SAS Journal of Surgery
Abbreviated Key Title: SAS J Surg
ISSN 2454-5104
Journal homepage: https://www.saspublishers.com

OPEN ACCESS

Surgery

Colonoscopic Evaluation of Patients Treated Conservatively for Intestinal Obstruction: An Observational Study

Dr. Abu Kawsar Mohammed Naser Mazumder[1*], Dr. Mobashera Samia Haque[2], Dr. Md. Anwarul Haque[3], Dr. Md. Anisur Rahman[4], Professor A B M Khurshid Alam[5]

[1]Jr Consultant (Surgery), 250 Bed General Hospital, Kurigram, Bangladesh
[2]FCPS Part-2 Course Student (Obstetrics & Gynaecology)
[3]Jr Consultant, Department of Surgery, Upazila Health Complex Paba, Rajshahi, Bangladesh
[4]Senior Consultant (Anesthesiology), 100 Bed Sador Hospital, Lalmonirhat, Bangladesh
[5]Professor of Surgery & DG, Directorate General of Health Services, Bangladesh

DOI: 10.36347/sasjs.2022.v08i10.009 | **Received:** 06.09.2022 | **Accepted:** 10.10.2022 | **Published:** 17.10.2022

Corresponding author:** Dr. Abu Kawsar Mohammed Naser Mazumder ***FCPS
Jr Consultant (Surgery), 250 Bed General Hospital, Kurigram, Bangladesh **Email:** nasercmc@gmail.com

Abstract **Original Research Article**

Background: Acute intestinal obstruction occurs when there is an interruption in the forward flow of intestinal contents. This interruption can occur at any point along the length of the gastrointestinal tract, and clinical symptoms often vary based on the level of obstruction. ***Objectives:*** To evaluate the causes of obstruction of patients who were treated conservatively for acute intestinal obstruction. ***Materials & Method:*** A cross-sectional observational study. The study was carried out in the Surgery In-patient Department of Comilla Medical College Hospital, Comilla, from 01.07.2013 to 31.12.2013. A total of 246 patients got admitted to the surgery in-patient department and diagnosed as a case of intestinal obstruction. 101 patients of both sex, aged 23-79 responded to initial conservative treatment and were recruited for the study. The remaining 145 patients underwent emergency surgery for intestinal obstruction and were excluded from the study. All data gathered from the data collection sheet was compiled manually. After compilation, these data were shifted to statistical analysis software for further analysis. ***Results:*** Out of 246 intestinal obstruction patients, we recorded 101 patients who responded to conservative management. 59 (58.4%) patients were male, and the remaining were female. Peak Incidence (45.5%) was in 51-66 years age group. 54(53.4%) patients presented with large bowel obstruction, the remaining with small bowel obstruction. Most of the patients 68 (67.3%), presented with sub-acute obstruction, followed by acute 28 (27.7%) and chronic 5 (4.9%) obstruction, respectively. 12(11.8%) patients were diagnosed with colorectal carcinoma, 5(4.9%) patients with intestinal TB, and 1(0.9%) patient with diverticulosis. 10(83.3%) of the patients with Colorectal carcinoma were in the elderly age group (>50 years) whereas two patients were below 80 years of age. The cause of obstruction could not be detected in 83 (82.2%) patients by colonoscopy. These patients could be diagnosed if other diagnostic tools evaluated them for Intestinal obstruction. ***Conclusion****:* About one-half of the patients with intestinal obstruction respond to conservative treatment. Those who achieve resolution can be properly evaluated preoperatively and undergo definitive surgery in a more favorable elective condition, especially in cases of colorectal carcinoma. Patients with colorectal carcinoma can present with intestinal obstruction with a significant peak in the elderly age group. So, emergency surgery should be avoided as far as possible in these cases.

Keywords: Intestinal Obstruction, Colonoscopy.

INTRODUCTION

Intestinal obstruction is a term that encompasses impedance to the normal passage of bowel contents through the small or large bowel. It accounts for approximately 15% of all emergency department visits for acute abdominal pain [1]. It affects both the small and large intestines and may present in acute, sub-acute or in chronic form [2, 3]. It can be the result of mechanical causes or motility disturbances [4].

The most common causes of intestinal obstruction include adhesions, neoplasm, and herniation. Adhesions resulting from prior abdominal surgery are the predominant cause of small bowel obstruction, accounting for approximately 60 percent of

cases [5]. Large bowel obstruction is usually caused by an underlying carcinoma or occasionally diverticular disease and presents in an acute or chronic form. The condition of pseudo-obstruction should always be considered [6]. Less common obstruction causes include intestinal intussusception, volvulus, intra-abdominal abscesses, gallstones, and foreign bodies. The hallmarks of intestinal obstruction include colicky abdominal pain, nausea and vomiting, abdominal distension, and a cessation of flatus and bowel movements. Distal obstructions allow for a greater intestinal reservoir, with pain and distension more marked than emesis, whereas patients with proximal obstructions may have minimal abdominal distension but marked emesis. Auscultation in patients with early obstruction revises high-pitched bowel sounds, whereas those with late obstruction may present minimal bowel sounds as the intestinal tract becomes hypotonic.

The most important initial investigation is plain upright abdominal radiography. Radiography can accurately diagnose intestinal obstruction in approximately 60 percent of cases [7]. For all patients presenting with intestinal obstruction, the initial management is Conservative. Conservative management starts with fluid resuscitation and correction of metabolic derangements, intestinal decompression by nasogastric suction and bowel rest [8]. In the presence of sepsis, broad-spectrum antibiotics should be commenced early. Although conservative management is associated with shorter initial hospitalization, there is also a higher rate of eventual recurrence [9]. With conservative management, resolution generally occurs within 24 to 48 hours. Beyond this time frame, the risk of complications, including vascular compromise, increases. If the intestinal obstruction is not resolved with conservative management, surgical evaluation is required [10].

It is not always easy to make a decision to perform surgery for intestinal obstruction. The following risk factors should be carefully monitored: peritonitis, clinical instability, unexplained leukocytosis or acidosis, concern for abdominal sepsis, intestinal ischemia, or perforation [8]. Patients requiring emergency surgery have a poorer outcome, with increased morbidity and mortality (40% in comparison to approximately 10% electively), which may partly be due to a greater number of elderly patients presenting as an emergency [6]. Many large bowel obstructions pose no immediate threat to bowel wall viability. Therefore emergency surgery is not indicated in those cases, and a delay for further evaluation is beneficial. These patients should be evaluated by colonoscopy because colonoscopy can detect lesions of the whole of the large bowel and the terminal part of the ileum as well. This will be especially helpful for the detection of an obstructing colorectal canoer and any synchronous lesion and help to make a proper decision for definitive surgery. There is very few research works done in this field in our country. Considering the fact, the research work was designed to find out the lesions of those patients who responded to initial conservative treatment for intestinal obstruction.

Intestinal obstruction and colorectal carcinoma

The majority of cases of colonic obstruction are secondary to colorectal cancer. Up to 20% of patients with colonic cancer present with symptoms of acute obstruction [11, 12]. Emergency presentation of colorectal carcinoma is associated with a significant risk of mortality and morbidity and with a high percentage of stoma creation (either temporary or permanent) [13, 14]. Whereas right-sided colonic obstructions are usually treated by one-stage resection with primary anastomosis for all patients but the frailest, controversy continues to revolve around emergency management of obstructed left colon cancer [15].

OBJECTIVES

General objectives

1. To evaluate the causes of obstruction of patients who were treated conservatively for acute intestinal obstruction.

Specific Objectives

1. To find out the large bowel lesions by colonoscopy in cases of conservatively treated intestinal obstruction patients.
2. To find out the percentage of colorectal carcinomas in case patients responded to conservative treatment for acute intestinal obstruction.

METHOD

A cross-sectional observational study was carried on for six months, dated 01.07.2013 to 31.12.2013. The study was conducted Total number of patients (n=246) in the Surgery In-patient Department of Comilla Medical College Hospital, Comilla. The study population included patients admitted in the surgery in-patient department with a clinical diagnosis of intestinal obstruction and who responded to conservative treatment. After admission, all the patients were initially treated conservatively by nasogastric suction, intravenous fluid, a broad-spectrum antibiotic, and continuous catheterization. Frequent monitoring of the risk factors (peritonitis, clinical instability, unexplained leukocytosis, intestinal ischemia or perforation) and patient assessment was done from time to time. The patients who did not respond to initial conservative treatment underwent emergency surgery. And those who responded and showed no immediate threat to bowel wall viability were managed conservatively and were recruited for the study.

Inclusion criteria

1. Patients presenting with acute, sub-acute or chronic intestinal obstruction.

Exclusion criteria

1. Patients of <20 years of age.
2. Patients who will not agree to do a colonoscopy.
3. Patients with severe co-morbid conditions

All data gathered from the data collection sheet was transferred to SPSS (Statistical Package for Social Science) version 26.0 for statistical analysis. The results were expressed in percentages. Then the results were taken in a bar chart, pie chart, and table format.

LITERATURES REVIEW

Pathogenesis of intestinal obstruction

The fundamental concerns about intestinal obstruction are its effect on whole-body fluid electrolyte balances and the mechanical effect that increased pressure has on teeth & perfusion. Proximal to the point of obstruction, the intestinal tract dilates as it fills with intestinal secretions and swallowed air [17]. Failure of intestinal contents to pass through the intestinal tract leads to a cessation of flatus and bowel movements.

Fluid loss from emesis, bowel edema, and loss of absorptive capacity leads to dehydration. Emesis leads to loss of gastric potassium, hydrogen, and chloride ions, and significant dehydration stimulates renal proximal tubule reabsorption of bicarbonate and loss of chloride, perpetuating metabolic alkalosis [18]. In addition to derangements in fluid and electrolyte balance, intestinal stasis leads to the overgrowth of intestinal flora, which may lead to the development of feculent emesis. Additionally, the overgrowth of intestinal flora in the small bowel leads to bacterial translocation across the bowel wall [19].

Ongoing dilation of the intestine increases luminal pressures. When luminal pressures exceed venous pressures, loss of venous drainage causes increasing edema and hyperemia of the bowel. This may eventually lead to compromised arterial flow to the bowel, causing ischemia, necrosis, and perforation. A closed-loop obstruction, in which a section of the bowel is obstructed proximally and distally, may undergo this process rapidly, With few presenting symptoms. Intestinal volvulus, the prototypical closed-loop abstraction, causes torsion of arterial inflow and venous drainage and is a surgical emergency.

Role of Colonoscopy

Colonoscopy enables visual inspection of the entire large bowel from the distal rectum to the cecum. The procedure is a safe and effective means of evaluating the large bowel. The technology for colonoscopy has evolved to provide a very clear image of the mucosa through a video camera attached to the end of the scope. The camera connects to a computer, which can store and print color images selected during the procedure. Screening for and follow-up of colorectal cancer are among the indications for colonoscopy. Although colorectal cancer is highly preventable, it is the second most common cancer and cause of cancer deaths [34]. Botnmen and women face a lifetime risk of nearly 6% for the development of invasive colorectal cancer [35]. Proper screening can help reduce mortality rates at all ages, and colonoscopy plays an important role in this effort. Compared with other imaging modalities, colonoscopy is especially useful in detecting small lesions such as adenomas; however, the main advantage of colonoscopy is that it allows for intervention because biopsies can be taken and polyps removed.

Management of intestinal obstruction

Management of intestinal obstruction is directed at correcting physiologic derangements caused by the obstruction, bowel rest, and removing the source of obstruction. The former is addressed by intravenous fluid resuscitation with isotonic fluid. The use of a bladder catheter to closely monitor urine output is the minimum requirement for measuring the adequacy of resuscitation; other invasive measures, such as arterial canalization or central venous pressure monitoring, can be used as the clinical situation warrants. Antibiotics are used to treat the intestinal overgrowth of bacteria and translocation across the bowel wall [36]. The presence of fever and leukocytosis should prompt the inclusion of antibiotics in the initial treatment regimen. Antibiotics should have coverage against gram-negative organisms and anaerobes, and the choice of a specific agent should be determined by local susceptibility and availability. Aggressive replacement of electrolytes is recommended after the adequate renal function is confirmed.

The decision to perform surgery for intestinal obstruction can be difficult. Peritonitis, clinical instability, or unexplained leukocytosis or acidosis are concerning for abdominal sepsis, intestinal ischemia, or perforation; these findings mandate immediate surgical exploration. Patients with an obstruction that resolves after the reduction of a hernia should be scheduled for elective hernia repair, whereas immediate surgery is required in patients with an irreducible or strangulated hernia. Stable patients with a history of abdominal malignancy or high suspicion of malignancy should be thoroughly evaluated for optimal surgical planning. Abdominal malignancy can be treated with primary resection and reconstruction, palliative diversion, or placement of venting and feeding tubes.

Treatment of stable patients with intestinal obstruction and a history of abdominal surgery presents a challenge. Conservative management should be attempted initially, using intestinal intubation and

decompression, aggressive intravenous rehydration, and antibiotics. The inclusion of oral magnesium hydroxide, simethicone, and probiotics decreased the length of hospitalization in a randomized controlled trial of 144 patients with partial small bowel obstructions [37]. Caution should be used when clinical and radiologic evidence suggest complete obstruction because the use of intestinal stimulation can exacerbate the obstruction and precipitate intestinal ischemia.

RESULT

In the present study, male patients were greater than female patients. Fifty-nine (68.4%) of the patients were male, while the rest were female.

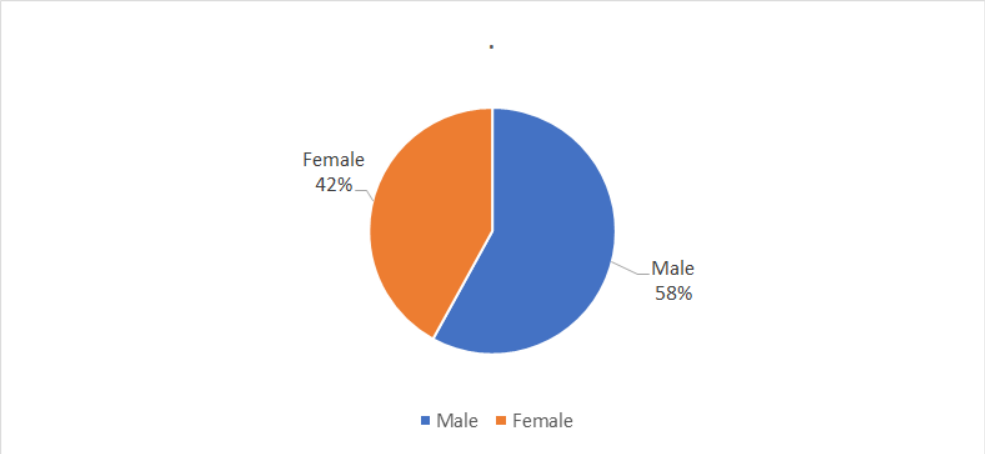


Fig 1: Gender distribution of patients

Most (45.5%) of the patients were from the 51-65years of age group, followed by 66-80years (31.6%), 36-50years (14.8%), and 20-35years (7.9%), respectively.

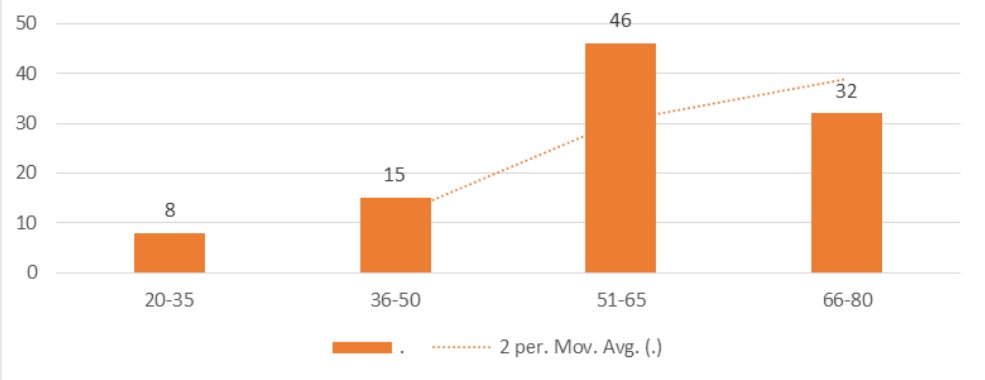


Fig 2: Age distribution of patients

Most of the patients (67.3%) presented with sub-acute obstruction followed by acute (27.7%) and chronic (4.9%) obstruction respectively.

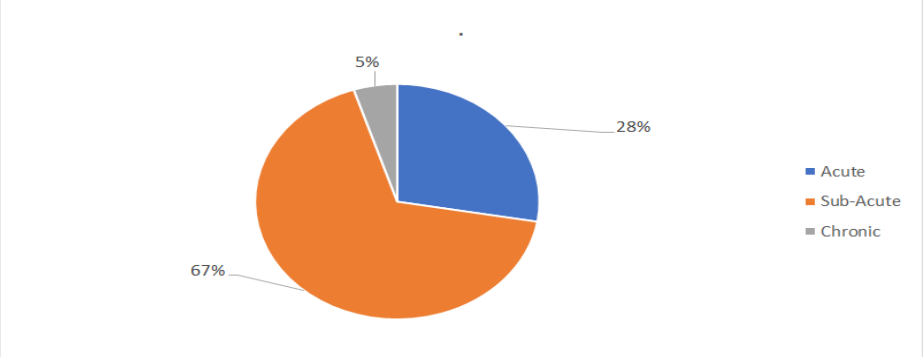
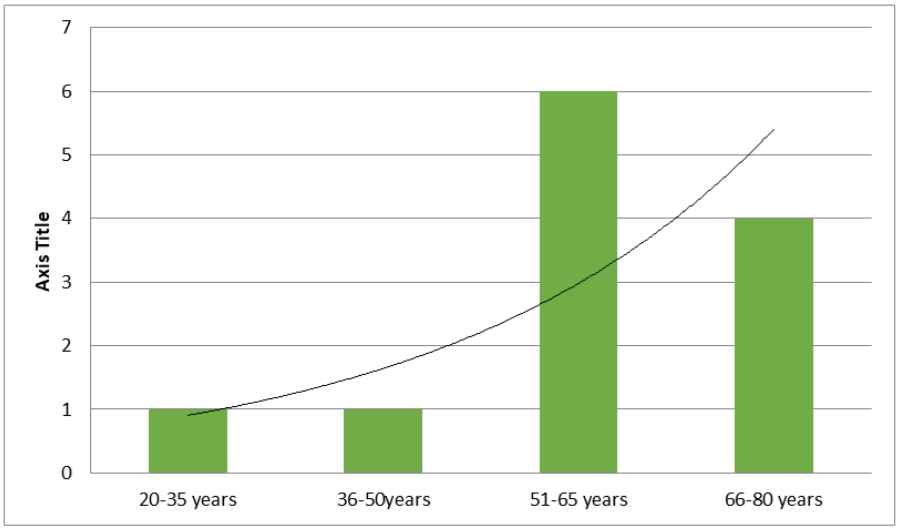


Fig 3: Types of intestinal obstruction



CRC- Colorectal carcinoma

Fig 4: Relative incidence of causes of intestinal obstruction

Table 1: Frequency distribution of causes of intestinal obstruction according to colonoscopy

Causes of obstruction	Frequency	Percentage
CRC	12	11.9%
Intestinal TB	5	4.9%
Diverticular stricture	1	0.9%
Colonoscopy negative	83	82.2%
Total	101	100.0%

CRC- Colorectal carcinoma
Intestinal TB- Intestinal tuberculosis

Table 2: Association between age group and causes of intestinal obstruction

Causes of obstruction	Age group				Total	*P*-value
	20-35	36-50	51-65	66-80		
CRC	1	1	6	4	12	<0.05,s
Intestinal TB	1	1	2	1	5	>0.10.ns
Diverticular stricture	0	0	0	1	1	>0.10,ns
Colonoscopy negative	6	13	38	26	83	
Total	8	15	46	32	101	

Age group- in years
CRC- Colorectal carcinoma
Intestinal TB- Intestinal tuberculosis
s- Significant
ns- Not significant

The significance test was done by the chi-square (X2) test. Table 2 shows that colorectal carcinoma is significantly associated with the patient's age group.

Table 3: Association between sex and causes of intestinal obstruction

Causes of Obstruction	Sex of Patient		Total
	Male	Female	
CRC	8	1	12
Intestinal TB	3	2	5
Diverticular Stricture	1	0	1
Colonoscopy Negative	47	36	83
Total	59	42	101

CRC-Colorectal carcinoma
Intestinal TB-Intestinal tuberculosis

Table 4: Association between sex and causes of intestinal obstruction

Causes of Obstruction	Level of Obstruction		Total
	Small bowel	Large bowel	
CRC	0	12	12
Intestinal TB	3	2	5
Diverticular Stricture	0	1	1
Colonoscopy Negative	44	39	83
Total	47	54	101

CRC-Colorectal carcinoma
Intestinal TB-Intestinal tuberculosis

Table 5: Association between the type of intestinal obstruction and causes of intestinal obstruction

Causes of Obstruction	Level of Obstruction			Total
	Acute	Sub-Acute	Chronic	
CRC	4	7	1	12
Intestinal TB	1	4	0	5
Diverticular Stricture	0	0	1	1
Colonoscopy Negative	22	57	3	83
Total	28	68	5	101

CRC-Colorectal carcinoma
Intestinal TB-Intestinal tuberculosis

DISCUSSION

A total of 246 intestinal obstruction patients were admitted to the surgery in-patient department. 101 patients responded to initial conservative treatment and were included in the study. Bowel obstruction of any type- acute, sub-acute, or chronic was included in the study. Patients, less than 20 years of age and patients undergoing emergency surgery for obstruction were excluded from the study. The study population was recruited by consecutive purposive sampling. We included the elderly(> 50 years) patients of small bowel obstruction in view that this group of people is more prone to develop colorectal carcinoma, and there are some screening programs for CRC in some countries for this group of people. Besides these, colorectal carcinomas involving the proximal colon may present with small bowel obstruction. In cases of sub-acute and chronic obstruction, a colonoscopy was performed in the same admission after the reduction of obstruction. In cases of acute obstruction, the patients were discharged and advised to come after one week, and a colonoscopy was performed outdoors. We found positive results in 18 patients out of 101 patients. Colorectal carcinoma was the leading cause 12 (11.8%) followed by intestinal tuberculosis 5 (4.9%) and diverticulosis 1 (.09%), respectively. The cause of obstruction could not be detected in 83 (82.2%) patients by colonoscopy. These patients could be diagnosed if other diagnostic tools evaluated them for intestinal obstruction.

The incidence of colorectal carcinoma in Bangladesh is not known. However, it is not an uncommon disease. Incidence and death rates for colorectal cancer increase with age. Overall, 90% of new cases and 94% of deaths occur in individuals of age 50 and older. The incidence of colorectal cancer is more than 15 times higher in adults of 50 years and older than in those 20 to 49 years. Overall, colorectal cancer incidence and mortality rates are about 35% to 40% higher in men than in women. The reasons for this are not completely understood but likely reflect complex interactions between gender-related differences in exposure to hormones and risk factors [41].

The highest incidence was identified in the age group 51-65 years (50%) which coincides with that reported by Walderon *et al.*, but differs from David *et al.*, whose peak incidence was at 75 years. In this study, males (n = 8) were more than females (n = 4), a ratio of 2:1, which is almost similar to that shown by others [43, 44]. On the other hand, Guraya S Y & Eltinay O E showed a different male-to-female ratio (4:1)45. In our study, the rectum was the most affected site 5 (41.6%), followed by the transverse colon 3 (25%) and sigmoid 2 (16.6%). Nevertheless, a different report contrasts our findings [45].

Intestinal tuberculosis is a rare form of mechanical bowel obstruction; in our series, 5(4.9%) patients presented with intestinal TB. Nguyen reported the incidence of intestinal obstruction due to TB is 4.5% [46]. However, in the Maliks series, the incidence of intestinal TB is 5% [47]. So, our study is consistent with the result.

CONCLUSION

About one-half of the patients with intestinal obstruction respond to conservative treatment. Those who achieve resolution can be properly evaluated preoperatively and undergo definitive surgery in a more

favorable elective condition, especially in cases of colorectal carcinoma. Patients with colorectal carcinoma can present with intestinal obstruction with a significant peak in the elderly age group. So, emergency surgery should be avoided as far as possible in these cases.

LIMITATIONS

1. It was a nonrandomized study.
2. The study was done on small sample size. The findings thus obtained may not represent the whole picture.
3. This single-institution study might not reflect the whole population.
4. The study was done in a resource-poor setting.
5. We assessed the patients by colonoscopy, so small bowel lesions could not be identified.

RECOMMENDATION

1. The sample size of this study was not large enough to predict that such results represent the true picture of the whole population, and hence large-scale studies are required to validate the findings of this study.
2. In this series, we have seen that 11.8% of patients of colorectal carcinoma have presented with intestinal obstruction. So a nationwide screening Programme can be set to detect CRC earlier.
3. The patients who were not diagnosed by colonoscopy should undergo further evaluation by other diagnostic tools.

ACKNOWLEDGMENT

With great pleasure, I record my sincere gratitude and indebtedness to my guide, Professor Dr. A.B.M. Khurshid Alam, Head, Department of surgery, Comilla Medical College and Hospital, for his valuable suggestion and constant suggestions and supervision throughout the whole period of development of this dissertation. The constant guidance and inspiration of Dr. Jahangir Hossain Bhuiyan, Associate Professor, Department of Surgery, enabled me to complete this task. I would like to take this opportunity to pay my respect to Dr. Md. Abdur Rob Sarkar, Associate Professor, Dr. Md. Izazul Haque, Assistant Professor and Dr. Md. Belalul Islam, Assistant Professor, working in the Department of Gastroenterology, Comilla Medical College Hospital for their co-operation during my study.

I am ever grateful to my parents for their constant support and blessing throughout my whole. I express my heartiest thanks to my wife, Dr. Mobashera Samia Haque, for her constant encouragement during this study. I am ever grateful to almighty Allah for showering His blessings on me.

REFERENCES

1. Irvin, T. T. (1989). Abdominal pain: a surgical audit of 1190 emergency admissions. *Journal of British Surgery*, *76*(11), 1121-1125.
2. Delgado-Aros, S., & Camilleri, M. (2003). Clinical management of acute colonic pseudo-obstruction in patients: a systematic review of the literature. *Gastroenterologia y Hepatologia*, *26*(10), 646-655.
3. Delgado-Aros, S., & Camilleri, M. (2003). Pseudo-obstruction in the critically ill. *Best practice & research Clinical gastroenterology*, *17*(3), 427-444.
4. Farmer K C, Philips R K: True & false large bowel obstruction, Baillieres Clin Gastroenterol 1991; 5:563-85.
5. Shelton, B. K. (1999). Intestinal obstruction. *AACN Advanced Critical Care*, *10*(4), 478-491.
6. Katherine, E. B., Manish, C., & Tom D. C. (2010). Acute colonic emergencies. *Surgery*, 28(11), 536-37.
7. Maglinte, D. D., Heitkamp, D. E., Howard, T. J., Kelvin, F. M., & Lappas, J. C. (2003). Current concepts in imaging of small bowel obstruction. *Radiologic Clinics*, *41*(2), 263-283.
8. Jackson, P., & Raiji, M. T. (2011). Evaluation and mangement of intestinal obstruction. *American family physician*, *83*(2), 159-165.
9. Cox, M. R., Gunn, I. F., Eastman, M. C., Hunt, R. E., & Heinz, A. W. (1993). The safety and duration of non-operative treatment for adhesive small bowel obstruction. *Australian and New Zealand Journal of Surgery*, *63*(5), 367-371.
10. Fevang, B. T., Jensen, D., Svanes, K., & Viste, A. (2002). Early operation or conservative management of patients with small bowel obstruction?. *European Journal of Surgery*, *168*(8-9), 475-481.
11. Phillips, R. K. S., Hittinger, R., Fry, J. S., & Fielding, L. P. (1985). Malignant large bowel obstruction. *Journal of British Surgery*, *72*(4), 296-302.
12. Umpleby, H. C., Williamson, R. C. N., & Chir, M. (1984). Survival in acute obstructing colorectal carcinoma. *Diseases of the colon & rectum*, *27*(5), 299-304.
13. Tekkis, P. P., Kinsman, R., Thompson, M. R., Stamatakis, J. D., & Association of Coloproctology of Great Britain. (2004). The Association of Coloproctology of Great Britain and Ireland study of large bowel obstruction caused by colorectal cancer. *Annals of surgery*, *240*(1), 76-81.
14. Meyer, F., Marusch, F., Koch, A., Meyer, L., Führer, S., Köckerling, F., ... & Gastinger, I. (2004). Emergency operation in carcinomas of the left colon: value of Hartmann's procedure. *Techniques in coloproctology*, *8*(1), s226-s229.
15. Mella, J., Biffin, A., Radcliffe, A. G., Stamataki, J. D., & Steele, R. J. C. (1997). Population-based audit of colorectal cancer management in two UK

health regions. *Journal of British Surgery*, *84*(12), 1731-1736.
16. emedicine.medscape.com/article/1819350-overview. last accessed on 25.11.2013
17. Wright, H. K., O'Brien, J. J., & Tilson, M. D. (1971). Water absorption in experimental closed segment obstruction of the ileum in man. *The American Journal of Surgery*, *121*(1), 96-99.
18. Wangensteen, O. H. (1978). Understanding the bowel obstruction problem. *The American Journal of Surgery*, *135*(2), 131-149.
19. Rana, S. V., & Bhardwaj, S. B. (2008). Small intestinal bacterial overgrowth. *Scand J Gastroenterol*, 43(9), 1030-1037.
20. Shelton, B. K. (1999). Intestinal obstruction [published correction appears in AACN Clin table 2000; 11(1): following of contents]. AACN Clin Issues, 10(4), 478-491.
21. Maglinte, D. D., Heitkamp, D. E., Howard, T. J., Kelvin, F. M., & Lappas, J. C. (2003). Current concepts in imaging of small bowel obstruction. *Radiologic Clinics*, *41*(2), 263-283.
22. Lappas, J. C., Reyes, B. L., & Maglinte, D. D. (2001). Abdominal radiography findings in small-bowel obstruction: relevance to triage for additional diagnostic imaging. *American Journal of Roentgenology*, *176*(1), 167-174.
23. Stoker, J., van Randen, A., Laméris, W., & Boermeester, M. A. (2009). Imaging patients with acute abdominal pain. *Radiology*, *253*(1), 31-46.
24. Suri, S., Gupta, S., Sudhakar, P. J., Venkataramu, N. K., Sood, B., & Wig, J. D. (1999). Comparative evaluation of plain films, ultrasound and CT in the diagnosis of intestinal obstruction. *Acta Radiologica*, *40*(4), 422-428.
25. Furukawa, A., Yamasaki, M., Furuichi, K., Yokoyama, K., Nagata, T., Takahashi, M., ... & Sakamoto, T. (2001). Helical CT in the diagnosis of small bowel obstruction. *Radiographics*, *21*(2), 341-355.
26. Gazelle, G. S., Goldberg, M. A., Wittenberg, J., Halpern, E. F., Pinkney, L., & Mueller, P. R. (1994). Efficacy of CT in distinguishing small-bowel obstruction from other causes of small-bowel dilatation. *AJR. American journal of roentgenology*, *162*(1), 43-47.
27. Hayanga, A. J., Bass-Wilkins, K., & Bulkley, G. B. (2005). Current management of small-bowel obstruction. *Advances in surgery*, *39*, 1-33.
28. Choi, H. K., Chu, K. W., & Law, W. L. (2002). Therapeutic value of gastrografin in adhesive small bowel obstruction after unsuccessful conservative treatment: a prospective randomized trial. *Annals of surgery*, *236*(1), 1-6.
29. Abbas, S., Bissett, I. P., & Parry, B. R. (2007). Oral water soluble contrast for the management of adhesive small bowel obstruction. *Cochrane database of systematic reviews*, (3), CD004651.
30. Anderson, C. A., & Humphrey, W. T. (1997). Contrast radiography in small bowel obstruction: a prospective, randomized trial. *Military medicine*, *162*(11), 749-752.
31. Dunn, J. T., Halls, J. M., & Berne, T. V. (1984). Roentgenographic contrast studies in acute small-bowel obstruction. *Archives of Surgery*, *119*(11), 1305-1308.
32. Lim, J. H., Ko, Y. T., Lee, D. H., Lee, H. W., & Lim, J. W. (1994). Determining the site and causes of colonic obstruction with sonography. *AJR. American journal of roentgenology*, *163*(5), 1113-1117.
33. Matsuoka, H., Takahara, T., Masaki, T., Sugiyama, M., Hachiya, J., & Atomi, Y. (2002). Preoperative evaluation by magnetic resonance imaging in patients with bowel obstruction. *The American journal of surgery*, *183*(6), 614-617.
34. DiPalma, J. A., Wolff, B. G., & Meagher, A. (2003). Comparison of reduced volume versus four liters sulfate-free electrolyte lavage solutions for colonoscopy colon cleansing. *The American journal of gastroenterology*, *98*(10), 2187-2191.
35. Samarasena, J. B., Muthusamy, R. V., & Jamal, M. M. (2012). Split-dosed MiraLAX/Gatorade is an effective, safe, and tolerable option for bowel preparation in low-risk patients: a randomized controlled study. *Official journal of the American College of Gastroenterology, ACG*, *107*(7), 1036-1042.
36. Sagar, P. M., MacFie, J., Sedman, P., May, J., Mancey-Jones, B., & Johnstone, D. (1995). Intestinal obstruction promotes gut translocation of bacteria. *Diseases of the colon & rectum*, *38*(6), 640-644.
37. Chen, S. C., Yen, Z. S., Lee, C. C., Liu, Y. P., Chen, W. J., Lai, H. S., ... & Chen, W. J. (2005). Nonsurgical management of partial adhesive small-bowel obstruction with oral therapy: a randomized controlled trial. *CMAJ*, *173*(10), 1165-1169.
38. Hoque, M. M. (2009). abc Biostatistics. 1st ed. Dhaka: Dept. of Biochemistry, BSMMU, Dhaka.
39. http://www.rightdiagnosis.com/i/intestinal-obstruction / stats-country.htm. last accessed on 30.07.2013.
40. Surveillance, Epidemiology, and Program November 2009 submission. End Results (SEER) (www.seer.cancer.gov), National Cancer Institute, DCCPS, Surveillance Research Program, Cancer Statistics Branch, released April 2010, based on the
41. Murphy, G., Devesa, S. S., Cross, A. J., Inskip, P. D., McGlynn, K. A., & Cook, M. B. (2011). Sex disparities in colorectal cancer incidence by anatomic subsite, race and age. *International journal of cancer*, *128*(7), 1668-1675.
42. Sabiston, D. C., & Lyerly, K. L. (1995). The biological basis of modern surgical practice. Philadelphia: W. B. Saunders, 32(IX), 1020-1030.
43. Garden, O. J., Bradury A. W., & Forsythe, J. (2002). Principles and practice of surgery. 4th ed. City: Churchill Livingstone, 23, 343-348.

44. Verschueren, R. C., Mulder, N. H., Van Loon, A. J., De Ruiter, A. J., & Szabo, B. G. (1997). The anatomical substrate for a difference in surgical approach to rectal cancer in male and female patients. *Anticancer research*, *17*(1B), 637-641.
45. Guraya, S. Y., & Eltinay, O. E. (2006). Higher prevalence in young population and rightward shift of colorectal carcinoma. *Saudi medical journal*, *27*(9), 1391-1393.
46. Nguyen, V. H. (2002). Intestinal obstruction due to tuberculosis. *Asian Journal of Surgery*, *25*(2), 145-148.
47. Malik, A. M., Shah, M., Pathan, R., & Sufi, K. (2010). Pattern of acute intestinal obstruction: is there a change in the underlying etiology?. *Saudi journal of gastroenterology: official journal of the Saudi Gastroenterology Association*, *16*(4), 272-274.