Journal of
Gastroenterology and Hepatology Research

Online Submissions: http: //www.ghrnet.org/index./joghr/
doi: 10.17554/j.issn.2224-3992.2021.10.1022

Journal of GHR 2021 August 21; **10(4)**: 3554-3560
ISSN 2224-3992 (print) ISSN 2224-6509 (online)

ORIGINAL ARTICLE

Role of Upper Gastrointestinal Endoscopy in Diagnosis of Recurrent Abdominal Pain in Children

Ola galal Ali Behairy[1], Bahaa Eldeen Hassanin[1], Rasha Mahmoud Abdrabo[2], Eman Elsayed Abdekader[3]

1 Pediatrics department, Faculty of Medicine, Benha University, Egypt;
2 pathology department, Faculty of Medicine, Benha University, Egypt;
3 M.B.B.Ch., Faculty of Medicine, Benha University, Egypt.

Conflict-of-interest statement: The authors declare that there is no conflict of interest regarding the publication of this paper.

Correspondence to: Ola galal Ali Behairy, faculty of medicine - Benha university -Benha -Qualiopia -Egypt.
Email: olaped99@yahoo.com
Telephone: +01011655885

Received: June 23, 2021
Revised: July 12, 2021
Accepted: July 15, 2021
Published online: August 21, 2021

ABSTRACT

BACKGROUND: In the pediatric population, recurrent abdominal pain (RAP) is one of the most frequent indications of upper gastrointestinal endoscopy.

AIM: To evaluate the diagnostic role of upper gastrointestinal endoscopy (UGIE) in children with recurrent abdominal pain.

MATERIALS AND METHODS: A three year prospective study was conducted on 100 consecutive children with recurrent abdominal pain who had UGIE. Baseline sociodemographic data, dyspepsia and any alarm symptoms were recorded. Other investigations such as stool analysis for ova, parasites, occult blood and fecal antigen for Helicobacter pylori as well as an abdominal ultrasound were also registered.

RESULTS: Our children were 47 (47%) males and 53 (53%) females with mean ±SD age of 10.9 ±4.2. Red flag symptoms were seen in 39(39%) of the subjects, and dyspepsia was seen in 52(52%). Endoscopy was diagnostic in 75 patients with the following endoscopic findings were: Esophagitis & hiatus hernia in 7%, gastritis in 39% of cases, nodularity in 25% of cases, 6% had gastric erosion, gastric ulcer was present in 5 %, 14% had hyperemia& erythemic membrane in the duodenum, and duodenal ulcer was seen in 2%. Significantly greater diagnostic yield of UGIE was determined in patients with alarm symptoms (66.6%) compared to those without (OR = 6.7, 95% CI: 2.5-23.3, $p = 0.03$).

CONCLUSION: Upper gastrointestinal endoscopy is a helpful tool for determining the reason of recurrent abdominal pain in children because it provides an accurate assessment of gastrointestinal etiology.

Key words: Children; Recurrent abdominal pain; Upper gastrointestinal endoscopy

Ola G. Behairy, Bahaa Eldeen M. Hassanin, Rasha M. Abdrabo, Eman E. Abdekader. Role of Upper Gastrointestinal Endoscopy in Diagnosis of Recurrent Abdominal Pain in Children. *Journal of Gastroenterology and Hepatology Research* 2021; **10(4)**: 3554-3560
Available from: URL: http://www.ghrnet.org/index.php/joghr/article/view/3193

INTRODUCTION

In children, abdominal pain is a common gastrointestinal symptom. Recurrent abdominal pain (RAP) affects 34% of the world's population, with RAP prevalence ranging from 10 to 20% in school children[1]. RAP has long been considered as functional and psychological problem in children, as well as a public health issue [2].

According to the Rome IV Criteria, RAP is described as abdominal pain that lasts for ≥ 2 months and has at least one episode of pain/week that is severe enough to interfere with children's daily activities[3]. RAP is a common cause for child's referral to the paediatric gastroenterology unit and when treating any child with this condition, the attending physician must be able to rule out any organic causes[4].

With the emergence of new technologies and technical advances,

organic causes of RAP are increasingly being discovered, especially with diagnostic gastrointestinal endoscopy[5].

Abdominal pains are the most common indications of upper gastrointestinal endoscopy (UGIE) in children in African countries, according to several studies[6-8] with rates varying from 22% to 90%. The definition of the alarm features or "red flags" has been developed in order to recognize organic causes of RAP in children, and it is suspected that endoscopy is more commonly associated with abnormal findings in patients who have alarm features than in those who do not. Weight loss, poor growth, GI bleeding, significant vomiting, abdominal tenderness, abdominal mass, and other alarm features are examples of such warning signs[9].

Upper gastrointestinal endoscopy (UGIE) or gastroscopy is a procedure that allows for visual inspection of the inner walls (mucosa) of the esophagus, stomach and duodenum as well as the collection of tissues (biopsies) for histological analysis[6]. This crucial diagnostic tool aids us in distinguishing organic causes, which account for 10% to 50% of RAPs from functional abdominal pain in children[10].

Therefore, the aim of this study was to evaluate the diagnostic role of upper gastrointestinal endoscopy (UGIE) in children with recurrent abdominal pain.

MATERIAL AND METHODS

This was a three year prospective study on 100 consecutive children with recurrent abdominal pain who went to pediatric gastroenterology and hepatology clinic and had UGIE from December 2017 to December 2020, ranging in age from 4 to 17 years. The parents of the enrolled children signed a written informed consent. The study was approved by Benha University's ethical committee. The inclusion criteria were: children and adolescents younger than 18 years old with recurrent abdominal pain that motive the performance of UGIE with no prior gastrointestinal endoscopy procedures. Exclusion criteria were: children with previous identified organic diseases (such as inflammatory bowel disease, peptic ulcer, or celiac disease), or who had previously undergone gastrointestinal endoscopy, use of proton pomp inhibitors (PPIs) during the previous two weeks, critically ill children and patients with medical comorbidities or any other major chronic diseases.

Methods

All enrolled children were subjected to:

A: Full history was taken and detailed clinical examination that focused on the following: 1-abdominal pain, described as (abdominal pain for ≥ 2 months with at least one episode of pain/week extreme enough to interfere with children's daily activities). 2-dyspepsia is characterized by the following symptoms: Peptic-like dyspepsia is diagnosed by the presence of two or more of the following symptoms: periodic pain, pain relieved by food, pain relieved by antacid, pain before meal or when hungry, nausea and/or vomiting, and night pain. Dysmotility-like dyspepsia is diagnosed by the presence of two or more of the following: abdominal bloating or distention, pain exacerbated by food or milk, and pain relieved by belching. Reflux-like dyspepsia is diagnosed if the child had heartburn, chest pain or acid regurgitation[11]. 3-Alarm symptoms (red flags) including: anemia, high ESR, gastrointestinal bleeding, faltering of growth (failure to thrive), significant vomiting (defined as prolonged or protracted vomiting; bilious vomiting or a pattern of vomiting that was concerning to the referring clinician), chronic diarrhea, unexplained fever, persistent pain in the right upper quadrant or right lower quadrant, presence of abdominal mass, hepatomegaly, splenomegaly, perianal anomalies were also documented [12].

B: *Laboratory investigations*: Abdominal ultrasonography, complete blood count (by SysmexKX-21N; Sysmex Corporation, America, Inc., Mundelein, IL, USA), urine analysis and culture, erythrocyte sedimentation rate (ESR), stool analysis and culture for ova, parasites, occult blood and antigen for helicobacter pylori (by bioNexia® H. pylori Ag test) which is a rapid immunochromatographic test (monoclonal antibodies specific to H. pylori antigen) for the qualitative detection of H. pylori antigen in human stool. During testing, the stool sample interacts with anti-H. pylori monoclonal antibody coated red latex particles. The particle-antigen-antibody complexes migrate by capillary along the membrane that is pre-coated with anti-H.pylori monoclonal antibody in the test line region in the case of a positive sample. The complex particle antibody-antigen reacts with these specific antibodies, resulting in a red line in the test-line region. The green control line shows that test migration was completed successfully.

C: Upper GIT endoscopy and histopathology of gastric and duodenal biopsies. Prior to endoscopy, patients were asked to fast overnight. Single dose of intravenous midazolam 0.1mg/kg and intravenous ketamine 1-2 mg/kg was administered with proper monitoring of the vital signs. The pulse oximeter was also used to check oxygen saturation. Flexible fibreoptic pediatric gastroscopy (Olympus XQ20) was used to perform upper GIT endoscopy. After each application, the endoscope and biopsy forceps were disinfected with 2% glutaraldheyde. Biopsies were taken from the stomach (3 antral, 2 fundal, 1angular) and second portion of the duodenum and sent for histopathological analysis. The specimens were embedded in paraffin wax, sectioned, and stained with haematoxylin and eosin after being fixed in 10% buffered formalin. H. pylori infection was confirmed by presence of H. pylori at antral biopsy stained with Giemsa staining and positive rapid urease test. H. pylori, chronic inflammation, activity, atrophy, and intestinal metaplasia were all identified and graded using the updated Sydney system[13]. Two pathologists were blinded to the patients' health condition and endoscopic results while evaluating biopsy specimens**.**

Statistical analysis

SPSS software program, version16 (Spss Inc., Chicago, IL, U.S.A.) was used to analyze the data. The mean ± standard deviation (SD) was used to present descriptive statistics. In two-group comparisons, student's *t* test was used for normally distributed variables and the Mann-Whitney *U* test for non-normally distributed variables. Number (percent) was used to classify qualitative data and the chi-square (χ^2) test was used to compare them. To quantify the strength of the study, odds ratio (OR) and 95% confidence interval (CI) were calculated. Significance was set at $p < 0.05$.

RESULTS

A total 100 children with recurrent abdominal pain were enrolled in this study and had an upper gastrointestinal endoscopy. The mean ± SD age was 10.9 ± 4.2, 47 (47%) males and 53 (53%) females. The mean duration of recurrent abdominal pain was 19 ± 22 months, the main complaint was 94% of patients had epigastric pain, the pain was relieved by antacid in 33% of patients, the pain occurred before meals in 40% of cases, there was vomiting in 28% of patients and 17% of patients had attacks of night pain. 52% of the children had dyspepsia in form of dysmotility like dyspepsia symptoms (34% of patients had abdominal distension, 52% of patients the pain was aggravated by

food, and in 17% of patients the pain was relieved by bleaching).

Reflux like dyspepsia and bowel habits symptoms was (38% of patients had heart burn, 35% of patients had chest pain, 19% of patients had acid regurgitation, 21% of patients had constipation, and 5% of patients had diarrhea).

Red flag symptoms were present in 39% as 20% of patients had anemia, and 11% of patients had GI bleeding which occurred secondary to the ingestion of NSAIDs, vomiting in 28% and 13% had weight loss.

Fifty two (52.0%) of the children were H.pylori positive (Table 1).

Endoscopic findings in the study participants with RAP

The diagnostic yield of UGIE in children's abdominal pain was 75% which were diagnosed to have an organic etiology for their RAP while the examination was normal in 25% of cases which had a non-organic cause. Regarding esophagus examination; 93% of cases had normal esophagus examination, 7% of cases had Esophagitis & hiatus hernia. Regarding stomach examination; 25% of cases had normal stomach examination, 39% of patients had hyperemia & erythemic membrane, 25% of cases had nodularity, 6% had erosion, and 5% had ulcer. Regarding the duodenum examination; 84% of cases had normal duodenum examination, 14% had hyperemia& erythemic membrane, and 2% had ulcer (Table 2).

Histopathology findings

The histopathology of gastric and duodenal biopsies finding among the studied group; 52% of patients had normal histopathologic examination, 28% of patients had non-atrophic H.pylori associated gastritis and duodenitis with mild activity and mild H. pylori density, 14 % of patients had non-atrophic H.pylori associated gastritis and duodenitis with moderate activity and moderate to marked H.pylori density, and 6 % of patients had non-atrophic H.pylori associated gastritis and duodenitis with sever activity and marked H.pylori density, with superficial ulceration in gastric and duodenal mucosa.

Red flag symptoms and endoscopic findings

39 children (39%) of the studied children had red flag symptoms and 26 of these children with red flag signs had significantly greater diagnostic yield of UGIE was determined in patients with alarm symptoms (66.6%) compared to those without (OR = 6.7, 95% CI: 2.5-23.3, p = 0.03) as (11 children had Upper GI bleeding (Hematemesis and Melena) had significant endoscopic findings inform of gastritis and gastric erosions, 28 participants (28%) had significant vomiting and only 4 of them had hiatus hernia. Anemia was seen in 20 children, only 11 of them had endoscopic findings inform of (hyperemia and gastritis associated with positive H.pylori. Weight loss was also present in 13 participants however the endoscopy was normal in this instance.

Dyspepsia and endoscopic findings

Fifty two (52%) children presented with dyspepsia and 36 (69.2%) of these participants had significant endoscopic findings. Thirty three of the dyspeptic children had gastritis (Hyperemia & erythemic membrane) the remaining 3 participants had hiatus hernia and esophagitis.

Comparison between patients with and without upper GI diagnostic yield regarding clinical data (dysmotility like dyspepsia and reflex like dyspepsia, red flag symptoms and H. pylori stool test)

There was a statistical significant difference between both groups

Table 1 General characteristics of the studied patients.

Variables		Study group (n=100)	N (%)
Duration of recurrent abdominal pain (month)	Mean ± SD	19 ± 22	33.00%
	Range	3-72	67.00%
Dysmotility like dyspepsia			
Epigastric pain	No	6	6.00%
	Yes	94	94.00%
Pain relieved by antacid	No	67	67%
	Yes	33	33%
Pain before meal	No	60	60.00%
	Yes	40	40.00%
Night pain	No	83	83.00%
	Yes	17	17.00%
Abdominal distension	No	66	66.00%
	Yes	34	34.00%
Pain aggravated by food	No	48	48.00%
	Yes	52	52..0%
Pain relieved by bleaching	No	83	83.00%
	Yes	17	17.00%
Reflux like dyspepsia and bowel habits			
Heart burn	No	62	62.00%
	Yes	38	38.00%
Chest pain	No	65	650%
	Yes	35	35.00%
Acid regurgitation	No	81	81.00%
	Yes	19	19.00%
Constipation	No	79	79
	Yes	21	21
Diarrhea	No	94	94
	Yes	5	5
Red flag symptoms			
Anemia	No	80	80.00%
	Yes	20	20.00%
GI bleeding	No	89	89.00%
	Yes	11	11.00%
vomiting	No	72	72.00%
	Yes	28	28.00%
weight loss	No	87	87.00%
	Yes	13	13.00%
High ESR	No	100	100.00%
	Yes	0	0.00%
Presence of Helicobacter pylori			
H pylori stool antigen	Positive	52	52.00%
	Negative	48	48.00%

Table 2 Upper GI endoscopy findings in the studied group.

		Study group (n=100)	%
Endoscopic finding in esophagus	Normal	93	93
	Esophagitis & hiatus hernia	7	7
Endoscopic finding in stomach	Normal	25	25
	Hyperemia & erythemic membrane	39	39
	Nodularity	25	25
	Erosion	6	6
	Ulcer	5	5
Endoscopic finding in duodenum	Normal	84	84
	Hyperemia & erythemic membrane	14	14
	Ulcer	2	2

Table 3 Comparison between patients with and without upper GI diagnostic yield regarding clinical data (Dysmotility like dyspepsia and reflex like dyspepsia, red flag symptoms and H. pylori stool test).

		Upper GI endoscopy				Test	P value	OR(95% CI)
		with diagnostic yield		Without diagnostic yield				
		N=75	%	N=25	%			
Duration of abdominal pain (month)	Mean ± SD	29.24 ± 20.64		21.08 ± 24.5		t=1.566	0.049	2.9 (1.12-6.71)
	Range	3-72		3-72				
Dysmotility like dyspepsia								
Epigastric pain	No	0	0.00%	6	24.00%	X2=40.32	0.031	4.9 (3.7-9.8)
	Yes	75	100.00%	19	76.00%			
Pain relieved by antacid	No	50	66.70%	7	28.00%	X2=3.22	0.029	1.5 (1.12-1.92)
	Yes	25	33.30%	18	72.00%			
Pain before meal	No	44	58.70%	16	64.00%	X2=0.222	0.637	-
	Yes	31	41.30%	9	36.00%			
Night pain	No	60	80.00%	23	92.00%	X2=3.15	0.028	2.9 (0.9-13.4)
	Yes	15	20.00%	2	8.00%			
Pain aggravated by food	No	33	44.00%	15	60.00%	X2=1.855	0.055	1.9 (0.76-4.5)
	Yes	42	56.00%	10	40.00%			
Pain relieved by bleaching	No	63	84.00%	20	80.00%	X2=0.231	0.642	
	Yes	12	16.00%	5	20.00%			
Abdominal distension	No	48	64%	18	72%	X2=0.535	0.432	-
	Yes	27	36%	7	28%			
reflex like dyspepsia								
Heart burn	No	42	56.00%	20	80.00%	X2=5.503	0.04	3.1 (1.1-9.2)
	Yes	33	44.00%	5	20.00%			
Chest pain	No	44	58.70%	21	84.00%	X2=4.417	0.039	3.7 (1.2-10.3)
	Yes	31	41.30%	4	16.00%			
Acid regurgitation	No	61	81.30%	20	80.00%	X2=0.02	0.883	-
	Yes	14	18.70%	5	20.00%			
Constipation	No	57	76.00%	22	57	X2=1.64	0.202	-
	Yes	18	24.00%	3	18			
Diarrhea	No	69	93.20%	25	69	X2=1.78	0.182	-
	Yes	5	6.80%	0	5			
red flag symptoms and H. plyori stool test								
Anemia	No	58	77.30%	22	88.00%	X2=3.571	0.03	2.1 (0.5-8.1)
	Yes	17	22.70%	3	12.00%			
GI bleeding	No	66	88.00%	23	92.00%	X2=2.92	0.04	1.6 (0.32-7.78)
	Yes	9	12.00%	2	8.00%			
Vomiting	No	51	68%	21	84%	X2=2.39	0.033	2.49 (0.77-8)
	Yes	24	32%	4	16%			
Weight loss	No	65	86.70%	22	88.00%	X2= 0.86	0.423	-
	Yes	10	13.30%	3	12.00%			
High ESR	No	75	100.00%	25	100.00%	-	-	-
	Yes	0	0.00%	0	0.00%			
H. pylori	Positive	39	52.00%	13	52.00%	X2=0	1	
	Negative	36	48.00%	12	48.00%			

X2: Chi-square test, t: student t-test.

and the diagnostic yield of UGIE which was greater in children with epigastric pain (p = 0.031, OR = 4.9, 95% CI: 3.7-9.8), the duration of abdominal pain (p = 0.049, OR = 2.9, 95% CI: 1.12-6.71), history of pain relieved by antacid (p = 0.029, OR = 1.5, 95% CI: 1.12-1.92), night pain (p = 0.028, OR = 2.9, 95% CI: 0.9-13.4), pain aggravated by food (p = 0.055, OR = 1.9, 95% CI: 0.76-4.5), heart burn (p = 0.04, OR = 3.1, 95% CI: 1.1-9.2), and chest pain(p = 0.039, OR = 3.7, 95% CI: 1.2-10.3), anemia (p = 0.03, OR = 2.1, 95% CI: 0.5-8.1), history of vomiting (p = 0.033, OR = 2.49, 95% CI: 0.77-8), GI bleeding (p = 0.04, OR = 1.6, 95% CI: 0.32-7.78) and red flag (p = 0.03, OR = 6.7, 95% CI: 2.5-23.3). While there was no significant difference between groups regarding pain before meal, pain relieved by bleaching, the abdominal distension, weight loss, acid regurgitation, constipation, diarrhea, weight loss or H. pylori test (Table 3).

Comparison between patients with and without red flag symptoms regarding clinical data(dysmotility like dyspepsia and reflex like dyspepsia, patient with diagnostic yield and H. pylori stool test).

There was a statistical significant difference between groups

Table 4 Comparison between patients with and without red flag symptoms regarding presenting symptoms (Dysmotility like dyspepsia and reflex like dyspepsia, patient with diagnostic yield and H. pylori stool test).

		Red flag symptoms					
		Yes		No			
		N=39	%	N=61	%		
Duration of abdominal pain (month)	Mean±SD	28.4 ± 21.8		19.5 ± 21.5		t = 2.262	0.044
	Range	3-72		3-72			
Epigastric pain	No	0	0.00%	6	9.80%	X2 = 5.14	0.024
	Yes	39	100.00%	55	90.20%		
Pain relieved by antacid	No	14	35.90%	53	86.90%	X2 = 6.05	<0.001
	Yes	25	64.10%	8	13.10%		
Pain before meal	No	16	41.10%	44	72.10%	X2 = 8.18	0.004
	Yes	23	58.90%	17	27.90%		
Night pain	No	24	61.50%	59	96.70%	X2 = 9.1	<0.001
	Yes	15	38.50%	2	3.30%		
Vomiting	No	15	38.50%	57	93.40%	X2 = 11.9	<0.001
	Yes	24	61.50%	4	7.60%		
Pain relieved by bleaching	No	34	87.20%	49	80.30%	X2 = 0.178	0.78
	Yes	5	12.80%	12	19.70%		
Abdominal distension	No	29	74.40%	37	60.60%	X2 = 1.83	0.116
	Yes	10	25.60%	24	39.40%		
Heart burn	No	25	64.10%	37	60.60%	X2 = 0.172	0.768
	Yes	14	35.90%	24	39.40%		
Chest pain	No	25	64.40%	40	65.50%	X2 = 0.06	0.844
	Yes	14	35.90%	21	34.40%		
Acid regurgitation	No	32	62.10%	49	80.30%	X2 = 0.616	0.442
	Yes	7	17.90%	12	19.70%		
Constipation	No	30	76.90%	49	80.30%	X2 = 0.45	0.67
	Yes	9	23.10%	12	19.70%		
Diarrhea	No	34	87.20%	61	100.00%	X2 = 6.46	0.025*
	Yes	5	12.80%	0	0.00%		
Patients with diagnostic yield	No	13	33.30%	39	61.80%	X2 = 2.27	0.031
	Yes	26	66.60%	22	36.10%		
H pylori stool antigen	Positive	19	48.70%	33	54.10%	X2 = 0.317	0.571
	Negative	20	51.30%	28	45.90%		

X2: Chi-square test, t: student t-test.

regarding duration of recurrent abdominal pain, recurrent abdominal pain, pain relieved by antacid, pain before meal, night pain, and vomiting and patient with diagnostic yield, while there was no statistical difference between groups regarding or history of pain relieve by bleaching, history of abdominal distension, heart burn, chest pain, acid regurgitation, constipation, diarrhea H. pylori stool antigen ($p = 0.571$) (Table 4).

DISCUSSION

Recurrent abdominal pain is still a significant public health problem, despite the fact that most cases were previously classified as functional. However, since the introduction of GI endoscopy, the number of organic causes of RAP in children has increased[4,9,14]. In the present study, 100 upper GI endoscopies were performed on children and adolescents with RAP in order to elucidate potential underlying gastrointestinal causes. Epigastric pains were the most common reason for gastroscopy in our study as it was 94%. These findings are consistent with these results[2,15,16] which found that epigastric pain was present in 88% of cases.

We found in the present study that 75% of RAP cases had endoscopic abnormalities and the most common endoscopic findings in this current study were gastropathies, particularly gastritis. These findings were in accordance with studies in Northern Thailand by Ukarapol[5] and Aanpreung[17] perform a similar study as they were able to demonstrate organic causes of RAP in44.7% and 51.6% of children respectively. Joshi[16] conduct another study at Kathmandu medical college teaching hospital and found that out of 26 cases of RAP, 8 cases (30%) had positive finding in endoscopy. Also Akbulut et al., [18] found that EGD had a high diagnostic yield in children with CAP with a prevalence of 209 patients out 372 (56.2%; 95% CI: 30.35-40.05%), and the most common diagnosis was Helicobacter pylori (+) gastritis (35.2%), followed by reflux esophagitis (8.6%). Thakkar et al[19] found that EGD has a diagnostic yield of 38% in children with CAP. Also endoscopic abnormality was found in 28.9% of children with CAP who underwent endoscopy and histopathological abnormality was found in 35.2%[20]. Organic endoscopic abnormalities were found in 76 (87.4%) and 84% of children with RAP according to Adeniyi et al[4] and Motamed et al[21]. However, in the above studies gastroscopy was only conducted on children with alarm symptoms or red flag signs, which may account for the high number. Children with RAP are seldom referred to our center for gastroscopy because other investigations have not shown an underlying cause and the prescribing doctor still

suspect an underlying organic pathology. This may explain why our research found such a high prevalence of endoscopic abnormalities. Nevertheless, studies from Ivory Coast by Banguorou et al[2] and Nepal by Upadhyay et al[1] found endoscopic abnormalities in up to 70% and 71% of the children respectively, when gastroscopies were performed for all patients who presented with RAP.

The most common endoscopic findings in this current study were gastropathies, particularly gastritis. These correspond to the results of[1,2,4,16,21,22]. The high prevalence of H.pylori infection in our study may be attributed to the high incidence of gastritis, as 48% of the participants were H.pylori positive. However, only small number of participants had gastric or duodenal ulcers in our study, which may be secondary to the ingestion of non-steroidal anti-inflammatory drugs. This result is constant with studies from Nigeria where gastric ulcers were reported to be (2.3%) and duodenal ulcers were reported to be (1.1%)[4]. In Ivory Coast, ulcers were 2.70% for bulbar ulcer and 0.90% for gastric ulcer in [2], while in Uganda ulcer were (14.8%) [32], and in Kathamandu ulcer were (13%)[16].

In the present study 39 % of the patients reported alarm symptoms and there was a statistically significant difference in alarm symptoms between patients with and without upper GI diagnostic yield. These findings are consistent with Thakkar et al[19] who found gastrointestinal system pathologies by UGIE in children having chronic abdominal pain (CAP) with alarm symptoms at a high rate (39%). In addition, Akbulut et al[18] found that UGIE has a higher diagnostic yield in children with CAP who have alarm symptom(s) than in those who do not. Also Adeniyi et al[4] found that eleven (12.6%) of the study participants had red flag symptoms with 6 of these children having endoscopic findings, yielding 54.5% overall yield.

In comparison to our findings, several studies have shown that children with RAP and alarm symptoms are more likely to have the functional form of chronic abdominal pain (CAP)[23-24], as alarm symptoms were seen in 59% of children with functional chronic abdominal pain according to Gijsbers et al[23]. Furthermore, they claimed that while alarm symptoms may aid in the diagnosis of serious diseases like crohn's disease, they are useless in the diagnosis of functional diseases. Also Akbulut et al[18] stated that there was no significant difference in EGD diagnostic yield when patient with alarm symptoms.

However, according to the ESPGHAN and ESGE guidelines, EGD is recommended in pediatric patients who have alarm symptoms such as weight loss, persistent vomiting, retardation of growth, unexplained anemia, chronic diarrhea, dysphagia or gastrointestinal bleeding[25]. Endoscopy is now recommended for children with red flags or alarm symptoms and it can be a practical way to evaluate them[26].

In the current research, UGIE was used to diagnose H. pylori gastritis in 48% in children with RAP. These results come in accordance with Akbulut et al[18] who discovered that H. pylori (+) gastritis were the most common pathology in children with CAP (35.2%). Thakkar et al[19] used EGD to diagnose H. pylori gastritis in 8 (2.8%) of 290 children with CAP. Low socioeconomic status, poor living and hygiene conditions, crowded conditions and intra-familial interaction are the most significant risk factors for the spread of *H. pylori* infection. The infection transmitted from one person to another through fecal-oral or oral-oral transmission[27]. The association between H. pylori infection and CAP in children is still a point of contention. Apart from the development of peptic ulcer, no evidence of relation between CAP and H. pylori infection has been found[28-31]. Furthermore, some studies have found no change in abdominal pain or gastric inflammation in children after H. pylori eradication[32].

Majority of children with dyspepsia (52%) in the present study had significant endoscopic abnormalities 36 (69.2%). Other scholars have made similar reports[16,22] although other researchers have reported contradictory reports[1,2,17]. Nevertheless, in the paediatric age group with dyspepsia, endoscopy continues to be useful in the diagnosis of dyspepsia.

Our study was limited due to our sample only reflect small percentage of children with RAP

CONCLUSION

Upper GI endoscopy plays an important role in determining the cause of RAP in children, particularly when alarm features are present. The upper gastrointestinal endoscopy is now being used to examine children of all ages and has proven to be an important diagnostic tool that allow for direct visualization of the GI tract and when combined with histopathologic assessment, allows for accurate diagnosis.

ACKNOWLEDGEMENTS

Authors would like to thank all children and their parents who participated in this study.

REFERENCES

1. Upadhyay S, Sharma A, Kumar P. Recurrent Abdominal Pain in Children: The role of Upper gastrointestinal endoscopy. *Nepal Med Coll J* 2017; **19(1)**: 21-23. https: //www.nmcth.edu/images/gallery/Original%20Articles/6_Upadhyay_S.pdf.
2. Bangoura AD, Kissi-Kacou HYA, Fanou DC, Kouame DG, Doffou S, Assi C, Mahassadi AK, Attia AK, N'dri-Yoman AT. Upper Gastrointestinal Endoscopy in Children's Abdominal Pains in Ivory Coast. *Open Journal of Gastroenterology* 2016; **6**: 397-405. [DOI: 10.4236/ojgas.2016.612042].
3. Edwards T, Friesen C, Schurman JV. Classification of pediatric functional gastrointestinal disorders related to abdominal pain using Rome III vs. Rome IV criterions. *BMC Gastroenterology.* 2018; **18(1)**: 41. [PMID: 29549882]; [DOI: 10.1186/s12876-018-0769-z].
4. Adeniyi OF, Odeghe EA, Lawal MA, Olowu AO, Ademuyiwa A. Recurrent abdominal pain and upper gastrointestinal endoscopy findings in children and adolescents presenting at the Lagos University Teaching Hospital. *PLoS ONE*. 2019; **14(5)**: e0216394. [DOI: 10.1371/journal.pone.0216394].
5. Ukarapol N, Lertprasertsuk N, Wongsawasdi L. Recurrent abdominal pain in children: the utility of upper endoscopy and histopathology. *Singapore Med J*. 2004; **45(3)**: 121-124. [PMID: 15029414].
6. Bangoura AD, Anzouan-Kacou HYK, Doffou S, Assi C, Bathaix MFY, Attia AK, Ndri-Yoman AT. Upper Gastrointestinal Endoscopy and Children Digestive Pathology in Abidjan. *Open Journal of Gastroenterology* 2016; **6**: 265- 274. [DOI: 10.4236/ojgas.2016.610031].
7. Mudawi HM, El Tahir MA, Suleiman SH, Eltaybe NH, Gamer NM, Abdallha FA, Ibrahim SZ. Pediatric Gastrointestinal Endoscopy: Experience in a Sudanese University Hospital. *Eastern Mediterranean Health Journal* 2009; **15**: 1027-1031. [PMID: 20187556].
8. Alatise OI, Anyabolu HC, Sowande O, Akinola D. Paediatric Endoscopy by Adult Gastroenterologists in Ile-Ife, Nigeria: A Viable Option to Increase the Access to Paediatric Endoscopy in Low Resource Countries. *Afr J Paediatr Surg* 2015; **12**: 261-265. https://www.afrjpaedsurg.org/text.asp?2015/12/4/261/172568.
9. Stordal K, Nygaard EA, Bentsen B. Organic abnormalities in recurrent abdominal pain in children. *Acta Paediatr* 2001; **90**:

638-42. [PMID: 11440096].
10. Størdal K, Nygaard EA, Bentsen BS. Recurrent abdominal pain: A five-year follow-up study. *Acta Pædiatrica*, 2005; **94**: 234-238. [DOI: 10.1111/j.1651-2227.2005.tb01897.x.]; [PMID: 15981760].
11. Agre´us L, Svardsudd K, Nyren O, Tibblin G. Reproducibility and validity of a postal questionnaire. The abdominal symptom study. *Scand J Prim Health Care.* 1993; **11(4)**: 252-262. [DOI: 10.3109/02813439308994840]; [PMID: 8146509].
12. Gijsbers CF, Benninga MA, Schweizer JJ, Kneepkens CM, Vergouwe Y, Büller HA. Validation of the Rome III criteria and alarm symptoms for recurrent abdominal pain in children. *J Pediatr Gastroenterol Nutr* 2014; **58**: 779-85. [DOI: 10.1097/MPG.0000000000000319]; [PMID: 24866784].
13. Stolte M, Meining A. The updated Sydney system: Classification and grading of gastritis as the basis of diagnosis and treatment. Can J Gastroenterol. 2001; 15(9): 591-598. [DOI: 10.1155/2001/367832]; [PMID: 11573102].
14. Roma E, Panayiotou J, Kafristsa Y, Van-Vlietc, Gianoulia A, Conatantopoulos A. upper gastrointestinal diseae, helicobacter pylori and recurrent abdominal pain. *Acta paediatr* 1999; **88**: 589-601. [DOI: 10.1080/08035259950169224]; [PMID: 10419241].
15. Kawami E, Machado RS, Fonseka JR, Patrício FR. Clinical and Histological Features of Duodenal Ulcer in Children and Adolescents. *Jornal de Pediatria.* 2004; **80**: 321-325. [DOI: 0021-7557/04/80-04/321]
16. Joshi MR, Sharama SK, Baral MR, Upper GI endoscopy in children in an adult suite. *Kathmandu university medical gournal* 2005; **3**: 111-114. [PMID: 16415605].
17. Aanpreung PI, Atisook k, Suwanagool P, Vajaradul C. upper gastroentistinal endoscopy in children with recurrent abdominal. *J med Assoc Thai*. 1997; **80**: 22-5. [PMID: 9078813].
18. Akbulut UE, Emeksiz HC, Kocak FG, Livaoglu A. "Diagnostic yield of esophagogastroduodenoscopy in children with chronic abdominal pain". *Arch Med Sci* 2018; **14(1)**: 74-80. [DOI: 10.5114/aoms.2017.67675]; [PMID: 29379535]; [PMCID: PMC5778425].
19. Thakkar K, Chen L, Tessier ME, Gilger MA. Outcomes of children after esophagogastroduodenoscopy for chronic abdominal pain. Clin Gastroenterol Hepatol 2014; **12**: 963-9. [DOI: 10.1016/j.cgh.2013.08.041]; [PMID: 24016631]; [PMCID: PMC4412350].
20. Sheiko MA, Feinstein JA, Capocelli KE, Kramer RE. Diagnostic yield of EGD in children: a retrospective single- center study of 1000 cases. *Gastrointest Endosc* 2013; **78**: 47-54. [DOI: 10.1016/j.gie.2013.03.168].[PMID: 23669024]; [PMCID: PMC4041371].
21. Motamed F, Norouzi S, Najafi M, Khodadad A, Farahmand F, Mossahebi S, Heidari-Bateni G. Upper endoscopic findings in children with recurrent abdominal pain: high prevalence of hiatus hernia. *Iran J Pediatr* 2012; **22(3)**: 309-313. [PMID: 23399792]; [PMCID: PMC3564084].
22. Okello TR. Upper gastrointestinal endoscopic findings in adolescents at Lacor Hospital, Uganda. *Afr Health Sci*. 2006; **6(1)**: 39-42. [DOI: 10.5555/afhs.2006.6.1.39]; [PMID: 16615826]; [PMCID: PMC1831958].
23. Gijsbers CF, Benninga MA, Schweizer JJ, Kneepkens CM, Vergouwe Y, Büller HA. Validation of the Rome III criteria and alarm symptoms for recurrent abdominal pain in children. *J Pediatr Gastroenterol Nutr* 2014; **58**: 779-85. [DOI: 10.1097/MPG.0000000000000319]; [PMID: 24866784].
24. Helgeland H, Flagstad G, Grĺta J, Vandvik PO, Kristensen H, Markestad T. Diagnosing pediatric functional abdominal pain in children (4-15 years old) according to the Rome III Criteria: results from a Norwegian prospective study. *J Pediatr Gastroenterol Nutr* 2009; **49**: 309-15. [DOI: 10.1097/MPG.0b013e31818de3ab]; [PMID: 19525874].
25. Thomson M, Tringali A, Dumonceau JM, Tavares M, Tabbers MM, Furlano R, Spaander M, Hassan C, Tzvinikos C, Ijsselstijn H, Viala J, Dall'Oglio L, Benninga M, Orel R, Vandenplas Y, Keil R, Romano C, Brownstone E, Hlava Š, Gerner P, Dolak W, Landi R, Huber WD, Everett S, Vecsei A, Aabakken L, Amil-Dias J, Zambelli A. Paediatric Gastrointestinal Endoscopy: European Society for Paediatric Gastroenterology Hepatology and Nutrition and European Society of Gastrointestinal Endoscopy Guidelines. *J Pediatr Gastroenterol Nutr* 2017; **64**: 133-53. [DOI: 10.1097/MPG.0000000000001408]; [PMID: 27622898].
26. Shahraki T, Farahmand F; Khatami GhR, Najafi M, Shahraki M. Recurrent abdominal pain: an etiological study among in a referral children's medical center in Iran. *Iran J Pediatr* 2007; **17(3)**: 235-240.
27. Hasosah M, Satti M, Shehzad A, Alsahafi A, Sukkar G, Alzaben A, Sunaid A, Ahmed A, AlThubiti S, Mufti A, Jacobson K. Prevalence and risk factors of Helicobacter pylori infection in Saudi children: a three-year prospective controlled study. *Helicobacter* 2015; 20: 56-63. [DOI: 10.1111/hel.12172]; [PMID: 25495104].
28. Wewer V, Andersen LP, Paerregaard A, Gernow A, Hansen JP, Matzen P, Krasilnikoff PA. Treatment of Helicobacter pylori in children with recurrent abdominal pain. *Helicobacter* 2001; **6**: 244-8. [DOI: 10.1046/j.1523-5378.2001.00035.x]; [PMID: 11683928].
29. Talley NJ. How should Helicobacter pylori positive dyspeptic patients be managed? *Gut* 1999; **45 (1)**: 128-31. [DOI: 10.1136/gut.45.2008.i28]; [PMID: 10457033]; [PMCID: PMC1766654].
30. Macarthur C. Helicobacter pylori infection and childhood recurrent abdominal pain: lack of evidence for a cause and effect relationship. *Can J Gastroenterol* 1999; **13**: 607-10. [DOI: 10.1155/1999/286943]; [PMID: 10519960].
31. O'Donohoe JM, Sullivan PB, Scott R, Rogers T, Brueton MJ, Barltrop D. Recurrent abdominal pain and Helicobacter pylori in a community-based sample of London children. *Acta Paediatr* 1996; **85**: 961-4. [DOI: 10.1111/j.1651-2227.1996.tb14194.x]; [PMID: 8863879].
32. Ashorn M, Rägö T, Kokkonen J, Ruuska T, Rautelin H, Karikoski R. Symptomatic response to Helicobacter pylori eradication in children with recurrent abdominal pain: double blind randomized placebo-controlled trial. *J Clin Gastroenterol* 2004; **38**: 646-50. [DOI: 10.1097/01.mcg.0000135366.58536.b3]; [PMID: 15319645].