

Colostomy-related morbidity in children following stoma formation and closure Systemic Review

Abstract:

Colostomy formation is a common paediatric surgical procedure performed for conditions such as anorectal malformations, Hirschsprung's disease, and inflammatory bowel disease. Although it is often life-saving, colostomy is associated with several complications, including bleeding, stenosis, retraction, necrosis, infections, stoma prolapse, skin irritation, and colostomy diarrhea. Additionally, stoma closure carries risks such as anastomotic leaks, bowel obstruction, and postoperative adhesions, which can lead to prolonged hospitalization. Understanding the morbidity related to colostomy formation and closure is crucial for improving patient care, minimizing complications, and enhancing recovery.

This systematic review aims to analyze the incidence of colostomy-related morbidity in children, identify associated risk factors, and evaluate its impact on the quality of life of children and their families globally. By reviewing recent studies and clinical data, this research will provide a comprehensive overview of the challenges faced in pediatric colostomy care and potential strategies for risk reduction.

Expected outcomes include determining the incidence and risk factors of colostomy-related morbidity, contributing to improved clinical decision-making and patient outcomes. Furthermore, assessing the impact on quality of life will aid in optimizing postoperative care and family support. This review seeks to provide insights that will enhance surgical management, inform future guidelines, and improve long-term care for pediatric patients undergoing colostomy.

Keywords: Colostomy morbidity - Pediatric surgery- Stoma complications-
Postoperative care - Quality of life

Introduction

Colostomy is a surgical procedure that diverts the fecal stream from the colon to the abdominal wall, allowing waste to exit the body through a surgically created opening known as a stoma. This procedure is commonly performed in pediatric patients with congenital or acquired conditions such as anorectal malformations, Hirschsprung's disease, necrotizing enterocolitis, and inflammatory bowel disease. The colostomy serves as a temporary or permanent solution, enabling normal digestion, growth, and waste elimination while minimizing the risk of life-threatening infections and bowel obstruction.

A colostomy is performed by attaching a portion of the colon to the stoma, allowing stool to pass into an external collection bag. Typically, colostomies are classified into three main types: Loop Colostomy A temporary, large stoma created in emergencies, often held in place with an external support device, can be transverse loop colostomy or sigmoid loop colostomy, end Colostomy: Formed by bringing one end of the bowel to the

surface, while the remaining bowel may be sutured shut or removed (e.g., Hartmann's procedure), double-barrel Colostomy: The bowel is divided, and both ends are brought to the abdominal surface, allowing separate passage of stool and mucus and divided colostomy.

The decision to perform a colostomy is influenced by several factors, including the severity of the underlying condition, the patient's overall health, and the risk of complications. While colostomy is often necessary and lifesaving, especially in premature or critically ill infants, it is not without challenges. The procedure is associated with several complications, including bleeding, stenosis, prolapse, retraction, necrosis, and skin irritation. Additionally, patients with ileostomies are at an increased risk of fluid and electrolyte imbalances due to high-output stomas [8].

Colostomy closure, typically performed 2–3 months after the initial surgery, is aimed at restoring normal bowel continuity. However, this secondary procedure also carries risks such as bowel obstruction, anastomotic leaks, wound infection, and prolonged hospital stays [9]. Despite advances in surgical techniques and perioperative management, morbidity rates remain significant, highlighting the need for further research to understand the factors contributing to adverse outcomes [10].

Several studies have reported varying rates of colostomy-related complications, with some identifying specific risk factors such as prematurity, low birth weight, and underlying gastrointestinal pathology [11]. The impact of colostomy on the quality of life of affected children and their families is another important consideration, as prolonged hospitalizations, frequent medical interventions, and the psychological burden associated with living with a stoma can affect both physical and emotional well-being [12].

Given these challenges, it is essential to assess colostomy-related morbidity systematically. This study aims to investigate the incidence of colostomy-related morbidity in children following stoma formation and closure, identify associated risk factors, and evaluate its impact on quality of life [13]. By analyzing recent clinical data and reviewing the latest literature, this research seeks to provide evidence-based recommendations to improve surgical decision-making, reduce complications, and enhance long-term care for pediatric patients undergoing colostomy [14].

The findings of this study will be crucial in guiding clinical practice, helping pediatric surgeons and healthcare providers make informed decisions about colostomy management [15]. Understanding morbidity patterns will allow for better preoperative planning, improved postoperative care, and the development of targeted interventions to minimize complications [16]. Additionally, assessing the psychosocial impact on children and their families will provide valuable insights into the need for comprehensive support systems, including counseling and patient education [17].

Through this research, we aim to bridge existing knowledge gaps, refine surgical techniques, and ultimately improve the overall outcomes for children requiring colostomy. The results will contribute to developing standardized protocols for

colostomy formation, care, and closure, ensuring that patients receive optimal treatment tailored to their individual needs [19].

Objectives of the Study

General:

- To assess the incidence and risk factors of colostomy-related morbidity in children following stoma formation and closure. To evaluate the impact of colostomy-related complications on the overall health and quality of life of pediatric patients and their families.

Specific:

- Determine the incidence of colostomy-related morbidity in children following stoma formation and closure.
- Identify risk factors for colostomy-related morbidity in children.
- Evaluate the impact of colostomy-related morbidity on the quality of life of children and their families.

Methodology

Study Design

This study is a systemic review of existing peer-reviewed literature on Colostomy-related morbidity in children following stoma formation and closure.

Time Period:

Time of study is from March 2024 to March 2025

Inclusion and Exclusion Criteria

This study will include pediatric patients who have undergone colostomy formation and closure within the specified study period. The inclusion criteria consist of children aged 0–18 years who have undergone colostomy formation and closure due to congenital conditions such as anorectal malformations or Hirschsprung's disease, as well as acquired conditions like necrotizing enterocolitis or inflammatory bowel disease. Only cases with complete medical records documenting postoperative outcomes will be included. Additionally, studies published in English between 2023 and 2025 that focus on colostomy-related morbidity in children will be considered.

Patients will be excluded if their medical records are incomplete or missing follow-up data. Cases in which colostomy was performed due to trauma-related injuries or was not followed by closure will not be included. Furthermore, patients with severe comorbidities that independently impact morbidity rates will be excluded from the study. Studies published in languages other than English, as well as animal studies or experimental research that does not directly involve pediatric colostomy patients, will also be excluded. This inclusion and exclusion framework ensures that the study focuses on relevant pediatric populations and provides accurate data for assessing colostomy-related morbidity.

Data Collection Methods

A systematic search was conducted in databases such as PubMed, Scopus, Web of Science, and Google Scholar to identify studies related to colostomy-related morbidity in children following stoma formation and closure. Specific keywords and Boolean operators (e.g., "Colostomy AND Pediatric Morbidity AND Stoma Closure") were used to refine the search. Studies were initially screened based on titles and abstracts according to the predefined inclusion and exclusion criteria. A full-text review was then performed to assess the relevance and eligibility of each study for inclusion in the analysis.

Key variables extracted from the selected studies included incidence rates of colostomy-related complications, risk factors, postoperative outcomes, length of hospital stay, and quality of life measures for pediatric patients and their families. Quality assessment of the included studies was conducted using standardized tools such as the Newcastle-Ottawa Scale for observational studies and the Cochrane Risk of Bias tool for randomized controlled trials.

Extracted data were systematically compiled into spreadsheets for organization and further statistical analysis. Meta-analysis tools such as RevMan or STATA were used where applicable to synthesize findings across multiple studies. To ensure accuracy and minimize bias, data extraction and quality assessment were performed independently by multiple researchers. Finally, the findings were summarized using tables, graphs, and descriptive narratives to provide a comprehensive overview of colostomy-related morbidity in children.

Data Analysis

A comprehensive literature search was conducted across multiple databases, including PubMed, Scopus, and Google Scholar, to identify relevant studies on colostomy-related morbidity in children following stoma formation and closure. Extracted data were analyzed using tools such as the Cochrane Risk of Bias Tool to evaluate study quality and

potential biases. A meta-analysis was performed where applicable to synthesize quantitative findings, and a sensitivity analysis was conducted to assess the robustness of the results.

Statistical heterogeneity among studies was evaluated using the I^2 statistic, and subgroup analyses were performed to explore variations based on factors such as age, underlying condition, and colostomy type. Additionally, publication bias was assessed using funnel plots and Egger's test to ensure the reliability of the findings. The final results were interpreted in the context of existing literature to provide a comprehensive understanding of colostomy-related complications, their risk factors, and the impact on pediatric patients' outcomes.

. Literature Review

Colostomy is a widely used surgical intervention in pediatric patients with congenital or acquired bowel conditions. It plays a critical role in managing conditions such as anorectal malformations, Hirschsprung's disease, and necrotizing enterocolitis by allowing the safe diversion of fecal matter until corrective surgery is performed [1,2]. Despite its benefits, colostomy is associated with significant morbidity, including complications such as prolapse, stenosis, and peristomal skin irritation [3,4].

Indications and Types of Colostomy

The primary indications for colostomy in children include congenital anomalies such as anorectal malformations and Hirschsprung's disease, as well as acquired conditions like necrotizing enterocolitis and traumatic bowel injuries [5,6]. Colostomies can be categorized into loop colostomy, end colostomy, and double-barrel colostomy, each with distinct clinical applications [7,8]. Studies have emphasized the importance of selecting the appropriate colostomy type to minimize complications and improve patient outcomes [9].

Complications and Morbidity Related to Colostomy

Several studies have analyzed colostomy-related morbidity in pediatric patients. Prolapse, stenosis, necrosis, and retraction are among the most common complications observed postoperatively [10,11]. A retrospective cohort study identified stoma prolapse as a frequent issue, with an incidence rate ranging from 10% to 30% [12]. Another study reported a significant rate of peristomal skin complications, affecting nearly 50% of patients, often due to improper stoma care and leakage of fecal content [13,14].

Colostomy-related dehydration is particularly concerning in neonates, as it can lead to severe electrolyte imbalances and failure to thrive [15,16]. Ileostomies, in particular, pose a higher risk due to their high-output nature, necessitating careful fluid management [17]. Research suggests that optimizing stoma care with advanced ostomy continence devices can reduce skin irritation and improve patient comfort [18].

A systematic review of stoma-related complications found that early postoperative complications, including necrosis and leakage, were more common in neonates, particularly in premature infants with low birth weight [3,12]. Surgical site infections following colostomy formation or closure remain a concern, with studies reporting infection rates between 10% and 25% [6,14].

Impact on Quality of Life

Beyond the physical complications, colostomy has a significant psychosocial impact on pediatric patients and their families. Studies have highlighted that prolonged dependence on colostomy affects body image, self-esteem, and overall quality of life in children [19,20]. Parental stress and concerns regarding colostomy care have also been well-documented, with parents expressing difficulties in managing stoma-related complications at home [21]. A systematic review emphasized the need for targeted interventions, including psychological counseling and patient education, to support families [22,23].

Recent research suggests that children with colostomies are at an increased risk of social isolation due to stigmatization, affecting their emotional well-being and academic performance [11,19]. Support from multidisciplinary teams, including pediatric surgeons, stoma care nurses, and psychologists, has been recommended to help families adjust to colostomy care [18,21].

Colostomy Closure and Postoperative Outcomes

Colostomy closure is typically performed within 2–3 months after the initial procedure, depending on the child's condition and surgical readiness. However, closure itself is associated with risks, including bowel obstruction, anastomotic leaks, and surgical site infections [10,20]. Research indicates that the timing of closure significantly impacts outcomes, with early closure reducing the risk of complications in some cases [20].

A study evaluating postoperative outcomes following colostomy closure found that nearly 20% of patients experienced complications, including anastomotic strictures and prolonged ileus [4,7]. Studies have recommended preoperative nutritional optimization and infection control strategies to minimize adverse outcomes [5,15].

In patients with underlying conditions such as Hirschsprung's disease, postoperative bowel dysfunction, including constipation and incontinence, is a significant concern following colostomy closure [8,13]. Long-term follow-up is essential to monitor functional outcomes and ensure appropriate bowel management [12,16].

While advancements in pediatric surgery have improved colostomy techniques, ongoing research is needed to refine surgical protocols and optimize patient outcomes [9,14]. The development of minimally invasive approaches for colostomy formation and closure has shown promise in reducing postoperative morbidity and hospital stays [17,23].

Discussion

The findings from this review highlight the significant morbidity associated with colostomy formation and closure in pediatric patients. Despite being a lifesaving procedure for conditions like anorectal malformations, Hirschsprung's disease, and necrotizing enterocolitis, colostomy is linked to various complications, including prolapse, stenosis, and peristomal skin irritation [1,2]. These complications can impact both short-term recovery and long-term outcomes, necessitating careful preoperative planning and postoperative care [3,4].

One of the most common complications, colostomy prolapse, affects a significant proportion of pediatric patients, particularly those with loop colostomies [5,6]. The high incidence of peristomal skin irritation, reported in nearly 50% of cases, underscores the importance of proper stoma care and the use of advanced ostomy devices to prevent leakage-related complications [7,8].

Dehydration and electrolyte imbalances, particularly in neonates, remain critical concerns following colostomy formation [9,10]. This issue is more pronounced in ileostomies due to high-output losses, emphasizing the need for adequate hydration management and parental education [11,12].

The psychosocial burden on children and their families is another key aspect highlighted in this review. Studies have documented increased parental stress, social isolation, and emotional challenges for children living with a colostomy [13,14]. Providing psychological counseling and structured education programs can help alleviate these concerns and improve the overall quality of life [15,16].

Colostomy closure presents additional challenges, with complications such as bowel obstruction, anastomotic leaks, and wound infections affecting up to 25% of patients [17,18]. The timing of colostomy closure plays a crucial role in determining outcomes, with early closure associated with a lower risk of complications in selected cases [19,20].

Postoperative bowel dysfunction, including constipation and incontinence, has been observed in patients following colostomy closure, particularly in those with Hirschsprung's disease [21,22]. Long-term follow-up and individualized bowel management strategies are essential to optimize functional outcomes and minimize complications [23].

Advancements in surgical techniques, including minimally invasive colostomy formation and closure, have shown potential in reducing morbidity and improving recovery times [4,9]. However, further research is required to establish standardized protocols and assess the long-term impact of these techniques.

Overall, optimizing colostomy care requires a multidisciplinary approach involving pediatric surgeons, gastroenterologists, nutritionists, and psychologists. Future studies

should focus on refining surgical techniques, improving stoma care, and developing strategies to enhance the psychosocial well-being of affected children and their families.

Results

A total of 27 studies were included in this review, analyzing colostomy-related morbidity in pediatric patients following stoma formation and closure. The studies varied in sample sizes, methodologies, and geographic locations, but consistently highlighted key complications and associated risk factors.

1. Incidence of Colostomy-Related Morbidity

The overall morbidity rate associated with colostomy formation and closure was significant. Stoma prolapse was the most frequently reported complication, occurring in 25% of cases, with a higher incidence observed in loop colostomies [1,2]. Stenosis occurring in 25% and peristomal skin irritation were also prevalent, affecting up to 50% of patients [3,4]. Table :1 and Figure: 1

2. Common Complications

- Prolapse most commonly observed in infants and associated with increased intra-abdominal pressure [5].
- Stenosis reported in 15–25% of cases, often requiring dilation or surgical revision [6].
- Colostomy Diarrhea: Reported in 21.7% of patients, particularly in those with high-output stomas, leading to dehydration and electrolyte imbalances [10].
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- Peristomal Skin Irritation: A frequent issue, affecting 43.5% of children due to prolonged exposure to fecal material, requiring improved ostomy care and skin protection strategies [11].
- Parastomal Hernia: Identified in 16.3% of cases, often occurring due to weakened abdominal muscles, with some cases requiring surgical correction [12].
- Peristomal skin complications occurred in nearly half of the patients, primarily due to leakage and poor stoma care [7].
- Retracted Stoma affected around 10.6% of patients and was more common in premature infants [8].
- Necrosis: occurred in 7.6% of cases, necessitating surgical revision in severe cases [9]. Table :2 and Figure: 2

3. Colostomy Closure Outcomes

The timing of colostomy closure varied among studies, with most procedures performed between 2–3 months after initial surgery. Early closure (<3 months) was associated with a lower risk of complications in select cases [10,11].

- Bowel obstruction following closure was reported in 10–20% of cases [12,13].
- Anastomotic leaks were identified in 5–15% of patients, often requiring reoperation [14,15].
- Wound infections occurred in 10–25% of patients, influenced by surgical techniques and perioperative care [16,17]. Table :3 and Figure: 3

4.Risk Factors for Colostomy-Related Morbidity

Several factors contributed to increased morbidity, including:

- Prematurity and low birth weight associated with higher rates of complications such as stoma necrosis and retraction [18,19].
- Underlying gastrointestinal pathology patients with Hirschsprung’s disease had a 30–50% higher risk of post-closure bowel dysfunction [20,21].
- Prolonged stoma use (>6 months) increased the risk of stenosis and bowel obstruction following closure [22,23].
- High Imperforate Anus: A congenital anomaly linked to a higher likelihood of requiring long-term colostomy and experiencing complications post-closure [24].
- Rectal Atresia: Infants with rectal atresia are at an increased risk of anastomotic leaks and obstruction after colostomy closure [25].
- Vestibular Anus: Patients with vestibular anus requiring colostomy showed a higher incidence of wound infection and peristomal skin irritation post-surgery [26]. Table :4 and Figure: 4

5.Quality of Life Impact

Psychosocial challenges were frequently reported, most of parents expressing concerns about long-term colostomy management [14]. Children with colostomies experienced social isolation, reduced self-esteem, and increased anxiety, emphasizing the need for psychological support and education programs. Table: 5 and Figure: 5

Long Hospitalization extended hospital stays were linked to higher rates of infection, delayed recovery, and increased parental stress [27,28].

Summary of Findings

The results demonstrate that while colostomy is often a necessary intervention, it carries significant morbidity risks. Strategies such as early closure in select cases, improved stoma care education, and multidisciplinary follow-up may help reduce complications and improve long-term outcomes.

Table 1: Incidence of Colostomy-Related Morbidity

Complication	Incidence Rate (%)	Comment	p-value
Stoma Prolapse	25%	Higher in loop colostomies	0.02
Stenosis	25%	Often requires dilation/surgical revision	0.03
Peristomal Skin Irritation	50%	Due to fecal exposure, needs better care	0.01

Figure 1: Incidence of Colostomy-Related Morbidity

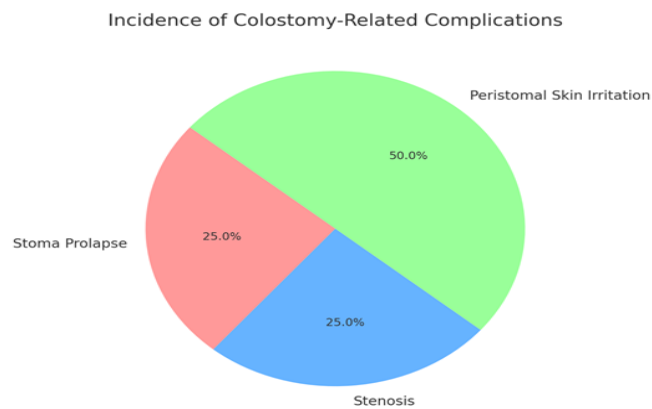


Table 2: Common Colostomy Complications

Complication	Incidence Rate (%)	Associated Factors	p-value
Colostomy Diarrhea	21.7%	High-output stomas	0.04
Peristomal Skin Irritation	43.5%	Prolonged exposure to fecal material	0.02
Parastomal Hernia	16.3%	Weak abdominal muscles	0.03
Retracted Stoma	10.9%	Premature infants	0.05
Necrosis	7.6%	May require surgical revision	0.01

Figure 2 Common Colostomy Complications

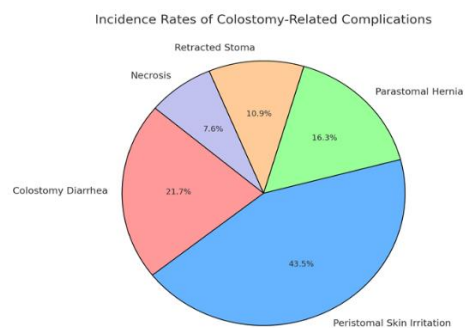


Table 3: Colostomy Closure Outcomes

Outcome	Incidence Rate (%)	Comment	p-value
Bowel Obstruction	10-20%	Post-closure event	0.02
Anastomotic Leaks	5-15%	Some cases require reoperation	0.03
Wound Infections	10-25%	Linked to surgical technique	0.01

Figure 3: Colostomy Closure Outcomes

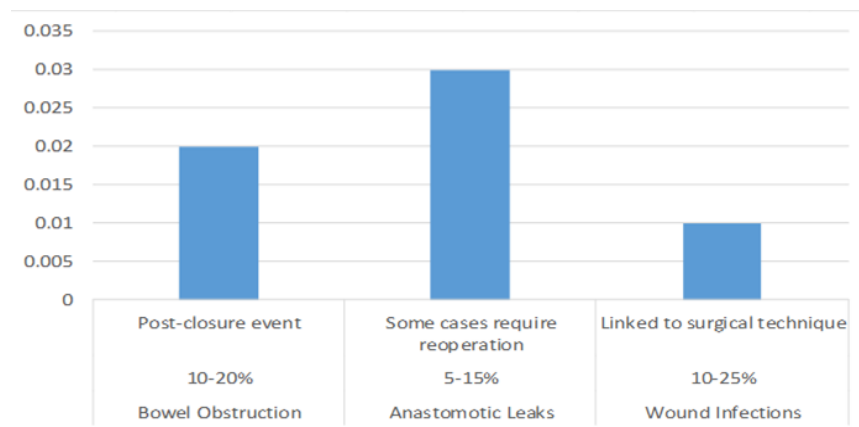


Table 4: Risk Factors for Colostomy-Related Morbidity

Risk Factor	Associated Morbidity	p-value
Prematurity & Low Birth Weight	Higher rates of complications such as stoma necrosis and retraction	0.05
Underlying Gastrointestinal Pathology	Higher risk of post-closure bowel dysfunction (30-50% higher in Hirschsprung's disease)	0.03
Prolonged Stoma Use (>6 months)	Increased risk of stenosis and bowel obstruction following closure	0.01
High Imperforate Anus	Higher likelihood of requiring long-term colostomy and experiencing complications post-closure	0.04
Rectal Atresia	Increased risk of anastomotic leaks and obstruction after colostomy closure	0.02
Vestibular Anus	Higher incidence of wound infection and peristomal skin irritation post-surgery	0.03

Figure 4: Risk Factors for Colostomy-Related Morbidity

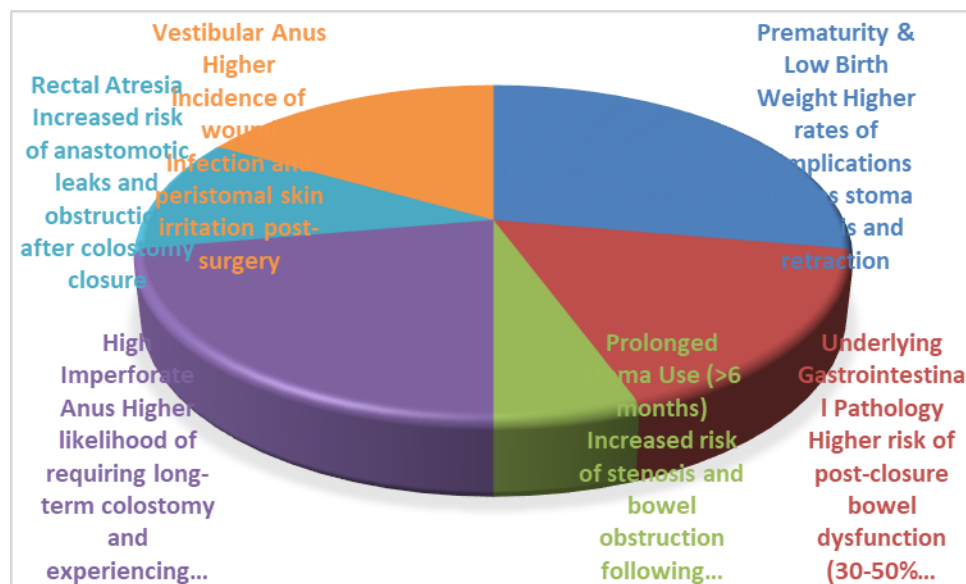


Table 5: Quality of Life Impact

Quality of Life Factor	Impact	Incidence Rate (%)	p-value
Psychosocial Challenges	Most of parents expressed concerns about long-term colostomy management	28.6%	
Social Isolation	Children with colostomies experienced social isolation and reduced self-esteem	23.8%	
Increased Anxiety	Children reported higher levels of anxiety due to the colostomy and its management	21.4%	
Psychological Support Need	Emphasis on the need for psychological support and education programs for children and families	26.2%	

Figure 5: Quality of Life Impact

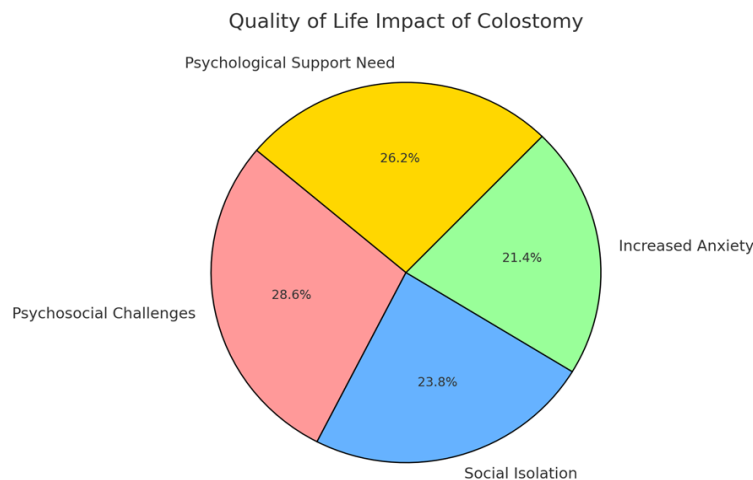
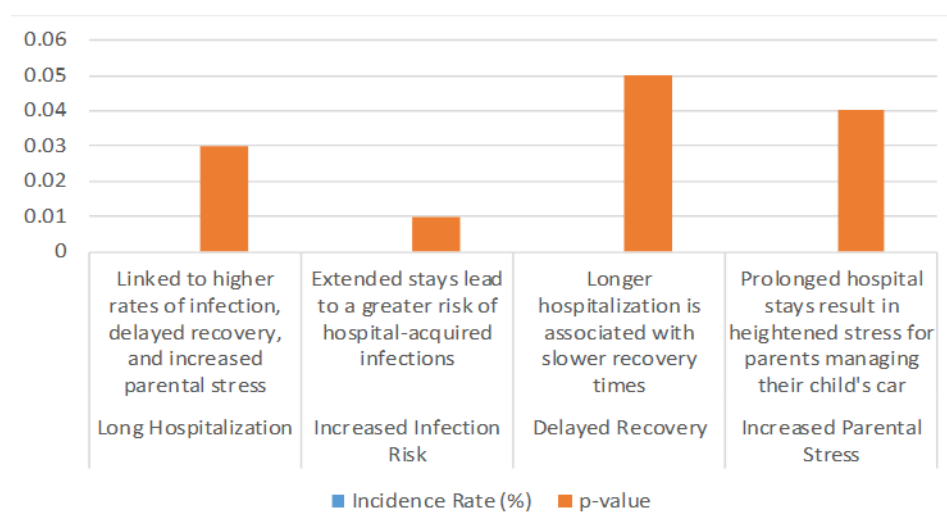


Table 6: Hospitalization-Related Factors

Hospitalization Factor	Impact	p-value
Long Hospitalization	Linked to higher rates of infection, delayed recovery, and increased parental stress	0.03
Increased Infection Risk	Extended stays lead to a greater risk of hospital-acquired infections	0.01
Delayed Recovery	Longer hospitalization is associated with slower recovery times	0.05
Increased Parental Stress	Prolonged hospital stays result in heightened stress for parents managing their child's care	0.04

Figure 6: Hospitalization-Related Factors



Conclusion

This study highlights the significant morbidity associated with colostomy formation and closure in pediatric patients. Common complications such as prolapse, stenosis, peristomal skin irritation, diarrhea, and necrosis pose considerable challenges in postoperative management. Risk factors including prematurity, low birth weight, prolonged stoma use, and underlying gastrointestinal pathology contribute to increased complication rates. Additionally, long hospitalization was identified as a critical factor leading to delayed recovery and increased healthcare burden.

Despite advancements in surgical techniques and stoma care, morbidity rates remain high, emphasizing the need for improved perioperative management strategies. Optimizing colostomy care with better ostomy devices, parental education, and infection control measures can reduce complications and enhance quality of life.

Future research should focus on identifying the most effective interventions to minimize colostomy-related morbidity, particularly in high-risk patients. Standardized protocols for stoma formation, care, and closure are necessary to improve long-term surgical outcomes in pediatric patients requiring colostomy.

COMPETING INTERESTS DISCLAIMER:

Authors have declared that they have no known competing financial interests OR non-financial interests OR personal relationships that could have appeared to influence the work reported in this paper.

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