (RSUD Karawang), under approval number 070/43/Kom-Etik./I/2023.

RESULTS

Total of 310 patients were screened during sampling period, there were eventually 270 subjects recruited, and others excluded due to inadequate data. The prevalence of GERD in this study was 55.6%. More than half subjects were women (52.2%). The average age of the subjects in

this study was 47.18 ± 13.67 years. Subject characteristics are presented in **Table 1**.

Table 1. Characteristics of subjects

Characteristics	Mean (SD)	Frequency (n)	Percent (%)
Age	47.18 ± 13.67		
The average weight	63.36 ± 12.44 kg		
mean height	161.13 ± 9.79 cm		
and the average BMI	24.46 ± 4.64 kg/m ²		
Based on sex distribution,			
129 subjects (47.8%)			male
and 141 subjects (52.2%)			were female
Regarding occupation, the largest proportion			were housewives (102 subjects, 37.8%), followed by employees (79 subjects, 29.3%), farmers (53 subjects, 19.6%), laborers (18 subjects, 6.7%), students (7 subjects, 2.6%), pensioners (8 subjects, 3.0%), entrepreneurs (4 subjects, 1.5%), and merchants (3 subjects, 1.1%).
Based on GERD-Q category,			150 subjects (55.6%) were categorized as GERD, while 120 subjects (44.4%) were categorized as non-GERD.
For smoking status,			198 subjects (73.3%) were non-smokers and 72 subjects (26.7%) were smokers.
In terms of coffee-drinking habits,			131 subjects (48.5%) reported not drinking coffee, while 139 subjects (51.5%) were coffee drinkers.

Table 2 presents the analysis of risk factors associated with GERD. Gender was not significantly associated with GERD ($p = 0.263$), although a higher prevalence was observed in women compared to men (58% vs. 42%). Age showed a significant association with GERD ($p < 0.001$), with individuals under 40 years demonstrating a protective effect (OR = 0.126; 95% CI: 0.043–0.369; $p < 0.001$). No significant relationship was found between BMI categories and GERD ($p = 0.091$). Regarding lifestyle habits, 26% of GERD patients reported smoking ($p = 0.904$), 72.7% had a habit of consuming spicy foods ($p < 0.001$), 37.3% regularly drank herbal medicine ($p = 0.130$), 9.3% consumed alcohol ($p = 0.057$), and 56.7% frequently used NSAIDs ($p = 0.035$). Multivariable logistic regression analysis identified two lifestyle factors significantly associated with GERD: frequent consumption of spicy foods (OR = 5.002; 95% CI: 2.534–9.877; $p < 0.001$) and regular use of NSAIDs (OR = 2.002; 95% CI: 1.049–3.821; $p = 0.035$).

Table 1. Characteristics of Subjects Characteristics

Characteristics	Mean (SD)	Frequency (n)	Percent (%)
Age	47.18±13.67		
Weight	63.36±12.44		
Height	161.13±9.79		
BMI	24.46±4.64		
Sex			
Male		129	47.8
Female		141	52.2
Occupation			
Entrepreneur		4	1.5
Employee		79	29.3
Labor		18	6.7
Housewife		102	37.8
Pensioner		8	3.0
Farmer		53	19.6
Student		3	1.1
Merchant		3	1.1
GERD-Q Category			
Non-GERD		120	44.4
GERD		150	55.6
Smoking Status			
Non-Smoker		198	73.3
Smoker		72	26.7
Coffee-Drinking Status			
Non-Coffee Drinker		131	48.5
Coffee Drinker		139	51.5
Spicy Eating Status			
Don't have spicy eating habit		104	38.5
Have spicy eating habit		166	61.5
Herbal medicine drinking			
Non herbal medicine drinking		184	68.1
Herbal medicine drinking		86	31.9
Alcohol drinking status			
Non-alcohol drinker		254	94.1
Alcohol-drinker		16	5.9
NSAID-Consumption status			
Do not have NSAID-consumption habit		137	50.7
Have NSAID-consumption habit		133	49.3

Table 2. Analysis of GERD Risk Factors

Characteristics	Non-GERD (n, %)	GERD (n, %)	p-value	OR (95%CI)
Sex				
Male	66 (55%)	63 (42%)		
Female	54 (45%)	87 (58%)	0.263	0.713 (0.394–1.289)
Age				
18-29 Years Old	20 (16.7%)	11 (7.3%)	0.015	0.243(0.078–0.759)
30-39 Years Old	33 (27.5%)	13 (8.7%)	<0.001	0.126(0.043–0.369)
40-49 Years Old	15 (12.5%)	41 (27.3%)	0.749	0.856(0.330–2.221)
50-59 Years Old	34 (28.3%)	49 (32.7%)	0.720	0.859(0.373–1.976)
≥60 Years Old	18 (15%)	36 (24%)		
BMI Category				
Underweight	14 (11.7%)	8 (5.3%)		
Normal	39 (32.5%)	44 (29.3%)	0.249	2.091(0.596–7.335)
Overweight	24 (20%)	34 (22.7%)	0.216	2.310(0.613–8.710)
Obese I	29 (24.2%)	45 (30%)	0.207	2.283(0.633–8.233)
Obese II	14 (11.7%)	19 (12.7%)	0.091	3.680(0.810–16.713)
Smoking Status				
Non-Smoker	87 (72.5%)	111 (74%)		
Smoker	33 (27.5%)	39 (26%)	0.904	0.951 (0.423–2.141)
Coffee-Drinking Status				
Non-Coffee Drinker	56 (45.7%)	75 (50%)		
Coffee Drinker	64 (53.3%)	75 (50%)	0.691	1.139 (0.600–2.163)
Spicy-Food Eating Status				
Does not eat spicy food	63 (52.5%)	41 (27.3%)		
Eats spicy food	57 (47.5%)	109 (72.7%)	<0.001	5.002(2.534–9.877)
Jamu-Drinking Status				
Does not drink Jamu	90 (75%)	94 (62.7%)		
Drinks Jamu	30 (25%)	56 (37.3%)	0.130	1.698(0.855–3.369)
Alcohol-Drinking Status				
Does not drink	118 (98.3%)	136 (90.7%)		
Drinks	2 (1.7%)	14 (9.3%)	0.057	5.999(0.949–37.942)
NSAID-Consumption Status				
Does not consume	72 (60%)	65 (43.3%)		
NSAID Consumes NSAID	48 (40%)	85 (56.7%)	0.035	2.002(1.049–3.821)

DISCUSSION

Based on this hospital-based study, the prevalence of GERD in Karawang was 55.6%. This rate is higher than that reported by Darnindro et al. in Jakarta (49%),¹⁵ but slightly lower than the prevalence found in the study by Syam et al., which was 57.6%.¹⁶ The relatively high prevalence of GERD observed in this study may be attributed to differences in study populations, as well as the influence of local socioeconomic conditions and community lifestyle habits. Among the 270 subjects, most GERD cases were found in women (58%). A similar trend was reported by Alkhatami et al., who found that among 587 respondents in Saudi Arabia, 51.4% were women and 48.5% were men.¹⁰ Studies by Sun Kim et al. and Yoon Kim et al. also noted that the prevalence of GERD among women tends to increase with age, particularly after the age of 50. This age group is at risk of menopause, which leads to a decline in estrogen levels, a hormone that plays a role in regulating lipolysis. Reduced estrogen levels during menopause contribute to increased fat accumulation, especially in the abdominal area, which raises intra-abdominal pressure and, consequently, the risk of developing GERD.¹⁷ Several studies have reported a correlation between age and the incidence of GERD. In the present study, age was significantly associated with GERD ($p < 0.001$), with individuals under 40 years showing a protective effect (OR = 0.126; 95% CI: 0.043–0.269; $p < 0.001$). These findings are consistent with research by Wang et al., which also demonstrated that the prevalence of GERD tends to increase with age.¹⁸

There have been inconsistencies in the relationship between BMI and the incidence of GERD. In the present study, there was no significant association between BMI and the incidence of GERD ($p = 0.091$). This finding aligns with conclusions of a meta-analysis conducted by Cheng et al., which found that numerous environmental factors, including BMI, were not strongly associated with the risk of GERD.¹⁹ The study conducted by Choe et al.¹⁴ found no significant relationship between BMI and the incidence of GERD. Another study conducted in Jakarta also found that subjects suffering from GERD often had a normal BMI.²⁰ However, based on epidemiological studies, a correlation exists between GERD and obesity. In a Mendelian randomization analysis, Yuan and Larson²¹ also found that adiposity, in the form of central obesity, was associated with GERD. The abdominal adipose tissue in obese patients increases intragastric pressure, this in turn displaces the lower esophageal sphincter.²² This statement is aligning with conclusions of study conducted by Lee et al. that found central obesity and waist belt cause partial hiatus herniation and short-segment acid

reflux.²³ Additionally, obesity has been linked to vagal nerve dysfunction, which can increase the secretion of biliary and pancreatic enzymes, thereby exacerbating GERD and dyspeptic symptoms. Overweight individuals are also at greater risk for developing hiatal hernia, another known risk factor for GERD.²²

Several studies have identified daily lifestyle habits, such as smoking, alcohol intake, consumption of tea or coffee, spicy foods, herbal medicine, and NSAID use, as potential risk factors for GERD. However, in the present study, only two lifestyle factors showed a statistically significant association with GERD: frequent consumption of spicy foods (OR = 5.002; 95% CI: 2.534–9.877; $p < 0.001$) and regular use of NSAIDs (OR = 2.002; 95% CI: 1.049–3.821; $p = 0.035$).

Spicy foods, which contain the neurotoxin capsaicin, may delay gastric emptying and promote the reflux of gastric contents into the esophagus.¹⁴ This can lead to direct irritation of the lower esophageal mucosa, potentially worsening heartburn symptoms. The burning and painful sensation associated with spicy food intake is believed to be mediated by transient receptor potential vanilloid 1 (TRPV1) receptors located on C-fibers. Activation of TRPV1 by capsaicin has also been linked to an enhanced gastric accommodation reflex, which may contribute to the pathophysiology of GERD.^{14,24}

In this study, NSAID consumption was significantly related to GERD. This is in accordance with research conducted by Alkhatami et al. in Saudi Arabia.¹⁰ NSAIDs use is the second most common cause of upper gastrointestinal tract ulceration after *Helicobacter pylori* infection. NSAIDs can induce mucosal injury by inhibiting the enzyme cyclo-oxygenase (COX)-1, which decreases mucosal cytoprotective prostaglandins and reduces the protective bicarbonate mucus barrier secretion in the stomach and small intestine. Approximately a third of patients who take NSAIDs encounter symptoms of dyspepsia and gastroesophageal reflux.²⁵ To prevent complications from using NSAIDs, the duration of NSAID use needs to be limited whenever possible. In cases where NSAIDs are to be used for prolonged periods, the adverse effects associated with NSAIDs can be mitigated by the administration of PPI and/or switching to a selective COX-2 inhibitor. However, PPIs do not prevent NSAID adverse events in the lower GI tract. While COX-2 inhibitors are usually introduced as an alternative after NSAID adverse events occur, the lesions in the small intestine tend to persist. As such, it may be more beneficial to administer patients COX-2 inhibitors from the beginning.²⁶

This study has several limitations, primarily its cross-sectional design, which restricts the ability to establish causal correlations between risk factors and disease outcomes. A cohort study design would be more suitable for analyzing such associations over time. Nevertheless, the findings from this research can serve as a valuable reference for future studies employing longitudinal designs and larger sample sizes.

CONCLUSION

This study identified age, frequent consumption of spicy foods, and NSAID use as significant risk factors associated with the incidence of GERD. Further research is warranted to explore the broader role of lifestyle and behavioral habits in the development of GERD. Given the high prevalence observed in this population, it is recommended that primary healthcare facilities adopt routine screening using the GERD-Q questionnaire to support early diagnosis and timely management of GERD.

Conflict of Interest

The authors have no competing interests to disclose.

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Author Contribution

Each author contributed substantially to the research and manuscript development and approved its final version.

Data Availability

All datasets are included within this article.

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