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EVALUATION OF MECHANICAL BOWEL PREPARATION IN ELECTIVE COLORECTAL SURGERY

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ABSTRACT

Background: Complications in elective colorectal surgery, such as surgical site infection and anastomotic leakage, wound infection and abdominal abscess frequently resulted from inadequate bowel preparation practices. Mechanical bowel preparation (MBP) was employed to mitigate these risks by thoroughly cleansing the bowel before surgery. However, due to conflicting research findings, a study was conducted to assess MBP's specific impact on our patient population, aiming to provide clarity on its role in optimizing surgical outcomes.

Objective: To evaluate the impact of mechanical bowel preparation (MBP) compared to non-MBP on surgical outcomes.

Methods: A total of 132 patients undergoing colorectal surgery at Surgical Unit II, Bolan Medical Complex Hospital Quetta, meeting inclusion criteria were enrolled after taking informed written consent and were randomly divided into two equal groups. Patients in Group A underwent colorectal surgery following MBP, while Group B underwent surgery without MBP. Patients on MBP fasted on a liquid diet until midnight pre-surgery; others had a low-residue diet until then. Both groups took 10 mg diazepam and 150 mg ranitidine orally for anxiety and sleep. Intravenous antibiotics (metronidazole 500 mg, ceftriaxone 1g) were given at induction and post-op for 72 hours. All the procedure was performed as per standard protocol of the hospital and data was noted for analysis.

Results: Mean age of the patients was 49.94 years (±9.60). In terms of gender distribution, 56.8% (75 patients) were male, and 43.2% (57 patients) were female. Regarding their place of residence, 56.1% (74 patients) were from rural areas, and 43.9% (58 patients) were from urban areas. Moreover, comparison of baseline characteristics between the groups showed insignificant difference with p-value>0.05. The prevalence of constipation was 59.8% whereas bleeding was observed in 58.3% of the patients. Abdominal pain was reported by 29.5% of the patients, anorexia affected 58.3% of the patients, and weight loss was noted in 47.7% of the patients. For wound infection, Group A had 23 cases (34.8%) compared to 17 cases (25.8%) in Group B (p=0.256). Abdominal abscess occurred in 17 cases (25.8%) and 15 cases (22.7%) in Group A and B (p=0.685), respectively. Anastomotic leak was reported in 7 cases (10.6%) in Group A and 5 cases (7.6%) in Group B (p=0.545). Surgical site infection was noted in 10 cases (15.2%) in Group A and

11 cases (16.7%) in Group B (p=0.812).
Across all measured outcomes, difference between the groups was not statistically significant, suggesting similar incidences of these complications between the groups.
Conclusion: This study found no significant differences in surgical outcomes between MBP and non-MBP groups, challenging MBP's routine use and highlighting the need for evidence-based guidelines in colorectal surgery.

Key Words: Elective Colorectal Surgery, Mechanical Bowel Preparation.

Introduction

Colorectal surgery encompasses a range of surgical procedures performed to treat conditions affecting the colon, rectum, and anus. It addresses various conditions such as colorectal cancer, inflammatory bowel diseases (like Crohn's disease and ulcerative colitis), diverticular disease, and benign anorectal conditions.[1] Surgical interventions can involve tumor removal, bowel resection, colostomy or ileostomy creation, and minimally invasive techniques like laparoscopic or robotic-assisted surgeries, tailored to each patient's specific medical needs and clinical situation.[2] Nevertheless, there are hazards associated with surgical treatments. Anastomotic leakage (AL) and surgical site infections (SSI), with occurrences reported between 3-30% and 5-30%, respectively, are two of the most prevalent postoperative sequelae.[3]

Patient outcomes are significantly impacted by postoperative complications (POCs).[4] According to reports, depending on the type and degree of the complication as well as the study design, these complications and disturbances from the anticipated postoperative course, occur in 10–37% of cases.[4,5] It is commonly known that these consequences have an impact on quality of life and survival rates.[6,7] It has been suggested that MBP, which often involves the evacuation of intestinal contents by oral or rectal methods, has a number of advantages.[8,9] But MBP is also linked to certain side effects, like electrolyte and fluid imbalances.[10]

Numerous studies have demonstrated that patients undergoing colorectal surgery with and without MBP do not significantly differ in their rates of wound infection, abdominal abscess, anastomotic leak, or surgical site infections.[11,12,13] For example, a study discovered that the MBP group experienced considerably more abdominal abscesses (18.87% vs. 1.89%; p-value=0.012) and wound infections (45.28% vs. 20.76%; p-value=0.003) than the non-MBP group.[14] The current evidence is primarily derived from international studies, with no significant local studies available to the best of the candidate's knowledge. In a developing country like Pakistan, where healthcare facilities are limited and patient awareness about hygiene is low, it is crucial to assess the relevance of these findings in a local context. Therefore, this study aimed evaluation of the impact of MBP on postoperative outcomes in elective colorectal surgery within Pakistan. The goal was to provide more conclusive evidence that could guide treatment protocols and improve patient outcomes in colorectal surgery.

Methodology

This randomized controlled trial was conducted for a period of one year from June, 2023 to June, 2024 after approval from hospital's ethical review committee. A sample size of 132 patients scheduled for elective colorectal surgery was determined based on the reported wound infection rates of 45.28% in MBP group versus 20.76% in non-MBP group.[14] Patients included were aged between 30-70 years and of both genders, provided they were undergoing elective colorectal surgery. Exclusion criteria encompassed patients who had undergone a colonoscopy within seven days prior to surgery, those who refused to provide informed consent, patients with preoperative comorbidities like chronic obstructive pulmonary disease, diabetes, asthma, immunodeficiency, coagulopathy, individuals with renal failure, pregnant and lactating women and patients requiring emergency procedures due to obstructive features. Participants were randomly assigned to two groups. Group A underwent colorectal surgery following MBP, while Group B underwent surgery without MBP. The MBP group received oral preparation using two packs of polyethylene glycol

dissolved in two liters of water, consumed over 12–16 hours before surgery. Vital signs were monitored both before and after preparation, with corrections made for any abnormalities. Patients on MBP were restricted to a liquid diet until midnight before surgery, whereas those without MBP were allowed a low-residue diet until the same time. All patients received premedication with 10 mg of diazepam orally the night before surgery to reduce anxiety and ensure sound sleep, along with 150 mg of ranitidine taken with sips of water. Broad-spectrum intravenous antibiotics (metronidazole 500 mg and ceftriaxone 1g) were administered at the time of induction and continued postoperatively for 72 hours. To eliminate bias, the operating surgeon was blind regarding patients' preparation status. The data analysis was done with SPSS 26.0.

Results

The study sample consisted of 132 participants with a mean age of 49.94 years (±9.60). Of these participants, 40.2% (53 patients) were aged between 30 and 50 years, while 59.8% (79 patients) were aged between 51 and 70 years. In terms of gender distribution, 56.8% (75 patients) were male, and 43.2% (57 patients) were female. Regarding their place of residence, 56.1% (74 patients) were from rural areas, and 43.9% (58 patients) were from urban areas, as given in Table-1. Moreover, comparison of baseline characteristics between the groups showed insignificant difference with p-value>0.05, as given in Table-1.

The prevalence of constipation was 59.8% overall, with 66.7% in Group A and 53.0% in Group B (p-value = 0.110). Bleeding was observed in 58.3% of the patients, with a distribution of 57.6% in Group A and 59.1% in Group B (p-value = 0.860). Abdominal pain was reported by 29.5% of the patients, with 24.2% in Group A and 34.8% in Group B (p-value = 0.182). Anorexia affected 58.3% of the patients, with 54.5% in Group A and 62.1% in Group B (p-value = 0.377). Weight loss was noted in 47.7% of the patients, with 48.5% in Group A and 47.0% in Group B (p-value = 0.862). Groups were statistically comparable, as given in Table-2.

For Wound Infection, Group A had 23 cases (34.8%) compared to 17 cases (25.8%) in Group B (p=0.256). Abdominal Abscess occurred in 17 cases (25.8%) in Group A and 15 cases (22.7%) in Group B (p=0.685). Anastomotic Leak was reported in 7 cases (10.6%) in Group A and 5 cases (7.6%) in Group B (p=0.545). Surgical Site Infection (SSI) was noted in 10 cases (15.2%) in Group A and 11 cases (16.7%) in Group B (p=0.812). Across all measured outcomes, the difference was insignificant between the groups, suggesting similar incidences of these complications between Group A and Group B cohorts, as given in Table-3.

Table-1 Demographics of the Study Sample

Characteristics	Study Sample n=132	Group A n=66	Group B n=66	p-value
Age (years)	49.94±9.60	50.56±8.99	49.32±10.20	0.459 *
• **30-50 years**	53 (40.2%)	23 (34.8%)	30 (45.5%)	0.214 **
• **51-70 years**	79 (59.8%)	43 (65.2%)	36 (54.5%)	
Gender				
• **Male**	75 (56.8%)	36 (54.5%)	39 (59.1%)	0.598 **
• **Female**	57 (43.2%)	30 (45.5%)	27 (40.9%)	
Residence				
• **Rural**	74 (56.1%)	35 (53.0%)	39 (59.1%)	0.483 **
• **Urban**	58 (43.9%)	31 (47.0%)	27 (40.9%)	

Comparison between the groups: * Independent Sample ** Chi square test, taking p-value≤0.05 as significant

Table-2 Comparison of Presenting Symptoms between the Groups

Characteristics	Study Sample n=132	Group A n=66	Group B n=66	p-value

• **Constipation**	79 (59.8%)	44 (66.7%)	35 (53.0%)	0.110
• **Bleeding**	77 (58.3%)	38 (57.6%)	39 (59.1%)	0.860
• **Abdominal Pain**	39 (29.5%)	16 (24.2%)	23 (34.8%)	0.182
• **Anorexia**	77 (58.3%)	36 (54.5%)	41 (62.1%)	0.377
• **Weight Loss**	63 (47.7%)	32 (48.5%)	31 (47.0%)	0.862

Comparison between the groups: Chi square test, taking p-value≤0.05 as significant

Table-3 Comparison of Study Outcomes between the Groups

Study Variables	Yes/No	Group A n=66	Group B n=66	p-value
Wound Infection	Yes	23 (34.8%)	17 (25.8%)	0.256
	No	43 (65.2%)	49 (74.2%)	
Abdominal Abscess	Yes	17 (25.8%)	15 (22.7%)	0.685
	No	49 (74.2%)	51 (77.3%)	
Anastomotic Leak	Yes	7 (10.6%)	5 (7.6%)	0.545
	No	59 (89.4%)	61 (92.4%)	
Surgical Site Infection (SSI)	Yes	10 (15.2%)	11 (16.7%)	0.812
	No	56 (84.8%)	55 (83.3%)	

Comparison between the groups: Chi-square test, taking p-value≤0.05 as significant

Discussion

Elective colorectal surgery requires effective bowel preparation to prevent complications such as infections and leaks.[15,16] Mechanical bowel preparation is conventionally used for pre-surgical cleansing, but its efficacy and necessity are debated.[17,18] This study investigated the specific impact of MBP on our patient group to establish evidence-based guidelines. It aimed to clarify the role of MBP in optimizing surgical outcomes and address the need for standardized protocols. By contributing insights into MBP's utility in enhancing safety and efficacy during colorectal surgery, the research aimed to inform clinical practices and improve patient outcomes as existing literature was not conclusive.[11,12,13,14]

Mean age of the patients in this study was 49.94±9.60 years. Our findings are almost similar to the results of Khan et al. (2020)[11] in Pakistan and Bhat et al. (2016)[13] in India as 48.51±9.82 and 51±18.15 years, respectively. Consistent age data supports study comparability across regions.

In terms of gender distribution, 56.8% (75 patients) were male, and 43.2% (57 patients) were female. This male dominance in the study cohort was also reported by some other studies as 75.0%, 68.7%, 57.0% and 56.0% by Khan et al. (2020)[11] in Pakistan, Islam et al. (2022)[14] in Bangladesh, Bhat et al. (2016)[13] in India and Panja et al. (2023)[12] in India, respectively. The study's gender distribution aligns with regional trends, indicate potential gender-based factors in disease prevalence.

Regarding their place of residence, 56.1% (74 patients) were from rural areas, and 43.9% (58 patients) were from urban areas. In an Indian study conducted by Bhat et al. (2016),[13] rural participants were 74% of the total population. The higher rural representation highlights potential access and healthcare disparity issues.

Moreover, comparison of baseline characteristics between the groups showed insignificant difference with p-value>0.05.

The prevalence of constipation was 59.8% overall, with 66.7% in Group A and 53.0% in Group B (p-value = 0.110). Bleeding was observed in 58.3% of the patients, with a distribution of 57.6% in Group A and 59.1% in Group B (p-value = 0.860). Abdominal pain was reported by 29.5% of the patients, with 24.2% in Group A and 34.8% in Group B (p-value = 0.182). Anorexia affected 58.3% of the patients, with 54.5% in Group A and 62.1% in Group B (p-value = 0.377). Weight loss was noted in 47.7% of the patients, with 48.5% in Group A and 47.0% in Group B (p-value=0.862). Previously, Bhat et al. (2016)[13] reported presenting symptoms in their study

population as constipation (49.0%), bleeding (58.2%), abdominal pain (38.8%), anorexia (52.0%) and weight loss (46.9%). Similar symptom prevalence suggests consistent clinical patterns across different studies.

For wound infection, Group A had 23 cases (34.8%) compared to 17 cases (25.8%) in Group B (p=0.256). Previously similar insignificant difference between the groups was reported by Panja et al. (2023)[12] as 20.0% vs. 16.0%; p-value=0.712 and by Bhat et al. (2016)[13] as 39.4% vs. 32.6%; p-value=0.31. However, significantly high frequency of wound infection in mechanical bowel preparation group was reported by Islam et al. (2022)[14] as 45.28% vs. 20.76%; p-value=0.003. The varying wound infection rates suggest inconsistencies in outcomes across studies, potentially influenced by differing methodologies or patient populations.

Abdominal Abscess occurred in 17 cases (25.8%) in Group A and 15 cases (22.7%) in Group B (p=0.685). However, Islam et al. (2022)[14] reported significantly higher frequency of abdominal abscess in group A than group B (18.87% vs. 1.89%; p-value=0.012).

In this study, Anastomotic Leak was reported in 7 cases (10.6%) in Group A and 5 cases (7.6%) in Group B (p=0.545). Bhat et al. (2016)[13] reported insignificant difference in frequency of anastomotic leak between the groups (p-value=0.45). Khan et al. (2020)[11] and Panja et al. (2023)[12] reported it as 13.8% vs. 17.5%; p-value=0.514 and 12.0% vs. 8.0%; p-value=0.637, respectively. The study shows no significant difference in AL rates between the groups, corroborating previous findings.

Surgical Site Infection (SSI) was noted in 10 cases (15.2%) in Group A and 11 cases (16.7%) in Group B (p=0.812). Khan et al. (2020) also reported insignificant difference between the group A and B (10.0% vs. 15.0%; p-value=0.339), respectively.

Conclusion

This study comparing MBP with non-MBP in elective colorectal surgery found no significant differences in anastomotic leak, abdominal abscess, wound infection, and surgical site infection rates. These findings challenge routine MBP use, highlighting the need for evidence-based guidelines to optimize colorectal surgery outcomes.

Limitations & Recommendations

This study's strengths include a precisely defined patient population and meticulous data collecting, both of which increase the validity of the conclusions. Furthermore, a comparison of MBP and non-MBP groups provides important information about why MBP is required for colorectal surgery. A comparatively limited sample size and the possibility of selection bias are drawbacks, though. Furthermore, the results' applicability to larger, more diverse populations may be limited by the study's single-center approach.

Conflict of Interest: None
Source of Funding: None

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