

# The Prevalence and Habit-associated Risk Factors of Gastroesophageal Reflux Disease among Fishermen in Indonesia

Ahmad Fariz Malvi Zamzam Zein\*, Catur Setiya Sulistiyana\*\*,  
Tissa Octavira Permatasari\*\*, Uswatun Khasanah\*\*\*, Tiar Masykuroh  
Pratamawati\*\*\*\*, Ismayanti Ismayanti\*\*\*\*\*, Dwi Listiany Corneli\*\*\*\*\*, Eni  
Suhaeni\*\*\*\*\*

\* Department of Internal Medicine, Faculty of Medicine, Universitas Swadaya Gunung Jati, Cirebon

\*\* Department of Medical Education, Faculty of Medicine, Universitas Swadaya Gunung Jati, Cirebon

\*\*\*Department of Biostatistics and Epidemiology, Faculty of Medicine, Universitas Swadaya Gunung Jati, Cirebon

\*\*\*\* Department of Genetics, Faculty of Medicine, Universitas Swadaya Gunung Jati, Cirebon

\*\*\*\*\* Faculty of Medicine, Universitas Swadaya Gunung Jati, Cirebon

\*\*\*\*\* Department of Public Health, Faculty of Medicine, Universitas Swadaya Gunung Jati, Cirebon

## Corresponding author:

Ahmad Fariz Malvi Zamzam Zein. Department of Internal Medicine, Faculty of Medicine, Universitas Swadaya Gunung Jati. Jln Taman Pemuda 2 Kompleks Stadion Bima Kesambi Cirebon West Java Indonesia. Phone: +62-231-483928; facsimile: +62-231-488923. Email: fariz\_zein\_dr@yahoo.com

## ABSTRACT

**Background:** This study was aimed to investigate the prevalence and habit-associated risk factors of gastroesophageal reflux disease (GERD) among fishermen.

**Method:** A cross-sectional study was conducted among 168 adult fishermen in Cirebon Regency, West Java, Indonesia. A self-administered questionnaire was given. The questionnaire consisted of demographic characteristics and validated GERD questionnaire (GERDQ) in Indonesian language. A symptom score of at least 8 was considered as GERD. The habits were also reported. Data were analyzed using descriptive statistics and Chi-square test. The study has been approved by the Medical Research Ethic Committee.

**Results:** The median age of the participants was 39.0 (24-86) years old. They were predominantly (60.7%) female. The prevalence of GERD was 22.6%. According to bivariate analysis, there was association between smoking ( $PR = 1.181$ ; 95% CI: 1.013-1.377;  $p 0.041$ ), high-salt intake ( $PR = 2.419$ ; 95% CI: 1.079-5.424;  $p 0.029$ ), herb consumption ( $PR = 3.068$ ; 95% CI: 1.307-7.200;  $p 0.008$ ), poor hand hygiene ( $PR = 3.202$ ; 95% CI: 1.445-7.095;  $p 0.003$ ), and non-steroidal anti-inflammatory drug (NSAID) consumption ( $PR = 3.062$ ; 95% CI: 1.446-6.488;  $p 0.003$ ) with GERD. Tea consumption, coffee consumption, and raw vegetable eating were not associated with GERD.

**Conclusion:** This population-based study showed that the prevalence of GERD among fishermen in Indonesia is high. Habits associated with GERD in this study were smoking, high-salt intake, herb consumption, poor hand hygiene and NSAID consumption.

**Keywords:** prevalence, habit, risk factor, gastroesophageal reflux disease, fishermen

## ABSTRAK

**Latar belakang:** Penelitian ini bertujuan untuk mengetahui prevalensi gastroesophageal reflux disease (GERD) dan faktor risiko terkait kebiasaan pada nelayan.

**Metode:** Penelitian potong lintang ini dilaksanakan pada 168 nelayan dewasa di Kabupaten Cirebon, Jawa Barat, Indonesia. Pengumpulan data dari responden menggunakan kuesioner yang meliputi karakteristik demografi, kebiasaan, dan GERD questionnaire (GERDQ) yang tervalidasi dalam bahasa Indonesia. Responden dengan skor gejala sekurang-kurangnya 8 dipertimbangkan sebagai GERD. Analisis data pada penelitian ini menggunakan statistik deskriptif dan uji Chi-square. Penelitian ini telah mendapatkan klirens etik dari Komisi Etik Penelitian Kedokteran.

**Hasil:** Median usia responden pada penelitian ini 39 (24-86) tahun dan sebagian besar responden (60,7%) adalah perempuan. Prevalensi GERD didapatkan sebesar 22,6%. Berdasar analisis bivariat, terdapat hubungan antara merokok (PR = 1,181; 95% CI: 1,013-1,377; p 0,041), asupan tinggi garam (PR = 2,419; 95% CI: 1,079-5,424; p = 0,029), konsumsi jamu (PR = 3,068; 95% CI: 1,307-7,200; p = 0,008), kebersihan tangan yang buruk (PR = 3,202; 95% CI: 1,445-7,095; p 0,003), dan konsumsi obat antiinflamasi nonsteroid (PR = 3,062; 95% CI: 1,446-6,488; p = 0,003) dengan GERD. Konsumsi teh, kopi, dan lalap tidak berhubungan dengan GERD.

**Simpulan:** Penelitian berbasis populasi ini menunjukkan bahwa prevalensi GERD pada nelayan di Indonesia tinggi. Pada penelitian ini, beberapa faktor risiko terkait kebiasaan didapatkan berhubungan dengan GERD meliputi merokok, asupan tinggi garam, konsumsi jamu, kebersihan tangan yang buruk, dan konsumsi obat antiinflamasi nonsteroid.

**Kata kunci:** prevalensi, kebiasaan, faktor risiko, gastroesophageal reflux disease, nelayan

## INTRODUCTION

Gastroesophageal reflux disease (GERD) is, based on the Montreal Consensus, defined as a condition that develops when the reflux of stomach contents into the esophagus causes troublesome symptoms and/or complications.<sup>1</sup> It is worldwide health problem leading to potential devastating complications, societal consequences, adverse impact on work productivity, and impaired quality of life.<sup>2-4</sup> Its intriguing diagnostic tools and its complex approach of management contribute the huge burden. It is urged to strengthen the prevention strategy by restricting the risk factors of GERD.

The prevalence of GERD is considerable geographic variation and is increasing worldwide, including Asia-Pacific region.<sup>2-4</sup> Eusebi et al reported that pooled prevalence of GERD worldwide is 14.8%.<sup>3</sup> Two population-based studies in Asia-Pacific region reported high prevalence of GERD, those were Taiwan (25%) and India (18.7%).<sup>4</sup> Abdullah et al showed that the prevalence of GERD among urban population in Indonesia is 9.35%.<sup>5</sup>

Beside geographical difference, certain lifestyle or habit is known as risk factor for GERD as well. Each community has its own specific habit. This study was aimed to investigate the prevalence of GERD and its habit-related risk factors among fishermen in Indonesia.

## METHOD

This population-based, cross-sectional study was conducted in Januari – Maret 2018 in littoral area at the village of Gebang Mekar, Gebang Sub-district, Cirebon Regency, West Java, Indonesia. The participants in this study were randomly selected using stratified random sampling method among healthy individuals aged more than 18 years old. There were no specific exclusion criteria.

This survey used instrument for determining the baseline characteristics of the participants, habits, and validated GERD questionnaire (GERDQ). The baseline characteristics included demographic information regarding sex, age, ethnic, socioeconomic status, level of education, and occupation. Habits in this study encompassed analgetic herb (*jamu pegel linu*) consumption, tea consumption, coffee consumption, raw vegetable (*lalap*) eating, high-salt intake, and non-steroidal anti-inflammatory drug (NSAID) consumption. The status of GERD is determined by symptoms score system known as GERDQ. The positive GERD-related symptoms in the GERDQ included heartburn (burning sensation behind the breastbone), regurgitation (the sensation of stomach contents, either liquid or food, moving upwards to throat or mouth), sleeping difficulty due to heartburn and/or regurgitation, and the additional medication taken for heartburn and/or regurgitation.

The negative GERD-related symptoms in the GERDQ included epigastric pain and nausea. We used validated GERDQ in Indonesia language in this study as valid and reliable for Indonesia-speaking persons.<sup>6</sup> Score of 8 or more was the recommended cut-off point to define GERD status.

The sample size was calculated to assess prevalence of GERD. We used a 9.35% prevalence rate from a previous study in Indonesia,<sup>5</sup> population size of fishermen in Gebang Sub-district 6825 persons,<sup>7</sup> confidence level of 95%, and margin of error 5%. The calculated sample size was 128. We proposed to recruit 168 participants in this study.

Baseline data were presented as mean (SD) for parametric variables, median (range) for non-parametric variables, and frequencies (proportions) for categorical variables. Prevalence ratio (PR) with 95% confidence intervals were derived using logistic regression models. On bivariate analysis, only variables with  $p \leq 0.05$  were considered as significantly associated with GERD. The data were analyzed using IBM SPSS Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp.

This study protocol was approved by the Institutional Review Board, the Medical Research Ethics Committee at the Faculty of Medicine, Universitas Swadaya Gunung Jati, Cirebon, West Java, Indonesia (registration no. 120/EC/FK/XII/2017). Informed consent was confirmed by the IRB.

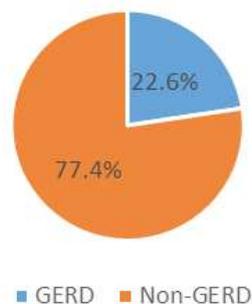
## RESULTS

A total of 168 respondents were recruited in this study. The baseline characteristics are shown at Table 1. The median age was 39 (24-86) years. They were predominantly female. All of the respondents were Javanese.

**Table 1. The baseline characteristics of the subjects**

Characteristics	n (%)
Gender	
Male	78 (46.43)
Female	90 (53.57)
Age (years)	
< 40	85 (50.59)
40-60	57 (33.93)
≥ 60	26 (15.48)
Ethnic	
Javanese	168 (100)
Non-Javanese	0 (0)
Level of education	
Below high school	122 (72.62)
High school or above	46 (27.38)
Level of income	
< 1.500.000 IDR	94 (55.95)
≥ 1.500.000 IDR	74 (44.05)

Of total respondents, there were 38 (22.6%) respondents with GERDQ score  $\geq 8$  (Figure 1). On univariate analysis, NSAID consumption, analgetic herb consumption, high-salt intake, and poor hand hygiene were significantly associated with GERD (Table 2).



**Figure 1. Prevalence of GERD in this study**

**Table 2. The association between habit and GERD**

	GERD n	Non-GERD n	p	Univariate PR (95%CI)
NSAID consumption	19	32	0.003	3.062 (1.446-6.488)
Yes	19	98		
No				
Analgetic herb consumption	12	17	0.008	3.068 (1.307-7.200)
Yes	26	113		
No				
Tea consumption	22	61	0.234	1.555 (0.749-3.228)
Yes	22	61		
No	16	69		
Coffee consumption	8	32	0.650	0.817 (0.340-1.961)
Yes	30	98		
No				
Raw vegetable eating	14	43	0.666	1.180 (0.555-2.508)
Yes	24	87		
No				
High-salt intake	13	23	0.029	2.419 (1.079-5.424)
Yes	13	23		
No	25	107		
Poor hand hygiene	15	22	0.003	3.202 (1.445-7.095)
Yes	15	22		
No	23	108		

GERD: gastroesophageal reflux disease; NSAID: non-steroidal anti-inflammatory drug

## DISCUSSION

This is the first study conducted to measure the prevalence of GERD among fishermen in Indonesia. Gebang Sub-district is one of littoral areas in Cirebon Regency, West Java, Indonesia. Of total population 60,899 people, there were 6,825 fishermen in Gebang Sub-district in 2018.<sup>7,8</sup> We found in this study that the prevalence of symptom-based GERD among fishermen was 22.6%. We also revealed that NSAID consumption, analgetic herb consumption, high-salt

intake, and poor hand hygiene were associated with GERD.

This study proposes that GERD is high number among fishermen in Indonesia which is higher than the prevalence of GERD among urban population in Indonesia.<sup>5</sup> Abdullah et al in their study with 278 adult urban population in Depok, Indonesia, found that the prevalence of GERD was 9.35%, using the same validated GERDQ in Indonesia language.<sup>5</sup> The finding in this study is also higher than the prevalence of GERD among South-East Asian studies. Leonardo HE et al reported that the pooled prevalence of GERD in South-East Asian countries was 7.4 (5.0-10.1)%.<sup>3</sup>

We reported that NSAID consumption is associated with GERD. It was supported by P Ruzniewski et al in their study with 6,823 French adults reporting that NSAID consumption is a significant risk factor for GERD (OR = 1.64; 95% CI: 1.36-1.98;  $p < 0.01$ ).<sup>9</sup> Sylvester CN et al also reported that NSAID use among 3520 Nigerian adults increases the risk of GERD (OR = 1.461; 95% CI: 1.060-2.025;  $p 0.021$ ).<sup>10</sup> Leonardo et al further revealed in their meta-analysis that the pooled prevalence of GERD among NSAID and/or aspirin users was significantly higher than non-users (OR = 1.44, 95% CI: 1.10-1.88).<sup>3</sup> The NSAIDs affect mucosal damage in the digestive tract through direct mechanism by inhibiting cyclooxygenase (COX) enzymes and indirect mechanism by increasing gastric acid secretion.<sup>11</sup> Both mechanisms reduce lower esophageal sphincter pressure and promote delayed gastric emptying.<sup>11</sup> These impacts are responsible for promoting gastroesophageal reflux symptoms.

We demonstrated that analgetic herb consumption is significant risk factors for GERD. Analgetic herb, commonly known as *jamu pegel linu*, is freely available in the form of powder or liquid at both traditional and modern markets in Indonesia. Andriati et al further reported that almost 50% of Indonesian people consumed herb in the term of medication or health promotion.<sup>12</sup> To the best our knowledge, this is the first study evaluating the association between analgetic herb consumption and GERD. There is no clear mechanism of analgetic herb consumption in promoting GERD yet. Some studies detected that analgetic herb may contain mefenamic acid, paracetamol, diclofenac sodium, or ibuprofen.<sup>13-16</sup> We assumed that analgetic herb had similar mechanism with NSAID in promoting gastroesophageal reflux symptoms due to its contents. Further investigations are needed to clarify this finding.

We reported in this study that high-salt intake was associated with GERD. It is in accordance with study

by M Nilsson et al.<sup>18</sup> They also showed that there was dose-response relationship between high-salt intake and the risk of GERD.<sup>18</sup> Ping W et al showed that high-salt intake was associated with reflux esophagitis among 269 subjects in China (adjusted OR = 9.93; 95% CI: 5.33-18.49;  $p < 0.01$ ).<sup>19</sup> T Tanaka et al reported that saline intake inhibited gastric motor activity and delayed solid gastric emptying.<sup>20</sup> Marissa CA et al showed that high-sodium intake did not increase gastroesophageal reflux in healthy subjects, but it decrease lower esophageal sphincter pressure.<sup>21</sup> Further studies are needed to investigate this association.

Poor hand hygiene was associated with increased risk of GERD in this study. Hapsari et al reported that poor hand hygiene was associated with the presence of GERD among 90 people in rural area in Jakarta (OR = 6.93; 95% CI: 1.1-43.8).<sup>22</sup> The mechanism underlying the precipitation and/or aggravation of gastroesophageal reflux by poor hand hygiene is poorly understood. It is assumed that poor hand hygiene can increase risk of gastrointestinal infection that can induce higher gastric acidity and risk for reflux. It is needed to enroll the study investigating this association.

Tea consumption was not associated with GERD in this study. Tao-Yang W et al in their study among 1,837 persons in Taiwan reported that drinking tea was not associated with reflux symptoms or erosive esophagitis.<sup>23</sup> Hongying et al in their meta-analysis of 30 studies revealed that there was no significant association between tea consumption and risk of GERD.<sup>24</sup> However, the role of tea in the development of GERD is still controversial. Chun-Yan et al showed that strong tea was correlated with the increased risk of GERD in Uyur and Han Chinese adult ( $r 1.124$ ).<sup>25</sup> Ai et al demonstrated that the frequent tea consumption was associated with GERD (OR = 2.63; 95% CI: 1.24-5.59).<sup>26</sup> Many aspects may contribute this controversial results, including the type of tea, the frequency of tea consumption, and the mixture of tea (salt, sugar, milk).

This study showed that coffee consumption was not associated with increased risk of GERD. It is supported by some studies reported similar association.<sup>23,27</sup> On the contrary, some studies showed that coffee intake induced GERD through direct stimulant to esophagus and further decreased lower esophageal sphincter pressure.<sup>28,29</sup> John KD reported that coffee intake induced gastrin release and stimulated gastric acid secretion.<sup>30</sup> A meta-analysis by J Kim et al failed to demonstrate significant association between coffee intake and GERD (OR = 1.06; 95% CI: 0.94-1.19).<sup>31</sup>

There are several limitations of the present study.

Firstly, there were no specific details about habit included in this study, such as the type and the quantity of NSAID, and the type, method of processing, and caffeine content of coffee.

## CONCLUSION

The prevalence of GERD among fishermen in Indonesia was high. Habit-associated risk factors are NSAID consumption, analgetic herb consumption, high-salt intake, and poor hand hygiene. Studies with larger numbers of subjects and more detailed about habits are needed to analyze community-specific risk factors.

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