

Retrospective study on endoscopic findings of gastritis in children attending the gastrointestinal tract endoscopic unit of Assiut University Children Hospital over a 15-year-period

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Abstract

Background: Children with gastritis typically exhibit recurrent stomach pain and dyspepsia or vomiting.

Objectives: To assess the frequency, clinical manifestations, endoscopic pictures, aetiology and outcome of gastritis in children who visited the gastrointestinal tract (GIT) endoscopic unit of Assiut University Children Hospital.

Method: This was a retrospective, cross-sectional study conducted at Assiut University Children Hospital GIT Endoscopic Unit from 1st January 2005 to 31st December 2019.

Results: Upper GI endoscopy, done in all cases, showed that 66 (8.1%) had erythematous gastric mucosa, 106 (13%) had nodular gastric mucosa, 212 (25.9%) had erythematous gastric mucosa and hyperaemia, 147 (18%) had erythematous gastric mucosa and nodularity, 156 (19.1%) had hyperaemic mucosa and petechiae, 77 (9.5%) had hyperaemic mucosa and erosion, and 53 (6.5%) had multiple erosions and ulcers.

Conclusions: Gastritis represented 9.4% of children who underwent upper GI endoscopy. *Helicobacter pylori* was the commonest cause with high recurrence. Patients presented with recurrent GI bleeding, and those with erythematous hyperaemic mucosa on

endoscopy showed recurrence compared to their counterparts.

(Key words: Gastritis, *Helicobacter pylori*, Children, Gastro-intestinal tract endoscopy)

Introduction

Gastritis is an inflammatory disease that affects the lining of the stomach mucosa¹. Haematemesis or melaena may appear in young children². While *Helicobacter pylori* (*H. pylori*) gastritis primarily manifests as recurrent stomach pain and dyspeptic symptoms, drug-induced or food-related gastritis frequently displays acute symptoms. Other symptoms include bloating, gas, weariness, low energy, loss of muscle mass, bad breath, etc³. The most frequent cause of gastritis in children is an infection with *H. pylori*⁴. Crohn's disease, allergy and coeliac disease are among the leading causes of gastritis⁵.

Suppression of acid is a useful technique for symptom relief. Proton pump inhibitors (PPIs) and histamine 2 receptor antagonists (H2RAs) are available medications. Rebound symptoms and tachyphylaxis are linked to the H2RAs. Hence, if prolonged therapy is required, some practitioners utilise PPIs. Cimetidine is less advised because it can suppress the cytochrome P450 enzymes, which results in a slower digestion of other medications. Omeprazole, esomeprazole, pantoprazole, and lansoprazole are among the medications that are offered⁶.

Objectives


To assess the frequency, clinical manifestations, endoscopic pictures, aetiology and outcome of gastritis in children who visited the gastrointestinal tract (GIT) endoscopic unit of Assiut University Children Hospital.

Method

This was a retrospective, cross-sectional study at GIT Endoscopic Unit, Assiut University Children Hospital for 15 years from 1st January 2005 to 31st December 2019.

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Inclusion criteria: Males and females aged one month to 18 years, diagnosed as gastritis by upper GI endoscopy and stomach biopsy.

Exclusion criteria: Patients whose indication for upper GI endoscopy was not gastritis.

Data of patients were collected from the endoscopic database in the GIT Endoscopic Unit. Data collected included name, age and gender, main complaint, type of sedation, type of endoscopy, endoscopic pictures, histopathological pictures by bio-gastric biopsy, cause and complications encountered during and after the procedure and outcome.

Ethical issues: Ethical Committee of Scientific Research of the Faculty of Medicine at Assiut University Children Hospital accepted the study's protocol (IRB no. 17100935). Being a retrospective study, informed consent was not feasible.

Statistical analysis: Statistical package for social sciences (SPSS Inc., Chicago, IL, USA) version 22 was used. Data were described using mean (standard deviation), median (range) and number (percentages). For comparing categorical data, Chi square test was used. Fisher's exact test was used instead when expected frequency was less than 5. p-value was always 2 tailed set significant at 0.05 level.

Results

During the study period 8651 paediatric patients were admitted to the GIT Endoscopic Unit; according to the endoscopic pictures of these cases 817 (9.4%) were diagnosed as gastritis. Demographic data of studied participants are shown in Table 1.

Table 1: Demographic data of studied participants (n=817)

Variable	Result
Age: Median (range)	4 years (3 months – 17 years)
Age groups: n (%)	
<5 years	460 (56.3)
5-10 years	200 (24.5)
>10 years	157 (19.2)
Gender: n (%)	
Male	476 (58.3)
Female	341 (41.7)

Clinical presentations and histopathologic pictures of studied participants are shown in Table 2. Frequent presentations were persistent vomiting (41.6%), gastrointestinal bleeding

(41.4%), and recurrent abdominal pain (17.0%). *H. pylori* induced gastritis was observed in 54.8% of studied cases, non-specific gastritis in 24.8% and eosinophilic gastritis in 20.3%.

Table 2: Clinical presentations and histopathologic pictures of studied participants (n=817)

Variable	Number	Odds Ratio	95% CI	p-value
Age groups				
<5 years	460	Ref		
5-10 years	200	1.980	1.414 – 2.773	<0.001
>10 years	157	2.257	1.557 – 3.270	<0.001
Gender				
Male	476	Ref		
Female	341	0.795	0.602 – 1.051	0.107
Clinical presentation				
Gastrointestinal bleeding	338	2.991	1.989 – 4.496	<0.001
Persistent vomiting	340	0.798	0.532 – 1.197	0.276
Recurrent abdominal pain	139	Ref		
Endoscopic pictures				
Helicobacter pylori	448	2.895	1.987 – 4.218	<0.001
Non-specific gastritis	203	1.698	1.107 – 2.605	0.015
Eosinophilic gastritis	166	Ref		

CI: Confidence interval, p-value is significant <0.05

Upper endoscopy was done for all studied cases and showed that 212 (25.9%) had erythematous gastric mucosa and hyperaemia, 156 (19.1%) had hyperaemic mucosa and petechiae, 147 (18.0%) had erythematous gastric mucosa and

nodularity and 106 (13.0%) had nodular gastric mucosa. Clinical presentations and endoscopic pictures of studied cases according to their histopathology are shown in Table 3.

Table 3: Clinical presentations and endoscopic pictures of studied cases according to histopathology

Variable	H. pylori induced gastritis (n=448) n (%)	Non-specific gastritis (n=203) n (%)	Eosinophilic gastritis (n=166) n (%)	p-value
<i>Clinical presentation</i>				<0.001
Gastrointestinal bleeding	224 (50.0)	81 (39.9)	33 (19.9)	
Persistent vomiting	108 (24.1)	99 (48.8)	133 (80.1)	
Recurrent abdominal pain	116 (25.9)	23 (11.3)	0 (0.0)	
<i>Endoscopic pictures</i>				0.006
Erythematous gastric mucosa	41 (09.2)	23 (11.3)	02 (01.2)	
Nodular gastric mucosa	60 (13.4)	18 (08.9)	28 (16.9)	
Erythema and hyperaemia	116 (25.9)	58 (28.6)	38 (22.9)	
Erythema and nodularity	83 (18.5)	25 (12.3)	39 (23.5)	
Hyperaemic mucosa & petechiae	77 (17.2)	44 (21.7)	35 (21.1)	
Hyperaemic mucosa & erosion	42 (09.4)	21 (10.3)	14 (08.4)	
Multiple erosions and ulcers	29 (06.5)	14 (06.9)	10 (06.0)	

p-value is significant <0.05

Outcome of studied cases according to patient's characteristics is shown in Table 4. Whilst 416

(50.9%) cases improved 401 (49.1%) experienced recurrence of gastritis.

Table 4: Outcome of studied cases according to patient's characteristics (n=817)

Variable	Outcome			p-value
	Improved (n=416) n (%)	Recurrence once (n=325) n (%)	Recurrence more than once (n=76) n (%)	
<i>Age groups</i>				0.000*
<5 years	271 (65.1)	149 (45.8)	40 (52.6)	
5-10 years	84 (20.2)	93 (28.6)	23 (30.3)	
>10 years	61 (14.7)	83 (25.5)	13 (17.1)	
<i>Gender</i>				0.254
Male	231 (55.5)	200 (61.5)	45 (59.2)	
Female	185 (44.5)	125 (38.5)	31 (40.8)	
<i>Main complaint</i>				0.000*
Gastrointestinal bleeding	112 (26.9)	187 (57.5)	39 (51.3)	
Persistent vomiting	221 (53.1)	92 (28.3)	27 (35.5)	
Recurrent abdominal pain	83 (20.0)	46 (14.2)	10 (13.2)	
<i>Endoscopic pictures</i>				0.000*
Erythematous gastric mucosa	19 (04.6)	31 (09.5)	16 (21.1)	
Nodular gastric mucosa	44 (10.6)	48 (14.8)	14 (18.4)	
Erythema and hyperaemia	115 (27.6)	78 (24.0)	19 (25.0)	
Erythema and nodularity	67 (16.1)	66 (20.3)	14 (18.4)	
Hyperaemic mucosa & petechiae	108 (26.0)	43 (13.2)	05 (06.6)	
Hyperaemic mucosa & erosion	41 (09.9)	32 (09.8)	04 (05.3)	
Multiple erosions and ulcers	22 (05.3)	27 (08.3)	04 (05.3)	

p-value is significant <0.05

By comparing the studied variables among patients with *H. pylori* gastritis, we observed that it was more frequent among older children (p<0.001) who mainly presented with GI bleeding (p<0.001), showing mainly erythematous hyperaemic gastric mucosa and a notable nodularity on endoscopy, and was

associated with high recurrence rate (p<0.001), as shown in Tables 3 and 4.

By comparing studied variables among patients with non-specific gastritis, we observed that it was more frequent among younger children (p<0.001) who mainly presented with persistent

vomiting ($p=0.014$), showing mainly erythematous gastric mucosa on endoscopy ($p=0.031$), with no difference in recurrence rate between patients with and without non-specific gastritis, as shown in Tables 3 and 4.

By comparing studied variables among patients with eosinophilic gastritis, we observed that it was more frequent among younger children ($p<0.001$) who mainly presented with persistent vomiting ($p=0.014$), showing mainly erythematous gastric mucosa and a notable nodularity on endoscopy ($p=0.003$), with low recurrence rate compared to patients with other

types of gastritis ($p<0.001$), as shown in Tables 3 and 4.

Younger patients had higher improvement rate compared to older patients ($p<0.001$). According to the presenting complaint among studied cases, patients complaining of GI bleeding had recurrence more than once compared to other presenting complaints ($p<0.001$). Also, patients with erythematous hyperaemic gastric mucosa on endoscopy had recurrence more than once compared to other endoscopic pictures ($p<0.001$) as shown in Table 4. The various endoscopic appearances encountered in the study are shown in Figure 1.

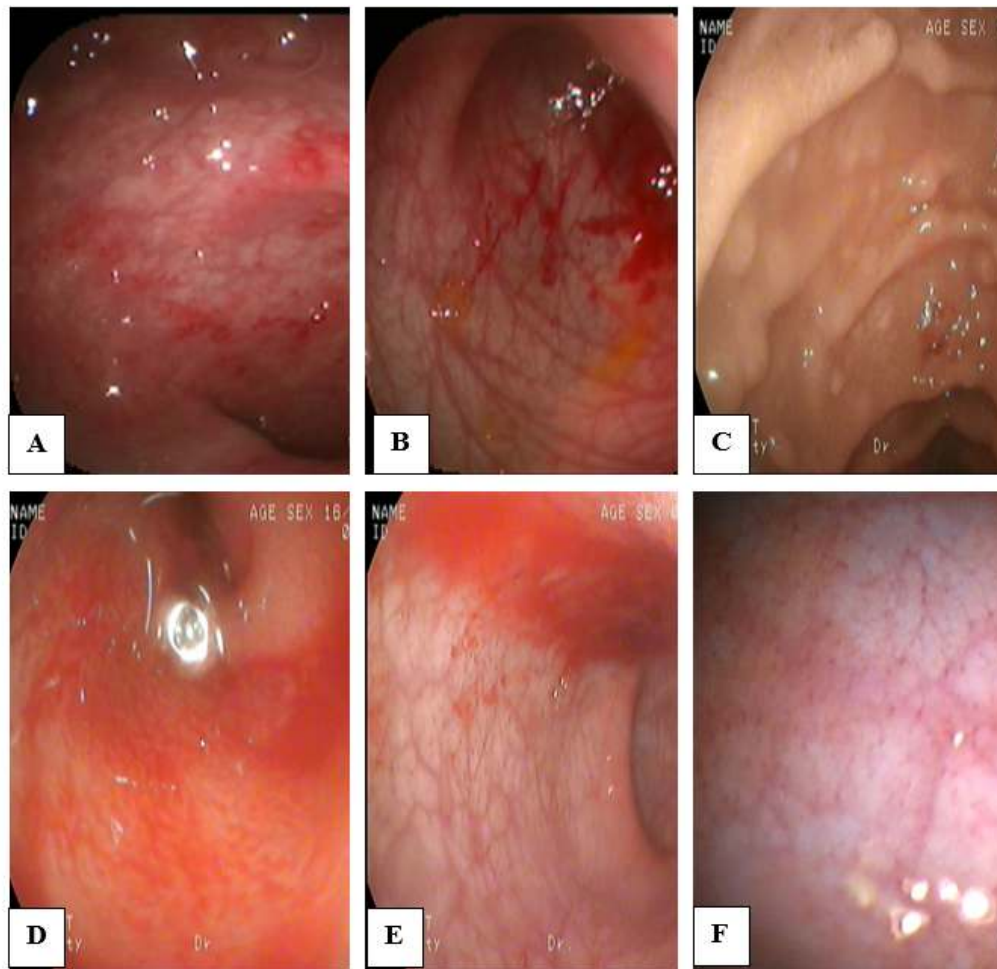


Figure 1: Endoscopic picture showing A) multiple gastric ulcers B) haemorrhagic gastritis C) multiple nodularity of gastric mucosa D) erythema and hyperaemia of gastric mucosa E) hyperaemia and petechiae, F) spotty erythema in the corpus

Patients with eosinophilic gastritis had higher improvement rate compared to patients with *H. pylori* induced gastritis, and patients with non-specific gastritis ($p<0.001$) as shown in Table 5. However, long-term outcome and clinical

consequences of non-specific and eosinophilic gastritis in paediatric patients are poorly defined. Hence, we could not compare our results with other studies.

Table 5: Outcome of studied cases according to their histopathological pictures (n=817)

Histopathological pictures by bio-gastric biopsy	Outcome			p-value
	Improved (n=416) n (%)	Recurrence once (n=325) n (%)	Recurrence more than once (n=76) n (%)	
<i>H. pylori</i> induced gastritis	190 (42.4)	208 (46.4)	50 (11.2)	0.000*
<i>Non-specific gastritis</i>	113 (55.7)	74 (36.5)	16 (07.9)	
<i>Eosinophilic gastritis</i>	113 (68.1)	43 (25.9)	10 (06.0)	

p-value is significant <0.05

Discussion

The present study is a fifteen-year retrospective, cross sectional one to assess the frequency, clinical presentations, endoscopic pictures of gastritis, aetiology and outcome of paediatric patients who visited the GIT Endoscopic Unit at the University Children Hospital from January 2005 to December 2019 and were diagnosed as gastritis by endoscopic pictures. In the current study, 817 (9.4%) of the 8651 paediatric patients admitted to the GIT Endoscopic Unit throughout the study period were found to have gastritis.

Median age of studied participants was 4 years, ranging from 3 months to 17 years. Whist 460 (56.3%) gastritis cases were <5 years old, 200 (24.5%) were 5–10 years old, and 157 (19.2%) were >10 years old; 58.3% were males with a male: female ratio of 1.4:1. Burgard M, *et al*⁷, in a study on 5983 children, reported a median age of 7.6 years and a range of one month to 17.9 years, 51.9% being males with a male: female ratio of 1.1:1. Renault M, *et al*⁸, reported a mean age of 12.5±3.0 years in the 23 studied children with male predominance. This age difference could be due to the smaller sample size in the Renault study.

H. pylori induced gastritis was observed in 54.8% of our studied cases. In Turkey, Koca T, *et al*⁹ found that of 1026 children who underwent upper GI endoscopy, 45.8% were seropositive for *H. pylori*. In a population-based study in Japan, 1.8% Japanese children had *H. pylori* infection¹⁰, while Burgard M, *et al*⁷ in Belgium found that prevalence of *H. pylori* infection was 35.4%. Prevalence in poorer nations is considerable, which may be due to differences in degree of sanitation, personal hygiene, and level of illiteracy¹¹. However, it is widely accepted that *H. pylori* infection is the main aetiological factor for gastritis and peptic ulcer¹². Prevalence of non-specific gastritis and eosinophilic gastritis have not been well-described. In our study 203 (24.8%) had non-specific gastritis, and 166 (20.3%) had eosinophilic gastritis. Standardized estimated prevalence of eosinophilic gastritis among the

general population was 6.3/100,000¹³. Jensen ET, *et al*¹³ in 2016 reported a similar prevalence (20.5%) of eosinophilic gastritis among children aged <20 years.

The main complaints among our studied cases were persistent vomiting in 340 (41.6%), gastrointestinal bleeding in 338 (41.4%) and recurrent abdominal pain in 139 (17.0%) cases. *H. pylori* induced gastritis mainly presented with GI bleeding while persistent vomiting was the main presentation in eosinophilic gastritis (80.1%) and non-specific gastritis (48.8%). In contrast, a prospective Egyptian study by Abu-Zekry MA, *et al*¹⁵ on 150 consecutive patients, aged 5-15 years, observed recurrent abdominal pain as the most frequent GI complaint of the studied *H. pylori* population (82%). This difference could be due to differences in inclusion criteria as Abu-Zekry MA, *et al*¹⁵ included outpatient clinic patients with GI complaints, whereas our cases were recruited from the GIT Endoscopic Unit, and furthermore we only studied patients with gastritis.

The current study revealed that *H. pylori* mainly showing erythematous hyperaemic mucosa (25.9%) and a notable nodularity (18.5%) of the gastric mucosa on endoscopic examination were associated with high recurrence rate; a similar finding was observed by Domsa AT, *et al*¹⁴. In agreement with present study, Hojo M, *et al*¹⁶ reported that in children, nodularity was seen in 93% of studied cases; other endoscopic findings included mucosal swelling (32.6%), spotty redness (25.6%), diffuse redness (18.6%), and atrophy (9.3%). There is agreement that antral nodularity is a predictor of *H. pylori* infection in children¹⁷; additionally, Łazowska-Przeorek I, *et al*¹⁸ observed that presence of nodularity was 91.6% sensitive and 91% specific in indicating *H. pylori* infection. It is also known that nodularity is a common endoscopic finding in children with *H. pylori*¹⁶. However, according to the Sydney method, over 15% children with *H. pylori* infection had erythematous/exudative gastritis and atrophic gastritis¹⁹.

In current study we observed that *H. pylori* induced gastritis was more frequent among older children. In agreement with present study; older age was shown to be a risk factor for *H. pylori* infection in studies by Abu-Zekry MA, *et al*¹⁵, Burgard M, *et al*⁷, Domsa AT, *et al*¹⁴, Nam JH, *et al*²⁰ and Vilaichone RK, *et al*²¹. Also, we observed that eosinophilic gastritis was more frequent among younger children aged <five years, showing mainly erythematous gastric mucosa and a notable nodularity (23.5%) on endoscopy and associated with lower recurrence rate. Non-specific gastritis was more frequent among younger children showing mainly erythematous gastric mucosa (28.6%) on endoscopy. In agreement with present study, Nam JH, *et al*²⁰ stated that the eosinophilic gastritis was more common among younger patients with favourable outcome compared to older children. Also, Koca T, *et al*⁹ observed that histological eosinophilic gastritis was highly responsive to therapy in children with favourable outcome. But, in contrast to our study, Jensen ET, *et al*¹³ stated that eosinophilic gastritis was more prevalent among older children, with female predominance. Koutri E, *et al*²² concluded that eosinophilic gastritis is a chronic relapsing disease.

Regarding outcome, 416 (50.9%) cases improved and 401 (49.1%) cases experienced recurrence of gastritis. Among 448 cases with *H. pylori* induced gastritis, 190 (42.4%) improved, 208 (46.4%) had recurrence once and 50 (11.2%) had recurrence more than once, while among 166 cases with eosinophilic gastritis, 113 (68.1%) improved, 43 (25.9%) had recurrence once and 10 (6%) had recurrence more than once and among 203 cases with non-specific gastritis, 113 (55.7%) improved, 74 (36.5%) had recurrence once and 16 (7.9%) had recurrence more than once.

Patients presented with recurrent GI bleeding and those with erythematous hyperaemic mucosa on endoscopy showed recurrence more than once compared to their counterparts. This finding could be explained by the fact patients with GI bleeding and those with erythematous hyperaemic mucosa on endoscopy mainly had *H. pylori* induced gastritis which is characterized by a high recurrence rate¹⁴.

Regarding the strong correlation between advanced age and recurrence rate, there are a few considerations. First, after *H. pylori* removal, severe atrophic and metaplastic alterations brought on by advancing age may cause a false negative result on follow-up tests. Proton pump inhibitor use on a regular basis can

potentially alter the outcome of an *H. pylori* test. Additionally, lack of interest in eliminating *H. pylori* and an increase in the infection's resistance to eradication due to old age are two additional potential explanations²³.

One limitation of the study is that it is a retrospective one and some of the clinical data of the patients may have been missed.

Conclusions

Gastritis represents only 9.4% of children with indications for upper GI endoscopy. *H. pylori* (54.8%), non-specific gastritis (24.8%) and eosinophilic gastritis (20.3%) were the common causes. GI bleeding was the main presentation in *H. pylori*-induced gastritis while persistent vomiting was the main presentation in non-specific and eosinophilic gastritis. Erythema and hyperaemia (25.9%) and nodularity (18.5%) were the main endoscopic findings in *H. pylori*-induced gastritis. Erythema and hyperaemia were the main endoscopic findings in non-specific gastritis (28.6%) while erythema and nodularity were the main findings in eosinophilic gastritis (23.5%). Patients with GI bleeding had recurrence more than once compared to other presenting complaints. Patients with erythematous hyperaemic gastric mucosa on endoscopy had recurrence more than once compared to other endoscopic pictures. Patients with eosinophilic gastritis had a higher improvement rate compared to patients with *H. pylori*-induced gastritis and patients with non-specific gastritis. Younger patients had a higher improvement rate compared to older patients. Among 817 studied cases diagnosed with gastritis, 419 (50.9%) improved, 325 (39.8%) had recurrence once and 76 (9.3%) had recurrence more than once.

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