Journal of Chitwan Medical College 2022;12(39):65-70
Available online at: www.jcmc.com.np

ORIGINAL RESEARCH ARTICLE

# PATTERN, MANAGEMENT AND OUTCOME OF ACUTE INTESTINAL OBSTRUCTION AT CHITWAN MEDICAL COLLEGE TEACHING HOSPITAL

**Abhishek Bhattarai[1,*], Pragya Devkota[2], Anup Shrestha[1], Manoj Chand[1], Santosh Timalsina[3], Kishor Kumar Tamrakar[1], Harish Chandra Neupane[1]**

[1]Department of Surgery, Chitwan Medical College Teaching Hospital, Chitwan, Nepal
[2]Department of Clinical Pharmacology, Kist Medical College Teaching Hospital, Lalitpur Nepal
[3]Department of biochemistry, Chitwan Medical College Teaching Hospital, Chitwan, Nepal

**Received**: 21 Nov, 2021

**Accepted**: 7 Feb, 2022

**Published**: 15 Mar, 2022

**Key words**: Adhesion; Hernia; Intestinal obstruction; Malignancy.

***Correspondence to:** Abhishek Bhattarai, Department of surgery, Chitwan Medical College Teaching Hospital, Chitwan, Nepal.*
*Email:* abhishekbhattarai@gmail.com
*DOI:*https://doi.org/10.54530/jcmc.575

**Citation**

Bhattarai A, Devkota P, Shrestha A, Chand M, Timalsina S, Tamrakar KK, Neupane HC. Pattern, management and outcome of acute intestinal obstruction at Chitwan medical college teaching hospital. Journal of Chitwan Medical College. 2022;12(39):65-70.



## ABSTRACT

**Background**: Acute intestinal obstruction is one of the commonly encountered emergencies in surgical practice. Gynecological surgery, especially adnexal surgery and hysterectomy has a higher incidence of bowel obstruction as compared to bowel surgery. Conservative management can be done in patients with post-operative adhesive bowel obstruction if there is no evidence of ischemia, bowel necrosis, or perforation. Therefore, a correct diagnosis is essential for appropriate management. We conducted a study to evaluate the etiology, clinical presentation as well as management and outcome of patients presenting with Acute intestinal obstruction at our center.

**Methods:** This was a retrospective study of all the patients with a diagnosis of Acute intestinal obstruction from January 2015 to December 2019. The diagnosis of Acute intestinal obstruction was made by a combination of clinical and radiological parameters. The data were analyzed using Statistical Package for Social Sciences (SPSS) for Windows version 16. The data were expressed in number and percentage.

**Results:** During the study period, 178 patients were admitted with the diagnosis of Acute intestinal obstruction. Abdominal pain and vomiting were the main complaints seen in 98.3% (n=175) and 84.8% (n=151) respectively. Hernia (n=49, 27.5%) was the most common cause of acute intestinal obstruction in adults, and Intussusception (n=15, 8.4%) was the leading cause of Acute intestinal obstruction in a pediatric age group. Majority of the patients' needs (n=148,83.1%) operative intervention to relieve the obstruction. The overall mortality rate was 6.7% (n=12).

**Conclusions:** Hernia was the most common cause of Acute intestinal obstruction in adults while intussusception was the commonest in the pediatric age group.

## INTRODUCTION

The etiology of Acute intestinal obstruction (AIO) varies in between countries.[1-4] Postoperative adhesion and hernia account for the majority of the AIO and malignancy is the frequent cause of large bowel obstruction.[5]

Opening the peritoneal cavity during surgery leads to some form of adhesions or formation of bands in most of the patients.[6] Gynecological surgery especially adnexal surgery and hysterectomy have a higher incidence post operative adhesion and AIO as compared to bowel surgery.[7]

Patients with any kind of intestinal obstruction are the potential candidates for surgical intervention. Major surgery in emergency settings carries high morbidity and mortality. Conservative management can be done in a patients with post-operative AIO if there is no evidence of ischemia, necrosis, or perforation. Therefore, a correct diagnosis is essential for appropriate management.

We conducted a retrospective study to evaluate the etiology, clinical presentation as well as management and outcome of patients with a diagnosis of AIO.

## METHODS

This was a retrospective study that includes all the patients who presented to the Emergency Department of Chitwan Medical College Teaching Hospital with a diagnosis of AIO from January 2015 to December 2019. The diagnosis of AIO was made by clinical and radiological parameters. Clinical parameters include a history of abdominal pain and distension, nausea or vomiting, and constipation or obstipation and Physical examination showing abdominal distension with palpable or visible peristaltic waves, tenderness, changing bowel sounds, or features of peritonitis. Apart from clinical criteria, one should be met one of the following conditions on plain abdominal radiographs or abdominal ultrasound or CT scan showing multiple multiple air-fluid levels in the small bowel/ large bowel with dilated small and large bowel with transition point and compressed bowel distal to the obstruction, were used in making the diagnosis of AIO.

**Table 1: Clinical presentation of the patients in different etiology**

| Etiology (n=178) | Abdominal pain | Vomiting | Constipation | Abdominal distension |
|---|---|---|---|---|
| Post-operative Small bowel obstruction (n=34, 19.1%) | 34 (100%) | 34 (100%) | 34 (100%) | 34 (100%) |
| Hernia (n=49, 27.5%) | 49 (100%) | 43 (87.7%) | 34 (69.3%) | 42 (85.7%) |
| Small bowel pathology (n=30, 16.8%) | 28 (93.3%) | 28 (93.3%) | 24 (80%) | 19 (63.3%) |
| Ileo-cecal pathology (n=25, 14%) | 25 (100%) | 24 (96%) | 12 (48%) | 14 (56%) |
| Large bowel pathology (n=31, 17.4%) | 31(100%) | 13 (42%) | 31 (100%) | 29 (93.5%) |
| Mesentery and Others (n=9, 5%) | 8 (88.8%) | 9 (100%) | 6 (66.6%) | 6 (66.6%) |

Routine hematological and biochemical investigations were done before admission. All the patients with a diagnosis of AIO irrespective of the cause were admitted to the Department of General Surgery. Patients with postoperative paralytic ileus and gastric outlet obstruction due to gastric pathology were excluded from the study.

In the emergency, fluid resuscitation was done on every patient. Patients with previous laparotomy were initially, kept on conservative management if a CT scan showed no sign of ischemia and perforation. It comprised of nasogastric decompression, fluid, and electrolyte correction by intravenous route and broad-spectrum antibiotics, monitoring of vital signs, abdominal girth measurement, and monitoring of intake and output.

Criteria for the operative management in patients with post-operative adhesive bowel obstruction were: development of hemodynamic instability after initial stabilization, peritoneal signs on physical examination, identification of bowel ischemia, necrosis, and/or perforation on imaging, development of fever, tachycardia, feculent nasogastric drain and failure of non-operative management on the 4th post-admission day or 4 days of onset of symptoms.

Small bowel obstruction at a young age, obstruction in the non-operated abdomen, and large bowel obstruction were managed operatively, within 24 hours of admission, after resuscitation and nasogastric decompression. Pediatric ileo-cecal intessusception without evidence of lead point and bowel ischemia were also managed conservatively with hydrostatic reduction. Written informed consent was taken from all patients before surgery.

Data were collected in preformed proforma from the hospital records. Socio-demographic details of the patients, relevant clinical details, intraoperative findings (such as the etiology of obstruction, presence of bowel ischemia, and perforation), postoperative complications, and outcomes were also recorded. Ethical approval was taken from the Chitwan Medical College Institutional Review Committee (CMC-IRC).

The data were analyzed using Statistical Package for Social Sciences (SPSS) for Windows version 16. The data were expressed in number and percentage.

## RESULTS

During the four years study period, 178 patients were admitted to the Department of General Surgery ward with the diagnosis of AIO. Among them, 112 (63%) were male and 66 (37%) were females. The median age of the patient was 50 (4 days to 85) years. Abdominal pain and vomiting were the most frequent presenting symptoms seen in 98.3% (n=175) and 84.8% (n=151) respectively. The clinical presentation of the different etiology is presented in Table 1.

Hernia (n=49, 27.5%) was the most common cause of AIO followed by postoperative small bowel obstruction (SBO) (n=34, 19.1%). Malignancy (n=19, 10.6%) was the most common cause of large bowel obstruction. The etiology of intestinal obstruction is shown in Table 2.

**Table 2: Etiology of intestinal obstruction**

| Etiology | Frequency (%) |
|---|---|
| **Post-Operative SBO** | **34** |
| • Gynecological pathology | 23 (67.6) |
| • Laparotomy for perforation/ other cause | 7 (20.5) |
| • Obstructed incisional hernia | 2 (5.8) |
| • Appendectomy | 1 (2.9) |
| • Open cholecystectomy | 1 (2.9) |
| **Hernia** | **49** |
| **Ventral and Groin Hernia** | 44 (89.7) |
| • Inguinal Hernia | 29 (59.1) |
| • Femoral | 6 (12.2) |
| • Epigastric hernia | 2 (4.0) |
| • Umbilical hernia | 3 (6.1) |
| • Pediatric hernia | 4 (8.1) |
| **Internal hernia** | 5 (10.2) |
| • Obturator hernia | 2 (4.0) |
| • Trans mesenteric hernia | 1 (2.0) |
| • Para duodenal hernia | 1 (2.0) |
| • Diaphragmatic hernia | 1 (2.0) |
| **Small bowel** | **30** |
| • Duodenal/ DJ flexure mass | 3 (10) |
| • SMA syndrome | 2 (6.6) |
| • Jejunal stricture | 1 (3.3) |
| • Cocoon abdomen | 1 (3.3) |
| • Ileal mass | 1 (3.3) |
| • Ileal stricture | 2 (6.6) |
| • Ileo-ileal intussusception (pediatric) | 2 (6.6) |
| • Jejuno-ileal intussusception | 2 (6.6) |
| • Meckel's band/ congenital band | 7 (23.3) |
| • Phytobezoars | 3 (10) |
| • Gall stone ileus | 1 (3.3) |

| | |
|---|---|
| • Crohns | 1 (3.3) |
| • Periampullary mass | 1 (3.3) |
| • Malrotation | 1 (3.3) |
| • Unknown | 2 (6.6) |
| **Ileo cecal pathology** | **25** |
| • Ileo-cecal mass | 4 (16) |
| • Ileo-cecal stricture | 3 (12) |
| • Ileo-cecal intussusception (adult) | 3 (12) |
| • Appendicular lump/abscess | 2 (8) |
| • Pediatric ileo-cecal intussusception | 13 (52) |
| **Large bowel pathology** | **31** |
| **Malignant** | |
| • Cecum/ascending colon mass | 5 (16.1) |
| • Hepatic flexure mass | 1 (3.2) |
| • Splenic flexure mass | 3 (9.6) |
| • Descending colon polyp | 1 (3.2) |
| • Sigmoid mass | 3 (9.6) |
| • Rectal mass | 4 (12.9) |
| • Anal canal CA | 2 (6.4) |
| **Non-malignant** | |
| • Cecal volvulus | 1 (3.2) |
| • Peri diverticulitis /abscess | 1 (3.2) |
| • Radiation stricture | 2 (6.4) |
| • Colonic pseudo-obstruction | 2 (6.4) |
| • Sigmoid rectal intussusception | 1 (3.2) |
| • Fecal impaction | 3 (9.6) |
| • Sigmoid volvulus | 1 (3.2) |
| • Retro rectal mass | 1 (3.2) |
| **Mesentery and others** | **9** |
| • Mesenteric volvulus (one neonate) | 4 (44.4) |
| • Mesenteric ischemia | 2 (22.2) |
| • Pancreatic pseudocyst | 2 (22.2) |
| • Sealed DU perforation | 1 (11.1) |

The incidence of bowel obstruction due to tuberculosis or its squeal was 6.7% (n=12). The ileocecal region was the commonest area of involvement and the majority of them required right hemicolectomy (Figure 1).

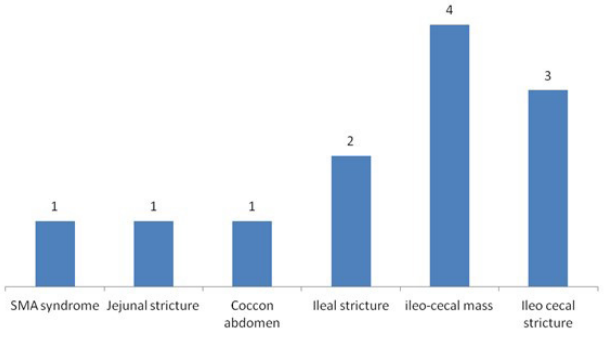


**Figure 1: Tubercular causes of intestinal obstruction (n=12, 6.7%)**

Twenty-three cases were in the pediatric age group (below the age group of 15). Intussusception (n=15, 8.4%) and irreducible groin hernia (n=4, 2.2%) were the leading cause of intestinal obstruction in this group. Among them, two patients had ileo-ileal intussusception. One ileocecal and one ileo-ileal intussusception had polyp as a lead point (Figure 2).

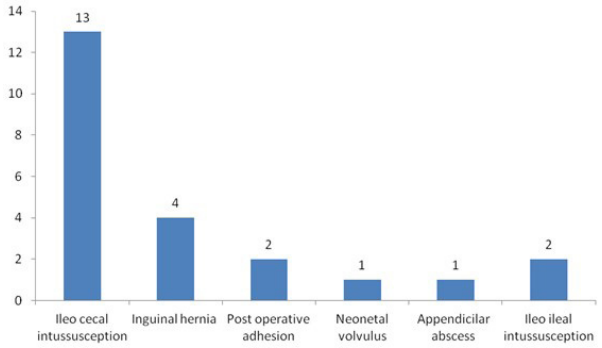


**Figure 2: Etiology of intestinal obstruction in pediatric population**

The majority of the patients needed operative intervention (n=148 83.1%). Conservative management was successful only in 16.9% (n=30) of patients, among them, 5.6% (n=10) cases were pediatric intussusception for which hydrostatic reduction was done, and another 5.6% (n=10) cases were post-operative adhesive bowel obstruction. Two cases of small bowel obstruction resolved spontaneously and a contrast-enhanced CT scan could not detect any pathology after spontaneous recovery. The conservative management of patients with different etiology is presented in figure 3.

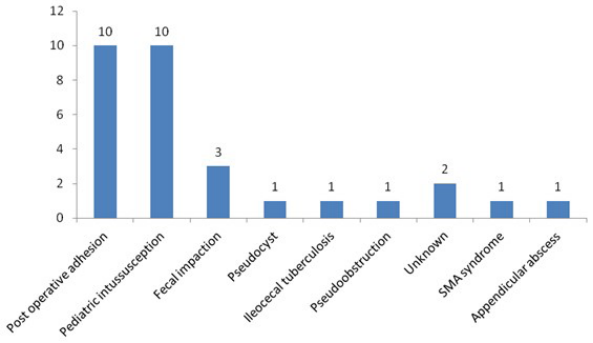


**Figure 3: Successful conservative management with different etiology (n=30, 16.9%)**

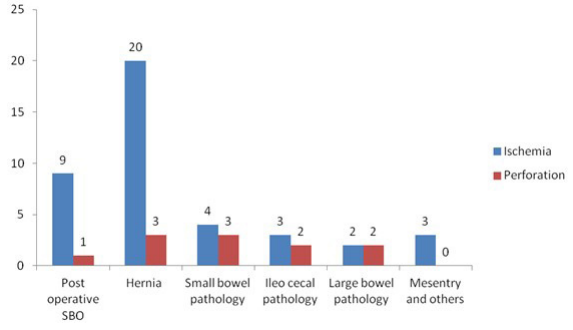


**Figure 4: Incidence of bowel ischemia (n=41,23%) and perforation (n=11, 6.2%)**

Among patients who underwent operative intervention, 41 patients (23%) had bowel ischemia and 11(6.2%) had bowel perforation (Figure 4). Seventy-one patients (39.8%) required bowel resection and anastomosis. Apart from bowel resection, four patients required gastrojejunostomy, two patients required enterotomy, two required stricturoplasty, and nine required diversion colostomy (Table 3).

**Table 3: Surgical management of the patients with different etiology**

| Operative management (n=148, 83.1%) | Frequency (%) |
|---|---|
| **Post-operative adhesive SBO (n=34)** | |
| • Adhesiolysis and band release | 14 (41.1) |
| • Resection and anastomosis | 10 (29.4) |
| **Hernia (n=49)** | |
| • Reduction of content and resection and anastomosis | 20 (40.8) |
| • Herniotomy/Herniorraphy/Hernioplasty/ Anatomical repair / Repair of the defect | 29 (59.1) |
| **Small bowel pathology (n=30)** | |
| • Resection and anastomosis | 10 (33.3) |
| • Congenital band release | 7 (23.3) |
| • Gastro-jejunostomy | 4 (13.3) |
| • Enterotomy | 2 (6.6) |
| • Stricturoplasty | 2 (6.6) |
| • Milking | 2 (6.6) |
| **Ileo cecal pathology (n=25)** | |
| • Hemicolectomy | 12 (48) |
| • Laparotomy and drainage of pus | 1 (4) |
| **Large bowel pathology (n=31)** | |
| • Right hemicolectomy | 6 (19.3) |
| • Extended right hemicolectomy | 3 (9.6) |
| • Left hemicolectomy | 1 (3.2) |
| • Sigmoid resection | 5 (16.1) |
| • Anterior resection | 1 (3.2) |
| • Colostomy | 9 (29) |
| • Cecopexy | 1 (3.2) |
| • Operative decompression of pseudo-obstruction | 1 (3.2) |
| **Mesentry and others (n=9)** | |
| • Derotation of mesenteric volvulus | 3 (33.3) |
| • Derotation with resection and anastomosis | 1 (11.1) |
| • Cysto jejunostomy for pseudocyst | 1 (11.1) |
| • Resection and anastomosis | 2 (22.2) |
| • Laparotomy and lavage | 1 (11.1) |

Post-operatively thirty-one (17.4%) patients developed surgical site infection (SSI) and 11.2% (n=20) developed pneumonia during the hospital stay. The overall mortality rate was 7% (n=12). Most of them had a shock at the time of the presentation.

## DISCUSSION

Intestinal obstruction is one of the common emergencies that bring patients to the hospital. Most of the literature suggests that the most common causes of intestinal obstruction are post-operative adhesions and hernias[5,8,9] However, in many parts of the world, the spectrum of etiology has been changed and hernia has become the leading cause of intestinal obstruction.[3,10] In our study also hernia is the leading cause of intestinal obstruction (27.5%) followed by postoperative bowel obstruction (19.1%) and majority of the cases of large bowel obstruction was due to malignancy.This could be due to several patients who were reluctant for elective surgery of hernias due to poverty, lack of education, fear of surgery and ultimately land up with bowel obstruction and strangulation. Another probable reason for this shift in etiology is the widespread use of minimal invasive surgery (MIS) in the last two decades to deal with abdominal pathology. One of the major benefits of MIS is a reduction in postoperative adhesion development and its complication in long term.[7]

An interesting cross-sectional study from Ethiopia in 2016, reported that small bowel intussusception and small bowel volvulus were the most common cause of intestinal obstruction. Sigmoid volvulus was the most common cause of large bowel obstruction followed by colonic cancer.[11]This data shows that geographical location ethnicity, dietary habits, and several other factors also play a role in the development of intestinal obstruction. Its incidence varies from one country to another and from one area to another area in the same country.[11]

Intestinal obstruction due to gastro-intestinal tuberculosis is common in countries like Nepal and India. In India, 3% to 20% of all intestinal obstructions are due to abdominal tuberculosis.[12] A study from Vietnam shows that the incidence of mechanical bowel obstruction caused by abdominal tuberculosis is 4.5% and the majority of them have pathology lies in the ileocecal region.[12] Our study showed 3.9% (n=7) of the patients had tubercular pathology in the ileocecal region. Together with a duodenal, jejunal, and ileal case, it accounts for 6.7% (n=12) of total bowel obstruction.

Bowel obstruction in the pediatric age group differs from that in adults.The etiology also differs by age group and geographical location.[13] Shah M et al from Malawi shows the Hirschprung's disease and anorectal malformation accounts for the majority of small bowel obstruction.[14] whereas the study from Kenya and India (Kashmir) shows ascariasis is the leading cause of intestinal obstruction in children.[15-17] In contrast to the above study in our series, the most common cause of pediatric intestinal obstruction was ileocecal intussusception followed by irreducible /obstructed inguinal hernia.

Regarding the clinical presentation, abdominal pain and vomiting were the most common presenting symptoms in our patients. Constipation and abdominal distension were less frequent. This incidence also varies in different studies. Akrami M et al reported the abdominal pain and obstipation were the most frequent presenting symptoms whereas Markogiannakis H et al. reported that constipation and or obstipation were the most frequent presenting symptoms.[5,18] Cheadle et al noticed

abdominal pain (92%), vomiting (82%) were the most frequent symptoms. [19] This difference in the incidence of clinical symptoms is probably due to differences in underlying etiology and time of presentation and patient response to the disease.

The World Society of Emergency Surgery (updated in 2017) suggested that non-operative management should always be tried in patients with adhesive small bowel obstruction unless there are signs of peritonitis, strangulation, or bowel ischemia and 72-h period is considered to be safe and appropriate for conservative management.[20] Tabchouri N et al in their review of 154 patients showed that failure of the conservative management seems to be associated with similar overall morbidity compared with immediate surgery but with increased postoperative mortality.[21]Similarly, operative management of the first episode of adhesive small bowel obstruction has been associated with a significantly reduced risk of recurrence of the symptoms and new hospitalization in other studies.[22,23]

In our study, less than one third had successful conservative management for adhesive small bowel obstruction. The higher incidence of operative intervention is probably due to fear of further complications associated with bowel obstruction.

The incidence of ischemia and strangulation varies in different literature. It ranges from 7-42% in different literature.[5] Kossi et al reported an incidence of ischemia (strangulation) of 20%, necrosis in 8 %, and perforation in 2 % during operations and 38% bowel resection rate.[24] A study done by Markogiannakis H et al shows an overall incidence of bowel ischemia in 14%, necrosis in 9.3%, and perforation in 5.3%.[5] whereas in this present study incidence of ischemia was seen in 23% and necrosis was seen in 6.2% and bowel resection and anastomosis rate was 39.8%. A higher incidence of bowel resection rate than the rate of nonviable bowel (bowel ischemia and perforation) found in operation is due to the difficult adhesiolysis, inadvertent enterotomies, and obstruction due to benign and malignant pathology which necessitate bowel resection and anastomosis.

Mortality and morbidity depend on the age of the patients, etiology of obstruction, and timing of surgery.[25] Doing surgery within 36 hours of the onset of symptoms decreases the mortality to 8% which increases to 25% if postponed beyond 36 hours.[25,26] In the literature, the complication rate ranges from 6% to 47% whereas mortality ranges from 2% to 19%.[5] In the present study also, we observed that the incidence of complications (SSI-17.4%, pneumonia-11.2%) and mortality (7%) are similar to the available literature.

## CONCLUSION

Hernia followed by post-operative bowel obstruction was the most common cause of intestinal obstruction in adult patients while intussusceptions followed by irreducible hernia were the commonest in the pediatric age group. The majority of the adult patients need surgical intervention to relieve obstruction with a successful outcome.

**CONFLICT OF INTEREST:** None

**FINANCIAL DISCLOSURE:** None

## REFERENCES:

1. Miller G, Boman J, Shrier I, Gordon PH. Etiology of small bowel obstruction. Am J Surg. Jul 2000;180(1):33-6. [DOI]
2. Ajao OG. Abdominal emergencies in a tropical African population. Br J Surg. May 1981;68(5):345-7. [DOI]
3. Adhikari S, Hossein MZ, Das A, Mitra N, Ray U. Etiology and outcome of acute intestinal obstruction: a review of 367 patients in Eastern India. Saudi J Gastroenterol Off J Saudi Gastroenterol Assoc. Oct-Dec 2010;16(4):285-7. [DOI]
4. Archampong EQ, Naaeder SB, Darko R. Changing pattern of intestinal obstruction in Accra, Ghana. Hepato-Gastroenterology. Jan-Feb 2000;47(31):185-93. [PMID]
5. Markogiannakis H, Messaris E, Dardamanis D, Pararas N, Tzertzemelis D, Giannopoulos P, et al. Acute mechanical bowel obstruction: clinical presentation, etiology, management and outcome. World J Gastroenterol. Jan 21 2007;13(3):432-7. [DOI]
6. Ellis H, Moran BJ, Thompson JN, Parker MC, Wilson MS, Menzies D, et al. Adhesion-related hospital readmissions after abdominal and pelvic surgery: a retrospective cohort study. Lancet. May 1 1999;353(9163):1476-80. [DOI]
7. Barmparas G, Branco BC, Schnüriger B, Lam L, Inaba K, Demetriades D. The incidence and risk factors of post-laparotomy adhesive small bowel obstruction. J Gastrointest Surg. Oct 2010;14(10):1619-28. [DOI]
8. Ihedioha U, Alani A, Modak P, Chong P, O'Dwyer PJ. Hernias are the most common cause of strangulation in patients presenting with small bowel obstruction. Hernia. Aug 2006;10(4):338-40. [DOI]
9. Moran BJ. Adhesion-related small bowel obstruction. Colorectal Dis. Oct 2007;9;Suppl 2:39-44. [DOI]
10. Tamijmarane A, Chandra S, Smile SR. Clinical aspects of adhesive intestinal obstruction. Trop Gastroenterol. Jul-Sep 2000;21(3):141-3.[PMID]
11. Soressa U, Mamo A, Hiko D, Fentahun N. Prevalence, causes and management outcome of intestinal obstruction in Adama Hospital, Ethiopia. BMC Surg. Jun 4 2016;16(1):38. [DOI]
12. Nguyen VH. Intestinal obstruction due to tuberculosis. Asian J Surg. Apr 2002;25(2):145-8. [DOI]
13. Ogundoyin OO, Afolabi AO, Ogunlana DI, Lawal TA, Yifieyeh AC. Pattern and outcome of childhood intestinal obstruction at a tertiary hospital in Nigeria. Afr Health Sci. Sep 2009;9(3):170-3. [PMID]
14. Shah M, Gallaher J, Msiska N, McLean SE, Charles AG. Pediatric intestinal obstruction in Malawi: characteristics and outcomes. Am J Surg. Apr 2016;211(4):722-6. [DOI]
15. Ooko PB, Wambua P, Oloo M, Odera A, Topazian HM, White R. The spectrum of paediatric intestinal obstruction in Kenya. Pan Afr Med J. 2016;24:43. [DOI]
16. Shiekh KA, Baba AA, Ahmad SM, Shera AH, Patnaik R, Sherwani AY. Mechanical small bowel obstruction in children at a tertiary care centre in Kashmir. Afr J Paediatr Surg. May-Aug 2010;7(2):81-5. [DOI]
17. Mir M, Bucch M, Younus U, Sheikh G, Bali B. Clinical study of mechanical small-bowel obstruction in children in Kashmir. Internet J Surg. 2012;28(2):1-8. [DOI]

18. Akrami M, Ghaeini Hesarooeih A, Barfei M, Zangouri V, Alborzi Z. Clinical characteristics of bowel obstruction in Southern Iran; results of a Single Center experience. Bull Emerg Trauma. Jan 2015;3(1):22-6. [PMID]

19. Cheadle WG, Garr EE, Richardson JD. The importance of early diagnosis of small bowel obstruction. Am Surg. Sep 1988;54(9):565-9. [PMID]

20. Ten Broek RPG, Krielen P, Di Saverio S, et al. Bologna guidelines for diagnosis and management of adhesive small bowel obstruction (ASBO): 2017 update of the evidence-based guidelines from the world society of emergency surgery ASBO working group. World J Emerg Surg WJES. 2018;13:24. [DOI]

21. Tabchouri N, Dussart D, Giger-Pabst U, Michot N, Marques F, Khalfallah M, et al. Only surgical treatment to be considered for adhesive small bowel obstruction: A new paradigm. Gastroenterol Res Pract. 2018;2018:9628490. [DOI]

22. Behman R, Nathens AB, Mason S, Byrne JP, Hong NL, Pechlivanoglou P, et al. Association of Surgical Intervention for Adhesive Small-Bowel Obstruction with the risk of recurrence. JAMA Surg. May 1 2019;154(5):413-20. [DOI]

23. Williams SB, Greenspon J, Young HA, Orkin BA. Small bowel obstruction: conservative vs. surgical management. Dis Colon Rectum. Jun 2005;48(6):1140-6. [DOI]

24. Kössi J, Salminen P, Laato M. The epidemiology and treatment patterns of postoperative adhesion induced intestinal obstruction in Varsinais-Suomi Hospital District. Scand J Surg. 2004;93(1):68-72. [DOI]

25. Schick MA, Kashyap S, Meseeha M. Small bowel obstruction. StatPearls. Treasure Island FL. Stat. 2021:28846346, Bookshelf ID: NBK448079. ht[LINK]

26. Belyaev ON, Müller C, Uhl WH. Small bowel obstruction. In: Bland KI, Büchler MW, Csendes A, Sarr MG, Garden OJ, Wong J, editors General surgery. London: Springer London; 2009. p. 595-606. [DOI]