Original Article

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Quick Response Code:

Website: www.herniasurgeryjournal.org

DOI: 10.4103/ijawhs.ijawhs_15_25

Early postoperative morbidity and risk stratification in intestinal stoma surgery: A single-center experience

Shahbaz Bashir[1], Yawar Nazir[1], Bilal Ahmad Wagay[1], Rumaisa Ayoub[2], Rauf A. Wani[1]

Abstract

BACKGROUND: Intestinal stomas remain an essential aspect of surgical practice despite medical technology advances. This study aimed to evaluate the early postoperative morbidity associated with diversion stomas in both elective and emergency settings.

MATERIALS AND METHODS: A prospective observational study was conducted over 3 years (June 2020 to May 2023) in the Department of General and Minimal Invasive Surgery. All patients aged >18 years undergoing intestinal stoma formation for benign and malignant conditions were included. Early postoperative complications were recorded and analyzed.

RESULTS: A total of 148 patients were included, with 102 (69%) males. The most common procedure was loop ileostomy (105, 71%). Early postoperative complications occurred in 101 (68%) patients, with skin excoriation (53, 36%), mucosal necrosis (31, 21%), and retraction (21, 14%) being the most frequent. Multivariate logistic regression analysis identified emergency surgery (odds ratio [OR]: 2.6, 95% confidence interval [CI]: 1.4–4.9, $P = 0.002$), low serum albumin (<3 g/dL) (OR: 3.1, 95% CI: 1.5–6.3, $P = 0.001$), and ileostomy formation (OR: 2.8, 95% CI: 1.3–5.7, $P = 0.003$) as independent predictors of early postoperative complications. Trainee-led surgeries (OR: 2.4, 95% CI: 1.2–4.8, $P = 0.009$) and malignancy (OR: 2.2, 95% CI: 1.1–4.5, $P = 0.025$) were also significantly associated with increased morbidity.

CONCLUSION: Early postoperative complications following stoma formation remain significant. Ileostomies were associated with higher complication rates than colostomies. Patient factors, surgical expertise, and operative conditions significantly influence outcomes. The development of specialized stoma care teams and early involvement of enterostomal therapists may help in early detection and management of complications. Regular audit of outcomes and complications can identify areas for improvement in surgical technique and perioperative care.

Keywords:

Cancer, colostomy, complications, gangrene, ileostomy, stoma

[1]Department of General and Minimal Access Surgery, SKIMS, [2]Department of Anesthesiology, GMC Srinagar, Srinagar, Jammu and Kashmir, India

Address for correspondence:
Dr. Shahbaz Bashir, Department of General and Minimal Access Surgery, SKIMS, Soura, Srinagar 190011, Jammu and Kashmir, India.
E-mail: followshahbaz@gmail.com

Submitted: 05-Feb-2025
Revised: 12-Jul-2025
Accepted: 15-Jul-2025
Published: 30-Sep-2025

Introduction

The construction of an intestinal ostomy represents a major life event for patients, potentially impacting their quality of life. Despite advances in surgical techniques and medical management, intestinal ostomies remain an indispensable aspect of surgical practice.[1,2] These procedures are performed for various conditions, including colorectal cancer, inflammatory bowel disease, and trauma.[3,4]

Complication rates following stoma formation vary widely in the literature, ranging from 21% to 70%.[5] This variation may be attributed to differences in assessment methods, timing of evaluation, and definition of complications. Understanding these complications and their risk factors is crucial for improving patient outcomes.

How to cite this article: Bashir S, Nazir Y, Wagay BA, Ayoub R, Wani RA. Early postoperative morbidity and risk stratification in intestinal stoma surgery: A single-center experience. Int J Abdom Wall Hernia Surg 2025;8:164-9.

Materials and Methods

Study design and setting

A prospective observational study was conducted from June 2020 to May 2023 in the Department of General and Minimal Invasive Surgery at a tertiary care center. The study was approved by the institutional ethics committee and was conducted according to ethical guidelines established by the Declaration of Helsinki and other guidelines like Good Clinical Practice Guidelines and those established by the Indian Council of Medical Research.

Inclusion and exclusion criteria

Patients aged >18 years undergoing intestinal stoma formation for benign and malignant conditions were included. Exclusion criteria were stomas for gynecological diseases, metastatic cancers, and urinary diversions.

Data collection

Patient demographics, clinical presentation, surgical details, and postoperative complications were recorded using a standardized checklist. Early complications were defined as those occurring within 30 days of surgery.

Statistical analysis

Data analysis was performed using Statistical Package for the Social Sciences version 2.0. Descriptive statistics were used to summarize patient demographics, clinical characteristics, and outcomes. Categorical variables were analyzed using the chi-square test, with a P value < 0.05 considered statistically significant.

To identify independent predictors of early postoperative complications, a multivariate logistic regression analysis was performed. Factors with a P value < 0.05 in univariate analysis were included in the regression model. Adjusted odds ratios (ORs) with 95% confidence intervals (CIs) were calculated to determine the strength of association between risk factors and complications.

Results

Patient demographics

Among the 148 patients studied, males constituted the majority (69%, n = 102) of cases. The predominant age group was 46–60 years (38%, n = 56), followed by 31–45 years (24%, n = 35). Rural patients comprised 68% (n = 101) of the study population, reflecting the hospital's catchment area demographics [Table 1]. The mean age of presentation was 52.3 ± 14.7 years.

Clinical presentation

Constipation was the most frequent presenting symptom (95%, n = 141), followed by abdominal pain (77%, n = 114) and per rectal bleeding (68%, n = 101). Abdominal tenderness was observed in 53% (n = 79) of cases, while vomiting was present in 35% (n = 52). The duration of symptoms ranged from 2 days to 6 months, with a median duration of 2.5 months [Table 2].

Patient characteristics

Approximately half of the patients (49%, n = 73) had no comorbidities. Among those with comorbidities, hypertension was most common (21%, n = 31), followed by diabetes mellitus (19%, n = 28). Serum albumin levels were adequate (>3.5 g/dL) in 49% (n = 73) of patients, while 16% (n = 24) had levels below 3.0 g/dL, indicating poor nutritional status [Table 3].

Perioperative characteristics

Most procedures (76%, n = 113) were performed in an elective setting, with consultant surgeons performing 78% (n = 115) of operations. Malignancy was the predominant indication (79%, n = 117), with 76% of these patients receiving neoadjuvant therapy. Preoperative stoma site marking was performed in 83% (n = 94) of elective cases [Table 4].

Table 1: Patient demographics (n = 148)

Characteristic	Category	n (%)
Gender	Male	102 (69)
	Female	46 (31)
Age (year)	<30	16 (11)
	31–45	35 (24)
	46–60	56 (38)
	61–75	33 (22)
	>75	8 (5)
Domicile	Rural	101 (68)
	Urban	47 (32)

Table 2: Clinical presentation

Symptom	n (%)
Constipation	141 (95)
Abdominal pain	114 (77)
Bleeding PR	101 (68)
Abdominal tenderness	79 (53)
Vomiting	52 (35)
Abdominal mass	32 (22)

PR = per rectal

Table 3: Comorbidities and serum albumin levels

Parameter	Category	n (%)
Comorbidities	Hypertension	31 (21)
	Diabetes mellitus	28 (19)
	Both HTN and DM	14 (9)
	Hypothyroidism	2 (1)
	None	73 (49)
Serum albumin (g/dL)	>3.5	73 (49)
	3.0–3.5	51 (34)
	2.5–3.0	16 (11)
	2.0–2.5	8 (5)

HTN: hypertension, DM: diabetes mellitus

Types of stomas

Loop ileostomy was the most frequently performed procedure (71%, $n = 105$), followed by end ileostomy (9%, $n = 14$). Colostomies comprised 20% ($n = 29$) of all cases, with a similar distribution between end and loop configurations [Table 5].

Early postoperative complications

Complications occurred in 68% ($n = 101$) of patients, with skin excoriation being most common (36%, $n = 53$), as shown in Figure 1A. Mucosal necrosis occurred in 21% ($n = 31$) of cases, while retraction and mucocutaneous separation each affected 14% ($n = 21$) of patients, as shown in Figure 1B. Reoperation was required in 11% ($n = 16$) of cases, primarily for stoma revision or complications. Prolapse of the stoma occurred in 9% patients, as shown in Figure 1C. These findings are summarized in Table 6.

Table 4: Perioperative characteristics

Characteristic	Category	*n* (%)
Surgery setting	Elective	113 (76)
	Emergency	35 (24)
Disease nature	Malignant	117 (79)
	Benign	31 (21)
Neoadjuvant therapy	Yes	89 (76.0)
	No	28 (24.0)
Operating surgeon	Consultant	115 (78)
	Trainee	33 (22)

Table 5: Types of stomas performed

Type	*n* (%)
Loop ileostomy	105 (71)
End ileostomy	14 (9)
End sigmoid colostomy	12 (8)
Loop sigmoid colostomy	12 (8)
Loop transverse colostomy	3 (2)
End transverse colostomy	2 (1)

Factors associated with complications

Statistical analysis revealed significant associations between complications and various factors. Emergency surgery (80% vs 40%, $P < 0.05$), trainee surgeons (79% vs 37%, $P < 0.05$), and ileostomies (77% vs 42%, $P < 0.05$) were associated with higher complication rates. Low serum albumin (<3 g/dL) and malignant disease also showed significant associations with increased morbidity [Table 7]. A multivariate logistic regression analysis identified emergency surgery (OR: 2.6, 95% CI: 1.4–4.9, $P = 0.002$), low serum albumin (<3 g/dL) (OR: 3.1, 95% CI: 1.5–6.3, $P = 0.001$), and ileostomy formation (OR: 2.8, 95% CI: 1.3–5.7, $P = 0.003$) as independent predictors of early postoperative complications.

Table 6: Early postoperative complications

Complication	*n* (%)
Skin excoriation	53 (36)
Mucosal necrosis	31 (21)
Retraction	21 (14)
Mucocutaneous separation	21 (14)
Obstruction	19 (13)
Gangrene	16 (11)
Prolapse	14 (9)
Abscess	14 (9)

Table 7: Association of complications with various factors

Factor	Category	Odds ratio	95% confidence interval	*P* value
Surgery setting	Emergency vs. elective	2.6	1.4–4.9	0.002
Type of stoma	Ileostomy vs. colostomy	2.8	1.3–5.7	0.003
Serum albumin	<3 g/dL vs. ≥3 g/dL	3.1	1.5–6.3	0.001
Operating surgeon	Trainee vs. consultant	2.4	1.2–4.8	0.009
Disease nature	Malignant vs. benign	2.2	1.1–4.5	0.025

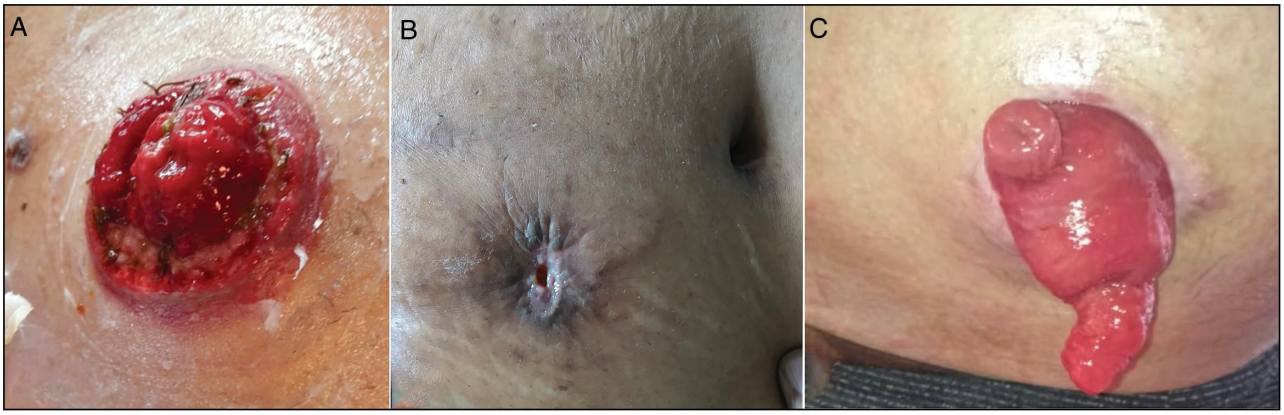

Figure 1: Complications (A) peristomal skin excoriation; (B) retraction of stoma; and (C) prolapse of stoma

Discussion

Complications after formation of ileostomy and colostomy are very common today. These complications include skin excoriation, mucosal necrosis, and prolapse obstruction. These complications can severely compromise the daily activity as well as the quality of patients' life. Efforts should be made right from the preoperative period to address the factors that lead to these complications so as to decrease their incidence and severity. Our study demonstrates that early complications following stoma formation remain a significant challenge, with an overall complication rate of 68.2%. This finding aligns with those of previous studies reporting rates between 21% and 70%.[1,2] The wide variation in reported rates may reflect differences in definition, classification, and duration of follow-up.[3] The predominance of loop ileostomies (71.4%) in our series reflects current surgical practice, particularly in the context of rectal cancer management.[4,5] The higher complication rate observed with ileostomies compared to colostomies (76.5% *vs.* 41.7%, $P < 0.05$) corroborates findings from several studies.[6,7] This difference is attributed to the corrosive nature of small bowel output and higher output volumes.[8] Skin excoriation, affecting 36% of our patients, emerged as the most frequent complication. This rate falls within the reported range of 3%–42%.[9,10] The higher incidence with ileostomies emphasizes the importance of meticulous stoma care and appropriate appliance selection.[11] Emergency surgery was associated with significantly higher complication rates (80% *vs.* 39.6%, $P < 0.05$). This finding supports those of previous studies highlighting the adverse impact of emergency settings on stoma outcomes.[12,13] Factors contributing to this include suboptimal preoperative preparation, compromised tissue planes, and technical challenges.[14] The influence of surgeon experience on outcomes (trainee 78.6% *vs.* consultant 36.7%, $P < 0.05$) underscores the technical nature of stoma formation.[15] This finding supports the argument for specialized training in stoma surgery and appropriate supervision of trainees.[16] Nutritional status, reflected by serum albumin levels, significantly influenced outcomes. Patients with levels below 3 g/dL experienced more complications (70% *vs.* 35.8%, $P < 0.05$), consistent with previous reports.[17,18] This highlights the importance of preoperative nutritional optimization when feasible. The higher complication rate in malignant conditions (76% *vs.* 38.5%, $P < 0.05$) may be attributed to various factors including prior radiotherapy, compromised tissue healing, and altered anatomy.[19,20] This finding emphasizes the need for careful patient selection and meticulous techniques in oncological cases.

Our study has several limitations. The relatively short follow-up period may underestimate the true complication rate. Additionally, the single-center nature of the study may limit its generalizability. Future multi-center studies with longer follow-up periods are needed to validate these findings.[3,21]

Central illustration

Figure 2 summarizes the study including the perioperative parameters, risk factors, and the complications.

Conclusion

Early postoperative complications following stoma formation remain significant. Patient factors, surgical expertise, and operative conditions significantly influence outcomes. Ileostomies were associated with higher complication rates than colostomies. Our findings emphasize the need for a multifaceted approach to reducing stoma-related morbidity.

Preoperative optimization of nutritional status, especially in patients with malignancy, should be prioritized whenever possible. The significant impact of surgeon experience suggests that dedicated training programs and supervision protocols for trainees performing stoma surgery could improve outcomes. In emergency settings, where possible, involvement of experienced surgeons may help mitigate complications. Implementation of standardized protocols for stoma marking and construction, particularly in emergency cases, could help reduce technical complications.

Furthermore, the development of specialized stoma care teams and early involvement of enterostomal therapists may help in early detection and management of complications. Regular audit of outcomes and complications can identify areas for improvement in surgical techniques and perioperative care. Future research should focus on developing risk prediction models to identify high-risk patients who may benefit from additional preventive measures or more intensive monitoring.

Author contributions

SB and YN: conceptualization, SB and RA: methodology, SB, YN, and RA: formal analysis and investigation, SB: writing – original draft preparation; funding acquisition: [not applicable], resources: [not applicable], SB: supervision.

Ethical policy and Institutional Review Board statement

The Institutional Ethics Committee of SKIMS, Soura, Srinagar, J&K, India (IEC/SKIMS protocol #RP 172 /2022 dated 11/10/2022), approved this study.

Declaration of patient consent

Written informed consent was obtained from all individual participants included in the study.

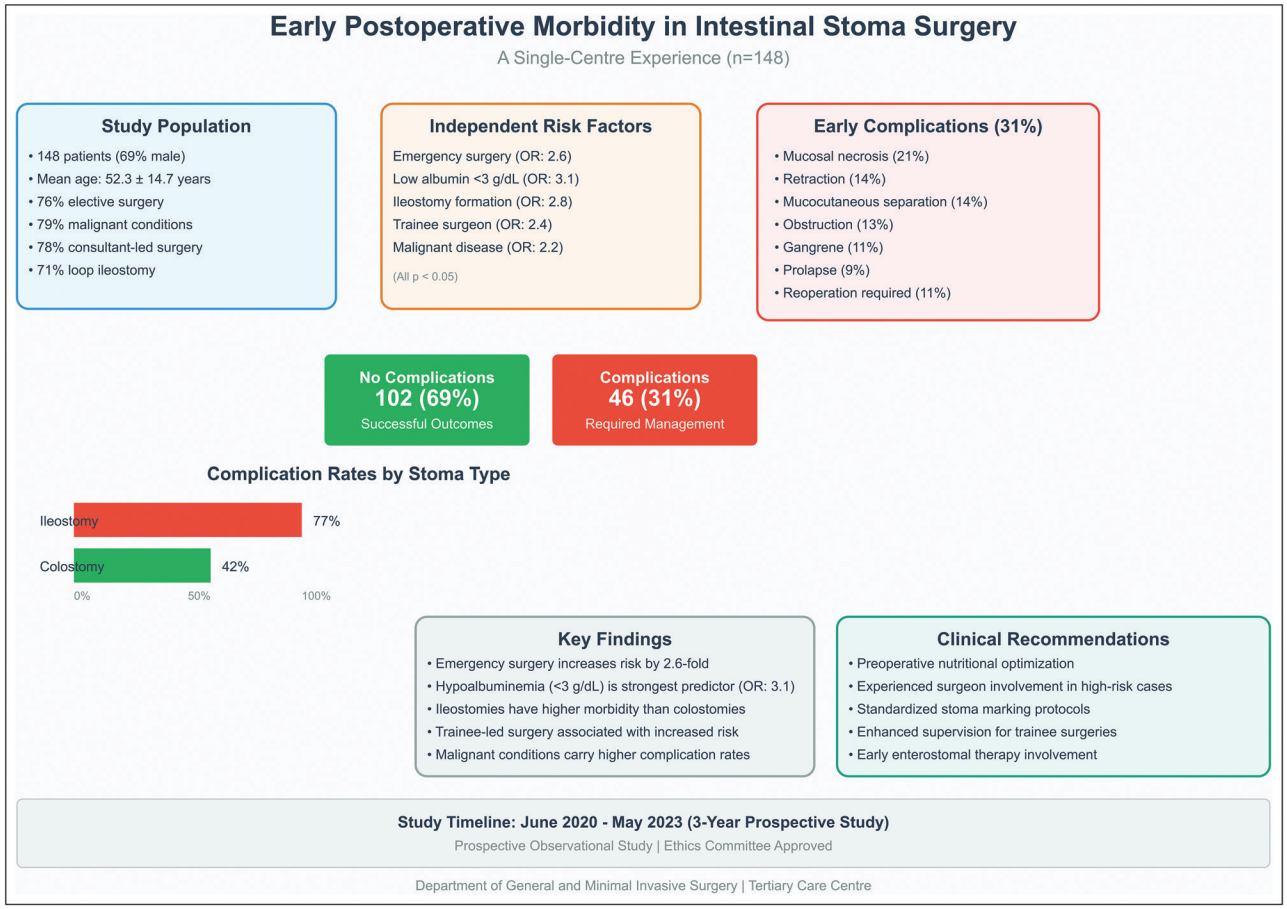

Figure 2: Central illustration

Data availability statement

The datasets generated and analyzed during the current study are available from the corresponding author on reasonable request.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

Acknowledgments

The authors would like to thank the nursing staff of the surgical department and the stoma care nurses for their assistance in data collection and patient care.

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