

## Aetiology, clinical pattern and outcome of adult intestinal obstruction in Jos, North Central Nigeria.

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### Abstract

**Background:** Intestinal obstruction is a challenging surgical emergency with major clinical and financial burden as well as considerable morbidity and mortality around the world. This study was conducted to determine the aetiological spectrums, clinical course and outcome of intestinal obstruction in North Central, Nigeria

**Methods:** A prospective cross sectional study of all consecutive patients presenting with intestinal obstruction to Jos University Teaching Hospital, Jos, Nigeria between June 2010 and May 2013.

**Results:** A total of 217 patients constituting about 10.1% of 2,149 non-trauma surgical emergencies were treated, with male to female ratio of 1.15:1. Their age ranged from 17-98years (mean 42.5±15.5 years) with a peak age group of 21-40years. Adhesions 112 (51.6%) with peak incidence in the fourth decade was the leading cause of obstructions followed by neoplasms 39(18%), hernia 28(12.9%) and volvulus 22(10.17%). Majority of obstructions involved the small bowel 169 (77.8%) and strangulated bowel was present in 56(25.8%) patients. Surgical intervention was carried out in 169 (77.9%) and the rest were treated conservatively. Morbidity consisting mainly of local wound, peritoneal sepsis and systemic complications occurred in 63 (29 %) patients. The overall mortality rate was 12 (5.5%) and this was predicted by the presence of strangulations, shock, loop obstructions and delayed presentation. The mean inpatient admission in days was 14.4±11.9 days (range 1-75 days).

**Conclusion:** Bowel obstruction constitutes about 10% of all non-trauma surgical emergencies. Adhesions, neoplasm, hernia and volvulus were the leading causes. Morbidity and mortality remains high due to intestinal strangulation. Concerted efforts directed towards adhesion prevention, early elective hernia repair, prompt screening and cancers treatment will therefore

likely reduce the morbidity and mortality of bowel obstruction.

**Keywords:** *Bowel obstruction, strangulation, adhesion, neoplasm, hernia, surgical emergency, mortality.*

### Résumé

**Contexte:** Occlusion intestinale est une urgence chirurgicale difficile avec une lourde charge clinique et financière ainsi qu'avec une considérable morbidité et mortalité dans le monde. Cette étude a été menée afin de déterminer les spectres étiologiques, l'évolution clinique et les résultats de l'occlusion intestinale au Nord-central du Nigeria.

**Méthodes:** Une étude de cross-section prospective de tous les patients consécutifs présentant avec une occlusion intestinale à l'hôpital d'enseignement universitaire de Jos, Jos Nigeria entre Juin 2010 et Mai 2013.

**Résultats:** Un total de 217 patients constituant environ 10,1% de 2149 urgences chirurgicales non-traumatiques ont été traités, avec un ratio homme-femme de 1,15: 1. Leur âge rangeait de 17-98 ans (moyenne de 42,5±15,5 ans) avec un groupe d'âge modal de 21-40 ans. L'adhésion 112 (51,6%) avec une incidence plus élevée dans la quatrième décennie a été la cause principale des occlusions suivie par néoplasme 39 (18%), hernie 28 (12,9%) et volvulus 22 (10,17%). La majorité des occlusions impliquait l'intestin grêle 169 (77,8%) et de l'intestin muselée était présent dans 56 (25,8%) patients. L'intervention chirurgicale a été effectuée dans 169 (77,9%) et le reste a été traité de manière conservatrice. La morbidité constituée notamment de blessure locale, septicémie péritonéale et des complications systémiques était dans 63 (29%) patients. Le taux entier de mortalité était de 12 (5,5%) et cela a été prédit par la présence d'étranglements, choc, obstructions d'anneau et la présentation retardée. L'admission des patients hospitalisés était en moyenne de 14,4 ± 11,9 jours (rang : 1-75 jours).

**Conclusion:** L'occlusion du côlon constitue environ 10% de toutes urgences chirurgicales non traumatiques. Adhésion, néoplasme, hernie et

volvulus étaient les causes principales. La morbidité et la mortalité reste élevée en raison de la strangulation intestinale. Des efforts concertés dirigés vers la prévention des adhésions, raccommodage précoce de l'élective hernie, dépistage rapide et traitement des cancers seront donc susceptibles à réduire la morbidité et la mortalité de l'occlusion d'intestin.

**Mots-clés:** occlusion intestinale, étranglement, adhésion, néoplasme, hernie, urgence chirurgicale, mortalité.

### Introduction

Obstruction to the bowel is a commonly encountered problem in gastrointestinal surgery all over the world. [1-3] It is the most frequent disorder affecting the small bowel and could complicate any form of abdominal procedure including laparoscopic approach [2, 4]. Despite advances in surgery, bowel obstruction remains a difficult problem with significant morbidity and mortality due to disrupted gastrointestinal flow. Consequently, Intestinal obstruction is associated with considerable clinical burdens, major financial expenditure, frequent emergency room visits and economic loss from time spent away from duties. [1, 4, 5]

Intestinal obstruction is a symptom complex of a disease with diverse aetiologies of wide geographical variations worldwide. The resultant pattern of intestinal obstruction is dependent upon several factors including environmental, cultural, dietary, demographic factors, variations in the level of sophistication of the local medical services as well as individuals' anatomic differences. [3] In the last century, significant changes in etiological factors of intestinal obstruction have occurred from changes in epidemiologic and environment factors, health services provision and education. Considering the aetiological causes and controlling the risk factors for bowel obstruction is important in decreasing morbidity and mortality [2]. Emphasis placed on prognostic indicators for survival is important for therapeutic decisions making and maximizing outcomes. This study therefore, was embarked upon to determine the aetiology, clinical course and factors predictive of outcome of intestinal obstruction among the adult population in North Central Nigeria

### Methods

All patients with a clinical diagnosis of intestinal obstruction seen between June 2010 and May

2013 were prospectively enrolled into the study after informed consent. Diagnosis of intestinal obstruction was based on medical history, physical examination, and abdominal radiographic or laparotomy findings. In all patients, supportive care including the correction of dehydration, electrolyte imbalances and blood volume restoration were carried out. Operative intervention were carried out in patients with complete obstructions, presence of peritonitis, obstructions of hernia origin, strangulated obstructions and failed conservative management. Patient's biodata, the aetiologies of obstruction, clinical features, the mode of treatment, duration of hospitalization and outcome of intestinal obstruction were collected in a proforma from both case notes and oral interview, entered into Epi info 3.5.4 statistical software and computer analysed.

### Results

#### Demography/Incidence

There were a total of 217 patients treated for mechanical bowel obstruction during the study period. The mean age was 42.5±15.5 years (range 17 to 98years) and the largest numbers of patients were represented in the age group 21-40years (Table 1). Among the group with adhesions, a female predominance was noted but overall, there was a male dominance 116 (53.5%) with a male to female ratio of 1.15:1

**Table 1:** Sex and age distribution

Age Group	Number
17-20	12 (5.5 %)
21-30	48 (22.1%)
31-40	58 (26.7%)
41-50	36 (16.6%)
51-60	38 (17.5%)
61-70	13 (6.0%)
71-80	11 (5.1%)
91-100	1(0.5%)
Total	217

#### Etiology

Adhesions accounted for more than half of mechanical intestinal obstruction 112(51.6%) as in table 2 and these was followed by appendectomy 36 (32.1%), pelvic and gynaecological surgeries 32 (28.6%), typhoid perforation 14(12.5%), laparotomy for abdominal trauma 5 (4.5%), perforated peptic ulcer 3 (2.7%), hepatobiliary surgery 2 (1.8%), multiple procedures 16 (14.3%) and unspecified 4(3.6%). Neoplasms of the large bowel (29),

small bowel (2), ovary (4), cervix (3) and gastrum (1), were the aetiological factor in 39 (18%). Obstructed hernia occurred in 28(12.9%) patients consisting of 17inguinal, 3femoral, 4 umbilical/paraumbilical, 2 incisional and 2 intraperitoneal hernias. Volvulus of the caecum 2, small bowel 3, sigmoid 14 and ileosigmoid knotting 3 were seen in 22(10.1%) patients. Other aetiologies were intussusception in 4 (1.8%) patients of which two were ileocolic and colocoliceach. Three patients had abdominal tuberculosis and intra-abdominal abscesses 3(1.4%) each and the distribution of rest 6 (2.8%) is as outlined in table 2.

performed for bowel adhesions in 66 postoperative adhesions and 3 tuberculosis; Bowel resection and primary bowel anastomosis was effected in 56(33.1%) patients (volvulus.18, neoplasms 17, hernia 13, intussusception 4 and others 4); Bowel exteriorization with or without bowel resection in 26 (15.4%)patients (Neoplasms 22 and volvulus 4); Herniorraphy without bowel resection was done in 15 (8.9%) and 3 (1.8%)abscesses were drained at laparotomy.

#### Outcome

Complications occurred in 63 (29 %) patients and were majorly local wound, intraperitoneal and

**Table 2:** Aetiology and outcome of management of intestinal obstruction

Aetiology OUTCOME	Gender		Mean age (yr.)	Age range	Number Total	strangulated	Complications	Death
	M	F						
Adhesions	50	62	39.0±14.7	17-75	112(51.6%)	22	31	2
Neoplasm	23	16	51.7±16.6	25-98	39(18%)	4	15	2
Hernia	17	11	46.6±13.0	23-78	28(12.9%)	13	8	3
Volvulus	18	4	45.1± 15.1	20-72	22(10.1%)	11	4	3
Intussusception	3	1	36.0±7.0	30-45	4(1.8%)	2	2	-
TB	1	2	47.3±18.6	30-67	3(1.4%)	1	-	1
Abscess	1	2	45.7±23.1	29-72	3(1.4%)	-	1	-
Mesenteric Vas- cular occlusion	1	1	41.5± 13.4	32-51	2(2%)	2	1	1
Faecal impaction	1	1	37.0±4.2	34-40	2(0.9%)	-	-	-
Endometriosis	0	1	34	34	1(0.5%)	1	-	-
Iatrogenic	1	0	35	35	1(0.5%)	-	1	-
<b>Total</b>	<b>116</b>	<b>101</b>	-	<b>56(25.8)</b>	<b>12(5.5%)</b>	-	<b>63(29 %)</b>	<b>-</b>

#### Presentation

Obstructions involved the small and large bowel in 169 (77.8%) and 48(22.1%) patients; and was strangulated in 56(25.8%) patients. In the history, only 37 (17.1%) presented within 24 hours while 69(35.9%) presented after 48hours. The most common mode of presentation was abdominal pain (100%), vomiting (86%), distension (82%) and constipation (75%). Fever was recorded in 27%, rectal bleeding (6.0%) and diarrhoea in 5%, Tenderness (97%), Shock (10%), Pallor 23% and Peritonitis (46%) were among the findings on clinical evaluation.

#### Treatment

All patients with volume deficit and electrolyte derangement had correction. Of 169 (77.9%) operated upon, adhesiolysis 69 (40.8%) was

systemic complications as listed in Table 3. Death occurred in 12 patients with a mortality rate of 5.5%. Strangulation ( $p < 0.0003$ ), loop obstruction ( $p < 0.0069$ ), duration of symptom more than 48hours ( $p < 0.0096$ ), Shock ( $p < 0.00033$ ) were the parameters found to be statistically significant in predicting mortality (Table 4). The average hospital stay was  $14.4 \pm 11.9$  (range 1-75) days.

#### Discussion

Worldwide, bowel obstruction causes significant surgical admissions and adversely affects the lives of millions of individuals, cutting across all ages with considerable healthcare systems cost and burden [6]. In this study a total of 217 patients were affected within 3 years representing about 10.1% of non-trauma emergencies. The peak

**Table 3: Spectrum of Complications from intestinal obstruction**

<i>Complication</i>	<i>Frequency</i>
Wound complications	26(41.3%)
Wound infection	17(27%)
Wound dehiscence	6(9.5%)
Incisional Hernia	1(1.6%)
Stitch granuloma	1(1.6%)
Colostomy prolapse	1(1.6%)
Intraperitoneal complications	7(11.1%)
Peritoneal abscess	4 (6.3%)
Enterocutaneous fistula	3 (4.8%)
Systemic complications	8(12.7%)
Orthostatic pneumonia	3(4.8%)
Urinary tract infection	2(3.2%)
Acute kidney injury	1(1.6%)
Deep venous thrombosis	1(1.6%)
Delirium/hypocalcaemia	1(1.6%)
Long term complications	22(34.9%)
Recurrent adhesions	21(33.3%)
Infertility	1(1.6%)

incidence between 21 and 40 years, representing the economically viable segment of the population indicate bowel obstruction as a common cause of loss of productive life. The 41.8 years mean age of incidence in this study, though at variance with 25 and 63.8 years reported by Drozdz *W et al* and Markogiannakis *H et al* respectively but very similar to 43.08 years reported by Arshad *et al*, 41.27 by Souvik *et al* and 45 years by Lawal *et al* highlights the variability in the clinical presentations of bowel obstructions depending on the underlying aetiologies [7,8,9,10,11]. 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. [9,10]

The small intestine was the most common site of alimentary tract obstruction in our study probably due to its narrower lumen. This finding may also not be surprising considering that the large bowel is to a great extent a retroperitoneal structure and less likely to be involved in the leading causes of obstructions like adhesions and hernia than small bowels. The most common causes of bowel obstruction vary widely with geographic region, socioeconomic status, patients' age group and medical services obtainable in a population. Our common causes of intestinal obstruction comprising of adhesions, large bowel cancer, hernias, and volvulus correspond with the

leading causes of bowel obstruction reported from Greece and Mexico [7,12]. However this differs from India, Pakistan and Kashmir where hernia, tuberculosis and ascaridal obstruction respectively were the leading causes of obstruction. [10,13,14]

In several parts of low income countries including Nigeria, Inguinal hernia is the most common cause of bowel strangulation, largely due to poor surgical access to elective hernia repair or ignorance [9, 15]. Of the estimated 20 million groin hernia repairs accomplished worldwide yearly, only an intangible proportion is accomplished in developing nations [16]. In this study, adhesions however were the most common cause of bowel obstruction. The relative decrease in proportion of hernia-related obstruction over time in our setting parallel an era of increased utilization of community based elective hernia repair during community surgical outreaches as well as quality day-case hernia surgery within our institution. This underscores the significance of establishing priority for early elective hernia repair strategies within the community.

Infracolic compartment procedures, especially pelvic operations are at increased risk of forming postoperative adhesions than supracolic procedures [1]. Appendectomy, gynaecologic and colorectal procedures were the main causes in this study. Adhesions formation generally represent peritoneal tissue response to diverse kinds of trauma including mechanical,

**Table 4:** Factors associated with the outcome of intestinal obstruction

Criteria	Alive	Dead	Total	$\chi^2$ value	P value	Fisher's test
<i>Age</i>	-	-	-	2.1010	0.1472	0.0818
<60yrs	28		4	32		
>60yrs	177		8	185		
<i>Sex</i>	-	-	-	0.0026	0.9595	0.7748
Male	109		7	116		
Female	96		5	101		
<i>Duration of symptom</i>	-	-	-	6.7153	0.0096	0.0096
<48hrs	136		3	139		
>48hrs	69		9	78		
<i>Strangulation</i>	-	-	-	13.45	0.0002	0.0003
Present	47		9	56		
Absent	158		3	161		
<i>Loop obstruction</i>	-	-	-	6.66	0.0099	0.0069
Yes	56	8	64			
No	149	4	153			
<i>Comorbidity</i>	-	-	-	1.8786	0.1705	0.1396
Present	42		5	47		
Absent	163		7	170		
<i>Shock</i>	-	-	-	17.765	0.000026	0.00033
Present	16		6	22		
Absent	189		6	195		

thermal, foreign body reactions, infectious, radiation, or ischaemic injuries [6]. Most adhesions in our patients followed operative trauma in keeping with other studies, but non-operative adhesions may also occur within a 'virgin abdomen' from peritoneal inflammation such as in endometriosis, inflammatory bowel diseases, long term peritoneal dialysis, intraperitoneal infections, sclerosing peritonitis, radiotherapy and chemotherapy like practolol [1,5,6]. Adhesions were predominantly seen among females and young individuals who are at risk of lifelong chronic pelvic pain, infertility, recurrent bowel obstructions, increased operating times and inadvertent enterotomies during future laparotomies [1,5,6]. This recurrent and unpredictable nature of adhesions, with serious burden on individual patient's quality or quantity of life and healthcare therefore, justify prophylactic measures against adhesion formation in every patients undergoing laparotomy

This study shows that neoplasms are the

leading single cause of large bowel obstruction contrary to our previous finding where colonic volvulus predominated [17]. This transition may be attributed to changes in lifestyle and dietary pattern. Although bowel obstruction may complicate any intra-abdominal or gynaecological malignancies, colonic, ovarian and cervical cancers accounted for most of our cases. It is striking that our patients with malignant obstructions presented about a decade earlier (average age of 54.7 years) compared with the average age of 71 years reported from the west [18]. Of all 39 patients with neoplasms, 22 (56.4%) were treated with colostomy. Our finding is similar to that of Sule *et al* who noted a substantial number of young patients with late stage obstructive malignancy of the large bowel necessitating palliative procedures [19]. This therefore calls for early, aggressive cancer screening and public enlightenment in the population.

Although colonic volvulus has been reported from all segments of the colon, sigmoid

and caecal volvulus representing the more freely mobile parts of the colon were the main varieties in this study. A rotation beyond 180 degree is usually required for obstruction, and a twist may undergo spontaneous distortion below this critical point [20]. A propensity for higher spontaneous reductions in women with their wider pelvises may account for a lower incidence. The rapid progression of the ileo-sigmoid knotting variety to extensive gangrene is explainable by a double loop obstruction around the small and large bowels. Tuberculous obstruction may result from luminal strictures formation, external compression, bowel wall adhesions or traction by enlarged lymph nodes [21,22]. All our patients presented with widespread, multiple and dense adhesions consistent with late disease and delay in seeking medical advice. Considering the relative increased exposure of females to children with tuberculosis, who are the usual reservoirs of infection, it is not surprising that they were more affected.

Intussusception, mesenteric vascular occlusion and intra-abdominal abscesses are among the miscellaneous causes of bowel obstructions occurring in 2% to 3% of all obstructions. Abscess may compress or kink adherent loops of bowel or cause local ileus. Intussusceptions occur in adults in only about 5% of cases commonly in association with pathologic lead points [23]. One of our patients was referred to us with recurrent abdominal pain and vomiting while convalescing from laparotomy, and at re-laparotomy, was diagnosed with postoperative gangrenous intussusception. Early distinction of the more sinister causes of postoperative bowel obstructions like internal herniation and intussusception is often difficult because the primary symptoms of abdominal pain, nausea or vomiting are often ascribed to the more prevalent and more innocuous causes like postoperative ileus and early adhesions which are often managed conservatively [24]. This reinforces a need for absolute circumspection in deciding on conservative management of postoperative bowel obstructions.

Optimal treatment of bowel obstruction depends on an expeditious and precise diagnosis based largely on its clinical features. Abdominal pain followed by vomiting, abdominal distension, constipation or absence of flatus were the most common mode of presentation in our patients in accordance with literature [1]. A thorough consideration of the sequence of evolution of the

clinical symptoms is helpful in determining the level of obstruction, prognosticating outcome and provides important therapeutic guides. Early onset bilious vomiting, frequent colicky abdominal pain, vigorous peristalsis and less abdominal distension are more prominent in proximal obstruction; resulting in rapid fluid and electrolytes derangements that warrants a more aggressive resuscitation [1, 4]. Distal obstruction causes progressive and remarkable abdominal distensions of insidious onset, early constipation and a late onset faeculent vomiting with a less dramatic body fluid and electrolytes loss. Fever with signs of peritoneal irritation remains an ominous sign that may signify an underlying bowel gangrene or perforation.

Operative intervention is required in patients with complete obstruction or bowel strangulation. In this study, 169 (77.9%) patients were managed operatively with adhesiolysis being the most frequent procedure. Single stage bowel resection and primary anastomosis which combines the advantage of a low recurrence rate with significant economic benefits over other methods was the main treatment of colonic volvulus in most of our patients [25]. This was feasible due to relatively younger and fit patients compared to the typical elderly patients with neurologic or psychiatric conditions in the west. Surgical treatment of abdominal tuberculosis depends on the disease morphology and may include segmental resection, strictureoplasty or adhesiolysis. Tissue biopsy for histologic confirmation and minimal separation of adhesions followed by antituberculous drugs was carried out in our patients who principally presented with extensive, multiple dense adhesions. Other authors have also emphasized a need for a more conservative surgery with changing morphology of intestinal tuberculosis [22]. Consequent upon a high rate of underlying malignant aetiology or gangrenous bowels, primary resection without manual reduction of intussusception was instituted in all our patients.

A high morbidity accompanying intestinal obstruction is demonstrated by complications rate of 29% from this study. Wound and septic complications were the most common in our patients but others have equally reported systemic complication as more common. Twelve patients died with a mortality rate of 5.5%. In other reports mortality rate varies between 1.5% and 14% [11,26]. Outcome of obstructions of the bowel may vary depending on underlying aetiological factors, presence of comorbidities,

advancement of age or the timing of institution of treatment. Identifying the prognostic indicators of survival in the patients is important in guiding future therapeutic decisions and maximising outcomes. In this study, mortality statistically correlate with the presence of strangulation, shock, loop obstructions and delayed presentation >48 hours.

### Conclusion

Majority of bowel obstructions occurred from benign lesions of adhesions, hernia and volvulus; however, neoplasms have replaced volvulus as the leading cause of large bowel obstruction. Prognosis with adverse outcome is associated with the presence of strangulation, shock, delayed presentation and loop obstruction. Considering the serious impact of intestinal obstruction on the quality and quantity of individual's life, instituting measures against adhesion formation, elective hernia repair, prompt screening and cancer treatment are critical to reducing the morbidity and mortality of bowel obstruction.

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### References

1. Wilson M.S, Ellist H, Menziest D, Moran B.J, Parker M.C and Thompson J.N. A review of the management of small bowel obstruction. *Ann R Coll Surg Engl* 1999; 81:320-328
2. Kapan M, Onder A, Polat S, Aliosmanoglu I. Arikanoğlu Z, Taskesen F and Girgin S. Mechanical bowel obstruction and related risk factors on morbidity and mortality. *Journal of Current surgery* 2012; 2(2):55-61
3. Akigun Y, Yilmaz G and Akbayin H. Causes and Effective Factors on Mortality of Intestinal Obstruction in the South East Anatolia. *Turk J Med Sci* 2002; 32: 149-154
4. Whang E.E, Ashley S.W and Zinner M.J. Small bowel obstruction. In: Schwartz's principles of surgery, Brunicaudi F. C (ed), 8th edition. The McGraw-hill companies Inc. 2005; 1027-1031
5. Margenthaler J.A, Longo W.E, Virgo K.S, Johnson F.E., Grossmann E.M, Schiffner T.L, Henderson W.G, Khuri S.F. Risk Factors for Adverse Outcomes Following Surgery for Small Bowel Obstruction. *Ann Surg* 2006; 243: 456-464
6. Ergul E and Korukluoglu B. Peritoneal adhesions: Facing the enemy. *Int J Surg* 2008; 6: 253-260
7. Drozdz W and Budzyn P. Change in Mechanical Bowel Obstruction Demographic and Etiological Patterns During the Past Century-Observations From One Health Care Institution. *Arch Surg* 2012; 147(2):175-180
8. Markogiannakis H, Messaris E, Dardamanis D, Pararas N, Tzertzemelis D, Giannopoulos P, Larentzakis A, Lagoudianakis E, Manouras A, Bramis I. Acute mechanical bowel obstruction: clinical presentation, etiology, management and outcome. *World J Gastroenterol.* 2007; 13(3):432-437.
9. Malik A.M, Shah M, Pathan R and Sufi K. Pattern of Acute Intestinal Obstruction: Is There a Change in the Underlying Etiology? *Saudi J Gastroenterol.* 2010; 16(4): 272-274
10. Souvik A, Hossein M.Z, Amitabha D, Nilanjan M and Udipta R. Etiology and Outcome of Acute Intestinal Obstruction: A Review of 367 Patients in Eastern India. *Saudi J Gastroenterol.* 2010; 16(4): 285-287.
11. Lawal O.O, Olayinka O.S, Bankole J.O. Spectrum of causes of intestinal obstruction in adult Nigerian patients. *SAJS* 2005; 43 (2): 34-36
12. De la Garza-Villasenor L. Etiology of intestinal occlusion. *Rev Gastroenterol Mex* 2001; 66(4):193-196
13. Hadi A, Aman Z, Batool I, Khan M, Khan S. A, Ahmad S, Khattak J.A. Causes of Mechanical Intestinal Obstruction in Adults. *JPMI* 2010; 24(3):212-216
14. Khan T.S, Wani M.L, Wani S.N, Kenu B.A, Misgar A.S, Fazili A, Shaheen N, Khan H.A, Bijli A.H.. Clinico-Pathological Profile and Management of Acute Mechanical Small Bowel Obstruction: A Prospective Study. *Arch Clin Exp Surg* 2013; 2 (3):154-

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15. Mabula J. B and Chalya P.L. Surgical management of inguinal hernias at Bugando Medical Centre in northwestern Tanzania: our experiences in a resource-limited setting. *BMC Research Notes* 2012, 5:585
  16. Kingsnorth AN and LeBlanc KA. Management of abdominal hernias. 3rd ed. London, New York: Edward Arnold, 2003: 40-47
  17. Sule A.Z and Ajibade A. Adult large bowel obstruction: a review of clinical experience. *Ann Afr Med* 2011; 10(1):45-50.
  18. Welch J.P and Donaldson G.A. Management of Severe Obstruction of the Large Bowel due to Malignant Disease. *Am J Surg* 1974; 127:492-499.
  19. Sule A.Z and Mandong B.M. Malignant colorectal tumors in patients 30 years and below: a review of 35 cases. *Cent Afr J Med* 1999; 45(8): 209-212
  20. Lupton C.H. Intestinal obstruction. *Am J Surg* 1952; 794-804
  21. Sharma M.P and Bhatia V. Abdominal tuberculosis. *Indian J Med Res* 2004; 120: 305-315
  22. Akbar M, Fakhar-ul-Islam, Haider I.Z and Naveed D, Akbar I, Khattak I, Akbar K, Zafar A. Surgical Management of Tuberculous Small Bowel Obstruction. *J Ayub Med Coll Abbottabad* 2010;22(2): 171-175
  23. Adult intussusceptions in Trinidad. *J of the royal coll of surgedinb.*1987; 32(1): 22-23
  24. Schein M and Sajja S B.S. Early Postoperative Small Bowel Obstruction. *Semin Colon Rectal Surg* 2005;16:228-234
  25. Yassaie O, Thompson-Fawcett M and Rossaak J. Management of sigmoid volvulus: is early surgery justifiable? *ANZ J Surg* 2013; 83: 74–78
  26. Akcakaya A, Sahin M, Coskun A and Demiray S. Comparison of mechanical bowel obstruction cases of intraabdominal tumor and non-tumoral origin. *World J Surg.* 2006;30(7):1295-1299.