



A Study of Peptic Ulcer and Associated Risk Factors Among Patients Undergoing Upper GIT Endoscopy in Duhok, Kurdistan, Iraq

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Abstract

Background: Peptic ulcer disease (PUD) is a multifactorial disease whose global prevalence has reduced over the past years.

Objectives: This study aimed to determine PUD's prevalence and risk factors and the associated risk factors behind this disease.

Methods: A cross-sectional study was conducted in Duhok, Kurdistan, Iraq, between August 11 and December 17, 2022. A total of 218 patients (116 males and 102 females) who underwent upper gastrointestinal endoscopy by specialists at Azadi Teaching Hospital were interviewed face-to-face. The participants' ages ranged between 18 and 81. The upper GIT endoscopy was performed using a PENTAXI-scan 5000-type endoscopy.

Results: The prevalence of peptic ulcers among the participants was 30 (13.8%), 27 (12.4%) duodenal ulcers and 3 (1.4%) gastric ulcers. Abdominal pain was the primary complaint, reported by (39%) of the participants, followed by heartburn (28.4%) and vomiting (6.9%). Regarding the risk factors for developing peptic ulcer among the studied cases, NSAID use was the highest risk factor (25.7%), followed by spicy food (21.6%), smoking (20.6%), family history (17%), and *Helicobacter pylori* infection (12.4%). A significant association was observed between *H. pylori* ($P = 0.001$) and gender ($P = 0.001$) with peptic ulcer. Additionally, (5%) of the participants reported melena as a complication, while only (2.3%) reported hematemesis.

Conclusions: This study found that 13.8% of individuals undergoing upper gastrointestinal endoscopy exhibit peptic ulcers, with 12.4% manifesting duodenal ulcers and 1.4% exhibiting gastric ulcers. Identified risk factors for peptic ulcer disease include sex and *H. pylori* infection. Further research is crucial to thoroughly explore the impact of various factors on the development of PUD.

Keywords: Peptic Ulcer, Prevalence, Risk Factors, Upper GIT Endoscopy, Duhok City, Kurdistan Region, Iraq

1. Background

Peptic ulcers are erosions caused by discontinuation or disruption in the inner lining of the gastrointestinal tract (GIT) due to hyperacidity, which often occurs in the stomach with the first and second parts of the duodenum. However, peptic ulcers are not limited to these areas, and they can involve the lower esophagus, end of the duodenum, or jejunum (1). Peptic ulcers are responsible for the variable of symptoms, including nausea, vomiting, abdominal pain, weight loss, bleeding, and perforation, which may occur in the severe form of the disease (1).

Various factors contribute to the development of peptic ulcers, including *Helicobacter pylori* infection (2), nonsteroidal anti-inflammatory drug (NSAID) and oral steroid use, and tobacco consumption (3-5). *Helicobacter pylori* infection and NSAID account for most cases of peptic ulcer disease (2, 6, 7). Peptic ulcers, which involve gastric and duodenal ulcers, usually are not differentiated based on history alone, but epigastric pain is the most common symptom in both, characterized by a burning sensation, which occurs 2 - 3 hours after a meal in duodenal ulcer and shortly (15 - 30 minutes) after a meal in gastric ulcer. *Helicobacter pylori* is responsible for 70 - 90% of gastric ulcers and 90% of duodenal ulcers, which can colonize the gastric mucosa, cause inflammation, and impair the secreting of

bicarbonate to enhance the development of gastric acidity, which is more common in lower socioeconomic status and often acquires during childhood (8).

According to a prospective study in Taiwan, of patients who undergo upper gastro-intestinal (GI) endoscopy as a routine health assessment, nearly two-thirds of them who had peptic ulcer were asymptomatic (9). A detailed history of NSAID use and *H. pylori* infection is essential. Upper endoscopy could be used for the diagnosis of peptic ulcer disease, and it is necessary for those who have dyspepsia and alarm symptoms such as weight loss, age > 60 years, family history of gastrointestinal tract (GIT) malignancy, dysphagia, early satiety, GIT bleeding, vomiting, Iron deficiency anemia) endoscopy to take a biopsy for peptic ulcer allows to distinguish benign and malignant etiology (10).

The global prevalence of peptic ulcer disease has reduced over the past years, and these changes occur due to significant changes in the risk factors involving the reduction of *H. pylori* infection and the widespread use of NSAID drugs and aging of the patients (11). Peptic ulcers affect approximately four million people annually. Duodenal ulcers often appear between ages 30 and 50 years and are more common in men, but stomach ulcers occur after the age of 60 years (11). The prevalence of ulcers over the last decades has decreased. Generally, duodenal ulcers are more common than gastric ulcers (12).

2. Objectives

This cross-sectional study was conducted in Duhok, Kurdistan, Iraq, reporting the prevalence and risk factors associated with peptic ulcers among patients undergoing upper GIT endoscopy.

3. Methods

3.1. Design of Study and Measurement

This cross-sectional study was conducted in Duhok, Kurdistan, Iraq, between August 11 and December 17, 2022. A total of 218 patients (116 males and 102 females) who underwent upper gastrointestinal endoscopy by specialists at Azadi Teaching Hospital were interviewed face-to-face. The participants ranged from 18 to 81 years, with a mean age of 39 ± 12.9 . The procedure involved using a flexible endoscope called PENTAXI-scan 5000, inserted through the mouth down to the esophagus, stomach, and duodenum. A gel containing 2% lidocaine HCL was applied before inserting the endoscope tube. In some cases, intravenous sedation (midazolam injection)

was administered to alleviate anxiety and discomfort associated with the procedure. Patients fasted for 8 hours before the procedure, typically lasting 5 - 15 minutes.

The study questionnaire consisted of three parts:

(1) Socio-demographic characteristics, including age, sex, educational level, marital status, and occupational status.

(2) Questions about major symptoms of peptic ulcers, including abdominal pain, vomiting, heartburn, and regurgitation.

(3) Questions about dietary habits such as smoking, coffee drinking, NSAID use, spicy food, and alcohol consumption.

3.2. Inclusion/Exclusion Criteria

The inclusion criteria were to be over 18 years of age, residing in the Kurdistan region of Iraq, and willing to participate. Conversely, individuals under 18 or over 85, those using proton pump inhibitors (PPI), and those with incomplete or missing information on the questionnaires were excluded.

3.3. Rapid Urease Test

A biopsy was taken and immersed in rapid urease test slides during an upper gastrointestinal endoscopy. When *H. pylori* is present in the biopsy sample, the urease enzyme the bacteria produces breaks down urea in the test solution. This process increases pH, causing the color to change to pink or red, indicating a positive result for *H. pylori*.

3.4. Ethical Approval

The study protocol, design, procedure, and format of informed consent were approved by the ethics and scientific committee of the College of Medicine, University of Zakho, Kurdistan region of Iraq. Informed consent was obtained from all participants before starting sampling.

3.5. Statistical Analysis

All the data were analyzed using GraphPad Prism version 9.3.1 software. Descriptive statistics, including frequencies and percentages, were employed to examine respondents' characteristics and responses. The chi-Square test explored the association between peptic ulcers and associated factors. A P-value < 0.05 was considered statistically significant

4. Results

Table 1. Prevalence of Peptic Ulcer Among the Participants in Duhok Province, Kurdistan Region, Iraq

Peptic Ulcer	Frequency (%)
Yes (30, 13.8%)	
Gastric ulcer	3 (1.4)
Duodenal ulcer	27 (12.4)
No	188 (86.2)
Total	218 (100)

The prevalence of peptic ulcers among the participants was 30 (13.8%), including duodenal ulcers (12.4%) and gastric ulcers (1.4%) (Table 1).

The relationship between peptic ulcer and socio-demographic characteristics and dietary habits is presented in Table 2. There was only a significant association between *H. pylori* ($P = 0.001$) and gender ($P = 0.001$) with peptic ulcer. However, no significant associations were found between peptic ulcer and other dietary habits (Table 2).

Table 3 presents the characteristics of peptic ulcers among the studied cases. The primary complaint was abdominal pain (39%), followed by heartburn (28.4%), vomiting (6.9%), and loss of appetite (0.5%). Additionally, Table 3 displays the complications of peptic ulcers among the studied cases, with 5% reporting melena, while only 2.3% reported hematemesis.

5. Discussion

This cross-sectional study involved 218 participants aged between 18 and 81 years. The study aimed to measure the prevalence rate and risk factors of peptic ulcers and to determine the main etiologies behind this disease among patients undergoing upper GIT endoscopy. The prevalence of peptic ulcers was 13.8%, with rates of 1.4% and 12.4% observed for gastric and duodenal ulcers, respectively. The findings were lower than those of a study in Saudi Arabia, which reported a prevalence rate of 21.9% (gastric ulcer: 16.2%; duodenal ulcer: 6.2%) (13). Additionally, the present research results were lower than those of another study conducted in Basrah, Iraq (14), which reported a prevalence rate of 51.7% for patients with peptic ulcers. However, the findings were higher than those of European endoscopic epidemiologic studies, which reported prevalence rates ranging from 4.1% (gastric ulcer: 2.0%; duodenal ulcer: 2.1%) (15) to 6.2% (gastric ulcer: 2.3%; duodenal ulcer: 3.9%) (16). Another study conducted in Iran reported that the prevalence of peptic ulcers was 8.20%, with rates of 3.26% and 4.94% for gastric

and duodenal ulcers, respectively (17). The discrepancy between the prevalence of peptic ulcers in this study and findings from other research could be attributed to several factors, including study population, geographical variation, study design and study period, sample size, and diagnostic techniques.

A higher prevalence of peptic ulcer disease occurred among men in the present study, which agrees with the study conducted in Basrah, Iraq (14). The findings indicated that NSAID use has a non-significant risk for peptic ulcer disease (PUD), which contrasts with the studies conducted in Basrah, Iraq, and elsewhere that indicate a strong association between NSAID and PUD (14, 17).

A study in Zambia reported that among PUD cases, 40% confirmed the use of NSAID, 34% were cigarette smokers, and 57% were regular alcohol drinkers (18). In the Iranian study (17), results showed that *H. pylori* infection (2.1%), smoking (1.1%), and NSAID use (1.3%) were the main risk factors for gastric ulcers. In a meta-analysis investigating the risk factors for peptic ulcer disease, it was shown that cigarette smoking *H. pylori* infection is the main risk factors (19). A study in the KSA reported that the prevalence of *H. pylori* infection among patients with peptic ulcers was 63% (20). In addition, a study conducted in Singapore showed that *H. pylori* prevalence was 67.9% in gastric ulcers, 85.1% in duodenal ulcers, and 85.7% in combined gastric and duodenal ulcers (21). This study found a significant association between *H. pylori* infection and PUD. *H. pylori* infection is very common in Iraq (4, 22). Previous studies have shown that the prevalence of infection was around 80% (23). Studying the *H. pylori* antibiotic sensitivity pattern in our country showed a high resistance rate to commonly used antibiotics for the eradication of the microorganism (24-26). This increases the challenge and the burden of dealing with such an infection.

In this study, the percentage of alcoholic patients was very small, resulting in a non-significant value. Corticosteroid use also showed a non-significant risk of developing PUD, which aligns with a study conducted in

Table 2. Socio-demographic Characters with Risk Factors and Their Relationship to the Development of Peptic Ulcer

Variables	Peptic Ulcer No. (%)		Total (N = 218)	P-Value
	Yes (n = 30)	No (n = 188)		
Gender				0.001
Male	26 (22.4)	90 (77.6)	116	
Female	4 (3.9)	98 (96.1)	102	
Age group (y)				0.77
18 - 25	4 (11.1)	32 (88.9)	36	
26 - 35	9 (14.8)	52 (85.2)	61	
36 - 45	5 (10.63)	42 (89.36)	47	
46 - 55	9 (18.75)	39 (81.25)	48	
> 55	3 (11.53)	23 (88.5)	26	
Marital status				0.62
Single	7 (15.9)	37 (84.1)	44	
Married	23 (13.2)	151 (86.8)	174	
Residence				0.42
Urban	27 (14.8)	156 (85.2)	183	
Rural	3 (9)	32 (91.4)	35	
Level of education				0.65
Uneducated	1 (9)	10 (90.9)	11	
Primary school	4 (10)	36 (90)	40	
Middle school	7 (16.7)	35 (83.3)	42	
High school	11 (17.5)	52 (82.5)	63	
University	6 (10.7)	53 (89.8)	59	
Post graduated	1 (33.3)	2 (66.6)	3	
Smoking				0.14
Yes	3 (6.7)	42 (93.3)	45	
No	27 (15.6)	146 (84.4)	173	
NSAID use				0.36
Yes	10 (17.9)	46 (82.1)	56	
No	20 (12.3)	142 (87.7)	162	
Iron use				0.37
Yes	5 (19.2)	21 (80.8)	26	
No	25 (13)	167 (87)	192	
Corticosteroid use				0.71
Yes	1 (6.7)	14 (93.3)	15	
No	29 (14.3)	174 (85.7)	203	
Previous peptic ulcer				0.99
Yes	2 (13.3)	13 (86.7)	15	
No	28 (13.8)	175 (86.2)	203	
Family history				0.61
Yes	6 (16.2)	31 (83.8)	37	
No	24 (13.3)	157 (86.7)	181	
H. pylori				0.001
Yes	15 (55.6)	12 (44.4)	27	
No	15 (7.9)	176 (92.1)	191	
Body Mass Index				0.32
< 25	17 (11.6)	129 (88.3)	146	
25 - 30	10 (16.7)	50 (83.3)	60	
> 30	3 (25)	9 (75)	12	
Coffee consumption				0.21
Yes	1 (4.2)	23 (95.8)	24	
No	29 (14.9)	165 (85.1)	194	
Spicy food				0.14
Yes	3 (6.4)	44 (93.6)	47	
No	27 (15.8)	144 (84.2)	171	

Basrah (14). However, another study at Konkuk University Medical Center in Korea demonstrated a strong association between alcohol drinking and PUD (27). In this study, oral iron supplementation had a non-significant effect on developing peptic ulcers. This contrasts with a study conducted in Basrah, which indicated a significant risk for PUD development (14). This study's most common complication of peptic ulcers was melena (5%), followed by hematemesis (2.3%). A Saudi study on adolescents and children found that

hematemesis and melena occurred in (13%) and (8%), respectively (28).

5.1. Conclusions

In conclusion, this study revealed that approximately 13.8% of individuals undergoing upper gastrointestinal endoscopy exhibit peptic ulcers, with 12.4% manifesting duodenal ulcers and 1.4% exhibiting gastric ulcers. Sex and *H. pylori* infection emerged as identified risk factors for peptic ulcer disease. The variability in associated risk

Table 3. Characteristics and Complication of Peptic Ulcer Among the Studied Participants

Characteristics	Frequency (%)
Signs and symptoms	
Abdominal pain	85 (39)
Heartburn	62 (28.4)
Vomiting	15 (6.9)
Regurgitation	2 (0.9)
Loss of appetite	1 (0.5)
Abdominal pain and heartburn	34 (15.6)
Abdominal pain and vomiting	12 (5.5)
Abdominal pain and regurgitation	7 (3.2)
Complications	
Hematemesis	5 (2.3)
Melena	11 (5)
Hematemesis and melena	1 (0.5)
No	201 (92.2)

factors with PUD may be attributed to the multifactorial nature of the inflammatory and ulcerative processes, influenced by genetic predisposition and environmental conditions. Further research is imperative to comprehensively investigate the impact of diverse factors on the development of PUD.

Footnotes

Authors' Contribution: Study concept and design: N. H. and I. N.; analysis and interpretation of data: L. D. and I. N.; drafting of the manuscript: L. D. and I. N.; critical revision of the manuscript for important intellectual content: I. N. and N. H.; statistical analysis: I. N. and N. H.

Conflict of Interests Statement: The authors declared that they have no conflict of interest.

Data Availability: The dataset presented in the study is available on request from the corresponding author during submission or after publication.

Ethical Approval: The study protocol, design and procedure and format of informed consent were approved by the ethics and scientific committee of the college of Medicine, University of Zakho, Kurdistan region of Iraq (code number: JUNE22/UOZE10).

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References

- Narayanan M, Reddy KM, Marsicano E. Peptic Ulcer Disease and Helicobacter pylori infection. *Mo Med.* 2018;**115**(3):219-24. [PubMed ID: 30228726]. [PubMed Central ID: PMC6140150].
- Al-Brefkani AMT, Naqid IA, Yahya NB, Hussein N. Seroprevalence and risk factors associated with Helicobacter pylori infection among children aged less than 18 years old in Duhok Province, Iraq: Prevalence and risk factors for H. pylori infection. *J Contemp Med Sci.* 2021;**7**(3):152-7. <https://doi.org/10.22317/jcms.v7i3.972>.
- Wallace JL. Prostaglandins, NSAIDs, and gastric mucosal protection: why doesn't the stomach digest itself? *Physiol Rev.* 2008;**88**(4):1547-65. [PubMed ID: 18923189]. <https://doi.org/10.1152/physrev.00004.2008>.
- Hussein NR. Helicobacter pylori and gastric cancer in the Middle East: a new enigma? *World J Gastroenterol.* 2010;**16**(26):3226-34. [PubMed ID: 20614477]. [PubMed Central ID: PMC2900713]. <https://doi.org/10.3748/wjg.v16.i26.3226>.
- Salih AM, Goreal A, Hussein NR, Abdullah SM, Hawrami K, Assafi M. The distribution of cagA and dupA genes in Helicobacter pylori strains in Kurdistan region, northern Iraq. *Ann Saudi Med.* 2013;**33**(3):290-3. [PubMed ID: 23793434]. [PubMed Central ID: PMC6078529]. <https://doi.org/10.5144/0256-4947.2013.290>.
- Naqid IA, Al-Brefkani AMT, Hussein NR. A study of prevalence and risk factors for Helicobacter pylori infection among Adult in Duhok Province, Kurdistan Region, Iraq. *Arch Razi Inst.* 2024;**79**(2):272-8. <https://doi.org/10.32592/ari.2024.79.2.272>.
- Hussein NR, Mohammadi M, Talebkhan Y, Doraghi M, Letley DP, Muhammad MK, et al. Differences in virulence markers between Helicobacter pylori strains from Iraq and those from Iran: potential importance of regional differences in H. pylori-associated disease. *J Clin Microbiol.* 2008;**46**(5):1774-9. [PubMed ID: 18353934]. [PubMed Central ID: PMC2395113]. <https://doi.org/10.1128/jcm.01737-07>.
- Lu CL, Chang SS, Wang SS, Chang FY, Lee SD. Silent peptic ulcer disease: frequency, factors leading to "silence," and implications regarding the pathogenesis of visceral symptoms. *Gastrointest Endosc.* 2004;**60**(1):34-8. [PubMed ID: 15229422]. [https://doi.org/10.1016/s0016-5107\(04\)01311-2](https://doi.org/10.1016/s0016-5107(04)01311-2).
- Kavitt RT, Lipowska AM, Anyane-Yebo A, Gralnek IM. Diagnosis and Treatment of Peptic Ulcer Disease. *Am J Med.* 2019;**132**(4):447-56. [PubMed ID: 30611829]. <https://doi.org/10.1016/j.amjmed.2018.12.009>.
- Gisbert JP, Khorrami S, Carballo F, Calvet X, Gene E, Dominguez-Muñoz E. Meta-analysis: Helicobacter pylori eradication therapy vs.

- antisecretory non-eradication therapy for the prevention of recurrent bleeding from peptic ulcer. *Aliment Pharmacol Ther.* 2004;**19**(6):617-29. [PubMed ID: 15023164]. <https://doi.org/10.1111/j.1365-2036.2004.01898.x>.
11. Xie X, Ren K, Zhou Z, Dang C, Zhang H. The global, regional and national burden of peptic ulcer disease from 1990 to 2019: a population-based study. *BMC Gastroenterol.* 2022;**22**(1):58. [PubMed ID: 35144540]. [PubMed Central ID: PMC8832644]. <https://doi.org/10.1186/s12876-022-02130-2>.
 12. Sung JJ, Kuipers EJ, El-Serag HB. Systematic review: the global incidence and prevalence of peptic ulcer disease. *Aliment Pharmacol Ther.* 2009;**29**(9):938-46. [PubMed ID: 19220208]. <https://doi.org/10.1111/j.1365-2036.2009.03960.x>.
 13. Albaqawi ASB, El-Fetoh NMA, Alanazi RFA, Alanazi NSF, Alrayya SE, Alanazi ANM, et al. Profile of peptic ulcer disease and its risk factors in Arar, Northern Saudi Arabia. *Electron Physician.* 2017;**9**(11):5740-5. [PubMed ID: 29403613]. [PubMed Central ID: PMC5783122]. <https://doi.org/10.19082/5740>.
 14. Jaccob AA, Kadhim SN, Hassan AM, Mohsin AA, Muslim SK. Screening and Preponderance of Peptic Ulcer and its Contributing Risk Factors Among Basrah City Residents in Iraq. *Curr Drug Saf.* 2021;**16**(3):284-9. [PubMed ID: 33050865]. <https://doi.org/10.2174/1574886315666201013151640>.
 15. Aro P, Storskrubb T, Ronkainen J, Bolling-Sternevald E, Engstrand L, Vieth M, et al. Peptic ulcer disease in a general adult population: the Kalixanda study: a random population-based study. *Am J Epidemiol.* 2006;**163**(11):1025-34. [PubMed ID: 16554343]. <https://doi.org/10.1093/aje/kwj129>.
 16. Zagari RM, Law GR, Fuccio L, Pozzato P, Forman D, Bazzoli F. Dyspeptic symptoms and endoscopic findings in the community: the Loiano-Monghidoro study. *Am J Gastroenterol.* 2010;**105**(3):565-71. [PubMed ID: 20010920]. <https://doi.org/10.1038/ajg.2009.706>.
 17. Barazandeh F, Yazdanbod A, Pourfarzi F, Sepanlou SG, Derakhshan MH, Malekzadeh R. Epidemiology of peptic ulcer disease: endoscopic results of a systematic investigation in Iran. *Middle East J Dig Dis.* 2012;**4**(2):90-6. [PubMed ID: 24829640]. [PubMed Central ID: PMC4017685].
 18. Sondashi KJ, Odimba BFK, Kelly PJ. A Cross-sectional Study on Factors Associated With Perforated Peptic Ulcer Disease in Adults Presenting to UTH, Lusaka. *Med J Zambia.* 2011;**38**:15-22.
 19. Kurata JH, Nogawa AN. Meta-analysis of risk factors for peptic ulcer. Nonsteroidal antiinflammatory drugs, Helicobacter pylori, and smoking. *J Clin Gastroenterol.* 1997;**24**(1):2-17. [PubMed ID: 9013343]. <https://doi.org/10.1097/00004836-199701000-00002>.
 20. Karima TM, Bukhari SZ, Ghais MA, Fatani MI, Hussain WM. Prevalence of Helicobacter pylori infection in patients with peptic ulcer diseases. *Saudi Med J.* 2006;**27**(5):621-6. [PubMed ID: 16680249].
 21. Vu C, Ng YY. Prevalence of Helicobacter pylori in peptic ulcer disease in a Singapore hospital. *Singapore Med J.* 2000;**41**(10):478-81. [PubMed ID: 11281437].
 22. Hussein NR, Napaki SM, Atherton JC. A study of Helicobacter pylori-associated gastritis patterns in Iraq and their association with strain virulence. *Saudi J Gastroenterol.* 2009;**15**(2):125-7. [PubMed ID: 19568578]. [PubMed Central ID: PMC2702972]. <https://doi.org/10.4103/1319-3767.48971>.
 23. Hussein NR, Robinson K, Atherton JC. A study of age-specific Helicobacter pylori seropositivity rates in Iraq. *Helicobacter.* 2008;**13**(4):306-7. [PubMed ID: 18665942]. <https://doi.org/10.1111/j.1523-5378.2008.00618.x>.
 24. Hussein NR, Tunjel I, Majed HS, Yousif ST, Aswad SI, Assafi MS. Duodenal ulcer promoting gene 1 (dupA1) is associated with A2147G clarithromycin-resistance mutation but not interleukin-8 secretion from gastric mucosa in Iraqi patients. *New Microbes New Infect.* 2015;**6**:5-10. [PubMed ID: 26042186]. [PubMed Central ID: PMC4442689]. <https://doi.org/10.1016/j.nmni.2015.02.005>.
 25. Mohammed SA, Al-lela OQ, Hussein NR, Hajany RS, Alduhoky IS. Clarithromycin versus Levofloxacin-Based Regimens for Helicobacter Pylori Eradication in the Kurdistan Region of Iraq: A Randomized Clinical Trial. *Gastroenterolo Insights.* 2019;**10**(1):8256. [PubMed ID: doi:10.4081/gi.2019.8256].
 26. Saeed A, Odeesh O, Abdulhafith K, Hussein N. Antimicrobial Resistance Profile of Helicobacter pylori Clinical Isolates in Duhok City, Kurdistan Region/Iraq. *IOSR J Dent Med Sci.* 2014;**13**:2279-861. <https://doi.org/10.9790/0853-13125104107>.
 27. Lee SP, Sung IK, Kim JH, Lee SY, Park HS, Shim CS. Risk Factors for the Presence of Symptoms in Peptic Ulcer Disease. *Clin Endosc.* 2017;**50**(6):578-84. [PubMed ID: 28008163]. [PubMed Central ID: PMC5719912]. <https://doi.org/10.5946/ce.2016.129>.
 28. El Mouzan MI, Abdullah AM. Peptic ulcer disease in children and adolescents. *J Trop Pediatr.* 2004;**50**(6):328-30. [PubMed ID: 15537716]. <https://doi.org/10.1093/tropej/50.6.328>.