



## Outcome of Delayed Stoma Closure in Patients Presenting to Tertiary Care Hospital

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### Declaration

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### ABSTRACT

**Background:** A late closure of ileostomies may have various post-operative complications, more in resource-limited settings where follow-up as well as preventive methods often stay suboptimal. Though early reversal is ideal, delays happen quite often, and assessment of the risk for a poor outcome is important in surgical decision-making and counseling of the patient. **Objective:** To determine the outcome of delayed stoma closure in patients presenting to tertiary care hospital. **Study Design:** Descriptive cross-sectional study. **Duration and Place of Study:** Conducted from October 2024 to March 2025 in the Department of General Surgery LRH Peshawar. **Methodology:** A total of 128 patients aged 18–65 years, undergoing ileostomy reversal beyond 14 days of initial surgery, were enrolled through consecutive non-probability sampling. Exclusion criteria included abdominal tuberculosis, inflammatory bowel disease, bleeding disorders, or psychiatric illness. Data on demographics, comorbidities, and post-operative outcomes were collected. Complications were evaluated over a 30-day post-reversal period. **Results:** Skin excoriation occurred in 27.3%, retraction in 6.3%, and prolapse in 2.3% of patients. Diabetes and hypertension were significantly associated with higher rates of excoriation ( $p < 0.001$  and  $p = 0.052$ , respectively), while hypertension also showed a strong association with both retraction ( $p < 0.001$ ) and prolapse ( $p = 0.015$ ). **Conclusion:** Delayed ileostomy closure is associated with notable rates of skin-related complications, with diabetes and hypertension emerging as key risk factors.

### INTRODUCTION

Ileostomy is a surgically induced opening in the abdominal wall such that the end of the ileum is brought external to the body with the intestinal contents bypassing the colon and with passage out of the body into an external pouch.<sup>1</sup> It is frequently done in the setting of inflammatory bowel disease, bowel perforation, trauma, or in the context of staged colorectal surgery.<sup>2</sup> Its main aim is diversion of fecal flow, protection of distal anastomosis, or fecal contamination control in emergency situations.<sup>3</sup> Although frequently lifesaving and mandatory in acute surgical conditions, it is generally a temporary solution with the expectation of subsequent reversal once the pathology is resolved and the patient stabilized.<sup>4</sup>

Timing of the reversal of the stoma still constitutes a significant portion of preoperative surgical planning and patient care at the time of discharge. It is optimally done once the patient is optimized nutritionally, is infection-free, and the distal bowel has regained functional integrity.<sup>5</sup> Early reversal is usually considered within 8–12 weeks of initial operation, while late reversal is beyond this period, most commonly due to comorbidities, complications, or shortage of resources.<sup>6</sup> Prolonged duration of the stoma can at times be necessary for

protection but can contribute towards the patient's misery, hospital sessions, and psychiatric distress with a resultant need for individualized decision-making for the point of reversal.<sup>7</sup>

Delayed stoma closure is associated with a number of local and systemic complications, most notably skin excoriation, retraction of the stoma, and prolapse. Continuous peristomal skin contact with effluent can lead to deep irritation, inflammation, with consequent secondary infection and excoriation.<sup>8</sup> Retraction of the stoma below skin level can lead to difficulties with appliance fit and leakage.<sup>9</sup> Additionally, prolapse of the stoma with excessive bowel herniation through the site of the stoma increases with duration of stoma presence and necessitates surgical correction.<sup>10</sup> These outcomes not only qualify for decreased quality of life but also represent a major risk for morbidity, which certainly necessitates expedient stoma management with subsequent closure.<sup>11</sup>

Shahab A, et al. reported that delayed stoma closure was associated with several complications, including skin excoriation in 34% of cases, stoma retraction in 3.3%, and prolapse in 3.3% of patients.<sup>12</sup>

In spite of global data about complications arising from delayed stoma closure, few local studies from tertiary

referral centers in Pakistan exist, even for Peshawar. Differences in surgical timing at initial operation, practices regarding postoperative follow-up, and pre-existing comorbidities in the patients can be a cause of differing outcomes in this part of the world. A study about the outcome of delayed stoma closure in patients who report a tertiary care hospital in Peshawar is important for determining the rate of complications like skin excoriation, retraction, and prolapse, and for informing local decision-making for the optimal timing for reversing a stoma.

## METHODOLOGY

This descriptive study was conducted over a six-month period, from October 2024 to March 2025, in the General Surgery Department of LRH Peshawar. A total of 128 participants were enrolled using a consecutive non-probability sampling method. The sample size was calculated using a 95% confidence level and a 3.1% margin of error, based on an estimated 3.3% frequency of stoma prolapse following delayed closure.<sup>12</sup> Patients aged 18 to 65 years, of either sex, were considered eligible if they had previously undergone an ileostomy and were scheduled for reversal beyond 14 days after the initial procedure. Any individual with a history of abdominal tuberculosis, inflammatory bowel disease, bleeding tendencies, or psychiatric illness was excluded from participation. All participants were briefed about the study's purpose and assured of the confidentiality of their information. Those meeting eligibility criteria and providing written consent were enrolled. Baseline data were collected, including demographic and clinical details such as age, sex, body mass index (BMI), educational background, occupation, area of residence, and socioeconomic status. Additionally, history of diabetes, hypertension, and smoking habits was recorded.

Patients undergoing ileostomy reversal after a delay of more than two weeks were closely monitored for post-operative complications over a 30-day period. The outcomes assessed included skin breakdown, stoma retraction, and prolapse. Skin breakdown was diagnosed in individuals reporting burning sensations and pain rated at 3 or above on the visual analog scale, along with physical findings such as redness, superficial tissue loss, and signs of inflammation surrounding the stoma site. Retraction was identified in those presenting with discomfort and irritation at the stoma, accompanied by inward displacement or sinking of the stoma opening relative to the surrounding abdominal wall. Prolapse was determined when a patient experienced pain (above 3 on the visual analog scale) and a sense of abdominal pressure, with physical examination revealing protrusion or bulging of the bowel through the stoma site. All outcome assessments were performed by a consultant surgeon with no less than five years of post-fellowship experience. Data were analyzed using IBM SPSS version 25. Normality of distribution for continuous variables such as age and BMI were evaluated using the Shapiro-Wilk test. Results were presented as mean  $\pm$  standard deviation for normally distributed data or as median and interquartile range where appropriate. Categorical data were expressed as

counts and percentages. Post-operative outcomes were further stratified to assess possible effect modifiers. The Chi-square test or Fisher's exact test was applied for comparison, with statistical significance established at a p-value below 0.05.

## RESULTS

The study included 128 patients with a mean age of 40.58  $\pm$  10.84 years and mean BMI of 26.61  $\pm$  3.41 kg/m<sup>2</sup>. The majority were male (102 patients, 79.7%) compared to female (26 patients, 20.3%). Most patients were non-smokers (91 patients, 71.1%) versus smokers (37 patients, 28.9%). Diabetes was present in 33 patients (25.8%) while 95 patients (74.2%) were non-diabetic. Hypertension affected 32 patients (25.0%) with 96 patients (75.0%) being normotensive. Regarding socioeconomic status, 69 patients (53.9%) belonged to middle class, 46 patients (35.9%) to lower class, and 13 patients (10.2%) to upper class. Educational status showed 69 patients (53.9%) were literate and 59 patients (46.1%) were illiterate. Employment status revealed 78 patients (60.9%) were unemployed while 50 patients (39.1%) were employed. Most patients resided in rural areas (74 patients, 57.8%) compared to urban areas (54 patients, 42.2%) as shown in Table-I.

**Table I**

### Patient Demographics

Demographics	Mean $\pm$ SD
Age (Years)	40.58 $\pm$ 10.84
BMI (kg/m <sup>2</sup> )	26.61 $\pm$ 3.41
<b>Gender</b>	
Male n (%)	102 (79.7%)
Female n (%)	26 (20.3%)
<b>Smoking</b>	
Yes n (%)	37 (28.9%)
No n (%)	91 (71.1%)
<b>Diabetes</b>	
Yes n (%)	33 (25.8%)
No n (%)	95 (74.2%)
<b>Hypertension</b>	
Yes n (%)	32 (25.0%)
No n (%)	96 (75.0%)
<b>Socioeconomic Status</b>	
Lower n (%)	46 (35.9%)
Middle n (%)	69 (53.9%)
Upper n (%)	13 (10.2%)
<b>Education Status</b>	
Literate n (%)	69 (53.9%)
Illiterate n (%)	59 (46.1%)
<b>Occupation Status</b>	
Employed n (%)	50 (39.1%)
Unemployed n (%)	78 (60.9%)
<b>Residence Area</b>	
Rural n (%)	74 (57.8%)
Urban n (%)	54 (42.2%)

Regarding stoma-related complications in patients with delayed stoma closure, skin excoriation emerged as the most prevalent complication, affecting 35 patients (27.30%) while 93 patients (72.70%) remained free from this complication. Stoma retraction was observed in 8 patients (6.30%) with 120 patients (93.80%) not experiencing this complication. Prolapse was the least frequent complication, occurring in only 3 patients (2.30%) while 125 patients (97.70%) did not develop prolapse as shown in Table-II.

**Table II**  
Frequency of Complications Among Patients with Delayed Stoma Closure

Complications	Frequency	% age
<b>Skin Excoriation</b>		
Yes	35	27.30%
No	93	72.70%
Total	128	100%
<b>Retraction</b>		
Yes	8	6.30%
No	120	93.80%
Total	128	100%
<b>Prolapse</b>		
Yes	3	2.30%
No	125	97.70%
Total	128	100%

The stratified analysis examining associations between demographic factors and stoma complications revealed several important findings. For skin excoriation, patients aged  $\leq 40$  years showed a higher incidence (20 patients, 30.3%) compared to those  $> 40$  years (15 patients, 24.2%), though this difference was not statistically significant ( $p=0.438$ ). Male patients experienced skin excoriation more frequently (29 patients, 28.4%) than females (6 patients, 23.1%), but again without statistical significance ( $p=0.585$ ). Smokers demonstrated a higher tendency toward skin excoriation (14 patients, 37.8%) compared to non-smokers (21 patients, 23.1%), approaching but not reaching significance ( $p=0.089$ ). Most notably, diabetic patients showed significantly higher rates of skin excoriation (17 patients, 51.5%) compared to non-diabetics (18 patients, 18.9%) with  $p<0.001$ . Hypertensive patients also experienced more skin excoriation (13 patients, 40.6%) than normotensive patients (22 patients, 22.9%), though this approached significance ( $p=0.052$ ). For stoma retraction, the age-stratified analysis showed patients  $\leq 40$  years had slightly higher rates (5 patients, 7.6%) compared to those  $> 40$  years (3 patients, 4.8%) with  $p=0.719$ . Gender analysis revealed that all retraction cases occurred in males (8 patients, 7.8%) with no cases in females (0 patients, 0.0%) yielding  $p=0.207$ . Smoking status showed minimal difference with smokers having 2 cases (5.4%) and non-smokers having 6 cases (6.6%) with  $p=1.000$ . Diabetes showed similar rates between diabetics (2 patients, 6.1%) and non-diabetics (6 patients, 6.3%) with  $p=1.000$ . However, hypertensive patients showed dramatically higher retraction rates (8 patients, 25.0%) compared to normotensive patients (0 patients, 0.0%) with highly significant  $p<0.001$ . Regarding prolapse complications, younger patients ( $\leq 40$  years) had lower rates (1 patient, 1.5%) compared to older patients (2 patients, 3.2%) with  $p=0.610$ . Similar to retraction, all prolapse cases occurred in males (3 patients, 2.9%) with no female cases (0 patients, 0.0%) yielding  $p=0.608$ . Smokers showed higher prolapse rates (2 patients, 5.4%) than non-smokers (1 patient, 1.1%) with  $p=0.200$ . Diabetic patients had higher prolapse incidence (2 patients, 6.1%) compared to non-diabetics (1 patient, 1.1%) with  $p=0.163$ . Most significantly, hypertensive patients demonstrated markedly elevated prolapse rates (3 patients, 9.4%) while no normotensive patients developed prolapse (0 patients, 0.0%) with statistically significant  $p=0.015$  as shown in Table-III.

**Table III**  
Association of Stoma Complications with Demographic Factors

Demographic Factors		Skin Excoriation	Retraction	Prolapse
		n(%)	n(%)	n(%)
Age (years)	$\leq 40$	20 (30.3%)	5 (7.6%)	1 (1.5%)
	$> 40$	15 (24.2%)	3 (4.8%)	2 (3.2%)
	p-value	0.438	0.719*	0.610*
Gender	Male	29 (28.4%)	8 (7.8%)	3 (2.9%)
	Female	6 (23.1%)	0 (0.0%)	0 (0.0%)
	p-value	0.585	0.207*	0.608*
Smoking	Yes	14 (37.8%)	2 (5.4%)	2 (5.4%)
	No	21 (23.1%)	6 (6.6%)	1 (1.1%)
	p-value	0.089	1	0.200*
Diabetes	Yes	17 (51.5%)	2 (6.1%)	2 (6.1%)
	No	18 (18.9%)	6 (6.3%)	1 (1.1%)
	p-value	$<0.001$	1	0.163*
Hypertension	Yes	13 (40.6%)	8 (25.0%)	3 (9.4%)
	No	22 (22.9%)	0 (0.0%)	0 (0.0%)
	p-value	0.052	$<0.001^*$	0.015*

**\*Fischer Exact Test**

**DISCUSSION**

Results show specific patterns of complications and demographic correlation deserving of clinical attention. The high prevalence of skin excoriation (27.30%) followed by retraction (6.30%) and prolapse (2.30%) indicates the progressive nature of complications related to the stoma over longer duration of stoma maintenance. The much higher prevalence of skin excoriation in diabetic patients (51.5% compared with 18.9% in non-diabetics) can be justified with the compromised wound healing mechanism and immunocompetence typical for diabetes mellitus. Hyperglycemia induces decreased collagen synthesis, delayed formation of new blood vessels angiogenesis, and susceptibility to colonization with bacteria, predisposing peristomal skin to a higher propensity for chemical irritation from effluent contact. High glucose levels in tissue fluids also provide an ideal milieu for proliferation of bacteria together with an added compromising effect on skin integrity surrounding the region of the stoma. High correlation between hypertension with retraction (25.0% in hypertensive compared with 0% in normotensive patients) and prolapse (9.4% compared with 0%) indicates a significant effect of atherosclerosis-driven comorbidity on tissue perfusion integrity and the capacity for healing. Chronic hypertension with resultant microangiopathic damage and a decrease in tissue perfusion compromises the supportive structure of the abdominal wall surrounding the stoma region. Furthermore, concomitant endothelial dysfunction together with decreased availability of nitric oxide compromised collagen formation together with mechanisms of tissue repair predispose hypertensive subjects to mechanical complications like retraction together with prolapse over a longer duration of stoma maintenance. Increased prevalence of complications in male patients although not statistically significant may be attributable to an association with occupation with physical workload with males being more inclined towards activity with heightened intra-abdominal pressure which can predispose towards mechanical complications like retraction together with prolapse over a prolonged duration of stoma maintenance. Increased

prevalence of skin excoriation in smokers (37.8% compared with 23.1%) indicates a similar established effect of nicotine on tissue perfusion together with natural wound healing with smoking-induced vasoconstriction together with decreased supply of oxygen to tissues impeding the natural repair mechanisms raising peristomal skin health.

Our study results revealed that skin excoriation was the most common complication affecting 35 patients (27.30%), followed by stoma retraction in 8 patients (6.30%) and prolapse in 3 patients (2.30%). Diabetic patients showed significantly higher rates of skin excoriation (51.5% vs 18.9%,  $p < 0.001$ ), while hypertensive patients demonstrated significantly elevated rates of both stoma retraction (25.0% vs 0.0%,  $p < 0.001$ ) and prolapse (9.4% vs 0.0%,  $p = 0.015$ ). These findings align with several previous studies examining stoma complications and closure outcomes. Mondal et al.<sup>13</sup> reported skin excoriation rates of 35% in their delayed closure group (10-12 weeks), which is remarkably similar to our 27.30% incidence, suggesting this complication is consistently problematic in delayed stoma closures. Similarly, Shahab et al.<sup>12</sup> found skin excoriation in 34% of their delayed closure group (42-84 days), further supporting our observation that prolonged stoma duration predisposes to skin complications. The consistency across these studies likely reflects the prolonged exposure of peristomal skin to effluent and mechanical irritation over extended periods. Regarding stoma retraction, our 6.30% incidence is consistent with the lower end of reported ranges. Shahab et al.<sup>12</sup> noted retraction in 3.3% of delayed closures, while our study found a slightly higher rate. The significant association with hypertension in our study (25.0% vs 0.0%) has not been previously reported and warrants further investigation. Hypertension may contribute to impaired tissue perfusion and healing, potentially predisposing to stoma retraction through compromised stomal vascularity. The prolapse rate of 2.30% in our study falls within the expected range for delayed closures. Shahab et al.<sup>12</sup> reported prolapse in 3.3% of delayed cases, showing comparable incidence. Our finding of significantly higher prolapse rates in hypertensive patients (9.4% vs 0.0%) again suggests that vascular comorbidities may compromise stomal tissue integrity and support structures.

The predominance of complications in male patients observed in our study (all retraction and prolapse cases occurred in males) contrasts with some previous reports. Tsai et al.<sup>14</sup> found similar gender distributions for complications between males and females in their IBD population, though their study focused on different patient demographics and underlying conditions. When comparing overall complication patterns, Turner et al.<sup>15</sup> demonstrated that prolonged stoma duration significantly increases morbidity, with complication rates rising from 8% in closures  $\leq 90$  days to 54% in closures  $> 720$  days. This supports our focus on delayed closure complications and emphasizes the importance of understanding factors that contribute to stoma-related morbidity during the waiting period.

The variation in rates of complications between studies can be explained by differences in patient populations, baseline conditions, protocols for stoma care, and duration of follow-up. Inclusion of variable socioeconomic backgrounds in our study along with an emphasis on delayed closures allows for informative assessment of real-world outcome in resource-constricted environments, where closures of stomas necessarily occur over a delayed period for reasons ranging from patient recovery and available surgeon schedules to institutional capability. Determination of diabetes and hypertension as important factors for specific types of stoma complications in our study contributes to the expanding literature base demonstrating comorbid conditions significantly affect stomal-related outcome. These observations have significant implications for counseling of patients at a clinical level, stratification of individuals at high risk for complications for preventive intervention with increased targeting in high-risk populations subjected to delayed stoma closure.

The study also has several limitations which need to be considered. As a center-specific study which has been done at a single center, generalizability of our findings for other healthcare settings and patient populations may be limited. Additionally, variations in caring practices for a stoma, patient education standards, and return for follow-up across diverse centers may affect the external validity of our findings for broader clinical practices. Relatively small sample size of 128 patients, although adequate for statistical testing, may diminish power for the identification of smaller but clinically significant associations, particularly for less common complications like prolapse. Additionally, a lack of commonly defined standards for grading and definitions of complications of the stoma in various studies will make direct comparison challenging. Particular demographic characteristics of the population examined like a preponderance of middle and lower socioeconomic groups and rural residing may not be characteristic for all types of patient populations who actually have a stoma closed. Additionally, a lack of longitudinal follow-up data limits our understanding of the natural history and course of these complications beyond shorter timescales.

## CONCLUSION

Our research has determined that delayed stoma closing is linked with considerable complications related to the stoma, with the most common being skin excoriation in turn followed by stoma retraction and prolapse. These findings indicate that various comorbidities significantly contribute towards the development of these complications over the waiting interval prior to closing. Diabetic individuals are significantly more at risk for skin excoriation compared to other complications, with hypertensive individuals significantly at a higher risk for complications of stoma retraction and prolapse.

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