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Research Article

Prevalence, Risk Factors and Socio-epidemiological Study of Gastroesophageal Reflux Disease: An Urban Population Based Study in Indonesia

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Abstract

Background: Several factors contribute to the incidence of gastroesophageal reflux disease (GERD). Demographic, ethnic and behavioral had been found to be the most important factors for having GERD symptoms. **Objective:** To determine the prevalence of GERD among urban population in Depok, Indonesia and any association with predictive risk factors and socio-epidemiological status. **Methodology:** Design of this study was cross sectional. Participants were randomly selected using stratified random sampling method among healthy people living near 5 public health services in Depok, West Java, Indonesia. The participants were evaluated using GerDQ tool. This tool is a questionnaire included detailed socioepidemiological factors and history of GERD symptoms. Statistical analysis was performed using SPSS version 17.0. **Results:** From 278 subjects of urban population in Indonesia, 9.35% of them had GERD. Statistical analysis found significant association between education level ($p = 0.005$), economic level ($p = 0.025$), asthma status ($p = 0.023$) and delayed gastric emptying ($p = 0.013$) with GERD. **Conclusion:** The GERD prevalence of urban population in Indonesia was 9.35%. Significant factors associated with GERD were education level, economic level, asthma status and delayed gastric emptying. Future, studies with larger number of subjects are needed to analyze factors which related with GERD.

Key words: Gastroesophageal reflux disease, urban population, risk factors, prevalence, socioeconomic factors, demographic, ethnic

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Data Availability: All relevant data are within the paper and its supporting information files.

INTRODUCTION

Gastroesophageal reflux disease (GERD) is defined as an abnormal reflux of the gastric contents into the esophagus at least once a week, leading to symptoms, such as heartburn and/or acid regurgitation and/or esophageal mucosal damage, which may also provoke long-term complications, such as Barrett's esophagus^{1,2}. Heartburn and acid regurgitation are the most common symptoms reported by patients with GERD^{3,4}.

Nowadays, this disease is one of a highly prevalent gastrointestinal (GI) disorder and is one of the most common GI illnesses encountered in clinical practice. The prevalence of GERD has been studied in many parts of the world and has been shown to be high in the Western population (about 10-20% in Western countries and under 5% in Asia) and its prevalence appears to be increasing^{5,6}. Focus in Asia from the population-based studies, the prevalence of symptom-based GERD in Eastern Asia was found to be 2.5-4.8% before 2005 and 5.2-8.5% from 2005-2010. In Southeast and Western Asia, it was 6.3-18.3% after 2005, which was much higher than those in Eastern Asia³.

Ethnic and geographical differences are important factors in studying disease frequencies, because they may highlight the environmental or genetic influences in the etiology³. There have been many studies, which examined the relation between GERD (especially reflux esophagitis) and predictive background factors, such as age^{2,6}, gender^{2,7}, Body Mass Index (BMI), obesity⁷, hiatus hernia⁸ and so on. These previous studies have shown an association between GERD and several demographic and behavioral factors^{6,9}. For example, gender has not been found to have any pronounced effects⁶ and about the correlation with education and income disparities, one British study found a higher prevalence of reflux symptoms in subjects with lower socioeconomic status and heredity^{10,11}. However, inconsistent results have been reported for both GERD prevalence rates and possible associated risk factors in different countries. These inconsistencies may be the result of geographical variation, different lifestyle habits and methodological differences concerning the definition and evaluation of GERD symptoms¹².

Since, it is a very common disease affecting millions of people around the world, it is important to clarify the socioepidemiological factors and background history of illnesses and risk factor affecting various GERD symptoms. Therefore, the aim of the present study was to establish the prevalence of GERD and its associations with predictive risk factors and socioepidemiological status among the urban population in Depok, Indonesia.

MATERIALS AND METHODS

Subject: A population based, cross sectional study was conducted in January-March, 2012. About 278 participants were randomly selected using stratified random sampling method among healthy individuals who live nearby with 5 public health service in Depok, Indonesia. All participants were above 40 years when this study was held. The eligible participants were assigned informed consent as agreement to follow the study. There is no specific exclusion criteria. This study was approved by the ethical committee in Faculty of Medicine, Universitas Indonesia.

Questionnaire: The GerdQ tool was used to evaluate all participants. The GerdQ is a potential useful tool with a sensitivity of 65% and specificity of 71% for the diagnosis of GERD, similar to that achieved by gastroenterologists¹³. This tool is a questionnaire which cover the sociodemographic factors, risk factors and symptoms of GERD. A score more than seven (≥ 7) suggested the presence of GERD in participant.

Statistical analysis: Categorical variables were summarized with number and percentage of patients. Univariate analysis was performed using the χ^2 tests were used to compare categorical variables, whereas Mann Whitney and Kruskal-Wallis one-way analysis of variance was used to analyze the demographic data. A two-sided p-value < 0.05 was considered statistically significant. A p-value < 0.05 was considered statistically significant. Data were analyzed using SPSS version 17.0 (SPSS Inc., Chicago, IL).

RESULTS

Interesting facts that can be obtained from the study whether most of subjects are female (72.66%), housewives (45.32%) and married (93.17%). In the present study, the incidence of GERD was 9.35% according to GERD questionnaire. In the present study, gender (5.2% male and 10.8% female; $p = 0.173$), age (7.8% aged < 45 years and 9.8% aged > 45 years; $p = 0.63$), ethnic (10.2% Javanese and 8.9% non-Javanese; $p = 0.825$), body mass index (8.7% $< 23 \text{ kg m}^{-2}$ and 15.3% > 23 ; $p = 0.782$) and marital status (9.26% married and 10.5% not married; $p = 0.856$) were not the significant characteristics in GERD patients. However, education level which is below high school (14.6%) was statistically significant for GERD risk factors compared to patients with whom graduated high school or above (4.72%) ($p = 0.005$). Income and GERD were also had

Table 1: Baseline characteristics of study participants

Characteristics	No.	%	GERD	p-value
Gender				
Male	76	27.34	4	0.173
Female	202	72.66	22	
Age (years)				
<45 years	64	23.02	5	0.63
≥45 years	214	76.98	21	
Tribe				
Javanese	88	31.65	9	0.825
Non-Javanese	190	68.35	17	
BMI				
<23 kg m ⁻²	114	41.01	10	0.782
≥23 kg m ⁻²	164	58.99	16	
Education level				
Below high school	130	46.76	19	0.005
High school or above	148	53.24	7	
Marriage status				
Married	259	93.17	24	0.856
Not married	19	6.83	2	
Job				
Permanent worker	64	23.02	3	0.337
Housewife	126	45.32	14	
Unemployed	88	31.66	9	
Income (per month)				
<Rp 1,000,000,-	124	44.60	17	0.025
≥Rp 1,000,000,-	154	55.40	9	

Table 2: Risk factors in GERD

Risk factors	GERD	Non GERD	p-value
Hiatal hernia	0	2	1.000
Asthma	6	20	0.023
Diabetes mellitus	5	27	0.198
Fatty food consumption	6	70	0.817
Meat consumption	4	33	0.761
Fast food consumption	0	15	0.375
Smoking	2	27	1.000
Delayed gastric emptying	4	7	0.013

GERD: Gastroesophageal reflux disease

significant correlation (13.7% income below 1 million rupiahs and 5.84% income above 1 million rupiahs; $p = 0.025$) as seen in the patient's baseline characteristics (Table 1).

Bivariate analysis using chi square test between GERD risk factors and GERD found statistically significance between asthma and GERD ($p = 0.023$) and between delayed gastric emptying and GERD ($p = 0.013$) (Table 2).

DISCUSSION

Results obtained showed that the prevalence of GERD was 9.35%. This was supported by previous studies which found that prevalence of GERD in Southeast Asia was 6.3-18.3%³. These findings came at variance to other studies in other regions. Kulig *et al.*¹⁴ in their study with 6,215 subjects in Germany, Austria and Switzerland found 34-44% had GERD symptoms. Dent *et al.*⁶ found that GERD prevalence

of the Western population was 20%. Ponce *et al.*¹⁵ in their study with 3,332 adult subjects in Spain found GERD prevalence was 15%. Shimazu *et al.*¹⁶ in their study with 1,234 subjects in Japan found GERD prevalence according endoscopy was 5.8%. Moshkowitz *et al.*¹⁷ in their study with 2,027 adult subjects in Israel found that the prevalence of GERD was 30%. These differences in prevalence may be due to the fact that the population groups that participated in this study had different lifestyle that caused various symptoms of GERD. Factors, which might have an effect are diet habit, smoking and body mass index among the populations. Different languages that was used during data collecting might interfered subject's perception of GERD symptoms. Different prevalence of peptic ulcer that was not analyzed in these studies might be confounding factor which was believed to be a protecting factor from GERD. Different numbers of subjects among studies might be a factor why the prevalence of GERD was different among studies.

The GERD was found to be associated with low education level ($p = 0.005$) and low income ($p = 0.025$). This finding agree with that of Moshkowitz *et al.*¹⁷ who also found that GERD was associated with low income and low education level. They found that low income and low education were related with lifestyle-related risk factors, such as smoking or overweight. On the other hand, several factors related to GERD, such as smoking or overweight were not significant factors associated with GERD. The researcher suggested that subjects with low education level and low income might had fatty diet of which was believed to delay gastric emptying and prone to had GERD as found that delayed gastric emptying was significant factor related to GERD ($p = 0.013$).

Body mass index was not a significant factor for GERD. Other several studies, such as Ponce *et al.*¹⁵, Kim *et al.*¹⁸, Lopez-Alvarenga *et al.*¹⁹, Cai *et al.*²⁰ and Djary *et al.*²¹ found that body mass index was a significant factor. Ponce *et al.*¹⁵ in their study with 3,332 adult subjects in Spain found that BMI > 25 kg m⁻² was associated with GERD. The GERD risk increased about 7% every kg m⁻². Kim *et al.*¹⁸ in their study with 25,536 adult subjects in Korea found BMI > 25 kg m⁻² was associated with erosive esophagitis. Lopez-Alvarenga *et al.*¹⁹ in their study with 917 adult subjects in Mexico found that factors which statistically significant with severe esophagus damage were overweight (BMI 25-30 kg m⁻²), severe heartburn, nausea, halitosis and regurgitation symptoms. They found subjects with BMI > 30 kg m⁻² had milder GERD symptoms than BMI 25-30 kg m⁻². They found that obese subjects had decreased sensation of pain and nausea so, it contributed to milder GERD symptoms. They also found that older age was associated with higher prevalence of erosive

esophagitis but had lower sensitivity for heartburn¹⁹. Cai *et al.*²⁰ found a positive association between BMI and the presence of erosive esophagitis and the risk seems to progressively increase with increasing weight. Djary *et al.*²¹ in their study with 6,969 subjects in Sweden found 6% of population with BMI < 25 kg m⁻² have GERD, 10% population with BMI 25-30 kg m⁻² have GERD and 16% population with BMI > 30 kg m⁻² have GERD, therefore, they found descriptively that people with higher BMI have higher risk for GERD. Contradicted to other studies, BMI was not a significant factor of GERD. It may correlated to the proportion of the subjects of this study, which more female than male subjects observed. In World Health Organization²² data, overall prevalence of obesity in Indonesia was 6.9% in female, which was higher than male with 2.6%. This may suggest that the body mass index was not a significant factor associated with GERD.

In the present study, gender was not a significant factor associated with GERD. Meanwhile, Yamamichi *et al.*²³ found that female gender was a significant factor associated with GERD both in bivariate and multivariate analysis. In contrary, Kulig *et al.*¹⁴ and Kim *et al.*¹⁸ found that male gender was a significant factor associated with GERD. In this study, however, higher proportion of female subjects were observed, this could interfere the association of gender and GERD. Moreover, the researchers suggested that female populations in Indonesia mostly housewives and married woman which tend to had scheduled meal time which may reduced the risk of GERD.

The researchers found that age was not a significant factor with GERD. In contrary, Yamamichi *et al.*²³, Kulig *et al.*¹⁴, Shimazu *et al.*¹⁶ and Moshkowitz *et al.*¹⁷ found the contrast. Yamamichi *et al.*²³ in their study with 19,864 adult subjects in Japan found that age was a significant factor with GERD in both bivariate and multivariate analysis. Kulig *et al.*¹⁴ found that age was a factor which contributed to GERD recurrence and longer disease duration. Shimazu *et al.*¹⁶ found that age was significant factor associated with GERD. Moshkowitz *et al.*¹⁷ found that prevalence of GERD symptoms was strongly associated with increasing age. The population in this study could opposed the result where the subjects were mostly female and gender was also not a significant factor, this may contributed for other findings such as age which observed also not a significant factor with GERD in this study. In addition, the diagnostic criteria was based on GerdQ questionnaire, which only had around 60-70% sensitivity of GERD, so, the researchers suggested that there were may be high false negative cases in this study.

Results obtained showed that hiatal hernia was not a significant factor associated with GERD. In contrary, Kim *et al.*¹⁸ and Shimazu *et al.*¹⁶ found that hiatal hernia was statistically significant with GERD. Lack of subjects with hiatal hernia might be the cause the finding of hiatal hernia was not a significant factor for GERD.

This study found that asthma was a significant factor associated with GERD ($p = 0.023$). Shimizu *et al.*²⁴ in their study with 120 subjects in Japan found that asthma was a significant factor associated with GERD and its mechanism was related to esophageal dysmotility. In addition the researchers present knowledge, asthma patient routinely used asthma reliever, such as beta agonists, aminophylline and anticholinergics which reduced low esophageal sphincter pressure and therefore, more vulnerable to GERD. Asthma attacks also usually happen at night so the subjects will have inadequate sleep and this factor is believed as important factor for GERD as Yamamichi *et al.*²³ found.

This study found that diabetes mellitus was not significant factor associated with GERD. Yamamichi *et al.*²³, Chen *et al.*²⁵, Hirata *et al.*²⁶ and Lee *et al.*²⁷ on the other hand found that diabetes mellitus was associated with GERD. Some studies have shown that diabetes mellitus patients may have motor dysfunction and that the neuropathy has a positive role on the development of GERD symptoms in type 2 diabetes mellitus. Autonomic nervous disorder in diabetic patients might cause gastric dysmotility, which increase intragastric distention and lead to a higher incidence of transient lower esophageal sphincter relaxation²⁶. The lack numbers of diabetic patients in this study might be the reason why this factor was not significant for GERD.

Results obtained from the present study showed that smoking was not significant factor associated with GERD. In contrary, Yamamichi *et al.*²³, Kulig *et al.*¹⁴ and Fujiwara *et al.*²⁸ found that smoking was significant factor for GERD. Thomas *et al.*²⁹ found that smoking decreases lower esophageal defensive mechanisms such as reduction of esophageal clearance and saliva secretion. In stomach, smoking increases acid secretion and pepsinogen release and delays gastric emptying. Most of the subjects were female therefore, lack of subjects who smoke and interfere the association analysis.

CONCLUSION

The GERD prevalence of urban population in Indonesia was 9.35%. Significant factors associated with GERD are education level, economic level, asthma status and delayed

gastric emptying. Studies with larger numbers of subjects are needed to analyze which factors are related with GERD in Indonesia.

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