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*Original Article*

# The epidemiology of gastroesophageal reflux disease: a survey on the prevalence and the associated factors in a random sample of the general population in the Northern part of Iran

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**Abstract:** Many people with gastro-esophageal reflux symptoms do not consult a physician; therefore studies on gastro-esophageal reflux in general practice or in hospitals may not accurately describe the burden of gastro-esophageal reflux symptoms in the general population. The aim of this study was to assess the prevalence of gastro-esophageal reflux disease and its association with some life-style parameters in Rasht-Iran. A telephone survey was performed. Phone numbers was randomly collected from the telecommunication service center of Rasht. 1473 people (Mean age: 38.31 ± 13.09) were included in the study. People who didn't answer the phone after three times or didn't have consent to enter the study were excluded. Data were collected by an examiner using a GerdQ questionnaire. The validity and reliability of the questionnaire was tested by translation and retranslation and a pilot study was performed to assess its appropriateness. The prevalence of gastro-esophageal reflux was achieved 2.4% daily, 9.1% weekly and 11.3% monthly. Among the patients with gastro-esophageal reflux, 69.5% were female. There was a significant positive association between gastro-esophageal reflux prevalence and body mass index, smoking habits, eating salted or smoked foods, lying down immediately after the meal, taking certain drugs as non-steroidal anti-inflammatory drugs/Amino salicylic acid and the age group of 30-45 year old. Overall, the prevalence of the weekly gastro-esophageal reflux in the present survey was 9.1% which was less than other similar studies in Iran and some other countries.

**Keywords:** Gastroesophageal reflux disease, general population, Iran

## Introduction

Gastro-esophageal Reflux (GER) is caused by the spontaneous and repeated opening of lower esophageal sphincter or its inappropriate closure which result in regurgitation of gastric contents and acid to esophagus [1, 2]. Gastro-esophageal reflux disease (GERD) is a prevalent, chronic and relapsing gastrointestinal disorder in which reflux of the gastric contents into the esophagus causes a range of troublesome symptoms (including heartburn, acid regurgitation and epigastric pain) and complications [2-4]. It can also be presented by cough, asthma-like symptoms or dysphasia [5, 6]. GERD has well-known complications such as esophagitis, esophageal ulcer, upper gastrointestinal bleeding, esophageal stricture, Barrett's esophagus and adenocarcinoma [7, 8]. It seems that the prevalence of this disease in Western communities has increased in recent decades [9]. Symptoms of gastro-esophageal reflux disease have prevalence in the general population ranging from 26% to 60% [10-12].

Although GER symptoms and gastro-esophageal reflux disease are rarely life threatening, cross-sectional studies have showed that GER symptoms affects many aspects of health-related quality of life, reduce work productivity, and lead to increased health-care resource utilization [13-15]. For example in the year 2000 approximately eight billion dollars in the United States and 461 million pounds in the United Kingdom were spent to treat GERD [2, 16].

**Table 1.** The GerdQ questionnaire respondents enter the frequency scores after reflecting on their symptoms over the previous week

| | Frequency score (points) for symptom | | | |
|---|---|---|---|---|
| Question | 0 day | 1 day | 2-3 days | 4-7 days |
| 1. How often did you have a burning feeling behind your breastbone (heartburn)? | 0 | 1 | 2 | 3 |
| 2. How often did you have stomach contents (liquid or food) moving upwards to your throat or mouth (regurgitation)? | 0 | 1 | 2 | 3 |
| 3. How often did you have a pain in the center of the upper stomach? | 3 | 2 | 1 | 0 |
| 4. How often did you have nausea? | 3 | 2 | 1 | 0 |
| 5. How often did you have difficulty getting a good night's sleep because of your heartburn and/or regurgitation? | 0 | 1 | 2 | 3 |
| 6. How often did you take additional medication for your heartburn and/or regurgitation, other than what the physician told you to take? (Such as Tums, Rolaids, Maalox?) | 0 | 1 | 2 | 3 |

Various risk factors were shown to be associated with gastro-esophageal reflux symptoms, including body weight, genetic factors, pregnancy, nutrition, alcohol consumption, smoking habits and intake of non-steroidal anti-inflammatory drugs and sleeping position [17, 18]. Many of these factors are related to populations' life styles. Therefore, considering the different life styles in western and Iranian population, we can expect some differences in prevalence of GERD between western and Iranian population.

However, many people with gastro-esophageal reflux symptoms do not consult a physician; therefore studies on GERD in general practice or in hospitals may not accurately describe the burden of gastro-esophageal reflux symptoms in the general population [13].

Considering the growing burden of the disease, it's important to estimate the prevalence of GERD in different populations; and because of special life-styles and dietary habits (eating salty and smoky foods) of Guilan population and lack of epidemiologic data on GERD prevalence in Rasht population (the center of Guilan province), we conducted a telephone survey to assess the prevalence of gastro-esophageal reflux disease and its association with some life-style parameters in this area.

## Material and methods

*Study design & population*

In this cross-sectional telephone survey which was done in Rasht-Guilan in year 2010, the sample was calculated 1473 telephone numbers based on the prevalence of monthly GERD symptoms in Tehran by Nouraie et al. (18.4%) [7] and considering the precision of 0.02 and the type one error of 0.05. In the study, telephone numbers were selected randomly from Rasht telephone directory. Because the time of the calls influenced the gender of the responders, if the calls were made in morning, the most of the responders would be housewives, telephone calls were made during day time (morning and afternoon) for six days a week except Fridays (the Iranian weekend) Only one interview was conducted per number. Whenever there was no response at the number reached, follow-up calls were made on subsequent days if it wasn't answered after three times, the number was exclusion from the study. All responders who were between 18 to 65 years and weren't pregnant entered the study. First of all the objectives of the survey were explained to the responders and oral consult were obtained and the interview started. Those who did not consent to answer the questions were excluded. All of the interviews were made by two trained general physicians.

The sampling was done in a sequencing pattern. The first number was selected randomly and it entered the study together with the two subsequent numbers. After a 20-number interval from the third number, three other subsequent numbers were entered the study and this process continued to reach the 1473$^{th}$ number.

*Questionnaires*

A questionnaire containing demographic characteristics (e.g. age, gender, height, and wei-

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

| Participants' characteristics | | N (%) |
|---|---|---|
| Sex | Male | 453 (31) |
| | Female | 1020 (69) |
| Education | Illiterate | 66 (4.5) |
| | Elementary school | 29 019.7) |
| | High school | 251 (17) |
| | University degree | 866 (58.8) |
| Occupation | Housewife | 677 (46) |
| | Not occupied | 26 (1.8) |
| | Private job | 304 (20.6) |
| | Employee | 233 (15.8) |
| | Laborer-farmer | 12 (0.8) |
| | Student | 149 (10.1) |
| | Retired | 72 (4.9) |
| Smoking | Yes | 167 (11.4) |
| | No | 1306 (88.6) |

ght), cardinal GERD symptoms during previous week and month, medical history, drug history, family history of gastrointestinal diseases, 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 [7]. Also questions on the frequency and severity of symptoms were asked. The standard GerdQ questionnaire [19] was used to assess the GERD symptoms (**Table 1**). GerdQ has been created from three different validated questionnaires evaluated in the DIAMOND study [19-21]. They objectively identify the treatment needs of different patients, based on the overall disease impact. GerdQ is made up of six questions which are categorized to A, B, and C questions. A and B questions are related to GERD symptoms and C questions are related to the disease impact. Category A contains questions on heartburn and acid regurgitation; category B contains questions on stomach pain and nausea and category C contains questions on sleep disorders due to heartburn and regurgitation and taking additional medication for relieving these symptoms. Answered were compiled according to a scale of options ('never', '1 day', '2-3 days', and '4-7 days') and were scored accordingly.

In A and C category, the answer of each question is scored 0 to 3 in an ascendant pattern, and in category B, each answer is scored 3 to 0 in a descendant pattern. All of the scores in each category were added together and analyzed. If the total score from three categories is 8-18, the patient has GERD and if the total score is less than 8, he/she is not categorized in GERD group. Also if the patient's score from category C is less than 3, he/she is categorized as INCONVINIENT GERD and if this score is ≥ 3, he/she is categorized as DISRUPTIVE GERD group [22].

*Validity of the questionnaire:* The GerdQ questionnaire was verbally validated by translation and retranslation. Before the study, a pilot phase was conducted on 20 persons. They were interviewed by telephone, and after 2 weeks they were asked again the same questions on the phone, and the answered were the same as the last answers. This way the reliability and appropriateness of the study were assessed.

*Data analysis*

Data was analyzed using SPSS 16.0. Descriptive statistics (frequency rates) and comparative tests (chi-square) with 95% confidence intervals were used to assess the data. *P* values < 0.05 were considered significant. This study was approved by ethical Community of Gastrointestinal and Liver Diseases Research Center of Guilan University of Medical Science.

## Result

A total of 1473 subjects were included in the study. The mean (± SD) age of participants was 38.5 ± 13 years. Of them, 454 (30.8%) were male. The mean (± SD) BMI of the participants was 26 ± 4.5. **Table 2** shows participants' characteristics.

Frequency of heart burn among the subjects was as follows:

Among the study participants, 85.6% never experienced heartburn, 3.3% experienced it after meal, 5.9% one day a week, 3.2%, 2-3 days a week, and 2% of them had heartburn 4-7 days a week. Using GerdQ questionnaire, 134 (9.1%) of subjects experienced GERD in the previous week, 174 (11.8%) experienced GERD in the previous month (e.g. scores 8-18 from the questionnaire), and 36 subjects (2.4%) experienced it in daily pattern. Among 134 sub-

**Table 3.** GERD in relation to demographic data

| Demographic data | | GERD during previous week n (%) | | | GERD during previous month n (%) | | |
|---|---|---|---|---|---|---|---|
| | | Present | Absent | p | Present | Absent | P |
| Sex | Male | 41 (9) | 412 (91) | 0.953 | 53 (11.7) | 400 (88.3) | 0.912 |
| | Female | 93 (9.1) | 927 (90.9) | | 121 (11.9) | 899 (88.1) | |
| Age group | 18-30 y/o | 27 (6.1) | 418 (93.9) | 0.028 | 39 (8.8) | 406 (91.2) | 00.03 |
| | 30-45 y/o | 59 (10.2) | 521 (89.8) | | 82 (14.4) | 498 (85.9) | |
| | 45-60 y/o | 48 (10.7) | 400 (89.3) | | 53 (11.8) | 395 (88.2) | |
| BMI | Thin (< 19) | 2 (3.1) | 62 (96.9) | 0.04 | 2 (3.1) | 62 (96.9) | 0.006 |
| | Normal (19-25) | 48 (8.1) | 543 (91.9) | | 59 (10) | 532 (90) | |
| | Overweight (25-30) | 51 (9) | 515 (91) | | 71 (12.5) | 495 (87.5) | |
| | Obese (≥ 30) | 33 (13.1) | 219 (86.9) | | 42 (16.7) | 210 (83.3) | |
| Smoking | yes | 25 (14.9) | 143 (85.1) | 0.001 | 33 (19.8) | 134 (88.9) | 0.001 |
| | no | 109 (8.4) | 1196 (91.6) | | 141 (10.8) | 1165 (89.2) | |
| NSAIDs/Aspirin use | Yes | 46 (12.1) | 334 (87.9) | 0.022 | 60 (15.8) | 320 (84.2) | 0.007 |
| | No | 88 (8.1) | 1005 (91.9) | | 114 (10.4) | 979 (89.6) | |
| OCP use | Yes | 7 (5.6) | 117 (94.4) | 0.0185 | 15 (12.1) | 109 (87.9) | 0.96 |
| | No | 88 (9.8) | 808 (90.2) | | 107 (11.9) | 789 (88.1) | |

**Table 4.** GERD in relation to lifestyle and dietary/drinking habits

| Lifestyle and dietary/drinking habits | | GERD during previous week N (%) | | | GERD during previous month N (%) | | |
|---|---|---|---|---|---|---|---|
| | | Present | Absent | p | Present | Absent | P |
| Drinking water with meal | Yes | 67 (8.5) | 729 (91.5) | 0.414 | 94 (11.9) | 694 (88.1) | 0.882 |
| | No | 67 (9.8) | 618 (90.2) | | 80 (11.7) | 605 (88.3) | |
| Drinking dough* with meal | Yes | 71 (9.2) | 700 (90.8) | 0.928 | 86 (11.2) | 685 (88.8) | 0.41 |
| | No | 63 (9) | 639 (91) | | 88 (12.5) | 614 (87.5) | |
| Drinking tea after meal | Yes | 124 (9.7) | 1159 (90.3) | 0.057 | 163 (12.7) | 1120 (87.3) | 0.005 |
| | No | 10 (5.3) | 180 (94.7) | | 11 (5.8) | 179 (94.2) | |
| Drinking beverage | yes | 37 (11.9) | 274 (88.1) | 0.059 | 55 (17.7) | 256 (82.3) | 0.001 |
| | no | 97 (8.3) | 1065 (91.7) | | 119 (10.2) | 1043 (88.2) | |
| Drinking coffee | Yes | 10 (9.6) | 94 (90.4) | 0.859 | 18 (17.3) | 86 (82.7) | 0.072 |
| | No | 124 (9.1) | 1245 (90.9) | | 156 (11.4) | 1213 (88.6) | |
| Lying immediately after meal | Yes | 58 (11.5) | 445 (88.5) | 0.022 | 73 (14.5) | 430 (85.5) | 0.027 |
| | No | 76 (7.8) | 894 (92.2) | | 101 (10.4) | 869 (89.6) | |
| Eating smoky and salty food | Yes | 7 (5.6) | 117 (94.4) | | 48 (16.3) | 247 (83.7) | 0.011 |
| | No | 76 (7.8) | 894 (92.2) | | 126 (10.7) | 1052 (89.3) | |
| Eating spicy food | Yes | 20 (21.5) | 73 (78.5) | 0.067 | 67 (14.4) | 398 (85.6) | 0.038 |
| | No | 114 (8.3) | 1266 (91.7) | | 107 (10.6) | 901 (89.4) | |
| Eating fatty food | Yes | 36 (11.3) | 284 (88.8) | 0.583 | 81 (13.1) | 535 (86.9) | 0.178 |
| | No | 98 (8.5) | 1055 (91.5) | | 93 (41) | 764 (59) | |

*Iranian drink: yogurt with water mixed with salt.

jects who had GERD symptoms during previous week, 82.1% showed the INCONVINIENT and the other 17.9% showed the DISRUPTING one using the category C scales. **Table 3** shows the frequency rate of GERD during previous week and month in relation to demographic data. There were no difference between males and females regarding GERD in previous week and month, but subjects who were in 45-65-year age group showed more frequency of GERD during the previous week and subjects who were in 30-45-year age group showed more fre-

quency of GERD during last month ($p < 0.05$). Obese subjects (BMI ≥ 30) and smokers showed significantly more frequency rates of GERD during previous week and month ($p < 0.05$). The frequency rate of GERD during previous week and month was significantly higher in subjects who took NSAIDs/Aspirin ($P < 0.05$), but this correlation was not significant regarding Oral Contraceptive Pills (OCPs). There was no significant relation between subjects' occupation and education and GERD frequency.

**Table 4** shows the frequency rate of GERD in relation to dietary and drinking habits and lifestyle. Subjects who had the habit of lying immediately after meal showed significantly higher prevalence of GERD during last week and month ($P < 0.05$). There was no significant relation between the history of drinking water and spirit dough (Iranian drink: yogurt with water mixed with salt) with meals and frequency rate of GERD, the history of drinking tea and beverage was significantly associated to GERD during previous week ($P < 0.05$). Those subjects who had the habit of salted foods showed significantly higher rates of GERD during the previous week and month ($P < 0.05$), but the association between eating fatty food and GERD prevalence was not significant, and those who ate spicy food frequently showed higher rates of GERD during previous month ($P < 0.005$).

## Discussion

Gastroesophageal reflux disease (GERD) is a common disorder which affects patients' quality of life, reduces work productivity and has adverse psychologic effects on the patients [23]. Considering its influence on different aspects of patients' life, knowing about its prevalence in the community is so important and can help in leading new community health strategies [23, 24]. In order to assess the prevalence of the disease in a community the best choice would be a community-based survey. In such a study, disease diagnosis is performed based on the common symptoms of the disease [23].

In the present study, which is a community-based telephone survey, 1473 participants were included. The prevalence of GERD in the present study (using GerdQ scale) was 2.4% in daily pattern, 9.1% in weekly pattern, and 11.8% monthly. Up to 20% of the US population experience GERD symptoms at least once a week. The weekly prevalence of GERD is estimated to 10-20% in the West and less than 5% in Asian countries [25, 26]. In a study by Nouraie et al., prevalence of GERD occurring monthly was 18.4% in Tehran [7]. Also in a study by Somi et al. the prevalence of heartburn and acid regurgitation in weekly pattern was 26.8% in Tabriz [27]. It seems that the incidence of GERD and distal esophageal adenocarcinoma is rising in Asian countries especially in Iran [7, 28, 29]. This rise can be ascribed to a true increase in the prevalence and/or an intensified awareness of the disease [23].

In a study by Rogha et al. [30] in Isfahan, 25% of the participants had experienced GERD weekly. The estimated weekly rate of GERD was 39.7% in a study in Tehran [25]. This frequency rate was much higher than the rate in our study.

In various studies in Japan, the prevalence of GERD was reported in a range of 1.6% to 16.3% [31]. In Bor's report [32], the prevalence of GERD (weekly) was 20% in Turkey. In studies in China, India, Korea, and Australia, the prevalence of GERD was reported 0.8%, 7.5%, 3.5%, and 14.7% respectively [23, 33]. Also the prevalence of GERD in America and Finland was reported 12.8% and 15% respectively [23]. In Srinirasan's survey, the prevalence of GERD in Philadelphia was 6.1% daily, 10% weekly, and 31.5% monthly [34]. The reason for this variation in different communities is not recognized clearly [33].

This data shows that the prevalence of GERD in the present study is rather lower than other similar researches. Generally, many explanations exist on the lower prevalence of GERD in some areas. We can refer to genetic factors, BMI, dietary habits, and maximum acid output as some impressive factors. But still there is no strong reason available for the role of some other factors such as age, smoking or alcohol consumption [35]. One of the factors which were noticed in some researches is the prevalence of GERD in two genders.

In the present survey, most of the patients with GERD were female (69.5%). In some studies GERD was more prevalent in females than males [30, 36, 37]. But in a prospective study in Japan, more frequency of GERD was reported in males [31]; also Bruley et al. and Pelechas

E, Azoicai showed this in their researches [38, 39]. In our study the association of gender and GERD was not significant. Also in Wang's study in China [23], in Young's study in Korea [34], and in Locke's study in Minnesota [40], there was no significant difference between two genders regarding GERD.

In the present study, GERD was more prevalent in 30-45 y/o age groups. Also in studies Papatheodoridis etal in Greek [41] and Mungan in Turkey [36] older age were reported to be the main risk factor for development of GERD score. Decline in GERD prevalence by age maybe is associated with the decrease of esophageal mucosal sensitivity [38]. In our study, there was a significant association between BMI and GERD, in a way that the most patients with GERD were overweight (BMI > 25) or obese (BMI ≥ 30). This finding was the same as the study by Nandurkar et al. [42]. Also Hansen et al. and Dore et al. found a positive relationship between BMI and the prevalence of GERD [13, 37]. Kouklakis et al. in a cohort study in Greece proved the link between obesity (BMI > 30) and GERD. It could be assumed that the barrier to gastroesophageal reflux is rendered insufficient in patients who are overweight [43].

In our survey, the association between education and occupation with GERD was not significant, just like Nouraie's study in Tehran [7]. In Dore's study was an inverse relationship between the level of education and presence of GERD [37].

In the present study, GERD was significantly more prevalent in smokers ($p = 0.01$), just like Hansen's study in Denmark [13]. Ehsani in a study in Tehran reported the prevalence of GERD in smokers 2-fold higher than nonsmokers [29].

Some foods have been showed to intensify GERD [44]. An advantage of the present study is analyzing the effects of different dietary and drinking habits on GERD which was not noticed in many studies before. In Northern area of Iran especially Guilan Province consumption of salty and smoky foods is so common. We have found a significant association between salty and smoky foods consumption and GERD. But this association was not significant about fatty and spicy foods consumption neither about beverage, dough, tea and coffee drink. Also we found that those people who lied immediately after meals showed more frequency of GERD. These lifestyles and dietary habits were not assessed in other studies before, as we know. Overall, the prevalence of the weekly GERD in the present survey was less than other similar studies in Iran and other some countries.

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## Disclosure of conflict of interest

None.

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