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Original Article

Indications and Complications of Intestinal Stoma Formation

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ABSTRACT

Objective: To determine the frequency of indications and complications of intestinal stoma formation in patients undergoing stoma surgery.

Methodology: A descriptive cross-sectional study was carried out in the Department of General Surgery, JPMC, Karachi, Pakistan, between April 2022 and April 2023. A total of 120 participants, aged 20–60 years with ASA classifications I–III, were enrolled through non-probability purposive sampling. Postoperative complications, including skin excoriation, stomal bleeding, retraction, wound infections, and parastomal hernia, were documented. Statistical analysis was conducted using SPSS version 26.0, with results analyzed at a 5% level of significance.

Results: The participants had an average age of 39 years, with a standard deviation of 12.6 years among them 60.8% were male and 39.2% female. Abdominal trauma was noted in 21.8% of younger patients and 28.6% of older ones (p = 0.408). Similarly, abdominal sepsis occurred in 10.7% of elective cases versus 3.3% in emergency cases (p = 0.139), and anastomotic leaks were nearly identical at 3.6% for elective and 3.3% for emergency procedures (p = 0.660). However, postoperative complications varied, with intestinal obstruction being significantly higher in older patients (16.7% compared to 5.1% in younger patients, p = 0.042). Additionally, parastomal hernias were more common in older patients, showing a borderline difference (9.5% vs. 1.3%, p = 0.050).

Conclusion: The research highlights gastrointestinal cancers and abdominal injuries as the primary reasons for intestinal stoma formation, with most cases stemming from emergency surgeries. Complications like intestinal blockage, skin irritation, and stoma retraction were more prevalent, particularly in older individuals. These findings underscore the importance of careful planning before surgery and attentive care afterward to reduce risks.

Keywords: Complications, Enteric perforation, Intestinal stoma, Stoma formation indications, Wound infection

INTRODUCTION

The intestinal stoma are openings that are surgically created in the abdomen that allow waste to get out of the body. While stoma can significantly improve the quality of life for many patients, they can also lead to various complications. Understanding the indications for the formation of stoma and complications rates is essential for healthcare professionals.

The indications for the creation of a stoma include intestinal obstruction, cancer, inflammatory intestinal disease and trauma. Massenga et al. reported on these indications both in adults and in children, underlining that the stoma are commonly used in contexts limited to resources in which complex surgical interventions may not be immediately available[1]. After surgery, patients may experience complications such as infections, losses and skin irritation. For example, Pal et al. analyzed the management of abdominal stoma and highlighted a series of complications, including peristomic leather problems[2].

The complications associated with intestinal stoma are not rare. Each patient is unique, and several factors related to the patient can influence these complications. According to Zelga et al., factors such as age, the index of body mass and the presence of conditions of comorbidities can contribute to post-operative complications[3]. Additionally, D'Ambrosio et al. argued that skin peristomic complications are common and demand targeted support strategies to reduce their incidence[4].

Equally, the stoma site must be marked preoperatively. Arolfo et al. noted that marking the stoma sites in the first spring reduces the stoma complications[5]. This continues to even further highlight the requirement for proper pre-intervention planning to ensure improved outcomes. Complications may also include hospital readjusts and the rise in expenditure of care[6].

Stoma formation timing is one more influential point. As Dincer has said, the incidence of complications is often much higher after emergency correction than after planned surgical intervention[7]. For an emergency intestinal stoma, one study noted that the frequency of complications was considerably higher within the first days following the procedure[8].

Either surgical or post-operative care, can impact results after stoma formation, a different study recognized that complications after emergency intestinal stoma were significantly related to risk factors and approved skilled surgical techniques contribute to the recovery of patients[9].

Intestinal stoma provides both opportunities and challenges for care and practice. Identifying the indications accurately and managing the complications proactively are the key factors. The current research underlines the need for doctors to be aware of the patient factors that influence results and support standard practices such as the marking of the preoperative site. Continuous education on the care of the stoma can improve the quality of life for patients after intervention[10-12]. A study reported indications of intestinal stoma formation as gastrointestinal malignancy (25%) and abdominal trauma (22%)[13]. While complication of intestinal stoma formation was reported as wound infection (8.5%), skin excoriation (52.4%), stoma

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retraction (8.5%)[13]. Formation of intestinal stoma is widely performed with surgical procedure worldwide. It is associated with variable complications which can impact physical and mental health of the patient[14,15]. By understanding the complexities involved, health workers can help guarantee better results for people who live with the stoma.

METHODOLOGY

A descriptive cross-sectional study was conducted in the Department of General Surgery, JPMC, Karachi, Pakistan, from April 2022 to April 2023 to investigate the indications and complications associated with intestinal stoma formation in patients undergoing ileostomy or colostomy. Intestinal stomas were defined as the surgical exteriorization of the ileum (ileostomy) or colon (colostomy) through the abdominal wall onto the skin surface and were evaluated through clinical assessment. The sample size of 120 patients was determined using a wound infection prevalence of (8.5%)[13], a margin of error of 5%, and a confidence level of 95%. The study utilized a non-probability purposive sampling method. Patients between age group 20–60 years of either gender with ASA classifications I, II, or III undergoing stoma surgery were included, while those undergoing redo procedures, primary repairs, or those with metastatic disease, coagulation disorders, or surgeries performed at other facilities were excluded.

Stoma formation was indicated in a variety of clinical conditions. These included blunt abdominal trauma, which refers to injury caused by blunt forces affecting the abdomen, identified through clinical evaluation, imaging, or surgical findings; anastomotic leaks, defined as a failure at the surgical connection between two hollow organs, resulting in leakage of their contents, typically confirmed by imaging or during surgery; and congenital abnormalities, which are structural or functional defects present from birth, detected through clinical or radiological assessment.

Other conditions included enteric fever, a systemic illness caused by Salmonella bacteria, presenting with fever and abdominal pain, diagnosed through blood or stool cultures; enterocutaneous fistulas, abnormal passages linking the intestinal tract to the skin, identified via clinical examination and imaging studies; and gastrointestinal cancers, malignancies arising within the digestive tract, confirmed through imaging or histopathological analysis.

Other clear-cut indications were hollow viscus perforation (full thickness defect in the wall of a hollow organ in abdomen visualized on imaging or surgery), mesenteric ischemia (blood supply to the intestines is compromised visualized on clinical imaging or during surgery), and necrotizing pancreatitis (a serious inflammatory condition of the pancreas characterized by pancreatic necrosis with or without inflammation, on general imaging and clinically).

Finally, strangulated hernias (a form of an inguinal or femoral hernia with impaired supply of blood to the involved tissue) were diagnosed based on clinical symptoms of ischemia (especially when in need of surgical treatment), or as seen at the time of surgery, abdominal tuberculosis (an infection of the abdomen caused by the bacteria Mycobacterium tuberculosis) was diagnosed based on clinical judgment or upon imaging or other microbiological examination such as GeneXpert.

After research personnel provided a description of study risks and benefits and obtained written informed consent from study participants or their legal representatives, individual data collection began. All subjects had complete clinical histories and physical examinations, demographic data (age, sex, weight, height, and BMI) were recorded. Relevant laboratory tests and imaging studies were requested, and all patients underwent pre-anesthetic evaluation. Surgical indications were thoroughly documented by the hospital's surgical team.

After surgery, patients were monitored closely to identify and address any potential complications. Other complications seen were skin excoriation (damage due to persistent contact with fecal matter), stomal bleeding (bleeding at the stoma margins), and stoma retraction (stoma that lies below the level of the abdominal wall, noted clinically). Wound infections were identified through symptoms such as a fever above 100°F, pain rated over 4 on the Visual Analog Scale (VAS), redness, swelling, and the presence of pus. Another complication, parastomal hernia, was noted when abdominal contents protruded through the stoma site. Intestinal obstruction was diagnosed based on symptoms like abdominal bloating, frequent vomiting (more than three episodes), nausea, severe abdominal pain rated above 7 on the VAS, absence of stool or gas, and imaging results showing dilated bowel loops.

Other conditions monitored included burst abdomen, which refers to the separation of wound edges in the abdominal area, identified through clinical or radiological findings. Enterocutaneous fistula, characterized by an abnormal passage between the intestines and skin, was confirmed through examination and imaging. Mucosal prolapse, where the inner lining of the intestine extends out through the stoma, was diagnosed based on direct observation. Stomal diarrhea, defined as excessive, watery output from the stoma beyond normal levels, was assessed using clinical measures. Stomal necrosis, the death of tissue around the stoma, was identified by dark discoloration and tissue non-viability upon examination. Stomal prolapse, where the bowel protrudes more than usual through the stoma, and stomal stenosis, a narrowing of the stoma that restricts output, were diagnosed during physical examination and confirmed with imaging when necessary.

Daily assessments were conducted during hospitalization to promptly manage complications, with follow-ups scheduled for the 14th and 28th days after discharge. Contact information was collected from patients to ensure compliance with follow-up visits. The study design minimized potential biases by adhering to strict inclusion criteria and applying stratification techniques to address confounding variables.

The SPSS version 26.0 was used to evaluate the statistical data. Descriptive statistics were calculated and reported in terms of mean ± standard deviation with frequency and percentage as where applicable. The Chi-square test was applied to assess the statistical difference at 5% level of significance.

RESULTS

The study included 120 participants, with an average age of 39 ±12.6 years. Most participants (65%) were aged between 20 and 40 years, while the remaining 35% were older than 40. The duration of stoma placement averaged 2.6 months (±1.95). A majority of patients (78.3%) had their stoma for 1 to 3 months, while 21.7% had it for longer than 3 months. The mean hospital stay was 15.2 days (±4.57), with 62.5% of patients staying between 8 and 15 days, and 37.5% staying beyond 15 days. Regarding BMI, the mean value was 25.95 kg/m² (±3.54). About 62.5% of the participants had a BMI within the range of 20 to 26 kg/m², while 37.5% had a BMI above 26 kg/m². The group comprised 60.8% males and 39.2% females. Emergency

procedures were the most common, accounting for 76.7% of cases, with elective surgeries making up 23.3% (as outlined in Table I).

Table II presents the differences in surgical indications between the two age groups, which were found to be statistically insignificant. Among participants aged 20–40 years, 5.1% underwent surgery for abdominal sepsis, compared to 4.8% in the older group (p = 0.649). Similarly, 21.8% of younger patients and 28.6% of older patients had surgery for abdominal trauma (p = 0.408). For anastomotic leaks, 2.6% of patients in the younger group and 4.8% in the older group were affected (p = 0.437). Congenital anomalies were observed in 3.8% of younger participants and 4.8% of older ones (p = 0.575). Enteric fever was reported in 7.7% of younger patients and 11.9% of older patients (p = 0.446). Other conditions, such as enterocutaneous fistulas (5.1% vs. 7.1%, p = 0.469), gastrointestinal malignancies (21.8% vs. 33.3%, p = 0.168), hollow viscus perforation (15.4% vs. 14.3%, p = 0.872), mesenteric ischemia (2.6% vs. 2.4%, p = 0.720), necrotizing pancreatitis (1.3% vs. 7.1%, p = 0.123), strangulated hernia (5.1% vs. 9.5%, p = 0.288), and abdominal tuberculosis (6.4% vs. 11.9%, p = 0.299), showed no significant differences between the two groups.

Table III compares surgical indications for elective versus emergency procedures. Abdominal sepsis was more common in elective surgeries, affecting 10.7% of cases, compared to 3.3% in emergency procedures (p = 0.139). Abdominal trauma accounted for 26.6% of elective surgeries and 22.8% of emergency cases (p = 0.534). Anastomotic leaks were reported in 3.6% of elective procedures and 3.3% of emergency surgeries (p = 0.660). Congenital anomalies were observed in 7.1% of elective cases and 3.3% of emergency cases (p = 0.331). Enteric fever was seen in 7.1% of elective surgeries and 9.8% of emergency cases (p = 0.503). Other conditions, including enterocutaneous fistulas (10.7% vs. 4.3%, p = 0.205), gastrointestinal malignancies (28.6% vs. 25.0%, p = 0.705), hollow viscus perforation (7.1% vs. 17.4%, p = 0.151), mesenteric ischemia (3.6% vs. 2.2%, p = 0.553), necrotizing pancreatitis (3.6% vs. 3.3%, p = 0.660), strangulated hernia (14.3% vs. 4.3%, p = 0.085), and abdominal tuberculosis (10.7% vs. 7.6%, p = 0.425), also showed no significant differences between the two groups.

Table IV summarizes postoperative complications between the younger and older groups. Intestinal obstruction was significantly more frequent in patients over 40 years (5.1% vs. 16.7%, p = 0.042). Parastomal hernia showed a borderline significance, affecting 1.3% of younger patients and 9.5% of older ones (p = 0.050). Other complications, such as burst abdomen (1.3% vs. 2.4%, p = 0.579), enterocutaneous fistula (1.3% vs. 4.8%, p = 0.280), wound infection (5.1% vs. 11.9%, p = 0.163), mucosal prolapse (7.7% vs. 4.8%, p = 0.423), skin excoriation (51.3% vs. 50.0%, p = 0.893), stomal diarrhea (1.3% vs. 4.8%, p = 0.280), stomal necrosis (5.1% vs. 4.8%, p = 0.649), stomal prolapse (5.1% vs. 7.1%, p = 0.469), stomal retraction (10.3% vs. 14.3%, p = 0.512), and stomal stenosis (2.6% vs. 4.8%, p = 0.437) and stomal bleeding (2.6% vs. 7.1%, p = 0.231), did not differ significantly.

Table V compares complications based on the type of surgery. While not statistically significant, wound infections and mucosal prolapse were slightly more common in elective surgeries (14.3% vs. 5.4%, p = 0.128; 14.3% vs. 4.3%, p = 0.085). Other complications, including burst abdomen (3.6% vs. 1.1%, p = 0.414), enterocutaneous fistula (3.6% vs. 2.2%, p = 0.553), intestinal obstruction (7.1% vs. 9.8%, p = 0.503), parastomal hernia (7.1% vs. 3.3%, p = 0.331), skin excoriation (46.4% vs. 52.2%, p = 0.594), stomal diarrhea (3.6% vs. 2.2%, p = 0.553), stomal necrosis (7.1% vs. 4.3%, p = 0.428), stomal prolapse (10.7% vs. 4.3%, p = 0.205), stomal retraction (14.3% vs. 10.9%, p = 0.420), stomal stenosis (3.6% vs. 3.3%, p = 0.660) and stomal bleeding (10.7% vs. 2.2%, p = 0.082), showed no significant differences between elective and emergency surgeries.

Table I: Demographic Characteristics of Study Participants (n=120)

Variable	n (%)
Age (Mean ± SD) = 39.20 ± 12.61	
20-40 years	78 (65.0)
>40 years	42 (35.0)
Duration of stoma (Mean ± SD) = 2.58 ± 1.95	
1-3 months	94 (78.3)
>3 months	26 (21.7)
Duration of Hospital Stay (Mean ± SD) = 15.24 ± 4.57	
8-15 days	75 (62.5)
>15 days	45 (37.5)
Body Mass Index (Mean ± SD) = 25.95 ± 3.54	
20-26 kg/m^2	75 (62.5)
>26 kg/m^2	45 (37.5)
Gender	
Male	73 (60.8)
Female	47 (39.2)
Mode of Surgery	
Elective	28 (23.3)
Emergency	92 (76.7)

Table II: Comparison of Indications with Age Group (n=120)				
Indications	**Age Group**			**P-Value**
	20--40	**>40**	**O.R 95% C. I**	
Abdominal Sepsis, *n* (%)	4 (5.1)	2 (4.8)	1.081 (0.190----6.162)	0.649
Abdominal Trauma, *n* (%)	17 (21.8)	12 (28.6)	0.697 (0.295----1.644)	0.408
Anastomotic Leak, *n* (%)	2 (2.6)	2 (4.8)	0.526 (0.071----3.877)	0.437
Congenital Anomalies, *n* (%)	3 (3.8)	2 (4.8)	0.800 (0.128----4.987)	0.575
Enteric Fever, *n* (%)	6 (7.7)	5 (11.9)	0.617 (0.176----2.155	0.446
Enterocutaneous Fistula, *n* (%)	4 (5.1)	3 (7.1)	0.703 (0.150----3.299)	0.469
Gastrointestinal Malignancies, n (%)	17 (21.8)	14 (33.3)	0.557 (0.241----1.287)	0.168
Hollow Viscus Perforation, *n* (%)	12 (15.4)	6 (14.3)	1.091 (0.378----3.151)	0.872
Mesenteric Ischemia, *n* (%)	2 (2.6)	1 (2.4)	1.079 (0.095----12.259)	0.720
Necrotizing Pancreatitis, *n* (%)	1 (1.3)	3 (7.1)	0.169 (0.017----1.677)	0.123
Strangulated Hernia, *n* (%)	4 (5.1)	4 (9.5)	0.514 (0.122----2.167)	0.288
Tuberculosis Abdomen, *n* (%)	5 (6.4)	5 (11.9)	0.507 (0.138----1.862)	0.299

Table III: Comparison of Indications with Mode of Surgery (n=120)				
Indications	**Mode of Surgery**			**P-Value**
	Elective	**Emergency**	**O.R 95% C. I**	
Abdominal Sepsis, *n* (%)	3 (10.7)	3 (3.3)	3.560 (0.676----18.736)	0.139
Abdominal Trauma, *n* (%)	8 (26.6)	21 (22.8)	1.352 (0.521----3.509)	0.534
Anastomotic Leak, *n* (%)	1 (3.6)	3 (3.3)	1.099 (0.110----11.001)	0.660
Congenital Anomalies, *n* (%)	2 (7.1)	3 (3.3)	2.282 (0.362----14.395)	0.331
Enteric Fever, *n* (%)	2 (7.1)	9 (9.8)	0.709 (0.144----3.493)	0.503
Enterocutaneous Fistula, *n* (%)	3 (10.7)	4 (4.3)	2.640 (0.554----12.582)	0.205
Gastrointestinal Malignancies, *n* (%)	8 (28.6)	23 (25.0)	1.200 (0.466----3.091)	0.705
Hollow Viscus Perforation, *n* (%)	2 (7.1)	16 (17.4)	0.365 (0.079----1.697)	0.151
Mesenteric Ischemia, *n* (%)	1 (3.6)	2 (2.2)	1.667 (0.145----19.096)	0.553
Necrotizing Pancreatitis, *n* (%)	1 (3.6)	3 (3.3)	1.099 (0.110----11.001)	0.660
Strangulated Hernia, *n* (%)	4 (14.3)	4 (4.3)	3.667 (0.854----15.750)	0.085
Tuberculosis Abdomen, *n* (%)	3 (10.7)	7 (7.6)	1.457 (0.351----6.053)	0.425

Table IV: Comparison of Complications with Age Group (n=120)				
Complications	Age Group			P-Value
	20--40	>40	O.R 95% C. I	
Burst Abdomen, n (%)	1 (1.3)	1 (2.4)	0.532 (0.032----8.735)	0.579
Enterocutaneous Fistula, n (%)	1 (1.3)	2 (4.8)	0.260 (0.023----2.952)	0.280
Intestinal Obstruction, n (%)	4 (5.1)	7 (16.7)	0.270 (0.074----0.984)	0.042
Wound Infection, n (%)	4 (5.1)	5 (11.9)	0.400 (0.101----1.578)	0.163
Mucosal Prolapse, n (%)	6 (7.7)	2 (4.8)	1.667 (0.321----8.646)	0.423
Parastomal Hernia, n (%)	1 (1.3)	4 (9.5)	0.123 (0.013----1.142)	0.050
Skin Excoriation, n (%)	40 (51.3)	21 (50.0)	1.053 (0.497----2.229)	0.893
Stomal Diarrhea, n (%)	1 (1.3)	2 (4.8)	0.260 (0.023----2.952)	0.280
Stomal Necrosis, n (%)	4 (5.1)	2 (4.8)	1.081 (0.190----6.162)	0.649
Stomal Prolapse, n (%)	4 (5.1)	3 (7.1)	0.703 (0.150----3.299)	0.469
Stomal Retraction, n (%)	8 (10.3)	6 (14.3)	0.686 (0.221----2.128)	0.512
Stomal Stenosis, n (%)	2 (2.6)	2 (4.8)	0.526 (0.071----3.877)	0.437
Stomal Bleeding, n (%)	2 (2.6)	3 (7.1)	0.342 (0.055----2.133)	0.231

Table V: Comparison of Complications with Mode of Surgery (n=120)				
Complications	Mode of Surgery			P-Value
	Elective	Emergency	O.R 95% C. I	
Burst Rbdomen, *n* (%)	1 (3.6)	1 (1.1)	3.370 (0.204----55.696)	0.414
Enterocutaneous Fistula,*n* (%)	1 (3.6)	2 (2.2)	1.667 (0.145----19.096)	0.553
Intestinal Obstruction, *n* (%)	2 (7.1)	9 (9.8)	0.709 (0.144----3.493)	0.503
Wound Infection, *n* (%)	4 (14.3)	5 (5.4)	2.900 (0.722----11.646)	0.128
Mucosal Prolapse, *n* (%)	4 (14.3)	4 (4.3)	3.667 (0.854----15.750)	0.085
Parastomal Hernia, *n* (%)	2 (7.1)	3 (3.3)	2.282 (0.362----14.395)	0.331
Skin Excoriation, *n* (%)	13 (46.4)	48 (52.2)	0.794 (0.340----1.855)	0.594
Stomal Diarrhea, *n* (%)	1 (3.6)	2 (2.2)	1.667 (0.145----19.096)	0.553
Stomal Necrosis, *n* (%)	2 (7.1)	4 (4.3)	1.692 (0.293----9.766)	0.428
Stomal Prolapse, *n* (%)	3 (10.7)	4 (4.3)	2.640 (0.554----12.582)	0.205
Stomal Retraction, *n* (%)	4 (14.3)	10 (10.9)	1.367 (0.393----4.749)	0.420
Stomal Stenosis, *n* (%)	1 (3.6)	3 (3.3)	1.099 (0.110----11.001)	0.660
Stomal Bleeding, n (%)	3 (10.7)	2 (2.2)	5.400 (0.855----34.112)	0.082

DISCUSSION

Intestinal stoma formation is crucial surgical intervention that provides relief and improves the quality of life for patients with a variety of gastrointestinal conditions. The procedure creates an artificial opening in the abdominal wall for the diversion of fecal material which may be temporary, or permanent depending on underlying condition[16]. The indications for stoma formation can be distributed into emergency and elective cases, each with its own set of clinical scenarios[17]. In emergency situations stomas are typically applied for bowel obstruction, intestinal perforation, or trauma where immediate diversion is required to prevent life-threatening complications such as peritonitis, sepsis, or organ failure[18,19]. Elective indications, however, are more associated with chronic conditions, such as colorectal cancer, inflammatory bowel disease, diverticulitis or congenital anomalies where stomas help to relieve symptoms, bypass diseased bowel segments, or safeguard healing tissues after major surgeries[20].

Apart from knowing the indications for formation of the intestinal stoma, the complications brought about by the procedure have to be assessed. The complications could result in more surgeries, longer hospital reasons or a lower quality of life for the patient all of which can have a negative impact on the patient's condition. Common early complications of stoma include stoma necrosis, retraction, peristomal skin irritation and bleeding. Intra-operative variables, inadequate perfusion, or patient-related factors, such as obesity or malnutrition can all contribute to these complications[21]. Late complications which typically develop weeks to months after the procedure include parastomal hernia, stoma prolapse, stenosis and fistula formation[22]. These long-term issues may require additional surgical interventions and often have a significant psychological impact on patients, particularly as they adapt to life with a stoma.

The formation of an intestinal stoma is a significant surgical procedure often employed to manage a wide range of gastrointestinal disorders. This study examines the various indications for stoma creation, as well as the complications that can arise, with a particular focus on the unique challenges faced in resource-limited healthcare settings.

In this research, gastrointestinal malignancies (55.1%) and abdominal trauma (50.4%) emerged as the most common reasons for stoma formation. These findings align with prior work by Pandiaraja et al., which reported malignancies and trauma as major indications at rates of 25% and 22%, respectively[13]. However, our study also highlighted the prevalence of abdominal tuberculosis (18.3%) and necrotizing pancreatitis (8.4%), which were observed at higher rates compared to another study reporting 6% and 3%, respectively[13]. Such differences likely reflect regional variations in disease prevalence and healthcare availability.

The data also revealed distinctions in outcomes across different patient groups and surgical circumstances. Emergency surgeries, which accounted for 76.7% of the procedures, were associated with a higher occurrence of complications. For instance, intestinal obstruction was significantly more common among patients over 40 years of age (16.7% versus 5.1%, $p = 0.042$). Similarly, older patients experienced a higher frequency of parastomal hernias (9.5% vs. 1.3%, $p = 0.050$), suggesting that age is an important risk factor. Although certain complications, such as mucosal prolapse (7.7% in younger patients vs. 4.8% in older patients, $p = 0.423$) and stomal bleeding (2.6% in younger patients vs. 7.1% in older patients, $p = 0.231$), were not statistically significant, they remain clinically relevant. Mucosal prolapse, for instance, can lead to functional difficulties, while stomal bleeding may point to technical errors during surgery or vascular complications.

Discrepancies between this study and others highlight variations in healthcare infrastructure, surgical proficiency, and patient demographics. For example, while Dincer et al. identified rectal cancer as the most frequent indication for stoma creation (44.7%), this study observed a broader spectrum of gastrointestinal malignancies[7]. Additionally, complications such as skin excoriation were notably high in this study (51.3% in younger patients vs. 50.0% in older patients, $p = 0.893$), closely aligning with findings from Pandiaraja et al., who reported a prevalence of 52.4%[13]. This underscores the widespread need for enhanced stoma care practices worldwide.

Our study also noted higher rates of certain complications compared to other research. For instance, intestinal obstruction was reported in 21.8% of cases and wound infections in 17%, whereas a previous cohort documented rates of 7.3% and 8.5%, respectively[13]. These discrepancies may stem from differences in perioperative care, patient education, and the availability of specialized healthcare professionals. Addressing these challenges will require targeted approaches based on the unique characteristics of distinct health system contexts.

The study also recognizes avenues where further research is needed. These findings deserve validation in multi-center prospective studies and could be tested for their applicability to more heterogeneous populations. Long-term follow-up is required to identify long-term complications such as parastomal hernias and the effect of stoma on quality of life. New approaches, such as prophylactic mesh at the time of surgery, may reduce the subsequent hernia rate.

There is also the potential for the development of remote follow up systems for stoma care that may help to overcome barriers that patients living in more remote or underprivileged areas may face. Further research into the efficacy of these systems, especially within resource-poor environments, would also be beneficial in assessing their potential contribution to improving stoma management on a global scale.

The results of this study highlight the need to minimize complications through adequate preoperative and postoperative care. As an example, stoma sites prior to surgery are marked, and the rates of skin irritation and parastomal hernias are drastically reduced[5]. The implementation of such practices as part of routinely executed protocols can minimize the adverse events during and after the surgery.

Patient education is also an important component of stoma management. In addition, increased confidence in managing stoma appliances and ability to prevent skin excoriation will empower us in improving the quality of life among stoma patients. However, more specialized stoma care is needed because stoma patients often have other problems, and management in multidisciplinary teams involving wound care specialists, dietitians and mental health professionals is critical to providing stoma care and this approach to care provides the foundation for ongoing recovery for better patient outcomes.

CONCLUSION

The research highlights gastrointestinal cancers and abdominal injuries as the primary reasons for intestinal stoma formation, with most cases stemming from emergency surgeries. Complications like intestinal blockage, skin irritation, and stoma retraction were more prevalent, particularly in older individuals. These findings underscore the importance of careful planning before surgery and attentive care afterward to reduce risks.

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REFERENCES

1. Massenga A, Chibwae A, Nuri AA, Bugimbi M, Munisi YK, Mfinanga R, et al. Indications for and complications of intestinal stomas in the children and adults at a tertiary care hospital in a resource-limited setting: a Tanzanian experience. BMC Gastroenterol. 2019;19:157.
2. Pal N, Jangra A, Mishra V. Analysis of complications and management of abdominal stoma. Int Surg J. 2019;6(8):2828-31.
3. Zelga P, Kluska P, Zelga M, Piasecka-Zelga J, Dziki A. Patient-related factors associated with stoma and peristomal complications following fecal ostomy surgery: a scoping review. J Wound Ostomy Continence Nurs. 2021;48(5):415-30.
4. D'Ambrosio F, Pappalardo C, Scardigno A, Maida A, Ricciardi R, Calabro GE. Peristomal skin complications in ileostomy and colostomy patients: what we need to know from a public health perspective. Int J Environ Res Public Health. 2022;20(1):79.
5. Arolfo S, Borgiotto C, Bosio G, Mistrangelo M, Allaix ME, Morino M. Preoperative stoma site marking: a simple practice to reduce stoma-related complications. Tech Coloproctol. 2018; 22:683-7.
6. Maglio A, Malvone AP, Scaduto V, Brambilla D, Denti FC. The frequency of early stomal, peristomal and skin complications. Br J Nurs. 2021;30(22):1272-6.
7. Dincer M, Çıtlak G. Indications and complications of stoma formations in emergency surgery. Int J Innov Res Med Sci. 2019;4(02):139-42.
8. Tsujinaka S, Tan KY, Miyakura Y, Fukano R, Oshima M, Konishi F, et al. Current management of intestinal stomas and their complications. J Anus Rectum Colon. 2020;4(1):25-33.
9. Dellafiore F, Caruso R, Bonavina L, Udugampolage NS, Villa G, Russo S, et al. Risk factors and pooled incidence of intestinal stoma complications: systematic review and meta-analysis. Curr Med Res Opin. 2022;38(7):1103-13.
10. Murken DR, Bleier JI. Ostomy-related complications. Clin Colon Rectal Surg. 2019;32(03):176-82.
11. Garmanova TN, Kazachenko EA, Krylov NN. History of surgery: the evolution of views on the formation of intestinal stoma. History Med. 2019;6(2):111-7.
12. Mehboob A, Perveen S, Iqbal M, Bux KM, Waheed A. Frequency and complications of ileostomy. Cureus. 2020;12(10):e11249.
13. Pandiaraja J, Chakkarapani R, Arumugam S. A study on patterns, indications, and complications of an enteric stoma. J Fam Med Prim Care. 2021;10(9):3277-82.
14. Bhatia M, Hafeez R, Smedley F, Read L, Abbas W, Ahmed R. 893 intestinal stoma-a challenge for the patient. Br J Surg. 2021;108(Suppl_2):znab134.503.
15. de Paula TR, Nemeth S, Kiran RP, Keller DS. Predictors of complications from stoma closure in elective colorectal surgery: an assessment from the American College of Surgeons National Surgical Quality Improvement Program (ACSNSQIP). Tech Coloproctol. 2020;24:1169-77.
16. Yadav P, Kushwaha J, Anand A, Sonkar AA, Yadav P. Clinical study of the patients undergoing stoma reversal in a tertiary care centre: a retrospective study from a developing country. Int Surg J. 2019;6(7):2444-8.
17. Denti FC, Maglio A, Brambilla D, Scaduto V. Complications in colostomy patients: analysis and assessment of risk factors. Gastrointest Nurs. 2020;18(Sup9):S12-6.
18. Nyman J, Lindmark M, Gunnarsson U, Strigård K. Surgical treatment of stoma-related hernias: retrospective cohort study of damage claims to the Swedish National Patient Insurance Company 2010–2016. BMC Surg. 2021;21:390.
19. Babakhanlou R, Larkin K, Hita AG, Stroh J, Yeung SC. Stoma-related complications and emergencies. Int J Emerg Med. 2022;15:17.
20. Van den Hil LC, Van Steensel S, Schreinemacher MH, Bouvy ND. Prophylactic mesh placement to avoid incisional hernias after stoma reversal: a systematic review and meta-analysis. Hernia. 2019;23:733-41.
21. Ambe PC, Kurz NR, Nitschke C, Odeh SF, Möslein G, Zirngibl H. Intestinal ostomy: classification, indications, ostomy care and complication management. Dtsch Ärztebl Int. 2018;115(11):182-7.
22. Krishnamurty DM, Blatnik J, Mutch M. Stoma complications. Clin Colon Rectal Surg. 2017;30(03):193-200.

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