Role of colonoscopy in the diagnosis of lower gastrointestinal disorders in children

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Introduction Adult colonoscopies are widely and routinely performed worldwide and provide a safe and effective diagnostic and therapeutic tool. Moreover, safety and effectiveness of pediatric colonoscopy in lower gastrointestinal diseases have been established.

Aim To assess the role of colonoscopy in the diagnosis of lower gastrointestinal tract diseases in a group of Egyptian children.

Patients and methods A total of 40 children were admitted to the Endoscopy Unit of Al-Zahraa University Hospital, Al-Azhar University, in both Pediatric and Tropical Medicine Departments in the period from October 2014 to December 2015.
They presented with various lower gastrointestinal symptoms, indicated for colonoscopy evaluation. Thorough clinical history taking and clinical examination, complete blood count, bleeding profile, liver enzymes, and kidney function tests were done. Colonoscopy and histopathological examination of colonoscopic specimen were done.

Results The most common indications of colonoscopy were bleeding per rectum in 42.5% of cases followed by bleeding per rectum associated with chronic abdominal pain in 25% of cases, bleeding per rectum associated with vomiting, hematemesis, and melena in 15% of cases, bloody chronic diarrhea in 7.5% of cases, chronic constipation associated with bleeding per rectum in 5% of cases, and nonbloody chronic diarrhea in 5% of cases. Regarding endoscopic results, colorectal polyps, inflammation with superficial ulceration, and normal mucosa were the main endoscopic findings, representing 42.5, 37.5, and 20% of cases, respectively. Based on histopathological results, juvenile polyps were the most common diagnoses in 42.5% of cases, whereas 37.5% of cases were chronic nonspecific colitis, 12.5% of cases were eosinophilic colitis, and 7.5% of cases were ulcerative colitis.

Conclusion Colonoscopy is a valuable and safe tool for diagnosis of lower gastrointestinal diseases in children.
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Introduction

Flexible colonoscopy in children was introduced slightly later than upper gastrointestinal endoscopy. Reports of pediatric colonoscopy first appeared in late 1970s. Since its development, colonoscopy has become possible in all children, including newborn infants [1].

The most common diagnostic indications of colonoscopy in children are unexplained lower gastrointestinal bleeding, chronic diarrhea, suspected inflammatory bowel disease, abnormality on radiographic imaging (filling defect, stricture), and unexplained iron-deficiency anemia [2], whereas polypectomy, hemostasis, foreign body removal, and dilatation of strictures are the most common therapeutic indications [1].

Absolute contraindications of colonoscopy include suspected bowel perforation and acute peritonitis. However, bleeding disorders or impaired platelet function, neutropenia, toxic dilatation of the bowel, partial or complete intestinal obstruction, and recent bowel surgery are relative contraindications of colonoscopy [3].

Abdominal pain and/or discomfort and bloating are the most common complications recorded after diagnostic colonoscopy [4]. Colonic perforation is rare, but serious complications of colonoscopy associate with high rate of morbidity and mortality. Factors known to increase risk of colonic perforation include transmural inflammation, strictures, adhesion, diverticulosis, and tumors [5].

Aim of the work

The aim was to assess the role of colonoscopy in the diagnosis of lower gastrointestinal tract diseases in a group of Egyptian children.

Patients and methods

This was a cross-sectional study. After explaining the purpose of the study, an informed written consent was taken from parents of each patient, in adherence with the guidelines of the ethical committee of Al-Zahraa Hospital, Al-Azhar University, Cairo, Egypt. It was carried out on 40 children of both sexes, aged 5–18 years admitted to Endoscopy Unit of Al-Zahraa University Hospital, Al-Azhar University, in both pediatric and tropical medicine departments in the period from October 2014 to December 2015. It included children with lower gastrointestinal bleeding, chronic diarrhea, unexplained recurrent abdominal pain, and unexplained chronic constipation.

Children with cardiovascular, respiratory, and neurological instability, bleeding disorders and/or impaired platelet function, children with suspected bowel perforation, children with acute peritonitis, and children with recent bowel surgery (<6 months) were excluded from the study.

An informed consent was obtained from parents of patients before getting them involved in the study. The steps of the study, the aim, the potential benefits, and hazards all were discussed with the parents.

All children were subjected to the following:

(1) Thorough medical history taking:
   (a) It included personal history, complaints, analysis of gastrointestinal symptoms, associated symptoms, history of previous similar attacks or previous endoscopy, history of medications for dose and duration, and familial history of bleeding tendency.
(2) Thorough clinical examinations: it included general examination, anthropometric measurements, and clinical examination of all systems.
(3) Laboratory investigations: complete blood count was done by automated hematology counter Sysmex Kx N 21 (Sysmex Corporation, Kobe,Hyogo, Japan). Bleeding profile was done, including prothrombin time, partial thromboplastin, and international normalized ratio. Erythrocyte sedimentation rate was estimated. Liver enzymes such as serum alanine and aspartate aminotransferases were assessed by Synchron System Cx4/Cx5. Regarding kidney function tests, serum creatinine and blood urea nitrogen were assessed by Synchron System Cx4/Cx5. Stool analysis and culture on aerobic and anaerobic media was done.
(4) Colonoscopy: full colonoscopy was done for all included children in the study using video-scope colonoscopy (Pentax EPM 3500 and EPK 1500) after the procedure had been explained to the parents and an informed consent had been obtained.
   (a) Patient preparation: patients were prepared by ingestion of low-residue diet for 3 days before procedure, as well as free of substances that may be confused with false hemorrhage [fruits and vegetables containing peroxides (broccoli and tomatoes), drinks containing red dye, and iron supplements] [6], with use of castor oil or lactulose. Patients had to be on liquids while using magnesium citrate 1 day before the procedure [7]. Bowel-cleansing enemas were performed at morning on the day of the examination, and all children fasted for 6–8 h before sedation [8].
   (b) Premedication: all children were sedated before the procedure to minimize anxiety and provide comfort. Patients were sedated by using general anesthesia with propofol in children younger than 10 years or conscious sedation with midazolam in the older ones by an anesthesiologist, with continuous monitoring of vital signs throughout the procedure.
   (c) Technique: preprocedural endoscopic equipment (Pentax EPM 3500 and EPK 1500) was disinfected and tested. After an acceptable level of sedation, the patient was placed on the examination table in the left lateral position. Digital rectal examination was then performed. A colonoscope was introduced into the rectum and advanced through entire colon. Sometimes position was changed during the procedure into supine position to optimize visual field. Mucosa was examined for the presence of any pathological findings, and then biopsies were taken for histopathological examination.
   (d) Postprocedure monitoring: monitoring of vital signs and oxygen saturation was done for all patients. The patient should stay on the ward until fully awake and alert (for at least 2 h). Intake of clear fluid is possible one hour after sedation for alert patient. Discharge is possible if sufficient cardiovascular function and airway patency is confirmed and the patient is fully oriented. There were no serious complications recorded in all studied patients.
(5) Histopathological assessment: all endoscopic colonic biopsies were immediately fixed in buffered neutral formalin 10% and processed to be embedded in paraffin wax. Sections of 5-μm thickness were prepared and stained with

hematoxylin and eosin. Assessment was done, and data were recorded [9,10].

Statistical analysis

Statistical analysis was performed by Microsoft office 2010 and the statistical analysis program IBM SPSS (statistical package for social studies; IBM) version 21. For quantitative variable, mean and SD were calculated. For categorical variable, number and percentage were calculated. Analytical statistics were performed using χ^2 test. Differences were considered statistically significant at P value less than or equal to 0.05.

Results

There were 40 children of both sexes aged 5–18 years, with mean±SD age of 7.77±3.06 years. Overall 52.5% of patients were male, whereas 47.5% were female. Regarding BMI percentile, the majority of cases (57.5%) were normal, whereas 30% of cases were underweight, 10% of cases were overweight, and only 2.5% of cases were obese (Table 1).

The most common indications of colonoscopy were bleeding per rectum in 42.5% of cases followed by bleeding per rectum associated with chronic abdominal pain in 25% of cases, then bleeding per rectum associated with vomiting, hematemesis, and melena in 15% of cases, then bloody chronic diarrhea in 7.5% of cases, the chronic constipation associated with bleeding per rectum in 5% of cases, and lastly, nonbloody chronic diarrhea in 5% of cases (Table 2).

The results of hematological findings revealed that 57.5% of cases had anemia in which the mean hemoglobin level was 10.97±1.04 g/dl (Table 3), which is considered moderate anemia according to WHO [11].

Regarding stool analysis, normal findings was found in 37.5% of cases, *Entameba histolytica* cyst was found in 25% of cases, Oxyuris eggs were found in 15% of cases, *Giardia lamblia* cysts were found in 10% of cases, pus cells were found in 10% of cases, and Ancylostoma eggs were found in 2.5% of cases only (Table 4). The results of stool cultures revealed no growth in 87.5% of cases, whereas revealed *Escherichia coli* in 12.5% of cases (Table 5).

Regarding colonoscopic finding, there were colorectal polyps in 42.5% of cases; normal mucosal appearance in

Table 1 Demographic data of the studied patients

Variables	*n* (%)
Sex	
Male	21 (52.5)
Female	19 (47.5)
BMI percentile	
Normal weight	23 (57.5)
Underweight	12 (30)
Overweight	4 (10)
Obese	1 (2.5)

Table 2 Indications of colonoscopy in the studied patients

Variables	*n* (%)
Bleeding/rectum	17 (42.5)
Bleeding/rectum+chronic abdominal pain	10 (25)
Bleeding/rectum and other manifestations (vomiting, hematemesis, and melena)	6 (15)
Bleeding/rectum+constipation	2 (5.0)
Nonbloody chronic diarrhea	2 (5.0)
Bloody chronic diarrhea	3 (7.5)

Table 3 Hematological results of the studied patients

Variables	Range	Mean±SD
Hemoglobin (mg/dl)	9–13	10.97±1.04
Platelets (10^3/mm^3)	215–812	366.95±130.33
Leukocytes (10^3/mm^3)	4–24.4	9.30±3.97
Prothrombin time (s)	11.4–14.7	13.18±1.46
Partial prothrombin time (s)	28–45	35.91±6.90
International normalized ratio	1–1.9	1.06±0.16
Erythrocyte sedimentation rate (ml/h)	6–60	16.68±10.62

Table 4 Stool analysis results of studied patients

Variables	*n* (%)
Normal	15 (37.5)
Entameba histolytica cyst	10 (25)
Oxyuris eggs	6 (15)
Giardia lamblia cyst	4 (10)
Ancyolstoma eggs	1 (2.5)
Pus cells (>5/HPF)	4 (10)

Table 5 Colonscopic findings of the studied patients

Colonoscopic findings	*n* (%)
Colorectal polyps	
Single polyp	5 (12.5)
Multiple polyps (2–5)	11 (27.5)
Polyposis syndrome (>5)	1 (2.5)
Hyperemia, edema, superficial ulceration, loss of vascular pattern, and mucosa easily bleed on touch	8 (20)
Hyperemia, edema, loss of vascular pattern, mucosa easily bleed on touch, and no ulcers	3 (7.5)
Congestion and edema	3 (7.5)
Edematous mucosa and bleeding on touch	1 (2.5)
Normal	8 (20)

20% of cases; hyperemia, superficial ulceration, loss of vascular pattern, and mucosa bleed on touch in 20% of cases; hyperemia, loss of vascular pattern, and no ulceration in 7.5% of cases; congestion and edema in 7.5% of cases; and edematous mucosa in 2.5% of cases.

The most common histopathological diagnoses were juvenile polyps in 42.5% of cases, followed by nonspecific colitis in 37.5% of cases, eosinophilic colitis in 12.5% of cases, and ulcerative colitis in 7.5% of cases (Table 6).

Table 6 Results of histopathological diagnosis of the studied patients

Histopathological findings	*n* (%)
Juvenile polyps	17 (42.5)
Chronic nonspecific colitis	15 (37.5)
Chronic eosinophilic colitis	5 (12.5)
Ulcerative colitis	3 (7.5)

Discussion

The safety and effectiveness of colonoscopy in the investigation of lower gastrointestinal tract pathology in children has been established for more than two decades. The skill and experience have since advanced to the point that both diagnostic and therapeutic colonoscopy are now routinely performed by most pediatric gastroenterologists [1].

The current study revealed that the most common presenting symptom was bleeding per rectum in ~87% of the studied cases, as there were 42.5% of cases presenting with bleeding per rectum only, associated with chronic abdominal pain in 25% of cases, associated with vomiting, hematemesis, and melena in 15% of cases, and associated with chronic constipation in 5%. Chronic diarrhea was presented in 12.5% of cases (7.5% bloody diarrhea and 5% nonbloody diarrhea).

These results are in agreement with Motamed *et al.* [12], who studied colonoscopic findings in children complaining of lower gastrointestinal bleeding, and they found that the most common presentations was bleeding per rectum in 87% of cases followed by abdominal pain, accounting for 6% of cases.

Moreover, Park [1] in his review on pediatric colonoscopy reported that bleeding per rectum was the most common symptom, leading to diagnostic colonoscopy in 56% of cases, followed by chronic abdominal pain in 27.5% of cases.

In our study, the most common colonoscopic findings were colorectal polyps in 42.5% of cases, which were found at rectosigmoid; normal mucosal appearance in 20% of cases, all over the entire colon; and other mucosal lesions such as hyperemia, superficial ulceration, loss of vascular pattern, and mucosa bleed on touch presenting in 37.5% of cases, scattered all over the entire colon.

These results were in agreement with Gadoa *et al.* [13] who studied the role of colonoscopy in diagnosis of lower gastrointestinal bleeding in children and found colorectal polyps in 51.79% of cases, whereas 33.93% of cases showed nonspecific lesions.

Moreover, another study by Gimiga *et al.* [6] revealed that the most common colonoscopic findings in children presenting with bleeding per rectum were colorectal polyps in 33% of cases followed by a picture suggestive of affection by ulcerative colitis in 22% of cases, then nonspecific lesions as local or disseminated inflammation, erythema, or decreased or increased vascular marking in 18.6% of cases, rectal ulcers in 3.4% of cases, and finally, intestinal polyposis in 3.4% of cases.

Regarding histopathological examination of our patients, specimens showed that the most common diagnoses were juvenile polyps in 42.5% of cases, followed by nonspecific colitis in 37.5% of cases, eosinophilic colitis in 12.5% of cases, and ulcerative colitis in 7.5% of cases.

These findings were in agreement Khushdil *et al.* [14] who studied the histopathological findings of colonic biopsies obtained through colonoscopy in 80 children presenting with lower gastrointestinal bleeding and found that juvenile polyp was the most common histopathological finding in 47 patients; however, 13 patients had chronic nonspecific colitis, 11 cases were found to be normal, three cases had evidence of ulcerative colitis, whereas six specimens revealed nonspecific findings.

On the contrary, our results disagreed with ElKhayat *et al.* [15] who found that infectious enterocolitis was the most common cause of lower gastrointestinal tract bleeding in 37.1% of 194 Egyptian children who presented with bleeding per rectum followed by colorectal polyps in 21.1% of cases and chronic colitis in 16% of cases.

Moreover, El-Shabrawi *et al.* [16] who studied colonoscopic findings in 174 Egyptian children who presented with bleeding per rectum and found that the

source of bleeding was colorectal polyps in 100 (57.4% of cases) patients. Moreover, they found that polyps were solitary in 56 (56%) children and ranged from two to five polyps in 34 (34%) and more than five in 10 (10%) children. Polyps were confined to the rectum in 68 children, were rectosigmoid in 20, in the descending colon in eight, and splenic flexure in four children. Polyps were juvenile in 84 (84%) children, inflammatory in 10 (10%), and hyperplastic, schistosomal, or adenomatous in two (6%) each.

In the current study, 12.5% of cases were diagnosed as having eosinophilic colitis, and the patients presented with bleeding per rectum associated with abdominal pain and atopy (one case with allergic rhinitis). Colonoscopic findings revealed that the lesions affected specific segments of the colon or may occur in a diffuse manner in the form of mucosal edema, patchy erythema, loss of vascularity, and superficial ulceration.

Histopathological examination of biopsies for these cases revealed that the lamina propria is expanded by eosinophil-rich infiltrate with clustering and degranulation of eosinophils; eosinophils are also seen infiltrating the surface and crypt epithelium (20 eosinophils per high-power field). These findings were in agreement with Alfadda *et al.* [17], in their review about eosinophilic colitis.In the current study, 7.5% of cases were diagnosed as ulcerative colitis who presented with bleeding per rectum, abdominal pain, diarrhea, and mucus. Two of them were anemic and had elevated erythrocyte sedimentation rate. Colonoscopic examination revealed that inflammation was diffuse, continuous, beginning at the rectum and extending proximally; disease severity was worse distally; and mucosa shows erythema with loss of vascular pattern, friability, and superficial ulceration.

Histopathological examination showed that, the lamina propria was infiltrated mainly by lymphoplasmacytic infiltrates, with chronic inflammation (crypt distortion), active inflammation (cryptitis and crypt abscess), and alteration of mucin production. These results are in agreement with Al-Saleem *et al.*[18], in their retrospective study on pediatric ulcerative colitis.

Our study revealed that 20% of cases normal mucosal appearance during colonoscopy, which is similar to the results of Motamed *et al.*[12] who found that 15.8% of children who presented with painless bleeding per rectum had normal colonic mucosal appearance. Another study done by Salamat *et al.* [19] reported that 38% of cases that presented with lower gastrointestinal tract disorders had normal colonic mucosal appearance in their retrospective review on colonoscopy.

The histopathological examination of these cases showed chronic nonspecific colitis. These results are in agreement with Ugiagbe and Ugiagbe [20] who found that, eight (61.5%) of the 13 patients with normal mucosa on colonoscopy had chronic nonspecific colitis on histology.

Conclusion

Colonoscopy is a valuable and safe tool for diagnosis of lower gastrointestinal diseases in children. Bleeding per rectum was the common indication for referral for colonoscopy. The most common cause of bleeding per rectum in children who underwent colonoscopies was juvenile polyp. Normal mucosal appearance did not exclude presence of underlying pathology.

Recommendation

General pediatricians should be aware of cases that need evaluation by gastroenterologist and referral should not be delayed. Endoscopist should be familiar with the risks and benefits of endoscopy. Patients diagnosed as having chronic nonspecific colitis need follow-up for more evaluation.

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Conflicts of interest

There is on conflict of interest.

References

1 Park JH. Role of colonoscopy in the diagnosis and treatment of pediatric lower gastrointestinal disorders. *Korean J Pediatr* 2010; **53**:824–829.

2 Kostovski A, Zdraveska N. Indications for gastrointestinal endoscopy in children. *Zdrav Vestn* 2013; **82**: I–114–I–126.

3 Friedt M, Welsch S. An update on pediatric endoscopy. *Eur J Med Res* 2013; **18**:1–7.

4 Ko CW, Riffle S, Shapiro JA, Saunders MD, Lee SD, Tung BY, *et al.* Incidence of minor complications and time lost from normal activities after screening or surveillance colonoscopy. *Gastrointest Endosc* 2007; **65**:648–656.

5 Lohsiriwat V, Sujarittanakarn S, Akaraviputh T, Lertakyamanee N, Lohsiriwat D, Kachinthorn U. Colonscopic perforation: a report from World Gastroenterology Organization endoscopy training center in Thailand. *World J Gastroenterol* 2008; **14**:6722–6725.

6 Gimiga N, Burlea M, Diaconescu S, Olaru C. An assessment of the causes of lower gastrointestinal bleeding in a children's hospital in northeastern Romania. *Arch Biol Sci Belgrade* 2015; **67**:715–720.

7 Hunter A, Mamula P. Bowel preparation for pediatric colonoscopy procedures. *J Pediatr Gastroenterol Nutr* 2010; **51**:254–261.

8 Chien-Ting WU, Chih-An C, Yao-Jong Y. Characteristic and diagnostic yield of pediatric colonoscopy in Taiwan. *Pediatr Neonatol* 2015; **56**:334–338.

9 Thompson SW. *Selected histochemical and histopathological methods, Charles C. ISBN 13:9780398031329*. Skokie, IL, USA: Thomas Pub Ltd; 1974.

10 Sheehan DC, Hrapchak BB. *Theory and practice of histo-technology. ISBN 10: 0935470395*. 2nd ed. Columbus: Battelle Press 1987.

11 World Health Organization. *The global prevalence of anemia in2011. ISBN: 9789241564960*. Geneva, Switzerland: WHO; 2011.

12 Motamed F, Najafi M, Khodadad A, Fallahi G, Sobhani M. Colonscopic findings in children with lower gastrointestinal bleeding. *Govaresh* 2008; **13**:54–57.

13 Gadoa AS, Ebeidc BA, Abdelmohsen AM, Eskanderd AE, Axone AT. Quality of colonoscopy in children with rectal bleeding in Egypt. *Egypt Soc Intern Med* 2015; **27**:21–25.

14 Khushdil A, Ali S, Sohail S, Ehsan A, Awais A, Jan GA. Histopathological findings of biopsy specimen in children presenting with lower gastrointestinal bleeding. *J Postgrad Med Inst* 2014; **28**:247–250.

15 El-Khayat HA, El-Hodhod MA, Abd El-Basset FZ, Tomoum HY, El-Safory HA, Hamdy AM. Rectal bleeding in Egyptian children. *Ann Trop Paediatr Int Child Health* 2006; **26**:337–344.

16 El-Shabrawi MH, El din ZE, Isa M, Kamal N, Hassanin F, El-Koofy N, *et al.* Colorectal polyps: a frequently-missed cause of rectal polyps: a frequently-missed cause of rectal bleeding in Egyptian children. *Ann Trop Paediatr* 2011; **31**:213–218.

17 Alfadda AA, Storr MA, Shaffer EA. Eosinophilic colitis: epidemiology, clinical features, and current management. *Ther Adv Gastroenterol* 2011; **4**:301–309.

18 Al-Saleem K, El Mouzan MI, Saadah OI, AlSaleem B, Al-Hussaini A, Hassosa M, *et al.* Characteristics of pediatric ulcerative colitis in Saudi Arabia: a multicenter national study. *Ann Saudi Med* 2015; **35**:19–22.

19 Salamat A, Ayub A, Zaheer S, Ehsan A. Colonoscopy: analysis of indications and diagnoses at a specialist unit. *Ann Pak Inst Med Sci* 2010; **6**:15–19.

20 Ugiagbe EE, Ugiagbe RA. Colonoscopic and histological assessment of colonic lesions in University of Benin teaching hospital, Benin City. *Ebonyi Med J* 2011; **10**:99–104.