

The prevalence of *helicobacter pylori* among dyspeptic patients in an earthquake-stricken area

Burak Suvak,^I Ahmet Cumhuri Dulger,^{I*} Ozlem Suvak,^{II} Enver Aytemiz,^{III} Ozgur Kemik^{IV}

^IYuzuncu Yil University, Medical School, Gastroenterology Department, Van, Turkey. ^{II}Kecioren Family Medicine Center, Ankara, Turkey. ^{III}Yuzuncu Yil University, Medical School, Internal Medicine Department, Van, Turkey. ^{IV}Yuzuncu Yil University, Medical School, Department of General Surgery, Van, Turkey.

OBJECTIVES: *Helicobacter pylori* is a gram-negative, spiral-shaped, urease-producing bacterium with multiple unipolar flagella. Humans are a major reservoir for *H. pylori*; however, there are no data on the prevalence of *H. pylori* among dyspeptic patients who have experienced natural disasters. Therefore, the aim of this study was to examine the prevalence of *H. pylori* in dyspeptic patients who survived a recent natural disaster and to compare the data between the pre-disaster and post-disaster periods.

METHODS: Between December 2011 and February 2012 (~ one month following an earthquake), 209 dyspeptic patients who underwent gastroscopy were included in the study. For microorganism identification, gastric biopsy materials from the 209 disaster survivors with dyspeptic complaints were tested for urease activity in a medium containing urea and a pH indicator. The obtained results were compared with pre-disaster data from dyspeptic patients in the same city during the corresponding period of the previous year. Furthermore, the current *H. pylori* prevalence was evaluated among 139 dyspeptic patients between January 2014 and May 2014.

RESULTS: We found a significantly higher prevalence of *H. pylori* in disaster survivors with dyspepsia compared with dyspeptic patients in the pre-disaster period ($p < 0.005$). Interestingly, the current *H. pylori* prevalence was found to be significantly higher than the prevalence in both the disaster and pre-disaster periods ($p < 0.005$).

CONCLUSION: These results suggest that a recent earthquake could contribute to the development of *H. pylori* infection in subjects who live in the disaster-stricken area. These data also highlight the exceptionally high *H. pylori* prevalence in dyspeptic patients. Regional variations require further analyses.

KEYWORDS: *Helicobacter pylori*; Earthquake; Van City.

Suvak B, Dulger AC, Suvak O, Aytemiz E, Kemik O. The prevalence of *helicobacter pylori* among dyspeptic patients in an earthquake-stricken area. Clinics. 2015;70(1):69-72.

Received for publication on September 19, 2014; First review completed on August 29, 2014; Accepted for publication on November 12, 2014

E-mail: acdulger@gmail.com

*corresponding author

INTRODUCTION

Since it was first isolated from gastric mucosa in 1990, *Helicobacter pylori* has been reported to be the cause of a variety of gastrointestinal (GI) diseases, including dyspeptic ulcers and gastric cancer. The vast majority of cases are the result of the ingestion of *H. pylori*-infected foods. Nonetheless, person-to-person transmission is currently considered to be the main route of contagiousness *H. pylori* infection and the proposed routes are mainly oral-oral and fecal-oral (1). The prevalence of *H. pylori* infection is higher in developing countries than in developed countries, mostly due to a lack of

safe drinking water and a lack of basic hygiene; this high prevalence may also be due to poor diet and overcrowded living conditions. Turkey reportedly has a high prevalence of *H. pylori* infection as well (2). Although there may be geographical differences in prevalence, the majority of patients with *H. pylori* infection have been found to live under poor hygienic conditions, including poor urban infrastructure. It is generally accepted that this infection is mainly prevalent among lower social classes as well as in poor countries, likely due to the favorable circumstances for contagion between persons living under overcrowded and unhygienic conditions. Relatively socially deprived populations may also harbor *H. pylori* infection (3). Natural disasters are one of the most common causes of social turmoil, particularly in the developing world. Disaster-related conditions may also be associated with poor hygienic conditions, leading to dyspeptic complaints. Indeed, a strong relationship between gastric disorders and disasters has recently been reported. In addition, a number of previous studies have suggested an association between GI disorders and natural disasters (4). A large-scale Japanese study that explored

This is an Open Access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<http://creativecommons.org/licenses/by-nc/3.0/>) which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

No potential conflict of interest was reported.

DOI: 10.6061/clinics/2015(01)12



whether earthquakes affect gastric disorders revealed that earthquake-related conditions not only triggered but also exacerbated gastric ulcers, particularly in the elderly (5). In developing countries, a lack of hygienic conditions and overcrowded living conditions may also be two of the main risk factors for developing *H. pylori* infection (6).

On October 23, 2011, a 7.2-magnitude earthquake killed more than 1,000 people in the eastern Anatolian city of Van; this was one of Turkey's worst natural disasters. More than 60,000 residents of the city lived in make-shift houses and containers under unfavorable climatic conditions (7). Furthermore, people in the disaster-stricken areas faced many health problems, mostly due to overcrowding in temporary, make-shift dwellings and other unfavorable accommodations. Van city's socioeconomic situation, which has further deteriorated due to a series of earthquakes of great magnitude, has also facilitated and contributed to a higher prevalence of such conditions and these types of areas have been considered to yield useful data for epidemiological studies on *H. pylori* infection.

Therefore, we conducted a prospective study to evaluate the effects of the recent earthquake on the frequency of *H. pylori* in dyspeptic patients who live in the disaster-affected area.

MATERIALS AND METHODS

In total, 209 dyspeptic patients (100 female and 109 male, aged 18-88 years) who experienced the recent disaster were evaluated at our clinic from December 2011 to February 2012. According to the most recent consensus committee, or Rome III, dyspepsia was defined as the presence of any bothersome symptom, postprandial fullness, early satiation, epigastric pain, or epigastric burning, with no evidence of structural disease that is likely to explain the symptoms. The criteria had to be fulfilled for the last three months, with symptom onset at least 6 months prior to diagnosis. The symptoms and their rates are shown in the Table 1. The study subjects were recruited from the residents of Van city, where, together with its environs, a recent earthquake caused massive devastation (Figure 1). Patients using antibiotics or anti-ulcer drugs, four weeks before initial admission were excluded from the study. All the patients provided informed consent to participate in the study. Esophagogastroscopy with antral biopsy was performed for each patient. The gastric biopsy samples were tested for urease activity using a commercial, rapid *H. pylori* test (GI Supply®, Camp Hill, PA, USA), which includes a urea-containing medium and a pH indicator. Medical data were obtained from 97 dyspeptic patients (57 women and 40 men,



Figure 1 - Map of the region.

aged 18-75 years) who underwent GI endoscopy before the earthquake. Between January 2014 and May 2014, 139 dyspeptic patients (60 female, mean age 48 ± 4 years) were also selected in the same region to evaluate the current status of *H. pylori* infection. Antral biopsies obtained from the endoscopic evaluation of patients who were examined before the disaster were assessed for *H. pylori* by the same method. *H. pylori* positivity was defined as positivity in the rapid urease test (RUT).

Statistical analysis: Comparisons between three groups were performed using the Mann-Whitney U-test. The differences were considered statistically significant at $p < 0.05$. Calculations were performed using conventional software (SPSS 12 for Windows).

RESULTS

The mean age was 45.96 ± 1.61 in the pre-disaster group and 48.49 ± 1.97 in the disaster group. *H. pylori* infection was observed in 118 of 209 (56.5%) disaster survivors with dyspepsia. In the pre-disaster group, *H. pylori* infection was found in 40 of 97 (41.2%) patients. We found significantly more frequent *H. pylori* infection in disaster survivors with dyspepsia compared with the pre-disaster data obtained from hospital records ($p = 0.02$). In the group of subjects who experienced the disaster, there were 112 (80.6%) patients with *H. pylori* infection. There was a statistically significant difference between the current *H. pylori* status of the dyspeptic patients and that of the disaster and pre-disaster groups ($p < 0.005$). However, there was no gender difference among the groups ($p > 0.05$). The data for *H. pylori* status are shown in Figure 2.

DISCUSSION

Our study clearly demonstrates a statistically significant association between the recent earthquake and the prevalence of *H. pylori* infection. Furthermore, this is the first study demonstrating higher rates of *H. pylori* infection due to and exacerbated by an earthquake. The results also show that the prevalence of *H. pylori* infection in dyspeptic patients who experienced the recent Van earthquake was as high as 57%.

Dyspepsia is characterized by the presence of postprandial fullness, early satiation, epigastric pain, and epigastric

Table 1 - Symptoms and their frequency.

Symptom*	Pre-disaster n (%)	Disaster n (%)	Post-disaster n (%)
Bothersome symptom	10 (6.2%)	55 (15%)	15 (7.5%)
Postprandial fullness	20 (12.4%)	60 (16.5%)	37 (18.5%)
Early satiation	32 (19.7%)	72 (19.7%)	42 (21%)
Epigastric pain	50 (30.9%)	85 (23.3%)	65 (32.5%)
Epigastric burning	50 (30.9%)	92 (25.3%)	41 (20.5%)

*Certain patients reported more than one symptom according to the Rome III criteria.

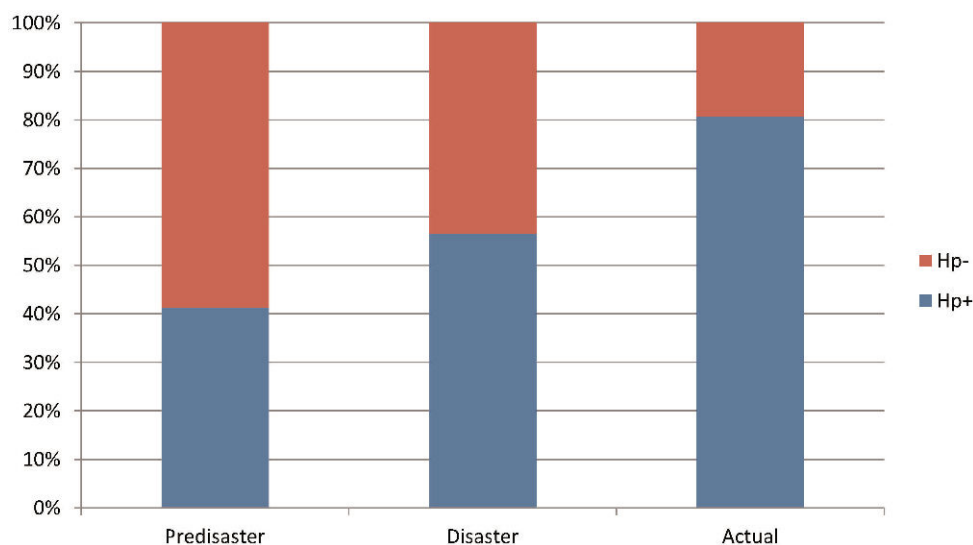


Figure 2 - *H.pylori* status among groups.

burning, and eradication of the bacterium has been demonstrated to be an effective and tolerable first-line treatment for dyspeptic patients infected with *H. pylori*. According to the American Gastroenterological Association, the most common organic causes in dyspeptic patients are peptic ulcer disease, gastroesophageal reflux disease and gastric cancer. However, non-ulcer dyspepsia is the most common cause on average and is defined as the presence of dyspepsia, with no evidence of organic disease, for at least 12 weeks (which do not have to be consecutive) within the last 12 months. Upper GI tract endoscopy is one of the most useful invasive methods for the exclusion of organic causes of dyspepsia (8).

Natural disasters have had a great impact on human history, killing numerous populations and devastating extensive residential areas. It has been shown that natural disasters, including earthquakes, contribute to the spread of water- and food-borne illnesses as well as GI infections (9). Natural disasters are also associated with a higher prevalence of dyspepsia (10), though the effect of earthquakes on the *H. pylori* profile of clinically apparent dyspepsia is not known. A limited number of epidemiological studies have revealed a very strong association between GI disorders and natural disasters (4). In a recent study from Iran, it was reported that approximately 20% to 40% of earthquake survivors suffered from GI complaints, including dyspepsia; however, the presence of *H. pylori* infection was not evaluated (10).

An increased rate of bleeding gastric ulcers, particularly in the elderly population has been reported in earthquake-stricken areas in Japan (5). Researchers have postulated that emotional stress is a contributing factor in the development of gastric ulcers in such cases (11). However, only a few studies have examined the prevalence of *H. pylori* in earthquake-stricken areas and all of these studied involved measurements of serum anti-*H. pylori* antibodies among patients with gastric ulcers. The researchers found that the seroprevalence of *H. pylori* in disaster-stricken areas was not different from that in less-devastated surrounding areas. In addition, they found a significant association between *H. pylori* infection and the development of gastric ulcers (4,12).

To establish a specific diagnosis, endoscopic biopsy samples from the antral mucosa should be obtained for the detection of *H. pylori* infection by RUT or histological testing (13). RUT is based on the detection of *H. pylori* urease activity and has a high sensitivity (85%) and specificity (>95%) in detecting *H. pylori* infection. As this test is considered to be cost-effective and suitable for endoscopy units (14), we used RUT to establish *H. pylori* infection. However, because our pathology unit was demolished by the earthquake, we were not able to examine the gastric specimens by light microscopy.

H. pylori infection is increasingly prevalent in the eastern part of Turkey, though there are few data on the modern epidemiology and the changes in the presentation of the disease, particularly its association with socioeconomic deprivation due to the recent Van city earthquake. Previous studies have also shown that the eastern part of Turkey has one of the highest rates of *H. pylori* infection. In the present study, the prevalence of *H. pylori* in infection gastric biopsy specimens from normal subjects in the Van region was also found to be as high as 36%. Low educational and socioeconomic statuses, consumption of smoked, salty, hot, and fatty foods, overconsumption of hot tea and well water, cigarette smoking, poor intake of fresh fruits and vegetables and poor hygienic conditions are probable key factors for the presence of *H. pylori* infection in the eastern part of Turkey (15,16). Mounting evidence indicates that disaster survivors are more likely to experience a lower health-related quality of life compared with their normal counterparts. In addition to the epidemiologic studies that have shown a strong link between poor hygienic conditions and GI infections, the effects of increased lower socioeconomic status during natural disasters also appear to have an impact on *H. pylori* infection in patients who live in disaster-stricken areas. Possible reasons include increased person-to-person transmission of *H. pylori* and a lack of hygienic conditions (17).

H. pylori infection is a topic of growing importance in developing countries, as a higher prevalence of infection has been described in disaster-stricken areas. Natural disasters, including earthquakes, have also been identified as a key



promoting factor for the spread of *H. pylori* infection, the production of CagA protein and the presence of hemorrhagic gastric ulcers (18).

In this study, the prevalence of *H. pylori* in dyspeptic patients seeking routine primary care was 80% in recent months, a huge difference between the disaster and current periods. This phenomenon may be linked to worsening socioeconomic conditions in our region in the post-disaster era. This gap needs to be investigated in further studies.

It can be concluded that *H. pylori* infection is prevalent in dyspeptic patients who live in disaster-hit areas. Our data also indicate that recent earthquake-related conditions may play an important role in the development of *H. pylori* infection. In addition, there is a close correlation between the recent earthquake and the presence of *H. pylori* infection. Although the mechanism for this phenomenon is presently unknown, it may be related to the devastating effects of the recent earthquake. Further characterization of disaster-related mechanisms might provide a broader application of novel strategies for preventing *H. pylori* infection.

AUTHOR CONTRIBUTIONS

Suvak B and Dulger AC were involved in developing the concept and design of the study. Dulger AC, Suvak O, Kemik O, Aytemiz E were involved in the implementation of the study, analysis of the data and manuscript writing. Suvak O was involved in the analysis of qualitative data and manuscript writing. Dulger AC and Suvak B were also involved in the collection and processing of data. All the authors read and approved the final manuscript.

REFERENCES

1. Delport W. The transmission of *Helicobacter pylori*: The effects of analysis method and study population on inference. *Best Pract Res Clin Gastroenterol*. 2007;21(2):215-36, <http://dx.doi.org/10.1016/j.bpg.2006.10.001>.
2. World Gastroenterology Organisation. World Gastroenterology Organisation Global Guideline: *Helicobacter pylori* in developing countries. *J Clin Gastroenterol*. 2011;45(5):383-8.
3. Woodward M, Morrison C, McColl K. An investigation into factors associated with *Helicobacter pylori* infection. *J Clin Epidemiol*. 2000;53(2):175-81, [http://dx.doi.org/10.1016/S0895-4356\(99\)00171-7](http://dx.doi.org/10.1016/S0895-4356(99)00171-7).
4. Kurokawa M, Nukina M, Nakanishi H, Miki K, Tomita S, Tohdo A. The relationship between hemorrhagic gastric ulcers often appearing among in the great Hanshin-Awaji earthquake sufferers and *Helicobacter pylori* infections. *Kansenshogaku Zasshi*. 1996;70(9):970-5, <http://dx.doi.org/10.11150/kansenshogakuzasshi1970.70.970>.
5. Aoyama N, Kinoshita Y, Fujimoto S, Himeno S, Todo A, Kasuga M, et al. Peptic ulcers after the Hanshin-Awaji earthquake: increased incidence of bleeding gastric ulcers. *Am J Gastroenterol*. 1998;93(3):311-6.
6. Dominici P, Bellentani S, Di Biase AR, Saccoccio G, Le Rose A, Masutti F, et al. Familial clustering of *Helicobacter pylori* infection: population based study. *BMJ*. 1999;319(7209):537-40, <http://dx.doi.org/10.1136/bmj.319.7209.537>.
7. Tolon M, Yazgan U, Ural DN, Goss KC. Overview of the critical disaster management challenges faced during Van 2011 earthquakes. *J Emerg Manag*. 2014;12(1):82-96.
8. Tack JL, Talley NJ, Camilleri M, Holtmann G, Hu P, Malagelada JR, et al. Functional gastroduodenal disorders. *Gastroenterology*. 2006;130(5):1466-79, <http://dx.doi.org/10.1053/j.gastro.2005.11.059>.
9. Ligon BL. Infectious Diseases that Pose Specific Challenges After Natural Disasters: A Review. *Semin Pediatr Infect Dis*. 2006;17(1):36-45, <http://dx.doi.org/10.1053/j.spid.2006.01.002>.
10. Honarkar Z, Baladast M, Khorram Z, Akhondi Sh, Antikchi M, Masoodi M, et al. An analysis of gastrointestinal symptoms in casualties of catastrophic earthquake of Bam, Iran. *SEMJ*. 2005;6:1-2.
11. Kanno T, Iijima K, Abe Y, Koike T, Shimada N, Hoshi T, et al. Peptic ulcers after the Great East Japan earthquake and tsunami: possible existence of psychosocial stressulcers in humans. *J Gastroenterol*. 2013;48(4):483-90, <http://dx.doi.org/10.1007/s00535-012-0681-1>.
12. Matsushima Y, Aoyama N, Fukuda H, Kinoshita Y, Todo A, Himeno S, et al. Gastric ulcer formation after the Hanshin-Awaji earthquake: a case study of *Helicobacter pylori* infection and stress-induced gastric ulcers. *Helicobacter*. 1999;4(2):94-9, <http://dx.doi.org/10.1046/j.1523-5378.1999.98290.x>.
13. Malfertheiner P, Chan FK, McColl KE. Peptic ulcer disease. *Lancet*. 2009;374(9699):1449-61, [http://dx.doi.org/10.1016/S0140-6736\(09\)60938-7](http://dx.doi.org/10.1016/S0140-6736(09)60938-7).
14. Onders RP. Detection methods of *Helicobacter pylori*: accuracy and costs. *Am Surg*. 1997;63(8):665-8.
15. Türkdoğan M, Kürşad, Alıcı Süleyman, İlhan Mahmut, Dilek Hüsnüye, Akman Emel, et al. *Helicobacter pylori* infection in gastric carcinoma in the Van region of Turkey. *Türk J Gastroenterol*. 1999;10(1):36-9.
16. Türkdoğan MK, Akman N, Tuncer I, Tuncer I, Dilek FH, et al. The high prevalence of esophageal and gastric cancers in Eastern Turkey. *Med Biol Environ*. 1998;26:79-84.
17. Waring SC, Brown BJ. The threat of communicable diseases following natural disasters: a public health response. *Disaster Manag Response*. 2005;3(2):41-7, <http://dx.doi.org/10.1016/j.dmr.2005.02.003>.
18. Yamanaka K, Miyatani H, Yoshida Y, Asabe S, Yoshida T, Nakano M. Hemorrhagic gastric and duodenal ulcers after the Great East Japan Earthquake Disaster. *World J Gastroenterol*. 2013;19(42):7426-32.