Clinical comparative analysis of various duodenal diseases in different age groups

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ABSTRACT

Background/Aims: *This study aimed to investigate the differences and relevance of various common duodenal diseases in different parts in the aspects of age, gender, helicobacter pylori (H. pylori) infection, application of nonsteroidal anti-inflammatory drugs (NSAIDs), smoking, or alcohol consumption.*

Materials and Methods: *The medical records of various duodenal diseases were collected and tested for difference using the χ^2 test or the Fisher exact probability method.*

Results: *1) The proportions of duodenal ulcer (DU), inflammation, and duodenal bulb diseases in the adult group (A) (47.98%, 36.70%, and 66.63%) were higher than those in the elderly group (E) (41.38%, 29.83%, and 56.82%), but the proportions of duodenal diverticulum (DD) and tumor diseases in the descending and ascending segments (2.95%, 1.43%, 9.14%, and 0.14%) were lower than those in group E (13.73%, 3.69%, 19.41%, and 0.76%) ($p<0.001$). 2) The positive rate of H. pylori (63.64%) in the duodenal bulb diseases was higher than that in the bulb-descending segment (53.75%), but the application rate of NSAIDs (16.44%) in the duodenal bulb-descending diseases was lower than that in the descending segment (24.81%) ($p<0.001$).*

Conclusion: *1) DU, inflammation, and duodenal bulb diseases are common in adults, but DD and tumor diseases in the descending and ascending segments are more common in the elderly. 2) Compared with the duodenal bulb-descending diseases, the application of NSAIDs has greater impact on the diseases in the descending segment, and the rate of H. pylori infection is higher in duodenal bulb diseases.*

Keywords: *Duodenal diseases, nonsteroidal anti-inflammatory drugs, H. pylori, analysis*

INTRODUCTION

The duodenum is a unique peritoneal interpositional organ, and as a small segment of intestinal canal occupying the peritoneal cavity and the extraperitoneal cavity, it is adjacent to many internal organs, including the pancreas, stomach, abdominal aorta, and liver. It starts from the pylorus and ends at the Treitz ligament, exhibiting the shape of "C" with a length of 25 cm, a width of 2.5 cm, and a thickness of 2 mm, which can be divided into 4 segments: duodenal bulb, descending segment, horizontal segment, and ascending segment (1). The duodenal anatomy is special; therefore, duodenal diseases are complex, including ulcer, inflammation, diverticulum, tumor, polyp, and hookworm disease. Duodenal ulcer (DU) is a common disease with high incidence rate worldwide (2), which is different in different regions (3-5), with an average incidence rate of about 10% (3, 4). DU usually occurs in young men with high gastric acid secretion (6, 7), and *Helicobacter pylori* (*H. pylori*) infection is the most important cause of DU (8-11). In addition to *H. pylori*, the application of nonsteroidal anti-inflammatory drugs (NSAIDs) can also induce peptic ulcer (11-15). Furthermore, smoking and excessive alcohol consumption are also the causes of DU and its complications (16). However, there is still lack of reports on the differences of various duodenal diseases in different parts in the aspects of age, gender, *H. pylori* infection, application of NSAIDs, smoking, or alcohol consumption. Therefore, this study retrospectively analyzed the clinical data of 3,190 patients with duodenal diseases to investigate whether there are significant differences in common duodenal diseases in different parts and to provide certain basis for clinical diagnosis and prevention of duodenal diseases.

MATERIALS AND METHODS

General information

From January 2012 to January 2017, a total of 3,190 patients were admitted to the Affiliated Hospital of Guizhou Medical University, the Affiliated Baiyun Hospital of Guizhou Medical University, and the Affiliated Tumor Hospital of Guizhou Medical University and de-

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finitively diagnosed with duodenal diseases by gastroscopy, pathological biopsy (gastroscopy/surgery), and/or computed tomography (CT). Inclusion criteria were patients aging 14 years or older and patients definitively diagnosed with duodenal diseases by gastroscopy, pathological biopsy (gastroscopy/surgery), and/or CT. Exclusion criteria were: 1) patients aging <14 years; 2) patients aging 14 years or older, who had not undergone gastroscopy, pathological biopsy (gastroscopy/surgery), and/or CT; 3) patients complicated with severe heart, liver, lung, kidney, blood, or endocrine system diseases; 4) patients who had undergone total duodenal resection; and 5) pregnant patients.

This study was conducted in accordance with the declaration of Helsinki. This study was conducted with approval from the Ethics Committee of Guizhou Medical University [2018 (No.144)]. Written informed consent was obtained from all the participants.

Clinical information

The medical records of the patients were collected, including the general data (age and gender), *H. pylori* results, medication history of NSAIDs, personal history (smoking or alcohol consumption), and other clinical data.

Statistical Analysis

Statistical analysis was performed by the Statistical Packages for the Social Sciences (SPSS) program, version 20.0 (IBM Corp; Armonk, NY, USA). The count data were sorted by n (percentage). The χ^2 test or the Fisher exact probability method was used to test the difference of rate and composition ratio, with the test level α=0.05; the intergroup pairwise comparison of composition ratio and rate used the adjusted-test level method ($\alpha' = 1 - \sqrt[m]{1-a}$).

MAIN POINTS

- *The proportions of DU and inflammation in group A was higher than those in group E, but the proportions of duodenal diverticulum (DD) and tumor were lower than those in group E.*
- *The proportion of duodenal bulb diseases was higher in group A than group E, but the proportions of diseases in the descending and ascending segments were significantly lower in group A than group E.*
- *The positive rate of H. pylori in the duodenal bulb diseases was higher than the bulb-descending segment, and the difference was statistically significant*
- *The application rate of NSAIDs in the duodenal bulb-descending diseases was statistically lower than the descending segment.*

RESULTS

Age

Among the 3,190 patients, the youngest was 14 years old, and the oldest was 92 years old, with the median age of 53 years. The 3,190 patients with duodenal diseases were divided into the youth group (Y, 14 years ≤age<18 years; 33 patients), the adult group (A, 18 years age≥65years; 2,101 patients), and the elderly group (E, age[3] 65 years; 1,056 patients).

Age and disease types

The 3,190 cases of duodenal diseases were classified, depending on disease types, into ulcer, inflammation, diverticulum, bulging lesion, polyp, cyst, tumor, lymphatic vessel dilatation, hookworm disease, and others. Among them, group Y included 17 cases of ulcer, 10 cases of inflammation, 1 case of diverticulum, and 5 other cases (1 case of intestinal fistula, 2 cases of mucosal roughness, 1 case of deformity, and 1 case of trauma); group A included 1,008 cases of ulcer, 771 cases of inflammation, 62 cases of diverticulum, 70 cases of bulging lesion, 97 cases of polyp, 6 cases of cyst, 30 cases of tumor (13 cases of cancer, 11 cases of Brunner's cysts, 3 cases of stromal tumor, 2 cases of lymphoma, and 1 case of lipoma), 10 cases of lymphatic vessel dilatation, 6 cases of hookworm disease, and 41 other cases (7 cases of stenosis, 6 cases of nipple swelling, 16 cases of deformity, 3 cases of place occupancy, 2 cases of external pressure, 1 case of ectopic pancreas, 2 cases of intestinal rupture, 1 case of intestinal dilatation, and 3 cases of hemorrhage); and group E included 437 cases of ulcer, 315 cases of inflammation, 145 cases of diverticulum, 36 cases of bulging lesion, 33 cases of polyp, 10 cases of cyst, 39 cases of tumors (19 cases of cancer, 15 cases of Brunner's cysts, and 5 cases of lipoma), 9 cases of lymphatic vessel dilatation, 2 cases of hookworm disease, and 30 other cases (9 cases of stenosis, 7 cases of malformation, 6 cases of space occupancy, 4 cases of mucosal swelling, 1 case of macula lutea, 1 case of hemorrhage, 1 case of intestinal deposition, and 1 case of nipple swelling).

Ulcer accounted for the largest proportion in all the age groups, but the distribution of different types of duodenal diseases among different age groups showing the difference is statistically significant (χ^2=179.950 and p<0.001; Table 1). There was no statistically significant difference in the distribution of duodenal diseases between groups Y and A, but the difference in the distribution between groups Y and E as well as between groups A and E was statistically significant (p<0.017; Table 1).

Table 1. Comparison of composition ratios (%) of various types of duodenal diseases among different age groups.

Disease type	Y A E	Age group		χ^2	p
Ulcer	17 (51.52)	1,008 (47.98)	437 (41.38)		
Diverticulum	1 (3.03)	62 (2.95)	145 (13.73)		
Inflammation	10 (30.30)	771 (36.70)	315 (29.83)		
Hookworm	0 (0.00)	6 (0.29)	2 (0.19)		
Polyp	0 (0.00)	97 (4.62)	33 (3.13)		
Cyst	0 (0.00)	6 (0.29)	10 (0.95)	179.950	0.000*
Bulging lesion	0 (0.00)	70 (3.33)	36 (3.41)		
Lymphatic vessel dilatation	0 (0.00)	10 (0.48)	9 (0.85)		
Tumor	0 (0.00)	30 (1.43)	39 (3.69)		
Others	5 (15.15)	41 (1.95)	30 (2.84)		
Sum	33 (100.00)	2,101 (100.00)	1,056 (100.00)		

*p<0.05; the test level α′ of the pairwise comparison ratio is 0.017 (p=0.028 for group Y vs. group A; p=0.014 for group Y vs. group E; and p<0.001 for group A vs. group E).

Table 2. Pairwise comparison of composition ratios (%) of various types of duodenal diseases among different age groups.

Type	Age group Y E		χ^2	P	Age group A E		χ^2	p
Ulcer	17 (51.52)	437 (41.38)	1.330	0.249	1,008 (47.98)	437 (41.38)	12.313	0.001*
Diverticulum	1 (3.03)	145 (13.73)	–	0.113	62 (2.95)	145 (13.73)	133.296	0.001*
Inflammation	10 (30.30)	315 (29.83)	0.003	0.953	771 (36.70)	315 (29.83)	14.687	0.001*
Hookworm	0 (0.00)	2 (0.19)	–	1.000	6 (0.29)	2 (0.19)	0.257	0.612
Polyp	0 (0.00)	33 (3.13)	–	0.621	97 (4.62)	33 (3.13)	3.961	0.047
Cyst	0 (0.00)	10 (0.95)	–	1.000	6 (0.29)	10 (0.95)	6.097	0.014
Bulging lesion	0 (0.00)	36 (3.41)	–	0.623	70 (3.33)	36 (3.41)	0.013	0.909
Lymphatic vessel dilatation	0 (0.00)	9 (0.85)	–	1.000	10 (0.48)	9 (0.85)	1.664	0.197
Tumor	0 (0.00)	39 (3.69)	–	0.627	30 (1.43)	39 (3.69)	16.869	0.001*
Others	5 (15.15)	30 (2.84)	–	0.003	41 (1.95)	30 (2.84)	2.529	0.112
Sum	33 (100.00)	1,056 (100.00)			2,101 (100.00)	1,056 (100.00)		

"–" represents the Fisher's exact probability method; the test level α′ of the pairwise comparison ratio is 0.0011; *p<0.0011.

The proportions of DU and inflammation in group A (47.98% and 36.70%) was higher than those in group E (41.38% and 29.83%), but the proportions of duodenal diverticulum (DD) and tumor (2.95% and 1.43%) were lower than those in group E (13.73% and 3.69%), and the differences were statistically significant (p<0.001; Table 2).

Age and location

The 3,190 cases were divided, according to disease locations, into the bulb-descending segment group (BD, referring to the range of the lesion covering both the duodenal bulb and the descending segment), the duodenal bulb segment group (DB), the descending segment group (DS), the horizontal segment group (HS), and the ascending segment group (AS). Group Y included 10 cases in BD, 16 cases in DB, 6 cases in DS, 1 case in HS, and 0 case in AS. Group A included 498 cases in BD; 1,400 cases in DB; 192 cases in DS; 8 cases in HS; and 3 cases in AS. Group E included 228 cases in BD, 600 cases in DB, 205 cases in DS, 15 cases in HS, and 8 cases in AS.

The distributions of duodenal diseases in different parts were statistically different among different age

Table 3. Pairwise comparison of composition ratios (%) of various types of duodenal diseases among different age groups.

Age group	BD	DB	DS	HS	AS	Sum	χ^2	p
Y	10 (30.30)	16 (48.49)	6 (18.18)	1 (3.03)	0 (0.00)	33 (100.00)		
A	498 (23.70)	1,400 (66.64)	192 (9.14)	8 (0.38)	3 (0.14)	2,101 (100.00)	88.610	0.000*
E	228 (21.59)	600 (56.82)	205 (19.41)	15 (1.42)	8 (0.76)	1,056 (100.00)		

*p<0.05; the test level α' of the pairwise comparison ratio is 0.017 (p=0.138 for group Y vs. group A; p=0.673 for group Y vs. group E; and p<0.001 for group A vs. group E).
BD: the bulb-descending segment group; DB: the duodenal bulb segment group; DS: the descending segment group; HS: the horizontal segment group; AS: the ascending segment group.

Table 4. Pairwise comparison of composition ratios (%) of duodenal diseases in different parts between groups A and E.

Site	Age group A	E	χ^2	p
BD	498 (23.70)	228 (21.59)	1.770	0.183
DB	1,400 (66.63)	600 (56.82)	29.170	0.001*
DS	192 (9.14)	205 (19.41)	67.480	0.001*
HS	8 (0.38)	15 (1.42)	–	0.009
AS	3 (0.14)	8 (0.76)	10.504	0.001*
Sum	2,101 (100.00)	1,056 (100.00)		

"–" represents the Fisher's exact probability method; the test level α' of the pairwise comparison ratio is 0.0051 (*p<0.0051).
BD: the bulb-descending segment group; DB: the duodenal bulb segment group; DS: the descending segment group; HS: the horizontal segment group; AS: the ascending segment group.

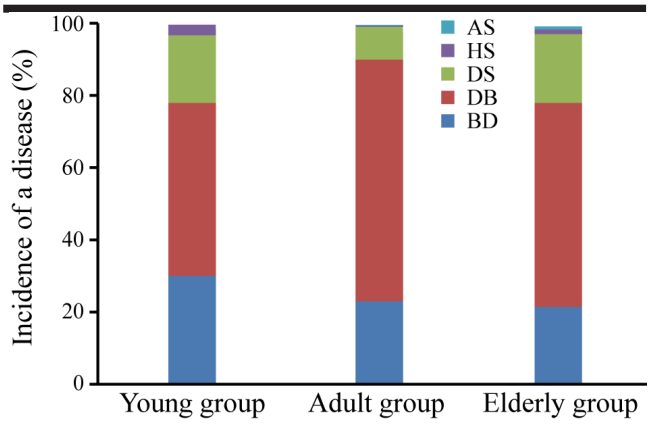

Figure 1. Percentages of duodenal diseases in different parts in different age groups.
BD: the bulb-descending segment group; DB: the duodenal bulb segment group; DS: the descending segment group; HS: the horizontal segment group; AS: the ascending segment group.

groups (χ^2=88.610 and p<0.001; Table 3). There was no statistically significant difference in the distributions of duodenal diseases in different parts between groups Y and A, or between groups Y and E, but the difference between groups A and E was statistically significant (p<0.017; Table 3).

Lesions in the duodenal bulb were more common in group A than group E, but those in the descending and ascending segments were more common in group E (Figure 1).

The proportion of duodenal bulb diseases was higher in group A (66.63%) than group E (56.82%), but the proportions of diseases in the descending and ascending segments were significantly lower in group A (9.14%, 0.14%) than group E (19.41%, 0.76%). (p<0.001; Table 4).

Gender

The 3,190 patients with duodenal diseases included 2,080 males (M) and 1,110 females (F). The proportions of duodenal diseases in different parts between male and female were statistically different (χ^2=10.375 and p=0.035; Table 5).

However, there was no statistical significance in the pairwise comparison of duodenal diseases in different parts between different genders.

Results of H. pylori infection

Among the 3,190 patients with duodenal diseases, 2,104 patients had undergone *H. pylori* test (1,282 patients with *H. pylori*-positive and 822 patients with *H. pylori*-negative). The positive rates of *H. pylori* in different duodenal parts were statistically different (χ^2=17.161 and p=0.002; Table 6). The positive rate of *H. pylori* (63.64%) in the duodenal bulb diseases was higher than that in the bulb-descending segment (53.65%), and the difference was statistically significant (p<0.001; Table 6).

History of NSAIDs application

Among the 3,190 cases, 656 cases had a history of NSAIDs and 2,534 cases had no history of NSAIDs. The application rates of NSAIDs in different duodenal parts were statistically different (χ^2=13.950 and p=0.007; Table 7). The application rate of NSAIDs in the duodenal bulb-descending diseases (16.44%) was statistical-

Table 5. Comparison of duodenal diseases in different parts between different genders.

Gender	BD	DB	DS	HS	AS	Sum	χ^2	p
M	498	1,324	239	13	6	2,080		
F	238	692	164	11	5	1,110	10.375	0.035*
M:F	2.09:1	1.91:1	1.46:1	1.18:1	1.2:1	1.88:1		

*p<0.05. BD: the bulb-descending segment group; DB: the duodenal bulb segment group; DS: the descending segment group; HS: the horizontal segment group; AS: the ascending segment group.

Table 6. Comparison of *H. pylori*-positive rates (%) of duodenal diseases in different parts.

H. pylori	BD	DB	DS	HS	AS	Sum	χ^2	p
Positive	258	882	133	8	1	1,282		
Negative	222	504	89	4	3	822	17.161	0.002*
Positive rate (%)	53.75	63.64	59.91	66.67	25.00	60.93		

*p<0.05; the test level α' of the pairwise comparison ratio is 0.0011 (p<0.001 for BD vs. DB; p=0.127 for BD vs. DS; p=0.560 for BD vs. HS; p=0.342 for BD vs. AS; p=0.285 for DB vs. DS; p=1.000 for DB vs. HS; p=0.141 for DB vs. AS; p=0.767 for DS vs. HS; p=0.307 for DS vs. AS; and p=0.262 for HS vs. AS).
BD: the bulb-descending segment group; DB: the duodenal bulb segment group; DS: the descending segment group; HS: the horizontal segment group; AS: the ascending segment group.

Table 7. Comparison of NSAIDs application rate (%) of duodenal diseases in different .

NSAIDs	*BD*	*DB*	*DS*	*HS*	*AS*	*Sum*	χ^2	*p*
Yes	121	430	100	4	1	656		
No	615	1,586	303	20	10	2,534	13.950	0.007*
Application rate (%)	16.44	21.33	24.81	16.67	9.09			

*p<0.05; the test level α' of the pairwise comparison ratio is 0.0011 (p=0.005 for BD vs. DB; p<0.001 for BD vs. DS; p=1.000 for BD vs. HS, p=1.000 for BD vs. AS, p=0.123 for DB vs. DS, p=0.579 for DB vs. HS, p=0.475 for DB vs. AS, p=0.366 for DS vs. HS; p=0.308 for DS vs. AS; and p=1.000 for HS vs. AS).
NSAIDs: nonsteroidal anti-inflammatory drugs; BD: the bulb-descending segment group; DB: the duodenal bulb segment group; DS: the descending segment group; HS: the horizontal segment group; AS: the ascending segment group.

Table 8. Comparison of smoking rates (%) of duodenal diseases in different parts.

Smoking history	BD	DB	DS	HS	AS	χ^2	p
Yes	350	968	163	10	3		
No	386	1,048	240	14	8	9.806	0.044*
Smoking rate (%)	47.55	48.02	40.45	41.67	27.27		

*p<0.05; the test level α' of the pairwise comparison ratio is 0.0011.
Among the 3,190 patients, 1,253 patients had a history of drinking, while 1,937 patients had no history of drinking. The drinking rates of duodenal diseases in different parts were different, but the differences were not statistically significant (χ^2=7.398, p=0.116).
BD: the bulb-descending segment group; DB: the duodenal bulb segment group; DS: the descending segment group; HS: the horizontal segment group; AS: the ascending segment group.

ly lower than that in the descending segment (24.81%; p<0.001; Table 7).

Smoking and alcohol consumption

Among the 3,190 patients, 1,696 patients had a history of smoking, and 1,494 patients had no history of smoking. The smoking rates of duodenal diseases in different parts were statistically different (χ^2=9.806 and p=0.044; Table 8). There was no statistically significant difference in the pairwise comparison of smoking rates (%) of duodenal diseases in different parts.

DISCUSSION

DU is a common disease with a high incidence rate (2), which is 6.57% in southeastern China (5), 5% in Malaysia (4), and 3.3% in Brazil (3). The average incidence rate is

about 10% (3, 4). The occurrence of DU is more in the duodenal bulb and usually in young men with high gastric acid secretion (6, 7). This study showed that ulcer was the most common type of duodenal diseases in all the age groups, and the most common site of ulcer was in the duodenal bulb; the proportions of DU and duodenal diseases in the duodenal bulb in group A were higher than those in group E, which was similar to other studies (2-4, 6, 7), but the impact of gender on duodenal diseases in different parts was not statistically different, which is consistent with the results of Archampong et al. (17). *H. pylori* is the most important cause of DU (8-11). At present, more than 50% of the world population is infected with *H. pylori* (18, 19), and there were high *H. pylori* infection rates in various age groups in this study. It has been reported that *H. pylori* infection mainly occurs in the duodenal bulb (20), and it is very rare below the descending segment. This study found that the positive rate of *H. pylori* in the duodenal bulb diseases was higher than that in the bulb-descending segment, which is consistent with previous studies (20). Therefore, totally eradicating *H. pylori* is important for the prevention and treatment of duodenal bulb ulcer in adults. In addition, the application of NSAIDs can also induce peptic ulcer (11-15), and this study showed that the application rate of NSAIDs in the duodenal bulb-descending diseases was lower than that in the descending segment, but only Zil-E-Ali et al. (14) reported the occurrence of NSAID-induced DU in the descending segment. In this regard, reducing or avoiding the use of NSAIDs may contribute to the prevention and treatment of DU in the descending segment in adults. Smoking and excessive alcohol consumption are also the causes of DU and its complications (16).

Duodenitis is a duodenal epithelial mucosal injury and mucosal inflammation, which accounts for 60% of the benign duodenal lesions (21) and is more common in young men (22). This study showed that the proportion of duodenal inflammation was higher in group A than that in group E, which is consistent with previous studies (22). *H. pylori* is a common cause of duodenitis; NSAIDs, smoking, and drinking can also induce duodenitis (16). However, this study showed no significant difference in the effects of smoking and alcohol consumption on duodenal diseases in different parts.

The incidence of DD lies in the second place of digestive tract diverticulosis and is only lower than the colon (1). The incidence rate of DD can range from 0.16% to 22% by different diagnostic methods (upper gastrointestinal angiography, CT, endoscopy, endoscopic retrograde cholangiopancreatography, and autopsy) (23). Most DD cases occur in middle-aged women (24) and are more common in the duodenal descending segment (1, 23). This study showed that the proportions of DD and duodenal descending diseases in group E were higher than those in group A, which is similar to previous studies (1, 23, 24).

Among all the gastrointestinal tumors, the proportion of primary duodenal tumors is less than 1% (25). Primary benign duodenal tumors mainly include duodenal adenoma, lipoma, lymphangioma, and hamartoma, among which adenoma is more common. Primary duodenal malignancies mainly include adenocarcinoma, malignant stromal tumor, neuroendocrine tumor, and leiomyosarcoma, among which adenocarcinoma is more common. Duodenal Brunner's adenoma is more common in middle-aged people and prefers in the duodenal bulb (25). Foreign scholar Levine et al. (26) once reported that there is no difference between gender and disease. This study showed that lesions in the duodenal bulb were more common in group A than group E, which is consistent with the previous study (25), but duodenal tumors were more common in group E, and it can be considered to be related to the fact that duodenal tumors include adenocarcinoma [adenocarcinoma can be seen in the elderly (27)].

Duodenal lipoma is a type of rare benign tumor. Currently, there are less than 230 cases reported (28). The peak incidence focuses on 50-70 years old and is mainly seen in the duodenal descending and horizontal segments (29). Endoscopy may often miss out lipoma in the ascending segment; the incidence is higher in women than men (30). In this study, group A included 1 case of lipoma, and group E included 5 cases of lipoma, indicating that among duodenal tumors, those in the descending and ascending segments are more common in the elderly, which is consistent with previous studies (29, 30). However, duodenal horizontal diseases in all the age groups showed no statistical significance.

The incidence rate of primary duodenal adenocarcinoma accounts for 0.035% in the upper gastrointestinal malignancies and 33%-45% in small intestinal malignancies (31), and most cases are located in the duodenal descending segment, followed by the horizontal and ascending segments. The incidence in the duodenal bulb is extremely low (32) and can be seen in the elderly (27). This study showed that the proportion of duodenal diseases in the descending segment in group E was higher than that in group A, which is consistent with previous studies (27, 32).

Duodenal stromal tumor accounts for 5% in gastrointestinal stromal tumor (33) and is more common in adults, while it is very rare in children and adolescents (34). Zhong et al. (35) reported that duodenal stromal tumor is mostly derived from the descending segment, but it can occur in any part of duodenum. The cases with duodenal stromal tumor in this study were from group A, which is consistent with previous studies (34). The limitation of this study is that no classification was performed on duodenal tumors.

In conclusion, we systematically studied whether there were differences in various common diseases of different duodenal parts in the aspects of age, gender, *H. pylori* infection, use of NSAIDs, smoking, and alcohol consumption, for the first time, to provide new basis for clinical prevention and treatment of duodenal diseases, as well as new ideas for studies of duodenal diseases.

DU, inflammation, and bulb lesions are more common in adults than the elderly, but DD, tumor, and lesions in the descending and ascending segments are more common in the elderly. Compared with duodenal bulb-descending diseases, the effect of applying NSAIDs is greater in the descending segment, and the infection rate of *H. pylori* in duodenal bulb diseases is higher than other duodenal segments.

Ethics Committee Approval: The study was approved by the Ethics Committee of Guizhou Medical University on May 1, 2018, number: 144.

Informed Consent: Written informed consent was obtained from the patients who participated in this study.

Peer-review: Externally peer-reviewed.

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REFERENCES

1. Srisajjakul S, Prapaisilp P, Bangchokdee S. Imaging spectrum of nonneoplastic duodenal diseases. Clin Imaging 2016; 40: 1173-81. [Crossref]

2. Lau JY, Barkun A, Fan DM, Kuipers EJ, Yang YS, Chan FK. Challenges in the management of acute peptic ulcer bleeding. Lancet 2013; 381: 2033-43. [Crossref]

3. Saul C, Teixeira CR, Pereira-Lima JC, Torresini RJ. [prevalence reduction of duodenal ulcer: a brazilian study. (retrospective analysis in the last decade: 1996-2005)]. Arq Gastroenterol 2007; 44: 320-4. [Crossref]

4. Leow AH, Lim YY, Liew WC, Goh KL. Time trends in upper gastrointestinal diseases and helicobacter pylori infection in a multiracial asian population - a 20-year experience over three time periods. Aliment Pharmacol Ther 2016; 43: 831-7. [Crossref]

5. Jiang JX, Liu Q, Mao XY, Zhang HH, Zhang GX, Xu SF. Downward trend in the prevalence of Helicobacter pylori infections and corresponding frequent upper gastrointestinal diseases profile changes in Southeastern China between 2003 and 2012. Springerplus 2016; 5: 1601. [Crossref]

6. Araújo MB, Borini P, Guimarães RC. Etiopathogenesis of peptic ulcer: back to the past? Arq Gastroenterol 2014; 51: 155-61. [Crossref]

7. Choninz D, Eisig J N, Cury M, Zaterka S. Úlcera péptica. In: Coelho JCU, editor. Aparelho digestivo: clínica e cirurgia. São Paulo: Ateneu, 2006; 522-43.

8. Sheh A, Fox JG. The role of the gastrointestinal microbiome in Helicobacter pylori pathogenesis. Gut Microbes 2013; 4: 505-31. [Crossref]

9. Selgrad M, Meyer F, Malfertheiner P. Helicobacter pylori: short overview on selected data from the history and their value for clinical medicine, in particular, surgery-what does the (general/abdominal) surgeon need to know. Zentralbl Chir 2014; 139: 399-405. [Crossref]

10. Dovjak P. [Duodenal ulcers, gastric ulcers and Helicobacter pylori]. Z Gerontol Geriatr 2017; 50: 159-69. [Crossref]

11. Chung CS, Chiang TH, Lee YC. A systematic approach for the diagnosis and treatment of idiopathic peptic ulcers. Korean J Intern Med 2015; 30: 559-70. [Crossref]

12. Yang YJ, Bang CS, Shin SP, et al. Clinical characteristics of peptic ulcer perforation in Korea. World J Gastroenterol 2017; 23: 2566-74. [Crossref]

13. Chan FKL, Ching JYL, Tse YK, et al. Strointestinal safety of celecoxib versus naproxen in patients with cardiothrombotic diseases and arthritis after upper gastrointestinal bleeding (CONCERN): an industry-independent, double-blind, double-dummy, randomised trial. Lancet 2017; 389: 2375-82. [Crossref]

14. Zil-E-Ali A, Bin Shafique M, Assad S, Ali H, Ghani U. A Non-invasive 24 Hours Stabilization of Duodenal Ulcer Perforation by a Combination Regimen. Cureus 2016; 8: e908. [Crossref]

15. Chinese Rheumatism Data Center; Chinese Systemic Lupus Erythematosus Treatment and Research Group. [Recommendation for the prevention and treatment of non-steroidal anti-inflammatory drug-induced gastrointestinal ulcers and its complications]. Zhonghua Nei Ke Za Zhi 2017; 56: 81-5.

16. Prabhu V, Shivani A. An overview of history, pathogenesis and treatment of perforated peptic ulcer disease with evaluation of prognostic scoring in adults. Ann Med Health Sci Res 2014; 4: 22-9. [Crossref]

17. Archampong TN, Asmah RH, Wiredu EK, Gyasi RK, Nkrumah KN. Factors associated with gastro-duodenal disease in patients undergoing upper GI endoscopy at the Korle-Bu Teaching Hospital, Accra, Ghana. Afr Health Sci 2016; 16: 611-9. [Crossref]

18. Wang YC. Medicinal plant activity on Helicobacter pylori related diseases. World J Gastroenterol 2014; 20: 10368-82. [Crossref]

19. Lahat A, Kopylov U, Neuman S, et al. Helicobacter pylori prevalence and clinical significance in patients with quiescent Crohn's disease. BMC Gastroentero 2017; 17: 27. [Crossref]

20. Samsonov AA, Grechushnikov VB, Andreev DN, et al. Pharmacoeconomic evaluation of treatment in patients with Helicobacter pylori-associated diseases. Ter Arkh 2014; 86: 56-61.
21. Terada T. Pathologic observations of the duodenum in 615 consecutive duodenal specimens in a single Japanese hospital: II. malignant lesions. Int J Clin Exp Pathol 2012; 5: 52-7.
22. Glener J, Poris S, Foles B, Harmon R. Perforated duodenal diverticulum case report. Int J Surg Case Rep 2016; 29: 100-2. [Crossref]
23. Yeh TC. Laparoscopic resection of perforated duodenal diverticulum - A case report and literature review. Int J Surg Case Rep 2016; 28: 204-10. [Crossref]
24. Ekici Y, Moray G. Large Duodenal Diverticula Treated by Laparoscopic Surgical Excision: A Case Report. Invasive Surg 2015; 4: e30196. [Crossref]
25. Sorleto M, Timmer-Stranghöner A, Wuttig H, Engelhard O, Gartung C. Brunner's Gland Adenoma - A Rare Cause of Gastrointestinal Bleeding: Case Report and Systematic Review. Case Rep Gastroenterol 2017; 11: 1-8. [Crossref]
26. Levine JA, Burgart LJ, Batts KP, Wang KK. Brunner's gland hamartomas: clinical presentation and pathological features of 27 cases. Am J Gastroenterol 1995; 90: 290-4.
27. Ecker BL, McMillan MT, Datta J, et al. Adjuvant chemotherapy versus chemoradiotherapy in the management of patients with surgically resected duodenal adenocarcinoma: A propensity score-matched analysis of a nationwide clinical oncology database. Cancer 2016; 123: 967-76. [Crossref]
28. Knoop RF, Richter-Schrag HJ, Walker C, Thimme R, Fischer A. Double-scope resection of a large duodenal polyp. Endoscopy 2015; 47 Suppl 1: E627-8. [Crossref]
29. Yaman I, Derici H, Paksoy S. Symptomatic duodenal lipoma with endoscopic snare polypectomy. Ulus Cerrahi Derg 2014; 30: 103-5. [Crossref]
30. Zirpe D, Wani M, Tiwari P, Ramaswamy PK, Kumar RP. Duodenal Lipomatosis as a Curious Cause of Upper Gastrointestinal Bleed: A Report with Review of Literature. J Clin Diagn Res 2016; 10: PE01-4. [Crossref]
31. Nonaka S, Oda I, Tada K, et al. Clinical outcome of endoscopic resection for nonampullary duodenal tumors. Endoscopy 2015; 47: 129-35. [Crossref]
32. Cloyd JM, George E, Visser BC. Duodenal adenocarcinoma: Advances in diagnosis and surgical management. World J Gastrointest Surg 2016; 8: 212-21. [Crossref]
33. Jones JD, Oh S, Clark C, Pawa R. A Bleeding Duodenal GIST Masquerading as Refractory Peptic Ulcer Disease. ACG Case Rep J 2016; 3: e189. [Crossref]
34. Valli PV, Valli C, Pfammatter T, Bauerfeind P. Life-threatening bleeding of a duodenal gastrointestinal stromal tumor in a teenager: a rare case report. Endosc Int Open 2016; 4: E1244-6. [Crossref]
35. Zhong Y, Deng M, Liu B, Chen C, Li M, Xu R. Primary gastrointestinal stromal tumors: Current advances in diagnostic biomarkers, prognostic factors and management of its duodenal location. Intractable Rare Dis Res 2013; 2: 11-7. [Crossref]