Original Article

Prevalence of Symptoms of Gastroesopahgeal Reflux in a Cohort of Saudi Arabians: A Study of 1265 Subjects

Majid A. Almadi[1,2], Maitha A. Almousa[3], Amani F. Althwainy[3], Afnan M. Altamimi[3], Hala O. Alamoudi[3], Hiba S. Alshamrani[3], Othman R. Alharbi[1], Nahla A. Azzam[1], Nazia Sadaf[1], Abdulrahman M. Aljebreen[1]

[1]Division of Gastroenterology, and [3]College of Medicine, King Khalid University Hospital, King Saud University, Riyadh, Saudi Arabia, [2]Division of Gastroenterology, The McGill University Health Center, Montreal General Hospital, McGill University, Montreal, Canada

Address for correspondence:
Dr. Majid A. Almadi,
Division of Gastroenterology,
King Khalid University Hospital,
King Saud University,
Riyadh, P.O. Box 2925 (59),
Riyadh 11461, Saudi Arabia.
Email: maalmadi@ksu.edu.sa

ABSTRACT

Background/Aims: In this study, we aimed to determine the prevalence of gastroesophageal reflux disease (GERD) in the general population of the capital city of Riyadh and to assess its association with other factors including age, smoking, body mass index (BMI), asthma, as well as the presence of other co-morbid diseases. **Materials and Methods:** We used the Gastroesophageal Reflux Disease Questionnaire (GerdQ) for diagnosing GERD, based on a GerdQ score of 8 or more. Riyadh was divided into four quadrants, and from each area, a single shopping mall was chosen randomly to conduct our surveys. Data collected included age, sex, history of smoking, history of asthma or any other medical condition, dietary habits, monthly household income, history and frequency of heartburn, epigastric pain, regurgitation of food, nausea, sleep disturbance from heartburn, the use of common over-the-counter antacids for the control of their symptoms, and their height and weight. **Results:** Over a 4-week period from the 19 December 2012 to 17 January 2013, a total of 1265 individuals were included in the survey. The mean age was 29.97 ± 11.58 years. Females formed 67.81% of the respondents and 62.73% had one or more episodes of heartburn per week. Based on a cutoff GERDQ score of 8, the prevalence of GERD in the surveyed population was 45.4%. GERD was more prevalent in older individuals (mean age 31.9 vs. 30.0 years, $P < 0.001$) and in those with a higher BMI (27.29 vs. 26.31 kg/m^2, $P = 0.02$). There was no difference between males (45.43%) and females (45.13%) ($P = 0.92$); there was a trend of a higher prevalence in smokers (51.63% vs. 44.41%), but it did not reach statistical significance ($P = 0.09$). **Conclusion:** Symptoms suggestive of GERD as determined by the translated GerdQ are prevalent among this study population.

Key Words: Epidemiology, gastroesophageal reflux, GerdQ, heartburn, obesity, predictors, prevalence, Saudi Arabia

Received: 10.01.2014, Accepted: 10.05.2014

How to cite this article: Almadi MA, Almousa MA, Althwainy AF, Altamimi AM, Alamoudi HO, Alshamrani HS, *et al*. Prevalence of symptoms of gastroesopahgeal reflux in a cohort of Saudi Arabians: A study of 1265 subjects. Saudi J Gastroenterol 2014;20:248-54.

The prevalence of gastroesophageal reflux disease (GERD), defined as heartburn, acid regurgitation, or both, at least once a week, in western populations is thought to be 10-20%, whereas in Asia, the prevalence is roughly less than 5%.[1] Furthermore, the burden of the disease is large and affects the quality of life of patients,[2] resulting in both direct health care related costs as well as indirect costs due to loss of productivity.[2,3] While some data from the Middle East has become available,[4-10] the prevalence of GERD in the Saudi population is unknown.[11,12] In this study, we aimed to determine the prevalence of GERD in the general population of the capital city of Riyadh and to assess its association with other factors including age, smoking, body mass index (BMI), asthma, as well as the presence of other co-morbid diseases.

Access this article online

Quick Response Code:

Website: www.saudijgastro.com

DOI: 10.4103/1319-3767.136982

MATERIALS AND METHODS

The Gastroesophageal reflux disease questionnaire

We used the Gastroesophageal Reflux Disease Questionnaire (GerdQ) for making the diagnosis of GERD.[13] The GerdQ was developed as a patient-centered, self-assessment questionnaire to assist health care professionals in the diagnosis of GERD.[13] The questions of the GerdQ are

derived from the Reflux Disease Questionnaire (RDQ), the Gastrointestinal Symptom Rating Scale, and the Gastro-esophageal Reflux Disease Impact Scale.[13] It is a point-based questionnaire where points are distributed based on the frequency and type of symptoms experienced by the respondent. Those with a score of 8 or more have a high likelihood of having GERD, while those with less than 8 have low or no likelihood of having GERD.[13] The GerdQ has a sensitivity of 65% and a specificity of 71%[13] for the diagnosis of GERD.

To our knowledge, a validated Arabic version of the GerdQ is not available. So, we translated the questionnaire and performed a pilot trial on 20 individuals prior to the study.

Data collection

The area of Riyadh was divided into four quadrants and all the major shopping centers were listed for each area. From each area, a single mall was chosen randomly to conduct our surveys. This sampling was done on consecutive days with 1 day spent at each mall.

In our survey, we included only those individuals who were willing and gave their consent to participate in the study. Those who did not consent to participate in the study were excluded. Participants could withdraw from the study at any time.

In each shopping center, following a convenience sampling approach, people were approached at random and were requested to fill out questionnaires that included questions on age, sex, history of smoking, history of asthma or any other medical condition, dietary habits, monthly household income, history and frequency of heartburn, epigastric pain, regurgitation of food, nausea, sleep disturbance from heartburn, and the use of common over-the-counter antacids for the control of their symptoms, and their self-reported height and weight. The data were gathered by MM, AT, HA, and HS and filled in standardized data abstraction forms.

No personal identification information or other personal identifiers were recorded to ensure patient confidentiality. The Internal Review Board (IRB) at King Khalid University Hospital, Riyadh, Saudi Arabia approved the study (Study No. E-12-771).

Statistical analysis

Data analysis included descriptive statistics computed for continuous variables, including means, standard deviation (SD), minimum and maximum values, as well as 95% confidence interval (CI). Percentages and 95% CI were used for categorical variables. Between-groups comparisons were performed using Chi-square, *t*-test, or Wilcoxon signed-rank testing, as appropriate.

Univariable and multivariable logistic regression analyses were used to examine the association between independent variables and dependent variables. The presence or absence of GERD was based on a GerdQ score of 8 or more, as suggested by Jones *et al*.[13] Independent variables included sex, age, height, weight, BMI, nationality, history of smoking, history of asthma, history of other chronic medical conditions, regurgitation of food, nausea, epigastric pain, sleep disturbance due to heartburn, and the use of antacid medications. Odds ratio (OR) and 95% CI were calculated. We used the software STATA 11.2 (Stata Corp., TX, USA) in our analysis. A statistical significance threshold of $P = 0.05$ was adopted. No attempt at imputation was made for missing data.

RESULTS

Demographics and historical data

Over a 4-week period from 19 December 2012 to 17 January 2013, a total of 1265 individuals were included in the survey from four different shopping centers. The mean age of the individuals who responded to the survey was 29.97 ± 11.58 years. The majority of the individuals in the survey were females (67.81%), while males formed only 32.19%. The majority were Saudi nationals (80.30%), while non-nationals formed 19.70%. Smokers comprised 12.20% of the individuals, 18.10% were asthmatics, and 22.35% reported having other diseases [Table 1]. Of those surveyed, 57.96% reported that they used to eat fatty foods (95% CI: 55.23-60.70).

The mean height was 162.8 ± 10.7 cms, the mean weight was 70.8 ± 20.3 kg, and the mean BMI was 26.76 ± 6.95 kg/m^2

Table 1: Baseline characteristics of individuals who responded to the survey

Variable	Mean (*N*=1265)	95% CI or SD
Age, years	29.97	11.58
Sex		
Females	67.81	65.22-70.39
Males	32.19	29.61-34.78
Nationality		
Saudi	80.30	78.10-82.50
Non-Saudi	19.70	17.50-21.90
Asthma	18.10	15.97-20.24
Other systemic diseases	22.35	20.04-24.66
Smokers	12.20	10.39-14.01
Body mass index	26.76	6.95
Monthly family income in Saudi Riyals		
5000-10,000	26.77	24.00-29.53
10,000-15,000	47.37	44.26-50.49
>15,000	25.86	23.13-28.59

SD: Standard deviation

[Figure 1]. The reported monthly income of those surveyed was 5000-10,000 SR in 26.77%, between 11,000 and 15,000 SR in 47.37%, and more than 15,000 SR in 25.86%.

There was a higher prevalence of smoking in males (30.92%) compared to females (3.42%) ($P < 0.01$). Asthmatics tended to be older (31.4 vs. 29.60 years, $P = 0.03$); also, those who reported other medical conditions were older (36.5 years vs. 28.0 years, $P < 0.01$) and had a higher BMI (28.8 vs. 26.2, $P < 0.01$).

Symptoms and medication use

Only 37.27% of patients did not experience any heartburn in our survey, while the remainder (62.73%) had one or more episodes of heartburn per week and 17.48% had four to seven episodes per week. There was no difference in age or gender ($P = 0.21$) and the frequency of heartburn symptoms [Table 2]. While there was an increase in the frequency in heartburn episodes in smokers ($P = 0.01$), there was also an increased episode of regurgitation ($P < 0.01$), sleep disturbance ($P < 0.01$), and use of antacids ($P < 0.01$) in those with more frequent heartburn episodes [Table 2]. But there was no association of heartburn with asthma ($P = 0.26$) or the self-reported consumption of fatty meals ($P = 0.13$). The prevalence of co-morbid illness was more common in those with frequent episodes of heartburn ($P < 0.01$). Those who reported to have frequent episodes of nausea were less likely to suffer from frequent heartburn. Furthermore, sleep disturbance secondary to heartburn occurred at least once per week in 48.59% of those surveyed, while 12.77% had four to seven episodes of sleep disturbance per week.

Regurgitation of food content at least once a week was reported by 60.87%; also, 13.69% of those surveyed reported four to seven episodes of regurgitation in a week. Nausea was reported to occur at a frequency of at least once a week by 75.13%. Epigastric discomfort was common with 77.15% experiencing it at least once a week and 35.14% experiencing it 4-7 times a week. The use of antacid medications at least once a week was reported by 31.48% of those surveyed and it was used by 9.60% at least 4-7 times per week [Table 3].

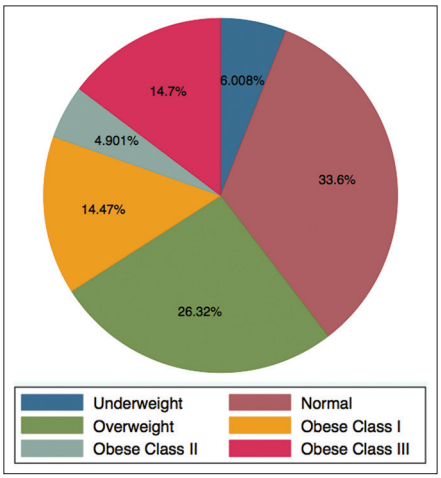

Figure 1: Weight distribution of individuals included in the survey

GerdQ score

The mean GerdQ score was 7.24 ± 4.16. Based on a cutoff value of 8, the prevalence of GERD in the surveyed population according to the GerdQ score was 45.4%. GERD was more prevalent in older individuals (mean age 31.9 vs. 30.0 years, $P < 0.01$) as well as in those with a higher BMI (27.29 vs. 26.31 kg/m^2, $P = 0.02$). The proportion of GerdQ scores in each class of BMI is shown in Figure 2. There was an association between GERD and other co-morbid diseases (86.67% vs. 42.86%, $P = 0.002$). No difference was found in the prevalence of GERD between males (45.43%) and females (45.13%) ($P = 0.92$). However, there was a trend of a higher prevalence in smokers (51.63% vs. 44.41%), but it did not reach statistical significance ($P = 0.09$). There was no association between the prevalence of GERD and asthma ($P = 0.29$) or the self-reporting of eating fatty meals ($P = 0.63$).

On univariable analysis, a weak association was found between GERD and age (OR: 1.03; 95% CI: 1.01-1.04) [Figure 3], BMI (OR: 1.02; 95% CI: 1.00-1.04), and the presence of other co-morbidities (OR: 1.54; 95% CI: 1.18-2.01). There was, however, no association between GERD and male gender (OR: 1.01; 95% CI: 0.80-1.28), smoking (OR: 1.34; 95% CI: 0.95-1.87), asthma (OR: 1.17; 95% CI: 0.88-1.56), or self-reported fatty food consumption (OR: 0.95; 95% CI: 0.76-1.18).

On multivariable analysis, the only variable that was associated with GERD was age (OR: 1.02; 95% CI: 1.01-1.04).

DISCUSSION

GERD is a constellation of symptoms resulting from the reflux of stomach contents which causes troublesome symptoms and/or complications[14] and can have esophageal and/or extraesophageal manifestations.[14] The distinction between GERD and functional dyspepsia can be difficult with recent data suggesting that they are not distinguishable based on the presence or absence of heartburn.[15,16]

The prevalence of GERD in the Gulf region is not well characterized and there is not much data. In a study of 200 Kuwaiti dyspeptic patients referred for endoscopy, only 7% were found to have esophagitis.[17] While in Gizan, in the southern part of Saudi Arabia, a retrospective study of individuals who underwent an upper

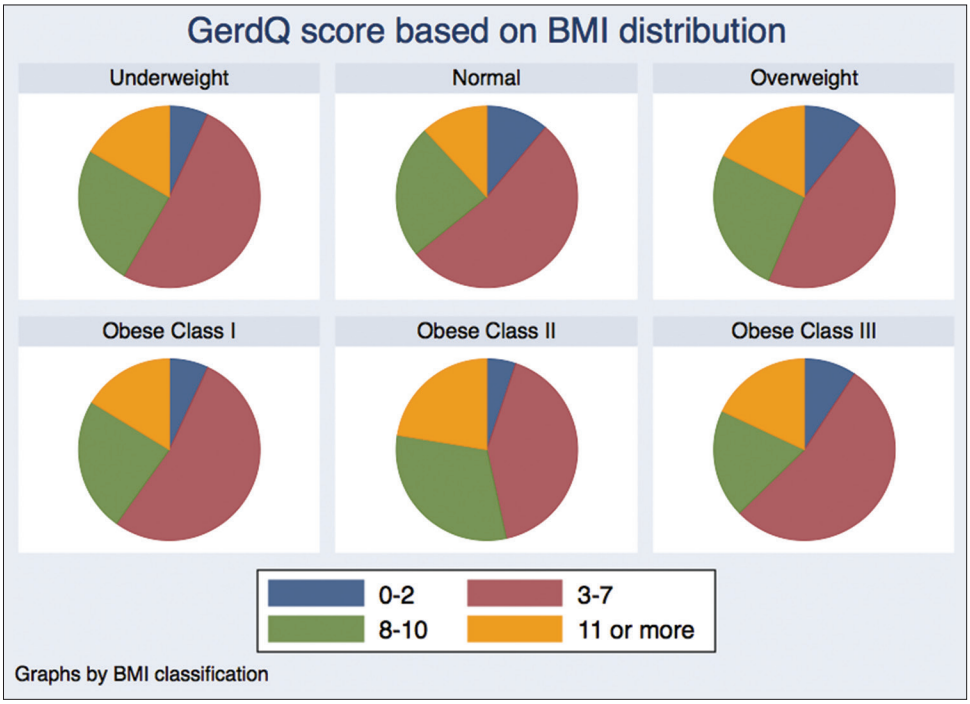

Figure 2: GerdQ score by obesity class of the surveyed population

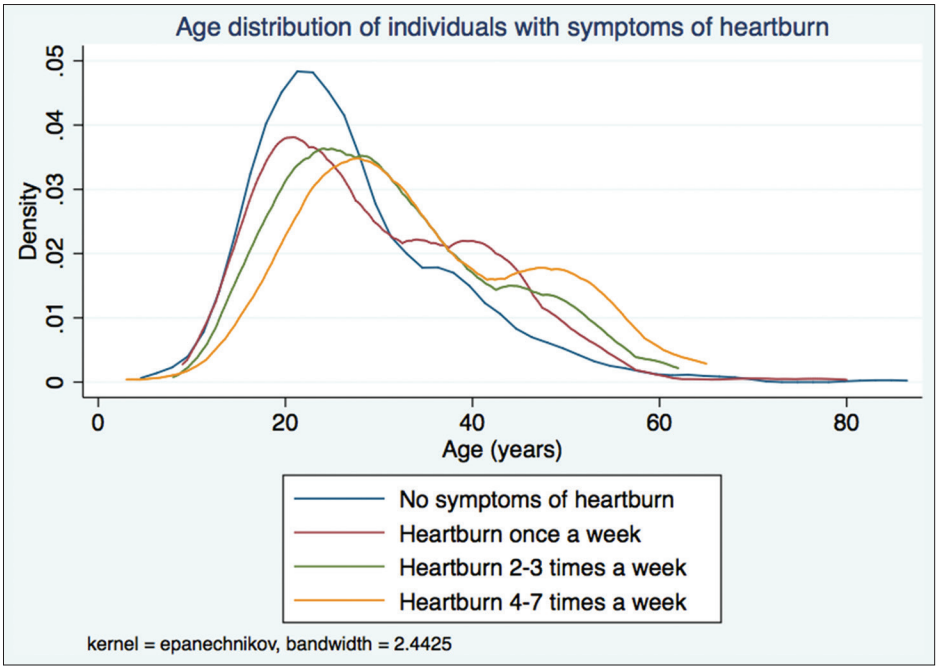

Figure 3: Age distribution of individuals with symptoms of heartburn

gastrointestinal endoscopy identified Barrett's esophagus in 0.003%.[18] A study from the Eastern Province of Saudi Arabia demonstrated that patients suffering from GERD and non-ulcer dyspepsia had worse health-related quality of life (HRQOL) scores when compared to those without these disorders.[12] The incidence and prevalence of GERD appears to be changing like that of other gastrointestinal disorders. This might be due to increased case detection with advanced diagnostic technology, better medical facilities, and heightened awareness of the disease.[19]

The use of standardized questionnaires for the diagnosis of GERD has been criticized in numerous studies.[20,21] A study that used wireless pH capsule monitoring found

that the GerdQ scores were predictive of an abnormal pH study in those not using proton pump inhibitors (PPI), but had only modest sensitivity and specificity in diagnosing acid reflux.[20] The authors stated that it cannot be recommended as a screening tool for GERD.[20] It is worth noting that these results as well as the conclusion were based on a study population that was referred for wireless pH monitoring and some were already on PPI therapy, which may denote that this is a difficult-to-manage population with reflux symptoms and these results cannot be generalized to the general population. In a single-blinded, single-arm study where the diagnostic accuracy of the RDQ, family practitioners, gastroenterologists, and a test of esomeprazole therapy were compared to endoscopy with 48-hour esophageal pH and symptom association monitoring, the sensitivity and specificity of each were 62% and 67% for the RDQ, 63% and 63% for family practitioners, 67% and 70% for gastroenterologists, and 54% and 65% for the esomeprazole therapy test, respectively.[21] Again, this study was conducted in a population that sought medical advice for troublesome symptoms and was not a community-based one, which limits its generalizability.

Table 2: Association between heartburn and other variables

Variable	Heartburn (%)				*P* value
	<Once a week	Once a week	2-3 times a week	4-7 times a week	
Sex					
Male	36.8	21.1	23.6	18.4	0.21
Female	37.4	25.7	19.8	17.0	
Smoking					
Yes	33.6	16.4	27.6	22.4	0.01
No	38.0	25.1	20.1	16.8	
Regurgitation					
<Once a week	61.7	20.6	10.5	7.2	<0.01
Once a week	32.9	37.0	24.1	6.0	
2-3 times a week	13.8	24.5	34.9	26.8	
4-7 times a week	12.9	10.0	23.5	53.5	
Epigastric pain					
<Once a week	40.4	18.1	15.9	25.6	<0.01
Once a week	18.5	29.2	32.0	20.3	
Two	20.4	36.5	27.4	15.7	
4-7 times a week	57.1	18.5	13.3	11.0	
Nausea					
<Once a week	40.7	19.9	18.5	20.9	<0.01
Once a week	20.2	30.2	28.7	20.9	
2-3 times a week	26.2	34.3	26.2	13.3	
4-7 times a week	51.9	18.5	15.8	13.8	
Sleep disturbance due to heartburn					
<Once a week	59.5	21.3	11.4	8.0	<0.01
Once a week	16.0	47.7	25.1	11.1	
2-3 times a week	13.2	14.7	44.7	27.4	
4-7 times a week	13.0	13.0	22.7	53.2	
Use of antacid medications					
<Once a week	49.8	23.6	15.1	11.5	<0.01
Once a week	11.7	40.7	33.3	14.2	
2-3 times a week	16.0	17.0	41.5	25.5	
4-7 times a week	7.8	9.4	25.6	57.3	
Asthma					
Yes	32.4	23.6	23.6	20.4	0.26
No	38.5	24.2	20.3	17.0	
Fatty food					
Yes	35.7	26.3	21.3	16.7	0.13
No	39.8	21.0	20.5	18.7	
Other systemic diseases					
Yes	28.2	26.4	20.9	24.5	<0.01
No	40.1	23.5	20.9	15.5	

Table 3: Frequency of symptoms reported by surveyed individuals

Symptoms	None		Once a week		2-3 times a week		4-7 times a week	
	%	95% CI	%	95% CI	%	95% CI	%	95% CI
Heartburn	37.27	34.59-39.95	24.18	21.81-26.56	21.07	18.81-23.33	17.48	15.37-19.58
Regurgitation	39.13	36.41-41.84	25.85	23.41-28.28	21.34	19.05-23.62	13.69	11.77-15.60
Nausea	24.87	22.45-27.31	21.26	18.96-23.57	17.32	15.19-19.45	36.53	33.83-39.24
Epigastric discomfort	22.85	20.49-25.21	23.10	20.73-25.46	18.91	16.72-21.11	35.14	32.45-37.82
Sleep disturbance due to heartburn or regurgitation	51.41	48.63-54.20	19.73	17.50-21.95	16.09	14.04-18.14	12.77	10.91-14.64
Use of antacid medications	68.52	65.93-71.11	13.24	11.35-15.13	8.64	7.07-10.20	9.60	7.96-11.25

Although an Arabic version of the Reflux Symptom Index questionnaire has been validated, it was developed for assessing the symptoms of laryngopharyngeal reflux specifically and not GERD.[22] These studies delineate the poor assessment tools that are available to us at this point in time for the diagnosis of GERD and show that there are not much differences between them. Given all these limitations, we thought that the use of the GerdQ was worthwhile as a simple noninvasive means to assess the prevalence of GERD in the general population.

In our cohort, the prevalence of GERD (45%) was high compared to that reported in the literature. In a recent systematic review, the range of GERD prevalence was found to be 18.1-27.8% in North America, 8.8-25.9% in Europe, 2.5-7.8% in East Asia, 8.7-33.1% in the Middle East, 11.6% in Australia, and 23.0% in South America.[23] We do have to note that these figures are based on variable assessment tools, and thus when directly comparing these figures, this should be taken into account.

In our study, GERD was found to be more prevalent in older individuals. Some population-based studies have found an association between GERD and age,[24,25] while others have not.[5,26] This variation in results maybe explained in part by the various methods in which age was categorized as well as the population under study, where some studies examined age as a continuous variable[24] while others used arbitrary cutoff values and compared groups to each other.[5,25,26]

We also found that the presence of GERD was associated with an increased BMI in keeping with the findings of a recent meta-analysis where obesity was associated with GERD (OR: 1.89; 95% CI: 1.70-2.09).[27] Although there was a trend toward an association between GERD and smoking, it did not reach statistical significance. This might be due to being underpowered to find such an association, but a similar finding was reported in a study where current smoking was not associated with GERD (OR: 1.3; 95% CI: 1.70-2.09)[28] while others found such an association.[5,6,24]

We did not find an association between GERD and the presence of asthma in our population. This is in keeping with a study on children in primary care practice in the United Kingdom (OR: 1.0; 95% CI: 0.9-1.2).[29]

In our study, the prevalence of GERD in the general population was assessed, rather than in a symptomatic population presenting to health care facilities; furthermore, the relatively large number of people surveyed and the multiple locations add to the strength of the study and its generalizability. However, it does have some limitations; recall bias is one of these, which is unfortunately common in studies of this nature. In addition, the GerdQ had not been validated in the studied population prior to the study and a validated Arabic version is lacking. The findings and interpretation of our results rest on the validity of this tool and point out the need for validation of this instrument. Nonetheless, the results of this study shed some light on the prevalence of GERD in the region and further studies are needed to validate these results and to explore the potential causes for such a high prevalence, as the public health implications of such a disease are great and affect the well-being of a large segment of the community.

ACKNOWLEDGMENTS

The authors would like to extend their sincere appreciation to the Deanship of Scientific Research at King Saud University for its funding of this research through the Research Group Project number RGP-VPP-279.

REFERENCES

1. Bredenoord AJ, Pandolfino JE, Smout AJ. Gastro-oesophageal reflux disease. Lancet 2013;381:1933-42.
2. Wahlqvist P, Karlsson M, Johnson D, Carlsson J, Bolge SC, Wallander MA. Relationship between symptom load of gastro-oesophageal reflux disease and health-related quality of life, work productivity, resource utilization and concomitant diseases: Survey of a US cohort. Aliment Pharmacol Ther 2008;27:960-70.
3. Jansson C, Wiberg M, Alexanderson K. Sickness absence due to gastroesophageal reflux diagnoses: A nationwide Swedish population-based study. Scand J Gastroenterol 2013;48:17-26.
4. Mostaghni A, Mehrabani D, Khademolhosseini F, Masoumi SJ, Moradi F, Zare N, *et al*. Prevalence and risk factors of gastroesophageal reflux disease in Qashqai migrating nomads, southern Iran. World J Gastroenterol 2009;15:961-5.

5. Nasseri-Moghaddam S, Mofid A, Ghotbi MH, Razjouyan H, Nouraie M, Ramard AR, *et al*. Epidemiological study of gastro-oesophageal reflux disease: Reflux in spouse as a risk factor. Aliment Pharmacol Ther 2008;28:144-53.
6. Nouraie M, Radmard AR, Zaer-Rezaii H, Razjouyan H, Nasseri-Moghaddam S, Malekzadeh R. Hygiene could affect GERD prevalence independently: A population-based study in Tehran. Am J Gastroenterol 2007;102:1353-60.
7. Nouraie M, Razjouyan H, Assady M, Malekzadeh R, Nasseri-Moghaddam S. Epidemiology of gastroesophageal reflux symptoms in Tehran, Iran: A population-based telephone survey. Arch Iran Med 2007;10:289-94.
8. Solhpour A, Pourhoseingholi MA, Soltani F, Zarghi A, Habibi M, Ghafarnejad F, *et al*. Gastro-esophageal reflux symptoms and body mass index: No relation among the Iranian population. Indian J Gastroenterol 2008;27:153-5.
9. Kitapcioglu G, Mandiracioglu A, Caymaz Bor C, Bor S. Overlap of symptoms of dyspepsia and gastroesophageal reflux in the community. Turk J Gastroenterol 2007;18:14-9.
10. Sperber AD, Halpern Z, Shvartzman P, Friger M, Freud T, Neville A, *et al*. Prevalence of GERD symptoms in a representative Israeli adult population. J Clin Gastroenterol 2007;41:457-61.
11. Makhadoom N, Abouloyoun A, Bokhary HA, Dhafar KO, Gazzaz ZJ, Azab BA. Prevalence of gastroesophageal reflux disease in patients with laryngeal and voice disorders. Saudi Med J 2007;28:1068-71.
12. Wahass S, Khalil MS, Al Qurain AA, Yasawy MI. The impact of functional dyspepsia on health-related quality of life in Saudi patients. Saudi J Gastroenterol 2006;12:123-9.
13. Jones R, Junghard O, Dent J, Vakil N, Halling K, Wernersson B, *et al*. Development of the GerdQ, a tool for the diagnosis and management of gastro-oesophageal reflux disease in primary care. Aliment Pharmacol Ther 2009;30:1030-8.
14. Vakil N, van Zanten SV, Kahrilas P, Dent J, Jones R. The Montreal definition and classification of gastroesophageal reflux disease: A global evidence-based consensus. Am J Gastroenterol 2006;101:1900-20.
15. Talley NJ. Functional (non-ulcer) dyspepsia and gastroesophageal reflux disease: One not two diseases? Am J Gastroenterol 2013;108:775-7.
16. Vakil N, Halling K, Ohlsson L, Wernersson B. Symptom overlap between postprandial distress and epigastric pain syndromes of the Rome III dyspepsia classification. Am J Gastroenterol 2013;108:767-74.
17. Abahussain EA, Hasan FA, Nicholls PJ. Dyspepsia and *Helicobacter pylori* infection: Analysis of 200 Kuwaiti patients referred for endoscopy. Ann Saudi Med 1998;18:502-5.
18. Gadour MO, Ayoola EA. Barrett's oesophagus and oesophageal cancer in Saudi Arabia. Trop Gastroenterol 1999;20:111-5.
19. Ho KY. Gastroesophageal reflux disease in Asia: A condition in evolution. J Gastroenterol Hepatol 2008;23:716-22.
20. Lacy BE, Chehade R, Crowell MD. A prospective study to compare a symptom-based reflux disease questionnaire to 48-h wireless pH monitoring for the identification of gastroesophageal reflux (revised 2-26-11). Am J Gastroenterol 2011;106:1604-11.
21. Dent J, Vakil N, Jones R, Bytzer P, Schöning U, Halling K, *et al*. Accuracy of the diagnosis of GORD by questionnaire, physicians and a trial of proton pump inhibitor treatment: The Diamond Study. Gut 2010;59:714-21.
22. Farahat M, Malki KH, Mesallam TA. Development of the Arabic version of Reflux Symptom Index. J Voice 2012;26:814 e15-9.
23. El-Serag HB, Sweet S, Winchester CC, Dent J. Update on the epidemiology of gastro-oesophageal reflux disease: A systematic review. Gut 2013 [Epub ahead of print].
24. Mohammed I, Cherkas LF, Riley SA, Spector TD, Trudgill NJ. Genetic influences in gastro-oesophageal reflux disease: A twin study. Gut 2003;52:1085-9.
25. He J, Ma X, Zhao Y, Wang R, Yan X, Yan H, *et al*. A population-based survey of the epidemiology of symptom-defined gastroesophageal reflux disease: The Systematic Investigation of Gastrointestinal Diseases in China. BMC Gastroenterol 2010;10:94.
26. Chen M, Xiong L, Chen H, Xu A, He L, Hu P. Prevalence, risk factors and impact of gastroesophageal reflux disease symptoms: A population-based study in South China. Scand J Gastroenterol 2005;40:759-67.
27. Eslick GD. Gastrointestinal symptoms and obesity: A meta-analysis. Obes Rev 2012;13:469-79.
28. Locke GR 3rd, Talley NJ, Fett SL, Zinsmeister AR, Melton LJ 3rd. Risk factors associated with symptoms of gastroesophageal reflux. Am J Med 1999;106:642-9.
29. Ruigomez A, Wallander MA, Lundborg P, Johansson S, Rodriguez LA. Gastroesophageal reflux disease in children and adolescents in primary care. Scand J Gastroenterol 2010;45:139-46.

Source of Support: The Deanship of Scientific Research at King Saud University. Research Group Project number RGP-VPP-27,
Conflict of Interest: None declared.