

PAIN ASSESSMENT FOLLOWING GASTROINTESTINAL ENDOSCOPIC PROCEDURES IN THE PEDIATRIC POPULATION – A PROSPECTIVE OBSERVATIONAL STUDY

PROCENA BOLA NAKON GASTROINTESTINALNIH ENDOSKOPSKIH PROCEDURA U PEDIJATRIJSKOJ POPULACIJI – PROSPEKTIVNA OPSERVACIONA STUDIJA

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Abstract

Introduction. Gastrointestinal endoscopic procedures are increasingly performed in pediatric populations; however, data on post-procedural pain and its determinants remain limited. Adequate sedation and effective pain management are essential for ensuring patient comfort and optimizing procedural outcomes. This study is aimed to evaluate intensity of postprocedural pain following gastrointestinal endoscopic procedures in children and to identify factors associated with increased pain perception. **Material and Methods.** This prospective clinical study included pediatric patients undergoing elective endoscopic procedures at the Pediatric Clinic in Novi Sad between May and July 2025. Pain intensity was assessed 30 minutes after the procedure using age-appropriate validated scales: the Numerical Rating Scale for children aged ≥ 9 years, the Wong-Baker Faces Pain Rating Scale, and the Face, Legs, Activity, Cry, Consolability scale for younger children. Patient demographics, procedural characteristics (type and duration), and overall satisfaction were analyzed. Statistical analysis was performed using SPSS version 23. **Results.** A total of 39 patients were included (16 boys and 23 girls). The most frequently performed procedure was combined esophagogastroduodenoscopy and colonoscopy (61.5%). The mean pain score was 2.69 (SD = 1.73), ranging from 0 to 6. Female patients reported higher pain scores (mean = 3.08) compared to males (mean = 2.12), with the difference approaching statistical significance ($p = 0.086$). No statistically significant associations were observed between pain intensity and age, type or duration of the procedure, or prior endoscopic experience. The mean satisfaction score was 4.64 (SD = 0.58), with significantly higher satisfaction reported among younger patients ($p = 0.03$). **Conclusion.** Identification of individual risk factors for postprocedural pain may facilitate optimization of sedation protocols and support more patient-centered approach in pediatric endoscopy.

Key words: Pain; Pain Measurement; Endoscopy, Gastrointestinal; Pediatrics; Child; Adolescent; Postoperative Pain; Pain Management; Analgesia; Risk Factors

Sažetak

Uvod. Gastrointestinalne endoskopske procedure mogu biti povezane sa nelagodnošću, bolom, anksioznošću, naročito u pedijatrijskoj populaciji. Cilj ovog istraživanja bio je procena intenziteta bola nakon gastroenteroloških endoskopskih procedura u pedijatrijskom uzrastu, kao i ispitivanje potencijalnih faktora rizika za veći stepen bola nakon pregleda. **Materijal i metode.** Istraživanje je sprovedeno kao klinička prospektivna studija. U analizu su uključeni pacijenti podvrgnuti elektivnim endoskopskim procedurama na Klinici za pedijatriju u Novom Sadu u periodu od maja do jula 2025. godine. Uvidom u medicinsku dokumentaciju analizirani su: osnovni podaci o pacijentima, dijagnoza, vrsta i trajanje endoskopske procedure. Za evaluaciju bola nakon endoskopskih procedura korišćene su numerička skala bola, Vong-Bejkerova skala (Wong-Baker) za procenu bola i skala Face, Legs, Activity, Cry, Consolability. **Rezultati.** U istraživanju je učestvovalo 39 pacijenata, od toga 16 dečaka i 23 devojčice. Najčešće je sprovedena kombinacija ezofagogastroduodenoskopije i kolonoskopije u istom aktu, kod 24 pacijenta (61,5%). Minimalna ocena bola za ukupan uzorak bila je 0, a najviša 6, sa prosečnom vrednosti od 2,69, i standardnom devijacijom od 1,73. Što se pola tiče, registrovana je marginalna statistička razlika između dečaka i devojčica – $p = 0,086$, u korist izraženije percepcije bola kod devojčica ($M = 3,08$, $SD = 1,62$) nasuprot dečaka ($M = 2,12$, $SD = 1,72$). **Zaključak.** Adekvatna sedacija i analgezija omogućava veći broj uspešnih pregleda i obezbeđuje bolje iskustvo pacijentima koji se podvrgavaju endoskopskim procedurama. Poznavanje faktora rizika za veći stepen postproceduralnog bola može doprineti poboljšanju ovih strategija i formiranje individualnog pristupa za svakog pacijenta.

Ključne reči: bol; procena bola; endoskopija gastrointestinalnog trakta; pedijatrija; dete; adolescent; postoperativni bol; upravljanje bolom; analgezija; faktori rizika

Introduction

Gastrointestinal endoscopy has undergone significant evolution over the past century, progressing from rigid instruments to flexible fiberoptic and ad-

vanced video-assisted systems. These technological advancements, along with improvements in sedation techniques, have significantly expanded the applicability of endoscopy in pediatric populations. Currently, gastrointestinal endoscopic procedures are

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Abbreviations

- ASA – The American Society of Anesthesiologists
- EGD – esophagogastroduodenoscopy
- FLACC Scale – Face, Legs, Activity, Cry, Consolability Scale
- FACES – Wong-Baker FACES Pain Rating Scale
- NRS – Numerical Rating Scale

routinely performed in children for both diagnostic and therapeutic purposes [1].

Despite its clinical utility, endoscopy remains an inherently invasive procedure and may be associated with discomfort, pain, anxiety, and procedural stress, particularly in pediatric patients. In developed health-care settings, most routine pediatric endoscopic procedures are performed under some form of sedation or general anesthesia [2]. Adequate sedation facilitates a more comprehensive examination, enhances patient cooperation, and contributes to overall procedural success. Furthermore, it has been shown to increase acceptance of repeat procedures among both patients and their caregivers when clinically indicated [3,4].

The American Society of Anesthesiologists (ASA) classifies sedation into a continuum ranging from minimal sedation to general anesthesia. In pediatric practice, European guidelines recommend that endoscopic procedures be performed under general anesthesia whenever feasible, with deep sedation considered an acceptable alternative when general anesthesia is not available [5,6]. Sedation strategies vary widely, ranging from moderate sedation using benzodiazepines and opioids to deep sedation with agents such as propofol, often administered in combination with analgesics to achieve synergistic effects [7,8].

Although sedation improves procedural tolerance, gastrointestinal endoscopy may still be followed by postprocedural discomfort or pain. Data on post-endoscopic pain in pediatric population remain limited, particularly regarding factors that may influence pain perception. Previous studies have suggested that female sex, prolonged procedure duration, and certain gastrointestinal conditions – such as irritable bowel syndrome – may be associated with increased pain perception [9]. Identification of such factors is essential for optimizing sedation and analgesia pro-

ocols and for enhancing the overall patient experience in pediatric endoscopy.

The aim of this study was to evaluate intensity of postprocedural pain following gastrointestinal endoscopic procedures in children and to identify factors associated with increased pain perception.

Material and Methods

This prospective observational clinical study was conducted at the Pediatric Clinic in Novi Sad between May and July 2025. The study population comprised pediatric patients undergoing elective gastrointestinal endoscopic procedures. Two patients with significant neurological impairments were excluded due to the inability to reliably assess pain.

Patient data were collected from medical records and included demographic characteristics, clinical diagnosis, type of endoscopic procedure, and procedure duration. Postprocedural pain intensity was assessed 30 minutes after completion of the procedure using age-appropriate, validated assessment tools:

- Numerical Rating Scale (NRS) (0 = no pain, 5 = moderate pain, 10 = worst imaginable pain), used for children aged ≥ 9 years [10] (**Figure 1**);
- Wong-Baker FACES Pain Rating Scale (FACES) (0–10 scale), used for children aged 0–8 years, based on facial expression [10] (**Figure 1**);
- FLACC Scale (Face, Legs, Activity, Cry, Consolability), used for children aged 0–8 years, based on behavioral observation [11].

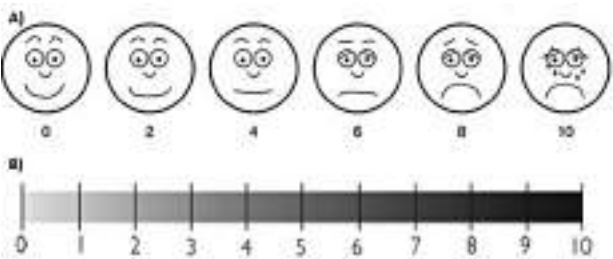


Figure 1. A) FACES Pain Rating Scale; B) Numerical Rating Scale

Table 1. FLACC Pain Assessment Scale

Category	Score 0	Score 1	Score 2
Face	No expression or smile	Occasional grimace or frown, with drawn	Frequent to constant frown, clenched jaw
Legs	Normal position or relaxed	Uneasy, restless	Kicking or legs drawn up
Activity	Lying quietly, normal movement	Squirming, shifting back and forth	Arched, rigid or jerking
Cry	No crying	Moans or whimpers, occasional complaint	Crying steadily, screams or sobs
Consolability	Content, relaxed	Reassured by touching, hugging	Difficult to console or comfort

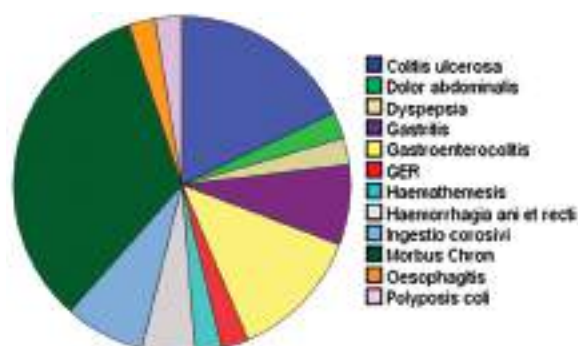


Figure 2. Diagnostic distribution among patients

The FLACC scale employs a three-point scoring system across five behavioral domains, with higher cumulative scores indicating greater pain intensity (**Table 1**).

In addition to pain assessment, caregiver-reported overall satisfaction with the procedure was recorded using a five-point Likert scale (1 = extremely dissatisfied, 2 = dissatisfied, 3 = neutral, 4 = satisfied, 5 = extremely satisfied).

All data were entered into a structured database and analyzed using IBM SPSS Statistics, version 23. Continuous variables were expressed as means and standard deviations, while categorical variables were presented as frequencies and percentages. Between-group comparisons were performed using the independent samples *t*-test, analysis of variance (ANOVA), and Pearson's correlation coefficient, as appropriate. A *p*-value of < 0.05 was considered statistically significant.

The study protocol was approved by the Ethics Committee of the Institute for Health Care of Children and Youth of Vojvodina. Written informed consent was obtained from the parents or legal guardians of all participants prior to study inclusion.

Results

Patient Characteristics

A total of 39 pediatric patients were included in the study, comprising 16 males and 23 females. The age of participants ranged from 1 to 18 years, with a mean age of 12.28 ± 4.71 years. The mean body weight was 47.66 ± 19.68 kg (range: 10–86 kg). Twelve distinct diagnostic categories were identified, with Crohn's disease and ulcerative colitis representing the most prevalent conditions. The distribution of diagnoses is presented in **Figure 2**.

Procedural Characteristics

The most frequently performed procedure was combined esophagogastroduodenoscopy (EGD) and colonoscopy during a single session, conducted in 24 patients (61.5%). Isolated EGD was performed in 9

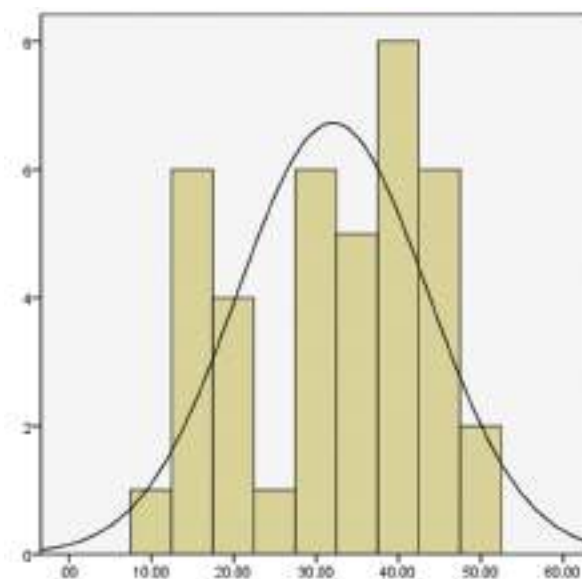


Figure 3. Distribution of procedure duration (in minutes)

patients (23.1%), while isolated colonoscopy was performed in 6 patients (15.4%). For 21 patients (53.8%), this was their first endoscopic procedure. The mean procedure duration was 32.05 ± 11.56 minutes, ranging from 10 to 50 minutes. The distribution of procedure duration is illustrated in **Figure 3**.

Postprocedural Pain and Satisfaction

Postprocedural pain intensity constituted the primary outcome of the study. The **mean pain score** was 2.69 ± 1.73 , with values ranging from 0 to 6. The distribution of pain scores is shown in **Figure 4**.

Overall satisfaction with the procedure was high, with a mean score of 4.64 ± 0.58 (ranging: 3–5), as presented in **Figure 5**.

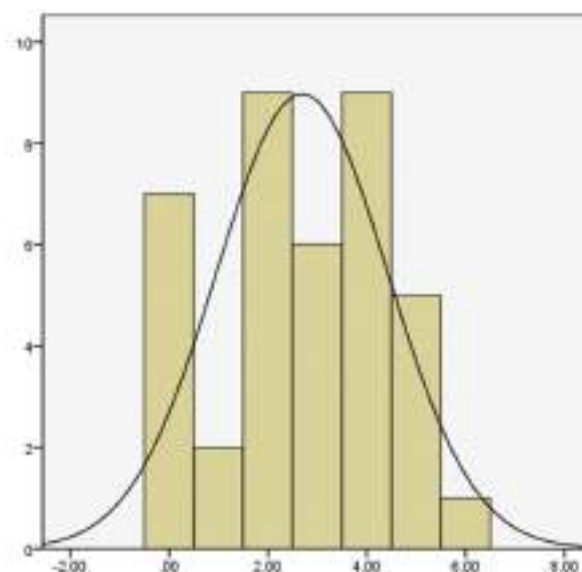


Figure 4. Distribution of reported pain scores

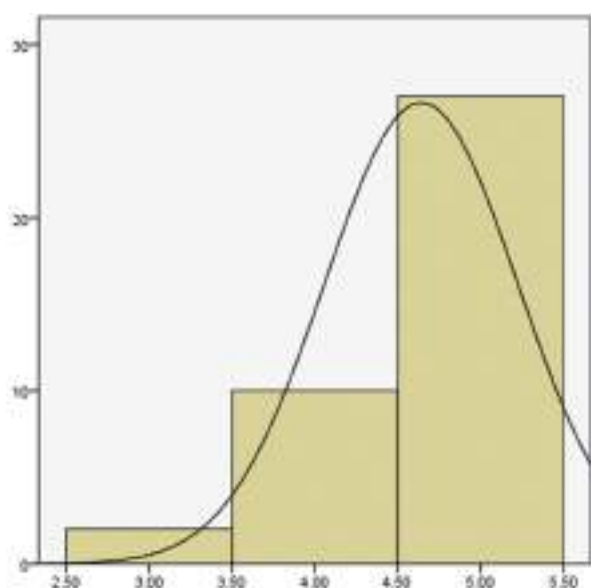


Figure 5. Distribution of overall satisfaction scores

Sex-Based and Procedure-Based Comparisons

A difference in pain perception between sexes approached statistical significance. **Female patients** reported higher mean pain scores (3.08 ± 1.62) compared to **males** (2.12 ± 1.72) ($t(37) = -1.749$, $p = 0.086$).

No statistically significant differences in pain intensity were observed between patients undergoing their first endoscopic procedure and those with prior experience ($t(37) = 0.45$, $p = 0.65$), nor across different types of procedures ($F(2) = 1.2$, $p = 0.28$).

Correlation analyses revealed no significant associations between pain scores and body weight ($r = -0.18$, $p = 0.28$), procedure duration ($r = 0.07$, $p = 0.65$) or overall satisfaction ($r = 0.008$, $p = 0.95$).

Satisfaction Analysis

No significant differences in satisfaction scores were identified between sexes ($t(37) = -0.14$, $p = 0.90$), nor between patients with and without prior endoscopic experience ($t(37) = 1.41$, $p = 0.16$). However, age demonstrated a statistically significant negative correlation with satisfaction ($r = -0.34$, $p = 0.03$) indicating that younger patients reported higher levels of satisfaction.

Discussion

This study evaluated postprocedural pain in children undergoing elective gastrointestinal endoscopic procedures and explored factors potentially associated with increased pain perception. Effective pain management represents a cornerstone of pediatric care, not only by ensuring immediate patient comfort but also by reducing anxiety, facilitating recovery, and improving the overall healthcare experience.

Pain is an inherently subjective and multifactorial phenomenon. Its assessment in pediatric populations is particularly challenging due to variability in cognitive development and communication abilities [10]. Consequently, the use of age-appropriate, validated assessment tools is essential. In older children, self-report instruments such as numerical rating scales are considered the gold standard, whereas in younger or non-verbal children, observational tools such as the FLACC and Wong-Baker FACES scales are widely utilized. Although these instruments are clinically practical, they rely on observer interpretation and are therefore subject to inherent limitations. Nevertheless, behavioral indicators – including facial expression, crying, motor activity, and consolability – remain indispensable components of pediatric pain assessment [11–13].

In the present study, the mean postprocedural pain score was relatively low (2.69), with a maximum value of 6, indicating that the procedures were generally well tolerated. A trend toward higher pain scores was observed in female patients compared to males. Although this difference did not reach statistical significance, it is consistent with previous reports suggesting greater pain sensitivity and reporting among female pediatric patients [9]. However, pain perception is influenced by a complex interplay of biological, physiological, and sociocultural factors, and these sex-related differences warrant further investigation in larger, adequately powered studies.

No statistically significant associations were identified between pain intensity and procedural characteristics. These findings differ from some reports in the literature that link longer or more invasive procedures with increased postprocedural pain [14]. The lack of significant associations in our study may be attributable to the relatively small sample size and the predominance of combined upper and lower endoscopy, which limited variability across procedural categories.

Psychological factors, particularly anxiety and fear, play a critical role in modulating pain perception in pediatric patients. Preprocedural anxiety has been consistently associated with increased postprocedural discomfort [15]. In our cohort, patients undergoing endoscopy for the first time tended to report higher pain scores, although this trend did not achieve statistical significance. This observation supports the hypothesis that unfamiliarity with medical procedures may amplify stress responses and perceived pain [16]. These findings highlight the importance of implementing child-centered communication strategies and preparatory interventions aimed at reducing anxiety prior to the procedure.

Overall satisfaction with the endoscopic experience was high among both participants and their caregivers. Notably, a significant inverse correlation was observed

between age and satisfaction, with younger patients reporting higher satisfaction levels. This finding may reflect lower anticipatory anxiety, fewer prior negative healthcare experiences, or a greater reliance on caregiver support in younger children. High satisfaction rates are particularly relevant in pediatric patients with chronic gastrointestinal disorders, who often require repeated endoscopic evaluations throughout their clinical course.

Several limitations of this study should be acknowledged. First, the relatively small sample size and single-center design limit the generalizability of the findings. Second, pain assessment was conducted at a single time point – 30 minutes post-procedure – without longitudinal follow-up. A more comprehensive evaluation, including serial pain assessment and documentation of analgesic requirements, would provide a more nuanced understanding of postprocedural pain dynamics. Finally, preprocedural anxiety was not formally assessed, which may have further elucidated individual differences in pain perception.

Despite these limitations, this study contributes to the growing body of evidence in pediatric endoscopy and underscores the importance of individualized sedation and analgesia strategies. Future research should incorporate larger, multicenter cohorts, lon-

gitudinal pain assessments, and psychological profiling to better characterize and mitigate postprocedural discomfort in pediatric populations.

Conclusion

Effective sedation and analgesia are essential for the safe and successful performance of gastrointestinal endoscopic procedures in pediatric patients. Although most children tolerate these procedures well, certain subgroups may be at increased risk for experiencing greater postprocedural pain. In the present study, overall pain intensity was low and patient satisfaction was high. However, observed trends toward higher pain perception in female patients and in those undergoing endoscopy for the first time suggest that individual patient characteristics and prior experience may influence outcomes.

Identification of these risk factors may assist clinicians in anticipating patient needs, optimizing perioperative care, and implementing individualized strategies to minimize discomfort and enhance the overall endoscopic experience. Further, large-scale, multicenter studies with extended follow-up are warranted to validate these findings and refine sedation protocols in pediatric endoscopy.

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