

## Original Article

## Epidemiology of Gastroesophageal Reflux Symptoms in Tehran, Iran: A Population-Based Telephone Survey

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**Background:** The prevalence of gastroesophageal reflux disease (GERD) in Asian populations is reported to be lower than that in the West. Population-based data on the prevalence and symptom profile of GERD in developing Caucasian countries is lacking. Our objective was to determine the prevalence of gastrointestinal symptoms and clinical spectrum of GERD in Tehran, northern Iran and their association with patient characteristics.

**Methods:** One thousand seven hundred telephone numbers were randomly selected from Tehran telephone directory using a simple random method. A two-step screening telephone survey was then performed. In each answered call a second rapid survey was done to select a subject 18 – 65 years old from that household. A validated questionnaire was then filled out for that individual. Patient characteristics (age, education, and gender) and history of acid regurgitation and heartburn during the last week, as well as the previous three months were inquired about.

**Results:** Of the 1,700 selected numbers, 278 either did not answer or did not have an eligible case; 220 refused to participate. A total of 1,202 subjects (42% males, mean age: 36 years, range: 18 – 65 yr) were surveyed. The prevalence of heartburn occurring monthly, weekly, and daily was 4.7% (CI<sub>95%</sub>: 3.5 – 6.0%), 1.6% (CI<sub>95%</sub>: 1.0 – 2.5%), and 0.6% (CI<sub>95%</sub>: 0.3 – 1.3%), respectively. The corresponding figures for acid regurgitation were 15.6% (CI<sub>95%</sub>: 13.6 – 17.7%), 5.7% (CI<sub>95%</sub>: 4.4 – 7.1%) and 1.5% (CI<sub>95%</sub>: 0.9 – 2.4%), respectively. The prevalence of GERD, defined as heartburn and/or acid regurgitation experienced daily, weekly and monthly was 1.9% (CI<sub>95%</sub>: 1.2 – 2.9%), 6.8% (CI<sub>95%</sub>: 5.4 – 8.3%), and 18.4% (CI<sub>95%</sub>: 16.2 – 20.6%). There was no relationship between the prevalence of GERD and either gender, age, or education.

**Conclusion:** Monthly GERD symptoms occur in 18.4% of the general population in Tehran. Acid regurgitation is more common (4 – 5 times) than heartburn. Gender, age, and level of education do not affect the prevalence of GERD symptoms in the community studied.

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**Keywords:** Acid-peptic disease • gastroesophageal reflux disease • Iran • prevalence

### Introduction

Gastroesophageal reflux disease (GERD) is a common, chronic and relapsing gastrointestinal disorder<sup>1</sup> that results from abnormal regurgitation of gastric and duodenal contents into the esophagus. It has well-

known complications such as esophagitis, esophageal ulcer, upper gastrointestinal bleeding, esophageal stricture, and Barrett's esophagus.<sup>2</sup> In addition, GERD is well-recognized to affect quality of life of the affected people.<sup>3</sup> Meanwhile, the cost of long-term medical therapy is substantial; for instance approximately eight billion dollars in the United States and 461 million pounds in the United Kingdom were spent to treat GERD in the year 2000.<sup>1,4</sup>

Epidemiologic studies of GERD are hampered by the absence of an easy to use gold-standard to diagnose the disease. Therefore, the true incidence and prevalence of GERD are unknown and natural

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history data are scanty.<sup>1</sup> Up to 44% of the US population experience GERD symptoms at least once a month, 20% once a week, and 7% daily.<sup>5-7</sup> Overall, the weekly prevalence of GERD is estimated to be 10 – 20% in the West and less than 5% in Asian countries.<sup>8</sup> It seems that Asian countries are facing a rise in GERD prevalence.<sup>9-12</sup> In a resurvey<sup>13</sup> of a community interviewed in an earlier study in 1994,<sup>14</sup> a more than 4-fold increase in the frequency of heart burn was found.

In a retrospective evaluation of endoscopic reports done at a single center in Tehran between 1994 and 1999, endoscopic GERD increased more than 3 folds (from 20% to 70%).<sup>9</sup> In another study in Tehran, daily heartburn and/or acid regurgitation were found in 2.1% and 4.7% of university students and blood donors, respectively.<sup>10</sup> Considering the growing burden of the disease, it is important to have an as accurate estimation as possible of GERD incidence and prevalence. So far, true population-based studies have not been performed in Iran. Therefore, we attempted to perform a telephone survey to assess the prevalence of GERD in Tehran, the capital of Iran.

## Patients and Methods

### Study population/design

Seventeen hundred telephone numbers were selected randomly from Tehran telephone directory using a computer-generated random table. Telephone calls were made during day time for six days a week excluding Fridays (the Iranian holiday). Telephone numbers not corresponding to households were excluded. Each telephone number was contacted once and the nature and objectives of the study were explained. In each contact, a rapid survey was done to select a nonpregnant family member aged between 18 and 65 years, born in the month closest to the date of interview. Then, oral consent was obtained and the interview proceeded. Only one interview was conducted per number. Whenever there was no response at the number reached, follow-up calls were made on subsequent days. Those numbers which did not answer in seven consequent calls (one per day) were excluded from the study.

The Research Ethics Committee of Digestive Disease Research Center (DDRC) of Tehran University of Medical Sciences approved the study. Data collection was done from January 2004 to June 2005.

### Questionnaire and definitions

A questionnaire covering demographic characteristics (e.g., age and gender), major GERD symptoms, and medical history was filled out for each individual. “Heartburn” defined as a burning pain or sensation beneath the breast bone and “acid regurgitation” defined as bitter or sour liquid rushing up to the mouth were considered as major GERD symptoms. Other questions included severity and frequency of symptoms over the past week, severity and frequency of symptoms over the past three months, and the first time the subject had ever experienced GERD. The GERD related questions were the most frequently used questions to assess the GERD prevalence, and then were verbally validated by translation and retranslation. Table 1 shows details of frequency and severity assessment. A trained general practitioner and two trained nurses performed the interviews. Before the study, a pilot phase was conducted on 50 unselected telephone numbers to assess the appropriateness of the questionnaire and feasibility of the job. No major change in questionnaire was made during this phase. Further analysis showed that the prevalence of finding GERD was not different between interviewers.

### Statistical analysis

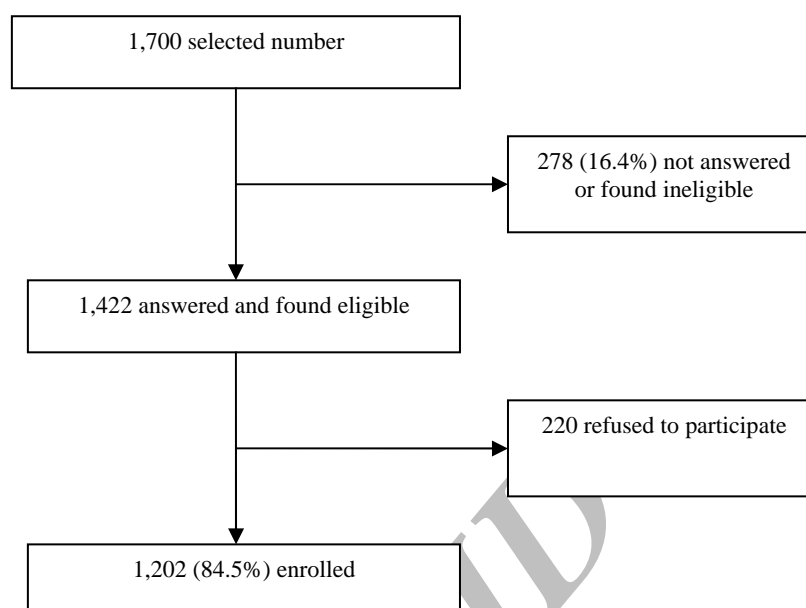
Frequency and 95% confidence intervals (CI<sub>95%</sub>) were calculated using binominal distribution. Chi-square test was used to assess differences in GERD symptoms between groups. Data was analyzed using SPSS 12.0 (SPSS Inc., Chicago, IL, USA). *P* values <0.05 were considered significant.

## Results

A total of 1,700 telephone numbers were included. Figure 1 shows the study flowchart. Of these, 1,202 (84.5% of the eligible sample) were interviewed. The mean  $\pm$  SD age of participants was  $36.1 \pm 12.4$  years; 505 (42%) were male.

**Table 1.** Severity/frequency scale used for major GERD symptoms.

Score	Frequency	Severity
1	None	Could be ignored
2	With special food	Could not be ignored but did not affect life style
3	One to three times a week	Affected life style
4	Almost everyday	—



**Figure 1.** The study flowchart.

Table 2 shows characteristics of the enrolled subjects. Characteristics of subjects without GERD symptoms in comparison to patients with monthly GERD are depicted in Table 3. Heartburn and/or acid regurgitation occurring at least once a month was seen in 18.4% of interviewees (CI<sub>95%</sub>: 16.2 – 20.6%). Of these, 6.8% (CI<sub>95%</sub>: 5.4 – 8.3%) experienced their symptoms weekly, and 1.9% (CI<sub>95%</sub>: 1.5 – 2.9%) reported daily symptoms.

The prevalence of heartburn occurring monthly, weekly, and daily was 4.7% (CI<sub>95%</sub>: 3.5 – 6.0%), 1.6% (CI<sub>95%</sub>: 1.0 – 2.5%), and 0.6% (CI<sub>95%</sub>: 0.3 – 1.3%), respectively. The prevalence of acid regurgitation occurring monthly, weekly, and daily was 15.6% (CI<sub>95%</sub>: 13.6 – 17.7%), 5.7% (CI<sub>95%</sub>: 4.4 – 7.1%), and 1.5% (CI<sub>95%</sub>: 0.9 – 2.4%), respectively. Of 1,202 subjects, 14.1% (CI<sub>95%</sub>: 12.2 – 16.2%) had experienced one of the symptoms over the week prior to the interview. Any acid regurgitation and/or heartburn provoked with food occurred in 22.2%. Severity of symptoms is shown in Table 4.

Most of the study subjects had experienced acid regurgitation and/or heartburn for more than six

months (85.3% and 89.5% for acid regurgitation and heartburn, respectively).

Overall 19.4% of men and 17.5% of women experienced acid regurgitation and/or heartburn at least once a month. The prevalence of GERD was 24.3% and 16.3% among illiterates and highly educated people, respectively ( $P = NS$ ). Prevalence of GERD was similar between males and females and among different age groups. Figure 2 depicts symptom frequency in different age groups according to gender. Chi-square for linear trend was not statistically significant in monthly and weekly frequencies but for daily symptoms it was significant ( $P = 0.02$ ) in male group but was not significant in females.

## Discussion

GERD is prevalent and increasing both in the West and in Iran.<sup>8–10, 15, 16</sup> We showed that major GERD symptoms occur at least monthly in 18.4% of the urban population in Tehran. The corresponding figures for weekly and daily symptoms were 6.8%, and 1.9%, respectively. This

**Table 2.** Characteristics of the study subjects

Characteristics	Men	Women	Total
Number of subjects (%)	505 (42%)	697 (58%)	1202
Mean ± SD age (yr)	36.0 ± 12.3	36.2 ± 12.5	36.1 ± 12.4
Level of education (%)			
Illiterate	1.8	4.1	3.1
Elementary school	6.7	13.2	10.4
High school	49.3	51.0	50.3
University degree	42.2	31.7	36.2

**Table 3.** Characteristics of the subjects without GERD in comparison to subjects with monthly GERD.

Characteristics	Monthly GERD	Without GERD	P
Number of subjects	220	973	
Male/Female	98/122	402/571	NS
Mean $\pm$ SD age (yr)	37.3 $\pm$ 12.4	35.8 $\pm$ 12.3	NS
Level of education (%)			NS
Illiterate	2.9	4.2	
Elementary school	10.3	11.4	
High school	49.8	51.9	
University degree	37.0	32.5	

is significant from several points of view. First, the population composition of Tehran is very similar to that of the whole country considering ethnicity. Therefore, the findings can most probably be generalized to depict a national picture of the disease burden at least for the urban population. Second, we sought only the major GERD symptoms by telephone. Thereby, our figures should be considered the lowest possible prevalence. This shows that GERD is an important and increasing disease. May be it is easier to look for causative factors during this transitional state. Third, our data also showed that most of the affected people (>85%) have suffered from their symptoms chronically (for more than six month) which is consistent with other studies.<sup>4, 9, 17</sup> This points to the fact that these patients will either use the healthcare resources or suffer from their problems chronically. Chronic GERD symptoms may increase the chance of serious complications (e.g., esophageal adenocarcinoma)<sup>2</sup> significantly. If this holds true in our population as well, then we should be prepared for facing increasing prevalence of these complications in the coming decades.

The prevalence of frequent (weekly) GERD symptoms among Tehran inhabitants was 6.8%. Studies, employing similar definitions for GERD

symptoms have reported prevalence of 23.0% in Argentina,<sup>18</sup> 21.0% in the UK,<sup>15</sup> 20.0% in US,<sup>14</sup> 15.0% in Finland,<sup>19</sup> 9.8% in Spain,<sup>17</sup> 9.0% in Italy,<sup>6</sup> 2.5 – 4.8% in China.<sup>20 – 22</sup> The prevalence reported in the current study is far less than North America and Europe but is close to that of southern Europe and is higher than the East Asia.

Interestingly, we found that most of our interviewees having GERD had moderate to severe symptoms. This is in contrast with others' reports who found that most GERD patients have mild to moderate complaints.<sup>17, 22, 23</sup> Our data may either be true and point to a difference between GERD in our population and that in the West, or be an overestimate because of technical aspects of the interviews, i.e., had more experienced clinicians made the interview, lower severity was found. This remains to be determined in further population-based studies.

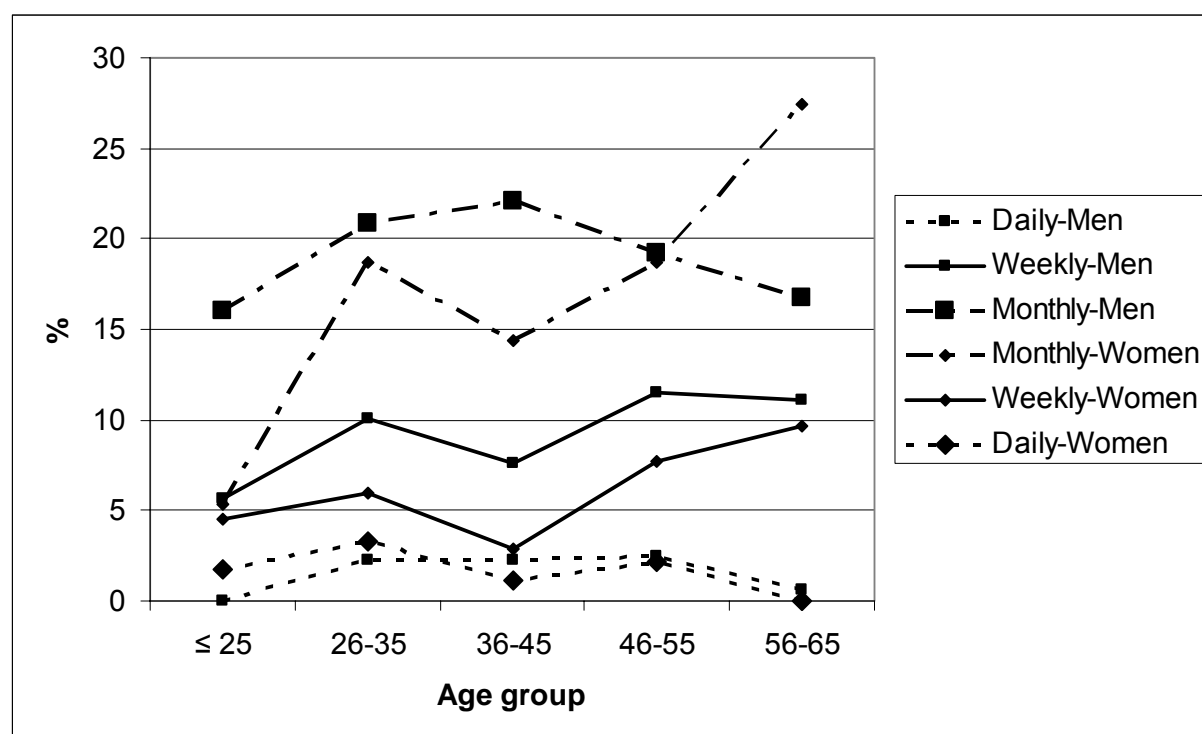
Another point in our findings is that "acid regurgitation" has been more common than "heartburn." Prevalence of monthly, weekly, and daily heartburn was 4.7%, 1.6%, and 0.05%, respectively which is much less than figures for acid regurgitation (15.6%, 5.7%, and 1.5%, respectively). In the West, the reverse is true,<sup>6, 24</sup> while reports from other Asian countries are consistent with our findings.<sup>22</sup> Whether this points to a different disease behavior, or pathophysiologic mechanisms or is just a clinical difference of uncertain importance, will be remained to be elucidated.

Our data did not show any relation between GERD symptoms and age which is consistent with some<sup>14, 24 – 28</sup> though not all<sup>19, 23, 29 – 34</sup> previous studies. Some of them found a direct<sup>23, 26, 28, 34</sup> while some other found an inverse<sup>6, 30, 31</sup> relationship.

We did not find any relation between gender and the prevalence of GERD which is consistent with previous studies.<sup>6, 19, 22, 24, 28, 33, 35</sup>

**Table 4.** Prevalence and severity of GERD symptoms.

Symptom	Time	Severity [No. (%), CI <sub>95%</sub> ]		
		Mild	Moderate	Severe
Heartburn	Monthly	7 (11.4)	22 (36.1)	32 (52.5)
		5.2 – 21.4	24.8 – 48.7	40.0 – 64.7
	Weekly	1 (4.0)	5 (20.0)	19 (76.0)
		0.1 – 18.19	7.7 – 38.9	56.6 – 89.7
	Daily	0	1 (11.1)	8 (88.9)
			0.6 – 43.9	56.1 – 99.4
Acid regurgitation	Monthly	14 (6.9)	131 (64.2)	59 (28.9)
		4.0 – 11.0	57.5 – 70.6	23.0 – 35.4
	Weekly	3 (3.9)	34 (44.7)	39 (51.4)
		1.0 – 10.4	33.9 – 56.0	40.1 – 62.4
	Daily	0	6 (28.6)	15 (71.4)
			12.5 – 50.2	49.8 – 87.5



**Figure 2.** Age- and sex-specific prevalence (percent) for any episode.

Increasing GERD prevalence and severity has been associated with a lower educational level.<sup>17, 35,</sup>

<sup>36</sup> We were not able to find such a relationship between educational level and GERD symptom frequency and severity. This latter may be due to that almost 97% of our study population was literate; to show any possible association between literacy and GERD, we need a much larger sample size. About one-third of the episodes of the major GERD symptoms in the week preceding the interview could be attributed to specific food. This means that correcting dietary habits may help to decrease the disease burden. As this is a simple measure, it can be planned for systematically in widespread patient education programs.

To conclude, our data support the concept that GERD is fairly common in our country; it is chronic and poses a significant burden to the healthcare system. Therefore, thinking of GERD and carefully looking for its symptoms is necessary to avoid unnecessary utilization of healthcare resources.

## References

- 1 Eisen G. The epidemiology of gastroesophageal reflux disease: what we know and what we need to know. *Am J Gastroenterol.* 2001; **96 (suppl)**: S16 – S18.
- 2 Lagergren J, Bergstrom R, Lindgren A, Nyren O. Symptomatic gastroesophageal reflux as a risk factor for

esophageal adenocarcinoma. *N Engl J Med.* 1999; **340**: 825 – 831.

- 3 McDougall NI, Johnston BT, Kee F, Collins JS, McFarland RJ, Love AH, et al. Natural history of reflux oesophagitis: a 10 year follow up of its effect on patient's symptomatology and quality of life. *Gut.* 1996; **38**: 481 – 486.
- 4 Delaney BC. Prevalence and epidemiology of gastro-oesophageal reflux disease. *Aliment Pharmacol Ther.* 2004; **20 (suppl 8)**: 2 – 4.
- 5 Petersen H. The prevalence of gastroesophageal reflux disease. *Scand J Gastroenterol Suppl.* 1995; **211**: 5 – 6.
- 6 Locke GR 3rd, Talley NJ, Fett SL, Zinsmeister AR, Melton LJ 3rd. Prevalence and clinical spectrum of gastroesophageal reflux: a population-based study in Olmsted County, Minnesota. *Gastroenterology.* 1997; **112**: 1448 – 1456.
- 7 A Gallup Organization National Survey. *Heartburn Across America.* Princeton, NJ: Gallup Organization; 1988.
- 8 Dent J, El-Serag HB, Wallander M-A, Johansson S. Epidemiology of gastroesophageal reflux disease: a systematic review. *Gut.* 2005; **54**: 710 – 717.
- 9 Malekzadeh R, Nasseri-Moghaddam S, Sotoudeh M. Gastroesophageal reflux disease: the new epidemic. *Arch Iranian Med.* 2003; **6**: 127 – 140.
- 10 Pourshams A, Rahmani AR, Hatami K. Gastroesophageal reflux disease in Iran. *Govaresh.* 2005; **10**: 48 – 53.
- 11 Freston JW, Asaka M, Chiba T, Howden CW, Hunt RH, Sugano K, et al. Acid-related disorders of the new millennium: European, Japanese, and North American perspectives. *Eur J Gastroenterol Hepatol.* 1998; **10 (suppl 2)**: S1 – S40.
- 12 Fujimoto K. Review article: prevalence and epidemiology of gastroesophageal reflux disease in

- Japan. *Aliment Pharmacol Ther.* 2004; **20** (suppl 8): 5 – 8.
- 13 Ho KY, Lim LS, Goh WT, Lee JMJ. The prevalence of gastroesophageal reflux has increased in Asia: a longitudinal study in the community. *J Gastroenterol Hepatol.* 2001; **16** (suppl): A132.
  - 14 Ho KY, Kang JY, Seow A. Prevalence of gastrointestinal symptoms in a multiracial Asian population, with particular reference to reflux-type symptoms. *Am J Gastroenterol.* 1998; **93**: 1816 – 1822.
  - 15 Mohammad I, Nightingale P, Trudgiff NJ. Risk factors for gastroesophageal reflux disease symptoms: a community study. *Aliment Pharmacol Ther.* 2005; **21**: 821 – 827.
  - 16 Khoshbaten M. Gastroesophageal reflux disease in northwestern Tabriz, Iran. *Indian J Gastroenterol.* 2003; **22**: 138 – 139.
  - 17 Diaz-Rubio M, Moreno-Elola-Olaso C, Rey E, Locke GR III, Rodriguez-Artalejo F. Symptoms of gastroesophageal reflux: prevalence, severity, duration, and associated factors in a Spanish population. *Aliment Pharmacol Ther.* 2004; **19**: 95 – 105.
  - 18 Chiocca JC, OLMOS JA, Solis GB, Soifer LO, Higa R, Marcolongo M. Prevalence, clinical spectrum and atypical symptoms of gastroesophageal reflux in Argentina: a nation wide population-based study. *Aliment Pharmacol Ther.* 2005; **22**: 331 – 342.
  - 19 Isolauri J, Laippala P. Prevalence of symptoms suggestive of gastroesophageal reflux disease in an adult population. *Ann Med.* 1995; **27**: 67 – 70.
  - 20 Hu WH, Wong WM, Lam CL, Lam KF, Hui WM, Lai KC, et al. Anxiety but not depression determines health care-seeking behavior in Chinese patients with dyspepsia and irritable bowel syndrome: a population-based study. *Aliment Pharmacol Ther.* 2002; **16**: 2081 – 2088.
  - 21 Wong WM, Lai KC, Lam KF, Hui WM, Hu WH, Lam CL, et al. Prevalence, clinical spectrum and health care utilization of gastroesophageal reflux disease in a Chinese population: a population-based study. *Aliment Pharmacol Ther.* 2003; **18**: 595 – 604.
  - 22 Wang Jin-Hai, Luo Jin-Yan, Dong Lei, Gong Jun, Tong M. Epidemiology of gastroesophageal reflux disease. A general population-based study in Xi'an of North-West China. *World J Gastroenterol.* 2004; **10**: 1647 – 1651.
  - 23 Nilsson M, Johnson R, Ye W, Hveem K, Lagergren J. Prevalence of Gastroesophageal reflux symptoms and the influence of age and sex. *Scand J Gastroenterol.* 2004; **39**: 1040 – 1045.
  - 24 Locke GR III, Talley NJ, Fett SL, Zinsmeister AR, Melton LJ III. Risk factors associated with symptoms of gastroesophageal reflux. *Am J Med.* 1999; **106**: 642 – 649.
  - 25 Haque M, Wyeth JW, Stace NH, Talley NJ, Green R. Prevalence, severity and associated features of gastroesophageal reflux and dyspepsia: a population-based study. *N Z Med J.* 2000; **113**: 178 – 181.
  - 26 Louis E, DeLooze D, Deprez P, Hiele M, Urbain D, Pelckmans P, et al. Heartburn in Belgium: prevalence, impact on daily life, and utilization of medical resources. *Eur J Gastroenterol Hepatol.* 2002; **14**: 279 – 284.
  - 27 Ruth M, Mansson I, Sandberg N. The prevalence of symptoms suggestive of esophageal disorders. *Scand J Gastroenterol.* 1991; **26**: 73 – 81.
  - 28 Kennedy T, Jones R. The prevalence of gastroesophageal reflux symptoms in a UK population and the consultation behavior of patients with these symptoms. *Aliment Pharmacol Ther.* 2000; **14**: 1589 – 1594.
  - 29 Kotzan J, Wade W, Yu HH. Assessing NSAID prescription use as a predisposing factor for gastroesophageal reflux disease in a Medicaid population. *Pharm Res.* 2001; **18**: 1367 – 1372.
  - 30 Drossman DA, Li Z, Andruzzi E, Temple RD, Talley NJ, Thompson WG, et al. U.S. householder survey of functional gastrointestinal disorders. Prevalence, sociodemography, and health impact. *Dig Dis Sci.* 1993; **38**: 1569 – 1580.
  - 31 Farup C, Kleinman L, Sloan S, Ganoczy D, Chee E, Lee C, et al. The impact of nocturnal symptoms associated with gastroesophageal reflux disease on health-related quality of life. *Arch Intern Med.* 2001; **161**: 45 – 52.
  - 32 Bolin TD, Korman MG, Hansky J, Stanton R. Heartburn: community perceptions. *J Gastroenterol Hepatol.* 2000; **15**: 35 – 39.
  - 33 Mohammed I, Cherkas LF, Riley SA, Spector TD, Trudgill NJ. Genetic influences in gastroesophageal reflux disease: a twin study. *Gut.* 2003; **52**: 1085 – 1089.
  - 34 Ruigomez A, Garcia-Rodriguez LA, Wallander MA, Johansson S, Graffner H, Dent J. Natural history of gastroesophageal reflux disease diagnosed in UK general practice. *Aliment Pharmacol Ther.* 2004; **20**: 751 – 760.
  - 35 El-Serag HB, Petersen NJ, Carter J, Graham DY, Richardson P, Genta RM, et al. Gastroesophageal reflux among different racial groups in the United States. *Gastroenterology.* 2004; **126**: 1692 – 1699.
  - 36 Oliveria SA, Christos PJ, Talley NJ, Dannenberg AJ. Heartburn risk factors, knowledge, and prevention strategies: a population-based survey of individuals with heartburn. *Arch Intern Med.* 1999; **159**: 1592 – 1598.