



**ORIGINAL ARTICLE**

**Long Term Effect of Acute Intestinal Obstruction Management following Laparotomy in a Tertiary Care Hospital**

Md. Mamunur Rahman<sup>1</sup>, Nelema Jahan<sup>2</sup>, Md. Mahfuzul Momen<sup>3</sup>, Syed Masud Reza<sup>4</sup>, Karina Rahman<sup>5</sup>, Sonia Akter<sup>6</sup>, Suman Chandras Roy<sup>7</sup>

<sup>1</sup>Associate Professor, Department of Gastro-Surgery, Sheik Russel Gastro-liver Institute & Hospital, Dhaka, Bangladesh; <sup>2</sup>Nelema Jahan, Associate Professor, Department of Surgery, Dhaka Dental College, Dhaka, Bangladesh; <sup>3</sup>Assistant Professor, Department of Surgery, Enam Medical College & Hospital, Dhaka, Bangladesh; <sup>4</sup>Associate Professor, Department of Surgery, Shaheed Suhrawardy Medical College, Dhaka, Bangladesh; <sup>5</sup>Registrar, Department of Surgery, Enam Medical College & Hospital, Dhaka, Bangladesh; <sup>6</sup>Assistant Professor, Department of Surgery, Enam Medical College & Hospital, Dhaka, Bangladesh; <sup>7</sup>Assistant Professor, Department of Surgery, Dhaka Dental College, Dhaka, Bangladesh

[Received on: 2 April 2020; Accepted on: 1 May 2020; Published on: 1 July 2020]

**Abstract**

**Background:** Post-surgical outcomes are very crucial for acute intestinal obstruction following laparotomy. **Objective:** The purpose of the present study was to identify the causes and risk factors that influence the outcome of post laparotomy acute intestinal obstruction and also to assess their management and outcome. **Methodology:** This cross sectional study comprising fifty patients irrespective of age and sex with diagnosis of Acute intestinal obstruction following laparotomy who attended at the Department of Surgery in different tertiary Hospital of Dhaka city, within the time period of July 2017 to June 2019. All these data were analyzed and tried to find out the outcome of management of acute intestinal obstruction following laparotomy. **Results:** All the 50 patients had undergone some conventional surgeries in previous instance. Acute intestinal obstruction was found in 80.0% of cases who had undergone emergency surgery and 20.0% cases were after routine surgery. The reasons behind Laparotomy for burst appendix (16.0%) followed by laparotomy for blunt trauma abdomen (12.0%) and classical appendicectomy (12.0%). After conservative management complication rate was low (21.0%) and the most prominent complication was UTI (28.57%) whereas mortality was 14.29%. After surgical management complication rate was higher which was in 56.25% of cases. **Conclusion:** Post laparotomy of acute intestinal obstruction can improve the outcome and reduce the chance of relaparotomy, surgical morbidity. [*Journal of Current and Advance Medical Research, July 2020;7(2):73-79*]

**Keywords:** Acute intestinal obstruction; Conservative management; Operative management; Bands and adhesion

**Correspondence:** Dr. Md Mamunur Rahman, Associate Professor, Department of Gastro-surgery, Sheikh Russel Gastro-liver Institute and Hospital, Mohakhali, Dhaka, Bangladesh; Cell no.: +8801711395087; Email: [mamunmmc27@gmail.com](mailto:mamunmmc27@gmail.com)

**Cite this article as:** Rahman MM, Jahan N, Momen MM, Reza SM, Rahman K, Akter S, Roy SC. Long Term Effect of Acute Intestinal Obstruction Management following Laparotomy in a Tertiary Care Hospital. J Curr Adv Med Res 2020;7(2):73-79

**Funding:** This study has been performed without any funding from outside else.

**Conflict of Interest:** There was no conflict of interest to any of the authors.

**Contributions to authors:** Rahman MM, Jahan N, Momen MM contributed from protocol preparation, data collection, statistical analysis. Reza SM, Rahman K, Akter S, Roy SC contributed to manuscript writing and revision of manuscript. All authors are responsible for the research works.

**Copyright:** ©2020. Rahman et al. Published by Journal of Current and Advance Medical Research. This article is published under the Creative Commons CC BY-NC License (<https://creativecommons.org/licenses/by-nc/4.0/>). This license permits use, distribution and reproduction in any medium, provided the original work is properly cited, and is not used for commercial purposes.

## Introduction

Acute intestinal obstruction is one of the most common surgical emergencies. Etiology of acute intestinal obstruction varies among different countries and there has also been a change over decades<sup>1-6</sup>. In advanced countries, the predominant cause is adhesions from a prior laparotomy<sup>7</sup>. Adhesions are responsible for approximately 60.0% of all cases of intestinal obstruction. Intestinal obstruction for previous laparotomy being associated with appendectomy, cholecystectomy. Colorectal surgery, gynecologic procedures and upper gastrointestinal like gastric, biliary, splenic, small-bowel surgery, pelvic surgery and emergency laparotomy for perforation of duodenum and ileum, blunt trauma abdomen, stab injury in the abdomen<sup>8</sup>. However obstructed hernia rather than adhesions appeared to be the most common cause followed by large bowel neoplasm as has been seen earlier in previous reports<sup>4-5</sup>. Intestinal tuberculosis is also an important factor in the etiology of acute intestinal obstruction as there is high prevalence of tuberculosis in the Indian subcontinent<sup>9-10</sup>. During the last few years, a change in the etiology of acute intestinal obstruction has been noted in the developing countries<sup>11-16</sup>.

Colonoscopy, small bowel investigation with ingested camera or push endoscopy, and laparoscopy are diagnostic tools<sup>11,12</sup>. The use of Gastrografin in adhesive small bowel obstruction is safe and reduces the need for surgery when conservative treatment fails<sup>17</sup>. The morbidity is high compared to mortality. Outcome of management are dependent on some factors such as age, previous illness, type of surgery, admission time, co-morbidity, post-operative convalescence, time required for surgery, duration of illness & postoperative complications. In the older individuals it occurs with a much higher rate of mortality and morbidity. Post-operative complication either single or multiple which are wound infection, burst abdomen, prolonged ileus (more than 72 h), basal atelectasis, septicaemia, small bowel fistula, peritonitis, urinary tract infection, aspiration pneumonia, deep vein thrombosis and myocardial infarction. Wound infection is the most common complication. Basal atelectasis occurs mostly in elderly patients. The mortalities are due to cardiac arrest following acute myocardial infarction in immediate postoperative period and sepsis with multi-organ failure. Mortalities are higher among grossly malnourished patient<sup>15-16</sup>.

A critical factor in managing these patients is to

determine whether patients can be subjected to conservative treatment or to surgical intervention<sup>8</sup>. Electrolyte replacement should be guided by test results, although in cases of repeated vomiting serum Na<sup>+</sup> and K<sup>+</sup> are likely to be depleted and a urinary catheter to monitor urine output. If bowel ischemia or infarction is suspected, antibiotics should be given like 3<sup>rd</sup> generation cephalosporin, such as ceftriaxone 2g IV before laparotomy<sup>18</sup>.

Conservative therapy is typically advocated for patients when the physiological parameters are within normal limits and patients with clinical evidence of adhesive small bowel obstruction are given trial conservative treatment unless there are suspicion of strangulation. Those who responded in the initial 48 hours should be continued conservative treatment. Patients showing no clinical and radiologic improvement in the initial 48 hours are randomized to undergo either Gastrografin meal and follow-through study or surgery.

Contrast that appeared in the large bowel within 4 hours is regarded as a partial obstruction, and conservative treatment is continued. Patients in whom contrast failed to reach the large bowel within 4 hours is considered to have complete obstruction, and laparotomy is performed. For patients who had conservative treatment for more than 48 hours with or without Gastrografin, surgery are performed when there are no continuing improvement<sup>17</sup>. The aim of this study was to determine the factors and causes that influence the outcome, overall management protocol and their outcome of the patients with acute intestinal obstruction following laparotomy.

## Methodology

The study was prospective type of observational study has been carried out at Department of Surgery of Dhaka Medical College Hospital over a period of 6 months from July 2017 to June 2019. Patients admitted in department of surgery, with a diagnosis of acute intestinal obstruction following previous laparotomy for benign diseases. All patient with diagnosis of acute intestinal obstruction following laparotomy for benign diseases from history, physical examination and relevant available investigations during study period were included for this study. Patient with acute intestinal obstruction following laparotomy for malignant diseases or patient of acute intestinal obstruction with extreme co-morbidity were excluded from this study. All collected data were compiled, analyzed in simple tabular form using SPSS version 16, and presented in textual, table and graphical manner.

**Results**

All the 50 patients had undergone some conventional surgeries in previous instance. The maximum number of patient (32%) was found in the 5<sup>th</sup> decade, the next 24.0% was in 4<sup>th</sup> decade and the lowest number was 8% in the 7<sup>th</sup> decade. The mean age of the study group was 52.92±8.89 years (Table 1).

**Table 1: Age Distribution of the Patients (n=50)**

Age Group	Frequency	Percent
< 30 Years	7	14.0
31 to 40 Years	12	24.0
41 to 50 Years	16	32.0
51 to 60 Years	11	22.0
61 to 70 Years	4	8.0
<b>Total</b>	<b>50</b>	<b>100.0</b>
Mean±SD(Range)	52.92±8.89 (18 to 70)	

The highest number of patients presented with acute intestinal obstruction underwent laparotomy for burst appendices (16.0%) followed by laparotomy for blunt trauma abdomen with gut injury (12.0%) and classical appendectomy (12.0%) (Table 2).

**Table 2: Distribution of the Patients According to Previous Surgery (n=50)**

Type of Previous Surgery	Frequency	Percent
Burst Appendices	8	16.0
Classical Appendectomy	6	12.0
Blunt Trauma Abdomen	6	12.0
Hernia Surgery (Obstructed Inguinal Hernia)	6	12.0
DU perforation	4	8.0
Total abdominal hysterectomy	4	8.0
Perforation of ileum	3	6.0
Caesarean section	3	6.0
Pelvic abscess	2	4.0
Cholecystectomy by Paramedian incision	2	4.0
Laparotomy for stab injury in the abdomen with gut injury	2	4.0
Small Bowel Surgery	2	4.0
Ruptured Ectopic Pregnancy	2	4.0
<b>Total</b>	<b>50</b>	<b>100.0</b>

The outcome of management in relation to complication following conservative and surgical intervention was recorded which reflected significantly lower (p=0.01) incidence of complication in case of conservative management and 68.0% patients managed by conservatively (Table 3).

**Table 3: Outcome of both Conservative and Surgical Intervention (n=50)**

Mode of Management	Complication	
	Present	Absent
Conservative	7(20.6%)	27(79.4%)
Surgical	9(56.3%)	7(43.8%)

p value calculated by Chi-square test; p value=0.01

Among 50 patients, uncomplicated recovery both conservative and surgical intervention was observed in 68.0% cases whereas morbidity and mortality was 28.0% cases and 4.0% cases respectively (Table 4).

**Table 4: Outcome of Management of both Conservative and Surgical Intervention (n=50)**

Outcome of Management	Frequency	Percent
Uncomplicated recovery	34	68.0
Morbidity	14	28.0
Mortality	2	4.0
<b>Total</b>	<b>50</b>	<b>100.0</b>

A wide range of complications was recorded following conservative management among which urinary tract infection (UTI) was predominant (28.57%) followed by RTI (28.57%) whereas mortality was 14.29% (Table 5).

**Table 5: Study Patients According To Complication of Conservative Management (n=7)**

Conservative Management	Frequency	Percent
UTI	2	28.57
RTI	2	28.57
Basal Atelectasis	2	28.57
DVT	1	14.29
Death due to Septicemia	1	14.29

UTI=Urinary Tract Infection; RTI=Respiratory Tract Infection; DVT=Deep Vein Thrombosis

The highest percentage of postoperative complication was wound infection 44.4% cases,

Respiratory tract infection 44.4% followed by UTI 33.3%, basal atelectasis 33.3%, and prolonged ileus (more than 72h) was 22.2% cases whereas mortality was 11.1% cases (Table 6).

**Table 6: Study Population according to Postoperative Complications (n=9)**

Postoperative complications	Frequency	Percent
Wound infection	4	44.4
RTI	4	44.4
UTI	3	33.3
Basal atelectasis	3	33.3
Prolong Ileus	2	22.2
Blind loop syndrome	1	11.1
Peritonitis	1	11.1
Faecal fistula	1	11.1
DVT	1	11.1
Death due to septicemia	1	11.1

UTI=Urinary Tract Infection; RTI=Respiratory Tract Infection; DVT=Deep Vein Thrombosis; Prolong ileus=more than 72hrs; Multiple response analysis was performed

**Discussion**

Acute intestinal obstruction is one of the most common surgical emergencies. Etiology of acute intestinal obstruction varies among different countries and there has also been change over decades<sup>1-6</sup>. All the 50 patients who were in our study had undergone some conventional surgeries in previous instance. Important exclusion criteria was malignancy. The highest number of patients presented with acute intestinal obstruction underwent laparotomy for burst appendices 8 (16.0%) followed by laparotomy for blunt trauma abdomen 6(12.0%), classical appendectomy 6 (12.0%), hernia surgery (obstructed inguinal hernia) 6 (12.0%), total abdominal hysterectomy 4 (8.0%), DU perforation 4 (8.0%), caesarean section 3 (6.0%), pelvic abscess 2(4.0%) cases, cholecystectomy by paramedian incision 2(4%) cases, stab injury in the abdomen with gut injury 2(4.0%) cases, small bowel surgery for TB 2(4.0%) cases and ruptured ectopic pregnancy 2(4.0%) cases.

In a retrospective study Kapana et al<sup>19</sup> have shown that the most common causes for relaparotomy were found to be appendectomy (40.5%) followed by small bowel surgery 17(23.0%) cases, gastric surgery 10(13.5%) cases, colorectal surgery 8(10.8%) cases, cholecystectomy 6(8.1%) cases,

blunt trauma abdomen 1(1.4%) cases, gynecological surgery 2(2.7%) cases. The common cause of mechanical bowel obstruction was benign diseases (79.1%) cases, such as adhesions (48.6%) and sigmoid torsion (15.5%), while 20% of causes were malignancies, like colorectal (16.2%) and small bowel tumors (3.4%)<sup>19</sup>.

Wilson et al<sup>4</sup> have reviewed on the management of small bowel obstruction and have proposed that postoperative adhesions were found to be accounted for 64.0% to 79.0% cases of admissions with small bowel obstruction (SBO) and previous operations were appendectomy (23.3%), colorectal resection (20.8%), gynaecological surgery (11.7%), upper gastrointestinal (gastric, biliary or splenic) surgery (9.2%), small bowel surgery (8.3%) and more than one previous abdominal operation was 23.6% cases<sup>4</sup>.

Total 50 cases were evaluated with mean age 52.92±8.89 years. The maximum number of patients 16(32%) was found in the 5<sup>th</sup> decade and 28(56%) were male and female was 22(44%) cases. The male female ratio was 1.3:1. Kapana et al<sup>19</sup> have reported in a retrospective study that over 148 patients has been postulated that the mean age of the patients was 51.5 ± 19.9 years. Another study have been shown that male patient suffered more than female patients in case of acute intestinal obstruction following laparotomy<sup>20</sup>.

In this study intestinal obstruction developed following emergency surgery were 40 (80%) cases and routine surgery 10(20%) cases. Rama and Hegde<sup>21</sup> have done a comparative study of postoperative adhesions by laparotomy and laparoscopic procedures and have observed that intestinal obstruction following emergency and routine surgery are 25.0% cases and 75.0% cases respectively<sup>21</sup>.

Maximum number of previous surgery was done through midline incision 18 (36%) followed by paramedian incision 12(24%), Pfannensteil incision 6(12%) cases and inguinal incision 6(12%) cases. Adhesions were the most common cause of acute intestinal obstruction following laparotomy. Single band and adhesion are in 10(62.5%) cases and multiple bands and adhesion 6(37.5%) cases. Adhesions are responsible for approximately 60.0% cases of all cases of intestinal obstruction<sup>8</sup>.

Successful conservative treatment is noted in 34(68.0%) patients and 16(32.0%) patients required surgical intervention primarily or due to failure of

conservative management. In a study, it was showed that successful conservative treatment was noted in 22(73.3%) patients following previous surgery and they were discharged on fourth day of admission. Eight patients (26.6%) are underwent surgery<sup>20</sup>.

This study showed wide range of complications following conservative management among which UTI (28.57%), RTI (28.57%) whereas mortality was (14.29%) (Table 3.8) and highest percentage of postoperative complication was wound infection were 44.4% of cases, RTI(44.4%) followed by basal atelectasis 33.3%, prolonged ileus (more than 72h) was 22.2% cases, whereas mortality was 11.1% cases. Complications following conservative management were 7(20.6%) patients and surgical intervention 9(56.2%) patients and overall uncomplicated recovery (both conservative and surgical intervention) was observed in 34(68.0%) cases whereas morbidity and mortality was 14(28.0%) and 2(4.0%) respectively. In a similar study out of 367 patients, postoperative complications occurred in 95(40.89%) patients and among them 38 patients had a single complication and other had more than one complication. Wound infection was the most common complication, occurring in 44(11.99%) patients, and out of these 21(5.72%) patients required application of secondary sutures. Burst abdomen requiring emergency closure of abdomen occurred in 16 cases (4.4%). Prolonged ileus (more than 72 h) occurred in 34 patients (9.26%). Basal atelectasis was noted in 31 patients (8.45%) mostly of the elderly age group. Small bowel fistula developed in seven patients (1.9%) and of them four (1.09%) required operative intervention in the long run. In their case series, the mortality rate was 17.35% (27 patients). Among them four patients died while on conservative management (5.1%) and the rest of them died after surgery. Two deaths (7.4% of deaths) occurred in the immediate postoperative period as a result of cardiac arrest following acute myocardial infarction. Five patients (18.5% of deaths) who developed septicaemia in the postoperative period expired because of multi-organ failure<sup>22</sup>. In another study on 2012 showed morbidity rate was 41.9% cases and mortality was 10.8% cases<sup>19</sup>.

Again the study showed varied per-operative complications such as serosal tear (18.75%) cases, haemorrhage (12.5%) cases, accidental enterotomy (16.25%) and stoma formation (6.25%) cases. Fevang et al<sup>23</sup> proposed different varieties of per-operative complications and sequentially death proceeded following laparotomy. In the study

showed that inadvertent complications occurred in per-operative period were serosal tear following adhesiolysis 25.12 % cases, accidental gut injury 20.58% cases<sup>23</sup>.

To assess time of onset of symptoms, admission, type of previous surgery, clinical evaluation & proper radiological investigations help to make decision about surgical or non-surgical management (NSM) which reduced mortality and morbidity. While age, co-morbidity, etiology, admission time and complications of management were the risk factors for mortality and morbidity<sup>19</sup>.

In my study, complication was higher in older age group following management of both Conservative and Surgical Intervention in comparison to younger age group. Ching et al<sup>24</sup> were studied over relaparotomy cases for intestinal obstruction and proposed that morbidity rate was observed to be higher in older age groups and overall morbidity rate was 38% cases.

Patients who presented with acute intestinal obstruction after 6 months of previous surgery had to undergo surgical intervention more (48.14%) in comparison to patients of less than 6 months whereas patients with intestinal obstruction before 6 months were treated more conservatively. Williams et al<sup>25</sup> have reported in their study on small bowel obstruction conservative versus surgical management and have Observed that the mean time interval between initial procedure and onset of small bowel obstruction was a significant consideration for conservative or surgical intervention. They observed 42.16% of cases requiring surgical intervention when patient had been subsequently admitted after 6 months of previous surgery<sup>25</sup>.

Complication rate was 20.6% following conservative management and 56.3% following surgical intervention when patient had been admitted after 48 hours of onset of symptom. Complication rate was higher when time of admission after onset of symptoms was prolonged following primary management of both conservative and surgical intervention. Sosa and Gardner<sup>26</sup> were observed that the group of patients who had been admitted to the hospital after 48 hours of the onset of related were more likely to be treated by relaparotomy on emergency basis with higher post-operative complication rate.

Patients with small bowel obstruction secondary to adhesions should be operated upon early (within 24

hours) but may be treated non-operatively for 24 to 48 hours, provided that no signs of strangulation are present or develop. Failure to show improvement during this 48-hour period requires immediate operative intervention<sup>27</sup>.

In this study, complication rate was higher in the group of patients with co-morbidities following management of both conservative (60.0%) and surgical intervention (62.5%) in comparison to patients without co-morbidities. Fevang et al<sup>23</sup> were observed that old age, comorbidity, nonviable strangulation, and a treatment delay of more than 24 hours were significantly associated with an increased complication and death rate.

In my study, time of hospital stay was higher in the group of patients with co-morbidities following management of both conservative (6 to 12 days) and surgical Intervention (9 to 24 days). Overall hospital stay was higher following complications after both conservative and surgical intervention. Average hospital stay in surgical intervention with complication was 17.5(10 to 25) days and without complication 8(6 to 10) days. Williams et al<sup>25</sup> proposed that the patient who were treated without operation had a significantly shorter time to hospital stay with less complication in comparable to surgical intervention. Average hospital stay in surgical intervention was 7.5 days and with complication 21 days was reported<sup>25</sup>.

Forty years ago, mortality rate of 40.0% to 60.0% was not uncommon<sup>23</sup>. Currently the mortality rate has decreased, but, is still between 10.0% to 20.0% cases<sup>23</sup>. Adhesions, usually secondary to previous surgical procedures, are the most common cause of intestinal obstructions in the United States, and are responsible for 49.0% to 74.0% of small bowel obstruction in industrial countries<sup>28</sup>.

Acute intestinal obstruction (AIO) is a common surgical emergency as encountered throughout the world with high morbidity. A thorough careful history taking, physical examination and relevant investigations play the major role in planning of treatment and estimation of patient prognosis. Acute and chronic intestinal obstruction due to bands & adhesions following laparotomy for benign and malignant diseases frequently admitted in the hospital. After resuscitation, some patients' response to conservative management but some need intervention. Outcome of management depend on some factors such as age, previous illness, type of previous surgery, admission time, co-morbidity, postoperative convalescence, time required for surgery, duration of illness and postoperative

complication. Intraoperative risk factors included surgical approach whether conventional or laparoscopic, obstructive structures defined as bands (>1 cm long and <1 cm diameter), simple adhesions and matted adhesion (dense, multiple, and tangled), site of obstruction, number of intraperitoneal pathologic structures divided for obstruction release, obstruction mechanism, obstructed organs, and intestinal status. The final operations are classify according to their presumed increasing degree of severity: band section, lysis of simple adhesion, lysis of matted adhesion, extensive adhesiolysis, sutured or non-sutured serosal defect or sutured accidental enterotomy and bowel resection. Postoperative risk factors included medical and surgical complications.

## Conclusion

Postoperative adhesions are among the commonest causes of intestinal obstruction. Early diagnosis and treatment of these patients is the key to saving their life as conservative management result in significantly lower rate of complication and hospital stay. Complication rate were higher in older age group, delayed admission after onset of symptoms, patient with co- morbidities and subsequent hospital stay was observed higher. Meticulous dissection to the surgical principles for adhesion reduction as well as decrease the incidence of subsequent postsurgical adhesions and hopefully bowel obstruction.

## References

1. Osuigwe AN, Anyanwu SN. Acute intestinal obstruction in Nnewi Nigeria: a five-year review. *Nigerian Journal of Surgical Research*. 2002;4(3):107-11
2. Ohene-Yeboah MA, Dippah E, Gyasi-Sarpong K. Acute intestinal obstruction is adults in Kumasi, Ghana *Med J* 2006;40:50-4
3. Mcconkey SJ. Case series of acute abdominal Surgery is rural Sierra Leon. *World J surg* 2002;26:509-13
4. Wilson MS, Ellias H, Menjies D, Moran BJ, Parker MC, Thompson JN. A Review of the Management of Small Bowel Obstruction. *ANN Coll Surg Engl* 1999;81:320-8
5. Miller G, Boman J, Shrier I, Gordon PH. Natural history of patients with adhesive small bowel obstruction. *British Journal of Surgery* 2000;87(9):1240-7
6. Moran BJ. Adhesion-related small bowel obstruction. *Colorectal Dis* 2007;9:39-44
7. Mucha P Jr. Small intestinal obstruction. *Surg Clin North Am* 1987;67:597-620
8. Cox MR, Gunn IF, Eastman MC, et al. The operative aetiology and types of adhesions causing small bowel obstruction. *Aust N Z J Med* 1993;63:848-852
9. Kapoor VK. Abdominal tuberculosis. *Postgrad Med J*. 1998;74:459-67
10. Horvath KD, Whelan RL. Intestinal tuberculosis: Return of an old disease. *Am J Gastroenterol*. 1998;93:692-6

11. Lawal OO, Olayinka OS, Bankole JO. Spectrum of causes of intestinal obstruction in adult Nigerian patients. *South African Journal of Surgery*. 2005;43(2):34-6
12. Adesunkanmi AR, Agbakwuru EA. Changing pattern of acute intestinal obstruction in a tropical African population. *East African medical journal*. 1996;73(11):727
13. Naaeder SB, Archampong EQ. Changing pattern of acute intestinal obstruction in Accra. *West Afr J Med* 1993;12:82-8
14. Archampong EQ, Naaeder SB, Darko R. Changing pattern of intestinal obstruction in accra, Gham *Hepatogas troenterology* 2000;47:185-93
15. Chen ZX, Wai T, Jiang K, Yan K, Zhang B, Chen ZX, et al. Etiological Factors and morality of acute intestinal obstruction: a review of 705 case, *Zhong Xi Jie He Xue Bao* 2008;6:1010-6
16. Khan M, Shah SA, Ali N. Pattern of dynamic intestinal obstruction in adults. *Journal of Postgraduate Medical Institute* 2005;19(2):157-61
17. Choi HK, Chu KW, Law WL. Therapeutic value of gastrografin in adhesive small bowel obstruction after unsuccessful conservative treatment: a prospective randomized trial. *Annals of Surgery* 2002;236(1):1-6
18. Barmparas G1, 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* 2010;14(10):1619-28
19. Kapana M, Ondera A, Polata S, Ibrahim A, Zulfu A, Fatih T, Sadullah G. Mechanical Bowel Obstruction and Related Risk Factors on Morbidity and Mortality. *J Curr Surg* 2012;2(2):55-61
20. Niyaf A, Bhandari RS, Singh KP. Management of adhesive intestinal obstruction. *Journal of Institute of Medicine* 2010; 32:2 18-20
21. Rama R, Hegde K. Comparative Study of Postoperative Adhesions by Laparotomy and Laparoscopic Procedures *World J Laparoscopic Surg* 2010;3(1):31-36
22. Adhikari S, Hossein M.Z, Das A, Mitra N, Ray U, Etiology and Outcome of Acute Intestinal Obstruction: A Review of 367 Patients in Eastern India. *Saudi J Gastroenterol* 2010;16(4): 285–287
23. Fevang BT1, Fevang J, Stangeland L, Soreide O, Svanes K, Viste A. Complications and death after surgical treatment of small bowel obstruction: A 35-year institutional experience. *Ann Surg* 2000;231(4):529-37
24. Ching SS1, Muralikrishnan VP, Whiteley GS. Relaparotomy for intestinal obstruction: a five-year review of indications and outcome. *Int J Clin Pract* 2003;57(4):333-7
25. Williams SB, Greenspon J, Young HA, Orkin BA. Small bowel obstruction: conservative vs. surgical management. *Dis Colon Rectum* 2005;48(6):1140-6
26. Sosa J, Gardner B. Management of patients diagnosed as acute intestinal obstruction secondary to adhesions. *Am Surg* 1993;59(2):125-8
27. Margenthaler JA, Longo WE, Virgo KS, Johnson FE, Grossmann EM, Schiffner TL, et al. Risk factors for adverse outcomes following surgery for small bowel obstruction. *Annals of Surgery*. 2006;243(4):456-64
28. Anonymous. Viewed on: 12 August 2020; Website:[http://www.gfmer.ch/International\\_activities\\_En/El\\_Mowafi/Bowel\\_Obstruction.htm](http://www.gfmer.ch/International_activities_En/El_Mowafi/Bowel_Obstruction.htm)