

## FIFTEEN YEARS' EXPERIENCE IN PEDIATRIC ENDOSCOPIC PROCEDURES AT THE ENDOSCOPIC SUITE OF A TERTIARY CARE HOSPITAL

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**Abstract:** *G.I. endoscopy is a highly efficient diagnostic and therapeutic tool now increasingly used in the pediatric population. Our country needs pediatric endoscopic data due to a lack of pediatric gastroenterologists and dedicated pediatric facilities; only a few facilities available in private setups are out of reach of the general population. Hence, this pediatric endoscopic audit was performed to analyze the indications, findings, and complications of all endoscopy procedures in a pediatric population referred to the endoscopy suite of a public sector tertiary care hospital. Data from all pediatric patients who underwent endoscopy from January 2006 to December 2020 was retrospectively reviewed for endoscopy indications, findings, and complications. Three thousand eight hundred seventy pediatric patients (age 0 -18 years) were analyzed. The mean age of the study population was 12.75 years, and the male-to-female ratio was 1.04:1. One thousand seven hundred seventy-nine patients underwent EGD, 1639 had colonoscopy, and 452 had ERCP. The most common indication for EGD was found to be epigastric pain (29.7%), the most common finding was gastritis (21.4%), and the complication rate for all upper G.I. endoscopic procedures was found to be 0.5%. The most common indication for colonoscopy was per rectal bleeding (69%), the most common finding was polyp (29.7%), and the complication rate was 0.9%. The most common indication for ERCP was found to be jaundice secondary to biliary obstruction (57.5%), the most common finding was bile duct stone (30%), and the complication rate was 5.6%. The overall incidence of adverse events was low and was found to be 0.7% in all of the 3870 procedures.*

**Keywords:** G.I Endoscopy, Upper G.I Endoscopy, Epigastric Pain, Gastritis, Colonoscopy, Polyp, ERCP, Bile Duct Stone

### Introduction

Worldwide, gastrointestinal disorders are a significant source of healthcare issues, particularly for young people (El-Mouzan et al., 2001). Gastrointestinal endoscopy has grown essential over the past forty years for diagnosing, treating, and preventing digestive system disorders in adult and pediatric populations (Lee et al., 2013). Following Hirschowitz's invention of flexible endoscopy in the 1950s, upper gastrointestinal endoscopy was also used in children (Haight and Thomas, 1995). As a result, pediatric gastroenterology was established in the 1960s (Franciosi et al., 2010). Later, upper GI endoscopy became the standard of care for diagnosing many gastrointestinal issues in children, and fiberoptic endoscopies were primarily created in the 1970s (Khan et al., 2014). Pediatric gastroenterology has expanded quickly since then.

A pediatric surgeon or gastroenterologist often carries out an endoscopy in the pediatric population. Simple endoscopies on children can be successfully performed by an adult gastroenterologist or adult surgeon with the assistance of a pediatrician in situations where the knowledge of a fully qualified pediatric gastroenterologist is unavailable (Hayat et al., 2008). Children may undergo endoscopy for therapeutic or diagnostic purposes. Children who exhibit symptoms suggestive of an underlying organic disorder of the gastrointestinal (GI) tract are frequently candidates for endoscopy (Lee et al., 2013).

Even with paediatric endoscopy's excellent diagnostic yield, most underdeveloped nations need more data about its effectiveness, making it an underutilized tool (Okello, 2006). This is mainly because parents are unaware that their

children can benefit from this crucial modality. Other factors may also be crucial, such as needing paediatric gastroenterologists with the necessary training or the absence of well-equipped paediatric endoscopic suites in nations with limited resources (Gilger, 2001). We conducted this study to examine the rationale, results, and complications of all endoscopic operations in the pediatric population at the endoscopy suite of a tertiary care hospital in Karachi because there is a shortage of pediatric endoscopic data in developing nations.

### Methodology

This study, which took place at the endoscopy suite of Surgical Unit-4, Dr. K. M. Ruth Pfau Civil Hospital Karachi, was retrospective and descriptive. It was carried out over 15 years, from January 2006 to December 2020. The Dow University of Health and Sciences (D.U.H.S.) institutional review board (IRB) authorized the study. Dr. K. M. Ruth Pfau Civil Hospital Karachi is a tertiary care referral center featuring a state-of-the-art endoscopic suite. All consecutive patients who received GI endoscopy in the unit between 0 and 18 were included during the study period. A group of skilled endoscopists employed Olympus scopes to perform endoscopy; patients older than two and a half years old were given an 8mm scope, and patients younger than that were given a 6mm scope. Every procedure was carried out under a propofol injection in the daycare setting. Patients who needed it received prophylactic antibiotic treatment. Patients were monitored for a week or admitted on a day-care basis in the event of any

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complications. A specialized endoscopic database retrieved patient data, and case notes were examined. Basic demographic information, an early diagnosis, a recommendation for an endoscopy, the results of the endoscopy, and any unfavorable outcomes during or following the procedure were among the data gathered. Patients with insufficient information or unfinished operations were excluded. The gathered information was loaded into SPSS (Statistical Package for Social Science) Version 22.0, where its statistical application was used to examine the data.

**Table 1 Demographic of the study population**

Variables		Frequency	Percentages (%)
<b>Gender</b>	Male	1974	51
	Female	1896	49
<b>Types of Endoscopic procedure</b>	EGD	1779	46
	Colonoscopy/sigmoidoscopy	1639	42
	ERCP	452	12
<b>Age groups (Years)</b>	0-5	362	9
	6-10	656	17
	11-14	989	26
	15-18	1863	48

*ERCP (Endoscopic Retrograde Cholangiopancreatography), OGD (Esophagogastroduodenoscopy)*

**Upper G.I endoscopy: (one table and one figure of findings)**

One thousand seven hundred seventy-nine patients with a mean age of 13.43 years underwent upper G.I. endoscopy. There were 792 males and 987 females, with the male-to-female ratio being 1:1.24. The two most common indications for the procedure were epigastric pain (29.7%) and hematemesis (15.7%) (Table 2). Of the 1779 procedures performed, one-third (604) was expected.

The most common findings were gastritis/ulcers (21.4%), celiac disease (11%), varies (9.6%), and strictures (8.3%) (Figure -1). No major complication was seen requiring admission. The total number of therapeutic procedures carried out was 355, and the most frequent therapeutic procedure performed was esophageal dilatation (171 patients). The most common cause found was accidental corrosive ingestion (Table 3).

**Colonoscopy:**

One thousand six hundred thirty-nine patients with a mean age of 12.01 years underwent colonoscopy/sigmoidoscopy (1087, sigmoidoscopy -552). There were 994 males and 643 females, with the male-to-female ratio being 1.5:1. The most common indication for the procedure was bleeding per rectum (69%) (Figure -2). Of the total 1087 colonoscopies, one-third (379) turned out to be expected. The most common findings were polyps (26.1%) and ulcers (22.2%). Of the 552 sigmoidoscopy, one-fifth (106) was normal. The most common findings were polyps (37.2%) and ulcers (12.6%). No significant complications were seen requiring admission.

**Endoscopic retrograde cholangiopancreatography (ERCP):**

**Results**

During the study period, 3966 pediatric endoscopies were performed in the unit. Of these, 96 procedures were excluded from the analysis. Fifty-two had incomplete data, and 44 had an incomplete procedure (colonoscopy abandoned because of poor bowel preparation). Thus, a total of 3870 patients were included in the study. Of these, 1,779 patients had upper G.I. endoscopy, 1,639 had colonoscopy, and 452 had endoscopic retrograde cholangiopancreatography (ERCP). (Table 1).

Four hundred fifty-two patients with a mean age of 14.01 years underwent ERCP. There were 213 males and 239 females, with the male-to-female ratio being 1:1.12. The most common indication for the procedure was jaundice (57.5%) secondary to obstruction (Figure 3) and the therapeutic procedure during ERCP, shown in Figure 4. The most common finding was CBD stones (29.8%) during ERCP (Figure 5).

**Table 2 Most common indications for Esophagogastroduodenoscopy**

Indications Of EGD	
INDICATION	PERCENTAGE
Epigastric pain	29.7
Hematemesis	15.7
Nausea	13.8
Dysphagia	11.6
Retrosternal Burning	10.7
Melena	4.6

**Table 3 Therapeutic Procedures (EGD)**

Therapeutic Procedures (N = 355)	
PROCEDURES	Number
Dilatation	171
Banding	96
Foreign body removal	44
Stenting	19
Polypectomy	15
PEG	10

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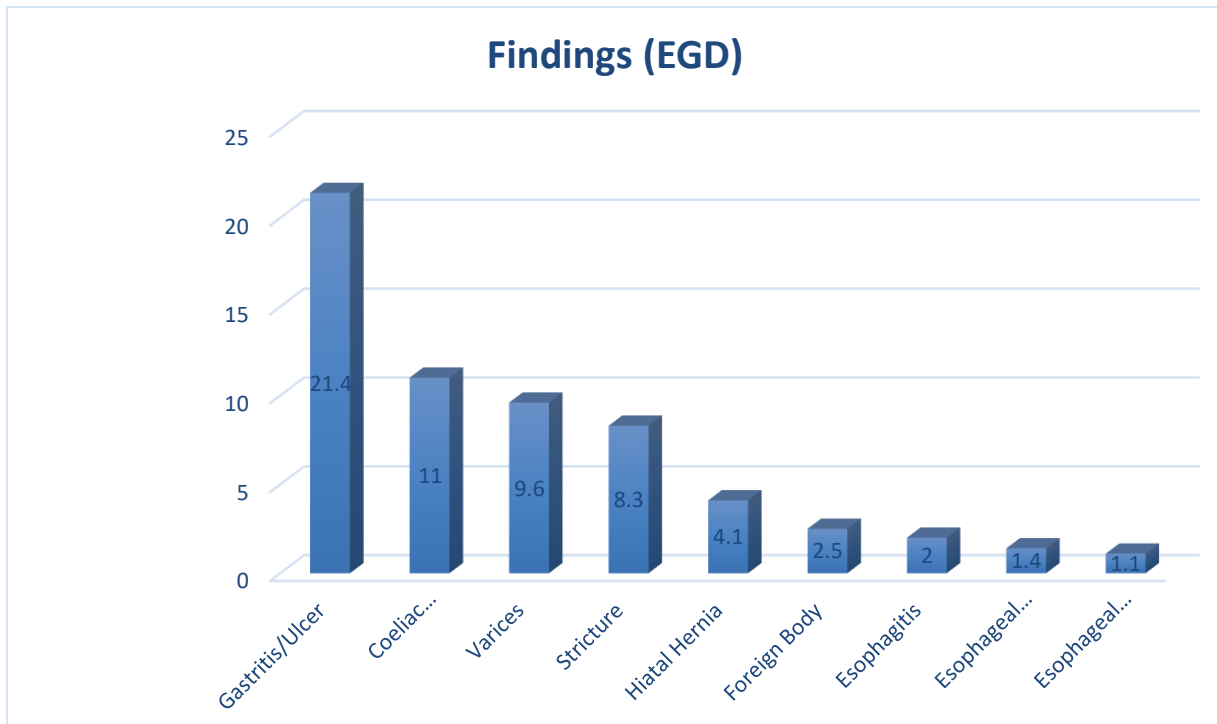


Figure 1: Findings of EGD

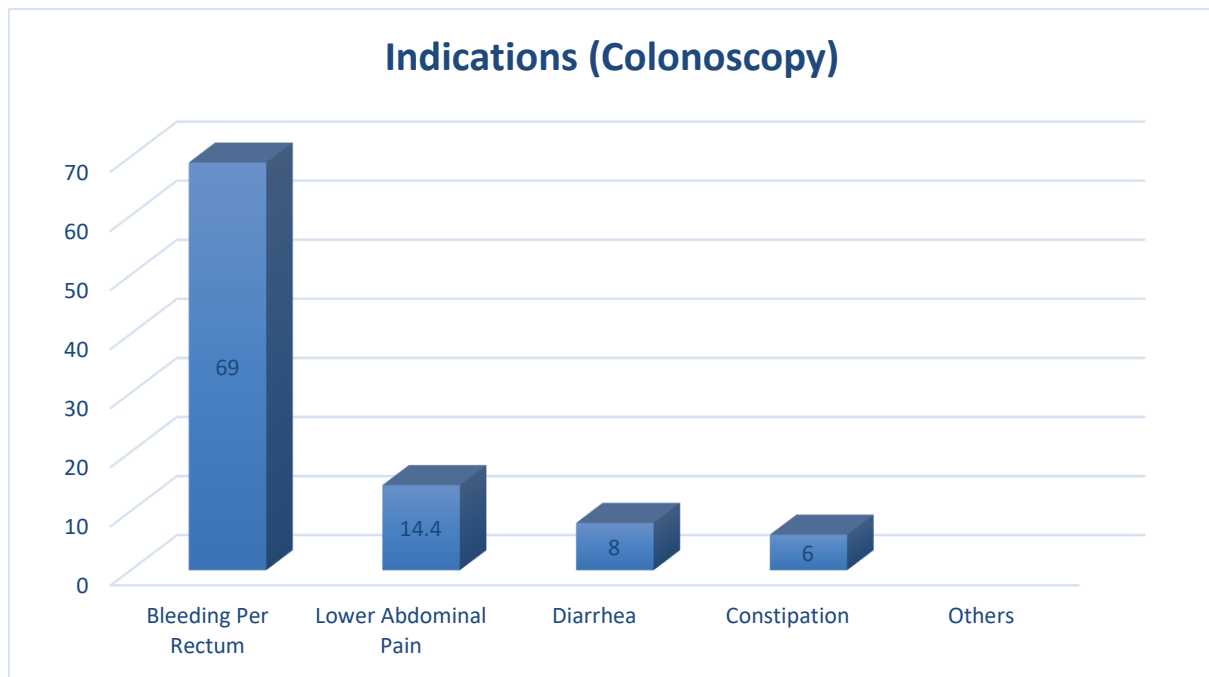


Figure 2: Indications of Colonoscopy

Esophageal perforation was observed in 10 patients undergoing upper G.I endoscopy with corrosive stricture, of which 7 were managed conservatively at our Unit, and 3 patients needed chest intubation. The total complication rate for upper G.I. endoscopy was 0.5%. Six patients during therapeutic colonoscopy developed bleeding, which was managed endoscopically; 9 patients developed minor bleeding after the procedure, which was managed

conservatively. The total complication rate was 0.9%. After ERCP, bleeding was encountered in 14 patients (3.0%) and was controlled by injecting adrenaline. 12 (2.65%) patients developed severe abdominal pain, and 6 of them were found to have mild pancreatitis. No death occurred as a result of endoscopy in the present study. A Comparison of complication rates during the procedure is shown in Figure 7.

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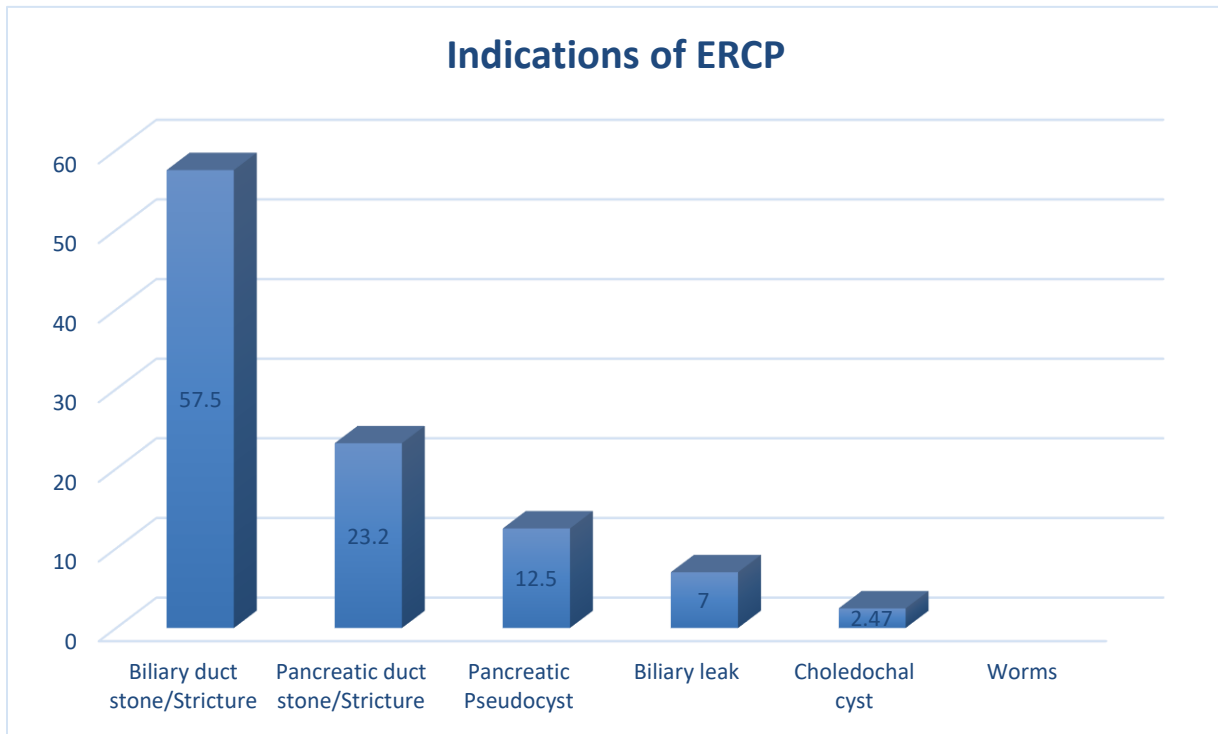


Figure 3: Indications of ERCP

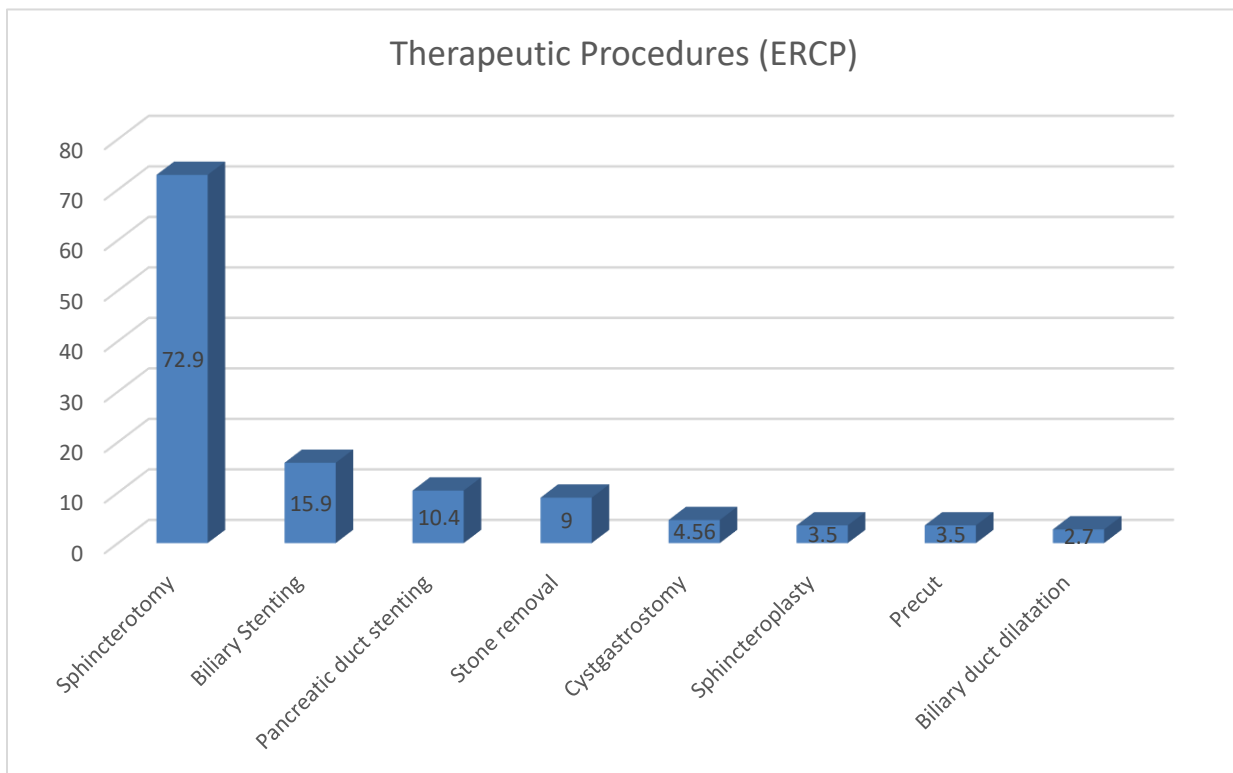


Figure 4: Therapeutic Procedures (ERCP)

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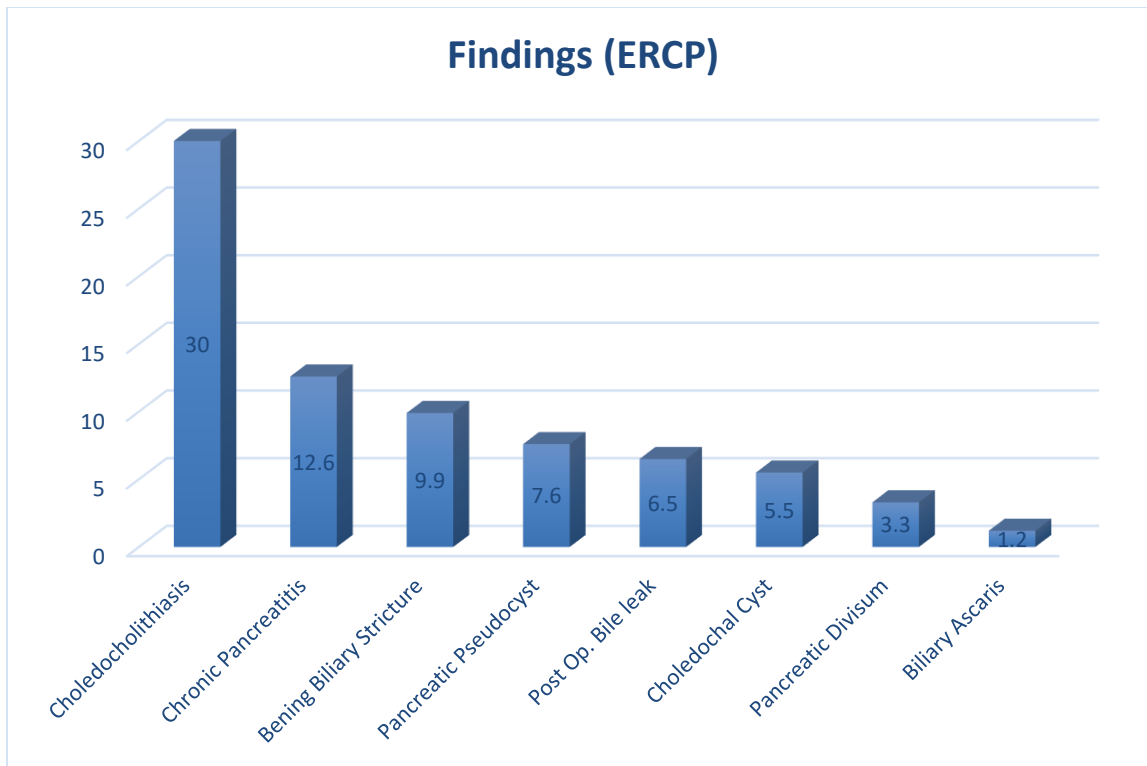


Figure 5: Findings of ERCP

**Adverse events:**

51(0.7%) adverse events were noted; most were minor (Figure 6).

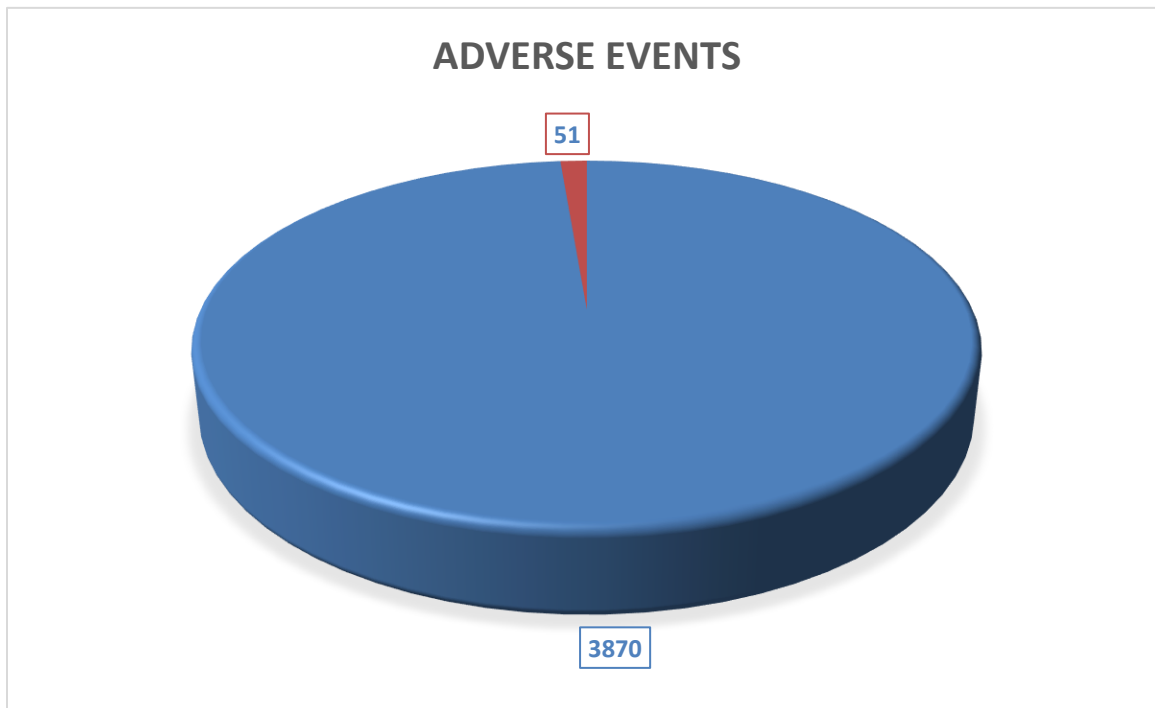


Figure 6: Adverse Events

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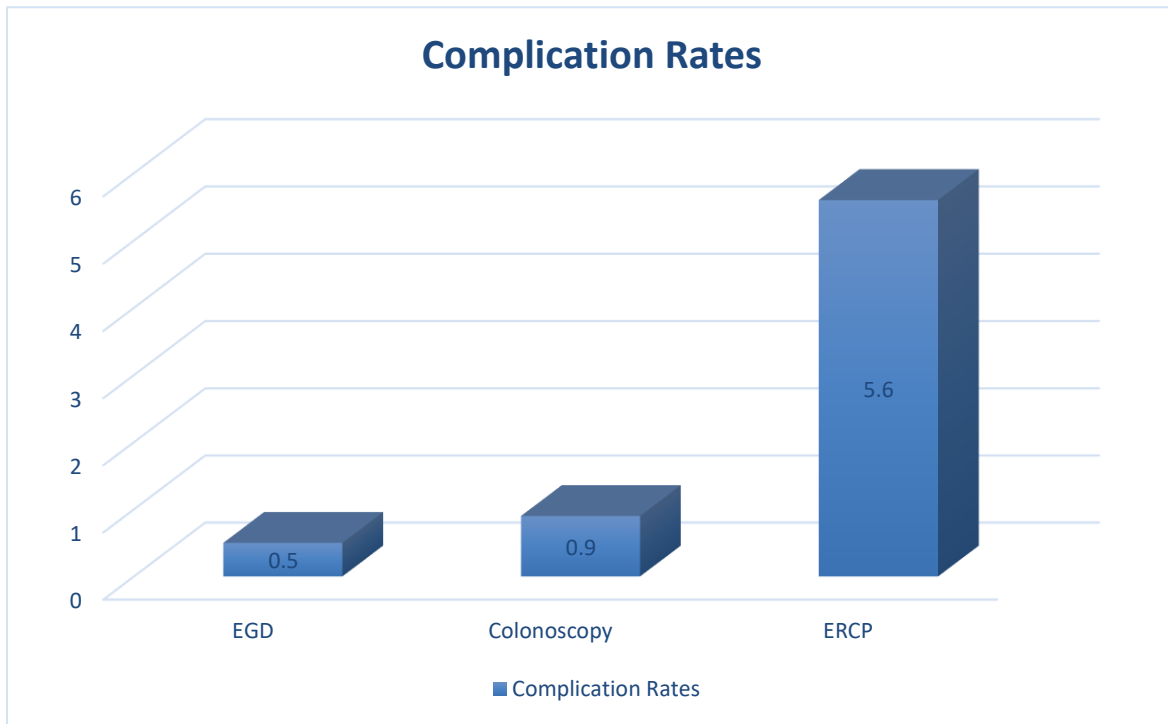


Figure 7: Complication Rates

**Discussion**

Audit is a standard technique that provides a snapshot of performance (Taylor et al., 2008). Audits are intended to summarize data, improve standards, and inform practitioners of the need for continual improvement (Gado et al., 2017). We conducted an audit to analyze the indications, findings, and complications of all endoscopy procedures in the pediatric population referred to the endoscopy suite of tertiary care hospitals in Karachi, Pakistan.

Modern gastroenterology began with Bozzini’s crude, candle-powered lichteiter in 1805 and blossomed with Hirschowitz’s introduction of flexible gastrointestinal endoscopy in the late 1950s. Pediatric gastroenterology followed soon after (Gilger, 2001). With the introduction of modern, small-sized, flexible endoscopes in the 1970s, broader applications have been evident in diagnostic and therapeutic endoscopic procedures (Goenka et al., 1993). Technological improvements in endoscope design and devices contribute to the evolution of pediatric endoscopy. Gastrointestinal diseases affect children worldwide, and in patients with digestive complaints, endoscopy is the gold standard and often the primary exploration. (Adeniyi et al., 2016; Lambert, 1999; Squires Jr and Colletti, 1996). In addition to its diagnostic use, GI endoscopy has an established therapeutic role in various disorders (Aduful et al., 2007). The indication for endoscopy in children is similar to that in adults. Although the indications have been changing over time, the use of diagnostic or therapeutic G.I endoscopy for various disorders is increasing in the pediatric population (Murray et al., 2003). Most hospitals do not have specialized pediatric gastroenterologists, and

pediatric endoscopy is performed by conventional gastroenterologists (27).

The total number of pediatric endoscopic procedures performed in our unit during the study period was 3966 (5% of all the procedures) (Figure 1). After exclusion, 3,870 procedures were included in the study; upper G.I. endoscopy comprised the bulk of procedures, with 45.9% of the total. The most typical indication of upper G.I. endoscopy was epigastric pain (29.7%). Various studies from the developing world have reported the frequency of epigastric pain (abdominal pain) as an indication for upper G.I endoscopy between 8% - 43% (Hafeez et al., 2000; Joshi et al., 2005; Khan et al., 2014; Mudawi et al., 2009). Hence, our results were found to be comparable to these studies. However, these studies did not show epigastric pain as the most common indication found in our study. Almost one-third of all the upper G.I endoscopic procedures were normal with no findings; similar studies have shown the rate of normal EGDs to be between 42 - 69%(Joshi et al., 2005; Khan et al., 2014; Mudawi et al., 2009; Okello, 2006; Quine et al., 1994) which is higher than our study. Gastritis was our study’s most common endoscopic finding, seen in 21.4% of children. Similar reports have also been shown in other studies (Khan et al., 2014; Okello, 2006).

1639 (42.3%) colonoscopies were performed during the study period. The most typical indication for colonoscopy in our study was per rectal bleeding; various studies have shown similar findings in developed and developing countries (Lee et al., 2013; Onyekwere et al., 2013). As shown by studies around the world, Cecal intubation rates are between 66% - and 81.2 % (Gado et al., 2017; Onyekwere et al., 2013), and in our study, it was found to be 93.7%. One-third (34.8%) of all the procedures were

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average, which was higher than found in other studies (9.1%) (Onyekwere et al., 2013). The most common finding was a polyp. However, other studies have not reported similar findings; most of them found vascular lesions to be the most common, followed by polyp/mass lesions (Onyekwere et al., 2013).

A total of 452 (11.6%) ERCPs were performed during the study period with a mean age of 14.01 years with almost equal gender distribution(1:1.12); similar findings were found in a study by Jaya et al., which showed the mean age of children undergoing ERCP to be 13.8 years with equal gender distribution(Agarwal et al., 2014). The most typical indication found was jaundice secondary to biliary obstruction (57.5%); a study from Seattle Children's Hospital showed biliary obstruction (43.3 %) and chronic pancreatitis (26.8 %) as the two most common indications for ERCP(Giefer and Kozarek, 2015). Hence, the results are comparable. Targeted duct cannulation was achieved in over 95 % of cases, similar to other studies (Giefer and Kozarek, 2015). Sphincterotomy was the most common therapeutic procedure in our study; other studies have shown similar data (65%) (Agarwal et al., 2014).

The complication rate was low (0.7%) (Figure 14). Studies have shown a complication rate of about 0 – 4.7 % in pediatric patients undergoing G.I endoscopic procedures, with ERCP having the highest rate of complications (Agarwal et al., 2014; Gado et al., 2017; Giefer and Kozarek, 2015; Goenka et al., 1993; Khan et al., 2014; Onyekwere et al., 2013; Otto et al., 2011; Varadarajulu et al., 2004; Williams et al., 1982) and our results showed similarity.

## Conclusion

A retrospective Audit of our Endoscopy unit shows that all pediatric endoscopic procedures were safely and successfully undertaken with an overall complication rate of 0.7% when performed by expert endoscopists. There is a need for increasing awareness about the diagnostic and therapeutic role of G.I endoscopy in the pediatric population and for dedicated pediatric endoscopic suites with trained pediatric endoscopists in developing countries.

## Declarations

### Data Availability statement

All data generated or analyzed during the study are included in the manuscript.

### Ethics approval and consent to participate

Approved by the department Concerned.

### Consent for publication

Approved

### Funding

Not applicable

## Conflict of interest

The authors declared absence of conflict of interest.

## Author Contribution

### MOHAMMAD FAISAL IBRAHIM

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### Conceptualization

### Methodology

### Writing - original draft preparation

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