

Surgical Management Outcome of Bowel Obstruction and its Associated Factors at Asella Teaching and Referral Hospital, Eastern Ethiopia: a Cross-Sectional Study

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Abstract

Background: Globally, bowel obstruction is a potentially risky surgical emergency in all age groups, linked with high morbidity and mortality. Management outcomes of bowel obstruction vary depending on geographic location. But there is a paucity of information in the study area. Therefore, this study was aimed to assess surgical management outcome of bowel obstruction and its associated factors at Asella Teaching and Referral Hospital.

Method: Hospital-based retrospective cross-sectional study was conducted among 222 patients surgically treated patients for bowel obstruction at Asella Referral and Teaching hospital between 1 February 2019 and 31 January 2021. Data were collected from August 1-30, 2021. A structured data extraction checklist was used to gather relevant data. Data were entered into EpiData version 3.1 and exported to the IBM SPSS statistics version 26 for analysis. Descriptive statistics were done to calculate frequencies. Bivariate and multivariable logistic regression was employed to assess the association between dependent and independent variables. 0.05 was used to declare statistical significance and adjusted odds ratio with a respective 95% CI was used to determine the strength of association.

Results: The magnitude of unfavourable surgical management outcome was 24.3%. Age group of 15 and 40 years [AOR (95% CI)], [3.495 (1.053 – 11.596)], WBC count [AOR (95% CI)], [3.888 (1.225 – 12.338)], preoperative diagnosis of simple large bowel obstruction [AOR (95% CI)], [8.358 (1.194-58.501)], and intraoperative finding of gangrenous small bowel obstruction [AOR (95% CI)], [0.187 (0.045–0.777)] were significantly associated with surgical management outcome of bowel obstruction.

Conclusion: Significant numbers of patients experience unfavourable surgical management outcomes in the study area. Morbidity and mortality after surgical management of bowel obstruction vary with different determinant factors. Therefore, optimal infection prevention and patient safety practices should be implemented in the hospital setting.

Keywords: Bowel obstruction; Acute abdomen; Outcome; Treatment

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Background

Bowel obstruction is a surgical emergency caused by a partial or complete blockage of the forward movement of the intestinal contents occurring at any point in the gastrointestinal tract. It usually presents with clinical symptoms that vary based on the level of obstruction [1-3]. It is one of the most common acute abdominal disorders, accounting for 12% to 15% of all

hospitalizations due to acute abdomen, and it frequently requires emergency surgical management in the hospital setting [4, 5]. Even though it is a common cause of emergency surgical admissions, it remains a challenge as it results in economical expenditure in hospitals and is associated with significant morbidity and mortality [6, 7]. Globally, 2.1 deaths occur per 100,000 patients due to bowel obstruction, 3.5 deaths per 100,000 in developed countries, and 1.8 deaths in developing countries [8].

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Bowel obstruction occurs in the small intestine in 80% of cases, and the large intestine in 20% of cases [9]. Sigmoid volvulus, small bowel volvulus, adhesions, hernias, inflammatory bowel illness, appendicitis, tumors, diverticulitis, ischemic bowel, TB, and intussusception are all causes of intestinal obstruction [10]. The causes of obstruction change depending on the location of the obstruction and the area [11]. According to data from several studies, the major causes of bowel obstruction in Uganda [12], Nigeria [13], and Ethiopia [11] were hernia (40.2%), adhesions (51.6%), and intussusceptions (30.9 %), respectively.

Surgical management outcome of bowel obstruction continues to be a burden for the healthcare system despite advances in medicine, the development of a safe surgery checklist, and improved monitoring and related safety practices during anaesthesia. Global attempts to reduce the burden of patient harm have not yielded significant results during the last 15 years [14]. It has been demonstrated that surgical management can result in unfavourable outcomes characterized by fatal and nonfatal postoperative complications, and the magnitude of unfavourable surgical treatment outcome is high (4, 6). According to the studies conducted in South, East, and Central Ethiopia, the fatality rate after the management of bowel obstruction ranges from 2.5% to 13.6% [11, 15, 16].

It has been shown in different literature that old age, late presentation of illness, length of hospital stay after operation, comorbidity, fever, tachycardia, hyperkalaemia, hypokalaemia, elevated serum urea and creatinine, high ASA score, bowel resection, and anastomosis, and gangrenous bowel obstructions are linked with unfavourable surgical management outcome. It is, therefore, vital to evaluate the role of these factors regularly [4, 11, 17, 18].

Even though management outcomes of bowel obstruction have been investigated in some parts of Ethiopia, evidence suggests that bowel obstruction varies in terms of management outcomes based on dietary habits, geographic location, community living condition, and service provision [19-22]. However, there is no research on this topic in the Arsi Zone of the Oromia Region. Therefore, this study was aimed to evaluate the surgical management outcome of bowel obstruction and its associated factors at Asella Teaching and Referral Hospital, Oromia Region, Ethiopia.

Materials and methods

Study design, setting, and population

A hospital-based retrospective cross-sectional study was conducted at Asella Teaching and Referral Hospital (ATRH) from August 1 to 30, 2021. Geographically, ATRH is located in Asella town, which is found in the Arsi Zone of the Oromia Region at about 175 km from Addis Ababa, the country's capital. The hospital provides health services to about 3.5 million populations in Arsi and the nearby zones. Among these, about 3000-4000 operations are performed annually. The hospital has 321 beds, 54 beds for the surgical ward, with more than 5 departments. The hospital is involved in training undergraduate and postgraduate students in different specialties. In the department of surgery,

there are 19 surgeons: 13 General surgeons, 4 orthopaedic surgeons, 1 Neurosurgeon, and 1 Urologist. The department is also teaching 30 year I to year IV surgical residents.

The study population for this study was all patients admitted to the surgical ward and operated at ATRH with a diagnosis of bowel obstruction between 1 February 2019 and 31 January 2020. Patient charts with incomplete data for major variables, lost charts/records, and patients who left the service against medical advice were excluded from the study.

Sample size determination and sampling procedures

Charts of all patients with the diagnosis of bowel obstruction and who had undergone operation were involved.

Variables and measurement

Surgical management outcome of bowel obstruction: Surgical management outcome of bowel obstruction is the condition of the patient after surgery is done for bowel obstruction. It is categorized into two: favourable and unfavourable surgical management outcomes.

Favourable surgical management outcome: Favourable surgical management outcome is the condition of the patient after surgery is done and a patient does not develop postoperative complications or death until the patient is discharged from the hospital.

Unfavourable surgical management outcome: Unfavourable surgical management outcome is the condition of the patient after surgery has been done where the patient develops one of the postoperative complications (dehiscence, surgical site infection, pneumonia, and shock) and/or died until the patient is discharged from the hospital.

Data collection instrument and procedure

Data were collected by using a structured data extraction checklist adapted from previous studies. Data extraction checklist was prepared. Data were collected by 3 trained year-III residents and supervised by one-year III residents. Patient charts submitted to the surgical ward of ATRH hospital with a diagnosis of bowel obstruction were identified from admission logbooks of the surgical ward and operation theatre registry of ATRH. Then chart number of each patient was obtained. Using the charts as a reference, all patients were identified, and relevant information was collected.

Data quality control

Data collectors were trained on data extraction process and regular follow-up was made. The content and quality of data collected were checked by the supervisor daily to ensure the quality of data. Improperly collected data were refilled. The data collection format was checked for completeness.

Statistical analysis

Data were cleaned, coded, and entered into EpiData Version 3.1 and exported to IBM SPSS Statistics Version 26.0 for analysis.

Descriptive statistics were conducted and results were presented using frequency tables, graphs, and percentages. Bivariate binary logistic regression analyses were conducted to select variables for the multivariable model. 0.25 was used as a cut-off point to select variables in the bivariate analyses. Multivariable binary logistic regression analysis was conducted to identify significant covariates of the outcome variable. 0.05 was used as a cut-off point to declare statistical significance. The fitness of the model was checked by Hosmer and Lemeshow's test, which was found to be insignificant (0.482) indicating that the model was fitted.

Results

A total of 1102 patients were admitted with acute abdomen to the surgical ward of ARTH between 1 February 2019 and 31 January 2021. Of these, 222 patients (20.14%) were diagnosed to have bowel obstruction and received surgical management.

Sociodemographic characteristics

Among 222 patients with bowel obstruction admitted, 56.3% fell in the age category of 15 to 40 years, followed by 41 to 60 years (28.4%) and >60 years (10.8%). Majority of patients, 170 (76.6%), were male. Majority of them, 153 (68.9%), were rural residents (Table 1).

Preoperative clinical characteristics

Majority of patients had abdominal pain associated with failure to pass feces and flatus (86%), vomiting (86.9%), and had no fever (only 9.5%). Of all patients, 62(27.9%) had previous history of abdominal surgery. Four precepts of patients had comorbidities like diabetes mellitus, hypertension, and others. In this study, 56.3% of patients presented to the hospital after one day of onset of their illness, and the rest (43.7%) within the first 24 hours. Almost half of them were dehydrated (47.3%) and tachycardia (46.4%). Only 19 patients (8.6%) had significant leucocytosis (WBC count >18,000/mm³).

Preoperative Assessment and care

This study showed that most of the patients (59.9%) were assessed to have simple small bowel obstruction (SBO), followed by gangrenous SBO (17.6%) preoperatively. Simple large bowel obstruction (LBO) and gangrenous LBO were 13.5% and 9.0%, respectively. Among 222 patients, 94.1% were resuscitated with crystalloid, nasogastric tube inserted for 91.4% of them while antibiotics were initiated for 42.8% of patients (Table 2).

Table 1. Sociodemographic characteristics of patients admitted to ARTH with bowel obstruction between 1 February 2019 and 31 January 2021 (n = 222).

Variables	Category	Frequency	Percentage
Age category	<5 years	6	2.7
	5-14 years	5	2.3
	15-40 years	126	56.8
	41-60 years	62	27.9
	>60 years	23	10.4
Sex	Male	170	76.6
	Female	52	23.4
Residence	Urban	69	31.1
	Rural	153	68.9

Table 2. Frequency distribution by preoperative assessment of patients admitted to ARTH with bowel obstruction between 1 February 2019 and 31 January 2021 (n = 222).

Preoperative assessment	Frequency	Percentage
Simple SBO	133	59.9
Gangrenous SBO	39	17.6
simple LBO	30	13.5
Gangrenous LBO	20	9

SBO: Small bowel obstruction; LBO: Large bowel obstruction

Table 3. Prevalence of bowel obstruction by etiology (Intraoperative finding) among patients admitted to ARTH with bowel obstruction between 1 February 2019 and 31 January 2021 (n = 222).

Intraoperative finding	Frequency	Percentage
Simple SBV	72	32.4
Gangrenous SBV	19	8.6
Simple SV	20	9
Gangrenous SV	17	7.7
Adhesion and band	47	21.2
Hernia simple	12	5.4
hernia strangulated	4	1.8
Others	31	14

SBO: Small bowel obstruction; SV: Sigmoid volvulus

Intraoperative Finding and Procedure

Small bowel volvulus (SBV) was the predominant intraoperative finding (32.4%) followed by adhesion and band (21.2%). Simple sigmoid volvulus (SV), gangrenous small bowel volvulus (SBV), and gangrenous SBV made 9%, 8.6%, 7.7%, respectively. Hernia (both viable and gangrenous) contributes to 7.2% of cases of bowel obstruction. Others like ileosigmoid knotting, large bowel tumor, and intussusception took 14% (Table 3).

All patients were taken to the operation theatre. Untwisting was the common procedure done (37.8%) followed by adhesion lysis and band release (20.7%). Reduction of viable intussusception, hemicolectomies, and sigmoidoplasty were categorized under other and accounts for 4.5% of procedure done (Figure 1).

Surgical management outcome of bowel obstruction

This study showed, 75.7% of operated patients with bowel obstruction had favourable outcome, while the rest experienced unfavourable outcome (24.3%). Among unfavourable outcome, 19.8% of patients developed one of the complications but recovered and 4.5% of them died of it. According to this study, ileus was the most common complication (unfavourable outcome) identified among operated patients followed by intra-abdominal collection (6.3%) and surgical site infection (SSI) (5.4%). Wound dehiscence (3.2%), sepsis (3.2%), and pneumonia (3.2%) were unfavourable outcomes (Figure 2).

A large number of patients who developed unfavourable outcome were those in the extreme age groups summing up to 68.1% (33.3% for under 5 years and 34.8% for >60years) on cross-tab analysis. The least to complicate was adult age group (19.8%) among the age groupings. The study showed 26.1% of those who

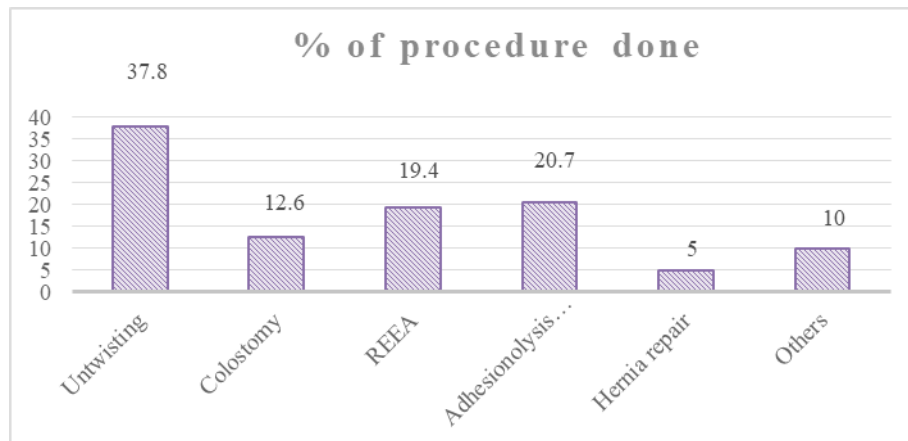


Figure 1 Frequency distribution of procedure done for management of bowel obstruction at ARTH between 1 February 2019 and 31 January 2021 (n = 222).

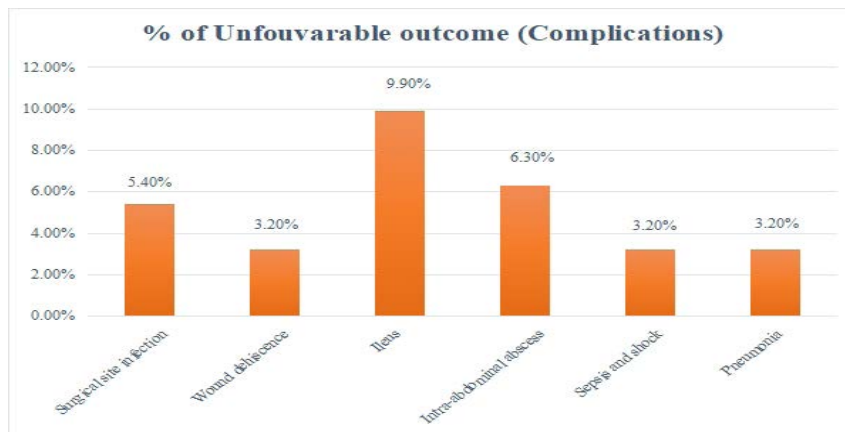


Figure 2 Percentage of each complication detected among patients treated surgically at ARTH between 1 February 2019 and 31 January 2021 (n = 222).

came from rural and 20.3% from urban developed complications (Figure 3).

Factors associated with surgical management outcome of bowel obstruction

Bivariate binary logistic regression analyses were conducted to select variables for multivariable logistic regression analysis. In the bivariate analysis, 9 variables demonstrated association with management outcome of bowel obstruction. All of these variables were entered into multivariable logistic regression analysis. Among the variables entered into the final model, 4 variables (15 – 40 years age group, leucocytosis, preoperative diagnosis of simple LBO, and intraoperative finding of gangrenous small bowel obstruction) showed significant association with the surgical management outcome of bowel obstruction. Accordingly, patients who were in the age group of 15 and 40 years were 3 times more likely to experience favourable outcome when compared to the patients who were above 60 years old [AOR (95% CI), [3.495 (1.053 – 11.596)]. Patients who had WBC count less than 18,000 cells/mm³ were 3 times more likely to experience favourable outcome than those who had WBC count

18,000 cells/mm³ [AOR (95% CI), 3.888 (1.225 – 12.338)]. The odds of favourable outcome was 8 times higher among patients who had a preoperative diagnosis of simple LBO as compared to those who had gangrenous LBO [AOR (95% CI)], [8.358 (1.194 – 58.501)]. The odds of favourable outcome was decreased by 81.3% among patients who had an intraoperative finding of gangrenous small bowel obstruction when compared to those who had simple small bowel obstruction [AOR (95% CI)], [0.187 (0.045 – 0.777)] (Table 4).

Discussion

In Ethiopia, intestinal blockage is one of the leading causes of morbidity and mortality [11]. Therefore, this study evaluated surgical management outcome of bowel obstruction and its associated factors at Asella Teaching and Referral Hospital, Oromia Region, Ethiopia. In the present study, the magnitude of unfavourable surgical management outcome was 24.3% with 95% CI (18.5, 30.2). This finding is in line with findings of the studies conducted in Chiro General Hospital, Eastern Ethiopia (21.3%), Adama hospital (24.6%), and Arba Minch General Hospital, Southern Ethiopia 22.3% [2, 11, 17]. However, it is slightly

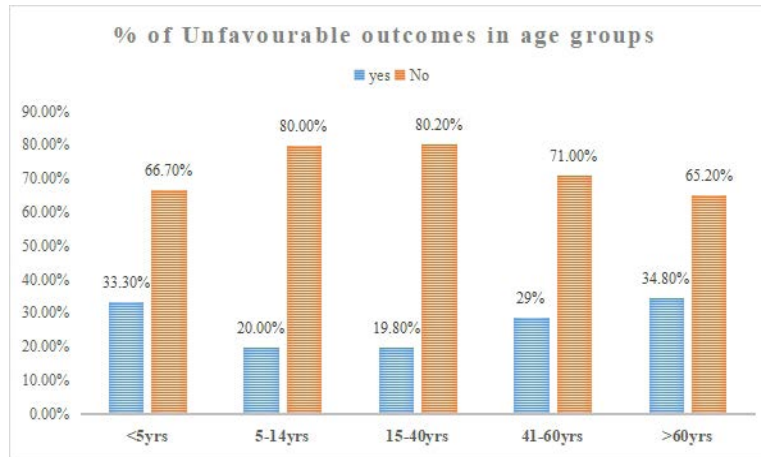


Figure 3 Cross-tabulation of prevalence of unfavourable outcomes among age groups of patients surgically treated for bowel obstruction at ARTH between 1 February 2019 and 31 January 2021 (n =222).

Table 4. Bivariate and multivariable analyses results showing factors associated with surgical management outcome of bowel obstruction.

Variables and categories		Surgical management outcome		COR (95% C.I.)	AOR (95% C.I.)
		Unfavourable	Favourable		
Age	<5 years	2 (33.6%)	4 (66.7%)	1.067 (0.159, 7.145)	3.342 (0.363, 30.798)
	5-14 years	1 (20%)	4 (80%)	2.133 (0.203, 22.444)	6.903 (0.301, 158.133)
	15-40 years	25 (19.8%)	101 (80.2%)	2.155 (0.822, 5.646)	3.495 (1.053, 11.596)*
	41-60 years	18 (29%)	44 (71%)	1.304 (0.471, 3.609)	1.700 (0.505, 5.717)
	>60 years	8 (34.8%)	15 (65.2%)		
Gender	Male	35 (20.6%)	135 (79.4%)	2.221 (1.130, 4.365)	1.631 (0.718, 3.706)
	Female	19 (36.5%)	33 (63.5%)		
Comorbidity	Present	4 (40%)	6 (60%)	0.463 (0.126, 1.706)	0.572 (0.130, 2.517)
	Absent	50 (23.6%)	162 (76.4%)		
Tachycardia	Present	37 (35.9%)	66 (64.1%)	0.297 (0.155, 0.571)	0.153 (0.452, 2.535)
	Absent	17 (14.3%)	102 (85.7%)		
Dehydration	Present	37 (35.2%)	68 (64.8%)	0.312 (0.163, 0.599)	21.066 (22.000, 82.715)
	Absent	17 (14.5%)	100 (85.5%)		
Leucocytosis	18,000	44 (21.7%)	159 (78.3%)	4.015 (1.537, 10.491)	3.888 (1.225, 12.338)*
	>18,000	10 (52.6%)	9 (47.4%)		
Duration of illness	<24 hours	17 (17.5%)	80 (82.5%)	1.979 (1.034, 3.787)	1.469 (0.672, 3.209)
	≥24 hours	37 (29.6%)	88 (70.4%)		
Preoperative diagnosis	Simple SBO	25 (18.8%)	108 (81.2%)	2.326 (0.842, 6.429)	0.959 (0.190, 4.846)
	Gangrenous SBO	19 (48.7%)	20 (51.3%)	0.567 (0.186, 1.725)	0.732 (0.148, 3.622)
	simple LBO	3 (10.0%)	27 (90.0%)	4.846 (1.075, 21.842)	8.358 (1.194, 58.501)*
	Gangrenous LBO	7 (35.0%)	13 (65.0%)	-	-
Intraoperative finding	Simple SBO	10 (13.9%)	62 (86.1%)	-	-
	Gangrenous SBV	11 (57.9%)	8 (42.1%)	0.187 (0.045, .777)	0.187 (0.045, .777)*
	Simple SV	4 (20.0%)	16 (80.0%)	0.255 (0.035, 1.858)	0.255 (0.035, 1.858)
	Gangrenous SV	5 (29.4%)	12 (70.6%)	0.419 (0.064, 2.763)	0.419 (0.064, 2.763)
	Adhesion and band	13 (27.7%)	34 (72.3%)	0.607 (0.216, 1.707)	0.607 (0.216, 1.707)
	Simple hernia	1 (8.3%)	11 (91.7%)	2.629 (0.256, 26.978)	2.629 (0.256, 26.978)
	Strangulated hernia	1 (25.0%)	3 (75.0%)	0.484 (0.036, 6.590)	0.484 (0.036, 6.590)
Others	9 (29.0%)	22 (71.0%)	0.335 (0.095, 1.179)	0.335 (0.095, 1.179)	

Dependent variable: Surgical management outcome of bowel obstruction
SBO: Small bowel obstruction; LBO: Large bowel obstruction; SV: Sigmoid volvulus

higher than the findings of the studies conducted in South Wollo Zone, Northern Ethiopia (18%), University of Gondar hospital (16.7%), and Southern Ethiopia (13.6%) [4, 23, 24]. The possible explanation might be due to variation in the distribution of the clinical and socio-demographic characteristics including the place of residence of the study participants, the overall infrastructures of the study area and the hospital's internal setup itself, the knowledge and skill of the health professionals regarding the diagnosis and management of intestinal obstruction.

In the present study, age, WBC count, preoperative diagnosis of simple LBO, and intraoperative finding of gangrenous small bowel obstruction were found to be significant covariates of surgical management outcome of bowel obstruction. It has been demonstrated in this study that age group is significantly associated with surgical management outcome of bowel obstruction. This association is supported by the studies conducted in India, Northwest Ethiopia, and Chiro Eastern Ethiopia [17, 25]. WBC count less than 18,000 cells/mm³ is also significantly associated with surgical management outcome in this study. This association is supported by the study at Debre Markos, Northwest Ethiopia

Furthermore, preoperative diagnosis of simple LBO is significantly associated favourable outcome after surgical management of bowel obstruction when compared to gangrenous LBO. Intraoperative finding of gangrenous small bowel obstruction is negatively associated with favourable surgical management outcome of bowel obstruction. This association is supported by the studies conducted in Northwest Ethiopia, Eastern Ethiopia, and Arba Minch Ethiopia [2, 17].

The following limitations should be taken into account while using the finding of this study. Patient characteristics that can only be assessed by observation or history taking was not included in the study because retrospective nature of the study. It is difficult to establish cause and effect relationship because of the cross-sectional nature of the study.

Conclusion

Most of the intraoperative finding in the study was SBO, primary SBV being the most common which is different from western setup in which adhesion and band is the leading etiology. Significant numbers of patients experience unfavourable surgical management outcome (postoperative complications and/or death) in the study area. Ileus is the most common postoperative complication followed by SSI. Morbidity and mortality after surgical management of bowel obstruction vary with determinant factors like age, leucocytosis, preoperative diagnosis, and intraoperative finding. Therefore, the finding of this study suggests that preoperative preparation and intraoperative aseptic technique should be improved and optimal infection prevention and patient safety practices should be implemented in the hospital setting. The Federal Ministry of Health and nongovernmental organizations should strengthen

healthcare system. Furthermore, prospective studies should be conducted in the area.

Abbreviations

AOR: Adjusted odds ratio; ATRH: Asella Teaching and Referral Hospital; ASA: American Society of Anaesthesiology; CI: Confidence interval; COR: Crude odds ratio; LBO: Large bowel obstruction; SBO: Small bowel obstruction; SBV: Small bowel volvulus; SV: Sigmoid volvulus; SPSS: Statistical package for social sciences; WBC: White blood cell.

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Authors' contributions

HG was involved in the proposal development, data analysis, and interpretation. AE was involved in the proposal development, data analysis, interpretation, and supervision. DN was involved in the proposal development, data analysis, interpretation, and supervision. BSS, DHR, and RDB were involved in the facilitation of data collection, data analysis, and interpretation of the findings, supervision, and manuscript writing. All authors made adequate contributions to the completion of this study. All the authors reviewed the manuscript.

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Availability of data and materials

Data used and analyzed during the current study are available from corresponding author on reasonable request.

Ethics approval and consent to participate

The study was reviewed and approved by Arsi University's Ethical Institutional Review Board with reference number R/U/H/S/C/120/14073. Arsi University's Ethical Institutional Review Board granted a full waiver of informed consent since it was impossible to contact the individuals for whose charts were being reviewed. Data extractors gained access to the patient records through the help of official letter of cooperation written by Arsi University to ATRH and permissions obtained from ATRH. Unintended exposure of elements of the record that were not essential to the research was reduced. All methods were performed in accordance with the relevant guidelines and regulations (Declaration of Helsinki).

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