

# PREVALENCE OF UPPER GASTROINTESTINAL TRACT ENDOSCOPIES AT THE PEDIATRIC CLINIC OF THE CLINICAL HOSPITAL CENTER RIJEKA FROM 2007 TO 2017

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## ABSTRACT

**Aim:** The aim of the study was to determine the frequency of individual indications, total number of esophagogastroduodenoscopies (EGDS) and pathohistological (PH) findings at the Pediatric Clinic, Clinical Hospital Center (CHC) Rijeka. The frequency of therapeutic interventions for foreign body extraction, the most common types of ingested objects, the frequency of ingestion of acids and alkalis, and the placement of PEG were also considered.

**Materials and methods:** The medical records of all patients undergoing EGDS from January 2007 to December 2017 were reviewed retrospectively. In the analysis of the obtained data, the reasons for performing EGDS in each patient were recorded. The sample for PH analysis was taken based on the assessment of the physician who performed the examination (pediatric gastroenterologist).

**Results:** The total number of examinations performed was 1022. The most common indications for EGDS were: dyspepsia 32% (n = 327), abdominal pain 21% (n = 211), and celiac disease 16% (n = 166). The most common endoscopic findings were: gastritis 50% (n = 450), normal findings 35% (n = 325) and esophagitis 9% (n = 84). The most common PH findings were: normal 43% (n = 390), gastritis 23% (n = 210), and duodenitis 15% (n = 133). Of the total number of examinations, endoscopy was therapeutic in 10% (n = 98) of cases. The most common therapeutic indications were: foreign body ingestion 5% (n = 51), PEG placement 3% (n = 35), and acid and alkali ingestion 1% (n = 12).

**Conclusion:** The results obtained are consistent with those of other studies and may in-

dicating areas for additional education of staff and a starting point for future research on the topic.

**Key words:** children, upper endoscopies, university hospital

## INTRODUCTION

Gastrointestinal (GI) diseases pose an important public health problem worldwide. In order to improve their diagnosis and treatment, numerous examination methods are being developed: esophagogastroduodenoscopy (EGDS), colonoscopy, foreign body extraction, magnetic resonance enterocolonography (MREC), video capsule endoscopy (VCE), percutaneous endoscopic gastrostomy (PEG), dilatation, variceal sclerotherapy or banding, and polypectomy (ACO). One of these, EGDS, has been used increasingly in the last 20 years. The reasons are multiple: the greater frequency of GI diseases, the advanced technique, shorter examination time (EGDS), and refinement of the procedure (primarily anesthesia). With technological advancement, upper endoscopy has become one of the main procedures in the diagnosis and treatment of GI disorders in children, regardless of age and disease (1). Endoscopy is useful only when it leads to correct diagnosis and proper treatment.

The most common diseases in which pediatric diagnostic EGDS is performed are: dyspepsia, abdominal pain, bleeding, dysphagia, celiac disease, inflammatory bowel disease (IBD), failure to gain weight, vomiting and anemia (1, 2, 3). The importance of individual indications for EGDS changes over time, and mucosal biopsies with histo-

pathological (PH) examination become an integral part of any endoscopic examination. At first endoscopy was used only for diagnostic purposes. This has gradually changed and EGDS is nowadays also used as a treatment method for extraction of foreign substances and treatment of acid or alkali ingestion, installation of percutaneous endoscopic gastrostomy (PEG), esophageal and pyloric dilatation and to stop bleeding (4, 5).

The contraindications for performing upper endoscopy are clear. Endoscopy should not be performed in patients with compromised breathing, cardiovascular collapse, intestinal perforation, or peritonitis. Intestinal obstruction, neutropenia, severe thrombocytopenia, coagulopathy, recent gastrointestinal surgery, unstable cardiopulmonary disorder and recent meal intake are only relative contraindications. Age is not a restriction to performing EGDS, as it can be done from the first days of life (6, 7).

Antimicrobial prophylaxis is not recommended for routine diagnostic endoscopy. There are different opinions about the prophylactic use of antibiotics in therapeutic endoscopy. Some authors recommend prophylactic administration of antibiotics in therapeutic endoscopies, such as PEG staging, endoscopic dilatation, sclerotherapy, ligation and ERCP. For others, their use is still under-explored. (6, 7).

One of the major difficulties in the implementation of EGDS in children is their cooperation/compliance during the procedure. Therefore, sedation with analgesia or general anesthesia is most commonly used. This shortens the duration of the endoscopic procedure and reduces emotional stress. Analgesia and amnesia (3, 6, 8) are mentioned as side effects of this type of screen-

ing. The most commonly used anesthetics during endoscopy are midazolam, fentanyl, propofol, and ketamine (1). After the examination, the patient should be monitored for 15 to 30 minutes. Food may be ingested one hour after the cessation of anesthesia.

GI endoscopy is considered to be a safe intervention. The overall risk of complications and mortality is between 0.13% and 0.004% (8, 9, 10). Risk factors for developing complications are younger age, higher ASA (American Society of Anesthesiologists) score, female patients and intravenous sedation (3).

The aim of this study was to assess the most common indications for performing pediatric endoscopy at the Clinical Hospital Center (CHC) Rijeka.

## SUBJECTS AND METHODS

The study was carried out at the Pediatric Clinic of the CHC in Rijeka. The clinic's catchment area comprises three different counties (Primorsko Goranska, Istarska and Ličko Senjska) with approximately 100,000 children and adolescents up to the age of 18. In agreement with specialists in adult gastroenterology, patients with chronic diseases (inflammatory bowel disease, celiac disease) diagnosed before the age of 18 are monitored at the Pediatric Clinic beyond the age of 18. This explains the older age of some patients undergoing endoscopic examinations. As a tertiary health care facility, the Clinic has appropriate endoscopic equipment that can be used to perform most endoscopic examinations and procedures in that population.

Data from January 2007 to December 2017 were reviewed retrospectively using the institution's "IBIS" (Integrirani bolnički informacijski sustavi - integrated hospital information systems) electronic database. All the patients who had undergone EGDS during this period were enrolled in the study. The medical records of 1,022 patients were reviewed. For 14 patients, the medical records were incomplete, and they were not included in the study.

Examinations were performed by trained and experienced pediatric gastroenterologists. Informed consent for the procedure was signed by all parents, after a detailed explanation of the procedure and potential complications. The type of anesthesia was decided by the anesthesiologist before the

procedure, based on the patient's age, compliance, and the reasons why the examination was being performed. The procedure for every patient was recorded and stored appropriately. The sample for PH analysis was taken according to the physician's assessment. After the procedure the patients were monitored in the "recovery room", for possible postoperative complications.

Patient demographics included age and gender. Indications for EGDS were recorded for each patient. The information collected was loaded and processed with descriptive statistics as a percentage using Microsoft Office Excel. Frequencies of individual indications, EGDS and PH findings were calculated.

## RESULTS

During the observed period, 1022 EGDS procedures were performed. The highest number of procedures performed was in 2017 (n = 131), followed by 2007 (n = 120) and 2008 (n = 117).

### Patient characteristics

The median age of patients who underwent EGDS was 12 years, with a range of two months to 24 years. Most patients were in the age range between 14 and 18 years (n = 429, 42%). The second most frequent age group were patients up to 4 years of age (n = 193, 19%). There were 53% (n = 540) girls and 47% boys (n = 482) in the study.

In the observed period, 90% of endoscopies were diagnostic and 10% therapeutic. The most common indication for endoscopy was dyspepsia, in 32% of patients (n = 327) followed by abdominal pain in 21% (n = 211), and celiac disease in 16% of patients (n = 166). The frequency of indications is shown in Figure 1.

The category "Other" includes poor body weight gain, vomiting, dysphagia, acid and alkali ingestion, Morbus von Recklinghausen, esophageal varices, cough, fever of unknown origin, juvenile arthritis, mouth odor, Overlap syndrome, Peutz Jegher's syndrome, liver disease, chronic lymphocytic leukemia, esophageal atresia, cystic fibrosis, Niemann-Pick disease, chronic renal failure, pylorospasm, and familial polyposis.

The frequency of the most common indications for EGDS over the years is relatively constant for dyspepsia and celiac disease, while the frequency of abdominal pain as a reason for EGDS performing has been in-

creasing over the last three years.

### Endoscopic findings

Gastritis was the most common EGDS finding, in 50% of patients (n = 450). A normal endoscopic finding was found in 35% of patients (n = 325) and esophagitis in 9% (n = 84). The frequency of other findings is presented in Figure 2. A complication was noted during only one EGDS procedure as patient hypoxia.

The group "Other" in Figure 2 includes esophageal varices, polyps, angiodysplasia, lymphangiectasia and esophageal stenosis. In the last four years there has been an increasing number of the EGDS finding of gastritis with a normal endoscopic finding.

### Pathohistological findings

A total of 903 (98%) biopsies were performed. Pathohistological analysis most commonly revealed a normal finding from the material taken - in 43% of patients (n = 390). The second most frequent finding was gastritis, in 23% of patients (n = 210), and the third was duodenitis, in 15% (n = 133). The most common findings are shown in Figure 3.

The "Other" group shown in Figure 3 includes a PH finding of inflammatory bowel diseases, most notably Crohn's disease. Over the years, there was a high percentage of normal pathological findings which varied between 30% in 2014 and 48% in 2014.

### Foreign body

Ingestions of foreign bodies were the reason for EGDS in 5% (n = 51) of cases and were most prevalent in children under 5 years of age, followed by those between 7-13 years. The type of objects swallowed in percentages is presented in Figure 4. Most often these were coins (33%, n = 17). In 11 patients (22%) the foreign body was not found. Third place belongs to small pieces of food (21%, n = 10), which are most often pieces of meat.

### Placement of percutaneous endoscopic gastrostomy (PEG)

A total of 35 PEGs were placed (3% of all EGDSs), most of them in the last 5 years.

### Ingestion of acids and alkalis

The EGDS procedure was performed due to acid or alkali intake in 12 patients (1%). Alkali intake was more common (n = 7) than acid intake (n = 5). Alkali intake included

substances such as "bleach" (sodium hypochlorite), detergents and potassium permanganate.

In one case, we also had a patient who intentionally poisoned herself with a cleaning agent, that is, an alkali. All other cases were accidental poisoning (92%).

## DISCUSSION

EGDS is one of the more specific, faster and cost-effective diagnostic and therapeutic procedures in GI disorders in children. It is especially useful at times when other diagnostic options do not provide satisfactory data.

Disorders that require this procedure are becoming more common, and so is the number of endoscopic examinations. Consequently, the highest number of searches was conducted in 2017 (n = 131), out of all years in the 10-year period observed (1, 5, 7, 11, 12,13).

In our study, most patients were children aged 15-24 years - 36% (n = 372, followed by those aged 10 -15 years 27% (n = 279) and 0 to 5 years 19% (n = 193) while the fewest number of examinations was performed in those 5 to 10 years old (17%). These data are slightly different from the results reported by Khan et al., where the procedure was mostly performed on older children (10-15 years) - 40%, followed by the youngest children (0-5 years) with 32% (14). The incidence of examining children aged 5 to 10 years was 28%, which is consistent with our results. Other studies support our results (4,13).

According to studies published to date, the most common indications for the implementation of EGDS in developed countries are abdominal pain (up to 43%), dyspepsia (12%), and bleeding (26%) (3, 4, 5, 6, 7, 11, 13, 14, 15, 16, 17, 18). In our study, dyspepsia was in first place 32%, followed by abdominal pain in 21%, and celiac disease in 16%. Dyspepsia refers to any pain in the upper abdomen. The exact diagnostic criteria are unclear, but dyspepsia and pain should be seen as almost congenial terms whose use depends almost entirely on the doctor. Although abdominal pain has not become more frequent than dyspepsia, in the last two years it has been more commonly used as a diagnosis, and remains the most common indication for EGDS, which is consistent with other studies. The number of

patients referred for GI bleeding decreased (from 34% to 5%), while the number of those with abdominal pain increased (from 23% to 43%) (1, 6, 7). The reasons should be sought in the widespread use of effective modern therapies in childhood, primarily proton pump inhibitors (PPI).

The most common endoscopic findings were gastritis 50% (n = 450), normal 35% (n = 325) and esophagitis 9% (n = 84) (6,19). This is also consistent with the results of other studies, except for the proportion of normal findings (1, 14, 20). In these studies, a regular EGDS finding was found in 16% of searches performed (1, 20). The increasing number of normal endoscopic findings may be explained by the increased number of children who present at the gastroenterology outpatient clinic due to abdominal pain, pressure from parents, and uncritical and irrational prescription of this examination. Of all examinations in 2017, 30% of EGDS findings were normal, compared to 2016, where they accounted for 16%. The larger number of endoscopic procedures increases the cost of health care and extends the patient waiting lists. As the number of normal EGDS findings is increasing, it is necessary to emphasize the importance of defining the correct indications, which is essential for rational use of EGDS (20).

According to various studies, the risk of complications varies from 0.13% to 0.004% (1, 3, 9,10, 21, 22). This corresponds to our data with only one complication (0.1%), which was associated with anesthesia (breathing complication).

Although one case is insufficient to draw conclusions, it has been shown that lower patient age is associated with a greater the risk of complications, (2).

During endoscopic examinations, biopsies were taken in 98% of cases, which is consistent with the results of other studies (6). The most common PH findings were a normal finding 43% (n = 390), gastritis 23% (n = 210) and duodenitis 15% (n = 133). Khan et al. found gastritis in 23% following 31% normal findings, celiac disease in 18%, duodenitis 10.5% and esophagitis 4% (14). Compared with the study by Alper et al., in our study, there was a higher proportion of duodenitis and esophagitis, and a lower proportion of gastritis (6). More recent studies suggest an increasing number of normal PH findings, even more than 1/3 (18).

In recent years, more and more people have been diagnosed with "eosinophilic esophagi-

tis". Following the introduction of "eosinophilic esophagitis" as a new diagnosis, much more attention has been paid to it and the frequency of esophagitis is more prevalent. A PH finding is crucial when making a diagnosis. In 2016, the number of PH findings labeled as eosinophilic esophagitis was the same as for celiac disease, 9% (n = 5), while in 2017, we recorded an increase to 21% (n = 25), proving the importance of biopsy and pathohistological analyses (5, 6, 23).

The importance of taking biopsies regardless of macroscopic findings is particularly emphasized in the case of celiac disease (4,5). The former diagnostic algorithm included EGDS and biopsy of the small intestine, which has changed in the latest ESPGHAN guidelines (24). There is no characteristic endoscopic finding for celiac disease, and the intestinal mucosa may be completely normal in appearance. Seventy of our patients had normal macroscopic EGDS findings, and the PH finding confirmed celiac disease. Without a routine biopsy, no diagnosis would have been made in these cases. The PH findings obtained also confirm the fact already observed regarding changes in the characteristics of celiac disease. While it was once thought to be exclusively a childhood illness, today an increasing number of diagnoses are being made in adults with an atypical or asymptomatic form of the disease (24).

Upper endoscopy was performed as a therapeutic procedure in 10% of cases. The most common therapeutic indications were foreign body ingestion in 5% (n = 51), PEG placement of 3% (n = 35), and acid and alkali ingestion in 1% (n = 12).

Swallowed foreign bodies most often pass spontaneously through the GI system, while only 10% - 20% require therapeutic endoscopic intervention (1, 9, 25, 26, 27, 28, 29). Unintentional foreign body ingestion is much more common in children than in adult patients (26). The most common age at which children accidentally swallow a foreign body is up to the age of 5 (1, 19, 21, 26), which is also consistent with our results. The most common ingested objects are coins (33% of cases), which is in line with other studies (although the incidence was up to 70% (5, 24, 25, 26, 27). In our study there were no complications related to foreign body ingestion and no patients required surgical procedure, while the literature argues that the frequency is 1% of all patients (25, 26, 27).

Our results support a slightly more frequent placement of PEG (3%) than the average in other studies (1%) (3).

In the 10-year observation period, one case of ingestion of potassium permanganate was noted. In these cases, it is important to know how its crystalloid particles adhere to the esophageal mucosa, where they can act extremely aggressively and create perforations. When performing endoscopy, it is important to remove crystals from the surface with a forceps or brush (21, 25, 26, 27).

The value of our research is the large representative sample ( $n = 1.022$ ) and the length period of 10 years. Clinical Hospital Center Rijeka is one of five clinical hospital centers and is the central hospital institution in this part of the Republic of Croatia. It is a hospital center for three counties, resulting in diversity and a large number of pediatric patients in the area. As EGDS is performed less frequently in children than in adults and the amount of data is limited, the topic of this paper is very relevant and indicates the need for this type of research (19).

The limitations of the study is that it is a

retrospective analysis of patients, and the subjectivity of data analysis. Several patients had to be excluded from the study because of incomplete data in the system ( $n = 14$ ). Our data, of course, cannot match the results of smaller hospitals that do not have similar capabilities and standards to the Clinical Hospital Center.

## CONCLUSION

EGDS is a procedure safe to perform in children. The development of the technology and awareness of particular diseases have contributed to the fact that it has become a routine procedure in pediatric gastroenterology.

This study provides insights into the frequency of individual indications, and EGDS and PH findings at the Pediatric Clinic of the CHC Rijeka from 2007 to 2017.

The most common indications for EGDS are dyspepsia, abdominal pain and celiac disease. The most common endoscopic findings are gastritis, normal findings, and

esophagitis. The most common PH findings are normal findings, gastritis and duodenitis. The most common therapeutic indications are foreign body ingestion, PEG placement, and acid and alkali ingestion. Patients are usually children between the ages of 15 and 18.

This is the first study evaluating the indications for performing pediatric endoscopy in CHC Rijeka, and to our knowledge in Croatia as well. Our results match the results obtained in Western European countries, indicating the areas for improvement in decision making in performing the procedure.

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