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## The role of bowel preparation preoperatively of reversal stoma in pediatric age group

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### Abstract

**Background:** Mechanical bowel preparation (MBP) aims to reduce infectious complications and anastomotic dehiscence by decreasing fecal material and bacterial load in the colon, minimizing fecal spillage during surgery.

**Objective:** To evaluate the impact of MBP on postoperative outcomes of colostomy closure.

**Patients and Methods:** A prospective study was conducted on patients aged 6 months to 4 years who underwent elective colostomy closure between May 2019 and December 2020 at the Central Child Teaching Hospital of Pediatrics, Baghdad, Iraq. Data included age, gender, original diagnosis, colostomy type and site, preoperative antibiotics, hospital and postoperative length of stay, admission-to-surgery time, preoperative preparation with normal saline, and complications (wound infection, anastomotic leak, additional surgery).

**Results:** The study involved 55 patients, predominantly females (58.2%). Age distribution was 6-12 months (32.7%), 13-24 months (45.5%), and >25 months (21.8%). MBP was performed in 35 patients (63.6%), while 20 (36.4%) did not undergo MBP. Postoperative complications occurred in 20 patients (36.4%), including wound infection (55%), fecal fistula (15%), wound dehiscence, adhesive small bowel obstruction (10% each), incisional hernia, and bleeding (5% each).

**Conclusion:** Preoperative MBP had no significant impact on outcomes. Wound infection was the most common complication.

**Keywords:** Bowel preparation, reversal, stoma, pediatric age group

### Introduction

Mechanical bowel preparation (MBP) for colorectal surgery has been a surgical dogma for decades, despite evidence since the 1990s refuting its benefits <sup>[1]</sup>. The rationale for MBP is to reduce fecal bulk and bacterial colonization, minimizing postoperative complications like anastomotic leakage and wound infection <sup>[2]</sup>. It is also believed to facilitate dissection and endoscopic evaluation. Critics, however, argue that with the use of prophylactic antibiotics, MBP may no longer be necessary. Furthermore, MBP can cause fluid and electrolyte imbalances preoperatively, and evidence suggests it does not significantly reduce gut microbial flora <sup>[3]</sup>. Additionally, liquefied feces from MBP may increase intraoperative spillage and contamination risks <sup>[4]</sup>. Colostomy is a widely practiced procedure for diverting fecal streams, decompressing obstructed bowel in emergencies, and protecting the lower colorectum after reconstructive repair <sup>[5]</sup>. Although lifesaving, it is a "double-edged sword," causing psychological trauma for children and their parents <sup>[6]</sup>. Historically, colostomies date back to the 18th century and were initially performed to treat conditions like imperforate anus <sup>[7]</sup>. Modern enterostomal techniques adapted for children have improved outcomes, especially in newborns with congenital intestinal obstructions <sup>[8]</sup>. Colostomies may be temporary or permanent, depending on the underlying condition <sup>[9]</sup>. In pediatric cases, most colostomies are temporary and performed to address conditions such as anorectal malformations (ARM) and Hirschsprung disease (HD) <sup>[10]</sup>. These stomas help divert fecal flow until the definitive procedure is performed <sup>[11]</sup>, providing benefits if complications and mortality are minimized <sup>[12]</sup>. However, closure of the colostomy presents significant challenges, including the risk of anastomotic leakage, wound infection, and fecal peritonitis <sup>[13]</sup>. Mechanical bowel preparation is routinely used before elective colorectal surgeries, including colostomy closure, to reduce infectious and anastomotic complications <sup>[14]</sup>. In children, MBP is typically performed inpatient, requiring a nasogastric tube, which increases cost and discomfort <sup>[15]</sup>.

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Despite limited pediatric data on its benefits, a significant majority of pediatric surgeons continue to use MBP in clinical practice [16]. Preoperative preparations often include MBP of both colostomy sides, prophylactic antibiotics, and standardized measures [17]. Colostomy closure is a major surgical procedure involving bowel anastomosis, which carries risks such as anastomotic leaks, wound infections, bowel obstruction, and hernias [18]. Proper timing and preparation are crucial to minimize complications [19]. Innovations in surgical techniques have improved outcomes, yet complications remain high [20]. Some centers advocate definitive procedures for HD and ARM without preliminary stoma formation to reduce morbidity associated with colostomies [21]. This study aims to evaluate the impact of mechanical bowel preparations on postoperative outcomes of closure colostomy.

### Method

This prospective study included children aged 6 months to 4 years who underwent elective colostomy closure between May 2019 and December 2020 at the Central Child Teaching Hospital in Baghdad, Iraq. Records were prospectively reviewed, and data collected included age, gender, original diagnosis, colostomy type and site, preoperative antibiotics, hospital length of stay, postoperative length of stay, time from admission to surgery, preoperative preparation medication (normal saline), stoma closure complications (wound infection, anastomotic leak), and the need for additional surgery.

Children were divided into two randomized groups: those who received an inpatient mechanical bowel regimen and those who did not undergo preoperative bowel preparation. A total of 55 patients were included to evaluate the impact of bowel

preparation on postoperative outcomes and hospital length of stay.

All patients were admitted to the hospital one to four days before surgery. Most patients (n=35) underwent preoperative bowel preparation, which included a fluid diet for two days and mechanical bowel preparation using normal saline (20 mL/kg) via Foley catheters on both sides of the colostomy. All patients also received preoperative antibiotics.

### Exclusion Criteria

1. Patients older than 4 years.
2. Ileostomy closure.
3. Duration of the operation.
4. Use of mannitol for irrigation.

**Data Analysis:** Data were coded and entered using SPSS version 24. Frequency, percentage, mean, standard deviation, and range were calculated. The Pearson Chi-square test was used to analyze differences in qualitative data. A p-value  $\leq 0.05$  was considered statistically significant.

### Results

The current study was performed on 55 patients, more than half of them were females 32 (58.2%) while the rest were males (41.8%). Among them were age 6- 12 months (32.7%), 13-24 months (45.5%), and older than 25 months were (21.8%). The original diagnosis of patients was Hirschsprung's Disease (54.5%), the rest group was diagnosed with Anorectal malformation 45.5%

The percentage of associated anomalies was 18.2% as shown in (Table 1).

**Table 1:** Distribution of the patients according to the demographic features of the patients, an indication of colostomy, and the presence of associated anomalies.

Demographic characteristics		Number (N = 55)	%
Age	6 M -12 M	18	32.7
	13 M-24 M	25	45.5
	> 25 M	12	21.8
Gender	Male	23	41.8
	Female	32	58.2
Original Diagnosis	Hirschsprung's Disease	30	54.5
	Anorectal malformation	25	45.5
Associated anomalies	Yes	10	18.2
	No	45	81.8

According to the site of colostomy was sigmoid colon in 23 (41.8%) patients and transverse colon in 32 (58.2%) patients. loop colostomy was the most common type in 35 (63.6%) while double colostomy was 20 (36.4%). About two-thirds of the patients had pre-operative bowel preparation 35 (63.6%) and 20 (36.4%) were without preparation. Prophylaxis antibiotics were applied in all 55 patients. (Table 2)

**Table 2:** Main operative criteria, Pre-operative preparations preceding and Prophylaxis Antibiotics;

Variable		Number (N = 55)	%
Site of colostomy	Sigmoid colon	23	41.8
	Transverse colon	32	58.2
Type of colostomy	Loop	35	63.6
	Double	20	36.4
Pre-op. preparation	Yes	35	63.6
	No	20	36.4

Prophylaxis Antibiotics	Yes	55	100
	No	0	0

Of the 55 cases, 20 cases (36.4%) of both groups founded had complications that vary between wound infection and anastomotic leak... etc. About twelve cases (21.8%) needed additional surgical intervention. (Table 3).

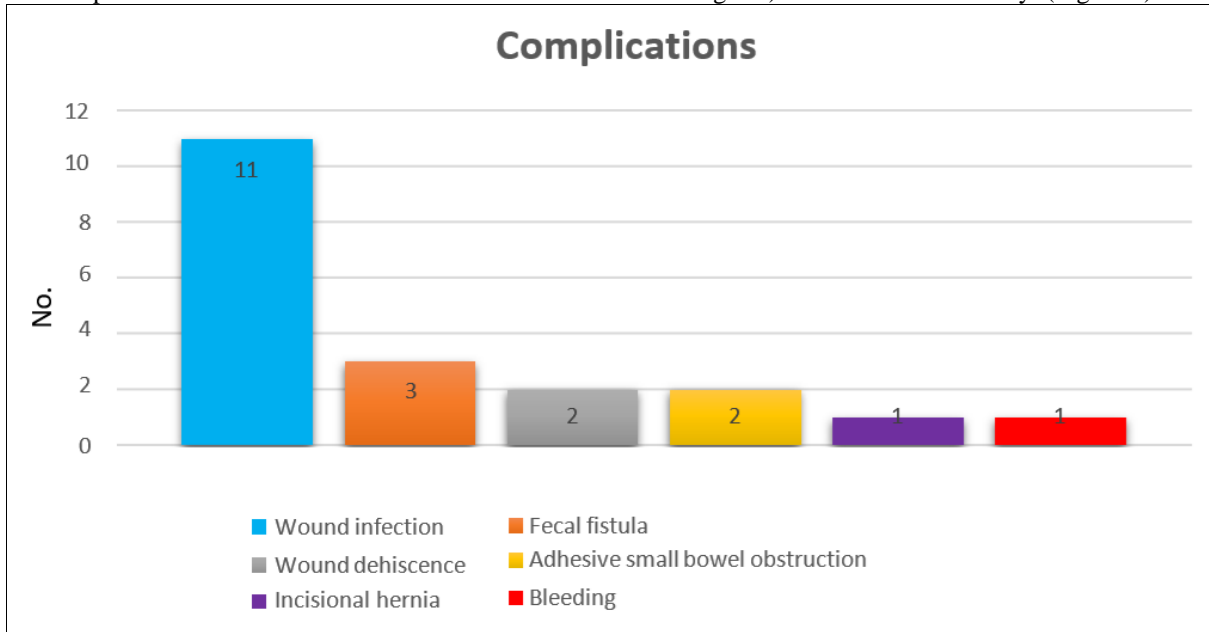
**Table 3:** Distribution of patients according to the presence of colostomy Closure complications and the need for additional surgery.

Variable		Number (N = 55)	%
Colostomy Closure Complication	Yes	20	36.4
	No	35	63.6
Need for additional surgery	Yes	12	21.8
	No	43	78.2

Twenty patients (36.4%) developed complications, the overall incidence of complications was as follow (eleven patients

developed wound infection 55%, three developed fecal fistulae 15%, two developed wound dehiscence and adhesive small

bowel obstruction 10%, one with an incisional hernia and one bleeding 5%) There was no mortality. (Figure 1)



**Fig 1:** Distribution of the patients who developed complications (n=20)

Table 4 shows the effect of different factors in relation to bowel preparation and the significant association between these factors. According to gender, there is a significant association between female gender in a comparison between the bowel preparation group and non-preparation group as the (P = 0.049), this was the same with Type of colostomy, Hospital Length of Stay pre-operative and Post-Operative Length of Stay as the p-value (0.025, 0.02 and 0.04) respectively. While the age, original

diagnosis, associated anomalies, prophylaxis antibiotics, complications, and the need for further surgery show no significant association with the two groups. (Table 4). Regarding morbidity (Table 5) show that there is a significant association between gender and type of colostomy with the morbidity among patients subjected to colostomy closure (P-value = 0.044, 0.013) respectively, while there was no association with the other factors. (Table 5).

**Table 4:** Comparison of various factors affected by either the bowel preparation or not.

Factors affected the result of bowel preparation				
Variable		Bowel preparation (n = 35)	No Bowel preparation (n = 20)	P-Value
Age	6 M -12 M	10	8	0.17
	13 M-24 M	16	9	
	< 25 M	9	3	
Gender	Male	12	11	0.049*
	female	23	9	
Original Diagnosis	Hirschsprung's Disease	21	9	0.455
	Anorectal malformation	14	11	
Associated anomalies		6	4	0.641
Prophylaxis Antibiotics		35	20	0.087
Site colostomy	of Sigmoid colon	18	5	0.135
	of Transverse colon	17	15	
Type colostomy	of Loop	20	15	0.025*
	of Double	15	5	
Hospital Length of Stay pre-operative (days)		3d (2-4)	2d (1-3)	0.02*
Post-operative Length of Stay (days)		6d (5-8)	8d (6-9)	0.04*
Colostomy closure Complications	Wound Infections	10	5	0.85
	Anastomotic Leak	2	3	
	Non- complicated	23	12	
Need Additional Surgeries	for Yes	8	4	0.741
	for No	27	16	

\*. The Chi-square statistic is significant at the .05 level. t Student's t-test

**Table 5:** Factors affecting morbidity among patients subjected to colostomy closure.

Variables		Morbidity in MBP (N=35)		Morbidity in NO MBP (N=20)		p-value
		Yes (N=12)	No (N=23)	Yes (N=13)	No (N=7)	
Gender, No. (%)	Male	7 (58.3)	5 (41.7)	6 (54.5)	5 (45.5)	0.044*
	Female	5 (21.7)	18 (78.3)	7 (77.8)	2 (22.2)	
Indication of colostomy, No. (%)	Hirschsprung's disease	6 (28.6)	15 (71.4)	4 (44.4)	5 (55.6)	0.064
	Anorectal malformation	6 (42.9)	8 (57.1)	9 (81.8)	2 (18.2)	
Associated anomalies, No. (%)		2 (40)	4 (60)	2 (50)	2 (50)	0.175
Prophylaxis Antibiotics, No. (%)		12 (34.3)	23 (65.7)	13 (65)	7 (35)	0.368
Site of colostomy, No. (%)	Sigmoid colon	7 (38.9)	11 (61.1)	2 (40)	3 (60)	0.873
	Transverse colon	5 (29.4)	12 (70.6)	11 (73.3)	4 (26.7)	
Type of colostomy, No. (%)	Double	2 (13.3)	13 (86.7)	1 (20)	4 (80)	0.013*
	Loop	10 (50)	10 (50)	12 (80)	3 (20)	
Complication, No. (%)		6 (40.0)	9 (60.0)	3 (60)	2 (40)	0.452

## Discussion

This study evaluated the impact of mechanical bowel preparation (MBP) on postoperative outcomes and complications in pediatric patients undergoing colostomy closure. The average age of patients was 1-2 years, consistent with findings by Hassan K. *et al.* [20], who reported an average age of 2.4 years. A younger age range was noted by Islam S. *et al.* [21], with patients aged 6 to 15 months, possibly due to differences in sample size. More than half of the patients in this study were females, which might also reflect the limited sample size. Hirschsprung's disease (HD) was the most common diagnosis (54.5%), followed by anorectal malformation (ARM) (45.5%). This aligns with Hassan K. *et al.* [20], who reported similar rates of HD (54.7%) and ARM (45.3%). Islam S. *et al.* [21], however, found a lower prevalence of HD (14.9%), likely due to differences in study duration and population. Preoperative preparation was performed in 63.6% of cases, higher than the 55% reported by Aldrink JH *et al.* [22]. Complication rates in this study were 48.6% in MBP patients and 45% in non-MBP (NMBP) patients. This is higher than Koen Zwart *et al.* [23], who reported 10.1% and 9.1%, respectively, potentially due to differences in preparation techniques or medications used (e.g., normal saline). The most common complication was wound infection (27.2%), higher than Maarten Janssen *et al.* and Chandramouli *et al.* [25], who reported rates of 13-25% and 12.6%, respectively. This may be linked to poor preoperative preparation or antibiotic resistance. Fecal fistula occurred in 5.4% of MBP patients, consistent with Hassan K. *et al.* [20] (5.7%), while Nasir, A.A. *et al.* [26] reported no cases. Wound dehiscence was found in 3.6% of MBP patients, similar to 3.8% in Hassan K. *et al.* [20]. Incisional hernia occurred in 1.8% of MBP patients, matching RN Haricharan [26]. These results underscore the importance of proper surgical techniques and fascial closure. Complications were higher in males (58.3%) for MBP patients, while females showed higher morbidity (77.8%) in NMBP patients, surpassing rates reported by Srinivasan K. *et al.* [27]. Complications were more frequent in ARM patients (42.9% MBP, 81.8% NMBP) compared to HD patients (28.6% MBP, 44.4% NMBP), potentially due to primary pathology-associated issues such as malnutrition and intestinal obstruction. Stomal complications were reported in 40% of MBP patients and 60% of NMBP patients, similar to Hassan K. *et al.* [20], where 40 out of 106 patients had stomal complications. The higher complication rates in transverse and loop colostomies, as seen in this study, align with findings by Srinivasan K. *et al.* [28] and S Nour *et al.* [29], emphasizing that loop colostomies, particularly transverse ones, are associated with higher risks compared to sigmoid colostomies. Antibiotics were administered preoperatively to all patients, yet complications occurred in

34.3% of MBP and 65% of NMBP patients. This suggests antibiotic resistance or multifactorial interactions as potential contributors, similar to Nasir, A.A. *et al.* [30]. These findings highlight the need for refined preparation techniques and better antibiotic stewardship to improve outcomes.

## Conclusion

The present study shows that preoperative mechanical bowel preparation (MBP) for colostomy closure is unnecessary and time-consuming, with no significant differences in complications such as anastomotic leaks or infections between MBP and non-MBP groups. Wound infection was common, and loop transverse colostomies had higher morbidity. Hirschsprung's disease was associated with more complications than anorectal malformations.

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