



How is the gastroesophageal reflux disease prevalence, incidence, and frequency of complications (stricture/esophagitis/Barrett's esophagus/carcinoma) in Turkey compared to other geographical regions globally?

Serhat Bor¹, Elif Sarıtaş Yüksel²

¹Division of Gastroenterology, Ege University School of Medicine, İzmir, Turkey

²Department of Gastroenterology, İzmir Katip Çelebi University School of Medicine, Atatürk Training and Research Hospital, İzmir, Turkey

Cite this article as: Bor S, Sarıtaş Yüksel E. How is the gastroesophageal reflux disease prevalence, incidence, and frequency of complications (stricture/esophagitis/Barrett's esophagus/carcinoma) in Turkey compared to other geographical regions globally? Turk J Gastroenterol 2017;28(Suppl 1); S4-S9

THE EPIDEMIOLOGY OF GASTROESOPHAGEAL REFLUX DISEASE IN TURKEY AND AROUND THE WORLD

Although many studies are conducted on gastroesophageal reflux disease (GERD) and its complications, the questionnaires and reflux definitions used in the studies are different. Mayo, GERD-Q, DIGEST-Q, RDQ, and various other questionnaires that were created and have been used in the studies. The GERD definition that is mostly accepted around the world is the presence of the complaints of heartburn and/or regurgitation at least once a week. However, many different definitions, such as the presence of heartburn and/or regurgitation at least twice a week or at least once a year (if once a week, "frequent"; if once a year, "rare") and the presence of heartburn and/or regurgitation without considering the frequency and severity, were all used in the studies. Therefore, it is quite difficult to obtain a single datum by collecting these studies. However, studies including all questionnaires and reflux definitions were considered while collecting this data.

Another problem encountered while performing epidemiological scanning of GERD is that when the world was separated into two parts as the East and the West, some countries that were different from each other were included in the same group (such as Iran-China and Germany-Brazil). Even though continents are considered for this separation, countries that do not resemble each other from any perspective, such as Iran and China, were included in the same group. Therefore, groups must be formed according to the higher number of ethnic distributions. There are also regional epidemiological differences even in the same country. Moreover, there is no term equivalent to heartburn and regurgitation in some Eastern languages.

Turkey is geographically located in the middle of the Eastern and Western countries and the epidemiology of GERD and its complications is similar to both geographical groups (Figure 1). In the Eastern countries, the prevalence of GERD is lower and regurgitation is predominant. On the other hand, in the Western countries, the prevalence of GERD is higher and heartburn is predominant. Considering the complications, erosive esophagitis, Barrett's esophagus, and associated esophageal adenocarcinoma are seen in the Western countries more commonly.

In GERD epidemiological studies performed in Turkey, the Mayo questionnaire was mostly used (1, 2). The GERD-Q form was used in one study (3). The studies in which the Mayo questionnaire was used, found the prevalence of GERD as 20% (1), 19.3% (2), 12.5% (4), and 22.8% (5,6), respectively. In the study using the other question form, the prevalence of GERD was 24.7% (3). When 5 studies were evaluated cumulatively, the prevalence was calculated to be 23%. It was observed that regurgitation was predominant in all of the studies. In the cumulative evaluation, the rate of prevalence was 23% for regurgitation and 19% for heartburn.

While the date of the publications on the epidemiology of GERD goes back to the 2000s in the countries to the east of Turkey, the first articles on this subject were written in 1990s in the Western countries. The first extensive, randomized, and community-based study in the Eastern countries was performed in China using the Mayo questionnaire on phone interviewing. The prevalence of GERD was found to be 2.5% (7). However, in the following years, an increase

Address for Correspondence: Elif Sarıtaş Yüksel E-mail: elifsaritas35@gmail.com

© Copyright 2017 by The Turkish Society of Gastroenterology • Available online at www.turkjgastroenterol.org • DOI: 10.5152/tjg.2017.03

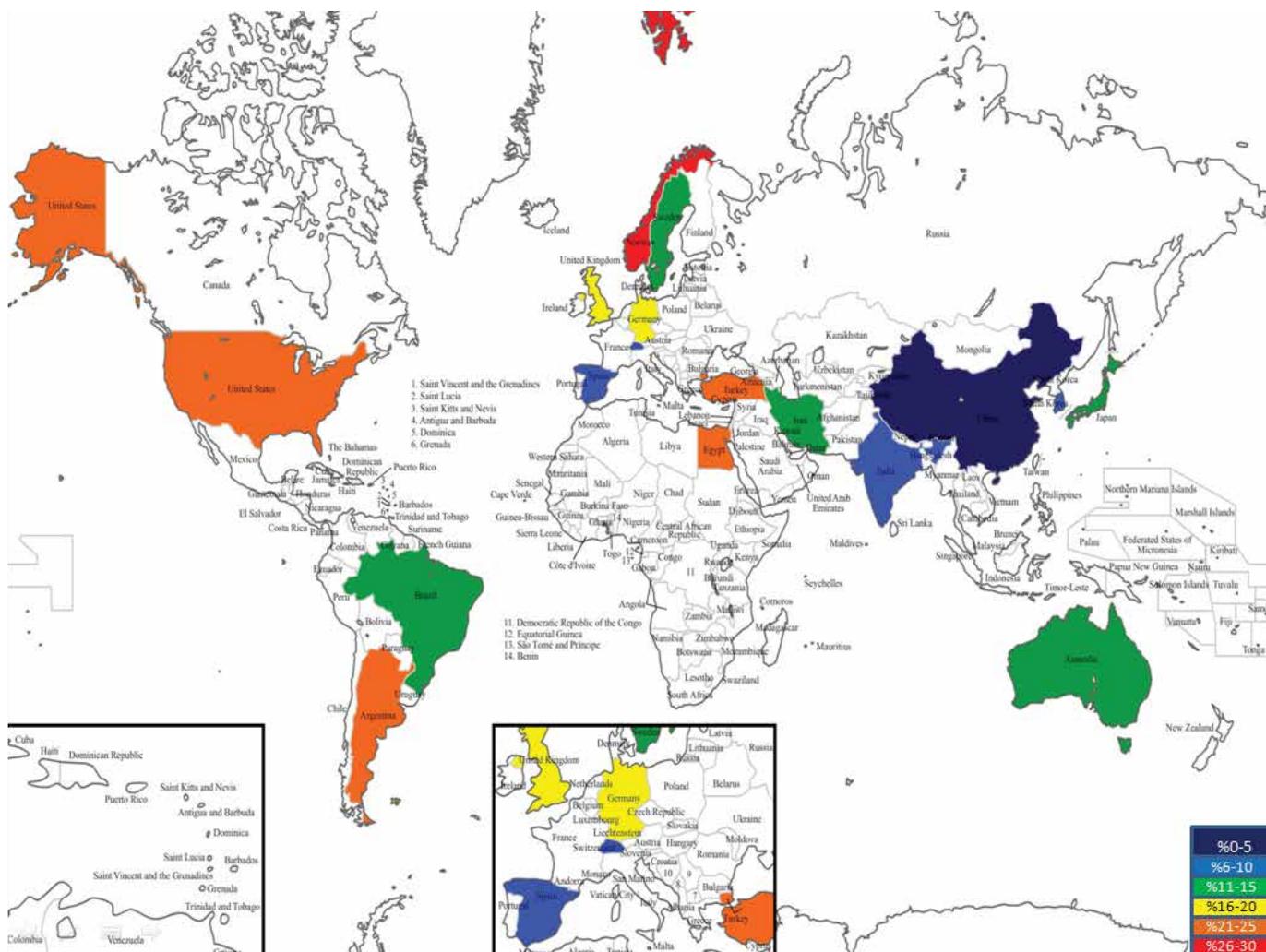


Figure 1. The distribution of GERD prevalence globally

up to 6.2% was observed in the values from China (8,9). In Japan, the prevalence of GERD was detected to be 16.5% with the QUEST questionnaire. This is one of the highest values from the Far East countries (10). On the other hand, in a study conducted on the Qashqai area of Iran, the rate of patients having reflux episode once a week during the last year was found to be 33%, and it was specified that this value increased with age (11). The authors explained that the reason for this higher value in nomads than in settled people was the fact that nomads had different socioeconomic features educational status, and lifestyles. Such a high prevalence of GERD was not reported from the other Middle Eastern countries (12,13). On the other hand, two studies from India were similar to each other (5.3% and 7.1%) but this study only included patients applying to hospitals for any reason (14,15).

Taking two studies from the South and East Mediterranean Region into consideration, the prevalence was found to be as high as 24.8% (because GERD was defined as heartburn and/or regurgitation once a year in the study) from Tunus (16), and as 12.5% in the Israel study where the Mayo questionnaire was used (17).

As a result of the cumulative evaluation of data from the abovementioned Eastern countries, the rate of prevalence was determined to be 8% for GERD, 4.2% for heartburn, and 5.3% for regurgitation.

According to data from the countries in the continents of Europe and America, the highest rates of GERD prevalence are in the northern countries. These high values were revealed in the epidemiologic studies from United States of America (USA) (18), Norway (19) and Sweden (20) were 26.2%, 26% and 25.9% respectively. In the study conducted in the USA, the prevalence values of GERD were divided into subgroups according to races, and some differences were found (38% in Hispanics; 14.7% in Asians; 29.9% in Caucasians; 22.1% in Africans) (18). In another study performed in the city of Olmsted (USA) where 90% of the population consisted of Caucasians, the prevalence of GERD was found to be 18.1% (21). According to the data from other Western countries, the prevalence rates vary between 8.5% and 18% (22-26). In the cumulative evaluation of Western data, the rate of prevalence was 16.1% for GERD, 23% for heartburn and 23% for regurgitation.

As a result, while Turkey is similar to Western countries, with a prevalence rate of 23%, it has a regurgitation-dominant GERD profile similar to the Eastern countries. When we divide the world as the East and the West, some dissimilar countries are included in the same group (such as Iran-China, Germany-Brazil, etc.). Therefore, further studies must be performed and groups must be formed based on ethnic distributions. There are regional epidemiological differences even in the same country. Moreover, there is no term equivalent to heartburn and regurgitation in some languages. Questionnaire forms and definitions of reflux used in the studies were different. For this reason, although it seems that there were many epidemiological studies in the literature, it is quite difficult to obtain a single datum by collecting all of these studies. Data on the incidence of GERD globally, particularly from the Western countries, is available; but no study has been performed on this subject yet in our country.

THE EPIDEMIOLOGY OF GERD COMPLICATIONS IN TURKEY AND AROUND THE WORLD

Erosive Esophagitis and Barrett’s Esophagus

The most important GERD complications are erosive esophagitis (ERD), Barrett’s esophagus (BE), and esophageal adenocarcinoma. The Los Angeles, and more rarely, the Savary Miller, classification systems were used for ERD. The diagnosis of BE was established histopathologically in many studies. On the other hand, in some studies from Eastern countries, BE was diagnosed using only endoscopic images. Histopathological diagnosis was made through the existence of intestinal metaplasia and columnar epithelial cells in the tissue samples collected from dark pink mucosa extending into the esophagus.

With the use of proton pump inhibitors in the last 30 years, the rates of stricture and bleeding associated with GERD have significantly decreased.

In the literature, the epidemiology of ERD, BE, and esophageal adenocarcinoma was evaluated in two groups: in patients with the complaint of GERD and in healthy individuals without GERD symptoms. However, the studies in Turkey were conducted either on patients having the complaints of GERD or on patients having undergone esophagogastroduodenoscopy due to any reason (such as dyspepsia).

The diagnosis of BE was established according to histopathological results in all studies performed in Turkey, and the prevalence rates of both endoscopic and pathological diagnoses of BE were published. In a study conducted in 2004, 395 endoscopies performed due to dyspeptic complaints were reviewed. The rate of BE was revealed to be 7.4%, which is a high rate. This is because the biopsy was taken from the Z-line in all patients although they seemed normal (27). Therefore, cardiac intestinal metaplasia was also included in the BE group. In the same study, the rate of ERD was found to be 17%. In another

study performed in 2006, the reports of endoscopy that were performed for any reason were retrospectively examined and the diagnosis of BE was verified through pathology reports. As a result, the prevalence of BE was detected to be 0.4% and the rate of ERD was 8% (28). On the other hand, in a study on patients having only GERD symptoms, the rate of ERD was found as 17% and the rate of BE was found as 2% histopathologically proven (29). In the GORHEN study, conducted on patients with GERD symptoms, the rate of BE was 1.05% and the rate of ERD was 34% (5). Odemis et al. (30) used the Savary Miller classification system for ERD. They found the rate of ERD as 11.9% and the rate of BE as 1.2%. In all studies, the rates of mild ERD were significantly higher (Los Angeles A-B, Savary Miller 1-2).

In the studies conducted on patients without GERD or any other gastrointestinal complaints in Eastern countries (China and South Korea), ERD was 15.7% and 7.9% and BE was histopathologically 0.06% and 0.84%, respectively (31,32). Four similar studies were performed in the USA, Sweden, and Italy (33-36). In the USA, the studies on BE and ERD were performed with patients that applied for colonoscopy for colorectal carcinoma screening. In a study by Gerson et al. (33) from the USA, it is striking that the rate of BE was histopathologically found to be 25% and the authors attributed this high value to the fact that the group that underwent colorectal carcinoma screening had features causing a risk for BE (being Caucasian, over-weight, old, and male). Ronkainen et al. (35) studied a more homogeneous group and they found the rate of ERD as 15.5% and the rate of BE as 1.2% in individuals not having GERD symptoms.

In the studies performed on patients with GERD or any gastrointestinal system complaint in the countries to the east of Turkey, the prevalence of ERD was between 3.4% and 66.5% (37,38) and the histopathological prevalence of BE was between 0.3% and 7.3% (39-43). On the other hand, in a study conducted in Japan, the rate of patients that were endoscopically diagnosed with BE was reported to be 37.6%. However, a problem in this study arises from the fact that the authors defined the esophagogastric junction as the area where the esophageal palisade vessels ended (44).

In the studies performed on patients with GERD or any gastrointestinal system complaint in the countries to the west of Turkey, the prevalence of ERD varied from 10.2% to 50% (45,46). Moreover, in a study on patients having only dyspepsia in Brazil, the rate of ERD was found to be as low as 8.6% (47). The study reporting the lowest rate of histopathological BE diagnosis was conducted in Spain (0.08%) (48). The highest prevalence of BE was detected in the USA (14.1%) (49).

In summary, the prevalence rates of ERD and BE were higher in the Western countries. Most of the ERD diagnoses were in the mild group, both globally and in Turkey (93% in Turkey, 91.2% in the Eastern countries, and 85% in the Western countries).

BARRETT-RELATED ESOPHAGEAL ADENOCARCINOMA

Epidemiological data on Barrett's esophagus-related dysplasia and esophageal adenocarcinoma generally come from longitudinal studies on incidence. In Turkey, the rates of Barrett's esophagus-related dysplasia were revealed through cross-sectional studies performed by reviewing endoscopic results of patients with GERD or any upper gastrointestinal complaint. However, there was no data on esophageal adenocarcinoma associated with Barrett's esophagus. The rate of distal and proximal gastric cancers was investigated and esophageal adenocarcinoma was included in the proximal cancers group. In this study, a relative increase was observed in the rates of proximal gastric cancer and indirectly in the rates of esophageal adenocarcinoma compared to distal gastric cancers (50).

Considering the countries to the east of Turkey, adenocarcinoma of the cardia was detected at the rate of 0.25% in the evaluation of the data obtained by reviewing the reports of endoscopic examinations performed for any reason in China. Because they were cross-sectional studies, it is unclear whether adenocarcinoma developed in association with Barrett's esophagus or not (42). In two cross-sectional studies conducted in Western countries, the prevalence of esophageal adenocarcinoma was 0%-0.1% (51,52). The symptoms of GERD were observed in approximately 1/10 of the individuals in the first study.

According to the studies on the incidence of esophageal adenocarcinoma, the risk rates can be summarized as 61/100,000 patientyear in patients undergoing endoscopy for any reason in China (meta-analysis); 26/100,000 and 6/100,000 patientyear in patients with and without ERD respectively, in Denmark; 3.9/100,000 patientyear according to patient databases in Holland; and 3.8/1000 patientyear in patients undergoing reflux surgery and 5.4/1000 patient year in patients receiving medical GERD treatment in the USA. The group under the highest risk seems to be in the USA (53-56).

AN INCREASE IN THE FREQUENCY OF GERD AND BARRETT'S ESOPHAGUS AROUND THE WORLD

When the Western studies defining GERD as the occurrence of heartburn and/or regurgitation at least once a week were evaluated in two groups, as the studies before and after 1995, a statistically significant increase was observed in the prevalence of GERD. However, when the data was evaluated at the intervals of 1995-1999, 2000-2004, and 2005-2009, this statistical difference disappears. Moreover, there were only 3 epidemiological studies conducted before 1995 (57). Based on the patient databases in England, the incidence of Barrett's esophagus has increased from 0.11 to 0.24/1000 in men and from 0.06 to 0.11/1000 in women (58). There were also other studies demonstrating an increase in the incidence of Barrett's esophagus (48,55,59-62).

RECOMMENDATIONS

- A standardization is needed in epidemiological definitions (gastroesophageal reflux disease, heartburn, regurgitation) and validated questionnaires must be used in research.
- The prevalence of GERD in Turkey is higher than that in the Eastern countries, but similar to that in Western countries.
- There is a predisposition towards an increase in the prevalence of GERD in the world and more studies are needed to be conducted on this subject in our country.
- In Turkey, the frequency of regurgitation is higher than that of heartburn similar with eastern countries.
- There is no data on the incidence of GERD in our country.
- The frequency of erosive esophagitis in Turkey is similar to that in other Western countries. In our country, mild esophagitis is apparently more common.
- The prevalence of Barrett's esophagus is higher in Western society and it is increasing. In the Eastern societies, it is apparently seen at lower rates.
- The frequency of Barrett's esophagus is lower than that in Western countries, but similar to that in Eastern countries in Turkey.
- The frequency of Barrett-related dysplasia and adenocarcinoma is unknown in Turkey.

Conflict of Interest: No conflict of interest was declared by the author.

REFERENCES

1. Bor S, Mandiracioglu A, Kitapcioglu G, Caymaz-Bor C, Gilbert RJ. Gastroesophageal reflux disease in a low-income region in Turkey. *Am J Gastroenterol* 2005; 100: 759-65. [CrossRef]
2. Yonem O, Sivri B, Ozdemir L, Nadir I, Yuksel S, Uygun Y. Gastroesophageal reflux disease prevalence in the city of Sivas. *Turk J Gastroenterol* 2013; 24: 303-10. [CrossRef]
3. Mungan Z. Prevalence and demographic determinants of gastroesophageal reflux disease (GERD) in the Turkish general population: a population-based cross-sectional study. *Turk J Gastroenterol* 2012; 23: 323-32. [CrossRef]
4. Ülkü D. Bolu ili merkezinde GÖRH prevalansı. UGH, Antalya. 2012.
5. Bor S, Vardar R, Vardar E, Takmaz S, Mungan ZA. Endoscopic findings of gastroesophageal reflux disease in Turkey: Multicenter prospective study (Gorhen). *Gastroenterology* 2008; 134: 4(Suppl 1): A-600.
6. Bor S, Kitapcioglu G, Kasap E. Prevalence of gastroesophageal reflux disease in a country with a high occurrence of *Helicobacter pylori*. *World J Gastroenterol* 2017; ; 23: 525-32.
7. Wong WM, Lai KC, Lam KF, et al. Prevalence, clinical spectrum and health care utilization of gastro-oesophageal reflux disease in a Chinese population: a population-based study. *Aliment Pharmacol Ther* 2003; 18: 595-604. [CrossRef]
8. He J, Ma X, Zhao Y, et al. A population-based survey of the epidemiology of symptom-defined gastroesophageal reflux disease: the Systematic Investigation of Gastrointestinal Diseases in China. *BMC Gastroenterol* 2010; 10: 94. [CrossRef]

9. Chen M, Xiong L, Chen H, Xu A, He L, Hu P. Prevalence, risk factors and impact of gastroesophageal reflux disease symptoms: a population-based study in South China. *Scand J Gastroenterol* 2005; 40: 759-67. [\[CrossRef\]](#)
10. Miyamoto M, Haruma K, Kuwabara M, Nagano M, Okamoto T, Tanaka M. High incidence of newly-developed gastroesophageal reflux disease in the Japanese community: a 6-year follow-up study. *J Gastroenterol Hepatol* 2008; 23: 393-7. [\[CrossRef\]](#)
11. Mostaghni A, Mehrabani D, Khademolhosseini F, et al. Prevalence and risk factors of gastroesophageal reflux disease in Qashqai migrating nomads, southern Iran. *World J Gastroenterol* 2009; 15: 961-5. [\[CrossRef\]](#)
12. Nouraié M, Radmard AR, Zaer-Rezaii H, Razjouyan H, Nasserimoghaddam S, Malekzadeh R. Hygiene could affect GERD prevalence independently: a population-based study in Tehran. *Am J Gastroenterol* 2007; 102: 1353-60. [\[CrossRef\]](#)
13. Khoshbaten M. Gastro-esophageal reflux disease in northwestern Tabriz, Iran. *Indian J Gastroenterol* 2003; 22: 138-9.
14. Shaha M, Perveen I, Alamgir MJ, Masud MH, Rahman MH. Prevalence and risk factors for gastro-esophageal reflux disease in the North-Eastern part of Bangladesh. *Bangladesh Medical Research Council bulletin* 2012; 38: 108-13.
15. Bhatia SJ, Reddy DN, Ghoshal UC, et al. Epidemiology and symptom profile of gastroesophageal reflux in the Indian population: report of the Indian Society of Gastroenterology Task Force. *Indian J Gastroenterol* 2011; 30: 118-27. [\[CrossRef\]](#)
16. Ben Chaabane N, El Jeridi N, Ben Salem K, et al. Prevalence of gastroesophageal reflux in a Tunisian primary care population determined by patient interview. *Dis Esophagus* 2012; 25: 4-9. [\[CrossRef\]](#)
17. Moshkowitz M, Horowitz N, Halpern Z, Santo E. Gastroesophageal reflux disease symptoms: prevalence, sociodemographics and treatment patterns in the adult Israeli population. *World J Gastroenterol* 2011; 17: 1332-5. [\[CrossRef\]](#)
18. Yuen E, Romney M, Toner RW, et al. Prevalence, knowledge and care patterns for gastro-oesophageal reflux disease in United States minority populations. *Aliment Pharmacol Ther* 2010; 32: 645-54. [\[CrossRef\]](#)
19. Breckan RK, Paulssen EJ, Asfeldt AM, Mortensen L, Straume B, Florholmen J. The impact of body mass index and *Helicobacter pylori* infection on gastro-oesophageal reflux symptoms: a population-based study in Northern Norway. *Scand J Gastroenterol* 2009; 44: 1060-6. [\[CrossRef\]](#)
20. Ronkainen J, Aro P, Storskrubb T, et al. High prevalence of gastroesophageal reflux symptoms and esophagitis with or without symptoms in the general adult Swedish population: a Kalixanda study report. *Scand J Gastroenterol* 2005; 40: 275-85. [\[CrossRef\]](#)
21. Jung HK, Halder S, McNally M, et al. Overlap of gastro-oesophageal reflux disease and irritable bowel syndrome: prevalence and risk factors in the general population. *Aliment Pharmacol Ther* 2007; 26: 453-61. [\[CrossRef\]](#)
22. Rey E, Alvarez-Sanchez A, Rodriguez-Artalejo F, Moreno Elola-Olaso C, Almansa C, Diaz-Rubio M. Onset and disappearance rates of gastroesophageal reflux symptoms in the Spanish population, and their impact on quality of life. *Rev Esp Enferm Dig* 2009; 101: 477-82. [\[CrossRef\]](#)
23. Djarv T, Wikman A, Nordenstedt H, Johar A, Lagergren J, Lagergren P. Physical activity, obesity and gastroesophageal reflux disease in the general population. *World J Gastroenterol* 2012; 18: 3710-4. [\[CrossRef\]](#)
24. Lofdahl HE, Lane A, Lu Y, et al. Increased population prevalence of reflux and obesity in the United Kingdom compared with Sweden: a potential explanation for the difference in incidence of esophageal adenocarcinoma. *European J Gastroenterol Hepatol* 2011; 23: 128-32. [\[CrossRef\]](#)
25. Diaz-Rubio M, Moreno-Elola-Olaso C, Rey E, Locke GR 3rd, Rodriguez-Artalejo F. Symptoms of gastro-oesophageal reflux: prevalence, severity, duration and associated factors in a Spanish population. *Aliment Pharmacol Ther* 2004; 19: 95-105. [\[CrossRef\]](#)
26. Nocon M, Labenz J, Willich SN. Lifestyle factors and symptoms of gastro-oesophageal reflux -- a population-based study. *Aliment Pharmacol Ther* 2006; 23: 169-74. [\[CrossRef\]](#)
27. Toruner M, Soykan I, Ensari A, Kuzu I, Yurdaydin C, Ozden A. Barrett's esophagus: prevalence and its relationship with dyspeptic symptoms. *J Gastroenterol Hepatol* 2004; 19: 535-40. [\[CrossRef\]](#)
28. Yilmaz N, Tuncer K, Tuncyurek M, Ozutemiz O, Bor S. The prevalence of Barrett's esophagus and erosive esophagitis in a tertiary referral center in Turkey. *Turk J Gastroenterol* 2006; 17: 79-83.
29. Bayrakci B, Kasap E, Kitapcioglu G, Bor S. Low prevalence of erosive esophagitis and Barrett esophagus in a tertiary referral center in Turkey. *Turk J Gastroenterol* 2008; 19: 145-51.
30. Odemis B, Cicek B, Zengin NI, et al. Barrett's esophagus and endoscopically assessed esophagogastric junction integrity in 1000 consecutive Turkish patients undergoing endoscopy: a prospective study. *Dis Esophagus* 2009; 22: 649-55. [\[CrossRef\]](#)
31. Tseng PH, Lee YC, Chiu HM, et al. Prevalence and clinical characteristics of Barrett's esophagus in a Chinese general population. *J Clin Gastroenterol* 2008; 42: 1074-9. [\[CrossRef\]](#)
32. Park JJ, Kim JW, Kim HJ, et al. The prevalence of and risk factors for Barrett's esophagus in a Korean population: A nationwide multicenter prospective study. *J Clin Gastroenterol* 2009; 43: 907-14. [\[CrossRef\]](#)
33. Gerson LB, Shetler K, Triadafilopoulos G. Prevalence of Barrett's esophagus in asymptomatic individuals. *Gastroenterology* 2002; 123: 461-7. [\[CrossRef\]](#)
34. Rex DK, Cummings OW, Shaw M, et al. Screening for Barrett's esophagus in colonoscopy patients with and without heartburn. *Gastroenterology* 2003; 125: 1670-7. [\[CrossRef\]](#)
35. Ronkainen J, Aro P, Storskrubb T, et al. Prevalence of Barrett's esophagus in the general population: an endoscopic study. *Gastroenterology* 2005; 129: 1825-31. [\[CrossRef\]](#)
36. Zagari RM, Fuccio L, Wallander MA, et al. Gastro-oesophageal reflux symptoms, oesophagitis and Barrett's oesophagus in the general population: the Loiano-Monghidoro study. *Gut* 2008; 57: 1354-9. [\[CrossRef\]](#)
37. Xiong LS, Cui Y, Wang JP, et al. Prevalence and risk factors of Barrett's esophagus in patients undergoing endoscopy for upper gastrointestinal symptoms. *J Dig Dis* 2010; 11: 83-7. [\[CrossRef\]](#)
38. Bafandeh Y, Esmaili H, Aharizad S. Endoscopic and histologic findings in Iranian patients with heartburn. *Indian J Gastroenterol* 2005; 24: 236-8.
39. Lee JI, Park H, Jung HY, Rhee PL, Song CW, Choi MG. Prevalence of Barrett's esophagus in an urban Korean population: a multicenter study. *J Gastroenterol* 2003; 38: 23-7. [\[CrossRef\]](#)
40. Fouad YM, Makhlof MM, Tawfik HM, el-Amin H, Ghany WA, el-Khayat HR. Barrett's esophagus: prevalence and risk factors in patients with chronic GERD in Upper Egypt. *World J Gastroenterol* 2009; 15: 3511-5. [\[CrossRef\]](#)
41. Zhang RG, Wang CS, Gao CF. Prevalence and pathogenesis of Barrett's esophagus in Luoyang, China. *Asian Pac J Cancer Prev* 2012; 13: 2185-91. [\[CrossRef\]](#)

42. Zhang J, Chen XL, Wang KM, Guo XD, Zuo AL, Gong J. Barrett's esophagus and its correlation with gastroesophageal reflux in Chinese. *World J Gastroenterol* 2004; 10: 1065-8. [\[CrossRef\]](#)
43. Gadour MO, Ayoola EA. Barrett's oesophagus and oesophageal cancer in Saudi Arabia. *Tropical gastroenterology*. 1999; 20: 111-5.
44. Okita K, Amano Y, Takahashi Y, et al. Barrett's esophagus in Japanese patients: its prevalence, form, and elongation. *J Gastroenterol* 2008; 43: 928-34. [\[CrossRef\]](#)
45. Sikkema M, Looman CW, Steyerberg EW, et al. Predictors for neoplastic progression in patients with Barrett's Esophagus: a prospective cohort study. *Am J Gastroenterol* 2011; 106: 1231-8. [\[CrossRef\]](#)
46. Labenz J, Nocon M, Lind T, et al. Prospective follow-up data from the ProGERD study suggest that GERD is not a categorical disease. *Am J Gastroenterol* 2006; 101: 2457-62. [\[CrossRef\]](#)
47. Freitas MC, Moretzsohn LD, Coelho LG. Prevalence of Barrett's esophagus in individuals without typical symptoms of gastroesophageal reflux disease. *Arq Gastroenterol* 2008; 45: 46-9. [\[CrossRef\]](#)
48. Alcedo J, Ferrandez A, Arenas J, et al. Trends in Barrett's esophagus diagnosis in Southern Europe: implications for surveillance. *Dis Esophagus* 2009; 22: 239-48. [\[CrossRef\]](#)
49. Balasubramanian G, Singh M, Gupta N, et al. Prevalence and predictors of columnar lined esophagus in gastroesophageal reflux disease (GERD) patients undergoing upper endoscopy. *Am J Gastroenterol* 2012; 107: 1655-61. [\[CrossRef\]](#)
50. Bor S, Vardar R, Ormeci N, et al. Prevalence patterns of gastric cancers in Turkey: model of a developing country with high occurrence of *Helicobacter pylori*. *J Gastroenterol Hepatol* 2007; 22: 2242-5. [\[CrossRef\]](#)
51. Fan X, Snyder N. Prevalence of Barrett's esophagus in patients with or without GERD symptoms: role of race, age, and gender. *Dig Dis Sci* 2009; 54: 572-7. [\[CrossRef\]](#)
52. Lam KD, Phan JT, Garcia RT, et al. Low proportion of Barrett's esophagus in Asian Americans. *Am J Gastroenterol* 2008; 103: 1625-30. [\[CrossRef\]](#)
53. Chen X, Zhu LR, Hou XH. The characteristics of Barrett's esophagus: an analysis of 4120 cases in China 2009; 22: 348-53.
54. Lassen A, Hallas J, de Muckadell OB. Esophagitis: incidence and risk of esophageal adenocarcinoma—a population-based cohort study. *Am J Gastroenterol* 2006; 101: 1193-9. [\[CrossRef\]](#)
55. van Soest EM, Dieleman JP, Siersema PD, Sturkenboom MC, Kuipers EJ. Increasing incidence of Barrett's oesophagus in the general population. *Gut* 2005; 54: 1062-6. [\[CrossRef\]](#)
56. Corey KE, Schmitz SM, Shaheen NJ. Does a surgical antireflux procedure decrease the incidence of esophageal adenocarcinoma in Barrett's esophagus? A meta-analysis. *Am J Gastroenterol* 2003; 98: 2390-4. [\[CrossRef\]](#)
57. El-Serag HB, Sweet S, Winchester CC, Dent J. Update on the epidemiology of gastro-oesophageal reflux disease: a systematic review. *Gut* 2014; 63: 871-80. [\[CrossRef\]](#)
58. Alexandropoulou K, van Vlymen J, Reid F, Poullis A, Kang JY. Temporal trends of Barrett's oesophagus and gastro-oesophageal reflux and related oesophageal cancer over a 10-year period in England and Wales and associated proton pump inhibitor and H2RA prescriptions: a GPRD study. *Eur J Gastroenterol Hepatol* 2013; 25: 15-21. [\[CrossRef\]](#)
59. Post PN, Siersema PD, Van Dekken H. Rising incidence of clinically evident Barrett's oesophagus in The Netherlands: a nation-wide registry of pathology reports. *Scand J Gastroenterol* 2007; 42: 17-22. [\[CrossRef\]](#)
60. Hirschler D, Borovicka J, Neuweiler J, et al. Increased detection rates of Barrett's oesophagus without rise in incidence of oesophageal adenocarcinoma. *Swiss Med Wkly* 2003; 133: 507-14.
61. Kendall BJ, Whiteman DC. Temporal changes in the endoscopic frequency of new cases of Barrett's esophagus in an Australian health region. *Am J Gastroenterol* 2006; 101: 1178-82. [\[CrossRef\]](#)
62. Irani S, Parkman HP, Thomas R, Krevsky B, Fisher RS, Axelrod P. Increased Barrett's esophagus for the decade between 1991 and 2000 at a single university medical center. *Dig Dis Sci* 2005; 50: 2141-6. [\[CrossRef\]](#)