

ORIGINAL ARTICLE

Comparison of RDQ and GERDQ for Predicting Erosive Esophagitis in Patients with Typical GERD Symptoms

Titong Sugihartono^{1,2}, Amal Arifi Hidayat³, Michael Austin Pradipta Lusida³, Kuntaman⁴, Hafeza Aftab⁵ and Muhammad Miftahussurur^{2,6}

Doctoral Program of Medical Science, Faculty of Medicine, Universitas Airlangga¹; Division of Gastroentero-Hepatology, Department of Internal Medicine, Faculty of Medicine, Universitas Airlangga²; Internal Medicine Department, Faculty of Medicine, Universitas Airlangga³; Department of Medical Microbiology, Faculty of Medicine, Universitas Airlangga⁴, Surabaya, Indonesia; Department of Gastroenterology, Dhaka Medical College and Hospital⁵, Dhaka, Bangladesh; *Helicobacter pylori* and Microbiota Study Group, Institute Tropical Disease, Universitas Airlangga⁶, Surabaya, Indonesia

Background/Aims: The management decisions regarding gastroesophageal reflux disease (GERD) may differ according to the presence of erosive esophagitis. On the other hand, the availability of upper endoscopy in Indonesia is relatively limited. This study compared the Reflux Disease Questionnaire (RDQ) and the GERD questionnaire (GERDQ) performance in predicting the presence of clinically significant erosive esophagitis and determined the validity and reliability of the Indonesian-translated version of RDQ.

Methods: Ninety-two adults with GERD suspicion were recruited. All patients completed RDQ and GERDQ. Receiver operating curve analysis was conducted on RDQ and GERDQ to evaluate their performance in discriminating LA GERD B or higher esophagitis from others. The translated RDQ preserved its main structure and was culturally adapted.

Results: The patients were 66.3% female and 73.9% Javanese. Only 22 (23.9%) patients presented with LA grade B or higher erosive esophagitis. The RDQ showed a higher AUC than the GERDQ (0.602 vs. 0.589). A cutoff point of 20 was selected for the RDQ with sensitivity and specificity of 73% and 50%, respectively, whereas the optimal cutoff point of GERDQ was 8, with a sensitivity and specificity of 77% and 43%, respectively. The r -value greater than the critical value table ($r > 0.205$, $p < 0.01$) confirmed the construct validity of our translated RDQ. The questionnaire also demonstrated excellent reliability ($\alpha = 0.900$) and moderate similarity with the Indonesian version of GERDQ ($\kappa = 0.459$, $p < 0.01$).

Conclusions: The RDQ is slightly superior to GERDQ in predicting the presence of clinically significant erosive esophagitis (LA grade B or higher). The Indonesian-translated RDQ is valid and reliable. (Korean J Gastroenterol 2023;82:84-90)

Key Words: RDQ; GERDQ; GERD; Gastroenterology

INTRODUCTION

Gastroesophageal reflux disease (GERD) is when the reflux of stomach contents into the esophagus causes troublesome symptoms and complications.¹ The estimated global prevalence of GERD in the general population is 13.98%.² Substantial

racial differences in the prevalence of GERD have been reported previously. Compared to Caucasians, Asians have a relatively lower prevalence of gastroesophageal reflux disease.³ On the other hand, an internet-based survey conducted in Indonesia reported a higher prevalence of GERD at 57.6%.⁴ Another study also discovered that 53.8% of Asian patients

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Correspondence to: Titong Sugihartono, Doctoral Program of Medical Science, Faculty of Medicine, Universitas Airlangga, Jl. Mayjen Prof. Dr. Moestopo 47, Surabaya 60132, East Java, Indonesia. Tel: +62-(031) 5020251, Fax: +62-(031) 5020251, E-mail: titongspdp@gmail.com, ORCID: <https://orcid.org/0000-0003-4923-9832>

Correspondence to: Muhammad Miftahussurur, Division of Gastroentero-Hepatology, Department of Internal Medicine, Faculty of Medicine, Universitas Airlangga, Jl. Mayjen Prof. Dr. Moestopo 47, Pacar Kembang, Tambaksari, Surabaya 60132, East Java, Indonesia. Tel: +6281252326840, Fax: +62-(031) 5020251, E-mail: muhammad-@fk.unair.ac.id, ORCID: <https://orcid.org/0000-0003-1415-6033>

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with typical GERD symptoms showed erosive esophagitis on upper endoscopy investigation.⁵ The prevalence of GERD has continued to rise, burdening the healthcare system.⁶

The diagnosis of GERD remains a significant issue because of the lack of a gold standard. On the other hand, GERD can be determined objectively by upper endoscopy and reflux monitoring studies.⁷ Two main phenotypes of GERD are widely recognized based on the endoscopic findings: erosive reflux disease (ERD) and non-erosive reflux disease (NERD).⁸ In Indonesia, however, gastrointestinal endoscopy is only available in 313 hospitals, mostly on Java Island.¹⁰ In addition, only two centers can provide impedance-pH monitoring to establish a NERD diagnosis (Miftahussurur, personal communication). The limited availability of diagnostic modalities continues to be a major challenge worldwide. The Los Angeles (LA) classification is the most widely used system to describe the visual appearance of the esophageal mucosa. The endoscopic findings of LA grade C or D erosive esophagitis are sufficient for generating a conclusive diagnosis of GERD, whereas grade B can be diagnostic in the presence of typical symptoms.⁷ Recent expert consensus suggests that LA grade A is inadequate for making a definitive diagnosis of GERD because it is not distinguished reliably from a normal condition.^{11,12} Furthermore, management decisions for GERD may differ depending on the presence of erosive esophagitis. An endoscopic finding of LA grade B or higher is an objective indicator for medical management initiation. Switching to on-demand proton pump inhibitor (PPI) therapy or even PPI discontinuation should be considered for patients with LA grade B EE or NERD whose symptoms have resolved on maintenance PPI therapy. The American College of Gastroenterology (ACG) recommends anti-reflux surgery or indefinite maintenance PPI therapy for patients with severe reflux esophagitis (LA grade C or D EE).⁷

The growing interest in the study of GERD over the past decade has led to an increase in the number of questionnaires proposed for clinical practice and research. A valid symptom assessment is crucial, particularly when endoscopy and pH testing are unavailable. The latest Indonesian GERD consensus incorporates the GERD questionnaire (GERDQ) as an initial screening tool in the diagnostic algorithm of GERD.¹³ The questionnaire has been translated and validated in Bahasa Indonesia.¹⁴ Even with a higher cutoff value, the GERDQ remained too insensitive for diagnosis (sensitivity of

49%).¹⁵ The Reflux Disease Questionnaire (RDQ) is a reliable diagnostic instrument by multiple validation studies.¹⁶⁻¹⁹ The accuracy of RDC for assessing GERD was reported to be only slightly inferior to symptom-based diagnosis by gastroenterologists.¹⁹ In addition, the RDQ can also evaluate the treatment response.²⁰ The questionnaire has been translated into several languages, including German, Italian, Swedish, Norwegian, Spanish, Mandarin, and Chinese,^{18,20-24} but not into Bahasa Indonesia. Considering the importance of identifying significant erosive esophagitis in managing GERD, selecting the most optimal instrument is essential for prioritizing endoscopic referrals. This study compared the RDQ and GERDQ performance in predicting the presence of clinically significant erosive esophagitis (LA grade B or higher). The other objective of the present study was to determine the validity and reliability of the Indonesian-translated version of RDQ.

SUBJECTS AND METHODS

1. Study design and population

This was a prospective, multi-center study involving 92 adults (aged 18 years and older) suspected of having GERD and underwent esophagogastroduodenoscopy (EGD) in the outpatient gastroenterology clinic, Dr. Soetomo Hospital Surabaya and Siti Khadijah Sepanjang Hospital Sidoarjo. The presence of heartburn, regurgitation, or both at least twice per week for the past three months was suggestive of GERD. This study excluded patients with autoimmune disease, cirrhosis, malignancy, pregnancy, or contraindication to EGD. All participants were recruited consecutively during consultations with gastroenterologists and instructed not to take an acid suppressant for at least four weeks before endoscopy. The patients completed the translated RDQ and GERDQ immediately before performing the EGD. Therefore, this study used the Indonesian version of GERDQ that has been previously translated and validated.¹⁴ Informed consent was obtained from all participants, and the protocol was approved by the Medical Research Ethics of Dr. Soetomo Hospital by the letter number 0124/KPEK/1/2021.

Demographic data (sex, age, and ethnicity), BMI, and EGD findings of all patients were collected. The BMI was categorized according to the Asia-Pacific classification system²⁵ as follows: <18.5 kg/m² (underweight), 18.5–22.9 kg/m² (normal), 23–24.9 kg/m² (overweight), and ≥25 kg/m² (obese).

The endoscopic assessment of esophageal mucosal changes was described using LA classification system.¹² Patients with a normal esophageal mucosa and visible gastroduodenal pathology were grouped separately from those without endoscopic abnormalities.

2. Translation and cultural adaptation of RDQ

The original RDQ consists of 12 questions evaluating the frequency and severity of heartburn, acid regurgitation, and dyspeptic symptoms, which are scored on a five-point Likert scale. The translated questionnaire preserved the primary structure of the original survey to evaluate each subscale as intended. The translation process was conducted according to the method proposed by Acquadro et al.²⁶, as follows: (i) The first two versions of forward translation (v1 and v2) were performed independently by two licensed bilingual translators (N.B. and H.P.). (ii) The discrepancies between them were discussed with two gastroenterology experts (T.S. and M.M.) until a consensus was achieved (v3). (iii) The third version (v3) was sent to a professional translator with a medical background (I.K.) for a backward translation. There were no modifications at this stage because the result was similar to the original version. (iv) Subsequently, 10 patients with different ethnicities (four Javanese, three Madurese, one Sundanese, and one Chinese) were subjected to a pre-test cognitive interview to ensure the translated questionnaire was comprehensible. The participant feedback was considered by all parties to formulate the final version of the questionnaire (v4) (see Supplementary Table 1 for the final version of the Indonesian-translated version of RDQ).

3. Statistical analysis

The mean (\pm standard deviation), number (n), and percentage (%) are used to describe descriptive statistics. The association between the clinical characteristics of subjects with significant erosive esophagitis was analyzed using chi-square or Fischer exact test for categorical variables and a t-test or Mann-Whitney test for numerical variables. A Pearson product-moment correlation test was applied to assess the construct validity of the translated RDQ by comparing the *r* value to the critical table value for each item in the overall survey ($r > 0.205$, $p < 0.01$).²⁷ Cronbach's alpha internal consistency measurements were used to evaluate the reliability. The alpha values were described as follows: excellent (> 0.9), good

(> 0.8), acceptable (> 0.7), questionable (> 0.6), poor (> 0.5), and unacceptable (< 0.5).²⁸ The Cohen's kappa coefficient was used to measure the similarity between the RDQ and GERDQ (0.0–0.2, slight agreement; 0.21–0.40, fair agreement; 0.41–0.60, moderate agreement; 0.61–0.80 substantial agreement; 0.81–1.0, perfect agreement).²⁹ Receiver operating curve (ROC) analysis was also conducted to determine their ability to discriminate LA grade B, C, or D erosive esophagitis from other endoscopic results. The statistical performances were measured using the area under the receiver operating characteristic (AUC). All data analysis was performed using IBM SPSS Statistics version 25.0 (IBM Co., Armonk, NY, USA).

RESULTS

Table 1 lists the clinical characteristics of the 92 participants in this study. The subjects were 66.3% female, with an average age of 40.8 ± 13 years old. The study population

Table 1. Clinical Characteristics of the Study Participants

Characteristic	n (%) or mean \pm SD	p-value
Sex		0.798
Male	31 (33.7)	
Female	61 (66.3)	
Age (yr)	40.8 \pm 13	0.398
Ethnicity		0.098
Javanese	68 (73.9)	
Madurese	15 (16.3)	
Sundanese	4 (4.4)	
Mongoloid	5 (5.4)	
BMI (kg/m ²)	23.6 \pm 7.1	0.151
<18.5 (underweight)	18 (19.6)	
18.5–22.9 (normal)	36 (39.1)	
23–24.9 (overweight)	14 (15.2)	
≥ 25 kg/m ² (obese)	24 (26.1)	
EGD findings		
Erosive esophagitis	59 (64.1)	
LA grade A EE	37 (40.2)	
LA grade B EE	20 (21.7)	
LA grade C EE	2 (2.2)	
LA grade D EE	0 (0)	
Other gastroduodenal pathology	18 (19.6)	
Normal endoscopy	15 (16.3)	

EGD, esophagogastroduodenoscopy; LA grade A-D EE, Los Angeles grade A-D erosive esophagitis.

was ethnically diverse: 73.9% were Javanese, 16.3% were Madurese, 4.4% were Sundanese, and 5.4% were of Chinese descent. Based on BMI, 19.6%, 39.1%, 15.2%, and 26.1% of participants, respectively, were classified as underweight, normal weight, overweight, and obese. Endoscopic investigations showed that 59 (64.1%) patients had erosive esophagitis, with 22 identified as LA grade B and C. Eighteen (19.6%) patients had no virtual esophageal mucosal break but demonstrated other gastroduodenal pathologies: four gastric ulcers, 11 erosive gastritis, one gastric polyposis, one gastric antral vascular ectasia, and one erosive duodenitis. The remaining 16 patients revealed no abnormalities in the EGD examination. Sex, age, ethnicity, and body mass index were not associated with LA grade B or higher erosive esophagitis ($p>0.05$). In addition, neither being overweight nor obese was associated with clinically significant erosive esophagitis ($p>0.05$).

The construct validity of the questionnaire was confirmed when the r -value of each question was higher than the critical

value table ($r>0.205$, $p<0.01$) (Table 2). The Indonesian version of RDQ achieved a Cronbach alpha of 0.90, indicating excellent reliability. The questionnaire indicated moderate similarity with the Indonesian version of GERDQ ($\kappa=0.459$, $p<0.01$).

ROC analysis showed that RDQ was slightly superior to GERDQ in identifying erosive esophagitis with LA grade B or higher (AUC 0.602 vs. 0.589) (Fig. 1). A cutoff point of 20 for the RDQ was selected, considering its use as a screening instrument with a sensitivity and specificity of 73% and 50%, respectively. The optimal cutoff point of GERDQ was determined to be 8, with 77% sensitivity and 43% specificity.

DISCUSSION

Approximately two-thirds of the 92 participants in this study were female, suggesting a higher incidence of reflux symptoms and heartburn in women. This is consistent with a prior study that reported similar results.³⁰ Although reflux symp-

Table 2. Pearson Correlation Coefficient of the Indonesian Version of the RDQ

Item	r	α
Thinking about your symptoms over the past 7 days, how often have you had the following?		
Question 1 <i>A burning feeling behind your breastbone</i>	0.786	<0.01
Question 2 <i>Pain behind your breastbone</i>	0.766	<0.01
Question 3 <i>A burning feeling in the centre of the upper stomach</i>	0.740	<0.01
Question 4 <i>Pain in the centre of the upper stomach</i>	0.514	<0.01
Question 5 <i>An acid taste in your mouth</i>	0.603	<0.01
Question 6 <i>Unpleasant movement of material upwards from the stomach</i>	0.626	<0.01
Thinking about your symptoms over the past 7 days, how would you rate the intensity of the following?		
Question 7 <i>A burning feeling behind your breastbone</i>	0.802	<0.01
Question 8 <i>Pain behind your breastbone</i>	0.783	<0.01
Question 9 <i>A burning feeling in the centre of the upper stomach</i>	0.773	<0.01
Question 10 <i>Pain behind your breastbone</i>	0.585	<0.01
Question 11 <i>An acid taste in your mouth</i>	0.641	<0.01
Question 12 <i>Unpleasant movement of material upwards from the stomach</i>	0.638	<0.01

RDQ, Reflux Disease Questionnaire.

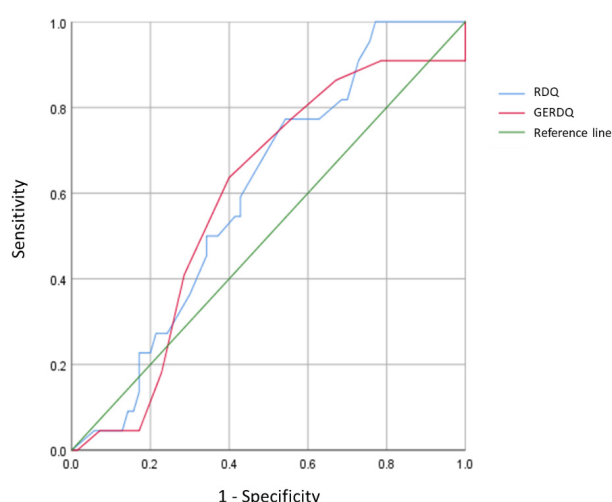


Fig. 1. ROC curves of the total RDQ and GERDQ to identify LA grade B, C, or D erosive esophagitis. ROC, receiver operating curve; RDQ, Reflux Disease Questionnaire; GERDQ, GERD questionnaire; LA grade A-D, Los Angeles grade A-D.

toms are more prevalent in females, previous studies showed that the male sex is associated with esophageal erosion and Barrett's esophagus on endoscopy.³⁰ In the present study, there was no significant association between erosive esophagitis and sex. The mean age in this study was 40.8 years old. Studies have found that GERD affects the elderly more than the younger population, with an age of over 50 years being a risk factor for GERD.³¹ On the other hand, several recent studies have also revealed that the prevalence of GERD in younger populations is rising.⁶ This study showed no association between ethnicity and the presence of clinically significant erosive esophagitis. This is consistent with another study done in Indonesia.⁵ Traditionally, a higher BMI is considered a risk factor for GERD.³² On the other hand, this study found no significant association between the BMI and clinically significant erosive esophagitis. While this finding contrasts with many international studies, another study in Indonesia reported similar findings.⁵ Further studies regarding BMI and erosive esophagitis will be required.

In contrast to previous studies that still included LA grade A, this study assessed the performance of RDQ and GERDQ in predicting LA grade B erosive esophagitis or higher in patients with symptoms of heartburn and regurgitation. RDQ and GERDQ had an AUC of less than 0.70. Hence, the optimal diagnostic cutoff value could not be determined. According to the accuracy classification table, an instrument with AUC between 0.6 and 0.7 is considered "not good".³³ Neither the

RDQ nor the GERDQ was good for identifying endoscopically defined GERD (LA grade B or higher). These findings suggest that upper endoscopy remains an irreplaceable workup for identifying clinically significant erosive esophagitis. Given the limited availability of EGD and impedance-pH tests, questionnaires may be useful for addressing unmet diagnostic needs. This study reported that the AUC of RDQ is slightly superior to GERDQ. Hence, RDQ is favored over GERDQ in predicting LA grade B or higher esophagitis, suggesting its role as a better screening tool for prioritizing endoscopic referrals.

The Indonesian version of RDQ showed excellent validity and reliability. These findings were consistent with previous studies translating the questionnaire into multiple languages.^{18,20-24} A literal translation cannot be conducted without considering cross-cultural aspects in a multiethnic nation, such as Indonesia.³⁴ The subjects were an adequate representation of the Indonesian population because Javanese, Sundanese, and Madurese are among the five most common ethnic groups.³⁵ No association was observed between ethnicity and clinically significant erosive esophagitis, suggesting that ethnicity did not confound the result. The pre-final version of the first ten patients was tested to ensure that it was comprehensible to individuals from various cultural backgrounds. The psychometric features of RDQ were initially developed in a primary care setting when it was used to assist GERD identification.¹⁶ Therefore, the questionnaire is concise and can be assessed quickly.

The RDQ focuses on heartburn and regurgitation, the most frequent and hallmark symptoms of GERD.⁷ The symptoms are described in a symbolic and non-technical manner, which is a crucial feature of the RDQ. Previous studies found that patients frequently misunderstand the terminology of "heartburn".³⁶ In response, the original developers of the RDQ performed cognitive interviews with patients to ensure that the questions were phrased most candidly. Therefore, they employed word symbolism, such as "burning behind the breastbone" and "acid taste in mouth" instead of "heartburn" and "regurgitation".¹⁶ This feature has been retained in the Indonesian translation.

This study showed that only 22% of patients with typical GERD symptoms demonstrated LA grade B or higher esophagitis. A previous study in Indonesia reported that 89.3% of patients with evidence of esophageal mucosal break were categorized as LA grade A and only 10.7% as grade B or higher.⁵ Indeed,

most patients with GERD symptoms (70%) showed normal esophageal mucosal on EGD investigation.²⁹ NERD represents the most prevalent phenotype of the GERD spectrum. On the other hand, patients with heartburn and negative endoscopic results cannot be defined as true NERD without an esophageal impedance-pH monitoring test.⁹ Patients with LA grade A and normal EGD may be heterogeneous, including NERD, acid-hypersensitive esophagus, nonacid hypersensitive esophagus, and functional heartburn because an impedance-pH study was not performed.

This study had several limitations. The sample size was relatively small. The performance of translated RDQ in assessing treatment response could not be evaluated because of the cross-sectional design. Patients with true NERD could not be differentiated from those with normal EGD results because of the lack of an impedance-pH monitoring test. In patients presenting with other gastroduodenal pathology, this study could not determine objectively whether the patient's symptoms were manifestations of the visible lesion or the probable coexisting NERD. Nevertheless, the Indonesian version of RDQ is useful and slightly superior to GERDQ in predicting the presence of significant erosive esophagitis (LA grade B or higher). The Indonesian-translated RDQ is valid and reliable.

SUPPLEMENTARY MATERIAL

Supplementary material is available at the Korean Journal of Gastroenterology website (<https://www.kjg.or.kr/>).

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Supplementary Table 1. Indonesian-translated Version of the RDQ
 Beri tanda centang (✓) pada yang paling sesuai dengan kondisi Anda!

1. Seberapa sering Anda mengalami keluhan di bawah ini dalam 7 hari terakhir?						
	Tidak ada	<1 hari per pekan	1 hari per pekan	2–3 hari per pekan	4–6 hari per pekan	Setiap hari
Rasa terbakar di balik tulang dada	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Nyeri di balik tulang dada	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Rasa terbakar di perut bagian tengah atas	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Nyeri di perut bagian tengah atas	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Rasa asam di mulut	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Gerakan tidak nyaman dari perut menuju tenggorokan	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

2. Seberapa parah keluhan yang Anda mengalami dalam 7 hari terakhir?						
	Tidak ada	Sangat ringan	Ringan	Sedang	Cukup berat	Sangat berat
Rasa terbakar di balik tulang dada	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Nyeri di balik tulang dada	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Rasa terbakar di perut bagian tengah atas	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Nyeri di perut bagian tengah atas	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Rasa asam di mulut	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Gerakan tidak nyaman dari perut menuju tenggorokan	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

RDQ, Reflux Disease Questionnaire.