

Research Article

Paediatric Gastrointestinal Endoscopies: An Overview of Bowel Preparation and Complications

Mansoor Ahmed*, Nyaish Mansoor-Ali, Tihami Mansoor and Jayaram Sivarupan

Department of Paediatrics, Queen's Hospital, UK

***Corresponding author**

Mansoor Ahmed, Consultant Paediatrician, Queen's Hospital, Burton Upon Trent, Staffordshire, DE13, United Kingdom, Tel: 441283566333; 447904485186

Submitted: 04 January 2024

Accepted: 07 February 2024

Published: 10 February 2024

ISSN: 2373-9312

Copyright

© 2024 Ahmed M, et al.

OPEN ACCESS**Keywords**

- Endoscopy
- Gastrointestinal
- Children
- Perforation
- laxative

Abstract

Objective: To evaluate adequacy of bowel preparation and complications during paediatric gastrointestinal (GI) endoscopy.

Design: A retrospective service evaluation project

Place and Duration: All patients < 18 years of age undergoing oesophagogastroduodenoscopy (OGD), colonoscopy or both at Royal Derby Hospital United Kingdom over a 12-month period in 2021.

Methodology: Patient characteristics (age and sex) combined with reasons for undergoing the procedure and complications during/after the procedure were recorded. All eligible patients received picolax sachet to prepare the bowel before colonoscopy. Adequacy of bowel preparation was subjectively analysed by the endoscopists during the procedure. 100% of the procedures were performed under general anaesthesia given by paediatric anaesthetist.

Results: A total of 76 procedures were carried out on 60 patients (50% female) with median age of 13 years. Various reasons for undergoing OGD, colonoscopy or both included epigastric pain (35%), gastro-oesophageal reflux disease (15%), rectal bleeding (13%) and likely coeliac disease (12%). No complications were encountered during or after the procedure. Two minor post-procedural events were recorded which resolved promptly, thereby not requiring hospital admission or overnight stay. Only 11% of bowel preparations were classified as poor.

Conclusion: All the paediatric GI endoscopies at Royal Derby Hospital were deemed safe with satisfactory bowel cleansing prior to colonoscopy. Further research is warranted to explore and recommend an ideal laxative combination prior to colonoscopy in children.

INTRODUCTION

Since its introduction in the 1960s, increasing number of paediatric gastrointestinal (GI) endoscopies are being carried out for diagnostic as well as therapeutic indications. One of the reasons is an increase in number of trained paediatric gastroenterologists [1]. With evolution and advancement in technology, other diagnostic modalities have emerged during the last few decades which are increasingly being used to aid or replace the need for paediatric GI endoscopies. Video capsule endoscopy, double balloon enteroscopy, narrow band imaging and magnetic resonance enterography are becoming increasingly established in paediatric gastrointestinal practise. Some of these have already been embedded as part of routine diagnostic investigations [2]. Pre-procedural preparation includes patient/parent counselling, consent and organising bowel preparation. Robust pre-procedure bowel cleansing protocol facilitates the endoscopists to complete the colonoscopy by inserting the

scope safely to caecum/terminal ileum along with adequate macroscopic visualisation of the large intestine [3].

Sub-optimal bowel preparation is usually seen in ~25% of the cases. Unfortunately, this results in inadequate visualisation of colonic mucosa with potential of missing the pathology, longer time to complete the procedure, greater risk of complications such as bleeding/perforation and incomplete procedure with the possibility of requiring a repeat colonoscopy and anaesthesia [3]. The European Society of Gastrointestinal Endoscopy (ESGE) and the European Society for Paediatric Gastroenterology Hepatology and Nutrition (ESPGHAN) have endorsed low-volume laxatives such as polyethylene glycol plus ascorbate or picosulphate plus magnesium citrate/Senokot for pre-procedure bowel preparation in children [4]. Furthermore, it is imperative to follow a concurrent strict dietary regimen outlined within the written instructions/leaflet, given to the family, detailing consumption of clear liquid diet a day before the procedure.

Overall, paediatric GI endoscopy is regarded as a safe procedure. However, several patient related factors as well as procedural circumstances enhance the probability of adverse events or complications during or after the procedure. These can be sub-divided into endoscopy related incidents for instance bleeding, perforation & infection and/or adverse consequences triggered by drugs, sedation or general anaesthesia [5]. Colonic perforation is regarded as the most serious complication, reported in 0.06-0.3% of all the procedures. This can occur following polypectomy or because of forceful/blind insertion of colonoscope around acute bends, with or without concurrent poor bowel preparation. With improved technology, better/slimmer colonoscopes and magnetic imaging-assisted colonoscopy, the risk of complications has been further reduced.

During paediatric GI endoscopy, ESPGHAN advocates general anaesthesia (GA) or deep sedation if the procedure can't be carried out under GA [4]. In contrast to sedation, general anaesthesia enables anxiety free procedure time for the patient, a fully secured airway with reduced risk of aspiration, good pain control and favourable conditions without patient agitation/movement causing inconvenience to the endoscopist.

The objective of this service evaluation project was to examine children who underwent paediatric GI endoscopies in 2021, evaluating the reasons for the procedure, complications during/after the procedure and adequacy of bowel preparation prior to colonoscopy.

METHODS

All patients were identified by computerised data maintained by the endoscopist (MA), verified with the diary kept by the paediatric wait list office and counterchecked with the histopathology department. The referring clinician's letter was accessed to gain insight into the reasons for paediatric GI endoscopy referrals. Post procedure letter was utilised alongside patient's day case admission related electronic health records to access information about the adequacy of bowel preparation. The bowel preparation for each case was subjectively categorised by a single endoscopist as follows.

Excellent: Colon completely devoid of faecal matter or faecal fluid and pan-colonic mucosa clearly visible.
Good: Liquid stool seen in small pockets and pan-colonic mucosa easily visible after satisfactory suctioning of liquid stool.

Satisfactory: Reasonable amount of liquid stool seen, most of which could be removed with majority of the colonic mucosa visible after suctioning. Smaller areas of colonic mucosa obscured by semisolid stool.

Poor: Copious amount of liquid or solid stool present throughout the colon, thereby preventing ileo-colonic intubation safely and leading to either incomplete or significantly limited colonic mucosal inspection.

To evaluate the complications, electronic patient health records were accessed to appraise the reason of overnight stay

and hospital admission following paediatric GI endoscopy. All the patients received general anaesthesia by a paediatric anaesthetist for paediatric GI endoscopies and all procedures were carried out by a paediatric gastroenterologist. As this was a retrospective service evaluation project, an ethical approval was not required.

All children < 18 years who underwent paediatric GI endoscopy by a single endoscopist (MA) in the paediatric theatre as a day-case procedure under general anaesthesia at Royal Derby Hospital were included. Patients > 18 years of age, having had GI endoscopy performed by a surgeon or adult endoscopist, either in a general theatre/endoscopy suite or under conscious sedation were excluded.

The patient information on Lorenzo (Royal Derby Hospital electronic health record) was recorded into Microsoft Excel 365 and tabulated. Descriptive statistics was analysed using SPSS® while quantitative variables were narrated as mean with standard deviation and median.

RESULTS

In a 12-month period (2021), 60 patients were subjected to a total of 76 GI endoscopies. One patient with possible diagnosis of eosinophilic esophagitis underwent two procedures in 2021. 41/60 (68%) children underwent OGD only while 16/60 (27%) subjects required both an OGD as well as colonoscopy. Only 3/60 (5%) children had a colonoscopy only. Male to female ratio was 1:1 with mean and median age of 12.6 (\pm 3.6) and 13 years respectively (Table 1).

As outlined in Table 2, commonest presentation/indication for paediatric GI endoscopy was epigastric pain (35%) followed by gastro-oesophageal reflux disease (15%), rectal bleeding (13%) and suspected coeliac disease (12%) based on raised tissue transglutaminase antibodies which were < 10 times the upper limit of normal laboratory values.

Two patients experienced abdominal pain and minimal rectal bleeding after the procedure. As their symptoms settled within a few hours of the procedure, none of them required an overnight hospital admission and both the patients were eventually discharged home on the day of procedure. Hence, overall, no significant complications were noted during/after the procedure. Of the 19 patients that underwent colonoscopy, 4 patients had an excellent bowel preparation, 5 were deemed good and 8 satisfactory (Table 3).

Table 1: Demographics of patients undergoing GI endoscopy (N = 60)

Demographics.	N=60
Sex	
Male	30
Female	30
Age (year)	
0-4	1
5-9	10
10-14	38
15-18	11

Table 2: Indications for GI endoscopy (N = 60)

Indication	Total	Percentage
Epigastric pain	21	35%
GORD	9	15%
Haematochezia	8	13%
Suspected coeliac disease	7	12%
Miscellaneous	15	25%

Table 3: Outcome of bowel preparation (N = 19)

Outcome	Cases	Percentage
Excellent	4	21%
Good	5	26%
Satisfactory	8	42%
Poor	2	11%

DISCUSSION

Paediatric GI endoscopy is an evolving field which is constantly undergoing improvements and innovation in healthcare technology to keep up with the pace of rising demand in the number of procedures being carried out worldwide. With expansion of trained paediatric gastroenterologists, these procedures are being offered in specialised GI units in a safe environment to facilitate swift diagnosis and management of GI disorders in children.

There were a number of reasons that culminated in a referral for paediatric GI endoscopy, with upper abdominal pain or epigastric discomfort as the topmost (35%) of all indications. This is in keeping with the data published by Arslan et al. [6], who also reported epigastric pain in 38.7% of their cohort. Similarly, Isa and Alfayez [7], investigated 1534 endoscopy procedures in a 25-year period and found chronic abdominal pain as the most common indication for endoscopy (40.9%). Franciosi et al. [8], identified variation in the indications for GI endoscopy and reported a rise in the rate of endoscopies from 23% to 43% for chronic abdominal pain over two decades. Sheiko et al. [9], evaluated the indications for GI endoscopy and discovered GORD in 11.7% of their cohort of patients. This corroborates with our findings of GORD being the second most common reason (15%) for GI endoscopy in children.

Although paediatric GI endoscopies are generally regarded as a safe procedure, a number of potential complications can result either secondary to the endoscopy itself or as a consequence of general anaesthesia. 0.26% to 2.5% of patients undergoing colonoscopy may experience post polypectomy or scope trauma/biopsy related bleeding². Two of our patients had transient symptoms which resolved very quickly and none of them required prolonged hospital stay or an overnight hospital admission. Hence, their symptoms were not counted as a post procedural complication. 100% of the GI endoscopies in our subjects were carried out under general anaesthesia, as endorsed by ESGE and ESPHGAN. Majority of our patients were intubated and ventilated using an endotracheal tube while a small number were ventilated via a laryngeal mask airway. Similar to a study conducted by Lei et al., we didn't observe any complications pertaining to general

anaesthesia [10]. Most studies report complication rate of <1% following GI endoscopy. On the other hand, some studies have reported much higher adverse events rate ranging from 2% to 7% (including even minor events, not affecting the hospital stay) [11,12].

Strict adherence to pre-colonoscopy bowel cleansing protocol along with dietary/fluid regimen is fundamental for successful completion of a safe and meaningful procedure in its entirety, leading to good visualisation of colonic mucosa and ileo-caecal intubation. The laxative used by our patients locally was Picolax Sachet (magnesium citrate with sodium picosulfate). No side effects were reported by patients/parents after using Picolax at 8 AM and 2 PM a day before the procedure. While a variety of bowel cleansing regimens have been recommended and have demonstrated reasonable efficacy in various studies, picolax sachet is considered as most effective agent for bowel preparation prior to colonoscopy as a consequence of superior acceptability by children [13,14]. In our cohort, only 11% of the bowel preparations were graded as poor. These patients were either unable to tolerate picolax sachet or didn't adhere to written instructions to follow dietary/fluid regimen 24-36 hours before the procedure in its entirety.

The limitations of our findings lie in its retrospective nature, relatively smaller sample size and patient recruitment from one specific geographical area in the United Kingdom. As the project review timeframe was during the Covid-19 pandemic, this may also have led to a skewed patient data. Moreover, cancellation of a few planned lists resulted in fewer procedures being carried out in 2021.

CONCLUSION

Based on our findings, it is fair to conclude that paediatric GI endoscopy under general anaesthesia can be categorised as safe and low risk procedure. The complication rate are very low/negligible in experienced hands and the adverse events are rare. A relatively small number of patients (11%) had poor bowel preparation. It is of paramount importance that patients strictly adhere to bowel preparation protocol in order to maximise the efficacy and completion of the procedure as well as to minimise the risk of complications such as bowel perforation. Further research is required to develop an appropriate guideline to ensure successful achievement of excellent bowel cleansing guideline prior to colonoscopies.

REFERENCES

1. Friedt M, Welsch S. An update on pediatric endoscopy. *Eur J Med Res.* 2013; 18: 24
2. Ahmed M, Karupaiah A. When to do paediatric gastrointestinal endoscopy? *Paediatr Child Health* 2014; 24: 506-512
3. Mamula P, Nema N. Bowel Preparation for Pediatric Colonoscopy. *Front Pediatr.* 2021; 9
4. Tringali A, Thomson M, Dumonceau JM, Tavares M, Tabbers MM, Furlano R, et al. Pediatric gastrointestinal endoscopy: European Society of Gastrointestinal Endoscopy (ESGE) and European

- Society for Paediatric Gastroenterology Hepatology and Nutrition (ESPGHAN) Guideline Executive summary. *Endoscopy*. 2017; 49: 83-91
5. Lightdale JR, Liu QY, Sahn B, Troendle DM, Thomson M, Fishman DS. Pediatric Endoscopy and High-risk Patients: A Clinical Report from the NASPGHAN Endoscopy Committee. *J Pediatr Gastroenterol Nutr* 2019; 68: 595-606.
 6. Arslan M, Işık H, Balamtekin N. Are Indications and Findings of Upper Gastrointestinal System Endoscopy Changing in Children Over the Years? *J Curr Pediatr* 2021;19: 285-291
 7. Isa HMA, Alfayez, F. Indications and Yield of Pediatric Endoscopy in Bahrain: A Tertiary Center Experience. *Int J Pediatr*. 2022; 6836842: 1-9.
 8. Franciosi JP, Fiorino K, Ruchelli E, Shults J, Spergel J, Liacouras CA, et al. Changing indications for upper endoscopy in children during a 20-year period. *J Pediatr Gastroenterol Nutr*. 2010; 51: 443-447
 9. 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.
 10. Lei P, Gu F, Hong L, Sun Y, Li M, Wang H, et al. Pediatric colonoscopy in South China: A 12-year experience in a tertiary center. *PLOS ONE*. 2014; 9: e95933
 11. Kramer RE, Narkewicz, MR. Adverse events following gastrointestinal endoscopy in children: Classifications, characterizations, and implications. *J Pediatr Gastroenterol Nutr*. 2016; 62: 828-833.
 12. Wani MA, Zargar SA, Yattoo GN, Haq I, Shah A, Sodhi JS, et al. Endoscopic yield, appropriateness, and complications of pediatric upper gastrointestinal endoscopy in an adult suite: A retrospective study of 822 children. *Clin Endosc*. 2020; 53: 436-442.
 13. Szaflarska-Poplawska A, Tunowska D, Sobieska-Poszwa O, Gorecka A, Krogulska A. The effectiveness, tolerability, and safety of different 1-day bowel preparation regimens for pediatric colonoscopy. *Gastroenterol Res Pract*. 2019: 3230654
 14. di Nardo G, Aloï M, Cucchiara S, Spada C, Hassan C, Civitelli F, et al. Bowel preparations for colonoscopy: An RCT. *Pediatrics*. 2014; 134: 249-256.