

DOI: 10.5281/zenodo.12426969

REHABILITATION PROGRAM FOR CHILDREN WITH INTUSSUSCEPTION: REDUCING THE RISK OF RELAPSE

Azim Abriyevich Ulugmuratov^{1*}, Yusupov Shukhrat Abdurasulovich², Zufarov Aziz Alimdjanovich³, Furkat Abdukarimovich Otamuradov⁴

¹*Republican Scientific Center of Emergency Medical Care, Samarkand Branch, Head of the Department of*

²*Emergency Pediatric Surgery, Doctor of Philosophy (DSc), Head of the Department of Emergency Pediatric Surgery*

³*Samarkand State Medical University, Doctor of Medical Sciences, Professor, Head of the Department of Pediatric Surgery No.1, Samarkand State Medical University*

⁴*Tashkent State Medical University, Doctor of Medical Sciences, associate professor, Department of Propedeutics of Children's Diseases No. 2, Tashkent State Medical University*

⁵*Tashkent State Medical University, MD (DSc), Associate Professor, Department of General Surgery, Pediatric Surgery, Urology, and Pediatric Urology*

Received: 30/11/2025

Accepted: 10/04/2026

Corresponding Author: Azim Abriyevich Ulugmuratov
(ulugmuratovazim@gmail.com)

ABSTRACT

Intussusception is one of the most common causes of intestinal obstruction in infants and young children and represents a significant pediatric surgical emergency. Although advances in diagnostic imaging and treatment techniques have improved clinical outcomes, recurrence remains a major concern in pediatric patients. The present study aimed to examine the prevalence, predictive factors, treatment outcomes, and rehabilitation-based follow-up strategies associated with recurrent intussusception in children through a comprehensive review of existing literature. The study adopted a qualitative literature review methodology based on previously published research articles related to pediatric intussusception. Relevant studies were identified from electronic databases including PubMed, Scopus, Web of Science, Google Scholar, and African Journals Online. Only English-language studies focusing on pediatric populations were included, while case reports and studies with incomplete data were excluded. A total of 23 studies involving 26,731 intussusception cases were reviewed, among which 3,164 cases were reported as recurrent, representing an overall recurrence rate of approximately 11.8%. The findings indicate that non-operative reduction methods, particularly hydrostatic or pneumatic enema reduction, remain highly effective in treating both primary and recurrent intussusception, with success rates approaching 85% in recurrent cases. Surgical intervention was required in approximately 12.1% of recurrent cases, usually in situations where non-operative reduction failed or complications such as bowel perforation or intestinal necrosis occurred. The presence of pathological lead points was relatively uncommon, accounting for only about 3.95% of cases, suggesting that most recurrences occur without identifiable anatomical abnormalities. Early diagnosis using ultrasonography was found to be crucial in improving treatment outcomes and reducing complications. The literature also highlighted several predictive factors influencing recurrence and treatment success, including delayed presentation, duration of symptoms, and the presence of underlying pathological conditions. In addition, rehabilitation-based follow-up care,

caregiver education, and improved access to diagnostic facilities were identified as important strategies for preventing recurrence and ensuring better recovery in pediatric patients.

KEYWORDS: Intussusception, Recurrent Intussusception, Pediatric Intestinal Obstruction, Non-operative Reduction, Hydrostatic Enema Reduction, Pediatric Gastrointestinal Disorders, Rehabilitation and Follow-up Care, Children. Adhesive obstruction. Intussusception. Intestinal obstruction. Diagnosis. Surgical treatment. Prevention. Postoperative rehabilitation.

1 INTRODUCTION

The telescoping of one segment of the intestine into a neighboring distal segment causes intussusception, a serious gastrointestinal emergency in children. If ignored, it may cause bowel blockage, inadequate blood flow, and intestinal ischemia. It is a leading cause of acute stomach problems in children less than one year old, affecting babies and toddlers especially between the ages of six and thirty-six months. Prompt diagnosis and treatments are crucial in preventing serious sequelae such as intestine necrosis, perforation, and sepsis, which make up a significant fraction of pediatric hospital admissions due to intestinal blockage (Xie et al., 2018).

About 90% of instances of pediatric intussusception are idiopathic, meaning there is no known clinical cause, even if the exact cause is still unknown in most cases. In a minority of cases, structural abnormalities such as lymphomas, duplication cysts, intestinal polyps, or Meckel's diverticulum could serve as entry sites for the bowel to invaginate. Recurrence of episodes might be worsened by these pathological factors, making therapeutic care more challenging (Wang et al., 2021). Treatment options for intussusception have vastly improved because of developments in diagnostic imaging and therapeutic therapies. Pneumatic or hydrostatic enema guided by ultrasound or fluoroscopy is now the gold standard for non-operative reduction because of its low risk of complications and high success rate. The necessity for surgical intervention in simple instances has been significantly decreased, according to studies (Yu et al., 2022; Ondhia et al., 2024), which have documented reduction rates surpassing 80-90%.

A major clinical worry, even with these new treatments, is the possibility of recurrence. Recurrence happens in around 8-20% of pediatric patients after effective treatment, according to many studies. Even while some patients have recurrent episodes for years, most recurrences happen in the first few weeks or months after therapy. Age,

pathological lead points, fever, and specific clinical symptoms at first presentation are risk factors for recurrence (Hsu et al., 2010; Xie et al., 2018). Patients and caregivers alike endure substantial physical and mental tolls when intussusception returns, since the condition often calls for follow-up appointments at the hospital as well as further imaging studies and treatments. In addition, problems are more likely to occur with recurring episodes, and surgical therapy may be necessary if non-operative reductions fail many times. Research in pediatric healthcare is now increasingly focused on developing thorough post-treatment rehabilitation measures to minimize recurrence risk.

1.2 Background of the study

Pediatric gastroenterologists have good reason to be concerned about intussusception, as it is among the leading causes of intestinal blockage in babies and young children. When one section of the intestine invaginates into another, it causes a blockage of blood flow, bowel obstruction, and, if left untreated, progressive ischemia of the intestines. Researchers have shown that intussusception is most common in infants between the ages of 6 and 36 months, and that the worldwide frequency of the condition ranges from 1 to 4 occurrences per 1,000 live births. Intussusception is still a serious disorder that has to be diagnosed quickly and treated well because of its dangerous consequences and sudden start (Jiang et al., 2013; Tate et al., 2016).

Pediatric imaging and minimally invasive therapy methods have made great strides in the last few decades, greatly improving the clinical management of intussusception. The primary diagnosis approach is ultrasound because of its high sensitivity and specificity. The typical first-line therapy is a non-surgical reduction procedure, such as a pneumatic or hydrostatic enema guided by radiologic or ultrasonographic imaging. Surgical intervention is reduced and postoperative problems in pediatric

patients are minimized by these techniques, which have great success rates.

There have been significant improvements in acute therapy, but recurrence is still a major obstacle in clinical practice. According to research, a small percentage of patients experience recurrence of intussusception even after effective non-operative reduction. Uncertainty surrounds long-term patient outcomes due to the possibility of recurrences occurring hours, days, or even months after the original episode. Possible causes of recurrence include factors like delayed presentation, intestinal motility disturbances, lymphoid hyperplasia from viruses, and pathological lead points like polyps or Meckel's diverticulum (Gray et al., 2014; Xie et al., 2018). Healthcare systems see an increase in clinical burden due to intussusception recurrence, and families and caregivers experience severe psychological and emotional stress as a result. The child's physical development and quality of life might be negatively impacted by frequent hospital visits, diagnostic procedures, and therapeutic measures. In addition, problems such as perforation, peritonitis, and intestinal necrosis are more likely to occur with recurring episodes; these consequences often call for surgical intervention and extended hospital stays.

Rehabilitation tactics used after treatment have received very little attention, despite their potential to aid in recurrence prevention and good recovery, in comparison to diagnostic and therapeutic modalities, which have received substantial attention in the literature. Nutritional treatment, restoring intestinal motility, gradually reintroducing physical activity, and caregiver education on early warning signals of recurrence are often the focuses of rehabilitation programs in juvenile gastrointestinal illnesses. In order to stabilize gastrointestinal function and decrease the chance of recurring episodes, such planned therapies may be crucial. Successful relapse prevention also requires parental knowledge and prompt identification of signs such as intermittent stomach discomfort, vomiting, lethargy, and the distinctive "currant jelly" feces. Improving clinical outcomes and reducing complications in children recovering from intussusception may be achieved by educating caregivers on proper feeding methods, hydration management, and early physician consultation.

1.3 Purpose of the study

The main goal of this research is to find out if children with intussusception who participate in a structured rehabilitation program have a lower chance of

experiencing a recurrence after receiving successful medical or non-surgical therapy. Acute bouts of intussusception may be effectively treated with modern methods, especially non-operative reduction procedures like pneumatic or hydrostatic enema. However, recurrence is still a significant clinical issue in juvenile populations. Research shows that 8-20% of kids have episodes again after their first therapy, therefore there has to be better post-treatment care beyond only clinical intervention (Gray et al., 2014; Xie et al., 2018).

Incorporating nutritional management, monitoring of gastrointestinal function, progressive reintroduction of physical activity, and caregiver education into a holistic rehabilitation strategy is the goal of this research. The goal is to see whether this approach may enhance recovery and reduce the likelihood of recurrence. The purpose of this study is to evaluate the effects of organized post-treatment treatments on relapse symptom detection, intestinal motility, and general gastrointestinal health in children who have recently recovered from intussusception.

Furthermore, the research aims to highlight the significance of caregiver engagement and parental knowledge throughout the post-treatment period. Timely medical consultation may lessen the chance of serious problems associated with delayed treatment, therefore it's important to educate caregivers about early warning signals such as intermittent stomach discomfort, vomiting, tiredness, and changes in bowel habits. The study's overarching goal is to encourage healthcare professionals and families to work together in managing the recovery process of children by including caregiver education into the rehabilitation framework.

1.4 Problem Statement of the study

A major issue in pediatric health on a global scale, intussusception is a major cause of abrupt intestinal blockage in newborns and young children. The recurrence of intussusception continues to be a therapeutic problem, even though diagnostic imaging and therapy approaches have advanced, with ultrasound-guided pneumatic or hydrostatic enema reduction being especially widely used. Recurrence rates among pediatric patients after successful treatment range from roughly 8% to 20%, according to various studies (Gray et al., 2014; Xie et al., 2018), even though non-operative reduction approaches have shown excellent success rates in resolving the first episode. Children who have recurrent episodes put themselves and their

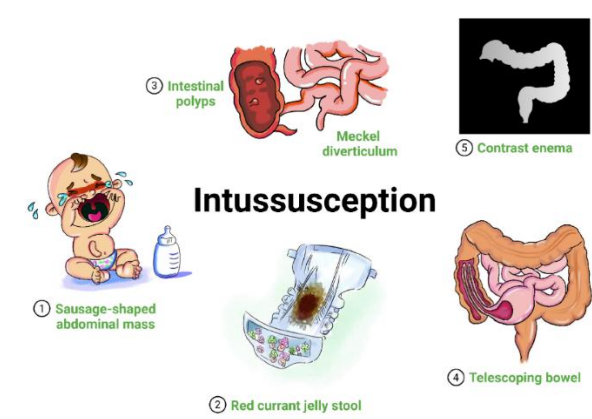
healthcare systems at risk via unnecessary hospitalizations, diagnostic tests, and even surgery. Ischemia of the colon, perforation, and peritonitis are serious medical consequences that may emerge from recurring intussusception if the condition is not treated quickly. The child's nutritional condition, development, and quality of life may all take a hit if this happens more than once, adding to the physical health hazards. When a child's recovery and relapse are up in the air, it may put a strain on the family's mental health. Acute therapy is important, but so is ensuring long-term healing and preventing recurrence; these issues underscore the need for integrated approaches.

Reducing the chance of recurrence after intussusception therapy has been the subject of little study, in contrast to the large body of literature devoted to increasing diagnostic accuracy and optimizing treatment approaches. Structured rehabilitation programs to restore intestinal function, improve gastrointestinal motility, and educate caregivers about early warning indications of recurrence are underemphasized in current therapeutic procedures, which mostly focus on urgent disease treatment. A crucial void in pediatric healthcare management is the lack of defined rehabilitation methods for children recovering from intussusception. Inadequate post-treatment monitoring and delayed detection of recurrence symptoms may also result from incomplete rehabilitation programs. Caregivers may increase the risk of problems by failing to detect early signs of recurrence without proper instructions on physical rehabilitation, symptom monitoring, and food management. Therefore, rehabilitation methods that are backed by research are desperately needed so that patients may have the best chance of a full recovery and have the least chance of experiencing intussusception again.

1.5 Clinical Outcomes of Rehabilitation-Based Follow-Up in Children Treated for Intussusception

A leading pediatric surgical emergency on a global scale, intussusception is a leading cause of intestinal blockage in newborns and young children. When one section of the intestines expands into another, it causes constriction, decreased blood flow, and, if left untreated, the risk of intestinal ischemia. Treatment results and the need for surgical intervention have been greatly enhanced by advances in diagnostic imaging and therapeutic approaches, including ultrasound-guided pneumatic or hydrostatic enema reduction (Marsicovetere et al., 2017). Recurrence is still a major problem in clinical practice, even with

recent advancements; this emphasizes the need for thorough follow-up and rehabilitation-based care after effective treatment. Following acute intussusception therapy, rehabilitation-based follow-up aims to restore gastrointestinal function, educate caregivers, monitor nutrition, and continuously assess clinical outcomes. The prevention or early identification of recurrence is a crucial therapeutic outcome linked to such follow-up procedures. Most recurrences happen in the first few days or weeks after treatment, and studies show that recurrent intussusception occurs in around 5- 20% of pediatric cases after effective non-operative reduction (Gray et al., 2014). Quick medical treatment and avoidance of serious consequences are made possible with early detection of recurrence signs through early follow-up evaluation.



Source: https://www.physio-pedia.com/Intestinal_Intussusception

The enhancement of recovery of gastrointestinal function is another significant clinical result of rehabilitation-based follow-up. Some children may have transient alterations in intestinal motility, eating intolerance, or stomach pain after intussusception has been successfully reduced. Beneficial bowel function restoration and reduction of secondary complication risk may be achieved with structured follow-up programs that include nutritional monitoring, progressive resumption of food, and medical surveillance (Marsicovetere et al., 2017). The digestive systems of newborns and toddlers are still maturing; therefore, these precautions are extra crucial for them. Recurrent intussusception risk factors may be better identified by follow-up programs. Xie et al. (2018) found that recurrence is more likely in patients who are older at presentation, have pathological lead points, enlarged mesenteric lymph nodes, and who get delayed therapy during the first episode. By doing follow-up examinations

on a regular basis, physicians may keep a closer eye on patients who are at high risk and take measures to prevent incidents from happening again.

Caregiver education is an essential part of rehabilitation-based follow-up. After a kid leaves the hospital, it is the responsibility of their parents or guardians to keep an eye on their health. By informing caregivers about symptoms including nausea, vomiting, fatigue, and the presence of blood in the stool, we may encourage prompt medical attention and lessen the impact of future occurrences. Better clinical outcomes and lower morbidity in pediatric intussusception cases are greatly contributed to by greater caregiver knowledge and rapid healthcare access (Tate et al., 2016). Children treated for intussusception often have multiple positive clinical outcomes when they participate in rehabilitation-based follow-up. Some of these benefits include better GI function recovery, earlier recurrence diagnosis, risk factor identification, and increased caregiver awareness. Therefore, in order to improve long-term results and reduce recurrence among children afflicted by intussusception, it is crucial to include systematic follow-up and rehabilitation procedures into normal pediatric treatment.

1.6 Predictive Factors and Rehabilitation Interventions for Preventing Recurrent Intussusception in Children

Intussusception is one of the most common causes of intestinal obstruction in infants and young children, and despite successful treatment using non-operative reduction methods such as pneumatic or hydrostatic enema, recurrence remains a significant clinical challenge. Studies have reported that recurrent intussusception occurs in approximately 8–19% of pediatric cases, making the identification of predictive factors and the implementation of preventive interventions essential components of pediatric care (Yang et al., 2023).

Predictive Factors for Recurrent Intussusception

Several clinical and demographic factors have been identified as predictors of recurrence in children who have undergone successful reduction of intussusception. Age is one of the most consistently reported predictors. Research indicates that children older than one year are more likely to experience recurrent episodes compared with infants younger than one year (Lee et al., 2019; Yang et al., 2023). Another important predictor is the presence of **pathological lead points**, including conditions such as Meckel's diverticulum, intestinal polyps,

duplication cysts, or tumors. These structural abnormalities can act as focal points that facilitate repeated bowel invagination, thereby increasing the likelihood of recurrence (Xie et al., 2018).

Clinical symptoms and laboratory indicators have also been associated with recurrence. Studies have identified factors such as **fever, absence of vomiting, abdominal mass location, and elevated inflammatory markers such as C-reactive protein (CRP) or increased white blood cell counts** as potential predictors of recurrent intussusception (Lee et al., 2019; Wang et al., 2017). Additionally, predictive models developed in recent studies have demonstrated that inflammatory parameters and symptom duration may help clinicians estimate the probability of relapse and identify high-risk pediatric patients (Zhang et al., 2024). Early recurrence has also been associated with specific clinical features such as vomiting, bloody stools, and elevated monocyte ratios, which may indicate inflammatory processes or altered intestinal motility contributing to repeated intussusception episodes (Li et al., 2023).

Rehabilitation Interventions for Preventing Recurrence

Beyond identifying predictive risk factors, rehabilitation interventions play a crucial role in preventing recurrence and promoting recovery in children treated for intussusception. Rehabilitation-based follow-up typically includes clinical monitoring, nutritional management, gastrointestinal motility support, and caregiver education. These interventions aim to restore normal intestinal function and ensure early detection of recurrent symptoms. Clinical monitoring and follow-up examinations are essential during the early recovery period. Children identified as high risk based on predictive factors require closer observation to detect early signs of recurrence and provide timely medical intervention (Yang et al., 2023). Regular follow-up also allows clinicians to monitor the resolution of gastrointestinal symptoms and assess the child's overall recovery.

Nutritional rehabilitation represents another key component of post-treatment care. Gradual reintroduction of feeding and maintenance of adequate hydration help restore intestinal motility and prevent complications related to gastrointestinal dysfunction. Proper dietary management also supports overall growth and recovery in pediatric patients following treatment for intussusception.

Caregiver education is equally important in preventing recurrent episodes. Parents and

caregivers should be informed about early warning signs such as intermittent abdominal pain, vomiting, lethargy, or bloody stools. Early recognition of these symptoms allows prompt medical evaluation and reduces the risk of severe complications associated with delayed treatment. In addition, advances in predictive modeling have facilitated the development of clinical tools that help identify children at higher risk of recurrence. Predictive models incorporating variables such as age, inflammatory markers, and symptom duration can guide clinicians in implementing targeted rehabilitation strategies and individualized follow-up protocols (Zhang et al., 2024).

2 LITERATURE REVIEW

The study's overarching goal is to identify the best course of treatment for children with RI by conducting a literature evaluation that assesses the prevalence of RI, the frequency of surgical intervention, and the pathological leading point (PLP). Excluding case reports, research concentrating on ileo-ileal or colo-colic intussusception, meta-analysis studies, and publications with unclear or altered data, we included English-written papers having a pediatric population. With 26,731 intussusception patients and 3,164 recurrent cases (11.8%), a total of 23 papers were considered. There was a median of 5 tries for nonsurgical reduction, with a range of 3 to 10. Surgery was performed on 358 patients (12.1%) on 2965 RI. Only 99 patients, or 3.95 percent, had a pathologic leading point. There seems to be no correlation between intussusception recurrence and the existence of a PLP. Nonsurgical treatment was effective for almost 85% of RI. Procedures for RI should be identical to those for primary intussusception in order to ensure patient safety; surgical intervention should only be considered in instances when a PLP is suspected. Parents should be informed about the prospect of surgery as a means to prevent recurrences in circumstances where there have been several occurrences (Arena, 2025)

The purpose of this retrospective research is to help doctors better diagnose and treat acute intussusception in children and adolescents so that it doesn't have a bad impact on recovery. Clinical data from 38 children identified with intussusception at Wuhan Children's Hospital during January 2013 and July 2024, who were all less than or equal to three months, were reviewed retrospectively. The success or failure of nonoperative reduction was used to divide patients into two groups. In order to detect trends and assess the efficacy of diagnostic and

therapeutic methods, the research looked at demographic information, clinical manifestations, imaging results, treatment modalities, and outcomes. There were 12,206 cases of intussusception in the children included among the research. Of them, 38 (0.31%) were newborns (mean age: 73.6 days; 20 males as well as 18 females). Among the most common symptoms, 36 instances included vomiting, 27 cases involved bloody feces, and 18 cases involved intermittent sobbing. In 97.4 percent of instances, the diagnosis was validated by ultrasonography (USG). The effectiveness rate of the enema reduction treatment was 48.1% (13/27) in 27 babies (71.1%). In two instances (7.4%), perforation was caused by an enema. Secondary intussusception was identified in 5 instances (15.8%), and 11 patients (28.9%) went straight to laparotomy. Six out of the twenty-five surgical patients required bowel resection as a result of necrosis. All of the babies were able to recover enough to be released from the hospital. Intussusception may present with unusual symptoms in babies younger than three months. A precise diagnosis may be achieved with early USG, and the results of this intervention are good. To prevent intestinal perforation, it is recommended to try enema reduction in newborns in excellent general health initially, while appropriately monitoring their pressure (Guo, 2025)

The purpose of this retrospective research is to help doctors better diagnose and treat acute intussusception in children and adolescents so that it doesn't have a bad impact on recovery. Clinical data from 38 children identified with intussusception at Wuhan Children's Hospital during January 2013 and July 2024, who were all less than or equal to three months, were reviewed retrospectively. There were 12,206 cases of intussusception in the children included among the research. Of them, 38 (0.31%) were newborns (mean age: 73.6 days; 20 males as well as 18 females). Among the most common symptoms, 36 instances included vomiting, 27 cases involved bloody feces, and 18 cases involved intermittent sobbing. In 97.4 percent of instances, the diagnosis was validated by ultrasonography (USG). The effectiveness rate of the enema reduction treatment was 48.1% (13/27) in 27 babies (71.1%). In two instances (7.4%), perforation was caused by an enema. Secondary intussusception was identified in 5 instances (15.8%), and 11 patients (28.9%) went straight to laparotomy. Six out of the twenty-five surgical patients required bowel resection as a result of necrosis. All of the babies were able to recover enough to be released from the hospital. Intussusception may present with unusual

symptoms in babies younger than three months. A precise diagnosis may be achieved with early USG, and the results of this intervention are good. To prevent intestinal perforation, it is recommended to try enema reduction in newborns in excellent general health initially, while appropriately monitoring their pressure (**Shikha, 2025**)

The current data from the area was methodically collected and examined by our study to provide a more precise evaluation. We combed through African Journals Online, Scopus, PubMed, and Google Scholar for papers that reported results of non-operative reduction in infants with intussusception in Sub-Saharan Africa. Our search spanned from inception (the earliest date covered by each database) to March 2025. The majority of the included research centered on non-operative reduction methods with well-defined results. Two reviewers worked separately to extract data, and the Newcastle-Ottawa Scale was used to quantify the quality of the studies. Results for treatment outcomes and sex distribution were meta-analyzed using random-effects models; narrative synthesis was used for complications, recurrence, and mortality. Using the GRADE system, the certainty of the evidence was assessed. The inclusion criteria were satisfied by nine studies, which included a total of 536 participants. The percentage of males was 67% (95% CI: 60-74%), and the average age was between 2.8 and 21 months. Overwhelmingly, non-operative reduction was successful in 78% of cases (95%CI 71-86%; I²=78.6%), with a failure incidence of 22%. The success rates for research published after 2022 were greater ($\geq 81.6\%$) than in previous publications ($\leq 73.1\%$). There was one death attributed to the surgery, and the combined perforation rate was 3% (95%CI 0-6%). In 7% of individuals (95%CI 3-12%), recurrence was seen. The failure rate was consistently higher in cases when there was a delay in presentation, pathological lead points, or no Doppler flow. Sex prevalence had moderate certainty of evidence, success/failure had low certainty of evidence, and complications, recurrence, and death had low to very low certainty of evidence. Results have been steadily increasing, especially when using ultrasound guidance, for non-operative reduction of pediatric intussusception within Sub-Saharan Africa. The procedure is both safe and successful. A postponed presentation is still the biggest obstacle to success. Improving results and evidence quality in the area requires expanding access to imaging, enhancing referral mechanisms, and standardizing reporting (**Molla, 2025**)

In hospitals in Sub-Saharan Africa, where surgery is

still the only treatment option, knowing the treatment result and related variables can help bring this procedure more widely used. Tibebe Ghion Specialized Hospital in Bahir Dar, Ethiopia, was the site of an institutional cross-sectional research. We recruited children with US-confirmed intussusception in a sequential fashion. After determining that there were no contraindications, a general radiologist or a resident in their last year of medical school conducted US-guided hydrostatic reduction with normal saline under close observation. In order to find the elements that were predictive of successful results, we used Firth's logistic regression analysis to get the odds ratios (ORs) and 95% confidence intervals (CIs). In all, 145 kids, with an average age of 24 months, took part in the research. Colicky abdominal discomfort was the primary complaint in 79 patients (54.5%), and the majority of patients (123, or 84.8%), arrived within 24 hours after the beginning of symptoms. Of the intussusceptions seen on US, 135 (93.1%) were of the ileocolic type, whereas 118 (81.4%) were of the short-length kind. The total rate of decrease was 93.1% (95% CI [89.0-97.2]). Ten patients, or 6.9% of the total, had successful surgeries after unsuccessful hydrostatic reduction attempts. Results from hydrostatic reduction were more likely to be effective if the patient had a reported sickness duration of less than 24 hours, an adjusted odds ratio (AOR) of 6.77 (95% CI [1.25-30.42]), and an intussusception length of less than 3 cm (AOR, 6.24; 95% CI [1.18-33.00]) (**Ayana, 2025**)

This research aims to assess the prevalence, symptoms, causes, surgical treatment, and results of intussusception in Ethiopian children. The PRISMA standards were followed in conducting the systematic review. Google Scholar, Scopus, Web of Science, and PubMed were used to retrieve relevant studies. Clinical presentation, diagnostic, and patient demographic data were gathered. approaches, surgical operations, risks, and outcomes. The Newcastle-Ottawa Scale was used for quality evaluation. We used I² statistics to measure heterogeneity in our random-effects model meta-analysis. Using Egger's test, we looked for evidence of publication bias. A total of seven trials including 672 people were considered. Males made up 66% of the afflicted population, and the average age of the children was 12 months (95% CI: 11.35, 12.67). A mean of 3.1 days elapsed after symptoms first appeared, indicating that delayed presentation was prevalent. There was a palpable lump, abdominal discomfort, and blood in the stool in 52% of patients (I² = 96.24%). The majority of doctors used

ultrasound as a diagnostic technique (74%). Manual reduction was the most common surgical technique (62% of cases), followed by stoma formation (35% of cases), and bowel resection with anastomosis (35% of cases). The most prevalent complication was an infection at the surgery site, which accounted for 15% of the total 26%. Compare that to high-income nations, where the pooled mortality rate is 5% to 13%. This is a substantial increase. There may have been publication bias, according to Egger's test ($p = 0.03$) (Molla, 2025)

Intussusception is a prevalent medical condition that mostly impacts children of all ages. There are a number of potential explanations, but for most people, the exact reason remains a mystery. Whether preexisting or the result of inflammatory processes, the majority of pathological defects primarily entail aberrant anatomy. One major factor in intussusception development is viral infections. There is some age and severity-related variation in the clinical presentation, but the classic trio of pain, a palpable sausage-shaped mass in the abdomen, and currant-jelly stool is always present. On rare occasions, the symptoms may not manifest at all, or the presentation may be entirely abnormal, resembling other diseases. Making a diagnosis is not always an easy task. Because symptoms might vary widely, doctors must maintain a high degree of suspicion. The non-invasive alternative to surgical procedures for intussusception is a procedure known as an enema. Depending on the kind of propulsion, we provide a range of options, from barium to basic saline solutions. Peritonitis and perforation are problems that may arise after an enema and need surgical intervention. A small incision is made in the belly button to access the intussusception location; the intestine is then delicately entangled, and the whole surgical procedure is performed inside the abdominal cavity. The dangers of infection, problems, and traumas that might result from open surgery are lessened with laparoscopy (Santamaria, 2025)

3 METHODOLOGY

Research Design

The present study adopted a qualitative literature-based research design to explore the predictive factors and rehabilitation interventions associated with the prevention of recurrent intussusception in children. Rather than conducting primary data collection or statistical analysis, the study relied on the systematic examination and interpretation of previously published research. The qualitative approach enabled the researcher to synthesize existing knowledge and provide a comprehensive

understanding of clinical outcomes, treatment strategies, and preventive measures related to pediatric intussusception. By reviewing multiple scholarly articles and clinical studies, the research aimed to identify common themes, treatment patterns, and recommendations that could guide clinical practice and improve patient outcomes.

Data Sources

The data for this study were obtained exclusively from secondary sources, particularly peer-reviewed journal articles and published clinical studies related to pediatric intussusception. Relevant literature was identified through electronic databases including PubMed, Scopus, Web of Science, Google Scholar, and African Journals Online. These databases were selected because they provide access to a wide range of high-quality medical and pediatric research publications. The search process focused on studies that addressed topics such as recurrent intussusception, treatment outcomes, non-operative reduction methods, surgical interventions, and predictive risk factors associated with recurrence in children. Only articles written in English and involving pediatric populations were considered for inclusion in the review.

Search Strategy

A structured search strategy was used to identify relevant literature. Keywords and combinations of keywords were used to retrieve appropriate studies from the selected databases. The main search terms included:

- Pediatric intussusception
- Recurrent intussusception
- Non-operative reduction
- Hydrostatic reduction
- Pneumatic reduction
- Pathological lead point
- Pediatric intestinal obstruction
- Rehabilitation and follow-up care

Boolean operators such as AND and OR were used to refine the search and improve the accuracy of the results. For example, search combinations such as "*pediatric intussusception AND recurrence*" and "*intussusception AND non-operative reduction AND outcomes*" were used to identify relevant studies.

Inclusion and Exclusion Criteria

To ensure the relevance and quality of the reviewed literature, specific inclusion and exclusion criteria were applied during the selection process.

Inclusion Criteria

- Studies focusing on pediatric patients diagnosed with intussusception.
- Articles written in English.
- Research articles reporting clinical outcomes, treatment methods, or recurrence factors.
- Studies discussing non-operative reduction, surgical intervention, or rehabilitation approaches.
- Peer-reviewed articles published in recognized academic journals.

Exclusion Criteria

- Case reports or single-patient studies.
- Studies focusing exclusively on adult intussusception.
- Articles dealing specifically with ileo-ileal or colocolic intussusception only.
- Meta-analyses or review articles with insufficient primary data.
- Studies with incomplete, unclear, or altered datasets.

After applying these criteria, a total of 23 relevant studies were selected for the literature review.

Data Extraction

After identifying eligible studies, relevant information was extracted from each article to facilitate comparison and thematic analysis. The extracted data included:

- Author(s) and year of publication
- Study design and sample size
- Demographic characteristics of participants
- Clinical symptoms and diagnostic methods
- Treatment modalities (non-operative or surgical)
- Recurrence rates and associated risk factors
- Reported clinical outcomes and complications

The collected information was carefully reviewed and organized to identify recurring patterns and key findings related to the management and prevention of recurrent intussusception in children.

Data Analysis Approach

Since the present study followed a qualitative literature review approach, no statistical or quantitative analysis was performed. Instead, the selected studies were examined through descriptive and thematic analysis. The analysis focused on identifying common findings across different studies regarding the prevalence of recurrent intussusception, the effectiveness of non-operative reduction techniques, the role of pathological lead points, and the factors influencing treatment outcomes. The findings from the selected literature were then synthesized to provide a general

understanding of current clinical practices and preventive strategies for managing recurrent intussusception in pediatric patients.

4 DISCUSSION

The present study aimed to provide a comprehensive understanding of recurrent intussusception in children by examining previously published literature on its prevalence, predictive factors, treatment outcomes, and the role of rehabilitation-based follow-up. The findings derived from the reviewed studies highlight important patterns in the occurrence of recurrent intussusception, the effectiveness of non-operative reduction methods, and the factors influencing clinical outcomes. The discussion below interprets these findings and places them within the broader context of pediatric gastrointestinal care.

Prevalence and Recurrence of Intussusception

One of the major findings emerging from the reviewed literature is the notable recurrence rate of intussusception in pediatric populations. The study by Arena (2025) reported that out of 26,731 intussusception cases analyzed across 23 studies, 3,164 cases were recurrent, representing a recurrence rate of approximately 11.8%. This indicates that although the majority of children recover successfully after initial treatment, a considerable proportion remains susceptible to repeated episodes. Similar patterns were also reported in regional studies and systematic reviews, suggesting that recurrence is a persistent clinical concern that requires careful monitoring and appropriate management strategies. The recurrence rate observed in the literature may be influenced by several factors, including the method of treatment, the presence of underlying pathological conditions, and the timing of medical intervention. The findings demonstrate that recurrence can occur even after successful non-operative reduction, emphasizing the need for continuous follow-up and preventive strategies. Understanding the prevalence of recurrence is therefore essential for clinicians when planning long-term management and educating caregivers about potential risks.

Effectiveness of Non-Operative Reduction Techniques

Another important aspect identified in the literature is the high success rate of non-operative reduction methods in treating intussusception. Non-surgical procedures such as hydrostatic or pneumatic enema reduction are widely considered the first-line

treatment due to their minimally invasive nature and favorable outcomes. The findings from Arena (2025) indicate that nearly 85% of recurrent intussusception cases were successfully managed using non-operative methods. This highlights the effectiveness and safety of these procedures in both primary and recurrent episodes.

Supporting evidence from studies conducted in Sub-Saharan Africa also demonstrates promising outcomes with non-operative reduction techniques. Molla (2025) reported that non-operative reduction achieved a success rate of approximately 78% among pediatric patients, with improved outcomes in more recent studies that utilized ultrasound guidance. These findings emphasize the importance of diagnostic imaging and appropriate procedural techniques in increasing treatment success rates. However, the effectiveness of non-operative reduction may vary depending on several clinical factors, including the duration of symptoms, the anatomical characteristics of the intussusception, and the overall health condition of the child. Delayed presentation to healthcare facilities has been identified as a significant barrier to successful reduction, particularly in low-resource settings where access to medical care may be limited.

Role of Surgical Intervention in Recurrent Cases

Although non-operative reduction remains the preferred treatment approach, surgical intervention is sometimes necessary when non-operative methods fail or when complications such as bowel perforation, necrosis, or pathological lead points are suspected. The reviewed literature indicates that surgical treatment is required in a relatively small proportion of cases. Arena (2025) reported that surgery was performed in 358 out of 2,965 recurrent intussusception cases, representing approximately 12.1% of the total.

Clinical evidence also shows that surgical procedures may involve manual reduction, bowel resection, or stoma formation depending on the severity of the condition. In cases where intestinal necrosis occurs, resection of the affected bowel segment may be required to prevent further complications. Although surgical management can be lifesaving in critical situations, it is generally associated with higher risks, including postoperative infections and prolonged hospitalization. These findings reinforce the importance of early diagnosis and prompt treatment in order to minimize the need for surgical intervention. When intussusception is identified and treated early, non-operative reduction is more likely to be successful, thereby reducing the risk of

complications.

Predictive Factors Influencing Treatment Outcomes

The literature reviewed in this study also highlights several predictive factors that influence treatment outcomes and the likelihood of recurrence. One important factor is the duration of symptoms prior to medical intervention. According to Ayana (2025), children who received treatment within 24 hours of symptom onset had a significantly higher probability of successful reduction compared with those who experienced delayed presentation.

Another factor influencing recurrence is the presence of pathological lead points. These structural abnormalities within the intestine, such as Meckel's diverticulum or intestinal polyps, can predispose children to repeated episodes of intussusception. However, the literature suggests that pathological lead points are relatively uncommon. Arena (2025) found that only 3.95% of patients with recurrent intussusception had a confirmed pathological lead point, indicating that most recurrent cases are idiopathic in nature. Clinical symptoms and diagnostic findings may also help predict treatment outcomes. Studies have shown that symptoms such as vomiting, bloody stools, and abdominal pain are common indicators of intussusception, although their presentation may vary depending on the age of the child. In infants younger than three months, atypical symptoms may occur, making early diagnosis more challenging. The use of ultrasonography has therefore become an essential diagnostic tool for accurately identifying intussusception and guiding treatment decisions.

Importance of Early Diagnosis and Imaging

Early and accurate diagnosis plays a crucial role in improving treatment outcomes for children with intussusception. Ultrasonography has emerged as the most reliable diagnostic technique due to its high sensitivity and non-invasive nature. The study conducted by Guo (2025) demonstrated that ultrasonography confirmed the diagnosis in 97.4% of cases involving infants younger than three months. The widespread use of imaging technologies has significantly improved the ability of clinicians to detect intussusception at an early stage and to perform reduction procedures safely. Ultrasound-guided hydrostatic reduction, in particular, has been shown to increase success rates and reduce complications associated with traditional diagnostic methods. In addition to diagnosis, imaging techniques also play a role in monitoring the progress

of treatment and identifying potential complications. The availability of advanced diagnostic tools therefore contributes significantly to improved clinical outcomes in pediatric patients.

Role of Rehabilitation and Follow-Up Care

The literature reviewed in this study also highlights the importance of rehabilitation-based follow-up in preventing recurrence and ensuring complete recovery. After successful reduction of intussusception, children may experience temporary disturbances in gastrointestinal function, which can affect feeding patterns and overall well-being. Structured follow-up programs help clinicians monitor recovery, detect early signs of recurrence, and provide guidance to caregivers.

Rehabilitation strategies may include nutritional management, gradual reintroduction of feeding, and education for parents regarding the early symptoms of recurrence. By improving caregiver awareness and promoting timely medical consultation, these interventions can significantly reduce the risk of complications associated with recurrent intussusception. Furthermore, regular follow-up appointments allow healthcare professionals to evaluate treatment outcomes and adjust management strategies when necessary. In this way, rehabilitation and monitoring play a crucial role in ensuring long-term health and reducing the likelihood of repeated episodes.

5 CONCLUSION

The present study aimed to provide a comprehensive understanding of recurrent intussusception in children by reviewing existing literature on its prevalence, predictive factors, treatment approaches, and the importance of rehabilitation-based follow-up care. Based on the analysis of the selected studies, it can be concluded that intussusception remains one of the most significant gastrointestinal emergencies affecting infants and young children. Although modern diagnostic techniques and treatment strategies have improved clinical outcomes, recurrence continues to be a notable concern in pediatric healthcare.

The findings of the reviewed literature indicate that recurrent intussusception occurs in a considerable proportion of cases, highlighting the need for effective management strategies and careful post-treatment monitoring. Non-operative reduction methods, such as hydrostatic or pneumatic enema reduction, were found to be highly effective in managing both primary and recurrent episodes of intussusception. These minimally invasive

procedures demonstrate high success rates and are widely regarded as the first-line treatment for most pediatric patients. Surgical intervention, although sometimes necessary in complicated cases, is generally reserved for situations where non-operative reduction fails or when complications such as intestinal perforation, necrosis, or pathological lead points are suspected.

Another important conclusion of the study is that early diagnosis plays a crucial role in improving treatment outcomes. Ultrasonography has proven to be a highly reliable diagnostic tool for detecting intussusception and guiding treatment decisions. Prompt medical intervention significantly increases the likelihood of successful reduction and reduces the risk of complications that may require surgical management.

The literature also highlights several predictive factors that may influence recurrence and treatment outcomes. Factors such as delayed presentation to healthcare facilities, the presence of pathological lead points, and variations in clinical presentation can affect the success of treatment and the likelihood of recurrent episodes. However, the overall evidence suggests that pathological lead points are relatively uncommon and are not always associated with recurrence.

In addition to clinical management, the study emphasizes the importance of rehabilitation-based follow-up and caregiver awareness in preventing recurrence and promoting recovery. Structured follow-up care allows healthcare professionals to monitor the child's progress, detect early signs of relapse, and provide guidance to caregivers regarding appropriate care and symptom recognition. Educating parents about warning signs such as abdominal pain, vomiting, or bloody stools can facilitate early medical consultation and reduce the severity of recurrent episodes.

Overall, the study concludes that effective management of intussusception requires a combination of early diagnosis, appropriate treatment strategies, and structured follow-up care. Strengthening healthcare systems, improving access to diagnostic imaging, and promoting caregiver education are essential steps in reducing recurrence rates and improving long-term outcomes for children affected by this condition. Through continued research and improved clinical practices, the management of pediatric intussusception can be further enhanced, ensuring better health outcomes and quality of life for affected children.

5.1 RECOMMENDATIONS

Early Diagnosis and Prompt Medical Intervention:

Early diagnosis of intussusception is essential for improving treatment success and preventing severe complications. Healthcare professionals should maintain a high level of clinical suspicion when evaluating children who present with symptoms such as abdominal pain, vomiting, bloody stools, or unexplained crying. Prompt use of diagnostic imaging, particularly ultrasonography, should be encouraged as it provides a rapid and reliable method for confirming the condition.

Promotion of Non-Operative Reduction as the First-Line Treatment:

Non-operative reduction methods, including pneumatic or hydrostatic enema reduction under imaging guidance, should continue to be promoted as the primary treatment option for pediatric intussusception. These procedures have demonstrated high success rates and lower complication risks compared with surgical approaches. Healthcare facilities should ensure that trained personnel and appropriate equipment are available to perform these procedures safely and effectively.

Strengthening Rehabilitation and Follow-Up Programs:

Structured follow-up care should be incorporated into routine management protocols for children treated for intussusception. Rehabilitation-

based follow-up programs can help monitor recovery, detect early signs of recurrence, and ensure proper gastrointestinal function. Regular follow-up visits and clinical evaluations are important in identifying potential complications and preventing repeated episodes of intussusception.

Enhancing Caregiver Education and Awareness:

Educating parents and caregivers about the symptoms and potential recurrence of intussusception is essential for early recognition and timely medical intervention. Caregivers should be informed about warning signs such as intermittent abdominal pain, vomiting, lethargy, or the presence of blood in the stool. Increased awareness among caregivers can lead to earlier medical consultation, thereby reducing the risk of complications associated with delayed treatment.

Improving Access to Diagnostic and Treatment Facilities:

Healthcare systems should focus on improving access to diagnostic imaging and specialized pediatric care, particularly in regions where delayed presentation is common. Expanding the availability of ultrasonography and training healthcare professionals in non-operative reduction techniques can significantly improve treatment outcomes and reduce mortality associated with intussusception.

REFERENCES

- Arena, S., Cassaro, F., Maisano, G., Impellizzeri, P., & Romeo, C. (2025). Recurrent ileocolic intussusception in children: a scoping review. *International journal of pediatrics*, 2025(1), 8860000.
- Atakulov J.O., Oripov F.S., Jovliey B.B., Saidov M.S. The incidence of malformations of the small intestine in regions with varying degrees of use of chemical protective agents and their surgical treatment *Journal of critical reviews* ISSN- 0975-2366 VOL 12, ISSUE 11,2020, p. 2841-2844
- Ayana, C. T., Feleke, T., Bazezew, A., Mehari, Z., Yaynishet, Y. A., Getinet, T., ... & Hailu, S. S. (2025). Treatment outcome of ultrasound-guided hydrostatic reduction of intussusception and its associated factors among pediatric patients in a resource-limited setting. *Pediatric Radiology*, 55(9), 1829-1837.
- Gray, M. P., Li, S. H., Hoffmann, R. G., & Gorelick, M. H. (2014). Recurrence rates after intussusception enema reduction: A meta-analysis. *Pediatrics*, 134(1), 110-119. <https://doi.org/10.1542/peds.2013-3102>
- Guo, H., Lei, H., Luo, J., Yang, J., Bian, H., Yang, H., & Guo, Q. (2025). Clinical manifestation and treatment of intussusception in children aged 3 months and under: a single centre analysis of 38 cases. *BMC pediatrics*, 25(1), 233.
- Jamshed Ostonokulovich Atakulov, & Maftuna Foziljon-Zoda (2023). Optimization of treatment of congenital lymphangiomas. *Science and Education*, 4 (4), 353-361.
- Jiang, J., Jiang, B., Parashar, U., Nguyen, T., Bines, J., & Patel, M. M. (2013). Childhood intussusception: A literature review. *PLOS ONE*, 8(7), e68482.
- Lee, D. H., Kim, S. J., Lee, H. J., & Jang, H. J. (2019). Identifying predictive factors for the recurrence of pediatric intussusception. *Pediatric Gastroenterology, Hepatology & Nutrition*, 22(2), 142-151. <https://doi.org/10.5223/pghn.2019.22.2.142>
- Li, J., et al. (2023). Risk factors and predictive models for early recurrent intussusception in children: A retrospective cohort study. *Translational Pediatrics*. <https://pubmed.ncbi.nlm.nih.gov/37969126/>
- Marsicovetere, P., Ivatury, S. J., White, B., & Holubar, S. D. (2017). Intestinal intussusception: Etiology, diagnosis, and treatment. *Clinics in Colon and Rectal Surgery*, 30(1), 30-39. <https://doi.org/10.1055/s-0036-1593429>

- Molla, Y. D., Mekonnen, D. C., & Alemu, H. T. (2025). Prevalence and surgical outcomes of pediatric intussusception in ethiopia: a systematic review and meta-analysis. *BMC surgery*, 25(1), 322.
- Molla, Y. D., Setargew, K. H., & Alemu, H. T. (2025). Efficacy and safety of nonoperative management for pediatric intussusception in Sub-Saharan Africa: a systematic review and meta-analysis. *Pediatric Radiology*, 1-11.
- Ondhia, M. N., et al. (2024). Efficacy and safety of nonoperative management for pediatric intussusception: A systematic review and meta-analysis. *Pediatric Surgery International*.
- Santamaria, A. (2025). *Intussusception in children: graduation/master's thesis* (Doctoral dissertation, Sveučilište u Rijeci, Sveučilište u Rijeci, Medicinski fakultet).
- Shamsiev A. M., Shamsiev J. A., Atakulov D. O., Togaev I. U., Makhmudov Z. M. TREATMENT OF POST-BURN Cicatricial Contractures of the Fingers in Children // Russian Bulletin of Pediatric Surgery, Anesthesiology and Resuscitation. 2020
- Shamsiev J. A., Atakulov D.O., Babayarov K.R., Tagaev I.U., and Saifutdinov S.Kh. "LAPAROSCOPIC VIDEO-ASSISTED ANORECTOPLASTY IN CHILDREN" Health of Tajikistan, no. S3, 2024, pp. 188-188.
- Shikha, A., Ahmed, M., Zaghloul, Z., Eltaeb, K., & Wong, J. (2025). Protocolized management of intussusception in children: optimizing pneumatic reduction outcomes. *Pediatric Surgery International*, 41(1), 231.
- Tate, J. E., Burton, A. H., Boschi-Pinto, C., Steele, A. D., Duque, J., & Parashar, U. D. (2016). Global, regional, and national estimates of intussusception incidence among children younger than 1 year. *Vaccine*, 34(48), 5938-5944. <https://doi.org/10.1016/j.vaccine.2016.09.037>
- Wang, A., et al. (2021). Clinical characteristics of recurrent intussusception: A single-center retrospective study. *Journal of Pediatric Surgery*, 56(10), 1831-1834. <https://doi.org/10.1016/j.jpedsurg.2021.03.051>
- Wang, X., et al. (2017). Risk factors for recurrent intussusception in children: A retrospective cohort study. *BMJ Open*. <https://pubmed.ncbi.nlm.nih.gov/29150477/>
- Xie, X., Wu, Y., Wang, Q., Zhao, Y., & Xiang, B. (2018). Risk factors for recurrent intussusception in children: A systematic review and meta-analysis. *Pediatric Surgery International*, 34(12), 1225-1233. <https://pubmed.ncbi.nlm.nih.gov/31041300/>
- Xie, X., Wu, Y., Wang, Q., Zhao, Y., & Xiang, B. (2018). Risk factors for recurrence of intussusception in pediatric patients: A systematic review and meta-analysis. *Pediatric Surgery International*, 34(12), 1225-1233. <https://doi.org/10.1007/s00383-018-4353-9>
- Yang, J., et al. (2023). Factors associated with in-hospital recurrence of intestinal intussusception in children. *BMC Pediatrics*, 23, 456. <https://doi.org/10.1186/s12887-023-04267-9>
- Yu, F., Chen, H., Cao, X., Mao, W., Jiang, S., Yao, Z., & Zhang, M. (2022). A technique to reduce the early recurrence of intussusception in ultrasound-guided hydrostatic reduction. *Journal of Ultrasound in Medicine*.
- Zhang, Y., et al. (2024). Developing a nomogram to predict recurrent intussusception after pneumatic reduction of primary intussusception in children. *BMC Surgery*. <https://doi.org/10.1186/s12893-024-02578-x>