

10-Year Study of Clinical Outcomes and Bowel Function Following Surgical Treatment in Hirschsprung's Disease

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Abstract: *The study investigates the clinical outcomes and bowel functions following surgical treatment of Hirschsprung's disease (HD) at BRD Medical College, Gorakhpur, using data from the past ten years. The research aims to assess postoperative complications, long-term bowel function, and overall quality of life in patients who underwent Modified Duhamel procedures. The findings aim to enhance current surgical techniques and postoperative care to improve patient outcomes and life quality.*

Keywords: Hirschsprung's disease, bowel function, postoperative complications, Modified Duhamel procedure

1. Introduction

Hirschsprung's disease was first identified by Harold Hirschsprung in the late 19th century.¹ It is a congenital anomaly of the colon characterized by the absence of ganglion cells in the enteric nervous system (within the submucosal and myenteric plexuses). This anomaly occurs due to an interruption in the normal migration of neural crest cells during the early stages of pregnancy. It often occurs between the 5th and 12th weeks of gestation. And this period is a critical period for the development of the enteric nervous system. Hirschsprung's disease manifests due to a failure of these neural crest cells to colonize the entire length of the intestine.² Because of which the affected segment of the colon cannot relax, leading to a functional obstruction and severe constipation or intestinal blockage. This condition is relatively rare, appearing in roughly one in 5,000 live births.³

Managing the Hirschsprung's disease majorly includes surgical intervention to remove the aganglionic segment of the colon. This helps restore normal bowel function. Postoperative outcomes are generally favourable. However, close follow-up is essential to monitor for potential complications. The study of Hirschsprung's disease not only focuses on improving surgical techniques and outcomes but also on understanding the genetic and developmental pathways that underlie this complex hereditary condition.⁴ The diagnosis of Hirschsprung's disease is primarily based on its characteristic clinical symptoms and is supported further through specific diagnostic procedures. A barium enema is a common initial diagnostic tool. This tool reveals a distinct transition zone between the affected and normal segments of the colon, which is indicative of this condition. However, the most conclusive diagnosis comes from a detailed examination of a rectal biopsy. This biopsy would typically show a lack of ganglion cells, evident nerve hypertrophy, and elevated levels of acetylcholinesterase. These are identified through specialized immuno-histochemical staining. Initially, treatment often involved the use of a diverting colostomy. This method initially alleviated symptoms. However, the recurrence of symptoms following the closure of the colostomy highlighted the need for more

effective and sustainable solutions. Modern treatment strategies now primarily focus on the surgical removal of the aganglionic segments of the colon.⁵ The Modified Duhamel's procedure stands out as a commonly utilized method for providing long-term relief. Considering the significant prevalence of Hirschsprung's disease in the northern regions of India, especially in states like Uttar Pradesh and Bihar, there is an evident need for comprehensive research. Some centres support single-stage procedures for Hirschsprung's disease. However, we find that a two-stage pull-through procedure is more appropriate given the large number of rural patients we serve.

Rationale of the Study

The rationale for this study, "10-year study of Clinical Outcome and Bowel Function Following Surgical Treatment in Hirschsprung's Disease: A Study at BRD Medical College Gorakhpur," is grounded in the need to enhance understanding and improve management strategies for Hirschsprung's disease (HD). Incidence and prevalence are high in Hirschsprung's disease. BRD medical college is the only testing referral centre in nearby district.

Aim & Objective

- The primary aim of this study is to evaluate the clinical outcomes and bowel function following the Modified Duhamel surgical treatment in patients with Hirschsprung's disease.
- This study aims to identify & analyse the potential factors & variables which may contribute to variations in these results among patients.

2. Material and Methods

Study Setting: The study was conducted in the Paediatric Surgery Unit of the Department of General Surgery.

Study Period: The research took place from last 10-year patient data.

Participants: All patients diagnosed with Hirschsprung's disease who had undergone a Modified Duhamel procedure were included.

Study Procedure: After taking ethical approval and informed consent, the patients eligible underwent surgical intervention based on the standard clinical protocols. Follow-up assessments occurred at scheduled intervals post-surgery (e.g., 1 month, 3 months, 6 months) to monitor

recovery and bowel function. ⁶ Data collection involved direct patient interviews, medical record reviews, telephonic conversation and objective assessments during follow-up visits.

S.NO	NAME	AGE/SEX	WEIGHT	DEMOGRAPHY			POST-OP COMPLICATION									
				ANTENATAL HISTORY	AGE OF PATIENT AT TIME OF COLOSTOMY	AGE OF PATIENT AT TIME OF DEFINITIVE SURGERY	ABDOMINAL DISTENSION	FACIAL INCONTINENCE	FACIAL SOILING	USAGE OF STOOL SOFTENER AND ENEMA	WOUND INFECTION	PAIN DURING DEFECACTION	BLEEDING DURING DEFECACTION	DRAIN RELATED INTESTINAL OBSTRUCTION	RECOLOSTOMY	ADHESIVE BOWEL OBSTRUCTION
1	REYANSH	3.5Y/M	12.4KG	TERM, CESSARIAN	6 MONTHS	3 YEARS	NO	NO	NO	YES	YES	YES	YES	NO	NO	NO
2	SONU	2.5Y/M	10.8KG	TERM, NVD	6 MONTHS	2 YEARS	NO	NO	YES	NO	NO	NO	YES	NO	NO	NO
3	ABHAY	4Y/M	13.2KG	PRETERM, CESSARIAN	2 YEARS	3.5 YEARS	YES	NO	NO	YES	YES	YES	YES	NO	NO	NO
4	AMARNATH	4Y/M	15KG	TERM, NVD	3 MONTHS	2 YEARS	NO	NO	YES	NO	NO	NO	YES	NO	NO	NO
5	JAI	3Y/M	11KG	PRETERM, CESSARIAN	1.4 MONTHS	2 YEARS	NO	NO	NO	YES	YES	YES	NO	NO	NO	NO
6	RENU	3Y/F	13.5KG	PRETERM, CESSARIAN	15 DAYS	2.5 YEARS	NO	NO	NO	YES	YES	YES	NO	NO	NO	NO
7	DANISH	3.5Y/M	13.2KG	TERM, CESSARIAN	2.5 YEARS	3 YEARS	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
8	FAISAL	5Y/M	14.8KG	TERM, NVD	6 MONTHS	2 YEARS	YES	NO	YES	YES	YES	YES	NO	NO	NO	NO
9	RAJKUMAR	3Y/M	13.4KG	PRETERM, CESSARIAN	2 MONTHS	2 YEARS	NO	NO	YES	NO	YES	NO	YES	NO	NO	NO
10	RUPESH	2.5Y/M	14.6KG	TERM, CESSARIAN	6 MONTHS	2 YEARS	YES	NO	NO	NO	YES	YES	NO	NO	NO	NO
11	YASH	3Y/M	12.4KG	TERM, NVD	1 MONTHS	2.3 YEARS	NO	NO	YES	YES	NO	NO	NO	NO	NO	NO
12	AMRENDRA	3Y/M	10.4KG	TERM, NVD	9 MONTHS	2 YEARS	YES	NO	NO	NO	NO	YES	YES	NO	NO	NO
13	ARAV	5Y/M	15.2KG	TERM, CESSARIAN	5.5 MONTHS	2 YEARS	YES	NO	NO	YES	YES	NO	NO	NO	NO	NO
14	ANURAG	4Y/M	13KG	TERM, NVD	2.5 YEARS	3.5 YEARS	YES	NO	NO	YES	NO	YES	NO	NO	NO	NO
15	ASHWANI	5Y/F	14KG	PRETERM, CESSARIAN	2.5 YEARS	3 YEARS	NO	NO	YES	YES	YES	YES	NO	NO	NO	YES
16	BABITA	4Y/F	14KG	PRETERM, CESSARIAN	15 DAYS	3 YEARS	YES	NO	NO	YES	NO	YES	YES	NO	NO	NO
17	ARYAN	3Y/M	8KG	PRETERM, CESSARIAN	15 DAYS	2.5 YEARS	YES	NO	YES	YES	YES	NO	NO	NO	NO	NO
18	SATYAM	2.5Y/M	12KG	TERM, NVD	1 MONTHS	2 YEARS	NO	NO	NO	NO	YES	YES	NO	NO	NO	NO
19	SATYAM	5Y/M	15.5KG	TERM, CESSARIAN	6 MONTHS	2 YEARS	YES	NO	YES	NO	NO	NO	YES	NO	NO	NO
20	SHYAM GIRI	6Y/M	16KG	TERM, CESSARIAN	2.5 YEARS	5.2 YEARS	YES	NO	NO	NO	YES	YES	NO	YES	NO	NO
21	RAUNAK	4.5Y/M	12 KG	PRETERM, CESSARIAN	3 MONTHS	2.5 YEARS	YES	NO	YES	YES	NO	YES	YES	NO	NO	NO
22	KRISH	3Y/M	10KG	TERM, CESSARIAN	1.1 YEAR	2.5 YEARS	YES	NO	YES	YES	NO	YES	YES	NO	NO	NO
23	SHIVANI	3Y/F	10.2KG	PRETERM, CESSARIAN	1.5 MONTH	2.3 YEARS	YES	NO	YES	NO	NO	NO	NO	NO	NO	NO
24	AROHI	4Y/F	13KG	TERM, NVD	2 YEARS	3 YEARS	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
25	ARADHYA	3Y/F	10KG	TERM, NVD	5 MONTH	2.3 YEARS	YES	NO	NO	NO	NO	YES	NO	NO	YES	NO
26	SHESHNATH	7Y/M	20.5KG	TERM, NVD	4.5 YEARS	6 YEARS	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO
27	HANJALU	4Y/M	15 KG	TERM, NVD	6.5 MONTHS	2.4 YEARS	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
28	DEEPAK	5 Y/M	15.2KG	TERM, CESSARIAN	10 MONTH	2.4 YEARS	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO
29	VEERA	3Y/F	10.2KG	TERM, CESSARIAN	1.1 YEAR	2.5 YEARS	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO
30	ARPIT	6.5Y/M	18KG	TERM, NVD	3 YEARS	5.5 YEARS	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
31	VEER	3Y/M	10.4KG	PRETERM, CESSARIAN	1.1 YEAR	2 YEARS	YES	NO	YES	NO	YES	YES	NO	NO	NO	NO
32	SUNITA	3Y/F	9.2KG	PRETERM, CESSARIAN	1.1 YEAR	2.3 YEARS	YES	NO	YES	NO	NO	YES	NO	NO	NO	NO
33	PRACHI	4Y/F	14.5KG	TERM, CESSARIAN	1.5 YEARS	2.4 YEARS	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
34	VEERA	3Y/M	11KG	TERM, NVD	6 MONTH	2.5 YEARS	YES	NO	NO	NO	NO	YES	NO	NO	NO	YES
35	ARADHYA	2.5Y/F	3.2KG	TERM, CESSARIAN	11 MONTH	2.3 YEARS	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
36	ARMAN	5Y/M	18KG	TERM, CESSARIAN	7 MONTHS	2.3 YEARS	NO	NO	YES	YES	NO	YES	YES	NO	NO	NO
37	ADARSH	2Y/M	12KG	TERM, NVD	11 MONTHS	3 YEARS	NO	NO	YES	NO	NO	YES	YES	NO	NO	NO
38	INDRAWATI	3.5Y/F	12.2KG	PRETERM, CESSARIAN	9 MONTHS	2.5 YEARS	NO	NO	NO	NO	YES	YES	YES	NO	NO	NO
39	SHIVANSH	3.5Y/M	13.2KG	TERM, NVD	7 MONTHS	2.8 YEARS	YES	NO	YES	YES	NO	YES	NO	NO	NO	NO
40	VEDIKA	2Y/F	9.3KG	PRETERM, CESSARIAN	8.5 MONTHS	2.4 YEARS	YES	NO	YES	YES	NO	YES	YES	NO	NO	NO
41	RISHABH	3Y/M	12.4KG	TERM, NVD	10 MONTHS	2.5 YEARS	NO	NO	YES	NO	NO	YES	NO	NO	NO	NO
42	AMIT	3.5Y/M	12.3KG	PRETERM, CESSARIAN	11.5 MONTHS	2 YEARS	NO	NO	NO	YES	NO	YES	NO	NO	NO	NO
43	KAUSHAL	4Y/M	14.5KG	TERM, NVD	11 MONTHS	2.7YEARS	YES	NO	YES	NO	YES	YES	YES	NO	NO	NO
44	SAURABH	2.5Y/M	12.1KG	TERM, NVD	7 MONTHS	2 YEARS	NO	NO	NO	NO	YES	YES	YES	NO	YES	NO
45	NEHA	3Y/F	11.8KG	PRETERM, CESSARIAN	8 MONTHS	2.6YEARS	YES	NO	YES	NO	NO	YES	NO	NO	NO	NO
46	AQIUL	4Y/M	16.3KG	TERM, NVD	9.5 MONTHS	2.5 YEARS	YES	NO	YES	YES	NO	YES	YES	NO	NO	NO
47	PRINYANKA	3Y/F	11.1KG	PRETERM, CESSARIAN	10 MONTHS	2.10 YEARS	NO	NO	YES	YES	YES	YES	NO	NO	NO	NO
48	NITESH	3Y/M	11.2KG	PRETERM, CESSARIAN	8 MONTHS	2.2 YEARS	YES	NO	YES	NO	NO	YES	YES	NO	NO	NO
49	TARUN	3.5Y/M	12.5KG	PRETERM, CESSARIAN	8 MONTH	2 YEARS	YES	NO	YES	NO	YES	YES	YES	NO	NO	NO
50	ABHISHEK	5.5Y/M	17.6KG	TERM, NVD	9 MONTHS	2.6 YEARS	YES	NO	YES	YES	NO	YES	NO	NO	NO	NO
51	JYOTI	3Y/F	13.1KG	PRETERM, CESSARIAN	11 MONTHS	2.4 YEARS	NO	NO	YES	NO	YES	YES	YES	NO	NO	NO
52	SHUBHAM	4Y/M	15.8KG	PRETERM, CESSARIAN	1.1 YEAR	2.7 YEARS	NO	NO	YES	NO	NO	YES	YES	NO	NO	NO

Image 1: Showing demography and post OP complication of the patients

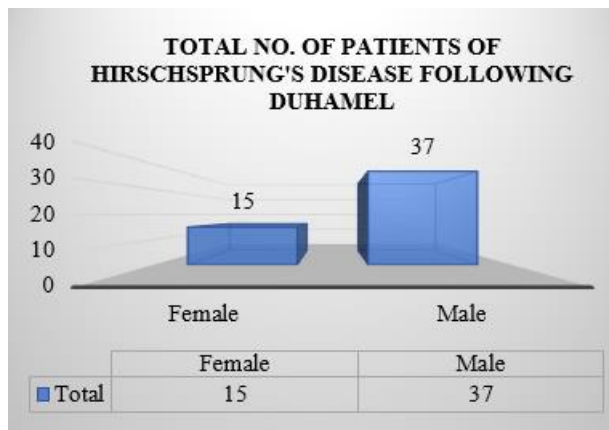


Image 2: Showing total number of Patients of Hirschsprunf's disease of Following Duhamel.

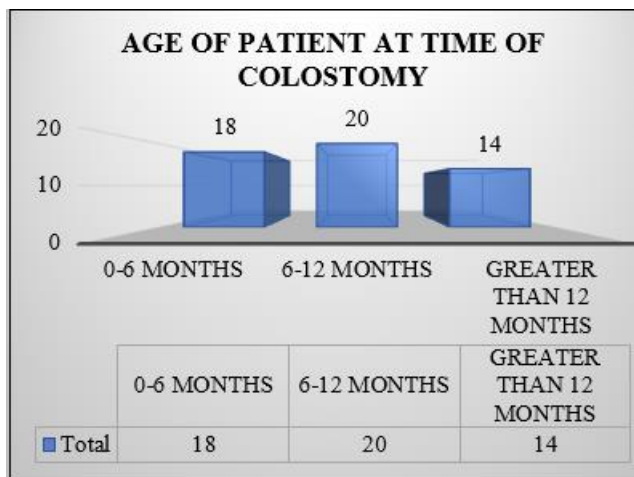


Image 3: Showing age of patient at time of colostomy

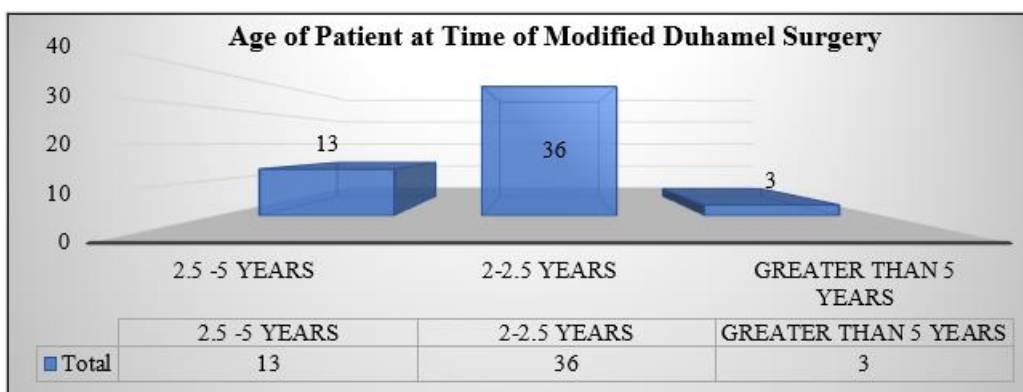


Image 4: Showing age of patient at the time of modified Duhamel Surgery

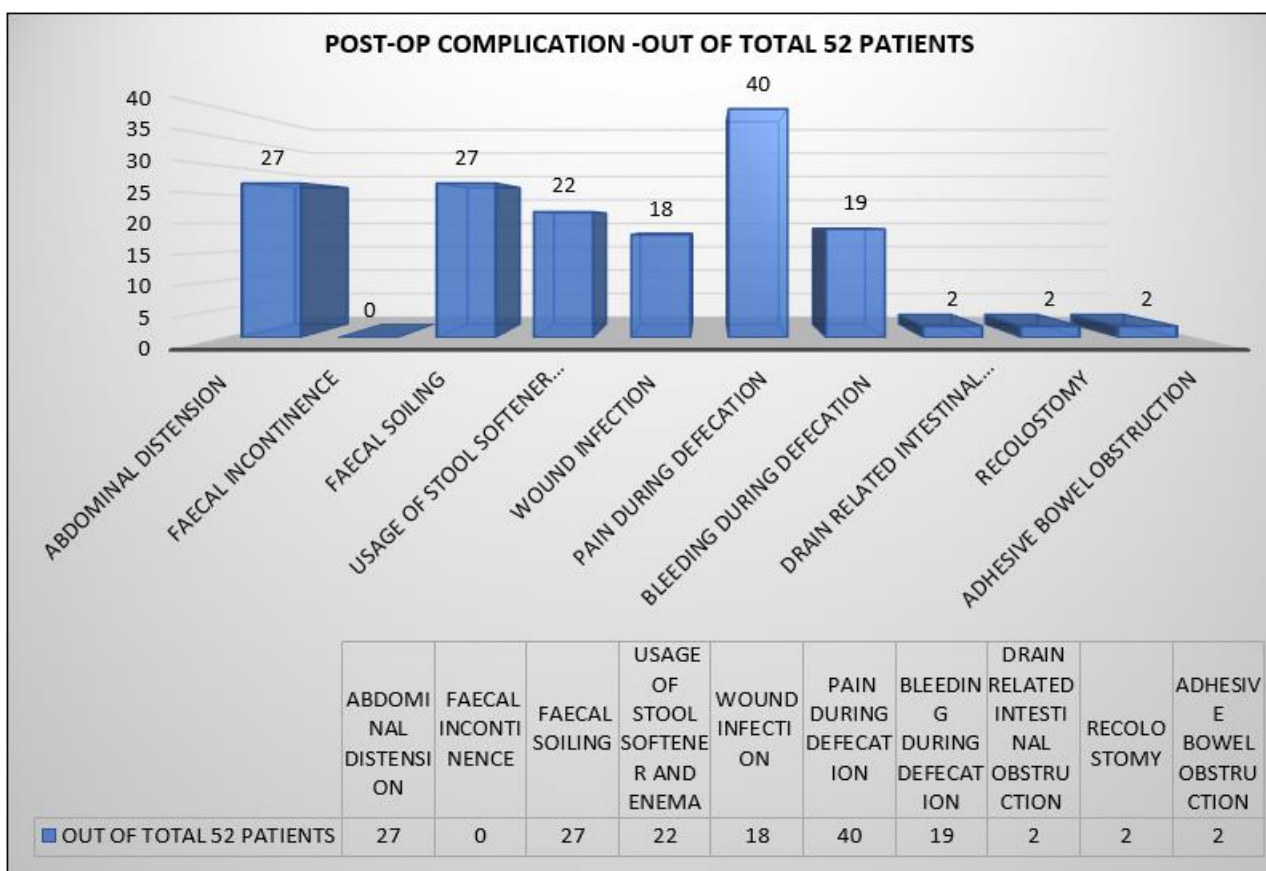


Image 5: Showing post-op Complication-out of total 52 pateints.

3. Results

The study encompassed a total of 52 patients diagnosed with Hirschsprung's disease who underwent the Modified Duhamel procedure. The analysis included various factors such as age at the time of colostomy, age at Modified Duhamel surgery, and post-operative complications.

The patient cohort consisted of 37 males (71.15%) and 15 females (28.85%) that reflects the known male predominance in Hirschsprung's disease (Image 2). The timing of colostomy, a preliminary surgical step, varied among patients. Eighteen patients (34.62%) underwent colostomy between 0-6 months of age (Image 3). Early intervention is often crucial in managing symptoms and preventing complications. Twenty patients (38.46%) received the procedure between 6-12 months which indicates a trend toward addressing the disease within the first year of life. Fourteen patients (26.92%) underwent colostomy after the first year. This suggests that some cases were identified later or required delayed intervention due to other factors.

The Modified Duhamel procedure was performed at varying ages. The majority of patients, 36 (69.23%), had surgery between 2 and 2.5 years. This highlights the preference for addressing the condition at an early stage to optimize outcomes. Thirteen patients (25%) were operated on between 2.5 and 5 years, suggesting flexibility in timing based on individual patient needs and circumstances (Image 3). Only three patients underwent surgery over five years. This is indicative of the fact that delayed surgery is uncommon and possibly related with specific clinical considerations.

Post-Operative Complications:

A detailed assessment of complications provided insight into the challenges following the Modified Duhamel procedure. Abdominal distension was found in 27 patients (51.92%) (Image 4). This tells that there is a need for effective postoperative strategies for addressing this discomfort and potential underlying causes. No patients reported faecal incontinence. And this is a positive outcome that acts as evidence to the surgery success in preserving bowel control & improving the quality of life. However, faecal soiling was present in 27 patients (51.92%) which represents a significant concern. Although temporary, this issue necessitates effective management strategies to promote recovery & overall hygiene.

Additionally, twenty-two patients (42.31%) needed assistance with stool softeners and enemas. This highlights the ongoing need for supportive care to manage bowel function during recovery. Wound infection was found in eighteen cases (34.61%). This stresses on the importance of infection control as an important aspect of postoperative care. The incidence underscores the importance of preventive measures and timely treatment. 40 patients suffered from pain during defecation (76.92%). This points out the need for comprehensive pain management protocols to enhance patient comfort and care. Bleeding during defecation was reported in 19 patients (36.53%) which reflects the need of careful monitoring and potentially

necessitating interventions to address and prevent further complications (Image 5).

Intestinal obstruction related to drain occurred in two patients (3.85%). The need for re-colostomy in two patients (3.85%) tells that the procedure is generally effective. However, some cases need more surgical intervention to resolve persistent issues. Small bowel obstruction was detected in two patients (3.85%) that calls for vigilance in postoperative monitoring to ensure timely detection and management of obstructions. The results of the present study demonstrate the effectiveness of the Modified Duhamel procedure in treating Hirschsprung's disease. In addition, they highlight areas for improvement in surgical techniques and postoperative care to enhance patient outcomes and cut down potential complications.

4. Discussion

The findings of this 10-year study on the clinical outcomes and bowel function following the Modified Duhamel procedure in Hirschsprung's disease (HD) provide valuable insights that are consistent with existing literature on the topic. The predominance of male patients, with a ratio consistent with known epidemiological data, reinforces the understanding that Hirschsprung's disease is more prevalent in males. This highlights the need for continued monitoring and early intervention in this demographic, as gender plays a critical role in the understanding of HD pathophysiology and outcomes.

The timing of interventions remains a crucial factor in managing Hirschsprung's disease effectively. The study reveals that a substantial number of colostomies (primarily within the first year of life) and subsequent Modified Duhamel procedures (most often between ages 2 to 2.5 years) align with the evidence that earlier interventions can lead to improved postoperative outcomes. This emphasizes the necessity for healthcare professionals to prioritize prompt diagnosis and treatment to mitigate future complications.

Post-Operative Complications

Interestingly, the most significant challenge identified in the aftercare of these patients was the management of postoperative complications, particularly abdominal distension, faecal soiling, and pain during defecation. While a majority of these issues improved significantly within five months, the initial discomfort underscores the need for comprehensive postoperative care protocols tailored to the individual needs of patients. The resolution of abdominal distension and pain during defecation with the use of stool softeners and supportive therapies aligns with other studies advocating for proactive pain management and regular follow-ups to improve bowel function post-surgery.

It is noteworthy that the absence of faecal incontinence in the present cohort stands in stark contrast to other studies, where rates of incontinence were reported following the Duhamel procedure. This difference may reflect the efficacy of the surgical technique used in this specific population, potentially indicating advancements in surgical methods or patient selection criteria that optimize outcomes.

Nevertheless, patient education regarding bowel management strategies post-surgery remains paramount, as factors like stool consistency and fear of pain can mold long-term bowel habits. Hence, ongoing education about maintaining bowel health, coping strategies for post-operative symptoms, and when to seek further medical attention should be emphasized during follow-up visits.

Additionally, the relatively high rate of wound infections (implicating 34.61% of patients) and complications leading to reoperation (like recolostomy for severe abdominal distension) persist as areas necessitating vigilance in surgical practice. Improving pre-operative assessments and postoperative care protocols can significantly reduce infection rates and the incidence of complications. Surgical teams must continue to enhance their skill sets and be prepared for potential emergency interventions, as shown by the successful recolostomy results in the patients requiring further procedures.

Furthermore, the long-term outcomes of this study suggest a favorable trajectory for many patients who underwent the Modified Duhamel procedure. While the small sample size does limit the generalizability of the findings, these results encourage further research with a broader cohort to validate efficacy and patient-reported outcomes. Continued investigations are necessary to establish a clearer understanding of the long-term impacts of surgical interventions on bowel function and quality of life.

Furthermore, a comparative review by Aworanti (2012)⁷ highlighted the functional outcomes post-surgery for Hirschsprung's disease that reinforce the importance of surgical timing and technique in achieving optimal patient outcomes. The necessity for accurate preoperative evaluations and postoperative follow-up was emphasized in order to minimize complications and maximize functional recovery.

Another recent study by Dai et al (2020)⁸ and Huizer et al (2022)⁹ focused on estimating the prevalence of complications such as fecal incontinence and constipation among patients following surgical interventions. The results underscored the importance of addressing these issues early on after surgery, as they can lead to long-term health-related quality of life impacts.

Our study primarily observed short-term complaints such as abdominal distension, fecal soiling, and painful defecation. However, all these symptoms showed significant improvement within a five-month follow-up period. Additionally, there was no long-term dependence on stool softeners or enemas in this study. These results align closely with those reported by Nitin James Peters, Prema Menon, K.L.N. Rao, and Ram Samujh¹⁰. However, other studies, such as those conducted by C.T. Baillie, S.E. Kenny, R.J. Rintala, J.M. Booth, and D.A. Lloyd,¹¹ have reported opposite results.

5. Conclusion

The study underscores the crucial role of early diagnosis and intervention in Hirschsprung's disease and the effective

management via the Modified Duhamel procedure. Although short-term postoperative complications, such as abdominal distension, faecal soiling, and pain during defecation, can still occur, notably, all the patients became symptom-free within five months following the procedure. No faecal incontinence, faecal soiling, or adhesive intestinal obstruction was reported even in the 10-year follow-up. Although the small number of patients in this study may be a limiting factor, which is attributed to data being collected from the paediatric surgery unit with single operating surgeons, this also alleviates the bias that may occur when a study includes the surgical results of more than one surgeon owing to minor variations in the application of the same surgical procedure. Continuous follow-up and comprehensive postoperative care are essential to address complications and improve patient outcomes. This study will continue to focus on reducing postoperative complications and enhancing the quality of life for patients with Hirschsprung's disease.

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