Original Article

Risk factors for Post-operative Complications of Surgical Interventions done in Small Bowel Obstruction (SBO): A study of 100 cases

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Abstract:

Background: *Small bowel obstruction (SBO) is one of the most frequent indications for emergency surgery, and is known as a high-risk procedure with a morbidity and mortality rates at 20-30% and 3-5% respectively. Although it is a frequent surgery encountered in daily practice but less scientific work is noticed regarding this topic. The aim of the study was to identify the risk factors associated with various post-operative complications of different surgical interventions done for small bowel obstruction (SBO).*

Methods: *This hospital based observational study was conducted at the department of surgery in Jahurul Islam Medical College Hospital, from January 2018 to June 2019. Patients undergoing surgery for SBO were included in the study. Informed consent was taken from all study subjects and ethical issues were ensured. Data were collected using a semi-structured questionnaire. Collected data were analyzed by the SPSS v22.*

Results: *Out of 100 patients, 66% were male. Mean age was 47.46±13.46 years and prevalent (54%) age group was 41 – 60 years. The most common cause of acute small bowel obstruction was band and adhesion (38%), followed by obstructed hernia (30%), intestinal tuberculosis (15%), obstruction due to neoplasm (9%), intussusception (4%), Crohn's disease (2%) and worm bolus (2%). During operation 78% patients had clear peritoneal content, 14% had hemorrhagic peritoneal content and 8% had purulent content. Condition of the gut was viable in 83%, reversibly ischemic and gangrenous bowel were present in 10% and 7% cases respectively. Most frequent complications were wound infection (14%) followed by post-operative ileus (6%) and basal atelectasis (6%). Delay in presentation was significantly associated with the development of post-operative complications ($p<0.05$). Other factors that were significantly associated with the development of post-operative complications were presence of prior sepsis ($p=0.01$), age of more than 65 years ($p=0.03$), presence of multiple comorbidities ($p<0.01$) and a BMI of more than 30 ($p<0.05$).*

Conclusion: *Post-operative complications were more common in those who presented late. Other factors that were significantly associated with the development of post-operative complications were presence of prior sepsis, age>65 years, presence of multiple comorbidities and a BMI of >30.*

Keywords: *Risk factors, Post-operative complications, Small Bowel Obstruction (SBO), Surgical Intervention.*

Background:

Intestinal obstruction is a common surgical emergency that accounts for at least 12 to 16% of surgical admissions.[1] It occurs in all age groups from neonate to old age with higher incidence among age group 20-60 years (64.03%) and mostly affects male (75.20%) than females (24.79%).[2] Intestinal obstruction may be defined as the interference with the normal forward progression of intestinal contents.[3] The small bowel is involved in about 80% of cases of mechanical intestinal obstruction.[4,5]

The obstruction may be adynamic or functional (due to absence or inadequate peristalsis) or due to a mechanical or dynamic obstruction, that may be acute or sub-acute.[6] In sub-acute intestinal obstruction, there is partial obstruction to the lumen. And in acute small bowel obstruction, there is complete obstruction, which leads to distention of bowel & retention of fluid and air within the lumen, proximal to the obstruction. While distal to the obstruction, as luminal contents pass, the bowel collapses. If bowel dilatation is excessive, perfusion to the intestine can be compromised (strangulation) leading to gangrene or perforation, which increases the mortality associated with small bowel obstruction.

Causes of mechanical bowel obstruction seem to vary from one country to another and even region to region in same country, and incidences of various etiological factors appear to alter from year to year.[7] Previously obstructed external

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hernia was the most common cause, but nowadays adhesive band is claimed as the commonest cause of intestinal obstruction in developed countries.[8] Other causes of small bowel obstruction include intra-mural pathology (e.g. tumors, inflammatory stricture) and intra-luminal obstruction (e.g. intussusception, bezoars, gallstones, foreign bodies).

Clinical presentation of small bowel obstruction depends on site of obstruction, duration of obstruction, type of obstruction (complete or incomplete), underlying pathology and presence or absence of strangulation. But classical presentations of small bowel obstruction are colicky abdominal pain, vomiting, abdominal distention and absolute constipation. In proximal bowel obstruction, predominant feature is vomiting which may lead to rapid dehydration. In distal bowel obstruction, central abdominal distention is the main presentation along with abdominal pain.

In the presence of strangulation, patient present with constant abdominal pain, signs of peritonitis and shock[6]. In our country, patients get admitted to hospital later than the developed countries. Interval between the onset of disease and the time of admission to hospital varies from several hours to several days as long as weeks. Mean duration is 3 days. During the period the patient remains untreated or maltreated by quacks & kabiraj etc[9] and the obstruction become complicated with strangulation and/or perforation, as well as shock, electrolyte imbalance, acute kidney Injury etc. So, most of the patient in our country requires surgical intervention with prior resuscitation.

Outcome of management depends on several factors like type of surgery, site of incision, post-operative convalescence, duration of symptoms & post-operative complication. In elderly patients & delayed admission, mortality & morbidity is high. Efforts should be taken for early diagnosis & prompt surgical treatment when indicated to reduce mortality & morbidity. In a developing country like us, poverty, illiteracy and unawareness to health are the obstacles in managing surgical pathology. As patients with small bowel obstruction come in late stage like strangulation with peritonitis, shock, acute kidney injury etc., the rate of post-operative mortality and morbidity are high. Post-operative complications include wound infection, burst abdomen, basal atelectasis, prolonged ileus (more than 72 hours), small bowel fistula, peritonitis, sepsis, urinary tract infection, aspiration pneumonia, deep vein thrombosis, myocardial infarction that lead to prolonged hospital stay and so an economic burden for the patient, as well as health care burden in our country. The aim of the study was to identify the risk factors associated with various post-operative complications of different surgical interventions done for small bowel obstruction (SBO).

Methods:

This observational study was done in the department of Surgery, Jahurul Islam Medical College & Hospital, Bajitpur, Kishoreganj (JIMCH), from January 2018 to June 2019. All the patients of small bowel obstruction (acute & sub-acute), undergoing operative treatment in JIMCH, were selected purposively according to the inclusion & exclusion criteria. Purposive consecutive type of sampling was done. Patients with large bowel obstruction, patients who refused surgery, patients who were not fit for surgery, patients who received only conservative management (e.g., adynamic obstruction) & those who didn't give consent were excluded from the study.

Before commencement of the study, formal ethical clearance was taken from the ethical review committee of JIMCH. Following admission all of the patients were examined clinically and investigated for confirmation of diagnosis. All the patients were informed clearly about the aim, objectives, benefits and risk of the study. An informed written consent form was obtained from each of the patients. Following confirmation of the diagnosis, all patients were managed in according to the standard protocol. Researcher himself collected all necessary information (cause of obstruction, per-operative and post-operative findings, post-operative complications etc.) and kept record on patient's case record form. Beside this, socio-demographic parameters and relevant information were also collected during interviewing of the patients. Subsequently, collected data were analyzed by SPSS v22.

Statistics

After collection of all the required data, they were checked, verified for consistency and then tabulated into the computer using the SPSS v22. Statistical analyses were carried out by using the Statistical Package for Social Sciences version 22.0 for Windows (SPSS Inc., Chicago, Illinois, USA). Variables were expressed as frequencies and percentages. Chi-square (X^2) test and ANOVA test was done to evaluate the association between variables. A p-value <0.05 was considered as significant.

Results:

Total 100 cases of small bowel obstruction (SBO), treated surgically, were included in this study. Mean age was 47.46±13.46 years. Maximum age was 70 years and minimum age 5 months. Majority of the patients belonged to age group 41 – 60 years (54%). Majority patients were male (66%). The most common symptom was abdominal pain (100%) followed by vomiting (94%) and abdominal distension (72%). Most common sign was dehydration (90%), followed by tachycardia (72%), hypotension (28%) and increased bowel sound (28%) (Table I). Patients most commonly presented in the hospital within 1 to 4 days after onset of symptoms (Table II).

The most common cause of acute small bowel obstruction was band and adhesion (38%) followed by obstructed hernia (30%), intestinal tuberculosis (15%), obstruction due to neoplasm (9%), intussusception (4%), Crohn's disease (2%) and worm bolus (2%). Among neoplasm 5% were carcinoma caecum and 4% were small bowel neoplasia. Out of 38 cases of band-adhesion, 23 (60.52%) were due to previous surgery. Among them most cases (26.31%) underwent laparotomy due to different pathology like DU perforation, intestinal obstruction etc. There were significant percentages of band-adhesion due to abdominal TB (28.95%). (Table III)

Table I: Clinical presentation of small bowel obstruction (n=100).

Variable	Percentage
Symptoms	
Abdominal pain	100
Vomiting	94
Abdominal distension	72
Fever	30
Groin swelling	24
Signs	
Dehydration	90
Tachycardia	72
Hypotension	28
Increased bowel sound	15
Abdominal rigidity	25
Visible peristalsis	16

Table II: Time lag between onset of symptom and admission in the hospital (n=100).

Time lag	Percentage
12 hours	12
12 - 24 hours	20
1 - 4 days	34
5 - 7 days	26
> 7 days	8

Table III: Causes of band-adhesion (n=38).

Causes		No of cases	Percentage
Previous	Laparotomy	10	26.31%
surgery = 23	Appendicectomy	8	21.05%
	Hysterectomy	5	13.16%
Tuberculosis		11	28.95%
Idiopathic		4	10.53%

During operation, 78 patients had clear peritoneal content, 14 had hemorrhagic peritoneal content and 8 patients had purulent content. Condition of the gut was viable in 83%, reversibly ischemic in 10% and gangrenous in 7% patients (Table IV). The most common surgical procedure was release of band-adhesion (32%) with or without resection & anastomosis. This was followed by hernia repair (26%), ileo-transverse bypass (15%), segmental resection and anastomosis (11%). (Table V)

Table IV: Per-operative findings (n=100).

Per-operative finding	Percentage (%)
Peritoneal contents	
Clear	78
Hemorrhagic	14
Purulent	8
Condition of the gut	
Viable	83
Reversibly ischemic	10
Gangrenous	7

Table V: Surgical interventions taken for small bowel obstruction (n=100)

Surgery	Percentage (%)
Exploration of hernia & herniorraphy	26
Laparotomy with resection-anastomosis & herniorraphy	3
Laparotomy with closure of mesenteric defect	1
Release of band – adhesion	22
Release of band - adhesion with resection & anastomosis	10
Segmental resection & anastomosis	11
Resection & ileostomy	3
Right hemicolectomy & Ileo-transverse anastomosis	7
Ileo-transverse anastomosis (bypass)	15
Enterotomy & extraction of worm bolus	2

Among patients who were given surgical intervention, 66% recovered without complication, and 30% developed complication and 4% died. The most common cause of post-operative mortality in SBO was severe sepsis with multi organ failure (50%). Other causes include septicemia (25%) and cardiac arrest (25%). The most common post-operative complication was wound infection (14%) followed by post-operative ileus (6%) and basal atelectasis (6%). Some patient had multiple complications & some had single complication (Table VI).

Table VI: List of post-operative complications (n= 100)

Complications	Percentage
Complication related to wound	
Wound infection	14
Wound dehiscence	3
Intra-abdominal complication	
Post-operative ileus	6
Sepsis	4
Respiratory complications	
Basal atelectasis	6
Pneumonia	2

Patients who spent longer duration before admission after onset of symptoms pertaining to small bowel obstruction had significantly higher proportion of complication than those whose time lag was lower (p<0.05) (Table VII). Other factors that were significantly associated with the development of post-operative complications were presence of prior sepsis (p=0.01), age of more than 65 years (p=0.03), presence of multiple comorbidities (p<0.01) and a BMI of more than 30 (p<0.05). (Table VIII-XI)

Table VII: Relationship of time from onset of symptom to admission with post-operative complication (n=30).

Time from onset of symptom to admission	Complication, n (%)		p Value
	Yes	No	
12 hours	0	12 (100%)	0.001
12 – 24 hours	3 (15%)	17 (85%)	
1 – 4 days	8 (23.5%)	26 (76.5%)	
5 – 7 days	14 (53.8%)	12 (46.2%)	
>7 days	6 (75%)	2 (25%)	

Table VIII: Association between sepsis & development of post-operative complication (n=30).

Prior sepsis	Outcome, n (%)		Total	p-value
	With complication	Without complication		
Present	22 (73.33)	5 (7.14)	27 (27)	0.01
Absent	8 (26.67)	65 (92.86)	73 (73)	
Total	30 (100)	70 (100)	100 (100)	

Table IX: Association between age & development of post-operative complication (n=30).

Age in years	Outcome, n (%)		Total	p-value
	With complication	Without complication		
≥ 65	9 (30)	4 (5.71)	13 (13)	0.03
< 65	21 (70)	66 (94.29)	87 (87)	
Total	30 (100)	70 (100)	100 (100)	

Table X: Association between presence of multiple comorbid illness & development of post-operative complication (n=30).

Multiple comorbid illness	Outcome, n (%)		Total	p-value
	With complication	Without complication		
Present	19 (63.33)	5 (7.14)	24 (24)	<0.01
Absent	11 (36.67)	65 (92.86)	76 (76)	
Total	30 (100)	70 (100)	100 (100)	

Table XI: Association between BMI & development of post-operative complication (n=30).

BMI	Outcome, n (%)		Total	p-value
	With complication	Without complication		
≥ 30	16 (53.33)	3 (4.29)	19 (19)	<0.05
< 30	14 (46.67)	67 (95.71)	81 (81)	
Total	30 (100)	70 (100)	100 (100)	

Discussion:

This prospective observational study was done to identify the risk factors associated with various post-operative complications of different surgical interventions done for small bowel obstruction (SBO). In our study the most common age groups affected were, 41 to 60 years with prevalent age ranging from 5 months to 70 years. This was different with the studies conducted by Sarvanan et al, Ooko et al, Adhikari et al and Ojo et al in which the cases of acute small intestinal obstruction occurred commonly in age groups of 30-50 years, 31-40 years, 30-50 years and 20-40 years respectively.[10-13] In study conducted by Cole et al most common age group affected was 31-40 years.[14]

The mean age for SBO was 47.46±13.46 in this study, which varies with 25 and 63.8 years of mean age reported by Drożñdz et al[15] and Markogiannakis et al[16] respectively but similar to 45.87 years reported by Jaiswal et al[17], and 45 years by Lawal et al[18]. The present study on acute intestinal obstruction in adults shows clear pre-ponderance of male sex over female sex with 66% males and 34% females. This was also true for the study done by Jaiswal et al [17] who reported 72.59% males and 27.41% females. The overall gender incidence in favour of males and in tandem with other reports may be ascribed to the higher prevalence of hernia and gastrointestinal diseases such as volvulus and malignancy in the males. [12,19]

In this study majority of the patients were day laborer (30%). Day laborer are more likely to carry high mechanical load during their work. Vad et al[20] showed that occupational mechanical exposures increase the risk of lateral and medial inguinal hernia requiring surgical repair. Therefore, it is also likely that they would get admitted in the hospital with obstructed inguinal hernia. The most common symptom of presentation in emergency department was abdominal pain (100%) followed by vomiting (94%) and abdominal distention (72%). This is similar to the findings of other studies. Jaiswal et al[17] found abdominal pain (91.11%), constipation (85.93%) and abdominal distension (74.07%) were the most common symptoms with which patients presented to emergency department. Markogiannakis et al[16] in their study showed that abdominal pain (74%), vomiting (78.6%) and constipation (90%) formed the major symptoms while the major signs included increase bowel sound (66%), abdominal distention (65.3%) and guarding (37.3%). The present study found dehydration (90%) and tachycardia (28%) to be the common signs.

Small bowel obstruction is one of the most common causes for surgical admissions worldwide. The most common causes of small bowel obstruction vary widely with geographic region, socioeconomic status, patients' age group and medical services obtainable in a population. However, in this study, band & adhesion (38%) appeared to be the most common cause as has been seen earlier in the Western world as well as in parts of Asia and Middle East [(21-23)], followed by obstructed hernia (30%). Earlier obstructed hernia was the predominant cause. But due to increasing elective hernia repair in community surgical outreaches as well as quality day-case hernia surgery in different institutions there is a progressive decrease in obstructed hernia cases. However, in Eastern India and West Bengal obstructed hernia (36%) was predominant, followed by adhesion (32%) and neoplasm (12%) as second and third common cause[24,25]. In our study 15% cases were due to intestinal tuberculosis. Intestinal tuberculosis appeared to be an important factor in the etiology given the high prevalence of tuberculosis in Bangladesh.[26]

Maximum numbers of patients with adhesive obstruction (60.52%) in this study had a history of laparotomy (26.31%), appendicectomy (21.05%) and pelvic surgery (13.16%) within last three years. Similar results are also described by many authors who have conducted similar trials.[27-29] All patients in the other studies with adhesive obstruction were initially given a trial of conservative management, and this approach was recommended and adopted by many other authors in their trials.[30-32] But in this study only operative cases were included. The most common surgical procedure was release of band (32%) with or without resection & anastomosis. This was followed by herniorrhaphy (29%) and ileo-transverse anastomosis (15%). In the study by Ojo et al[13] 169 (77.9%) patients were managed operatively with adhesiolysis being the most frequent procedure as the prevalent cause in their study was band adhesions. However, resection was needed in most of the patients (34%) because of complete obstruction by inflammatory stricture, gangrenous bowel, neoplasm etc. In our study per-operatively in most cases gut was found viable (83%) and peritoneal content was clear (78%). Ischemic & gangrenous bowel were found in 10% and 7% cases respectively.

Of all, 66% patients recovered completely, 30% had post-operative complications and 4% died. Wound infection (14%), post-operative ileus (6%) and basal atelectasis (6%) were more common than other post-operative complications. Sepsis was noted in 4% patients. Septicemia (25.93%) and wound infection (30.37%) were the most common post-operative complications found by Jaiswal et al[17]. Wound infection was the most common post-operative complication in the study by Adhikary et al[12] occurring in 11.99% patients. They also found prolonged ileus in 9.26% cases and burst abdomen (wound dehiscence) in 4.4% cases. Sepsis developed in seven patients with intestinal tuberculosis (13.46%) in their study[12]. In our study there was higher incidence of post-operative complication in male (42.4%) than in female (17.6%) and among those who admitted late (53.8% in those who admitted 5-7 days later from onset of symptoms).

The mortality rate (4%) of this study conforms to that of Ojo et al[13] (5.5%) and lower than that of Adhikari et al (7.35%).[12] Outcome of obstructions of the bowel may vary depending on underlying etiological factors, presence of comorbidities, advancement of age or the timing of institution of treatment. In this study, delay in presentation was significantly associated with the development of post-operative complications ($p<0.05$). Other factors that were significantly associated with the development of post-operative complications were presence of prior sepsis ($p=0.01$), age of

more than 65 years (p=0.03), presence of multiple comorbidities (p<0.01) and a BMI of more than 30 (p<0.05). Jeppesen et al[33] evaluated the risk factors affecting morbidity and mortality following emergency laparotomy for small bowel obstruction and found male sex, increasing age, presence of co-morbid chronic obstructive pulmonary disease, metabolic disease and peri-operative blood transfusion to be significant factors in determining outcome, which are quite similar to our study. Delay in presentation was also found to be an important prognostic factor in the study by Ojo et al[12]. Identifying these risk factors in the patients with SBO is important in guiding future therapeutic decisions and maximizing outcomes.

Conclusion

Wound infection, post-operative ileus and basal atelectasis were among the most common post-operative complications occurring after surgery for SBO. Delay in presentation was significantly associated with the development of post-operative complications. Other factors that were significantly associated with the development of post-operative complications were presence of prior sepsis, age of more than 65 years, presence of multiple comorbidities and a BMI of more than 30. However, the study findings should be used with caution as the study was limited in small sample size and was confined in one study center. Therefore, larger cohort study is needed to finalize the comment.

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