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Prevalence and demographic determinants of gastroesophageal reflux disease (GERD) in the Turkish general population: A population-based cross-sectional study

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Background/aims: *We aimed to establish the prevalence and demographic determinants of gastroesophageal reflux disease in the Turkish general population using the Turkish version of the gastroesophageal reflux disease questionnaire.* ***Material and Methods:*** *A total of 8143 volunteers (mean age: 38.5 (13.3) years; 52.3% males) were included in this cross-sectional questionnaire study conducted via a face-to-face administration of the questionnaire forms including items on sociodemographic features, past history of gastric disorders, gastroesophageal reflux disease, the influence of reflux symptoms on patients' lives, physician visits, diagnostic tests, and reflux medications.* ***Results:*** *A past history of gastric symptoms was reported in half of the population. More female participants (p<0.001) had a past history of gastric symptoms that yielded a previous diagnosis of gastroesophageal reflux disease in 19.1% of the population. The likelihood of gastroesophageal reflux disease was low in the majority (75.3%) of the subjects evaluated. Gastroesophageal reflux disease with an inconveniencing or disrupting impact on the patient's life was present in 17.9% and 6.8% of the population. Total gastroesophageal reflux disease-questionnaire scores and reflux prevalence were higher in older age groups (p<0.001). Females were more likely to have gastroesophageal reflux disease prevalence based on reflux symptoms. The impact of gastroesophageal reflux disease on sleep and psychological/emotional well-being was more pronounced in older and female patients, whereas the impact on eating/drinking behaviors and physical-social activities was more marked among females independent of their age (p<0.001). Reflux prevalence was higher in subjects from East Anatolia, Central Anatolia, Mediterranean, and Black Sea regions of Turkey (p<0.001 for each).* ***Conclusions:*** *Prevalence and demographic determinants of gastroesophageal reflux disease are compatible with the profile of the disease in the other Western populations, with a predilection for females and older individuals.*

Key words: Gastroesophageal reflux disease, gastroesophageal reflux disease questionnaire, prevalence, age, gender

Türk popülasyonunda gastro-özofageal reflü hastalığı (GÖRH) prevalansı ve demografik belirleyicileri: Toplum-tabanlı kesitsel bir çalışma

Amaç: *Gastro-özofageal reflü hastalığı anketi'nin Türkçe versiyonu ile Türk popülasyonunda gastro-özofageal reflü hastalığı prevalansı ve demografik belirleyicilerini saptamak.* ***Gereç ve Yöntem:*** *Sosyodemografik özellikler, mide hastalığı öyküsü, gastro-özofageal reflü hastalığı, reflü semptomlarının hastaların yaşamına etkisi, hekim vizitleri, tanısal testler ve reflü ilaçlarına yönelik maddeler içeren anket formlarının yüz-yüze görüşme metodu ile uygulanmasını temel alan bu kesitsel çalışma, toplam 8143 gönüllü (ortalama yaş: 38.5 (13.3) yıl; %52.3'u erkek) ile yürütüldü.* ***Bulgular:*** *Çalışılan popülasyonun yarısında mide semptomu öyküsü vardı. Kadınlarda daha sık bildirilen (p<0.001) semptomların, popülasyonun %19.1'inde gastro-özofageal reflü hastalığı olarak tanımlandığı tespit edildi. Katılımcıların büyük çoğunluğunda gastro-özofageal reflü hastalığı olasılığı düşüktü (75.3%). Gastro-özofageal reflü hastalığının hastaların yaşamına etkisinin, popülasyonun %17.9'unda hafif, %6.8'inde ise ağır derecede olduğu tespit edildi. Toplam gastro-özofageal reflü hastalığı anketi skorları ve reflü prevalansı ileri yaş gruplarında daha yüksek olarak bulundu (p<0.001). Reflü semptomları bazında kadınlarda gastro-özofageal reflü hastalığı prevalansı daha yüksekti. Yaşlı hastalar ile ve kadın hastalarda gastro-özofageal reflü hastalığının uyku ve psikolojik/emosyonel iyilik durumu üzerine etkisi daha belirgin iken, yeme/içme davranışı, psikososyal aktiviteler üzerine etkisi yaştan bağımsız olarak kadınlarda daha çok öne çıkmakta idi (p<0.001). Reflü prevalansının Doğu Anadolu, İç Anadolu, Akdeniz ve Karadeniz Bölgeleri'nde yaşayanlarda Türkiye'nin diğer coğrafik bölgeleri ile kıyaslandığında belirgin şekilde daha yüksek olduğu tespit edildi (p<0.001, her biri için).* ***Sonuç:*** *Gastro-özofageal reflü hastalığı prevalans ve demografik belirleyicileri, Batı toplumlarında gözlenen profili özellikler ile uyumlu olup, kadınlar ve ileri yaşa özgü seçicilik göstermektedir.*

Anahtar kelimeler: Gastro-özofageal reflü hastalığı, gastro-özofageal reflü hastalığı anketi, prevalans, yaş, cinsiyet

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INTRODUCTION

Gastroesophageal reflux disease (GERD) is a chronic, painful disease comparable with rheumatoid arthritis, asthma and back pain in that its symptoms may substantially affect the everyday lives of sufferers (1,2). GERD is one of the most common conditions encountered by physicians in routine daily practice (3). It causes the patient to seek consultation due to the impact of symptoms on everyday life as well as anxiety about the illness. Therefore, there is a need for quick and appropriate review by a physician, who is expected to determine how compromised the patient is,in terms of the severity and consequences of the symptoms (4,5).

Management of GERD at the primary care level can best be addressed based on the patient's reporting of his/her symptoms as well as diagnostic methods with high sensitivity, such as 24-hour esophageal pH monitoring and endoscopy (6,7). Therefore, development of measures enabling patients to communicate appropriately about their symptoms is encouraged to help foster agreement between patients and clinicians in various disciplines on the presence and severity of symptoms (5). In this regard, the aid of a structured questionnaire for information gathering has been documented in a past European study of primary care patients with GERD (8). Moreover, a striking disparity between the symptoms initially reported by the patients and upon specific questioning was found, indicating the likelihood of questionnaires to be considered as useful ways to gather accurate information at the primary care level (5,9).

As a part of this trend, several patient-completed questionnaires have been developed in recent years for the assessment of GERD symptoms in clinical practice or the general population, each with adequate psychometric properties (5). Nevertheless, the gastroesophageal reflux disease questionnaire (GERD-Q) has been considered to be unique as a simple validated tool documented to facilitate the management of GERD in routine clinical practice (10) in terms of diagnosis and disease impact. It involves input from the patients during item selection and development (11) as well as questions on sleep disturbance and over the counter (OTC) medication use that enhance the patient assessment (10).

The prevalence of GERD symptoms has been reported to range widely (5-40%) between countries, but there are few well-organized epidemiologic studies in the unselected general population (12). There are a few studies from Turkey related to the epidemiology of GERD (13-15). In these studies, the prevalence of GERD was shown to be similar to that of western countries and the severity of disease was generally reported to be mild (13,15). However, since these studies do not include patients from all geographical regions and have been performed with a limited number of participants, the need for a new well-designed study representing all regions of Turkey with respect to GERD prevalence has become prominent.

Therefore, based on the documented fact that GERD-Q provides a reliable way to objectively identify patients with disrupting GERD, monitor treatment response and determine the degree of symptom relief (10,16), the present study was designed to determine the prevalence and demographic determinants of GERD in the Turkish general population by means of the Turkish version of GERD-Q, which was validated in a pilot sample before the study.

MATERIALS AND METHODS

Subject Population

This cross-sectional questionnaire-based study was conducted with 8143 voluntary participants from 20 cities representing the population of Turkey in terms of gender, age and geographical region. The questionnaire was administered face-to-face in the street by pre-trained interviewers to obtain survey information directly from the respondent.

Volunteers were randomly selected by interviewers according to predefined quotas obtained from the Turkish Statistical Institute (TurkStat) based on the gender and age groups among passers-by in the street. Being >18 years old and accepting to participate in the study were the only inclusion criteria, whilst no specific exclusion criteria were defined. Completed questionnaire forms were transferred to a data management center where the accuracy of the questionnaire data was checked by calling the respondent's telephone number for a random 20% of the study population. In case of an unacceptable bias or suspicion about data quality in a certain region, all volunteers from that region were called to confirm the accuracy of the data collected.

Written informed consent was obtained from each subject following a detailed explanation of the objectives and protocol of the study, which was con-

ducted in accordance with the ethical principles stated in the Declaration of Helsinki and approved by the institutional ethics committee.

Questionnaire Form

The first part of the questionnaire, which was composed of items related to sociodemographic features (age, gender, educational status, occupation), past history of gastric disorder and GERD-Q were administered to all participants (n=8143). The second part of the form included questions about the influence of reflux symptoms on the subject's psychological/emotional well-being, sleep, eating/drinking behavior, and physical-social activities, in addition to average physician visits, diagnostic tests (endoscopy, pH monitoring, hematological tests, and X-ray) and use of medication in the last year due to reflux symptoms. It was administered to the population who identified the presence of reflux symptoms in the last week at any frequency while replying to the GERD-Q items (n=4382).

Gastroesophageal Reflux Disease Questionnaire (GERD-Q) Items

The reliability and validity analysis of the Turkish version of GERD-Q was performed by our team in a total of 175 patients diagnosed with GERD according to either clinical evaluation (n=75) or by endoscopy and pH monitoring (n=100). The questionnaire was then used to determine GERD prevalence in the Turkish general population. Developed from three different validated questionnaires as a management tool for patients with GERD to facilitate a symptom-based diagnosis, assess the impact of symptoms, and monitor treatment response (10,16,17), GERD-Q was documented to be a reliable means of objective identification of disrupting GERD (10).

GERD-Q is a Likert type (0-3) questionnaire made up of six questions (4 on symptoms, 2 on disease impact) completed by the patient and overseen by the physician. Answers are compiled according to a scale of options ('never', '1 day', '2–3 days' and '4–7 days' in the last week), and each option equates to a 0–3 score with an ascending scoring for questions 1-2 and 5-6 (from 0 to 3), but a descending scoring for questions 3-4 (from 3 to 0).

The overall total score (0-18) and the impact score (0-6) are used to compile a GERD-Q score, which informs the physician's diagnosis of disrupting or inconveniencing GERD and recommendation for the patient (10).

Total GERD-Q scores were interpreted upon classification of scores into 0-2 (indicating low likelihood of GERD), 3-7 (indicating low likelihood of GERD), 8-10 (indicating inconveniencing GERD with impact score of <3, but disrupting GERD for impact score of ≥3) and 11-18 (indicating inconveniencing GERD with impact score of <3, but disrupting GERD for impact score of ≥3) (10).

Reflux Prevalence and Influence of Symptoms on Patients' Lives

Reflux prevalence was determined based on total GERD-Q score (≥8) obtained on the Turkish version of the GERD-Q questionnaire and physician-made diagnosis of GERD. The influence of symptoms on patients' lives was evaluated with four Likert-type questions on psychological/emotional well-being, sleep, eating/drinking behaviors, and physical-social activities, each of which was scaled as 0-6, with higher scores indicating a worse impact of the disease.

Statistics

Validation of the Turkish GERD-Q: Before the prevalence study, a reliability and validity analysis of the Turkish version of GERD-Q was performed in 175 patients divided into two groups including patients diagnosed with GERD according to clinical evaluation (n=75) or by endoscopy and pH monitoring (n=100). Test-retest reliability was analyzed using McNemar test for dichotomous variables and McNemar-Bowker test for ordinal variables. Consistency of diagnoses by test and retest assessments was analyzed by kappa analysis. Correlation between test and retest assessments in terms of GERD-Q total score and impact score was analyzed via Pearson's correlation coefficient. For validity analysis concerning performance of GERD-Q in the diagnosis of GERD as a diagnostic tool, receiver operating characteristic (ROC) analysis was performed, and sensitivity, specificity, and positive and negative predictive value of the GERD-Q were determined.

Sample size calculation: For a prevalence study in a general population, at least 8000 participants were determined to be required according to sample size estimation based on a power of 80% at a type I error of 0.05, assuming a GERD prevalence of 20%, with 1% standard error (19-21%) of confidence interval (CI) and exclusion rate of 7.5%.

Statistical analysis was made using software [Statistical Package for the Social Sciences (SPSS) Inc., Chicago, IL; version 15.0]. Data were expressed as mean [standard deviation (SD)], percent

(%), and median (min-max) with 95% CI where appropriate. A value of p<0.05 was considered statistically significant.

RESULTS

Reliability and Validity of GERD-Q

The Turkish version of the GERD-Q questionnaire showed high test-retest reliability (McNemar-Bowker test, kappa: 0.940±0.034, p<0.001; Spearman r values for each question ranged between 0.920-0.978). The validity analysis revealed a good diagnostic performance (the area under the ROC curve was 0.824; 95% confidence limits: 0.751-0.897); sensitivity and specificity values were 90.2% and 70%, respectively; positive and negative predictive values were 88% and 74.5%, respectively, while the prevalence was 70.9%.

Sociodemographic Features

Evaluation of data from a total of 8143 respondents revealed that gender distribution was almost even (52.3% males). The mean age (SD) was 38.5 (13.3) years, while the most frequently represented age groups were 18-34 years (43.2%). Almost one-third of the participants were unemployed, and had graduated from high or elementary school (Table 1).

Past History of Gastric Disorder (Table 2)

Past history of gastric symptoms was reported in half of the overall population. In gender comparison, more female participants had a past history of gastric symptoms (p<0.001). These symptoms yielded a diagnosis of a gastric disease in one-third of the overall population and were also more common among females (p<0.001). Gastritis, ulcer and GERD were the leading diagnoses. While ulcer was more common among males (p<0.01) and GERD (p<0.001) was more common among females, there was no obvious gender influence on the prevalence of gastritis in our population.

Total GERD-Q Score

Total GERD-Q score was in the range of 0-7 in 75.3% (n=6135) of participants, indicating low likelihood of GERD. In subjects with total GERD-Q score of 8-10, impact score was determined to be <3 in 81.7%, indicating inconvenient GERD in 15.8% of the overall population, while it was ≥3 in 18.3%, indicating disrupting GERD in 3.5% of the overall population (Table 3).

In subjects with total GERD-Q score of 11-18, impact score was determined to be <3 in 37.8%, indi-

Table 1. Sociodemographic features of the overall participants (N=8143)

Age groups (year)	**n (%)**
18-34	3519 (43.2)
35-49	2700 (33.2)
≥50	1924 (23.6)
Gender	**n (%)**
Male / Female	4256 /3887 (52.3/47.7)
Educational status*	**n (%)**
High school	2583 (31.8)
Elementary school	2441 (30.0)
University	1572 (19.4)
Middle school	1073 (13.2)
Uneducated	289 (3.6)
Literate**	146 (1.8)
Other	20 (0.2)
Employment status***	**n (%)**
Employed	4297 (53.1)
Unemployed	2714 (33.6)
Retired	855 (10.6)
Other	223 (2.8)

Missing data for *19 and ***54 participants. **Lettered but not graduated from elementary school.

Table 2. Past medical history of gastric disease in all participants

	Overall (n=8143)	**Male (n=4256)**	**Female (n=3887)**
Past history of gastric symptoms	**n (%)**	**n (%)**	**n (%)**
Present	4100 (50.3)	1922 (45.2)	2178 (56.0)**
Absent	4043 (49.7)	2334 (54.8)	1709 (44.0)
Diagnosed with a disease due to gastric symptoms	2636 (32.4)	1169 (27.5)	1467 (37.7)**
Gastritis	1118 (42.4)	478 (40.9)	640 (43.6)
Ulcer	866 (32.9)	420 (35.9)	446 (30.4)*
Reflux	503 (19.1)	183 (15.7)	320 (21.8)**
Other	348 (13.2)	164 (14.0)	184 (12.5)
Present use of any gastric medication	2065 (25.4)	910 (21.4)	1155 (29.7)**

* p<0.01 and ** p<0.001 vs males; χ^2 test

Table 3. Percent distribution of frequency of reflux symptoms in the last week as evaluated by "6-item GERD-Q questionnaire" (n=8143)

GERD items	Frequency in past seven days			
	Never	1 day	2-3 days	4-7 days
Q1. How often did you have a burning feeling behind your breastbone (heartburn)?	5630 (69.1)	815 (10.0)	1045 (12.8)	653 (8.0)
Q2. How often did you have stomach contents (liquid or food) moving upwards to your throat or mouth (regurgitation)?	5164 (63.4)	1089 (13.4)	1181 (14.5)	709 (8.7)
Q3. How often did you have a pain in the center of the upper stomach?	5350 (65.7)	1104 (13.6)	1028 (12.6)	661 (8.1)
Q4. How often did you have nausea?	6018 (73.9)	847 (10.4)	735 (9.0)	543 (6.7)
Q5. How often did you have difficulty getting a good night's sleep because of heartburn and/or regurgitation?	6562 (80.6)	627 (7.7)	627 (7.7)	327 (4.0)
Q6. How often did you take additional medication for your heartburn and/or regurgitation other than what the physician told you to take?	7402 (90.9)	329 (4.0)	239 (2.9)	173 (2.1)

Total GERD-Q Score (Q1-Q6)	**n (%)**
0-2 "Low likelihood of GERD"	82 (1.0)
3-7 "Low likelihood of GERD"	6053 (74.3)
8-10	1571 (19.3)
Impact score (Q5-6) <3 "Inconvenient GERD"	1284 (81.7)
Impact score (Q5-6) ≥3 "Disrupting GERD"	287 (18.3)
11-18	437 (5.4)
Impact score (Q5-6) <3 "Inconvenient GERD"	165 (37.8)
Impact score (Q5-6) ≥3 "Disrupting GERD"	272 (62.2)

Each option equates to a 0–3 score, with an ascending scoring for questions 1-2 and 5-6 (from 0 to 3), but a descending scoring for questions 3-4 (from 3 to 0).

cating inconvenient GERD in 2.1% of the overall population, while it was ≥3 in 62.2%, indicating disrupting GERD in 3.3% of the overall population (Table 3).

Last Year History of GERD among Symptomatic Patients

In the GERD-Q questionnaire, 53.8% (n=4382) of the participants indicated presence of a reflux symptom for at least 1 to 7 days in the last week. For these symptomatic patients, evaluation of the last year's history of reflux symptoms revealed an average number (SD) of physician visits of 3.2 (4.2), ranging from 1 to 60, use of prescribed medications in 42.6% (n=1867) and of OTC medications in 24.3% (n=1066) for the relief of symptoms, and diagnostic work-up in 25.4% (n=1113), including hematological tests (n=849), X-ray imaging (n=530), endoscopy (n=464), and pH monitoring (n=114).

Gender- and Age-Based Evaluation of GERD Scores and Reflux Prevalence

Age-based evaluation of total GERD scores revealed that there was a significant association between total GERD scores and the age groups, indicating higher scores in older age groups even for the weighted age-adjusted data (p<0.001) (Table 4). However, there was no significant gender influence on GERD scores before (p=0.116) or after (p=0.150) gender adjustment (Table 4).

Prevalence of GERD was 27.5% before adjustment and 27.6% for adjusted age and gender data (Table 5). There was a significant relation between GERD prevalence and the age groups, indicating higher scores in older age groups even in weighted age-adjusted data (p<0.001 for each) (Table 5). Reflux was significantly more prevalent among females for the weighted data (p=0.042; Table 5).

Gender- and Age-Based Evaluation of the Influence of Symptoms on Patients' Lives

According to mean scores for the influence of symptoms on patients' lives summarized in Table 6, older age groups and female gender were determined to be associated with higher scores for psychological/emotional well-being as well as for sleep, indicating the worse impact of the disease on a patient's daily life in this respect (p<0.001 for each; Table 6).

Subjects in different age groups were determined to identify similar scores for the influence of symptoms on their eating/drinking behaviors and

Table 4. Distribution (n (%) of all participants (n=8143) according to GERD-Q scores and demographics

	GERD-Q Score					Adjusted GERD-Q Score[e]				
	0-2	3-7	8-10	11-18	Total (100%)	0-2	3-7	8-10	11-18	Total (100%)
Age group (year)[a,b]										
18-34	46 (1.3)	2763 (78.5)	571 (16.2)	139 (3.9)	3519	46 (1.3)	2763 (78.5)	571 (16.2)	140 (4.0)	3520
35-49	24 (0.9)	1923 (71.2)	580 (21.5)	173 (6.4)	2700	25 (0.9)	1924 (71.3)	578 (21.4)	172 (6.4)	2699
≥50	12 (0.6)	1367 (71.0)	420 (21.8)	125 (6.5)	1924	12 (0.6)	1360 (70.8)	425 (22.1)	123 (6.4)	1920
Total	**82 (1.0)**	**6053 (74.3)**	**1571 (19.3)**	**437 (5.4)**	**8143**	**83 (1.0)**	**6047 (74.3)**	**1574 (19.3)**	**435 (5.3)**	**8139**
Gender[c, d]										
Male	29 (0.7)	3172 (74.5)	805 (18.9)	250 (5.9)	4256	27 (0.7)	3043 (74.6)	772 (18.9)	238 (5.8)	4080
Female	53 (1.4)	2881 (74.1)	766 (19.7)	187 (4.8)	3887	56 (1.4)	3004 (74.0)	802 (19.8)	197 (4.9)	4059
Total	**82 (1.0)**	**6053 (74.3)**	**1571 (19.3)**	**437 (5.4)**	**8143**	**83 (1.0)**	**6047 (74.3)**	**1574 (19.3)**	**435 (5.3)**	**8139**

[a]Mantel-Haenszel test, p<0.001 for original data and [b] χ^2 test, p<0.001 for adjusted data; [c]Mantel-Haenszel test, p=0.116 for original data and [d]Mantel-Haenszel test, p=0.150 for adjusted data; [e]adjusted by age and gender according to age and gender distribution obtained from data on the Turkish population in 2009 provided by the Turkish Institute of Statistics.

Table 5. Prevalence of GERD according to demographics, n (%)

	GERD*			Adjusted[e] GERD		
	Absent	Present	Total	Absent	Present	Total
Age group (year)[a,b]						
18-34	2719 (77.3)	800 (22.7)	3519 (100.0)	2717 (77.2)	802 (22.8)	3519 (100.0)
35-49	1849 (68.5)	851 (31.5)	2700 (100.0)	1851 (68.6)	848 (31.4)	2699 (100.0)
≥50	1337 (69.5)	587 (30.5)	1924 (100.0)	1324 (68.9)	597 (31.1)	1921 (100.0)
Total	**5905 (72.5)**	**2238 (27.5)**	**8143 (100.0)**	**5891 (72.4)**	**2247 (27.6)**	**8138 (100.0)**
Gender[c,d]						
Male	3123 (73.4)	1133 (26.6)	4256 (100.0)	2993 (73.4)	1085 (26.6)	4078 (100.0)
Female	2782 (71.6)	1105 (28.4)	3887 (100.0)	2898 (71.4)	1162 (28.6)	4060 (100.0)
Total	**5905 (72.5)**	**2238 (27.5)**	**8143 (100.0)**	**5891 (72.4)**	**2247 (27.6)**	**8138 (100.0)**

*Diagnosed by a physician or had a GERD score of >8; [a]Mantel-Haenszel test, p<0.001 for original data and [b] χ^2 test, p<0.001 for adjusted data; [c] χ^2 test, p=0.068 for original data and [d]Mantel-Haenszel test, p=0.042 for adjusted data; Adjusted by age and gender according to age and gender distribution obtained from data on the Turkish population in 2009 provided by the Turkish Institute of Statistics.

physical-social activities, whereas female gender was determined to be associated with higher scores in both (p<0.001 for each) indicating worse impact of the disease on the patient's daily life in this respect (Table 6).

Evaluation of GERD Scores and Reflux Prevalence according to Geographical Region of the Participant

Reflux prevalence was higher in subjects from East Anatolia, Central Anatolia and Black Sea regions of Turkey when compared to Aegean (p<0.001 for each), Marmara (p<0.001 for each) and Southeastern Anatolia (p<0.001 for each). Accordingly, higher GERD scores were more frequent among participants living in these regions (p<0.001, Table 7).

DISCUSSION

Understanding the natural history and determinants of GERD has an important impact on the current management of GERD patients (18). According to our findings, being more common among female patients, a past history of gastric symptoms was reported in half of the individuals, while identification of these symptoms yielded a past history of GERD in 19.1% of the Turkish general population. Likewise, whilst reflux symptoms in the past week lasting for at least for one day were identified by 54%, "GERD-Q scoring" *per se* yielded the diagnosis of GERD in 25% of our population. Accordingly, "prevalence" as a function of both physician- and questionnaire-based evaluation resulted in diagnosis of the disease in 27.5% of the overall population.

Table 6. Influence of GERD symptoms on the psychological/emotional well-being, sleep, eating/drinking behaviors, and physical-social activities in symptomatic patients (N=4382)

	n	Mean (SD)	95% CI	Median (min-max)
Psychological/emotional well-being[1]	**4382**	**2.3 (2.1)**	**2.2-2.3**	**2 (0-6)**
Age group (year)[a]				
18-34	1870	2.1 (2.1)	2.0-2.1	2 (0-6)
35-49	1517	2.4 (2.2)	2.3-2.5	2 (0-6)
≥50	995	2.4 (2.1)	2.3-2.5	3(0-6)
Gender[b]				
Male	2131	1.9 (2.0)	1.8-2.0	1 (0-6)
Female	2251	2.6 (2.2)	2.5-2.7	3 (0-6)
Sleep[2]	**4382**	**2.0 (2.1)**	**2.0-2.1**	**2 (0-6)**
Age group (year)[a]				
18-34	1870	1.8 (2.0)	1.7-1.9	1 (0-6)
35-49	1517	2.2 (2.2)	2.1-2.3	2 (0-6)
≥50	995	2.3 (2.1)	2.2-2.4	2 (0-6)
Gender[b]				
Male	2131	1.8 (2.0)	1.7-1.9	1 (0-6)
Female	2251	2.3 (2.1)	2.2-2.4	2 (0-6)
Eating/drinking behaviors[3]	**4382**	**2.4 (2.1)**	**2.3-2.4**	**2 (0-6)**
Age group (year)				
18-34	1870	2.4 (2.1)	2.3-2.5	2 (0-6)
35-49	1517	2.4 (2.2)	2.3-2.5	2 (0-6)
≥50	995	2.3 (2.1)	2.2-2.4	2 (0-6)
Gender[b]				
Male	2131	2.0 (2.0)	2.0-2.1	2 (0-6)
Female	2251	2.7 (2.1)	2.6-2.8	3 (0-6)
Physical-social activities[4]	**4382**	**1.46 (1.9)**	**1.4-1.5**	**0 (0-6)**
Age group (year)				
18-34	1870	1.4 (1.9)	1.3-1.5	0 (0-6)
35-49	1517	1.5 (2.0)	1.4-1.6	0 (0-6)
≥50	995	1.5 (1.9)	1.4-1.6	0 (0-6)
Gender[b]				
Male	2131	1.2 (1.8)	1.2-1.3	0 (0-6)
Female	2251	1.7 (2.0)	1.6-1.7	1 (0-6)

[a]p<0.001 Kruskal-Wallis test; [b]p<0.001 Mann-Whitney U test Z_1=-11.705, Z_2=-7.947, Z_3=-10.383, Z_4=-7.408; CI: confidence interval

Table 7. Prevalence of GERD and distribution of total GERD score according to geographical regions in Turkey (n (%))

	GERD[a]		Total GERD Score				
Region	**Absent**	**Present**	**0-2**	**3-7**	**8-10**	**11-18**	**Total (100)**
Marmara	1793 (77.2)	529 (22.8)	18 (0.8)	1842 (79.3)	362 (15.6)	100 (4.3)	2322
Mediterranean	728 (68.5)	335 (31.5)	12 (1.1)	734 (69.0)	251 (23.6)	66 (6.2)	1063
Black Sea	592 (69.2)	263 (30.8)	12 (1.4)	617 (72.2)	172 (20.1)	54 (6.3)	855
Aegean	825 (75.0)	275 (25.0)	8 (0.7)	857 (77.9)	171 (15.5)	64 (5.8)	1100
East Anatolia	426 (66.1)	218 (33.9)	10 (1.6)	431 (66.9)	168 (26.1)	35 (5.4)	644
Southeastern Anatolia	651 (79.4)	169 (20.6)	4 (0.5)	658 (80.2)	129 (15.7)	29 (3.5)	820
Central Anatolia	890 (66.5)	449 (33.5)	18 (1.3)	914 (68.3)	318 (23.7)	89 (6.6)	1339
Total	5905 (72.5)	2238 (27.5)	82 (1.0)	6053 (74.3)	1571 (19.3)	437 (5.4)	8143

[a]p<0.001, χ^2test

Indeed, our findings are alike the results of a previous study conducted with a random sample of the general Greek population (n=700), in which 42% of GERD patients were reported to identify moderate/severe symptoms in the previous week, while the diagnosis of GERD according to an GERD-Q scoring was reported to be made in 33% (12).

Detection of a symptom-based diagnosis in 25% of our population is also in line with the findings of a recent internet surveillance study general population of 15,814 subjects indicating presence of GERD symptoms in 35.5% of respondents (19). The results of a computer-aided, telephone survey conducted across Europe (5046 subjects) indicated a higher prevalence (20-40%) and marked impact of GERD symptoms in European countries, with the documented limitation about the understanding of symptom significance and causes and treatment of the disease that varies between countries (20).

Additionally, in a recent study conducted with Dutch patients invited to complete the GERD-Q upon visiting their primary care physician for any reason, 19% of 970 patients scoring equal or above the cut-off in GERD-Q were reported to be classified as patients with GERD, despite the fact that only 2.4% of all included patients reported GERD as the reason to visit their primary care physician (21). Likewise, the percentage of responders with a GERD score ≥8 in our general population was 25%.

In fact, the GERD-Q has been suggested as a useful diagnostic tool in primary care since the diagnosis of GERD via GERD-Q scores was reported to encompass a much larger population for diagnosis with GERD compared to diagnosis of the disease based only on self-reporting of the symptoms by the patient as a reason for visiting their primary care physician (21).

Concerning demographic determinants in the present study, reflux prevalence based on physician diagnosis besides GERD scores indicated a higher likelihood of GERD among females in the adjusted population. This may be related to higher rates of physician visits among females leading to a diagnosis of gastric disorder. Indeed, GERD was reported to be more prevalent among women (18), and physician visits were reported in the literature to be more frequent among patients who have suffered GERD for a long time or patients with persistent symptoms than among patients with "inconveniencing GERD" (22).

Older age was reported to be the main risk factor for development of GERD score in the general Greek population, which was also reported to be associated with the female gender (12). In a past study conducted with 3471 patients diagnosed with GERD, patients most impacted by their GERD symptoms, "disrupting GERD", were documented to be older than patients with "inconveniencing GERD" (23).

In this regard, age-based evaluation of total GERD score and reflux prevalence in our population revealed that there was a significant relation between total GERD scores and the age groups, with significantly higher disease scores in older age groups, which persisted after age-based adjustment of data.

The negative effects of GERD have been considered to be dependent on the frequency and severity of symptoms rather than the presence of esophagitis (5). Nevertheless, a combination of symptom scores and impact scores rather than symptoms per se has been considered to predict erosions and pathological acid exposure (10). In this respect, different types of GERD patients have been identified in clinical practice, ranging from people who experience lifestyle-related "inconveniencing GERD" to those with persistent, recurring GERD (10,23). The latter have been shown to experience the most significant disruption in their lives and are potentially responsible for the greatest consumption of healthcare resources, since they need a more effective and lasting solution, enabling them to take control and remove the disruption from their lives (10). Accordingly, while most of our patients were classified to have a low likelihood of GERD, rates of inconvenient GERD and disrupting GERD were 17.9% and 6.8% with respect to impact scores among participants with GERD scores of 8-18. Accomplishment of a GERD-related diagnostic workup in only 25.4% of the symptomatic subjects in our study seems to correlate with the results of a previous study concerning the patient–clinician agreement on the presence and severity of reflux symptoms in four clinical trials, which highlighted poor agreement before treatment in three of the four studies due to clinicians underestimating symptoms reported by their patients (24).

Furthermore, despite the frequent use of drug therapy, a significant proportion of GERD patients were considered to have moderate-severe and frequent symptoms, which negatively affected their quality of life (12).

Recent reviews have highlighted that GERD interferes with physical activity, impairs social functioning, disturbs sleep, and reduces productivity at work (1,5). Accordingly, the influence of symptoms was prominent on psychological/emotional well-being, sleep, eating/drinking behaviors and physical-social activities of symptomatic patients in our study. Regarding demographics and the prevalence of the disease, the impact of the disorder on sleep and psychological/emotional well-being was more pronounced in older ages and in females, whereas the impact on eating/drinking behaviors and physical-social activities was more marked among females with a similar degree of influence over all age groups.

Indeed, the prevalence of diagnosed GERD has been described metaphorically as the tip of an iceberg, and many non-consulting GERD sufferers are thought to exist (19). In this context, the prevalence of GERD has been suggested to depend not only on country, race and life habits, but also on surveillance methods, such as questionnaire and endoscopy (25). Accordingly, methodological defects and lack of valid and reliable measurement tools were documented as the main criticisms of the reports available on the different epidemiologic aspects of GERD (25).

In this respect, validating the Turkish version of the international GERD-Q in a pilot sample before the present study seems to add a dimension to studies concerning the prevalence and management of GERD in Turkey by providing a valid and reliable scale to detect GERD symptoms, with sensitivity greater than 90% and a specificity of 70%. In addition, providing an easy to understand, internally consistent and reproducible method of assessing the prevalence of GERD in newly diagnosed GERD patients, the Turkish version of GERD-Q seems to aid recognition of GERD patient segments among healthcare providers that may facilitate management of the disease and reduce the burden of GERD symptoms on the patient's well-being.

In conclusion, the prevalence and demographic determinants of GERD in Turkey seem to be compatible with the profile of the disease in the Western population, with females and older individuals being the most affected.

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