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Relationship of Body Mass Index with Gastroesophageal Reflux Disease Based on Gastroesophageal Reflux Disease Questionnaire Score in the Department of Highways and Construction Development of North Sumatra

Bella Tiara Delfa Pardede[1] , Lidya Imelda Laksmi[*2]
[1]*Undergraduate Program of Medicine, Faculty of Medicine, Universitas Sumatera Utara, Medan, 20155, Indonesia*
[2]*Department of Pathology Anatomy, Faculty of Medicine, Universitas Sumatera Utara, Medan, 20155, Indonesia*

Abstract
Background: Gastroesophageal Reflux Disease (GERD) is a pathological condition due to the reflux of stomach contents back into the esophagus that causing symptoms. In Indonesia, there is no clear prevalence of the incidence of GERD. Some risk factors that can cause GERD are age, sex, race, family history, economic status, increased body mass index (BMI) to obesity and smoking. BMI is the most useful and practical indicator for measuring body fat. It is known that an increased BMI can increase the risk for the occurrence of GERD. **Objective:** Knowing the relationship between BMI and GERD based on the GERD-Q score at the Dinas Bina Marga dan Bina Konstruksi of North Sumatra province. **Methods:** This research is an analatic study using cross-sectional method. Sampling using simple random sampling. The sample of this study using Gastroesophageal Reflux Disease Questionnaire (GERD-Q) for GERD diagnosis tool and measurement of weight and height to get BMI. **Results:** The analysis results obtained by Kendalls Tau-b correlation test and found $p = 0.773$ ($p < 0.005$). **Conclusion:** There was no significant relationship between BMI and GERD based on GERD-Q scores on employees of the Dinas Bina Marga dan Bina Konstruksi of North Sumatera.

Keywords: body mass index, GERD, GERD-Q

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1. Introduction

Gastroesophageal reflux disease-, hereinafter referred to as GERD, is a pathological condition due to the reflux of gastric contents that re-enter the esophagus, causing symptoms due to the involvement of the esophagus, pharynx, larynx, and airways [1]. In 2008, the Asia Pacific Consensus proposed an emphasis on symptoms to disturb complications resulting from GERD indicating a disturbance in the quality of life, so that esophageal reflux that causes disturbing symptoms is declared a disease, GERD [2].

GERD has a different prevalence in each country. The prevalence of GERD in North America is 18.1% – 27.8%, in South America it is 23%, in Europe it is 8.8% - 25.9%, in Australia it is 11.6%, in the Middle East it is 8.7% - 33.1% and in Asia it is 2.5% - 6.7%.[3] Most GERD cases in Asia are found in West Asia with a prevalence of 12.5% - 27.6%, followed by a prevalence of GERD in Central Asia of 7.6% - 19.4%, and the lowest prevalence is found in East Asia of 2.5% - 9.4% [3, 4]. In Indonesia, there is no clear prevalence of incidence from GERD, but from the number of patients who undergo endoscopic examination, because there are indications of dyspepsia at Cipto Mangunkusumo Hospital Jakarta, it is found that 22.8% of patients experience cases of esophagitis, where many experts use the term reflux esophagitis which is the most common

* Corresponding author at: Department of Pathology Anatomy, Faculty of Medicine, Universitas Sumatera Utara, Medan, 20155, Indonesia.
E-mail address: lidya.imelda@usu.ac.id

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condition of gastroesophageal reflux disease [1].

After an evaluation of populations in Asia-Pacific, it is known that there are several risk factors that can cause GERD events. Some of the risk factors included are age, especially over 40 years old, gender, race, family history, economic status, increased body mass index to obesity, and smoking [2]. Direct body fat measurement is difficult, so BMI is the most useful and practical indicator to measure body fat. The formula of BMI is body weight in kilograms (kg) divided by height in meters squared (m2). Based on the BMI classification according to WHO criteria, normal BMI is in the range of 18.5 – 24.9 (kg/m2), body weight ≥ 25 (kg/m2), and obesity ≥ 30 (kg/m2) [5].

Strong evidence suggests a correlation between an increase in BMI and the incidence of GERD. In Asia-Pacific, populations found evidence of more than 25 studies proving such choleration. It is known that an increase in BMI can increase the risk for the occurrence of GERD and there have been many studies that show that obesity, weight, as well as an increase in BMI are related to GERD [2]. The author conducted this study because there has been no research in Indonesia, especially in the North Sumatra region, which discusses the relationship of BMI to GERD events and there are differences in some references regarding the presence or absence of a correlation between BMI and GERD.

2. Methods

The design of this study is an analytical study that uses a cross-sectional method to be able to find the relationship between BMI and GERD in employees of the Dinas Bina Marga and Bina Konstriksi of North Sumatra using GERD-Q. The sampling technique uses simple random sampling, which is included in probability sampling, where simple random sampling is a sampling technique carried out by taking samples from random members of the population so that each member of the population has the same opportunity to become a sample. The questionnaire used contains the respondent's informed consent, respondent's identity, GERD Questionnaire (Gerd-Q), and calculating the body mass index of the respondent by measuring the weight and height of the respondent.

The data in this study were processed using Statistical Package for the Social Sciences (SPSS). The existing data will be analyzed univariately to find out an overview of respondents' characteristics based on each variable in employees of the Bina Marga and Construction Development Office of North Sumatra Province as well as bivariate analysis which will be used to be able to analyze and find out the relationship between 2 variables, namely BMI and GERD using a correlation test with a degree of confidence of 90%.

3. Results

Based on the results of 84 respondents who had filled out the questionnaire, the characteristics of the respondents in this study were gender, age, BMI, and gerd incidence.

Table 1. Respondent Characteristics

Characteristics	Frequencies	Percentages
Gender		
Male	48	57,1
Female	36	42,9
Age (years old)		
18 – 30	6	7,1
31 – 40	17	20,3
41 -50	39	46,4
51 – 60	21	25
> 60	1	1,2
BMI		
Underweight	2	2,4
Normal	11	13,1
Overweight	17	20,2
Obesity	54	64,3
GERD		
Incidence GERD	66	78,6

Not GERD	18	21,4
Total	84	100

From table 1, it can be seen that 48 respondents (57.1%) and 36 women (42.9%) were obtained. Respondents with an age range of 18 – 30 years as many as 6 people (7.1%), an age range of 31 – 40 years as many as 17 people (20.3%), an age range of 41 – 50 years as many as 39 people (46.4%), respondents with an age range of 51 – 60 years as many as 21 people (25%) and respondents aged more than 60 years only 1 person (1.2%). Most respondents to this study suffered from obesity with a total of 54 people (64.3%). Then followed by respondents whose BMI was overweight as many as 17 people (20.2%), normal 11 people (13.1%), and underweight only found as many as 2 people (2.4%). Most respondents to this study did not suffer from GERD with 66 people (78.6%) and 18 respondents suffering from GERD (21.4%).

Table 2. Cross-tabulation of GERD incidence by BMI

BMI	GERD Incidence		Total		p-value
	GERD	Not GERD	n	%	
Underweight	1 (1,2%)	1 (1,2%)	2	2,4	0,773
Normal	1 (1,2%)	10 (11,9%)	11	13,1	
Overweight	4 (4,8%)	13 (15,5%)	17	20,2	
Obesity	12 (14,3%)	42 (50%)	54	64,3	
Total	18 (21,4%)	66 (78,6%)	84	100	

Based on table 2, there are respondents with underweight BMI who suffer from GERD as many as 1 person (1.2%), and among those who do not suffer from GERD there is also 1 person (1.2%). Furthermore, respondents with a normal BMI suffered from GERD only 1 person (1.2%) and those who did not suffer from GERD 10 people (11.9%). It is also known that respondents with overweight BMI suffer from GERD as many as 4 people (4.8%) and those who do not suffer from GERD as many as 13 people (15.5%). Of respondents with obese BMI, only 12 people (14.3%) suffered from GERD while 42 people (50%) did not suffer from GERD.

Table 3. Cross-tabulation of GERD incidence by age

Age (years old)	GERD Incidence		Total	p-value
	GERD	Not GERD	n	%
18 – 30	0 (0%)	6 (7,1%)	6	7,1
31 – 40	2 (2,4%)	15 (17,9%)	17	20,3
41 – 50	11 (13,1%)	28 (33,3%)	39	46,4
51 – 60	4 (4,8%)	17 (20,2%)	21	25
> 60	1 (1,2%)	0 (0%)	1	1,2
Total	18 (21,4%)	66 (78,6%)	84	100%

Based on table 3, respondents with an age range of 18 – 30 years no one has GERD followed by 6 people who do not suffer from GERD (7.1%). Furthermore, there were 2 people (2.4%) who suffered from GERD with an age range of 31 - 40 years and 15 people (17.9%) who did not have GERD. Then, there were 11 people (13.1%) who suffered from GERD in the age range of 41-50 years followed by 28 people (33.3%) who did not suffer from GERD and in the age range of 50-60 years found 4 people (4.8%) who had GERD and 17 people (20.2%) who did not have GERD. Furthermore, there was only 1 person (1.2%) respondent with an age range of more than 60 years and was found to have GERD.

Table 4. Cross-tabulation of GERD incidence by gender

Gender	GERD Incidence		Total		p-value
	Indicated GERD	Not GERD	n	%	
Male	11 (13,1%)	37 (44%)	48	57,1	
Female	7 (8,3%)	29 (34,5%)	36	42,9	0,703
Total	18 (21,4%)	66 (78,6%)	84	100	

Based on table 4, there were 11 respondents with GERD who did not suffer from GERD (13.1%) and 37 people who did not suffer from GERD (44%). It is known that respondents of the female sex who suffer from GERD were found as many as 7 people (8.3%) and those who did not suffer from GERD as many as 29 people (34.5%).

4. Discussion

Based on the results of the analysis obtained from bivariate analysis using the Kendalls tau-b choleration test, a p-value of 0.773 was obtained for the relationship of BMI with GERD. Because it was found that the p-value > 0.05, it can be concluded that there is no significant relationship between BMI and GERD. In table 2, it is known that the percentage of people with GERD has increased in respondents who have overweight BMI and especially in respondents who have entered the obese BMI category. From the results of studies that assess the morphology of pressure and the function of the esophagogastric junction using manometry, it was found that obesity causes changes in gastroesophageal pressure which results in exposure to the esophagus by substances in the gaster. The changes in intragastric pressure and gastroesophageal pressure that occur in the manometry method are related to BMI and waist circumference, but when analyzed using regression tests, it is known that waist circumference is related to changes in pressure that occur, but there is no significance with BMI. In the manometry method, it is also known that there is a relationship between obesity and hiatus hernia which is one of the mechanisms for the occurrence of GERD [6].

The results of the analysis in this study which showed the absence of a relationship between BMI and GERD were in line with the cohort study conducted at the State University of New York in New York, USA which concluded that there was no relationship between BMI and GERD obtained from BMI testing with GERD endoscopic results with a p-value of 0.75 and from the results of BMI testing with a degree of GERD histopathological abnormality with a p-value of 0.16.9 The same results were also found in a study at Sriwijaya University, Palembang, Indonesia with a regression test and found a relationship between obesity and GERD with a p-value of 0.001, but no relationship was found between overweight and GERD with a p-value of 0.988. This shows that increased BMI is not an independent risk factor of GERD [7].

The absence of a relationship between BMI and GERD in this study is in line with the absence of signs of BMI with changes in intragastric pressure and gastroesophageal pressure, which play a role in the pathogenesis of GERD [6] Because BMI as a determinant of nutritional status cannot distinguish the weight that a person has consisting more of fat tissue or muscle tissue [8, 9]. The risk factors that contribute to the occurrence of GERD are also not only an increase in BMI but there are several other risk factors such as age, gender, genetic factors, lifestyle such as diet, smoking, alcohol consumption, physical activity, and also the type of food eaten [10]. Based on table 3, it is known that the p-value is 0.184 for the analysis of the age relationship with GERD so it can be concluded that there is no significance between age and GERD. This is not in line with the systematic review conducted by a meta-analysis which found an increase in the prevalence of GERD sufferers in people with an age range of 35-59 years with a slight decrease in the prevalence of GERD sufferers in people with an age of more than 60 years compared to the prevalence of GERD sufferers in the age range of 18-34 years [11]. Likewise, the meta-analysis conducted by Eusebi et al. (2017) and it is known that the odds ratio in the population of people the age ≥ 50 years is higher than in the population of people with the age of < 50 years, indicating that there is an increase in the prevalence of GERD at the age of ≥ 50 years.

In table 4 it is found that the p-value for the relationship between sex and GERD is 0.703 so the conclusion that can be drawn is that there is no significance between sex and GERD. This is in line with research conducted on doctors in Indonesia. In the study, a p value of 0.061 was found so that there was no relationship between sex and GERD [11]. Therefore, the absence of a relationship between BMI and GERD can be influenced by other factors that play a role in giving rise to GERD. However, in this study, no control was carried out on other factors that played a role in the occurrence of GERD so that it could be suspected to be a role variable [8, 11].

5. Conclusion

Based on the results of the analysis of this study and the discussions that have been carried out, conclusions can be drawn about the relationship between BMI and GERD based on gerd-Q scores in the Dinas Bina Marga and Construction of North Sumatra that the results of the bivariate analysis using non-parametric static tests, namely the Kendalls tau-b correlation test, found that there was no relationship between BMI and GERD in the Bina Marga and Construction Dinas of North Sumatra. In the results of the analysis of the relationship between age and sex with GERD, it is known that there is no relationship between age and GERD as well as sex.

6. 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.

7. Ethical Statement

This study was approved by the Ethics Committee for Health Research at Universitas Sumatera Utara.

8. Author Contributions

All authors contributed to the design and implementation of the research, data analysis, and finalizing the manuscript.

9. Funding

No funding.

10. Conflict of Interest

Authors declares no conflict of interest.

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