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Research Article
Socio-demographic and Life Style Differences Between Males and Females as Risk Factors for Gastroesophageal Reflux Symptoms in Mecca City, Saudi Arabia

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Abstract

Background and Objectives: One of the clinical disorders that can impact the patient's quality of life and results in high costs to health care systems worldwide is Gastroesophageal reflux disease (GERD). In Saudi Arabia, there are few studies on the prevalence of GERD in some cities. This study was conducted to determine the prevalence of and risk factors for gastroesophageal reflux disease (GERD) symptoms in Saudi males and females in Mecca City. **Materials and Methods:** A cross-sectional study was conducted using an online reflux questionnaire to assess and evaluate GERD symptoms among the Saudi population in Mecca City over an 18 year period. Socio-demographic characteristics, GERD symptoms as heartburn, regurgitation, nausea and vomiting; lifestyle and risk factors as food, soda and coffee consumption, cigarette smoking, personality type and the use of certain types of drugs, such as NSAIDs. **Results:** About 554 (65.3%) subjects were symptomatic. It was more frequent in males (393, 70.9%) than in females (161, 29.1%) ($p = 0.0001$). A highly significant difference was observed between male students and female students ($p = 0.0001$). A total of 171 (30.9%) males complained of experiencing heartburn once per week, compared to 75 (13.5%) female participants ($p = 0.0001$). Epigastric pain, nausea and vomiting were frequent. A highly significant difference was observed between obese males and females ($p = 0.0001$). There was a highly significant difference between male and female participants ($p = 0.0001$) with respect to smoking habits. **Conclusion:** Results of the current study showed a higher prevalence of GERD symptoms among Saudi males than females. Soft drink, coffee and tea consumption, anxious personality, obesity and overweight represented important modifiable lifestyle risk factors. Heartburn once per week and epigastric pain was the most important symptoms among our study population.

Key words: Epigastric pain, GERD, risk factors, socio-demographic, clinical disorders

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Competing Interest: The authors have declared that no competing interest exists.

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

INTRODUCTION

Gastroesophageal reflux disease (GERD) is a common clinical disorder that can impact the patient's quality of life and results in high costs to health care systems worldwide[1,2]. This disease is recognized as a common health problem in Western countries but is uncommon in Eastern countries, among Asians and possibly among Africans in developing and under-developed countries[3,4].

The principal symptoms of GERD are heartburn and/or regurgitation that occurs at least twice a week or moderate to severe acid reflux that occurs at least once a week, which results in mucosal damage produced by the abnormal reflux of gastric contents into the oesophagus[5]. The pathophysiology of GERD is multifactorial; it may result from the retrograde flow of gastric contents through the gastroesophageal junction and the lower oesophageal sphincter (LES) into the oesophagus, impaired oesophageal clearance or diminished function of the anti-reflux barrier[6,7]. Therefore, the length and duration of oesophageal exposure and the components or volume of the gastric contents may affect the clinical manifestations, including symptom perception and mucosal injury [8]. However, not all patients with typical reflux symptoms have evidence of mucosal injury on endoscopy. These inconsistent findings are paradoxical[4,5]. Some experts believe that erosive and nonerosive reflux disease (NERD) may be two different subsets or differently progressive stages of the disease.

Several factors may have an impact on the prevalence and presentation of the disease, including environmental, lifestyle, mechanical, or metabolic profiles, which have been investigated in previous studies[9]. Younger age, female sex, obesity, shorter time between dinner and bed, fatty meal consumption, mental stress, smoking, alcoholism, the use of non-steroidal anti-inflammatory drugs and sleeping position are known risk factors for this disorder[1,4,5]. However, the aetiology of and risk factors for GERD remain inconclusive. Furthermore, different GERD diagnostic methods, either symptomatic or endoscopic, could yield inconsistent results. Whether the risk factors for perceived symptoms and mucosal injury differ remains unclear. The diagnosis and treatment of gastroesophageal reflux disease and heartburn are highly consequential. They may affect quality of life[6], decrease functional activity[7], increase health costs[8] and increase the risk of oesophageal carcinoma, in cases of Barrett's oesophagus[9].

The prevalence of GERD in the Gulf region is not well characterized and there is a shortage of data on the subject. A study in Riyadh showed that the frequency of GERD in the study population[10] was 45.4%. Furthermore, 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 compared with those without these disorders[11]. There is very limited information on the prevalence of and risk factors for GERD in the western regions of Saudi Arabia. The aim of the current study was to evaluate the differences between Saudi males and females with gastroesophageal reflux disease symptoms with respect to socio-demographic characteristics and lifestyle to determine risk factors for GERD in the western region of Mecca City.

MATERIALS AND METHODS

Study population: A cross-sectional study of the population of Mecca City, western Saudi Arabia, was carried out. A sample of 850 individuals was collected randomly through a self-administered questionnaire from February, 2018 to October, 2018.

The sample size was calculated using the following equation[12]:

$$\text{Sample size (n)} = \frac{\left[\text{DEFF}\times Np\ (1-p)\right]}{\left[(d^2/Z^2_{1-\alpha/2}\times(N-1)+p\times(1-p)\right]}$$

where, n is the sample size, N is the study population of Mecca City and is approximately 929,623 (General Authority for Statistics K.S. A, 2016), p is the maximum percentage of the properties studied in any community, which is considered to be 50%. Hypothesized% frequency of outcome factor in the population (p): 50%+/-5, Confidence limits as percentage of 100 (absolute +/-) (d): 5%, design[12] effect (for cluster surveys-DEEF): 1.

According to this formula, the sample size was calculated to be 385 participants, which represents a confidence level of 95% and 5% of the worst acceptable limit. To correct for any possible data loss, the total sample should be larger.

Gastroesophageal reflux disease questionnaire: An online gastroesophageal reflux disease questionnaire was used to assess and evaluate the Saudi population with GERD symptoms who were not previously diagnosed with or treated for GERD. The study targeted inhabitants of Mecca City, Kingdom of Saudi Arabia, over 18 years old who used social media, such as Twitter. A computer-assisted Google questionnaire survey programme was used. Subjects were collected randomly using a self-report questionnaire completed by trained medical students who conducted interviews of the general population. The interviews were based on a questionnaire that was developed as a population based self assessment to assist health care professionals in the diagnosis of GERD.

A team of trained interviewers completed a standardized questionnaire that included the following information:

- Socio-demographic characteristics, including age, gender, educational level, marital status and occupational status
- Questions about signs and symptoms of reflux, including heartburn, regurgitation, dyspepsia, dysphagia, epigastric pain, nausea, vomiting and regurgitation during sleep
- Biometry: Body mass index (BMI) can be calculated as:

$$BMI = \frac{\text{Weight (kg)}}{\text{Height (m)}}$$

  A BMI of 20 was considered normal, between 20 and 30 was considered overweight, >30 was considered obese
- Questions about risk factors such as food (fast food, spicy foods) and/or beverage intake (soda, coffee), health problems (cigarette smoking), personality type (anxiety and/or calm) and the use of certain types of drugs (NSAIDs)

The frequency of reflux symptoms was determined. Participants were defined as suffering from GERD when they reported heartburn and/or acid regurgitation at least one time per week in the preceding year, irrespective of severity or duration. The study subjects were also asked to classify the intensity of their GERD as follows: mild, once weekly, moderate, twice weekly or severe. No personally identifying information or other personal identifiers were recorded to ensure patient confidentiality.

Ethical approval: Ethical approval was obtained from The Internal Review Board (IRB) at Umm Al-Qura University, Mecca, Saudi Arabia, approved the study (Study No. HAPO-02K-012-2019-01-302).

Statistical analysis: Participant information was entered directly into a computer database under the supervision of a professional biostatistician. Statistical analysis was performed using the SPSS computer software package. The $p<0.05$ was considered statistically significant. All reported p-values were two-sided using χ^2 tests.

RESULTS

Eight hundred forty-nine subjects were randomly enrolled in the study through an online questionnaire distributed through social media. Symptomatic GERD was present in 554 (65.3%) subjects and asymptomatic GERD was present in 295 (34.7%) ($p = 0.7$) (Fig. 1). Among the symptomatic subjects, GERD was more frequent in males (393, 70.9%) than in females (161, 29.1%) ($p = 0.0001$).

Comparison of socio-demographic variables between males and females with symptomatic GERD: The socio-demographic characteristics of the participants are shown in Table 1. There was no difference between males and females regarding socio-demographic variables, however, GERD was more frequent in males than in females younger than 35 years, but the difference was not statistically significant ($p = 0.19$). Marital status showed a high association with GERD symptoms, which were more common in single males (222, 40.1%) and females (101, 18.2%) than in married males (171, 30.9%) and females (60, 10.8%) ($p = 0.17$). Regarding educational level, GERD symptoms were more common in male and female university students 299 (54.0%) and 125 (22.6%), respectively than in primary and secondary school students ($p = 0.87$). Regarding occupational status,

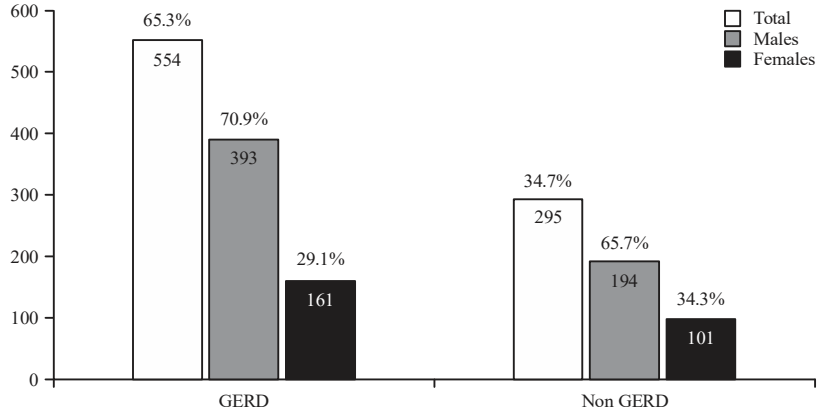

Fig. 1: Prevalence of GERD and non GERD in male and female participants in Mecca city, Saudi Arabia
n = 849, GERD was more frequent in males than in females ($p = 0.0001$), GERD: Gastroesophageal reflux disease

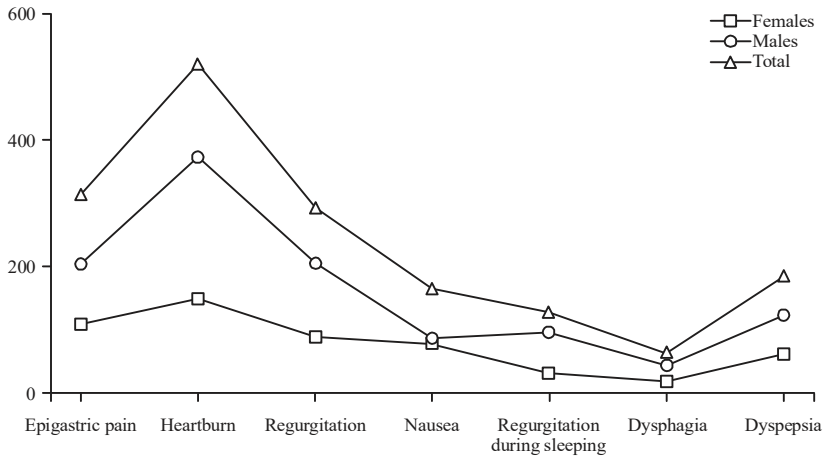

Fig. 2: Frequency of symptoms reported between Saudi males and females surveyed individuals
Significant differences in symptoms between males and females were epigastric pain and nausea p = 0.005, p = 0.0001

Table 1: Socio-demographic variables between Saudi males and females with symptomatic GERD (n = 554)

	GERD						
	Total 554 (100%)		Male 393 (70.9%)		Female 161 (29.1%)		
Variables	Number	Percentage	Number	Percentage	Number	Percentage	p-value
Age							
18-25	266	48.0	181	32.7	85	15.3	0.19
26-35	147	26.5	104	8.8	43	7.8	
36-50	90	16.2	72	13.0	18	3.2	
>50	51	9.2	36	6.5	15	2.7	
Marital status							
Single	323	58.3	222	40.1	101	18.2	0.17
Married	231	41.7	171	30.9	60	10.8	
Educational level							
Primary	16	2.9	11	2.0	5	0.9	0.87
Secondary	114	20.6	83	15.0	31	5.6	
University or more	424	76.5	299	54.0	125	22.6	
Occupational status							
No	91	16.4	47	8.5	44	7.9	0.0001
Student	220	39.7	149	26.9	71	12.8	
Employed	219	39.5	176	31.8	43	7.8	
Retired	24	4.3	21	3.8	3	0.5	

GERD symptoms showed a highly significantly difference between male students and employees compared with female students and employees (p = 0.0001).

Symptomatic GERD among males and females: The majority of the participants (93.9%, 520/554) reported heartburn symptoms (burning sensation in the chest), as shown in Fig. 2. Approximately 33.4% (185/554) of the participants reported highly frequent heartburn symptoms, occurring 3 times or more per week; among these participants, 139 (25.1%) were male and 46 (8.3%) were female. At the same time, 246 participants (44.4%) complained of experiencing heartburn once per week and 89 (16.1%) experienced heartburn twice per week. Approximately 171 (30.9%) of the male participants experienced heartburn once per week, compared to 75 (13.5%) of the female participants (p = 0.0001) (Fig. 3).

The participants also reported experiencing the following symptoms at least 2 or 3 times weekly: Regurgitation 52.9%, epigastric pain 56.5%, nausea 29.6%, regurgitation during sleeping 23.1%, dysphagia 11.2% and dyspepsia 33.2% (Fig. 2). The most significant differences in symptoms between males and females were epigastric pain, nausea and vomiting (p = 0.005, p = 0.0001 and p = 0.04,

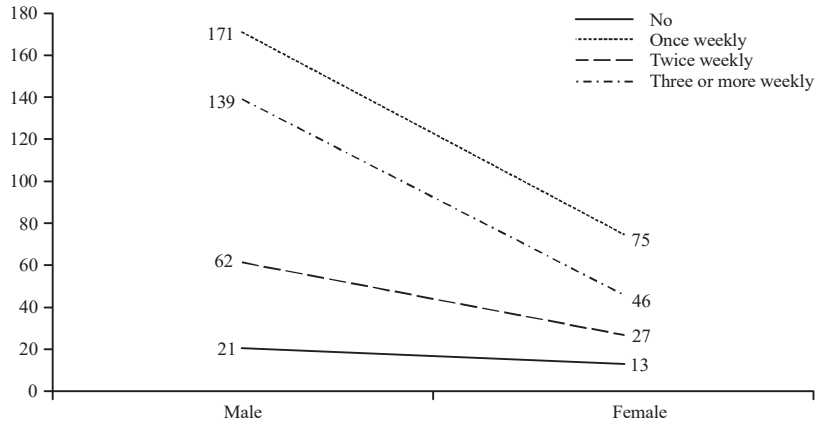

Fig. 3: Frequency of heartburn reported between Saudi males and females surveyed individuals

Approximately 171 (30.9%) of the male participants experienced heartburn once per week, compared to 75 (13.5%) of the female participants, p = 0.0001

Table 2: Life style variables between Saudi males and females with symptomatic GERD (n =554)

	GERD						
	Total 554 (100.0%)		Male 393 (70.9%)		Female 161 (29.1%)		
Risk factors and life style	Number	Percentage	Number	Percentage	Number	Percentage	p-value
Fast food							
Yes	307	55.4	217	39.2	90	16.2	0.47
No	247	44.6	176	31.8	71	12.8	
Spicy food							
Yes	335	60.5	233	42.1	102	18.4	0.21
No	219	39.5	160	28.9	59	10.6	
Soda							
Yes	218	39.4	162	29.2	56	10.1	0.09
No	336	60.6	231	41.7	105	19.0	
Tea or coffee							
Yes	272	49.1	195	35.2	77	13.9	0.38
No	282	50.9	198	35.7	84	15.2	
Smoker							
Yes	109	19.7	96	17.3	13	2.3	0.0001
No	445	80.3	297	53.6	148	26.7	
Type of personality							
Anxious	278	50.2	187	33.8	91	16.4	0.03
Calm	276	49.8	206	37.2	70	12.6	
Using NSAID* like aspirin							
Yes	208	37.5	136	24.5	72	13.0	0.02
No	346	62.5	257	46.4	89	16.1	

*NSAIDs nonsteroidal anti-inflammatory drug

respectively). In contrast, there were no significant differences between males and females regarding regurgitation, regurgitation during sleep, dysphagia and dyspepsia (p = 0.8, p = 0.16, p = 0.94 and p = 0.13, respectively). The statistically significant differences in symptoms between males and females are documented in Fig. 2.

Differences in lifestyle (risk factor) variables between males and females with symptomatic GERD: With regard to BMI, the mean and standard deviation (SD) were 26.8±5.9 kg m^{-2}, among the participants, 4.9% were underweight, 35.6% had a normal body weight, 28.7% were overweight and 30.9% were obese. The results showed in Table 2 depict a highly significant difference in the presence of symptomatic GERD between males (119, 21.5%) and females (78, 14.1%) with normal body weight compared to overweight males (119, 21.5%) and females (40, 7.2%) and obese males (143, 25.8%) and females (28, 5.1%) (p = 0.0001).

Table 2 shows the prevalence of GERD in relation to dietary habits, smoking, drinking habits, personality type and use of NSAIDs. Triggering factors included soft drinks in 218 participants (39.4%) and anxious personality in 278 (50.2%), with a highly significant difference between males and females (p=0.09 and p=0.03, respectively). There were no differences between males and females regarding the consumption of fast food, spicy foods or tea and coffee (p = 0.47, p = 0.21 and p = 0.38, respectively). The results showed that a higher percentage of males (96, 17.3%) than females (13, 3.2%) smokers and the difference was highly significant (p = 0.0001). We noticed more symptoms in subjects who did not take NSAIDs (346, 62.5%), but the difference between males and females was significant (p = 0.02).

DISCUSSION

This study was conducted among the Saudi population to determine the difference between males and females by studying the prevalence and effects of risk factors that play a great role in the presence of GERD symptoms, including sociodemographic data (age, sex, marital status, educational level, occupation), lifestyle (eating fast food and spicy foods, smoking) and personality type. All of these factors are associated with GERD symptoms such as heartburn, regurgitation of food, nausea, vomiting, regurgitation during sleep, dysphagia and dyspepsia.

In the present study, 65.3% of the study group had GERD, with a highly significant difference in prevalence between males (70.9%) and females (29.1%) (p = 0.0001).

Worldwide, gastroesophageal reflux disease (GERD) is a common disorder that can cause significant morbidity, affect the patient's quality of life and result in high costs to health care systems in the community[13,14]. The GERD symptoms occur as a result of the reflux of stomach contents, which causes a wide range of symptoms and/or complications and leads to oesophageal and/or extra-oesophageal manifestations[15]. Different risk factors play a great role in the occurrence of GERD symptoms either alone or in combination with many other factors.

In the Gulf region, the prevalence of GERD is not well characterized and limited data is available[16]. A cross-sectional study of the population of Arar City, northern Saudi Arabia, was conducted to evaluate the prevalence of gastroesophageal reflux disease and determine its main characteristics and risk factors. The study found that 61.8% of the population had GERD; however, it did not comment on the differences between males and females[17].

The present study proved that symptomatic cases of GERD showed a significant prevalence among male participants (70.9%) compared with female participants (29.1%). It was obvious that the majority of cases were in the younger age group, as those aged 18-25 years represented 48.0% of the cases; although it was more prevalent among males (32.7%) than among females (15.3%), there was no significant correlation (p = 0.19). This result is relevant to the result published by Sharma *et al.*[18] which showed that GERD was present in 25% of medical students and had a higher prevalence among male than female students (76.7 and 23.3%, respectively). A few studies have proven that GERD is prevalent among students, especially those at medical schools, as these groups are usually under stress from exams. Psychological stress is considered a risk factor for GERD symptoms due to its high relevance to increased gastric acid secretion, reduced gastric emptying and increased mucosal sensitivity to acid in the oesophagus[19,20].

The study population group showed a high prevalence and a highly significant correlation with weekly heartburn attacks, with a prevalence of 44.4% (p = 0.0001). Other symptoms of GERD, such as regurgitation, showed a non-significant correlation, although regurgitation was present in 59.9% of the study population and 31.0% had regurgitation attacks once per week (p = 0.8). With respect to nausea and vomiting, there was a highly significant correlation among the study group (p = 0.0001 and p = 0.04, respectively)[18]. With respect to regurgitation during sleep, dysphagia and dyspepsia, these symptoms were less marked in the study population participants and the correlations were non-significant. This result is not consistent with the previous study performed in Arar City, northern Saudi Arabia, which reported that 61.8% reported loss of appetite, 57% reported nausea and vomiting, 55.9% reported indigestion, 55.4 reported food regurgitation, 41.4% reported with chest pain and 35.5% reported headache[17].

Many risk factors are considered to contribute to symptomatic GERD, including a fatty and spicy diet, postprandial posture and consumption of meat and tea[21]. Among the study participants, there was no significant correlation between symptomatic GERD and lifestyle factors such as eating fast food and spicy food, although these factors were highly prevalent (55.4 and 60.5%, respectively). The consumption of soft drinks showed a more significant correlation among our study group (p = 0.09), while there was no significant correlation among tea or coffee consumption; GERD symptoms were present in 60.6 and 50.9% of soft drink consumers and consumers of tea or coffee, respectively. These

results were compared to other previous studies, which showed that special meals were the most common lifestyle risk factor (84.9%), followed by coffee drinking (77.4%), stress (71%) and spicy food (58.1%)[17].

Smoking is considered one of the most important lifestyle factors that lead to reduced oesophageal pressure, which can aggravate GERD and results in its increased prevalence in current smokers compared with non-smokers[22].

However, the present study revealed a negative association of smoking with the occurrence of reflux symptoms. This may be due to the very few smokers in this study[23]. There was a significant association between the study population and non-smokers ($p = 0.0001$).

From other previous studies, it is well known that subjects who are highly anxious are more likely to have GERD-related symptoms. This may be attributed to the fact that personality factors mediate the effects of stress on the gastro-oesophageal junction and can influence the occurrence of GERD symptoms[24]. The results of the present study showed that anxious personality was highly significantly correlated with GERD symptoms in approximately half of the population group (50.2%); furthermore, GERD was significantly more common among anxious males (33.8%) than females (16.4%). This result was marked, as study participants were not previously diagnosed with or treated for GERD. This is in comparison with a study by Manzoor *et al.*[25] that had certain limitations; their sample was chosen from patients who had been diagnosed with GERD by a gastroenterologist and were receiving treatment for GERD-related symptoms.

Considering the association between GERD and use of NSAIDs; the result of the present study did not agree with studies reporting an association between NSAIDs use and GERD as it was obvious that 62.5% of participants were not using NSAIDs and that non-NSAIDs use had a statistical association ($p = 0.02$) GERD symptoms. Regular use of NSAIDs was also among the prevalent risk factors and is known to be associated with GERD symptoms. Studies from Iran[26] and Europe[27] reported an association between GERD symptoms and NSAIDs or aspirin use.

Regarding with obesity and overweight subjects in the study group participants were more likely to have GERD symptoms than normal and underweight subjects ($p = 0.0001$). This result may be more or less consistent with the study performed by Jacobson *et al.*[28] on a large cohort of female subjects; that study demonstrated a positive relationship between GI symptoms and BMI and further proved that weight gain was associated with an increased risk of symptoms of GERD and that weight loss was associated with a decrease in risk. Another study by Zafar *et al.*[29] found a relationship between the increase in symptoms of GERD and increasing BMI, but it did not shed any new light on the possible mechanism involved.

CONCLUSION

This study is considered as the first to use an online questionnaire administered through social media to study the prevalence of GERD symptoms among the Saudi population in Mecca City and compare the prevalence between males and females. A high number of symptoms were found in males (70.9%) compared to females (29.1%). In terms of sociodemographic and lifestyle factors, the study found that GERD was highly prevalent among students, especially males with certain lifestyle factors, such as consumption of soft drinks, coffee and tea. Anxious personality, obesity and overweight are considered important modifiable lifestyle risk factors for symptomatic GERD. Heartburns once per week and epigastric pain were more important symptoms than nausea, vomiting and regurgitation among the study population.

SIGNIFICANCE STATEMENT

This study discovered the most important risk factors as life style and sociodemographic differences related to GERD symptoms among Saudi population. This study will help the researchers to formulate a well designed national programs and educational campaigns to help in decreasing the prevalence of GERD in Saudi population.

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