



SPECTRUM OF PEDIATRIC GASTROINTESTINAL ENDOSCOPY

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Abstract

Background & Objective: In History first gastroscope was made by Adolf Kussmaul in 1868 with the help of professional sword swallower to pass a tube into his stomach. Later, In 1881 Johann von Mikulicz and his colleagues introduced the first practical rigid gastroscope. Then, in 1932, Dr. Rudolph Schindler invented flexible gastroscope, however, the real breakthrough in endoscopy emerged in the 1950s with the development of glass fiber technology, and Basil Hirschowitz is credited with creating the first flexible fiber-optic endoscope in 1957. These innovations led to the widespread adoption of endoscopy as a standard diagnostic and therapeutic tool in gastroenterology units worldwide. In the early 1970s, further advancements in endoscope size reduction paved the way for pediatricians to begin using this tool as diagnostic modality. ^(1,2)

This field has grown exponentially in developed countries however literature search showed limited work has been done in developing countries so far. ^(5,6) This study aimed to identify prevalent reasons for conducting pediatric GI endoscopy and the typical endoscopic observations in children, with the ultimate goal of enhancing awareness and improving outcomes for gastrointestinal disorders in our population.

Methods: A comprehensive review was conducted on the medical records of 139 pediatric patients, aged 1 to 16 years, who had undergone gastrointestinal endoscopy at Aga Khan University Hospital. Infants were excluded from this analysis. The study gathered information regarding patient demographics, the reasons for the endoscopy as determined by the treating clinicians, the results of the procedure, whether it was performed by a pediatric or adult gastroenterologist, the type of anesthesia administered (sedation or general anesthesia), peri-procedural antibiotics prophylaxis if given, any complications that occurred during or after the procedure, and the histopathological findings obtained.

Results: Recurrent abdominal pain was the primary reason for GI endoscopy in 22.3% of cases, with gastritis being the most prevalent endoscopic finding in 30.2%. The most frequent histopathological finding, found in 23.5% of cases, was gastritis associated with *H. pylori*. Anesthesia and conscious sedation were administered for the procedures, which took place in various settings, including the operating theater, surgical day care, and endoscopic suites. No immediate complications were observed following the procedures in any of the cases.

Conclusion: Gastrointestinal endoscopy is a reliable and safe procedure that serves as a valuable tool for both diagnosis and treatment.

Keywords: Paediatric, Gastrointestinal Endoscopy, Gastritis, Abdominal pain, *H.pylori*

Introduction

Endoscopy has been acknowledged as a valuable tool in pediatric patients since the late 1970s. Over the past decades, there has been a significant increase in the utilization of this procedure, leading to a notable rise in the diagnosis of gastrointestinal disorders.^(2,5,6)

In children, non-pediatric endoscopist in conjunction with pediatric endoscopist are performing procedure. Gastrointestinal endoscopy preferably performed by specialized or trained pediatric gastroenterologists in accordance with PENQuIN (Pediatric Endoscopy Quality Improvement Network) guidelines.^(7,8) Pediatric GI endoscopy training predominantly relies on a mentor-apprentice approach, where the majority of trainees acquire fundamental endoscopy skills while being supervised by pediatric endoscopist during their training period.⁽⁹⁾

To ensure safety and quality in pediatric endoscopy guidelines and recommendations being established in developed countries from mentorship based learning to acquisition of competence and train the trainer approach.⁽¹⁰⁾

The indications are changed over time. Initial implications were gastrointestinal bleed and with subsequent passage of time abdominal pain became the commonest indication for the procedure.⁽⁶⁾ In the majority of the literature, abdominal pain and chronic diarrhea are the common indication for undergoing endoscopy in developed countries.⁽¹¹⁻¹³⁾

However, prior studies conducted in our country revealed that failure to thrive and anemia were the most common indications, and gastritis was the most frequently observed finding among endoscopic procedures.^(3,4)

It is recommended to obtain biopsy sampling in children from at least esophagus, stomach and duodenum in upper gastrointestinal endoscopy and from the colon, and terminal ileum in colonoscopy. This is in contrast to adult practice where biopsy is usually considered only from areas of gross abnormality.^(5, 12, 14)

Common pediatric therapeutic indications that may require endoscopy are the ingestion of foreign bodies and caustic substances, variceal surveillance and for securing hemostasis in gastrointestinal bleeding. Emergent foreign body removal in children is indicated for any symptomatic esophageal foreign body causing obstruction and for asymptomatic esophageal button batteries, magnets and sharp objects because of the high risk of esophageal tissue necrosis, perforation and risk of fistula formation. Endoscopy plays a significant role in predicting outcomes following caustic ingestion. It is safe to perform within the first 24 hours after ingestion and allows for the assessment of the extent of injury.⁽¹⁵⁾

Sedation is an integral part of endoscopy procedure; however, there is no ideal single or combined drug regimen available for the purpose of sedation in children. Current options include general anesthesia by anesthesiologist or intravenous sedation (benzodiazepines, opiates, propofol or ketamine) that can be given by non-anesthesiologist (certified for pediatric procedural sedation). In all cases preprocedure risk stratification is mandatory.^(16, 17)

Location where endoscopy is performed has been in transition as well. Endoscopy suite is gaining more acceptance. However there is scanty data related to designing of endoscopic suite.⁽¹⁸⁾

Endoscopy in pediatrics is considered safe procedure currently data is scanty and Endoscopy centers should develop ways to systematically record adverse events during and within the 72 h following

procedures. Risk from procedures increases incrementally with preoperative coexisting conditions.⁽¹⁹⁾ The complication rate of diagnostic EGD and colonoscopy in children are extremely low. Therapeutic procedures have obviously an increased rate of adverse events.⁽²⁰⁾

Nonetheless, it's essential to identify patients who may face an increased risk of potential complications and adverse events. The adaptation of a standardized pre-procedure assessment using a checklist, in collaboration with American Society of Anesthesiologist (ASA) classification system can assist endoscopist in categorizing patients based on their risk levels.⁽²¹⁾

According to the guidelines published by American Society of Gastroenterology, routine antibiotic prophylaxis is not recommended; however endoscopist can assess the need for antibiotic therapy on case to case basis. Bacteremia is most commonly reported in patients undergoing dilatation or sclerotherapy. The organisms commonly encountered on cultures are mouth commensals.⁽²²⁾

To promote appropriate use of endoscopy, NASPGHAN and the American Society of Gastroenterology have published standard guidelines; recent search showed appropriateness of 94.9% in Indian study.⁽²³⁾

To date significant work has been done in developed countries related to endoscopy, but there is scanty data available from developing countries like ours. This approach is gaining recognition as a developing technique in our nation, and further research is essential to emphasize its effectiveness. My study has integrated additional factors, such as biopsy results, the healthcare provider performing the endoscopy, the location of the procedure, peri-procedural antibiotics prophylaxis if given is recorded and considerations related to anesthesia or sedation administered to children during the procedure.

Subjects and Methods

A retrospective analysis was conducted at Aga Khan University Hospital in the Pediatric Department, encompassing various care settings such as inpatient wards, daycare facilities, special care units, and the ICU. The study spanned a one-year duration. We determined a sample size of 139 children for this study, taking into account a presumed 10% prevalence rate of clinical indications for chronic diarrhea, a 5% margin of error (d), and a 95% confidence level. The WHO's "Sample Size Determination in Health Studies" software was employed to calculate this sample size.

The inclusion criteria comprised children aged 1 to 16 years who had undergone endoscopy, and their clinician-assigned indications were documented. Infants were excluded as well as children with concurrent medical conditions such as cerebral palsy, bleeding disorders, and oncology-related illnesses were excluded from the study.

The study received approval from the Ethical Review Committee of the Aga Khan University Hospital. All patients who met the inclusion criteria were included in the study after obtaining informed consent from their parents or guardians. Data was systematically collected by the principal investigator using a structured questionnaire, which included information such as age, gender, duration of hospital stay, type of procedure performed (e.g., upper gastrointestinal endoscopy, lower gastrointestinal endoscopy, colonoscopy, sigmoidoscopy), clinical indications, and endoscopy findings. The confidentiality of the participants was rigorously maintained throughout the study.

For data analysis, the statistical software package for social sciences (SPSS V.19) was utilized. Descriptive statistics, including frequencies and percentages, were calculated for categorical variables such as gender, type of procedure, clinical indications, and endoscopy findings.

To control for potential confounding factors, the data was stratified based on age, gender, type of procedure, and duration of hospital stay.

Results:

As regards the gender, 62 (44.6%) enrolled children were females and 77 (55.4%) were males with male to female ratio of 1.2:1. Mean age in study is 8.03 ± 5.34 years with majority of the patients $n=70$ (50.36%) were between 9 to 16 years of age and $n=69$ (49.64%) were from 1 to 8 years.

A total of 18 (12.9%) procedure were conducted as an emergency while 121 (87.1%) were planned elective procedures. Pediatric endoscopist (gastroenterologist) performed 124 (89.2%) procedures and

adult endoscopist (in case pediatric expertise is not available and clinical condition merits immediate intervention such as ingestion of battery) performed 15 procedures (10.8%). Most of the procedures [n=58(41.7%)] were performed in operation theaters followed by surgical day care n=52 (37.4%) and endoscopy suites n=29(20.8%). In total, 117(83.5%) procedures were diagnostic, 16(12.2) were therapeutic and 6 (4.3%) for surveillance.

Endoscopy was done under general anesthesia in number n=118 (84.89%) cases and n=21(15.11%) underwent conscious sedation. Conscious sedation was given by intensivist in n=80 (57.5%) cases and endoscopist with sedation nurse in accordance with expertise n=59(42.4%).

Of these n=16 were combine upper and lower GI (11.51), upper GI alone constitutes n=114(82.01%), lower GI alone were n= 9(6.48%)

The commonest indication being recurrent abdominal pain (22.3%). upper GI Bleed (14.4%) and failure to thrive (14.4%) was the second most common cause. If all cases of gastrointestinal bleed (hematemesis, hematochezia and melena) are combined that outnumbers all other indications (26.7%).

Most common pathological finding is gastritis (30.2%) followed by normal (24.1%), duodenitis (7.9%), foreign body (6.5%), esophageal varices(6.5%) and colitis (4.3%).Histopathological finding of H-pylori gastritis (23%)was leading followed by non-specific gastritis (21%), celiac marsh 3(13.27%), non-specific duodenitis(12.25) and normal (8.16%) in our study.

Frequency of clinical indications, endoscopic findings and histopathological findings are illustrated in Tables 1, 2 and 3 respectively.

Few patients had prolonged hospital stay due to health conditions, however majority n=124 (89.21%) had small duration of stay of <7 days with an mean \pm SD stay of 3.00 ± 4.50 days.

In accordance with guidelines of ASGE published in 2015 none of participants in our study were given pre-procedure prophylactic antibiotics prior to elective procedure.

No immediate post procedure complication noted.

Figures 1&2 summarize the overall procedure performed during the study period.

Discussion:

In our study recurrent abdominal pain was the most common indication followed by upper GI bleed. Studies conducted previously in our part of world showed anemia and failure to thrive as common indications^(3,4).Our commonest indication, recurrent abdominal pain, is similar to study in Nigeria, china, Israel,Bahrain, turkey and Jordon. ^(11,24-28)While surveillance endoscopy being commonest indication in Indian study. ⁽²³⁾

Similar to present study ,the study done in Lagos, turkeyand Nigeria showed gastritis as the most common endoscopy finding.^(24,27,28)

Histopathologically H-pylori gastritis was the leading finding in our study. Burayzat S. et al has reported similar finding. ⁽²⁵⁾Isa H and Alfayez F has normal histology as the commonest finding in their study followed by non –specific gastritis and H-pylori gastritis. ⁽¹³⁾Arsalan M in his study from Turkey has non-spific gastritis being commonest followed by H-pylori gastritis.⁽²⁷⁾

Pediatric expertise are preferredhowever in some parts of world this is developing modality with few hospitals having child based endoscopy suits and expertise.⁽²³⁾With the advancement more pediatric endoscopist are trained and trainee guidelines has been established worldwide making it flourish as field and helping in management of pediatric gastrointestinal disorder.⁽⁹⁾

General anesthesia although preferredinitially nowconscious sedation is gaining acceptance and considered more suitable .It can be given by intensivist, or non-anesthetist sedation certified personnel. There is no single preferred agent, choice is based on personal knowledge and skill. Studies in developed world are going to analyze the safest agent. ^(16,17)Preprocedural assessment including ASA classification for stratifying high risk patient is mandatory. ^(1,21)

Biopsy is indicated in diagnostic endoscopy despite of absence of gross abnormality in pediatric population to minimize the risk associated with re-procedure that has been missed in 6.5% of patients in our study. ⁽¹²⁾

Conclusion

Endoscopy in the pediatric population can be safely performed with minimal risk of complications. Increasing awareness in pediatricians regarding its utility will result in timely referral of children who require intervention for diagnostic or therapeutic purpose.

Limitations

Limitations encompass the fact that this study is conducted at a single institute. More studies in future related its appropriateness and yield will improve efficacy of this evolving modality.

Author's contributions

1. Dr Hafsa Zaheer: conception and design, data collection, drafting of manuscript
2. Dr. Ambreen Raza: data collection, data analysis
3. Dr. Mahnaz Hakeem: Acquisition of data, data analysis
4. Dr. Sana Samreen: Acquisition of data, data analysis
5. Dr. Kamran Sadiq: Data analysis, interpretation, critical analyzing intellectual content
6. Dr. Sajid Bashir Soofi: Drafting and substantial contribution to the design of work

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Conflict of interest

None to declare.

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TABLES AND FIGURES:

Table 1: Clinical indications of Procedure

Indications	Emergency	Elective	Frequency	Percentage (%)
Recurrent Abdominal Pain	0	31	31	22.3
Hematochezia	0	20	20	14.4
Failure to Thrive	0	20	20	14.4
Hematemesis	5	9	14	10.1
Chronic Vomiting	0	11	11	7.9
Foreign Body	11	-	11	7.9
Chronic Diarrhea	0	10	10	7.2
Caustic Ingestion	0	8	8	5.7
Portal Hypertension	0	6	6	4.3
Anemia	0	4	4	2.9
Melena	2	1	3	2.2
Dysphagia	0	1	1	0.7
TOTAL	18	121	139	100%

Table 2: Endoscopic Findings

Endoscopic Finding	Frequency	Percentage(%)
Normal	34	24.4
Esophagitis	5	3.6
Esophageal Varices	9	6.5
Esophageal Stricture	3	2.2
Caustic Injury	2	1.4
Foreign Body	9	6.5
Achalasia	3	2.2
Gastritis	42	30.2
Portal Hypertension Gastropathy	1	0.7
Gastro-duodenitis	5	3.6
Gastro duodenal Ulcer	3	2.2
Duodenitis	11	7.9
Narrowing in Duodenum	2	1.4
Colitis	6	4.3
Polyp	3	2.2
Proctitis	1	0.7
TOTAL	139	100

Table 3: Histopathological Findings

Histopathological Findings	Frequency	Percentage(%)
Normal	8	8.16
H-pylori associated gastritis	23	23.47
Non-specific Gastritis	21	21.43
Celiac (Marsh grade 3)	13	13.27
Non specific Duodenitis	12	12.25
Gastroduodenitis	5	5.10
Giardiasis	3	3.06
Polyp	3	3.06
Active Colitis likely infectious	3	3.06
Colitis with Crypt abscess	2	2.04
Proctitis + active colitis	2	2.04
Esophagitis	2	2.04

Proctitis	1	1.02
TOTAL	98	100%

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