

# Analysis of gastroscopy results among healthy people undergoing a medical checkup: A retrospective study

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## Research article

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# Abstract

## Background

The association of upper gastrointestinal diseases with sex, age and *Helicobacter pylori* infection in asymptomatic healthy people is unclear. The aim of this study was to retrospectively determine the associations of upper gastrointestinal disease in asymptomatic healthy people with sex, age and *H. pylori* infection.

## Methods

A retrospective study was conducted on 2923 patients from a health examination center in Xiangya Hospital between September 2015 and September 2019. Data on sex, age, *H. pylori* infection and gastroscopy results were collected.

## Results

Among 2923 asymptomatic patients who underwent gastroscopy, 2911 patients (99.59%) had abnormal results. The top three results were chronic gastritis, peptic ulcer, and duodenitis. Inflammation of the gastric mucosa in chronic gastritis was more severe in the *H. pylori*-positive group. The incidence of peptic ulcer decreased with increasing age and was higher in males, patients aged < 30 years and *H. pylori*-positive patients. The incidence of polyps was higher in females than in males, and the incidence in individuals aged  $\geq 60$  years was higher than that in those aged < 60 years.

## Conclusion

The incidence of upper gastrointestinal diseases is high in asymptomatic healthy people undergoing a check-up and is associated with sex, age and *H. pylori* infection. Gastroscopy should be considered part of a routine health check.

## Background

The physical examination in the outpatient setting is a valuable tool. Even in settings where there is a lack of evidence, such as the annual physical examination of the asymptomatic adult, the physical examination is beneficial for the physician-patient relationship. When a patient has specific symptoms, the physical examination can help narrow down or, in many cases, establish a diagnosis<sup>[1]</sup>. Physical examination is an important feature of healthcare encounters and is considered a key aspect of diagnosis and treatment planning<sup>[2]</sup>. In an annual physical examination, imaging and laboratory tests are easily available, including gastroscopy.

Gastroscopy enables physicians to visualize a variety of upper gastrointestinal lesions, particularly small lesions<sup>[3]</sup>. Employing gastroscopy is essential for the diagnosis of gastric and upper gastrointestinal diseases. As the pace of modern people's life continues to accelerate, the pressures from work, family and even society are constantly increasing. People find it difficult to maintain good eating patterns, and the phenomenon of overeating is common; as a result, the incidence of upper gastrointestinal tract disease is also increasing. People who suffer from upper digestive tract diseases tend to be younger, and this population pays more attention to their health. Therefore, screening for upper gastrointestinal diseases has become a regular part of the medical examination. In the context of routine physical examinations, it is possible to screen for upper gastrointestinal diseases and to achieve early detection, early prevention, and early diagnosis.

In this study, we sought to clarify the incidence of various upper gastrointestinal diseases and to compare how they varied according to sex and age. Moreover, we also evaluated the association between the incidence of diseases and *Helicobacter pylori* (Hp) infection, as well as the association between pathological results and lesion location.

## Methods

### Subjects

This retrospective study included the results from healthy individuals age 14-78 years who underwent electronic gastroscopy at a health examination center at Xiangya Hospital between September 2015 and September 2019. There were 2923 subjects (1718 males and 1205 females). The average age was  $46.4 \pm 10.3$  years. Subjects were divided into five subgroups according to age (<30 years, 30-39 years, 40-49 years, 50-59 years, and  $\geq 60$  years). For this type of study, formal consent is not required.

### Inclusion criteria

The subjects who were referred for gastroscopy over a 4-year period (September 2015 to September 2019) and had complete basic information were eligible for the study. At the outset, we excluded patients with symptoms of the upper digestive tract, including acid reflux, belching, or heartburn and those who had a definite diagnosis of upper gastrointestinal disease.

### Data collection

The basic data collected at the endoscopy center included sex, age, detection of Hp and gastroscopy results. The pathological examination provided data according to gastroscopy diagnosis, biopsy site and pathological diagnosis.

## Diagnosis

Current practice guidelines advocate testing patients for Hp infection primarily using non-invasive methods, including the urea breath test (UBT), and invasive methods, including histology examination<sup>[4]</sup>. Hp tests in the study included UBT and histological examination of specimens obtained using gastroscopy. The pathologic diagnosis of chronic gastritis was in accordance with the second national consensus on chronic gastritis<sup>[5]</sup>. The criteria of histopathological grading are as follows, in mild cases, the lamina propria of the mucosa is infiltrated with few neutrophils; in moderate cases, more neutrophils are seen in the mucosal layer and can also be seen in between superficial epithelial cells, pit epithelial cells and glandular epithelial cells. In severe cases, more dense infiltration of neutrophils, or abscess on pits can be seen in addition to what is seen in moderate activity.

## Statistical analysis

SPSS 26.0 statistical software (SPSS, Inc., Chicago, IL, USA) was used to perform the statistical analyses. Measurement data are expressed as mean  $\pm$  SD, and comparisons between groups were performed using t-tests. Countable data were analyzed using the  $\chi^2$  test.  $p < 0.05$  indicated statistically significant differences.

## Results

Overall results for diseases detected in the upper digestive tract

Upper gastrointestinal diseases were not observed in 12 patients (0.41%; 4 males and 8 females). The remaining 2911 patients (99.59%) had upper gastrointestinal diseases (1714 males and 1197 females). There were 184 patients in the age group of < 30 years, 462 patients in the age group of 30-39 years, and 1100 patients in the 40-49 year age range. There were 816 patients aged 50-59 years, and 361 patients older than 60 years. A total of 976 Hp tests were completed and 354 cases were positive (36.27%).

Distribution of lesions detected in the upper digestive tract

Among 2923 patients who underwent gastroscopy, the five most common diseases were as follows (Table 1): Chronic gastritis (95.11%), peptic ulcers (17.45%), duodenitis (9.17%), esophagitis (8.96%), and polyps (7.42%). Raised lesions were examined in 70 cases (2.39%). Diseases such as gastric retention (0.44%), esophageal varices (0.24%) and ectopic pancreas (0.17%) were rare (Table 1).

## Analysis of factors related to diseases detected in the upper digestive tract

### Relationship between the diseases of the upper digestive tract and sex

#### *Relationship between chronic gastritis and sex*

Among 2780 cases of chronic gastritis, there were 1635 males and 1145 females (95.17% and 95.02% respectively) (Table 2). The occurrence of chronic gastritis was higher in males than in females, although the difference was not significant ( $\chi^2=0.03$ ,  $p=0.862$ ).

#### *Relationship between peptic ulcer and sex*

Among 510 cases of peptic ulcers, seven were esophageal ulcers and the remainder were gastric and duodenal ulcers. Peptic ulcers occurred in 376 males and 134 females (21.89% and 11.12% respectively) (Table 2). The occurrence of peptic ulcer in males was higher than in females ( $\chi^2=56.988$ ,  $p=0.000$ ).

#### *Relationship between polyps and sex*

Among 217 patients with polyps, there were 102 males and 115 females (5.94% and 9.54% respectively) (Table 2). The occurrence of polyps in females was higher than that of males ( $\chi^2=13.403$ ,  $p=0.000$ ).

### Relationship between diseases of the upper digestive tract and age

#### *Relationship between peptic ulcer and age*

A total of 510 patients with peptic ulcers were identified (Table 3); the occurrence of peptic ulcer gradually decreased with increasing age. We made independent comparisons between each age group (Table 3), and we adjusted  $\alpha$  to  $0.005$  ( $\alpha=2\alpha/k(k-1)$ ) according to the Bonferroni correction<sup>[6]</sup>. There were no significant differences between age groups ( $p>0.005$ ). The age groups were further divided into a age group of <30 years and one of  $\geq 30$  years (Table 3). The detection rates of these two groups were 24.46% and 16.98% respectively, with a statistically significant difference between these two groups ( $\chi^2=6.697$ ,  $p=0.012$ ). Peptic ulcers occurred more frequently in the age group <30 years than in people  $\geq 30$  years.

#### *Relationship between polyps and age*

There were 175 patients with polyps in the <60 year age group (6.83%) and 42 in the  $\geq 60$  years age group (11.63%) ( $\chi^2=10.624$ ,  $p=0.002$ ; Table 3). The detection rate of polyps was higher in the  $\geq 60$ -year age

group than in the <60-year age group. i over 60 years old is higher than that of group under 60 years old.

Relationship between diseases of the upper digestive tract and Hp infection

#### *Relationship between chronic gastritis and Hp*

Among the 2923 patients who underwent medical examinations, a total of 976 were tested for Hp infection. There were 306 cases of chronic gastritis and 48 cases of non-chronic gastritis in the Hp-positive group, with detection rates of 34.19% and 59.26%, respectively (Table 4). Positive Hp infection was only present in 34% of patients with chronic gastritis (statistically significant,  $\chi^2=17.545$ ,  $p=0.000$ ).

#### *Relationship between the extent of gastric mucosal inflammation and Hp in chronic gastritis*

The results of 346 gastric mucosal biopsies as follows: There were 26 cases of mild inflammation and 165 cases of moderate or severe inflammation in the Hp-positive group, with detection rates of 13.61% and 86.39%, respectively. There were 135 cases of mild inflammation and 20 cases of moderate or severe inflammation in the Hp-negative group (87.10% and 12.90%) (Table 4). There were significant differences between these two groups ( $\chi^2=185.708$ ,  $p=0.000$ ). The inflammation of gastric mucosa in chronic gastritis was more severe in the Hp-positive group than in the Hp-negative group.

#### *Relationship between the peptic ulcer and Hp infection*

A total of 976 patients underwent Hp examination. There were 176 Hp-positive and 117 Hp-negative cases with peptic ulcers, with detection rates of 49.72% and 18.81%, respectively (Table 4). More patients infected with *Hp* also had peptic ulcers (statistically significant,  $\chi^2=102.583$ ,  $p=0.000$ ).

#### *Relationship between the polyps and Hp infection*

A total of 152 patients with polyps underwent Hp examination and 28 patients were Hp positive (18.42%). A total of 824 patients without polyps underwent Hp examination and 326 patients were Hp positive (39.56%) (Table 4). The prevalence of *Hp* infection was higher in the patients in whom no polyps were detected (statistically significant,  $\chi^2=24.815$ ,  $p=0.000$ ).

#### *Relationship between the pathological types of polyps and Hp*

Pathological and Hp tests were performed in 147 patients with polyps. Because hyperplastic polyps and adenomatous polyps were detected only rarely, we compared the association between Hp infection and

glandular vs inflammatory polyps, with Hp-positive rates of 8.43% and 24.07%, respectively (Table 4). Patients who tested positive for *Hp* were more likely to develop inflammatory polyps than glandular polyps (statistically significant,  $\chi^2=9.326$ ,  $p=0.002$ ).

#### Relationship between pathological types of polyps and age

Glandular polyps were the most common pathological types of polyps present at all ages, followed by inflammatory polyps, and the adenomatous polyps were rare (Table 5).

#### Relationship between pathological types of polyps and distribution of lesions

We compared the pathological locations between the gastric fundus, gastric body, gastric antrum, and duodenum, and there were significant differences between these groups ( $\chi^2=44.188$ ,  $p=0.000$ ) according to Fisher precision testing (Table 6). The pathological types of polyps were associated with the distribution of polyp lesions. Glandular polyps were most prevalent in the gastric fundus and gastric body, while inflammatory polyps were most prevalent in the gastric antrum and duodenum.

## Discussion

We found that the incidence of upper gastrointestinal diseases is high in healthy asymptomatic people. This incidence was associated with sex, age, *Hp* infection. In addition,

the pathological results of polyps depended on the location of the lesion. These data suggest that gastroscopy should form part of a routine health check.

Gastroscopy plays a major clinical role in the diagnosis of gastric diseases. The detection and diagnosis of upper gastrointestinal diseases by gastroscopic intervention was the most routine procedure<sup>[7-8]</sup>. The development of endoscopic technology has led to an increase in the diagnostic rate of early gastric cancer. Several studies indicated a relationship between upper gastrointestinal diseases and associated factors in symptomatic patients, while the associations of upper gastrointestinal disease in asymptomatic healthy people with sex, age, and *Hp* infection remained unclear.

We found that chronic gastritis was the most common disease detected in healthy asymptomatic people undergoing a medical checkup, followed by peptic ulcer, duodenitis, esophagitis and polyps. Chronic gastritis, a chronic inflammatory condition of the gastric mucosa, was one of the most common findings of endoscopy in the general population of Eastern countries<sup>[9]</sup>. According to the classification and grading criteria of chronic gastritis proposed by the Chinese Society of Digestive Endoscopy<sup>[10]</sup>, chronic gastritis was classified as superficial gastritis, erosive gastritis, and atrophic gastritis according to endoscopic appearance. Each type of gastritis was further classified as mild, moderate, or severe

depending on the extent of severity. In the present study, we found that the positivity rate of Hp infection in the group of chronic gastritis was lower than that of patients without chronic gastritis. This may be because of the impact of environmental factors such as high-salt diet and smoking, as well as the effect of host genetic factors that could cause chronic gastritis in addition to Hp infection<sup>[11]</sup>. Another study demonstrated that the reason why some individuals developed more severe gastritis and progress to disease was multifactorial and included infection by more virulent strains of Hp<sup>[12]</sup>, this could explain our finding that inflammation of the gastric mucosa in chronic gastritis was more severe in the Hp-positive group than in the Hp-negative group.

Peptic ulcer disease is a source of significant morbidity and mortality worldwide. Approximately two-thirds of patients with peptic ulcer disease were asymptomatic<sup>[13]</sup>. A higher peptic ulcer disease incidence is associated with male sex, smoking, and chronic medical conditions<sup>[14-15]</sup>. In addition, Hp and NSAID use were the causes of the vast majority of peptic ulcers<sup>[16]</sup>. Peptic ulcer disease has also been found to be associated with increasing age<sup>[17]</sup>. This is consistent with the results of our study in that more patients infected with *Hp* also had peptic ulcers and the occurrence of peptic ulcer in males was higher than in females. Nevertheless, we found that the detection rate of peptic ulcer decreased with age, and peptic ulcers occurred more frequently in the age group < 30 years than for people ≥ 30 years. This suggests that the association between peptic ulcers and age is different in asymptomatic healthy people and patients. The detection rate of peptic ulcers decreased with age and people in the age group of < 30 years were suggested to pay more attention to peptic ulcers than people in the other age groups.

Upper gastrointestinal polyps are mainly composed of gastric polyps(GPs), and GPs are considered to be precancerous stages of gastric cancer. The clinical manifestations of GPs were nonspecific, with the majority of polyps occasionally found during gastroscopy examination<sup>[18]</sup>. It has been reported that the incidence of GPs was higher in females than in males, with a ratio of 1:1.8 to 2.5<sup>[19-20]</sup>. There was a difference in the incidence of GPs between males and females. It has been reported that duodenal fluid reflux, which may cause gastric mucosal hyperplasia and polyps, was more common in females<sup>[21]</sup>. However, further studies are needed to determine whether genetic factors, hormones, and other factors might cause differences in GPs between the sexes. These results corroborate those in our study in that the detection rate of polyps in females was higher than that of males, with a ratio of 1:1.6.

It has been reported that the detection rate of GPs increased with increasing age<sup>[22]</sup>. All types of GPs showed a clear-cut age-dependent rise<sup>[23]</sup>. Our data also suggest that the detection rate of polyps in the age group of ≥ 60 years was higher than that in the age group of < 60 years. The results of our study suggest that older patients are more likely to suffer from polyps. These findings suggest that the elderly population should be targeted for screening for upper gastrointestinal polyps.

Zheng E et al.<sup>[21]</sup> reported a retrospective study of 2125 patients diagnosed with GP between January 2004 and December 2013, and found that GPs in the gastric antrum and gastric body were the most prevalent in both sexes. Similarly, inflammatory polyps and hyperplastic polyps were the most prevalent

in both sexes. However, our results were different because the prevalence of common types of GPs is not the same across different regions of the world. Fundic gland polyps were the most common type in western countries<sup>[24]</sup>, while the hyperplastic polyps were more common in Turkey<sup>[25]</sup>. In the present study, the most common type of GPs were the glandular polyps followed by inflammatory polyps. Our study also suggests that glandular polyps account for a significant proportion of those found in the gastric fundus and gastric body, and inflammatory polyps account for a significant proportion of those found in the gastric antrum and duodenum. Understanding the occurrence of the various types of GPs is important<sup>[26-27]</sup> because gastric adenomatous polyps have a high malignancy potential, and a small number of hyperplastic polyps are cancerous.

A previous study reported that Hp infection was significantly less frequent in all subjects with GPs than in controls<sup>[22]</sup>. This is consistent with our finding that the positivity rate of Hp in the polyp group was lower than that in the non-polyp group. In another study, it was found that Hp infection rates in patients with inflammatory and hyperplastic GPs were significantly higher than in patients with fundic gland polyps and adenomatous polyps, suggesting that Hp infection was associated with the formation of inflammatory and hyperplastic polyps. These results were compatible with those of our study, where Hp infection was more prevalent in the inflammatory polyps group than in the glandular polyps group.

There were some limitations to this study. First, the cross-sectional nature of the survey does not support the assumption of a causal relationship. Second, this study was not a randomized controlled study; because it was a retrospective study using clinical data, complete information was not available on certain baseline data such as weight, BMI, and serum pepsinogen ratio of the participants. Third, the current study only included healthy people who were referred for a gastroscopy; people without medical insurance or younger people might be less likely to undergo gastroscopy. Fourth, not all cases had both a completed pathological examination and the Hp tests.

## Conclusion

In summary, since the results of the present study showed the incidence of upper gastrointestinal diseases is high in healthy people undergoing a check-up, and indicated an association of upper gastrointestinal disease in healthy people with sex, age and Hp infection. We suggest that gastroscopy be part of a routine medical examination for healthy subjects. Periodic physical examination is an effective way to monitor and manage physical health.

## List Of Abbreviations

Hp *Helicobacter pylori*

UBT urea breath test

GPs gastric polyps

## Declarations

- Ethics approval and consent to participate: For this type of study, formal consent is not required.
- Consent for publication: not applicable
- Availability of data and materials: not applicable
- Competing interests: none
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- Authors' contributions
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## Tables

Table 1 Distribution of lesions detected in the upper gastrointestinal tract

Upper gastrointestinal tract diseases	Number of cases detected (%)
Chronic gastritis	2780 (95.11)
Peptic ulcers	510 (17.45)
Duodenitis	268 (9.17)
Esophagitis	262 (8.96)
Polyps	217 (7.42)
Raised lesions to be examined	70 (2.39)
Esophageal papilloma	36 (1.23)
Gastric retention	13 (0.44)
Esophageal leiomyoma	11 (0.38)
Upper gastrointestinal diverticulum	10 (0.34)
Gastric cancer	9 (0.31)
Esophageal varices	7 (0.24)
Ectopic pancreas	5 (0.17)
Maga-esophagus	4 (0.14)
Esophageal cancer	3 (0.10)
Gastric lymphoma	2 (0.07)
Heterosis of esophagus and stomach mucosa	1 (0.03)
Glycogen acanthosis	1 (0.03)

Table 2 Relationship between diseases of the upper digestive tract and sex

Gender	Gastroscopy results		Total	$\chi^2$	P-value
	Chronic gastritis	Non-chronic gastritis			
Male	1635	83	1718		
Female	1145	60	1205	0.03	0.862
Total	2780	143	2923		

  

Gender	Gastroscopy results		Total	$\chi^2$	P-value
	Peptic ulcer	Non-peptic ulcer			
Male	376	1342	1718		
Female	134	1071	1205	56.988	0.000
Total	510	2413	2923		

  

Gender	Gastroscopy results		Total	$\chi^2$	P value
	polyps	Non-polyps			
Male	102	1616	1718		
Female	115	1090	1205	13.403	0.000
Total	217	2706	2923		

Table 3 Relationship between diseases of the upper digestive tract and age

Age	Gastroscopy results		$\chi^2$	P value
	polyps	Non-polyps		
Age	Gastroscopy results		$\chi^2$	P value
	peptic ulcer	non-peptic ulcer		
30-39 years old	89	373	1.053	0.310
40-49 years old	188	912		
30-39 years old	89	373	1.510	0.221
50-59 years old	135	681		
30-39 years old	89	373	2.981	0.094
60 years old and above	53	308		
40-49 years old	188	912	0.100	0.758
50-59 years old	135	681		
40-49 years old	188	912	1.146	0.290
60 years old and above	53	308		
50-59 years old	135	681	0.647	0.639
60 years old and above	53	308		
Under 30 years old	45	139	6.697	0.012
30 years old and above	465	2274		
Under 30 years old	19	165	2.406	0.144
30 years old and above	198	2541		
Under 40 years old	57	589	2.364	0.126
40 years old and above	160	2117		
Under 50 years old	137	1609	1.127	0.314
50 years old and above	80	1097		
Under 60 years old	175	2387	10.624	0.002
60 years old and above	42	319		

Table 4 Relationship between diseases of the upper digestive tract and *Helicobacter pylori* infection

<i>H. pylori</i> test results	Gastroscopy results		Total	$\chi^2$	P-value
	Chronic gastritis	Non-Chronic gastritis			
positive	306	48	354		
negative	589	33	622	17.545	0.000
Total	895	81	976		

  

<i>H. pylori</i> test results	The extent of gastric mucosal inflammation		Total	$\chi^2$	P-value
	Mild	Moderate severe			
positive	26	165	191		
negative	135	20	155	185.708	0.000
Total	161	185	346		

  

<i>H. pylori</i> test results	Gastroscopy results		Total	$\chi^2$	P-value
	Peptic ulcer	non-peptic ulcer			
Positive	176	178	354		
Negative	117	505	622	102.583	0.000
Total	293	683	976		

  

<i>H. pylori</i> test results	Gastroscopy results		Total	$\chi^2$	P-value
	polyps	Non-polyps			
Positive	28	326	354		
Negative	124	498	622	24.815	0.000
Total	152	824	976		

  

<i>H. pylori</i> test results	Pathological types of polyps		Total	$\chi^2$	P-value
	Glandular polyps	Inflammatory			
		polyps			
Positive	7	13	20		
Negative	76	41	117	9.326	0.002
Total	83	54	137		

Table 5 Relationship between pathological types of polyps and age

	Glandular polyps	Inflammatory polyps	Hyperplastic polyps	Adenomatous	Total
Under 30 years old	11	6	1	0	18
30-39 years old	15	13	2	0	30
40-49 years old	30	23	1	0	54
50-59 years old	15	5	3	1	24
60 years old and above	12	7	1	1	21
Total	83	54	8	2	147

Table 6 The correlation between pathological types of polyps and the distribution of lesions

	Glandular polyps	Inflammatory polyps	Hyperplastic polyps	Adenomatous	Total	P-value
Gastric fundus	37	18	2	1	58	
Gastric body	42	9	4	0	55	
Gastric antrum	2	13	1	0	16	0.000
Duodenum	2	14	1	1	18	
Total	83	54	8	2	147	