

**ASSESSMENT OF OUTCOME OF AND FACTORS ASSOCIATED WITH
GANGRENOUS SMALL BOWEL OBSTRUCTION AMONG PATIENTS
ADMITTED TO SURGICAL WARD OF HIWOT FANA SPECIALIZED
UNIVERSITY HOSPITAL, HARAR, EASTERN ETHIOPIA**

Specialty Thesis

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HARAMAYA UNIVERSITY, HARAR , ETHIOPIA

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UNIVERSITY HOSPITAL, HARAR, EASTERN ETHIOPIA**

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In Partial Fulfillment of the Requirements for the specialty of

General surgery

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February 2021

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HARAMAYA UNIVERSITY

SCHOOL OF GRADUATE STUDIES

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BIOGRAPHICAL SKETCH

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Abbreviations / Acronyms

BLH	Black lion hospital
CDC	Centers for disease control
Dx	Diagnosis
EC	Ethiopian calendar
ED	Emergency department
GC	Gregorian calendar
HFSUH	Hiwt fana specialized university hospital
NGT	Naso-gastric tube
PI	Personal investigator
SBO	Small bowel obstruction
SSI	Surgical site infection
TB	Tuberculosis bacilli
WHO	world health organization

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ABSTRACT

Background: small bowel obstructions account for 15% of hospital admissions for acute abdominal complaints and up to 30% of these patients will require operative intervention. Postoperative adhesions are the etiology of 75% of mechanical small bowel obstruction, followed by hernia and neoplasia.

Ethiopia is one of the countries where intestinal obstruction is a major cause of morbidity and mortality. A clearer understanding of the incidence and outcome of these patients is essential for establishment of preventive strategies as well as treatment protocols.

Objective: To assess outcome and factors associated with gangrenous small bowel obstruction among patients admitted to surgical ward of Hiwot Fana Specialized University Hospital from January 1, 2016-December 31, 2020.

Methods: A retrospective cohort study was conducted on all patients with gangrenous small bowel obstruction admitted to surgical ward of Hiwot Fana Specialized University Hospital from January 1, 2016-December 31, 2020. For this study, a customized data abstraction form was developed for data capturing from medical records of the patients. The captured data was coded, entered to EpiINFO and exported to statistical package for social sciences software, version 22.0 for analysis. To summarize demographic and clinical characteristics of the patients considered for this study, descriptive statistics such as percent and frequency was employed.

All variables with P-value < 0.3 , during bi-variable analyses were considered for multivariable logistic regression analyses. Odds ratio along with 95% Confidence interval were estimated to measure the strength of the association. Level of statistical significance was declared at p value less or equal to 0.05

Result: A total of 91 patients were included and finally analyzed in this study. From these 52 (57.1%) patients have un favorable surgical outcomes of gangrenous Small bowel obstruction. Of the 52 patients with unfavorable outcome, the most common postoperative complication occurred was anastomotic leak (29.5) followed by surgical site infection (25.5%) and pneumonia (23.6%) . A total of 15 postoperative deaths were also documented as unfavorable surgical management outcomes of gangrenous Small bowel obstruction. Three factors including duration

of illness before surgery, length of hospital stay after surgery and shock at presentation were significantly associated with the surgical management outcome of gangrenous Small Bowel Obstruction.

Conclusion: In this study, the majority of patients had unfavorable surgical management outcomes of gangrenous Small Bowel Obstruction, however the proportion of patients with favorable outcomes was considerable. Thus, designing a strategy that address the factors associated with unfavorable outcomes could be helpful to further increase the likelihood of favorable surgical management outcomes of gangrenous Small Bowel Obstruction.

Keywords: gangrenous small bowel obstruction, surgical ward, outcome, factors associated , Ethiopia.

1.Introduction

1.1 Background

Intestinal obstruction (IO) is defined as obstruction of the passage of the intestine for its contents (Soressa et al. 2016). The small intestine consists of the duodenum, jejunum and ileum. It extends from the distal end of the pyloric canal to the ileocaecal valve. Its overall length ranges from three to seven meters in the living adult. The duodenum extends up to the duodeno-jejunal junction and the remaining small intestine is often referred to as the “small bowel” of which proximal two-fifths is jejunum and distal three-fifths is ileum.(Brunicardi et al.,2015).

The IO can be classified as dynamic obstruction (mechanical obstruction) or adynamic obstruction (paralytic ileus and pseudo-obstruction) (Ellis et al., 2003).

If the intramural pressure becomes high enough, micro vascular perfusion to the intestine is impaired, leading to intestinal ischemia, and, ultimately, necrosis. This condition is termed as gangrenous bowel obstruction. Gangrenous small bowel obstruction (SBO) most often result from hernia, adhesions, and mesenteric insufficiency. The classical signs of gangrenous small bowel obstruction are fever, tachycardia, continuous abdominal pain, peritoneal signs, leukocytosis and metabolic acidosis (Brunicardi et al., 2015).

Of all IO gangrenous SBO forms an important part of pathologies that necessitate emergency surgical interventions in parts of Asia, including India, Iran and Pakistan (Sheikh et al., 2010; Quill et al., 2007).

In rural Africa, small bowel obstruction accounts for a great proportion of morbidity and mortality (Quill et al., 2007) and Ethiopia is one of the countries where intestinal obstruction constitutes a major cause of morbidity and mortality. (Adesunkanmi et al., 2011).

SBO account for 15% of hospital admissions for acute abdominal complaints and up to 30% of these patients will require operative intervention. In the study done at Adama hospital medical college the prevalence of IO was 21.8 % among patients admitted with the acute abdomen conditions, and 4.8 % among total surgical admission patients. Among these 7.9% had gangrenous SBO. Postoperative adhesions are the etiology of 75% of mechanical SBOs, followed by hernias and neoplasia (Soressa et al. 2016).

1.2 Statement of the problem

Mechanical SBO is a frequent indication for hospital admission. It is associated with significant morbidity and mortality and financial burden. (risk factors) It is common in low and middle income countries, accounting for 1.8 deaths per 100 000 population per year. The condition is associated with a mortality rate of approximately 10 % and high rates of morbidity among survivors. (M. J. Lee1, 2019).

IO has been the leading cause of acute abdomen in several African countries whereas acute appendicitis is the most frequently seen cause in the developed world. It continues to remain a challenge to surgeon despite advances in field of medicine, pathophysiology, surgical technique and accounts for a large percentage of surgical admissions for acute abdominal pain and high mortality ranges from 3% to 30% all over the world. Universally, intestinal obstruction varies from country to country or regions in terms of its incidence, causes and management outcomes depending on ethnicity, age group, dietary habits, and geographic location and living condition of the community among other factors. (Tsegaye T. et al., 2007) (Scott G. et al., 2007).

The leading causes of IO in Africans have mostly been hernia and volvulus whereas adhesions are most frequent in the developed world. There are, however, some African studies which are pointing to a change in these established patterns. Late presentation in case of IO accounts for disastrous outcomes, notably high rate of complications, long hospital stay and high mortality rates (Ntakiyiruta and Mukarugwiro, 2009).

A study done in Gondar University Hospital (GUH) showed that IO is the leading cause of surgically treated acute abdomen and two thirds of patients who died were operated for IO (Tsegaye T. et al., 2007). Similarly, a study done in Black Lion Hospital (BLH) showed that the mortality rate was 21.2 % (7 of 33 cases) for SBO. In those studies the duration of illness was found to be strongly associated with mortality rate. Patients who presented within two days of their illness had mortality rate of 7.6% where as those presented later than two days had a mortality rate of 25% (Kotiso B. and Abdurahman, 2007).

The outcome of emergency laparotomy may be affected by different factors. Some of these factors include the cause of obstruction, duration of illness, age and complication detection time. So, the knowledge of causes, presentations and management outcomes of IO in different areas within a country is very important (Adesunkanmi A. and Agbakwuru, 2011).

While some studies have been done to assess outcomes and associated factors of SBO in developed countries, the condition remains largely unstudied in the Ethiopian context. With only a few studies conducted in North and Central Ethiopia. (Kotiso B. and Abdurahman, 2007). There is a lack of research evidence on the outcomes and associated factors of SBO in Ethiopia, particularly in the eastern parts of the country. Furthermore, there is no recently published literature that has explored SBO in rural and regional hospitals. Thus, this study was conducted to address this information gap and generate base line information about outcomes and associated factors of gangrenous SBO in eastern part of Ethiopia.

1.3 Significance of the study

Small bowel obstruction is recognized as a major public health problem that is frequent cause of morbidity and mortality and this makes a considerable demand on health services. Gangrenous SBO is the leading cause of postoperative morbidity and mortality among patients with SBO. High incidence of gangrenous SBO is also suspected in Ethiopia. However, very little is known about the magnitude of management outcome and factors associated with this specific problem. Hence this study was deemed necessary to show the extent of the problem in this

institution. Furthermore, knowing the associated factors of the problem will also help to reduce the occurrence of this problem. In general, the findings of the study will be submitted to Haramaya University as well as to clinical practitioners as a feedback to initiate and to take measures to reduce the occurrence of the problem. The finding of this study will also be helpful for policy makers at regional, zonal and woreda level and the study will help as a source of information for other researchers to conduct similar study in different areas of Ethiopia.

1.4 Objectives

1.4.1 General objective

- ✚ To assess outcome of and factors associated with gangrenous SBO among patients admitted to surgical ward of HFSUH from January 1-2016-December 31, 2020.

1.4.2 Specific objectives

- To assess the management outcome of cases of gangrenous SBO.
- To determine factors associated with the incidence and management outcomes of gangrenous SBO.

2. Literature Review

2.1 Incidence of Gangrenous Small Bowel Obstruction

Patients with a bowel obstruction still represent some of the most difficult and existing problems that surgeons face with regard to reaching the correct diagnosis and identifying the most possible causes that will help for anticipation of appropriate treatment(Kotiso B. and Abdurahman, 2007).

According to study done in Haukeland University Hospital from 1,007 operations for mechanical SBO 152 patients was presented with gangrenous small bowel obstruction which is 16%. The rate of gangrenous small bowel obstruction and bowel resection increased significantly with increasing patient age.(Björg Tilde Fevang, MD, et al., 2000).

Study done in China, A total of 417 patients with SBO were included in the study; 76 (18.1%) were confirmed to have gangrenous SBO. Men comprised 277 and women comprised 140 patients. Average patient age was 57.4 (range 16–88) years. Two patients with gangrenous SBO died of entire small bowel necrosis (Xiaming H. et al, 2017).

A study done in Pakistan Total of 130 patients was enrolled in the study, 78 patients were male and 52 were female. 43 patients were in age group 26-40 years where as 36 patients were in 41-55 years. Among these 5 patients were having gangrenous ileum (M. AmmarSadiq et al., 2018).

A study done in University of Gondar Comprehensive Specialized Hospital, Northwest Ethiopia. A total of 227 patients who had a history of surgery for intestinal obstruction was involved in a study, Majority (72.2%) of patients were males, with a male-to-female ratio of 2.6 : 1. and among these the prevalence of gangrenous SBO was 11.5 % (Tesfamichael G et al. 2018).

A study done in Adama, Ethiopia 262 patients were admitted with intestinal obstruction. Among these the prevalence of gangrenous small bowel volvulus was 16 (7.9%)(Soressa U. et al., 2016).

2.2 Outcome of Gangrenous Small Bowel Obstruction

When intestinal obstruction is not relieved in time, the patient may die. Early diagnosis and prompt management are therefore mandatory. Several factors contribute to poor outcomes in the

case of intestinal obstruction. Some of these determinants may include poor health seeking behavior, ignorance and poverty. Poor clinical judgment is also one of the negative factors leading to poor prognosis in case of intestinal obstruction (Ntakiyiruta and Mukarugwiro, 2009).

A study done in Canada on Management and outcomes of small bowel obstruction in older adult patients, of the 53 patients who underwent surgery for SBO(Small Bowel Obstruction the magnitude of unfavorable management outcome of IO was 64%, with respiratory complications being the most common cause of complication. The rate of bowel resection was high (29%) among those who underwent delayed surgery (Jeremy E. et al., 2014).

A 3 year retrospective study 367 patients done in India on Etiology and Outcome of Acute Intestinal Obstruction 95 patients (25.89%) develop unfavorable management outcome of IO. Of these, 38 patients (10.35%) had a single complication while the remaining 57 (15.54%) encountered more than one complication. Wound infection was the most common complication, occurring in 44 patients (46.3%), and of these, 21 patients (47.7%) required application of secondary sutures. Burst abdomen requiring emergency closure of abdomen occurred in 16 cases (16.8%). Prolonged ileus (more than 72 h) occurred in 34 patients (35.8%). Basal atelectasis was noted in 31 patients (32.6%) mostly of the elderly age group. Sepsis developed in seven patients with intestinal tuberculosis (13.46%). Small bowel fistula developed in seven patients (7.4%) and of them four required operative intervention in the long run. Mortality rate was 7.35% (Souvik A et al., 2010).

According to a study done in Nigeria on predictive factors of management outcome in adult patients with mechanical intestinal obstruction out of 105 patients with mechanical IO, Magnitude of unfavorable management outcome was 66.7%. The common post-operative complications were surgical site infection, electrolyte imbalance and enterocutaneous fistula occurring in 31.4%, 11.4% and 6.7%, respectively (Adebambo O. et al., 2017).

In study done in western Kenya total of 361 patients underwent laparotomy, 303 male and 142 female patients, presented with acute mechanical Intestinal obstruction during the study period. Mean patient age was 40.6 years (range 17-91), with peak incidence in those aged 31-40 years. Bowel gangrene was noted in 112 (31%) cases, sigmoid volvulus, small bowel volvulus and ileo-sigmoid knotting accounted for 84% of all cases of bowel gangrene. The magnitude of unfavorable management outcome was 13.6%. The common post-operative complications were surgical site infections (32.7%), Enterocutaneous fistula (8.2%), wound dehiscence (6.1%), and intra-abdominal abscess (4.1%). Post-operative mortality rate was 5.3% (Philip B. et al., 2015).

A study done in Adama, Ethiopia, the prevalence of Intestinal obstruction was 21.8 % among patients admitted with the acute abdomen conditions, and 4.8 % among total surgical admission patients. The magnitude of unfavorable management outcome was 24.6%. The common post-operative complications were wound site infections (39.3%), facial dehiscence (17.8 %), anastomotic leakage (12.5 %), septic shock (8.9 %), developed other complications (10.7 %) like pelvic abscess collection or pneumonia respectively. Post-operative mortality rate was 2.5 % (Soressa U. et al., 2016).

2.3 Factors Associated with Unfavorable Management Outcome of SBO

The outcome of emergency laparotomy may be affected by different factors. Some of these factors include the cause of obstruction, duration of illness, age and complication detection time. The knowledge of causes, presentations and management outcomes of IO in different areas within a country is very important (Adesunkanmi A. and Agbakwuru, 2011).

According to a study done in Nigeria on predictive factors of management outcome in adult patients with mechanical intestinal obstruction out of 105 patients with mechanical IO, with mean age of 45.6 ± 14.8 years, male to female ratio 1.1:1 and 68.6% patients presented more than 24 h after onset of symptoms. Patients with bowel resection had significantly higher Unfavorable management outcome rates than patients with no bowel resection (Adebambo O. et al., 2017).

A study done on surgically treated acute abdomen performed at Gondar on 511 patients, 99 (34.1%) of the patients had longer than 72 hours duration of presenting complaint, 35 (35.1%) of which developed postoperative complication. Out of 511, 137 (47.2%) of the patients came to hospital earlier than 72 hours, and only 21 (15.2%) of them developed postoperative complications. Duration of illness before operation and older age was significantly associated with Unfavorable management outcome mortality while sex and residence was not predictive of unfavorable outcome (Tsegaye T. et al., 2007).

A study done in Adama, Ethiopia, from 262 patients admitted with intestinal obstruction, 94.2% (228) cases were managed by surgical procedure. Males in 65.8% of the cases and females in 20.2% were managed by operation. Patients who came late had high risk of developing Unfavorable management outcome, compared with patients who came early (30.89% vs 15.13%). (Soressa U. et al., 2016).

2.4 Conceptual frame work

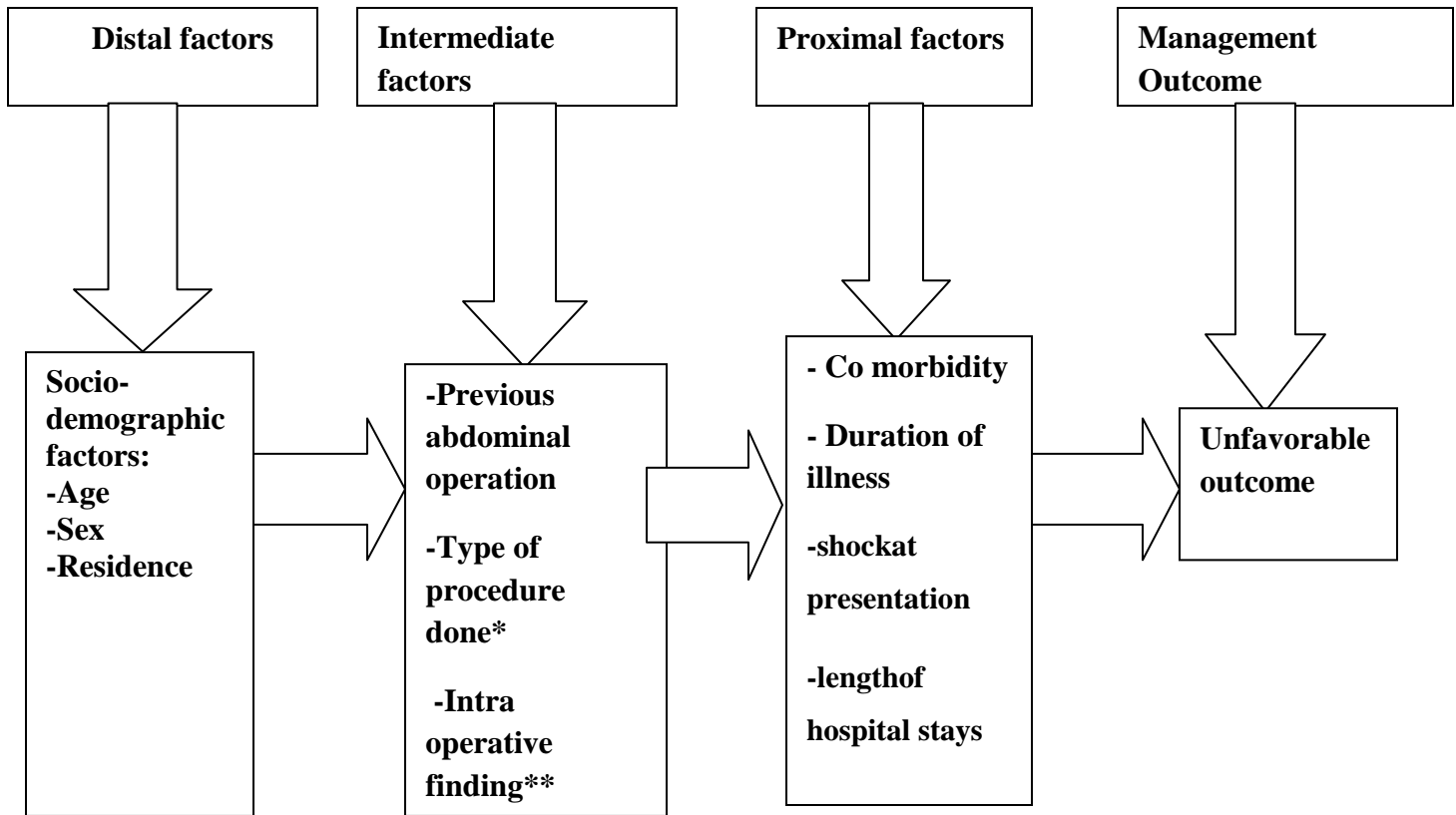


Figure 1: A conceptual framework showing management outcome and associated factors of gangrenous small bowel obstruction.

Developed from literature reviews

* Resection and anastomosis, stoma

**Gangrenous Small bowel volvulus obstructed Hernia, Intussusception, Adhesion, etc.

3. Materials and Methods

3.1 Study area and period

3.1.1 Study area

The study was conducted in surgical ward of HFSUH which is located in Harartown, Harari Region, eastern Ethiopia. Harari is one of the most popular historical city in the Eastern part of Ethiopia, surrounded by the State of Oromia. The total numbers of kebeles of the city are 19, while the rural part of the State has 17 farmers associations. The State's size is estimated at 340Km². Harari is located 526Km from the capital city Addis Ababa and populated by 205,000 people. The percentage share of males and females is about 50% each. This State is the only member state of FDRE where the majority of its population lives in urban area (Harari Regional Health office communication bureau, 2017).

Harari region has a total of six hospitals, three government Hospitals (Federal Police Hospital, Jugal Hospital & Hiwot Fana Specialized University Hospital.) & one non-government (Fistula) hospital & two private Hospitals (Harar general hospital & Yimage medical center). In the region, there are also eight health centers & many private clinics serving the people of the state

Hiwot Fana Specialized University Hospital serves as the Referral and teaching Hospital of the Haramaya University. Its catchment area involves eastern Ethiopia, Mainly giving service to the society of Harar and Eastern Hararghae. It has four main departments; Gynecology/Obstetric, Internal Medicine Surgery, and Pediatrics. It is well organized with senior physicians & other staffs; 6 gynecologists/obstetricians, 6 general surgeons, 3 orthopedic surgeons, 1 neurosurgeon, 9 internists, 6 pediatrician, 14 general practitioners, 7 health officers, 225 clinical and B.Sc. nurses, 36 midwives, 37 laboratory technologist and laboratory technicians, 42 pharmacists and technicians and other professional administrative staff totaling to 766 workers.

The surgical ward has intensive care unit and two major operation theatres with equipments sharing the same operation theatres with gynecology and surgery department. The hospital, apart

from giving daily medical service and referral center, it also serves as a teaching center for students coming from government and private institutions (HFSUH, 2019).

3.1.2 Study period

The study was conducted in HFSUH surgery ward on patients admitted with gangrenous SBO from November 1, 2020- December 31, 2020.

3.2 Study design

A retrospective cohort study was conducted from patient's medical charts with gangrenous SBO admitted to HiwotFana Specialized University Hospital surgical ward.

3.3 Population

3.3.1 Source population

The source population for this study was all patients admitted to surgical ward of HFSUH during the data capturing period.

3.3.2 Study Population

All patients admitted to surgery ward of HFSUH for management of gangrenous SBO was considered as study population.

3.4 Inclusion and exclusion criteria

3.4.1 Inclusion criteria

A) All patients diagnosed with gangrenous SBO during the study period and admitted to surgical ward of HFSUH.

B) Both male and female patients with complete medical record of required information were included.

3.4.2 Exclusion Criteria

Patients with incomplete medical charts with regard to the required information were excluded from the study.

3.5 Sample size determination and sampling technique

3.5.1 Sample size determination

For sample size determination the required sample size was calculated using a single population proportion formula with the following assumptions: prevalence of injury $P = 0.05$ (Soressa U. *et al.*, 2016), confidence level of 95% and margin of error (d) = 5%. Based on this data, the sample size was calculated as follows:

Where; $Z =$ Confidence interval (95% = 1.96)

$d =$ Marginal error (5%)

$P =$ Prevalence (0.05%)

$$n = \frac{(z\alpha/2)^2 P (1 - P)}{d^2}$$

$$n = \frac{(1.96)^2 0.05(1 - 0.05)}{(0.05)^2}$$

$$= 72.9904$$

$$= 73$$

So, after adding 10% adjustment to the calculated sample size, the final sample size was determined to be 81 patients.

3.5.2 Sampling techniques

Since the number of patients diagnosed with gangrenous SBO nears to the sample calculated all of the patients with this assessment during the study period were considered and no sampling technique was needed.

3.6 Data Collection Methods

3.6.1 Data collection tools

Data was collected using structured data abstraction format. Preliminary data source was log books of surgical ward. Patients' medical records documented on the respective log books and medical charts was employed for data capturing. The information obtained from the above mentioned sources including sociodemographic data such as sex, age and clinical characteristics involving abdominal pain, vomiting, constipation, abdominal distention, groin swelling, duration of symptoms, previous history of abdominal operation, preoperative diagnosis, initial managements performed, antibiotic initiated, intra-operative findings, Procedure done during operative management, length of hospital stay in days, any post-operative complication, (data collection form attached as annex). In addition, the number of surgical ward admissions during the data capturing period were analyzed in order to determine outcome and associated factors of gangrenous small bowel obstruction.

3.6.2 Data collectors

Three medical interns were involved in collection of data by prepared check list from patients' cards and registered log-books as secondary data. One junior resident supervised the daily activity, consistency and completeness of the checklist gave appropriate support during the data collection processes. The principal investigator checked the daily activities of supervisor.

3.6.3 Procedure of data collection

Review of medical records were employed to collect data by using pre tested and well-structured data retrieval form from the card as it was diagnosed by physicians. Medical charts with missing data and lacking the required information were excluded.

3.7 Study variables

3.7.1Independent variables

Age, sex, residence, duration of illness, cause, intra-operative findings, co morbid illness,time to event, and previous surgery

3.7.2Dependent variables

Management outcome (favorable outcome, unfavorable outcome).

3.8 Operational definitions

Anastomosis: it is connection made between adjacent blood vessels or parts of the intestine.(Schwartz's Principles of Surgery, 12th edition).

Anastomotic leak: defined as leak of luminal content from a surgical join (Schwartz's Principles of Surgery, 12th edition).

Antibiotics: are medications that destroy or slow down the growth of bacteria (Katzung basic and clinical pharmacology 12th edition).

ARDS: it is condition in which fluid collects in the air sacs (alveoli) of the lungs depriving organs of oxygen (Harrison internal medicine 20th edition).

Aspiration pneumonia: is complication of pulmonary aspiration when food, stomach acid or saliva is inhaled in to lungs (Harrison internal medicine 20th edition).

Atelectasis: it is partial or complete collapse of the lung (Harrison internal medicine 20th edition).

Deep SSI: Infection occurs within 30 days after the operation and infection involves deep soft tissues (e.g., facial and muscle layers) of the incision (Bailey& Love's short practice of surgery 27th edition)

Favorable outcome: if the patient is discharged alive and does not have any history of postoperative complications after surgery for gangrenous small bowel obstruction(SoressaU. et al. 2016).

Gangrenous small bowel obstruction: a condition in which obstruction blocks blood supply resulting in tissue death(Schwartz's Principles of Surgery, 12th edition).

Organ space: Infection occurs within 30 days after the operation and infection involves the internal organs of the body(Bailey & Love's short practice of surgery 27th edition).

Postoperative pneumonia: suspected in a patient with clinical findings of infection including fever, cough or purulent sputum in the after surgical treatment(Harrison internal medicine 20th edition).

Small bowel obstruction: is defined as obstruction of the passage of the small bowel for its contents(Schwartz's Principles of Surgery, 12th edition).

Superficial SSI: Infection occurs within 30 days after the operation and infection involves only skin or subcutaneous tissue of the incision(Bailey& Love's short practice of surgery 27th edition).

Surgical site infections (SSI): Infection following surgical treatment(Bailey& Love's short practice of surgery 27th edition).

Unfavorable outcome: if the patient dies or has one or more postoperative (after surgery for gangrenous small bowel obstruction) complications like dehiscence, surgical site infection, pneumonia, as documented in the medical charts (Soressa U. et al. 2016)

3.9 Data quality control

Before starting the data collection, data collecting format were cross matched (pretested) with available information on records in Jugal Hospital surgical ward; then the study questions were enhanced as necessary. Completeness of the data were cross checked on daily bases, if incomplete data were found, the data were recaptured for its completeness. If still incomplete registers revised to complete missed information, then finally incomplete data were discarded.

3.10 Data Analysis

The collected data was processed, coded and entered to Epi-INFO and analyzed with computer using SPSS version 22 software. Accordingly, sociodemographic and clinical characteristics was summarized using descriptive statistics (percent and frequency). In addition, outcome of gangrenous SBO management was also determined using frequency with percent. Proportion of gangrenous SBO relative to other admission was rated as well. Factors associated with outcomes of gangrenous SBO were identified using bivariable logistic regression analysis. Covariates with the potential for association were adjusted by using multivariable analysis. Significance of associations between the dependent and independent variables were determined by the use of 95% confidence level.

3.11 Ethical consideration

Ethical clearance for the study was obtained from Institutional Health Ethics Review committee of the College of Health and Medical Sciences. Before beginning data collection, official letter was taken from College of Health and Medical Sciences that were submitted to responsible body. There was no mentioning of patients name in data collection format and patient's card returned to card room as soon as data collection format was filled which helps in securing patients information.

3.12 Information dissemination

The result of the study was presented to HU community as part of thesis defense and it was disseminated to HU College of health and medical science, department of Surgery, to the targeted health facility. Further attempt was made to publish it on national or international scientific journals.

4.RESULTS

4.1 Socio demographic characteristics

A total of 91 patients who had a history of surgery for gangrenous SBO at the HFSUH were included and finally analyzed in this study. Of the 91 patients, 61(67%) were within 15–40 years, the largest age group . The minimum age of the patients was 10 years and the maximum was 75 years, with mean 32.38 years, median 28years, and standard deviation (SD) ± 16.025 years. The majority of patients were males (84.2 %) and 75.8% of them were rural dwellers (Table 1)

Table 1: Socio demographic characteristics of gangrenous SBO patients (N= 91) at HFSUH, Ethiopia, January 2016-December 31, 2020.

Variable	Category	Frequency	%
Age (years)	5-14	9	9.9
	15-40	61	67
	41-60	15	16.5
	>60	6	6.6
Median age (years)	28	-	-
Sex	Male	75	82.4
	Female	16	17.6
Residence	Rural	69	75.8
	Urban	22	24.2

4.2 Preoperative clinical characteristics.

The findings showed abdominal pain (100%), vomiting (93.4 %), abdominal distension(84.6 %), and failure to pass abdominal contents, such as feces and/or flatus, (79.1%) were the leading clinical symptoms among patients who presented with Gangrenous SBO at the healthcare facility (Table 2).

Regarding the duration of illness, 66 (72.5 %) of cases were presented longer than 24 hours after the onset of symptoms until the time of operation. The average duration for the symptoms prior to operation was 67.3 hours, with a SD of ± 46.089 hours. The duration however ranges from 7 to 168 hours among them. This study also showed 15 (16.5%) patients had a previous history of abdominal surgery, and 12.1% of all the gangrenous SBO cases had at least one diagnosed comorbid condition of cardiovascular diseases, lung diseases, and diabetes mellitus (Table 2).

Table 2: Pre-operative clinical characteristics of gangrenous SBO patients (N= 91) at HFSUH, Ethiopia, January 2016-December 31, 2020.

Presenting symptoms	Category	Frequency	%
Abdominal pain	Yes	91	100
	No	0	0
Vomiting	Yes	85	93.4
	No	6	6.6
Abdominal distention	Yes	77	83.8
	No	14	15.4
Constipation	Yes	72	79.1
	No	19	20.9
Duration of symptoms	< 24 hours	25	27.5
	> 24 hours	66	72.5
Previous abdominal operation	Yes	15	16.5
	No	76	83.5

Co morbid illness	Yes	11	12.1
	No	80	87.9

Concerning the key elements of preoperative care assessed in this study, IV fluid resuscitation was given for all (100%) patients and preoperative therapeutic antibiotics was initiated generally for 84 (92.3%) of the patients, with a combination of ceftriaxone and metronidazole, whereas the rest 7 (7.7%) of all patients did not receive therapeutic antibiotics before their operation for gangrenous SBO management. (Table 3)

Table 3: Pre-operative care of gangrenous SBO patients (N= 91) at HFSUH, Ethiopia, January 2016-December 31, 2020.

Variables	Category	Frequency	%
IV fluid resuscitation	Initiated	91	100
	Not initiated	0	0
Preoperative antibiotics	Initiated	84	92.3
	Not initiated	7	7.7

4.3 Intra and postoperative clinical characteristics

Gangrenous small bowel volvulus (GSBV) was the leading specific intraoperative clinical diagnosis of gangrenous SBO, followed by obstructing band, obstructing adhesion, Meckel's diverticulum and mesenteric ischemia, ileoileal knotting, and intussusception among others. The commonest specific type of intraoperative procedure done, after a general laparotomy, to treat the patients with gangrenous SBO was resection and anastomosis. Postoperative antibiotics were initiated for all of the patients. Regarding the length of hospital stay, 68.1% of patients stayed in the hospital for >7 days after their surgery for gangrenous SBO. The mean, median, and SD of hospital stay in days were found to be 12.54, 9, and 10.78, respectively, with the minimum of 2 days and the maximum of 66 days. (Table 4)

Table 4: Intra- and postoperative clinical characteristics of gangrenous small bowel obstruction patients (*N*= 91) at HFSUH, Ethiopia. January 2016-December 31, 2020.

Variables	Category	Frequency	%
Intraoperative Diagnosis	GSBV	42	46.2
	Adhesion	8	8.8
	Obstructing band	11	12.1
	Meckels diverticulum	8	8.8
	Mesenteric ischemia	6	6.6
	Iliolial knotting	5	5.5
	Intucesseption	4	4.4
	Groin hernia	3	3.3
	Ilio sigmoid knotting	3	3.3
	Others*	1	1.1
	Total	91	100
Intraoperative Procedure	Resectionand anastomosis	84	92.3
	Ileostomy	4	4.4
	Others**	3	3.3
	Total	91	100
Length of hospital stay (days)	≤ 7 days	29	31.9
	> 7 days	62	68
Median length of hospital stay (days)	9	-	-

Others* unknowncase for gangrenous SBO

Others** jejunosomy and the abdomen closed without further intervention

4.4 Surgical Management Outcome

This study shows 39 (42.9%) of 91 patients have favorable surgical management outcomes of Gangrenous SBO which was defined as the absence of all types of postoperative complications, whereas the rest 52 (57.1%) patients have unfavorable outcomes which was defined as the presence of one or more types of postoperative complications (Table 5).

Furthermore, the overall success rate of the surgery was 83.5%, with 76 patients discharged on improvement, although 15 (16.5%) inpatient postoperative deaths were documented, among a total of 91 analyzed cases who were engaged for the surgical management of gangrenous SBO at HFSUH, eastern Ethiopia. (Table 5)

Table 5: Types of postoperative complications documented from patients who had unfavorable surgical management outcomes of gangrenous SBO (*N*= 52) at HFSUH, Ethiopia.

Postoperative complication	Category	Frequency	%
Superficial incisional SSI	Yes	1223	
	No	40	77
Deep incisional SS I	Yes	5	9.6
	No	47	90.3
Anastomotic leak	Yes	13	25
	No	3975	
Facial dehiscence	Yes	1019.2	
	No	42	80.8

Pneumonia	Yes	815.3	
	No	44	84.7
Septic shock	Yes	1426.9	
	No	38	73.1
Postoperative death occurred	Yes	1528.8	
	No	37	71.2

4.5 Factors Associated with unfavorable outcomes of gangrenous SBO

From the bivariate binary logistic regression analysis, factors including duration of illness, comorbidity, shock at presentation, and length of hospital stay were associated with the surgical management outcome of Gangrenous SBO. Subsequently, all factors were entered into the multivariable binary logistic regression model. In the multivariable analysis, only three factors such as duration of illness, shock at presentation and length of hospital stays in days were significantly associated with the surgical management outcome of gangrenous SBO (at $P < 0.05$).

The patients seeking healthcare for gangrenous SBO after 24 hours of illness were about five times (AOR = 4.807; 95% CI: 1.201–19.235; $P = 0.026$) more likely to have unfavorable outcome than those seeking healthcare within 24 hours of illness. The patients those who had no shock at presentation were about 99.1 % (AOR =0.009; 95% CI: 0.000–0.179; $P = 0.002$) less likely to have unfavorable outcome than those who presented with shock. The patients who stayed in the hospital for >7 days after surgery were about 47 times (AOR =47.5 95% CI:5.25–429; $P =0.040$) more likely to have unfavorable outcome than those who stayed in the hospital for <7 days after surgery (Table 5).

Table 5 Factors associated with the surgical management outcome of Gangrenous SBO at HSUH, Ethiopia,, January 2016-December 31, 2020.

Variables (N=91)		Favourable (n)	Unfavourable (n)	COR (95% CI)	AOR, (95% CI)	P-value
Duration of illness	< 24 hrs	20	11	1	1	0.026
	>24hrs	19	41	3.324(1.272-8.688)	4.807(1.201-19.235)	
Residence	Urban	7	19	1	1	0.375
	Rural	31	34	0.700(0.26-1.885)	0.512(0.117-2.247)	
comorbidity	Yes	1	10	1	1	0.091
	No	38	42	0.111(0.14-0.904)	0.044(0.001-1.65)	
Previous history of abdominal operation	Yes	7	6	1.203(0.396-3.658)	1.3(0.437-4.288)	0.702
	No	32	46	1	1	
Shock at presentation	Yes	1	20	1	1	0.002
	No	32	38	0.042(0.005-0.331)	0.009(0.000-0.179)	
Hospital stay in days	≤ 7 days	21	9	1	1	0.004
	> 7 days	16	45	8.319(3.008-23.007)	47.5(5.2-429)	

5. DISCUSSION

In this study, the majority of patients had unfavorable surgical management outcomes of gangrenous Small Bowel Obstruction. This study also revealed that duration of illness before surgery, shock at presentation and length of hospital study were factors significantly associated with the surgical management outcome of Gangrenous SBO

The analyzed data showed that 57.1% of all cases have unfavorable surgical management outcomes of Gangrenous SBO, which was characterized by the presence of the recorded postoperative complications or death at the healthcare facility. The finding on this unfavorable outcome rate is in line with a study conducted in University of Gondar Comprehensive Specialized Hospital, Northwest Ethiopia 53.1 % (Tesfamichael G et al.,2019)but it is higher than the studies from Adama Hospital 44% (Soressa U. et al.,2016) and also higher than the findings from other countries, such as 22.3% in Kenya (Philip B. et al.,2015) The possible reason for the difference might be due to delay in the presentation of patients to health care facilities due to lack of awareness about gangrenous SBO and due to delayed referral from referring health facilities (Tsegaye T. et al., 2007 ,Soressa U. et al., 2016). In this study 15 (16.5 %) patients died and the finding was higher compared with the study done in India 7.35% (Souvik A et al., 2010) and in Kenya 5.3% (Philip B. et al., 2015).The possible reason for the difference might be due to delay in the presentation of patients to health care facilities that might predispose them to complications like sepsis and septic shock which predisposes for a higher mortality (Tsegaye T. et al., 2007, Soressa U. et al. 2016, Bailey & Love's short practice of surgery 27th edition). The patients who presented in the hospital after 24 hours of duration of illness were about 5 times more likely to have unfavorable surgical management outcome compared with those who presented within 24 hours after the onset of symptoms before surgery. This finding is supported by the research studies conducted in north central Ethiopia (11 times) (Tesfamichael G. et al.,2019) and by a research study done in India (6 times) (adhikari S. et al 2008). The possible reason for the high rate of unfavorable outcome for patients presenting late was patients might develop hypovolemic shock , sepsis, septic shock and electrolyte disturbance when the time goes on without intervention that negatively affects the outcome of patients who came late (Soressa U. et al., 2016,incision (Bailey & Love's short practice of surgery 27th edition).

This study also shows that patients who presented without shock to the hospital were 99.1 % less likely to have unfavorable outcome than those who presented with shock. It is consistent with other studies conducted in Ethiopia 95.5 % (soressa U. et al., 2016, Yohannes M. et al., 2017) and in Uganda 94.8 (okeny T. et al., 2011). This also might show patients with hemodynamic stability maintains end organ perfusion and cellular metabolism that met the cellular demand and enables to keep its function intact that helps to establish better defense to offending stimuli. (Schwartz's Principles of Surgery, 12th edition). This study also shows that patients who stayed in the hospital for more than 7 days after surgery were about 47 times more likely to have unfavorable outcomes when compared with those who stayed for shorter or equal to 7 days after the surgery. It is consistent with other studies conducted in Ethiopia 42 times (Tsegaye m. et al., 2007, Abdifetah D., et al., 2007) and in Uganda 44 (Okey P. et al., 2011). This also might be patients with increased morbidity after surgery tends to stay longer in the hospital till they get better than those who get better shortly after surgery and the short length of hospital stay may also decrease the chance of patients to acquire nosocomial infections, such as hospital-acquired pneumonia (soressa U. et al., 2016).

Since the study was conducted in one hospital, it cannot be generalized to all population living in the catchment area because of difference in factors such as socio economic status of the patients, the hospital set up differences and the human power that might affect the outcome of patients. Some important variables that might be associated with outcomes of surgery like economic status of patients, patients awareness about intestinal obstruction and investigation like serum electrolyte were not included in the study because the study was retrospective.

6. LIMITATIONS OF THE STUDY

6.2. Limitations of the Study

- ✓ Since the study was conducted in one hospital, it cannot be generalized to all population living in the catchment area
- ✓ The study addresses only human factor it has not assessed other factors like the setup of the hospital.
- ✓ Some important variables were not included in the study because the study was retrospective.

7. CONCLUSIONS AND RECOMMENDATIONS

7.1 CONCLUSIONS

This study provided insight into the surgical management outcome and its factors associated among patients with Gangrenous SBO at a tertiary teaching hospital in eastern Ethiopia. The majority of patients had unfavorable surgical management outcomes of Gangrenous SBO. In this study 15 (16.5 %) patients died. Determinant factors including duration of illness before surgery, shock at presentation, and comorbidity, hospital stay after operation were significantly associated with the surgical management outcome of Gangrenous SBO. Therefore, designing a strategy that address these factors would be helpful to further increase the likelihood of favorable surgical management outcome for the patients attending hospital with Gangrenous SBO.

7.2 RECOMMENDATIONS

- ✓ The health professionals in the hospital and referring health facilities should increase public awareness on gangrenous SBO by providing appropriate health information.
- ✓ The hospital should be improved in documentation and as well record keeping.
- ✓ The Harari Regional and East Haraghe health bureau should support referring health professionals with training on early detection & management of SBO.
- ✓ The Harari Regional and East Hararghe Mass media should work on creating awareness about intestinal obstruction
- ✓ The Harari Regional and East Hararghe Mass media should work on creating awareness about people with comorbid illness to seek medical attention as early as possible.
- ✓ The Harari Regional and East Haraghe health bureau should also facilitate the catchment hospitals to provide operative management service for Intestinal obstruction, this will help the patients increase access to health service.

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7. ANNEXS

7.1Hospital management information sheet and informed voluntary consent form

My name is _____. I am working as a data collector for the study being conducted in hospital on by **DrFasilWondim** Assessment of outcome of and associated factors of gangrenous small bowel obstruction. Who is studying for his specialty in general surgery at Haramaya University, Collage of Health and Medical Sciences. I kindly request you to lend me your attention to explain you about the study and your institution being selected as the study participant.

The study/project title: Assessment of outcome of and associated factors of gangrenous small bowel obstruction patients at HFSUH from January 1, 2018 - December 30, 2019.

Purpose/aim of the study: The main aim of this study is to write a thesis as a partial requirement for the fulfillment of specialty in general surgery for the principal investigator. Moreover, the result of the study will be used as evidence and input to planning for clients with outcomes and associated factors of gangrenous SBO in health care setting. The findings of this study can be of a paramount importance for the regional health office to plan intervention programs and improve the outcome of gangrenous small bowel obstruction.

Procedure and duration: Medical records will be retrieved and by using a questionnaire to provide me with pertinent data that is helpful for the study. There are 15 questions to answer where I will fill the questionnaire by using medical record of the patient. Reviewing one medical records of patients which take around 30 minutes.

Risks and benefits: The risk of being participating in this study is very minimal. There would not be any direct payment for reviewing in this study. But, the findings from this research will reveal important information for hospital and local health planners.

Confidentiality: The information will be confidential. There will be no information that will identify in particular. The findings of the study will be general for the study community and not reflect anything particular of individual persons or housing. The questionnaire will be coded to exclude showing names. No reference will be made in oral or written reports that could link data to the research.

Rights: Participation for this study is fully voluntary. On behalf of the participants, the hospital management have the right to declare to participate or not in this study.

Contact address: If there are any questions or enquires any time about the study or procedures, please contact in this address.

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Institutional Health Research Ethics Review Committee; Office phone: +251-254-66-2011
P.O. Box 235, Harar, Ethiopia.

Declaration of informed voluntary consent:

I have read the participant information sheet. I have clearly understood the purpose of research, the procedures, the risks and benefits, issues of confidentiality, the rights of participating and the contact address for any queries. I have been given allowed to ask questions for things that may have been unclear. I was informed that participants have the right to withdraw from the study at any time or not to answer any question that they do not want. I am also informed that the HFSUH management has the right to stop this study from being conducted if any misdeeds and unethical procedures are observed during the data collection process in the hospital premises. Therefore, I declare my voluntary consent on HFSUH to allow this study to be conducted in this hospital with my signature as indicated below.

Name and signature of administrator _____

Signature of data collector_____

Thank you for your cooperation!!

Dummy tables

Table 6.Age distribution of patients with Gangrenous SBO in HFSUH.

Age group	Frequency	Percent
0-5		
5-14		
15-40		
40-60		
>60		

Table 4 Sex and age distribution of pts with Gangrenous SBO in HFSUH.

Gender	0-5	5-14	15-40	41-50	40-60	>60
Male						
Female						
Total						

Data collection Check List

Research Check List format for pts with Gangrenous SBO in HFSUH from, January 1/2018 to December 30/ 2019GC.

I. Socio demographic profile:

- 1.1 .Age_____
- 1.2. Sex 1. Male 2. Female
- 1. 3. Residence _____

II. Clinical presentations, findings and management

- 1. Abdominal pain 2. Vomiting
- 3. Constipation 4. Abdominal distention
- 5. Groin swelling 6. Others_____
- 2.2. Duration of symptoms _____

2.3 previous history of abdominal operation

- 1)Yes 2)No

2.4. Preoperative diagnosis

1. Simple SBO 2. Simple LBO
3. Gangrenous SBO 4. Gangrenous LBO 5)thers specify_____

2.5. Initial managements performed (can have more than one option)

1. Resuscitation with IV crystalloids 2. NGT inserted
3. IV antibiotic initiated 4. Others, specify_____

2.6 If antibiotic initiated specify name of the drug(s) _____

2.7 causes of SBO /Intra-operative findings

- 1) Small bowel volvulus 2) Adhesion 3) Hernia 4) Iliosigmoid knotting
5) Intestinal TB 6)Meckel’s diverticulitis 7)Others specify _____

2.8. Procedure done during operative management

1. Resection & Anastomosis 2. Iliostomy. 3. Herniorrhaphy4. Adhesiolysis
5. Others (specify) _____

2.9 shock at presentation

- 1.yes 2.no

3.0 if yes mention type of shock.....

III. Management outcome

3.1. Length of Hospital Stay in day’s _____

3.2. Any Post-operative complication (can have more than one option)

1. Hematoma/seroma 2.superficial SSI 3. Deep SSI 4.organ/space SSI

5. Anastomotic leak 6 Facial dehiscence 7.Pneumonia 8. Others specify_____

3.3 Condition at discharge:

1. Discharged alive without complication
2. Discharged alive with at least one complication
3. Died in the hospital

CV OF THE INVESTIGATOR

DrFasilWondmu (MD)

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Personal information

Name: FasilWondimu Wale

Sex: Male

Date of Birth: January 3,1993GC

Place of Birth: Gonder

Marital Status: Single

Nationality: Ethiopian

Educational Background: Doctor of medicine

Languages: Amharic, English

Purpose: partial fulfillment of specialty in General surgery

