

Research Article

Colonoscopic polypectomy of juvenile polyps in children: Experience from a tertiary centre of Bangladesh

Salahuddin Mahmud^{a,*}, Mashud Parvez^b, Madhabi Baidya^a, Farhana Tasneem^c, Ahmed Rashidul Hasan^a, Tanzila Farhana^a, Md Jahangir Alam^d, Syed Shafi Ahmed^a

^a Department of Pediatric Gastroenterology, Hepatology & Nutrition, Bangladesh Shishu Hospital & Institute, Dhaka, Bangladesh

^b Department of Pathology, Bangladesh Shishu Hospital & Institute, Dhaka, Bangladesh

^c Department of Pediatrics, BIHS General Hospital, Diabetic Association of Bangladesh, Dhaka, Bangladesh

^d Bangladesh Shishu Hospital & Institute, Dhaka, Bangladesh

ARTICLE INFO

Keywords:

Juvenile polyp
Per-rectal bleeding
Colonoscopy
Polypectomy
Children

ABSTRACT

Aims: To assess the specifics of juvenile polyps and the value of polypectomy with complete colonoscopy in pediatric patients.

Methods: I retrospectively reviewed the medical records of 81 children diagnosed with juvenile polyps from 2017 to 2021.

Results: The patients' ages ranged from 1.5 to 18 years. Hematochezia was present in 100% of cases, in which 97.5% of the bleeding was painless. The most frequent was red or dark red hematochezia in 71.6% of cases, followed by red stool with blood dripping in 9 (11.1%) cases. The time interval between the first episode of hematochezia and the colonoscopy ranged from 1 to 47 months. Only 24.7% of polyps were diagnosed by digital rectal examination. Most of the Juvenile polyps were solitary (82.8%) and located in the rectosigmoid part of the colon. The size of the polyps varied from 0.3 to 4 cm. Early post-polypectomy bleeding occurred in two cases, while late post-polypectomy bleeding occurred in only one case.

Conclusions: Although solitary juvenile polyps in the rectosigmoid colon are more common, some patients had multiple and some had proximal polyps. Therefore, a colonoscopy of the entire colon with therapeutic polypectomy is important for improved outcomes when evaluating painless, intermittent hematochezia in children.

1. Introduction

Rectal bleeding in children is a prevalent issue in daily medical practice. Localizing the source of the bleeding is crucial in managing such children because small lower GI tract hemorrhages that occur frequently might cause serious anemia. In addition to a comprehensive history, evaluation of the perineal area, digital rectal examination, and stool test, diagnostic options include radiography, ultrasonography, upper GI endoscopy, and colonoscopy.¹

Polyps are growths of tissue that protrude from the intestinal wall into the intestinal lumen.² Around 1.1% of preschool- and school-aged children had colorectal polyps, which are prevalent in childhood.³ It has been shown to have a prevalence ranging from 0.08% to 3.7% in children, and the majority of cases are identified in youngsters, particularly young males between the ages of 3 and 10.⁴

Ninety percent of gastrointestinal polyps are juvenile polyps, which usually cause painless perrectal bleeding in children.^{3–5} Rectosigmoid area accounts for approximately 90% of all juvenile polyps, but others are

* Corresponding author. Department of Pediatric Gastroenterology, Hepatology & Nutrition, Bangladesh Shishu Hospital & Institute, Sher-E-Bangla nagar, Dhaka, 1207, Bangladesh.

E-mail addresses: drsmbablu@gmail.com (S. Mahmud), rashu220@yahoo.com (M. Parvez), madhabibaidya018@gmail.com (M. Baidya), drftasneem@gmail.com (F. Tasneem), upal.ah@gmail.com (A.R. Hasan), tanzila.djmc@gmail.com (T. Farhana), profdrmdjahangiralam@gmail.com (M.J. Alam), ahmedmuaz@yahoo.com (S.S. Ahmed).



Production and Hosting by Elsevier on behalf of KeAi

<https://doi.org/10.1016/j.gande.2023.11.002>

Received 16 July 2023; Received in revised form 18 October 2023; Accepted 8 November 2023

Available online 11 November 2023

2949-7523/© 2023 The Authors. Publishing services by Elsevier B.V. on behalf of KeAi Communications Co. Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

multiple and located more proximally, so a total colonoscopy is necessary.^{6–8} Previously, it was thought that children with juvenile polyps had no risk of malignant transformation, only children with familial adenomatous polyps and juvenile polyposis syndrome had the chance of developing adenocarcinoma.^{2,9} Juvenile polyps have been shown to have adenomatous alterations in recent research, suggesting neoplastic potential.^{6,10} Additionally, juvenile polyps have also been linked to instances of colorectal adenocarcinoma in youngsters.^{9,11} So, the diagnosis of polyps at an earlier stage may considerably enhance a patient's general health as well as their quality of life.

Juvenile polyps in children usually show up as fresh, painless, and intermittent rectal bleeding that comes and goes, with or without other symptoms like repeated abdominal pain, prolapse through the anus, diarrhea, anemia (Hb 10 g/dL), and anal mass.¹³ These result in serious anemia when left untreated for a long time because of hidden blood loss

and visible rectal bleeding.¹⁴ Therefore, early detection and polypectomy are necessary for all colonic polyps.^{14,15} Fiberoptic colonoscopy is a routine modality for diagnosing and treating colorectal polyps in pediatric patients.¹⁶

The risk of developing colorectal cancer and the likelihood of dying from the disease are both decreased when polyps are removed from the colon using endoscopy, and is considered an essential skill for all endoscopists who perform colonoscopies.¹⁷ Although there have been clinical studies on colonic polyps in Bangladeshi children,¹⁸ there have been only a few studies regarding colonoscopic polypectomy.^{12,19} With this background, this study was conducted to spot the clinical spectrum, laboratory profile, colonoscopic features, histology, the usefulness of colonoscopic polypectomy with entire colonoscopy, and complications in children attending a tertiary center in Bangladesh.

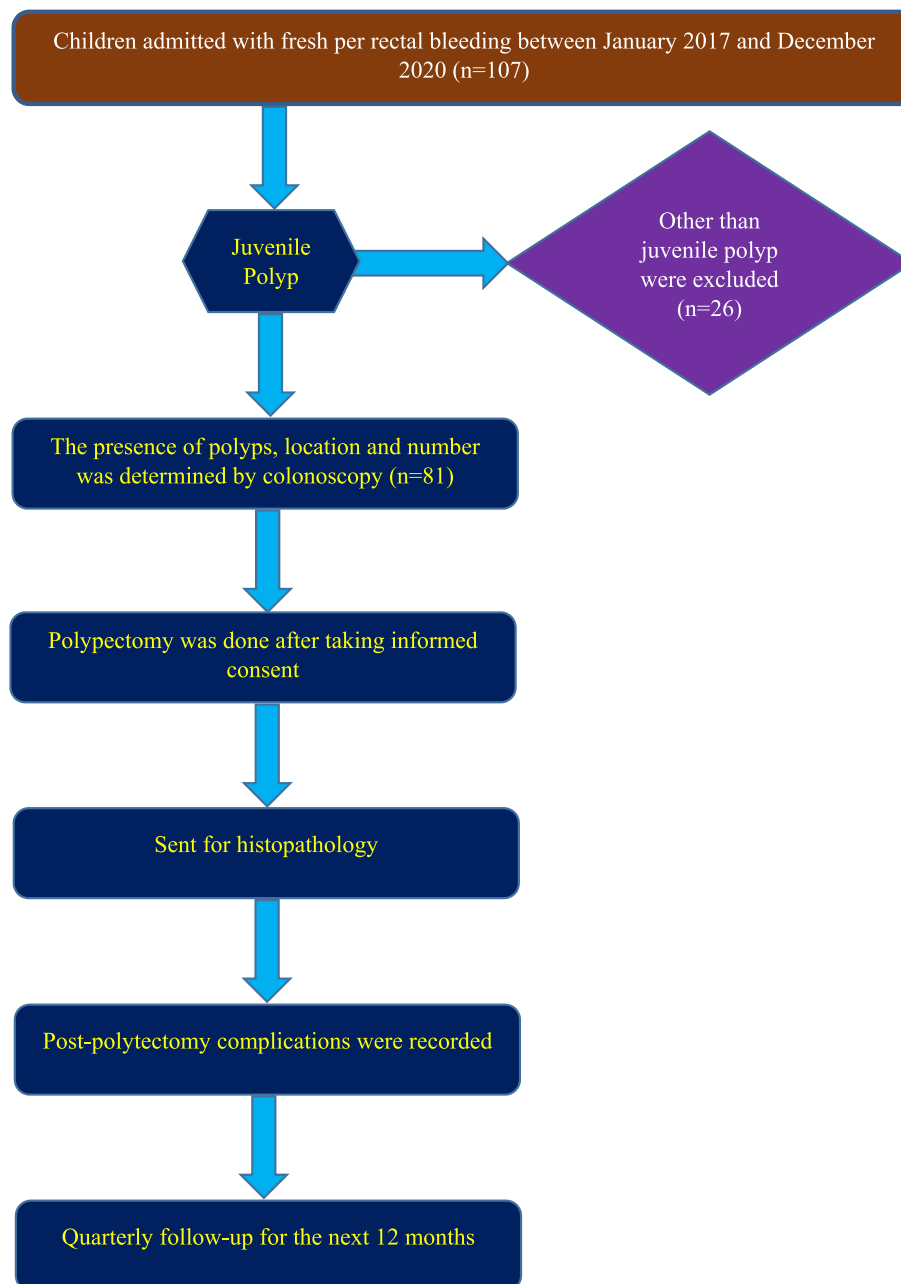


Fig. 1. Study flow chart.

2. Methods

2.1. Patients

Eighty-one children with colonic juvenile polyps were reviewed retrospectively in the department of Pediatric Gastroenterology, Hepatology, and Nutrition at Bangladesh Shishu Hospital & Institute, Dhaka, Bangladesh, from January 2017 to December 2021.

Ethical clearance was obtained from the ethical review committee of Bangladesh Shishu Hospital & Institute (No. Admin/1090/BSHI/2022). Written informed consent was obtained from the parents of individual participants at the time of admission.

2.2. Inclusion and exclusion criteria

Informed consent was obtained from the parents of the patients after carefully explaining the procedure details and potential complications. When more than 5 juvenile polyps in the colorectum or multiple juvenile polyps with a family history were excluded from the study. Parents who did not consent to the procedure and/or had thrombocytopenia and coagulopathy were also excluded from the study. The chief investigator performed all pediatric colonoscopic polypectomies (Figs. 1, 2 and 3).

2.3. Operational definitions

The juvenile polyp was diagnosed by the presence of five or fewer hamartomatous polyps in the colon or rectum in the absence of family history.² Clinically, it was diagnosed by painless rectal bleeding along with distinctive histopathology (cystic architecture, mucus-filled glands, prominent lamina propria, marked increase of the stromal cell compartment, distorted and dilated crypts with or without inflammatory and reactive changes of the epithelium), generally done after polypectomy via colonoscopy.²⁰ The definition of mild anemia was Hb between 10 and 10.9 mg/dL, moderate anemia was Hb between 9.9 and 7 g/dL, and severe anemia was Hb 7 g/dL.²¹ A bloody discharge was identified as blood-stained mucus secretion from the resection site after the polypectomy. Small amounts of bleeding after polypectomy that stopped independently without needing hemoclips, cautery, or epinephrine were classified as minor bleeding. A mixed infection was diagnosed when a patient had minor bleeding and a bloody discharge. There are two distinct classifications of post-polypectomy bleeding (PPB): immediate PPB and delayed PPB. The endoscopist can detect a bleeding complication during polypectomy using immediate PPB. Considerable hematochezia observed in a patient hours to days following a colonoscopy should invariably prompt suspicion of a delayed PPB. When both early and late post-polypectomy bleeding was absent, it was determined that there was no recurrence of bleeding.²²

2.4. Colonoscopy

2.4.1. Preparation

The patient received a standard written preparation from the

respective department, depending on the patient's age and the family's cooperation. One to two days before the procedure, the patient was advised to begin a clear fluid diet. On the day before the procedure, patients were made to drink a solution of polyethylene glycol (PEG, 17g) dissolved in water (250 mL) at a rate of 250 mL every 30 min. The stool output was checked in the afternoon, and another PEG solution was administered if the stool output contained solid components. At night, a saline enema was performed if solid particles were still present in the stool. If the patient could not drink the solution, it was administered through a nasogastric tube.

2.4.2. Machine

Most colonoscopic procedures were done with video endoscopes (OLYMPUS GIF-Q190; Olympus, To-kyo, Japan) for children ≥ 2 years of age. In children younger than two years or weighing less than 10 kg, colonoscopy was performed with a pediatric video endo-scope (OLYMPUS GIF-XP190; Olympus, To-kyo, Japan) with a diameter of 5.8 mm.

2.4.3. Anesthesia

The mode of anesthesia was decided depending on the patient's age, level of cooperation, and the physician's comfort level. Parenteral Midazolam (0.05–0.1 mg/kg IV, maximum single dose of 4 mg) with or without Ketamine (1 mg/kg I/V) was used as a sedative. Further dosing was considered according to the patient's comfort level and the maximum dose of the medications. In some adolescents, colonoscopy was done without sedation but under local xylocaine jelly. General anesthesia was not used on any patient due to the absence of an anesthetist and anesthetic facility.

2.4.4. Procedure

The procedure was performed in the left lateral position. A Colonoscopic polypectomy was performed with the help of a polypectomy snare. Polyps were excised using a combination of alternating coagulation and cutting. The excised polyp was retrieved with a tripod basket, a Roth net, or with the help of strong suction through the colonoscope. Polyps were immediately placed in formalin for transportation to the pathology department for histopathological examination.

2.4.5. Post-procedural complication

Children were observed for 6–24 h after polypectomy to detect any complications, such as hemorrhage or perforation.

2.5. Laboratory tests, follow up and outcome

A complete blood count (CBC), especially Hb% and type of anemia, was recorded. Patients were followed-up quarterly for a minimum period of 12 months. A surveillance colonoscopy was done whenever the child was symptomatic or twice a year. The outcome measures were divided by the presence or absence of further bleeding during intra-procedural and post-procedural time (12 months).

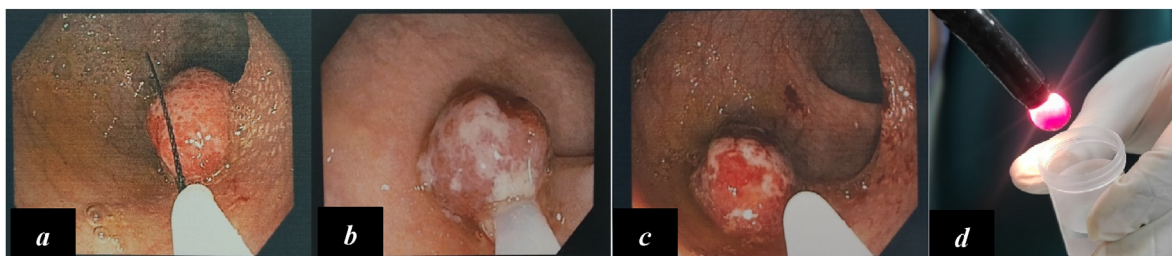


Fig. 2. Various snare polypectomy views: (a) Introduction of polypectomy snare, (b) Complete grasping of polyp, (c) Cauterization & cutting, (d) Specimen sent for histopathology.

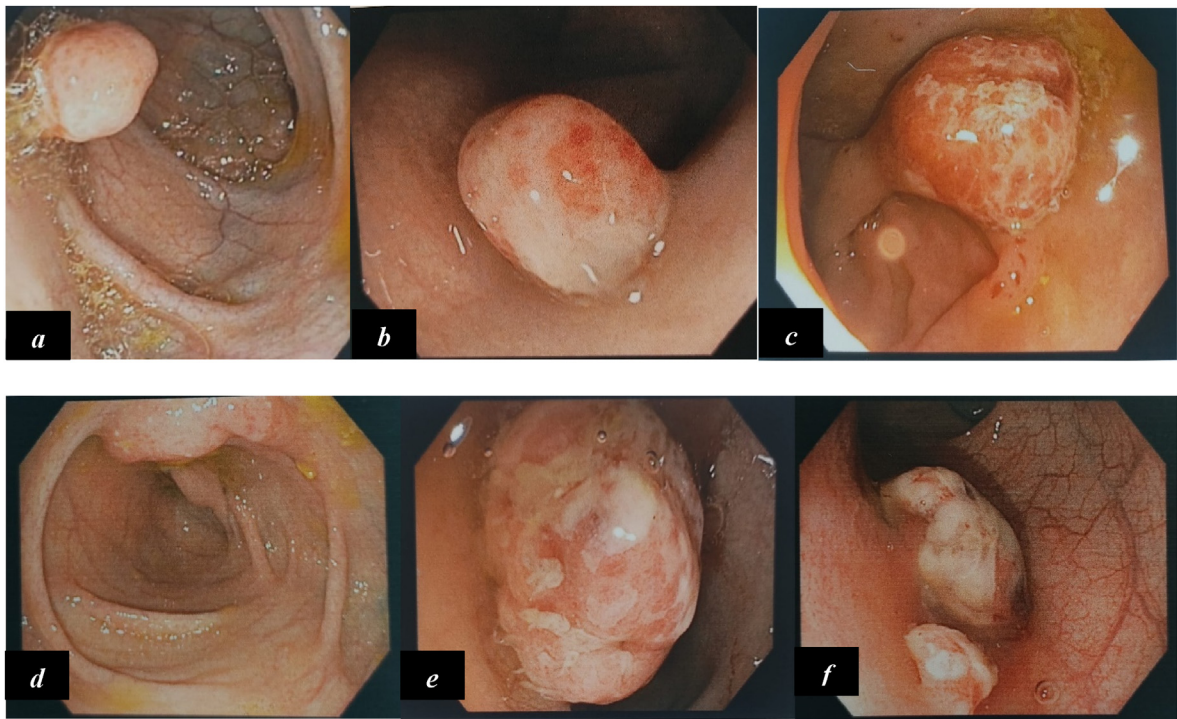


Fig. 3. Various types of polyp: (a) Sessile polyp, (b) Subpedunculated polyp, (c) Pedunculated polyp, (d) Sessile flat polyp, (e) Giant polyp, (f) Multiple polyp.

2.6. Statistical analysis

All clinical and biochemical parameters were collected from departmental registers before and after the intervention, and analysis was done by the statistical program SPSS (Statistical Package for Social Science) version 24.0 (by the IBM Corporation, USA).

3. Results

3.1. Patient characteristics

Among the 81 study patients, the majority were male (63%), with a male-to-female ratio of 1.7:1. They were presented at ages ranging from 1.5 to 18 years, with a mean age of 5.9 ± 2.7 years. A high frequency was observed in children aged between 2 and 5 years (Table 1).

3.2. Clinical presentation

The primary presenting feature was rectal bleeding, which was painless in most patients (97.5%). Only four (4.9%) patients presented with a prolapsed polyp along with bleeding per rectum. Nearly one-third (30.8%) of the children were mildly pale, and only one presented with severe pallor. Fifty-eight (71.6%) patients experienced bright or dark red bloody stool, and others experienced either blood dripping or blood on

wiping after defecation (Table 2). The interval between the onset of presenting symptoms and a colonoscopy ranged from 1 to 47 months after the first bleeding episode. However, most patients visited our OPD between 3 and 18 months of age.

3.3. Characteristics of polyp

Morphologically, the majority of the polyps were pedunculated (70.9%), and others were sessile, mixed (pedunculated plus sessile), and indefinite. Sixty-seven (82.8%) patients had a single polyp, and 14 (17.2%) patients had multiple polyps. The size of the polyps varied between 0.5 and 4 cm, with a commonly measured diameter between 1.0 and 1.9 cm. Polyps were predominantly found in the rectum (63.1%), along with the sigmoid colon (25.3%), descending colon (8.7%), and transverse colon (2.9%). Most of the multiple polyps were found in the rectosigmoid colon (Table 3).

Table 1
Characteristics of Study population (n = 81).

Age	No. of patient (%)
<2 years	01 (1.2)
2–5 years	38 (46.9)
5–10 years	36 (44.5)
10–15 years	04 (4.9)
>15 years	02 (2.5)
Sex	
Male	51 (63.0)
Female	30 (37.0)

Table 2
Clinical presentation of polyp (n = 81).

Symptoms	No. of patient (%)
Per rectal bleeding	81 (100)
Painless bleeding	79 (97.5)
Prolapsed polyp	04 (4.9)
Abdominal pain	02 (2.5)
Constipation	02 (2.5)
Signs	
Mildly pale	25 (30.8)
Moderately pale	9 (11.1)
Severely pale	1 (1.2)
Polyp palpated on D/R/E	20 (24.7)
Stool Characteristics	
Bright or dark red bloody stool	58 (71.6)
Bright red stool with blood dripping	9 (11.1)
Blood on wiping	8 (9.8)
Red color change of the stool	6 (7.4)

Table 3
Distribution of polyps by its characteristics (n = 103).

Number of Polyp	No. of patients (%)
Solitary	67 (82.8)
Double	8 (9.8)
Triple	4 (4.9)
Quadruple	2 (2.5)
Morphology of Polyp	No. of polyps (%)
Pedunculated	73 (70.9)
Sessile	19 (18.4)
Both pedunculated & Sessile	4 (3.9)
Indefinite	7 (6.8)
Size of Polyp (cm)	No. of polyps (%)
<1.0	40 (38.9)
1.0–1.9	57 (55.3)
2.0–2.9	5 (4.8)
≥3.0	1 (1.0)
Location of polyp	No. of polyps (%)
Rectum	65 (63.1)
Sigmoid colon	26 (25.3)
Descending colon	9 (8.7)
Transverse colon	3 (2.9)

3.4. Immediate complications

About half of the patients did not encounter any significant complications such as mucosal tears, profuse bleeding, or perforation (see Fig. 4). In the case of 19 (23.4%) patients, we observed bloody discharge immediately after the procedure, and minor bleeding was present in 13 (16.1%) patients (Fig. 5).

3.5. Outcome

Early post-polypectomy bleeding occurred in two (2.4%) cases, while late post-polypectomy bleeding occurred in only one (1.3%) case. These late bleedings resulted from a polyp recurrence (Fig. 6). The rest of the patients (96.3%) had no mentionable complications during the 12-month follow-up.

4. Discussion

Juvenile polyps are the most common gastrointestinal tract tumors and an important cause of rectal bleeding in the pediatric age group.^{6,8,12,19,23,24} The mean age of the patients at the time of diagnosis was 5.9 ± 2.7 and the male/female ratio was 1.7:1. Nearly similar results were observed in Das et al.¹² and Benzamin et al.¹⁹ from Bangladesh, Mandhan et al.²⁵ in Pakistan, Ashtiani et al.²⁴ in Iran, Lee et al.⁸ in Korea, and Ko et al.²⁶ in Taiwan. This male preponderance is probably due to being more concerned about the boy child. The children aged 2–5 years had the highest frequency (46.9%), followed by 5–10 years, in which the frequency of juvenile polyps was 44.5%. Similar results were observed in other studies in Bangladesh^{12,19} and Iran.²⁴

In our study, the mean time interval between the first episode of symptoms (hematochezia) and colonoscopy ranged from 1 to 47 months. Das et al.¹² from Bangladesh and Lee et al.⁸ from Korea also observed long ranges of about three and four years, respectively. This delay in treatment may be due to a lack of awareness and fear concerning colonoscopy procedures. Some patients also try homeopathic medicine to avoid instrumental intervention.

All patients had hematochezia, and in most cases, rectal bleeding was painless (97.5%). Hematochezia was commonly found as a bloody red stool and, in some cases, with blood dripping or on wiping. Lee et al.⁸ also observed similar features of hematochezia. Very few patients presented with abdominal pain or constipation. Inflammatory markers and histopathology exclude inflammatory bowel diseases in patients with

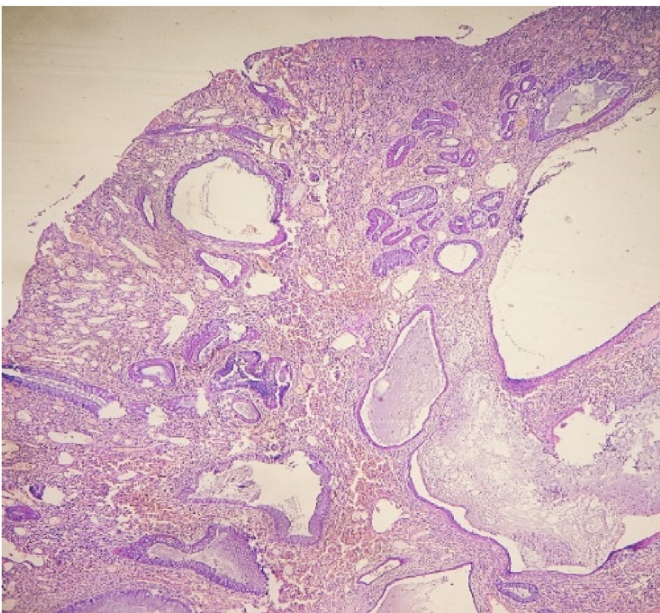


Fig. 4. H & E stain, low-power image: A juvenile rectal polyp, cystically dilated glands filled with mucus, devoid of atypical features, and separated by an inflamed and edematous stroma.

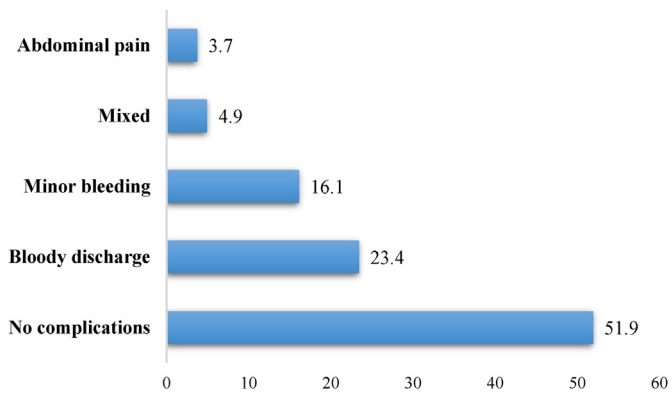


Fig. 5. Immediate complications after snare polypectomy.

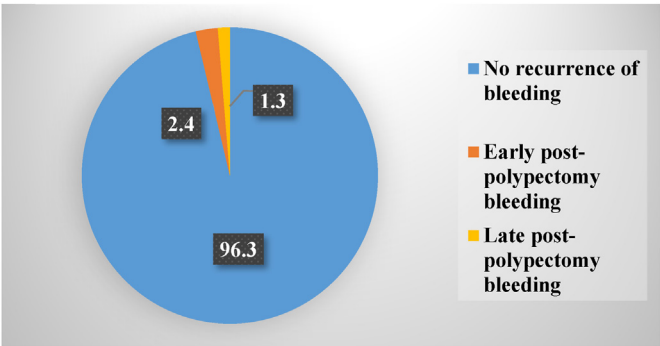


Fig. 6. Long term outcome after snare polypectomy.

abdominal pain, as observed by Rashed et al.²² Similar to other studies, we found different grades of anemia in our studied patients.^{13,14,19} However, in another Bangladeshi study, Das et al.¹² observed no evidence of anemia. This observation may be due to the mean duration of symptoms and the colonoscopy period being shorter in relation to the

present study. For proper evaluation, a total colonoscopy should be considered in every patient with a suspected rectal polyp, as polyps were found in only 24.7% of patients on the digital rectal examination.

Until colonoscopy became a common practice with children, it was believed that most of the detected juvenile polyps were solitary polyps, with 90% of them occurring in the rectosigmoid.²⁷ However, according to a report by Mestre, 50% of juvenile polyp patients had multiple polyps, of which 60% were found in more proximal locations than rectosigmoid.¹¹ Most of the patients in this current study had solitary polyps (82.8%) located in the rectosigmoid colon (88.9%). These observations align with the findings of Lee BG et al.,⁸ Kim et al.,³⁰ Cheon et al.²⁹ and Lee HJ et al.³¹ Given the above finding, some polyps can be found beyond the rectosigmoid area. Therefore, a total colonoscopy in all children with rectal bleeding, which was also emphasized by Poddar et al.⁶ The size of the polyps was, in most cases, 1.0–1.9 cm in diameter (55.6%). Large polyps larger than 3 cm were found in only one patient. These findings agree with the findings of other research that has been conducted.^{8,28–30}

Possible major complications of polypectomy include hemorrhage, and intestinal perforation, which are seen with electrocautery. Mild gastrointestinal symptoms such as abdominal pain, bloating, diarrhea, and nausea are reported to occur after polypectomy, which usually resolve in 24–48 h.^{8,32} In the present study, no significant complications were seen immediately following the procedure, except for minor bleeding. Regarding long-term outcomes, recurrence of bleeding was observed in only 7 patients. Lee BG et al.⁸ observed a nearly similar result.

Although solitary juvenile polyps in the rectosigmoid colon are more prevalent, some patients had multiple polyps, and some had polyps located in the proximal part. So, if a child has painless, intermittent hematochezia, a colonoscopy of the whole colon with therapeutic polypectomy is important for better results.

We advocate therapeutic colonoscopy for the management of colonic polyps since it is safe and effective.

Declaration of competing interest

All listed authors have read and approved the manuscript as submitted, and we do not have any conflicts of interest to declare.

Funding

The study is self-funded by the authors.

CRediT authorship contribution statement

Salahuddin Mahmud: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Supervision, Writing – original draft, Writing – review & editing. **Mashud Parvez:** Investigation, Supervision. **Madhabi Baidya:** Data curation, Methodology, Supervision. **Farhana Tasneem:** Conceptualization, Formal analysis. **Ahmed Rashidul Hasan:** Conceptualization, Data curation, Formal analysis, Investigation, Supervision, Validation. **Tanzila Farhana:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Writing – review & editing. **Md Jahangir Alam:** Methodology, Software, Supervision, Writing – review & editing. **Syed Shafi Ahmed:** Conceptualization, Methodology, Project administration, Supervision, Visualization, Writing – review & editing.

References

1. Yachha SK, Khanduri A, Sharma BC, et al. Gastrointestinal bleeding in children. *J Gastroenterol Hepatol*. 1996;11:903–907.
2. Bishop WP. Polyps and tumours of the intestines. In: Bishop WP, ed. *Pediatric Practice Gastroenterology*. The McGraw-Hill Companies, Inc.; 2010:319–328.
3. Gelb AM, Minkowitz S, Tresser M. Rectal and colonic polyps occurring in young people. *N Y State J Med*. 1962;62:513–518.
4. Ukarapol N, Singhavejakul J, Lertprasertsuk N, et al. Juvenile polyp in Thai children: Clinical and colonoscopic presentation. *World J Surg*. 2007;31:395–398.
5. Clarke G, Robb A, Sugarman I, et al. Investigating painless rectal bleeding- is there scope for improvement? *J Pediatr Surg*. 2005;40:1920–1922.
6. Poddar U, Thapa BR, Vaiphei K, et al. Colonic polyps: experience of 236 Indian children. *Am J Gastroenterol*. 1998;93:619–622.
7. Jaliha A, Misra SP, Arvind AS, et al. Colonoscopic polypectomy in children. *J Pediatr Surg*. 1992;27:1220–1222. [https://doi.org/10.1016/00223468\(92\)90792-6](https://doi.org/10.1016/00223468(92)90792-6).
8. Lee BG, Shin SH, Lee YA, et al. Juvenile polyp and colonoscopic polypectomy in childhood. *Pediatr Gastroenterol Hepatol Nutr*. 2012;15:250–255.
9. Giardiello FM, Hamilton SR, Kern SE, et al. Colorectal neoplasia in juvenile polyposis or juvenile polyps. *Arch Dis Child*. 1991;66(8):971–975.
10. Fox VL, Perros S, Jiang H, et al. Juvenile polyps: recurrence in patients with multiple and solitary polyps. *Clin Gastroenterol Hepatol*. 2010;8:795–799.
11. Mestre JR. The changing pattern of juvenile polyps. *Am J Gastroenterol*. 1986;81:312–314.
12. Das SR, Karim ASMB, Rukunuzzaman M, et al. Juvenile polyp in Bangladeshi children and their association with fecal calprotectin as a biomarker. *Pediatr Gastroenterol Hepatol Nutr*. 2022;25(1):52–60.
13. Holgersen LO, Mossberg SM, Miller RE. Colonoscopy for rectal bleeding in childhood. *J Pediatr Surg*. 1978;13:83–85.
14. Cynamon HA, Milov DE, Andres JM. Diagnosis and management of colonic polyps in children. *J Pediatr*. 1989;114:593–596.
15. Yashiro K, Tanabe M, Iizuka B, et al. Polypectomy of a large juvenile polyp in the ascending colon. *Endoscopy*. 1984;16:79–80.
16. Park JH. Role of colonoscopy in the diagnosis and treatment of pediatric lower gastrointestinal disorders. *Korean J Pediatr*. 2010;53:824–829.
17. Ferlitsch M, Moss A, Hasan C, et al. Colorectal polypectomy and endoscopic mucosal resection (EMR): European society of gastrointestinal endoscopy (ESGE) clinical guideline. *Endoscopy*. 2017;49:270–297.
18. Begum F, Nahid KL, Islam F, et al. Pediatric colonoscopy: experience from pediatric Gastroenterology and nutrition department, BSMMU. *Bangladesh J Child Health*. 2021;45(1):25–28.
19. Benzamin M, Sayeed M, Rukunuzzaman M, et al. Juvenile polyp & polyposis syndrome: experience at a tertiary hospital of Bangladesh. *Sri Lanka J Child Health*. 2020;49(1):35–40.
20. Hattem WAV, Langeveld D, Leng WWJ, et al. Histological variations in juvenile polyp phenotype correlate with genetic defect underlying juvenile polyposis. *Am J Surg Pathol*. 2011;35(4):530–536.
21. WHO multicentre growth reference study group WHO child growth standards based on length/height, weight and age. *Acta Paediatr*. 2006;450:76–85.
22. Gutta A, Gromski MA. Endoscopic management of post-polypectomy bleeding. *Clin Endosc*. 2020;53:302–310.
23. Andrade DO, Ferreira AR, Bittencourt PFS, et al. Clinical, Epidemiologic and Endoscopic profile in children and adolescents with colonic polyps in two reference centers. *Arq Gastroenterol*. 2015;52(4):303–310.
24. Ashtiani MTH, Monajemzadeh M, Motamed F, et al. Colorectal polyps: a clinical, endoscopic and pathologic study in Iranian children. *Med Princ Pract*. 2009;18:53–56.
25. Mandhan P. Juvenile colorectal polyps in children: experience in Pakistan. *Pediatr Surg Int*. 2004;20:339–342.
26. Ko FY, Wu TC, Hwang B. Intestinal polyps in children and adolescents—a review of 103 cases. *Zhonghua Min Guo Xiao Er Ke Yi Xue Hui Za Zhi*. 1995;36:197–202.
27. Toccalino H, Guastavino E, De Pinni F, et al. Juvenile polyps of the rectum and colon. *Acta Paediatr Scand*. 1973;62:337–340.
28. Seo JK. Therapeutic colonoscopy in children: endoscopic snare polypectomy and juvenile polyps. *Seoul J Med*. 1993;34:285–294.
29. Cheon KW, Kim JY, Kim SW. Solitary juvenile polyps and colonoscopic polypectomy in children. *J Korean Pediatr Soc*. 2003;46:236–241.
30. Kim SJ, Kim SM, Kim YJ, et al. Colonic polyps; experience of 34 cases in two hospitals. *Korean J Pediatr*. 2004;47:756–761.
31. Lee HJ, Lee JH, Lee JS, et al. Is colonoscopy necessary in children suspected of having colonic polyps? *Gut Liver*. 2010;4:326–331.
32. Anderloni A, Jovani M, Hassan C, et al. Advances, problems, and complications of polypectomy. *Clin Exp Gastroenterol*. 2014;7:285–296.