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Anastomotic Leak And Associated Factor After Sigmoidectomy And Colo-Colic Anastomosis Done At Bahir-Dar Public Teriary Hospitals From 2020- 2023

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BAHIR DAR UNIVERSITY
COLLEGE OF MEDECINE AND HEALTH SCIENCE
SCHOOL OF MEDICINE
DEPARTMENT OF General Surgery

**Anastomotic Leak And Associated Factor After Sigmoidectomy And
Colo-Colic Anastomosis Done At Bahir-Dar Public Teriary
Hospitals From 2020- 2023**

By Seifeyared Abebaw (Md)

A THESIS PROPOSAL SUBMITTED TO BAHIR DAR UNIVERSITY
SCHOOL OF MEDICINE AND HEALTH SCIENCE, DEPARTMENT OF
SURGERY IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR
SPECIALIZATION IN GENERAL SURGERY

SEPTEMBER 2023
BAHIR DAR , ETHIOPIA

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DECLARATION

This is to certify that the thesis entitled — Anastomotic leak and associated factor after Sigmoidectomy and Colo-Colic anastomosis done at Bahir-Bar public tertiary hospitals from 2020- 2023 GC. Submitted to Bahir-Dar university school of Medicine and health science, department of Surgery in partial fulfillment of the requirement for specialization in General surgery is a record of my original work carried out by me and has never been submitted to this or any other institution to get any other degree or certificates. The assistance and help I received during the course of this investigation have been duly acknowledged.

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Name of the candidate

Signature

Date

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ABSTRACT

BACKGROUND

Gastrointestinal resection and anastomosis is a very common procedure globally. Anastomotic leak is a complication affecting 2% to 10% of patients undergoing gastrointestinal surgery. Different factors have been attributed to the development of leak. This study was designed to assess the prevalence and associated risk factors for anastomotic leakage after sigmoidectomy so that understanding can help in clinical decision for anastomosis following sigmoidectomy, to control factors and to decrease anastomotic leak

OBJECTIVE

The aim of this study is to assess magnitude of anastomosis leak and associated factor in emergency and elective resection of sigmoid colon and colo colic anastomosis for patients with redundant sigmoid in TGSH and FHRH from 2020 to 2023

METHOD

Across-sectional Retrospective descriptive study through patients chart review was conducted from August 2020 to November 2023. Census sampling technique was used. The final sample size for this study is 170. Data collected through data collection tool , entered using EpiData 3.1 and analyzed using IBM SPSS statistics-26 .For independent variable of age, sex ,residence,duration of operation,Comorbidity, Hemoglobin, Type of Surgery and History of Deflation ,both bivariable and multivariable logistic regressionmodel used to analyze correlation of independent factor to the dependent factor at 95 % CI , $P < 0.05$

RESULTS

Among the patients operated a total of 16 patients developed postoperative anastomotic leakage, which makes the prevalence rate 9.6%. There was a statistically significant association between Elevated systolic blood pressure and prolonged intra operative time with the occurrence of anastomotic leakage.

Keywords: Anastomotic leakage; Redundant sigmoid, sigmoid volvulus, Public health hospitals, Bahir Dar.

ACRONYMS

AL –Anastomotic leak

ASA- American society of anesthesia

MI- Myocardial infraction

FHCSH -Felegehiwot Comprehensive Specialized Hospital

TGSH- Tibebeqion specialize referral hospital

LBO- Large Bowel Obstruction

RS- Redundant Sigmoid

RPA- Resection and Primary Anastomosis

SCV -Sigmoid Colon Volvulus

OR -Operation Room

SSI -Surgical site infection

BP- Blood Pressure

PR- Pulse rate

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1. INTRODUCTION

1.1. BACK GROUND

Anastomotic leak was defined as the leakage of air, fluid, enteric contents or contrast through an anastomosis. Anastomosis of bowel can be done for different reasons (21). One of them is mechanical obstruction of bowel after intra luminal or extra luminal mass, volvulus, stricture. A colonic volvulus occurs when a segment of colon twists around its mesentery giving rise to a partial or complete bowel obstruction (1). The sigmoid colon is involved in up to 90% of cases (2). It is responsible for approximately 4% of cases of large bowel obstruction. A redundant colon that is mobile on a long and narrow mesentery is a prerequisite that predisposes to colonic volvulus (1; 3).

The early integrity of the anastomosis is dependent on formation of a fibrin seal on the serosal side, which achieves water tightness, and on the suture holding capacity of the intestinal wall, particularly the sub mucosal layer. There is a significant decrease in marginal strength during the first week due to an early and marked collagenolysis. The integrity of the anastomosis represents equilibrium between collagenolysis, which occurs early, and collagen synthesis, which takes a few days to initiate (2). The capacity of maintaining this equilibrium and thus anastomotic healing is dependent on the patient's general condition and local conditions of the anastomosis (11). and From patient condition demographic factor male sex and older age is associated increased risk (25; 9), malnutrition with low BMI, low albumin is associated with increased anastomotic leak too (26). Delayed period of symptoms prior to admission, deranged vital sign, gangrenous change and emergency surgery are also associated with increased anastomotic leak (4; 6; 9; 27). Perioperative blood transfusions and anemia, smoking, and excessive alcohol abuse are associated with anastomotic leak (11; 26). comorbidity such as diabetes Mellitus, hypertension, coronary heart diseases also shows increased risk (26). While local factors include blood supply, condition of bowel ends, and anastomotic location (11; 23).

Diagnosis of anastomosis leak can comprise clinical indicators like pain, fever, tachycardia, peritonitis and biochemical markers; such as C-reactive protein, cytokines and radiologic studies ultrasound, CT (24). Clear radiologic evidence of leak, feculent drainage from the wound or drain, drain placement near an anastomosis by interventional radiology, or patient return to the operating room for treatment of a leak was identified as a leak (21).

The goal of management of anastomotic leak is to limit morbidity and mortality. It is dependent on the clinical condition of the patient and the extent of dehiscence. And it includes anti-biotic or surgical intervention such as diversion stoma or repair.

1.2 STATEMENT OF THE PROBLEM

Sigmoid volvulus is the commonest cause of large bowel obstruction in our country. In the region known as the volvulus belt, an area extending along South America, Africa, the Middle East, India, and Russia, colonic volvulus is more common and accounts for approximately 50% of all cases of colonic obstruction(3). As a study in Ethiopia by Gersam Abera Mulugeta and Seble Awlachew in one of the district hospitals it reaches 73% of large bowel obstruction(16). Redundancy of a colon is due to either colonic dysmotility, excessive fiber intake, or a genetic predisposition. A dynamic ileus and distal obstruction are also predisposing factors(1). Associated factors include chronic constipation and aging, with the average age at presentation being in the seventh to eighth decade of life. There is an increased incidence of the condition in institutionalized patients afflicted with neuropsychiatric conditions and treated with psychotropic drugs(3). Typically, an elderly patient presents with constipation, abdominal pain, and distension of sudden onset(4). A scout roentogram of the abdomen shows a large circular dilated loop running from the pelvis exhibiting a bent inner tube effect, which is very characteristic(4). Treatment differs depending upon the mode of presentation of volvulus. The two main considerations in treatment are relief of obstruction and curative resection of sigmoid colon(3; 4; 2). It includes non-operative detorsion, operative without resection and operative with resection. Non-operative decompression can be done by using a sigmoidoscope and a long rectal tube or with an endoscope. This procedure is objected in the presence of gangrenous colon (4; 9; 13). When the colon is gangrenous it is an indication for immediate resection of gangrenous sigmoid. Otherwise the common operative procedure with resection of sigmoid are Primary resection with end to end anastomosis, Hartmann's colostomy procedure but can also include non-resection procedures like detorsion or sigmoidoplexy(1)-(11)

The global surgical mortality rate of sigmoid volvulus is between 0-21%. In our country Ethiopia a study done by Gersam Abera Mulugeta and Seble Awlachew from 2012 to 2017 with a total of 131 patients managed for acute sigmoid volvulus the overall mortality rate was 4.5%(8). Emergency surgery had a higher rate of postoperative complications, more open surgery, and more need for

stomas compared to elective surgery(5). The main causes of morbidity (complications) are wound sepsis; wound dehiscence, anastomotic leak aurinary tract and chest infection.

In our study setting there is no guide line which clearly dictate the acute management of redundant sigmoid , especially when they acutely present. But in customary for patients came with acute sigmoid volvulus we manage with staged operation, that is if they came with un complicated simple sigmoid volvulus , rectal deflation and if successful discharge after 24 to 48 hrs observation with rectal tube insitu (but sometimes admitted to be operated after 7 days) and appointed on follow up clinic for elective sigmoidectomy and primary anastomosiswith the appointment date atleast 7 days away . But If detorsion is failed or complication is suspected such as perforation, gangrenous emergency laparotomy will proceed. For elective redundant sigmoid after 3 days of bowel preparation sigmoidectomy and primary anastomosis will be done. But this staged operation has its ownproblem; first it is planned at the expense of recurrence and lost of patient from follow up with increased risk to come with complication .Second it increase total hospital stay expense.

Now a days many literature are supporting emergency one-stage resection without mechanical bowel preparation for acute sigmoid volvulus .The goal of staged operation is to have bowel rest after acute volvulus and to have mechanical bowel preparation in order to reduce complications such as anastomotic. But what is the magnitude of the anastomosis leak among emergency and elective Sigmoidectomy and anastomosis of colon done for redundant sigmoid and what arethe factors affecting anastomosis leak and associated factor in emergency and elective Sigmoidectomy and anastomosis of colon done for redundant sigmoid

1.3. SIGNIFICANCE OF THE STUDY

This study is important because there is no large enough study that single out anastomotic leakin emergency and elective colorectal anastomosis for redundant sigmoid and There is no study that is done in our hospital that dedicate anastomotic leakin emergency and elective colorectal anastomosis for redundant sigmoid .This study can also help in formulating guide line in the management of redundant sigmoid and this study can be a source for other upcoming research and for possible ethical review

2. LITERATURE REVIEW

2.1. MAGNITUDE OF ANASTOMOTIC LEAK

Systemic review by Mohamed Ali Chaouchet et al in 2020 of English literature. Despite the advances in surgical procedures, the rate of AL following colorectal surgery remains high. With this clinical and emotional toll of this complication, research has been limited because of the lack of measurement of this outcome (22). Cochrane systematic reviews assessed Seventeen Systemic review and meta-analyses by Raphael N. et al via systemic literature search of the Cochrane Central Register of Controlled Trials and Medline until May 2019. And reported colorectal leakage rates range between 4 and 26% (28). Retrospective study done in South Korea by Keunchul Lee et al. of management of sigmoid volvulus of 39 elective and 35 emergency sigmoidectomy and colocolic anastomosis 2.6% and 2.9% of patients develop anastomotic leak respectively (5). While study in Turkey of 51 emergency sigmoidectomy and colocolic anastomosis 11.7% shows anastomotic leak (12). Descriptive study conducted at the from by Shantona Rani et al from May 2009 to June 2011. of 50 patients there was 0% anastomotic leak (20). But elective sigmoidectomy and colocolic anastomosis of 58 patients in Israel, 17.1% develop anastomotic leak (25). Study done in Ethiopia by Gutema Wako, Henok Teshome and Engida Abebe in Addis Ababa teaching hospitals of 221 patients 5.2% patients develop anastomotic leak (29). But in retrospective study done in one of district hospital of Ethiopia by Gersam Abera and Seble Awlache of 131 patients anastomotic leak reaches 10.8% (9). Retrospective Study done in our country Ethiopia by Daniel and Esayas from 2014 to 2016 in 157 patient at Tikur Anbessa Specialized Hospital and Menilik II Memorial Hospital. Sixty seven percent of cases were operated on an elective basis while 33% of cases as emergency shows 17 (10.8%) developed postoperative anastomotic leak (22). From these researches done in Ethiopia Sigmoid volvulus is the most common indication. But its epidemiological features as well as its management differ between developed and developing countries (6). Worldwide, sigmoid volvulus represents the leading cause of large bowel obstruction, accounting for 20% to 30% of the cases of intestinal obstruction (7). Disease is more prevalent in developing countries than developed countries (7; 8). In developed nations it is third after cancer and diverticular disease at about 10% (1; 3). In the region known as the volvulus belt, an area extending along South America, Africa, the Middle East, India, and Russia, colonic volvulus is more common (1;

2; 3; 4). In third-world countries such as Africa and South America, accounting for at least 50% of causes of LBO(1; 8). While in Ethiopia in study done in district hospital in South-west Ethiopia over the 5 year study period reaches 73% of bowel obstruction(9).

2.2 FACTORS ASSOCIATED WITH ANASTOMOTIC LEAK

Multiple risk factors for anastomotic leak have been identified, and these can allow for better prevention and an earlier diagnosis of this significant complication(30). Discussion of all alterable factors is made in the setting of the Risks can be local factor or patient factor pre-, intra-, and postoperative influencers(34)(32).

Anastomotic leakage is a morbid and potentially fatal complication of colorectal surgery. Determination of perioperative risk factors for colorectal anastomosis leak helps to identify patients requiring increased postoperative surveillance (29).

2.2.1 LOCAL FACTOR

The perfusion disorder and technical defects are considered as major factors of anastomotic dehiscence. The level of vascular ligation could, therefore, affect in some patients the blood flow at the level of the anastomosis and hinder its healing. The verification of the tightness of the anastomosis is crucial during the operation (28).

1.2.2. PREOPERATIVE FACTOR

2.2.2.1. SOCIO-DEMOGRAPHIC RELATED FACTORS

Of 58 patients studied in Israel by J.Tankel with mean age 67.4 years, range 13–97. There were 10 anastomotic leaks identified (17.2%). age > 80-years (OR 6.88, $p = 0.027$), were associated with anastomotic leak(25). And a study done by Theodore R. et al. on single variable analysis, patients 11 to 40 years of age had the lowest incidence of anastomotic disruption (2.2%) $p > 0.25$. In patients older than 60 years, dehiscence was significantly more common (5.4%), and patients over the age of 81 had a still higher incidence of leakage (9.6%)(Age 60-80, $p < 0.05$ age >80, $p < 0.01$). Systemic review by Raphael N. et al. on Alterable Risk Factors for Anastomotic Leakage in Colorectal Surgery shows male sex as a risk for anastomotic leak (28). Evaluating the

predictive factors for anastomotic leakage after total laparoscopic resection with transrectal natural orifice specimen extraction for colorectal cancer Univariate analysis of AL of 208 and the rate of AL was 10.1% (21 of 208 patients). The univariate analyses showed that male sex (85.7% vs 57.8%, $P = .013$), but on multivariable analysis no association (33). And by the study from Gutema et al. and another study done by Gersam et al. both From Ethiopia shows no association with anastomotic leakage rather both study show association of increased anastomotic leak in female sex in which association of sex with anastomotic leak not shown in the other reviews. (9; 29) .Even though Volvulus of the sigmoid colon affected people over a wide age range as young as 3 years it is generally disease of old (10).But the average age of patients with sigmoid volvulus in endemic areas tend to be younger as compared to none endemic(7).jendouba, TunisiaThe mean age of patients was 62 years with extreme ranging from 42 years to 95 years(6),NawabshahMean age was 49 years, district hospital in Ethiopia The mean age was 69 yrs(9)Seoul The median ages 68-70 years (range, 9 to 95 years) (5). The African patient may be as young as 15 to 20 years and mainly has a redundant sigmoid colon.with the mean age being 35.4 years at Zambia(10).

2.2.2.2. BEHAVIORAL RELATED FACTORS

On study done by Seung Yoon Yang et al. on late anastomotic leakage after anal sphincter saving surgery for rectal cancer ,smoking history and alcohol history shown to increase anastomotic leak with $P < 0.001$ for both(30). But study in Egypt didn't show any association (31)

1.2.2.3. AMERICAN SOCIETY OF ANESTHESIOLOGIST (ASA) GRADE AND COMORBIDITY

Review Article of for Alterable Risk Factors for Anastomotic Leakage in Colorectal Surgery by Raphael N.et al.shows Grade (ASA) >2 is associated with increased anastomotic leak with similar finding from Ethiopia by Daniel et al too(22; 28). But study in Israel and from Ethiopia by Gutema et al shows comorbidities didn't have association with anastomotic leak(29)(25).

1.2.2.4. ALBUMINE

Anastomotic dehiscence developed in 13 of 200 patients (6.5%) judged to be in a poor nutritional state at operation, and suture lines broke down in 61 of 1455 patients (4.2%) thought to be nutritionally adequate. This difference just fails to reach statistical significance ($p > 0.06$)(29).

1.2.2.5. TYPE OF OPERATION AND LOCATION OF ANASTOMOSIS

The goals of therapy in nonstrangulated sigmoid volvulus are directed at relief of acute torsion and prevention of recurrences (4; 3; 11; 14). After initial management of resuscitation the traditional standard treatment emergency endoscopic detorsion followed by semi-elective or elective resection, since the risk of recurrence is high (40%-50%) after endoscopic detorsion alone(2; 6; 9; 12; 5; 14) . But Urgent sigmoid resection is indicated when endoscopic detorsion of the sigmoid colon is not successful and in cases of non-viable or perforated colon(1)-(13).

Incidence of AL after emergency operation was 12.5% compared to 3.9% in elective operation ($P=0.029$)(29).

Colonic suture lines disrupted in 8.2% of patients operated upon as emergencies, while elective anastomoses dehisced in 4.1% ($p < 0.025$)(32)

Many series shows leak rate higher on emergency than elective . In Daniel and Esayas study of 157 patients sixty seven percent of cases were operated on an elective basis while 33% of cases as emergency. Among patients who underwent surgery as emergency 18% developed anastomotic leak, in contrast to 7% anastomotic leak rate in elective one(22). But when we come to surgical outcome of sigmoid has different view. On Bhuiyan et al. Study in South Africa of 33 emergencies and 9 electives had resection with primary anastomosis there was 3 anastomotic leak all from the emergency(18). While on study by Shantona Rani Paul et al in Rajshahi of 50 Acute sigmoid volvulus patient managed with resection and primary anastomosis there was 0 % anastomotic leak(20). while on our country Ethiopia by Gersam Abera Mulugeta and Seble Awlacheu from a total of 131 patients who were managed for acute sigmoid volvulus 78 patients underwent primary resection & end to end anastomosis anastomosis leakage 4 (3.7%)(9).

On study of Thibault Voron et al. on anastomotic Location Predicting Anastomotic Leakage After elective colonic resection for Cancer among 36 anastomotic leaks, 20 (55.5%) were observed

after ileo-colic anastomosis, 7 (19.4%) after colo-colic anastomosis, 7 (19.4%) after intraperitoneal colorectal anastomosis, and 2 (5.5%) after ileo-sigmoid anastomosis, leading to leak rates of 4.1%, 7.1%, 1.7%, and 6.2% after ileo-colic, colo-colic, intraperitoneal colorectal, and ileo-sigmoid anastomosis, respectively showing that colorectal anastomosis has lowest rate(23). In Daniel and Esayas study among 157 patients operated also small bowel was involved in 32% of cases; colon in 54% of the cases; and Rectum in 14% where the primary indication for the surgical intervention was redundant sigmoid colon 30%, shows 17(10.8%) developed the leak rate of left colon and right colon is similar with 9(11.2%) and 3(11.1%) respectively postoperative anastomotic leak and was small bowel 5(10%) and large bowel leak 12(11.2%)(22)

2.2.2.6 MECHANICAL BOWEL PREPARATION.

Cochrane review from 13 RCTs over 4633 patients revealed that preoperative mechanical bowel cleaning of the colon had no difference on the primary outcome of colorectal anastomotic leakage nor on secondary outcomes of mortality, peritonitis, reoperation, wound infection, and infectious and noninfectious extra-abdominal complications. Furthermore, mechanical bowel preparation was compared to rectal enema by the same Cochrane review including 5 RCTs with 1210 patients, which also showed no difference in outcomes (28)

2.2.2.7 TIME AND CONDITION OF PRESENTATION

Primary resection and anastomosis of gangrenous bowel and delayed presentation did associated with increased anastomotic leak(4; 5; 9; 16)

Patients with sigmoid volvulus may present as acute or sub acute intestinal obstruction. The classic triad of abdominal pain, abdominal distention and inability to pass feces & flatus was reported in patients(3; 9). About half will have symptoms suggestive of a previous attack(1). Clinical examination revealed abdominal distension more on left side with visible bowel loops. Abdominal tenderness was not a common finding present only in so was of abdominal guarding. Per rectal examination and proctoscopic examination revealed no specific findings, except empty(8). For bowel ischemia and infarction severe abdominal pain, rebound tenderness, and tachycardia are ominous signs(3).

1.2.3. INTRA OPERATIVE FACTOR

2.2.3.1. INTRAOPERATIVE HYPOTENSION

Theoder et al If the last hematocrit recorded prior to operation was less than 35%, the patient was arbitrarily termed "anemic." In anemic patients, the rate of anastomotic dehiscence was 7.0% as compared with 3.7% in patients with normal hematocrits ($p < 0.025$). Two or three transfusions correlated with 8.4% leakage ($p < 0.001$), and 16.2% of patients who were given four or more units of whole blood had dehiscence(32). Anemia requiring pre- operative transfusion was not deleterious by itself; patients with chronic illness or minor hemorrhage fit into this category(13). Transfusion of two or more units of blood during operation, however, was a strong influence to ward higher rates of anastomotic disruption, both in anemic patients and in those with normal preoperative hematocrits. Hypotension was associated with subsequent anastomotic dehiscence in 10.7% of patients, and leakage occurred in only 4.4% of patients who remained normotensive throughout the operation ($p < 0.01$). (32)

2.2.3.2. OPERATIVE TIME

Univariate analysis of AL of 208 patients into two groups (21 patients with AL vs 187 patients without AL) based on whether they developed AL, the rate of AL was 10.1% (21 of 208 patients). Both uni variant and multi variant analysis shows duration of operation ≥ 140 min (71.4% vs 29.4%, $P < .001$) were associated with an increased likage(35). Theoder et al. studies also shows operations that lasted more than 5 hours, dehiscence was much more common (8.7%) than in procedures lasting from 3 to 5 hours (4.0%, $p < 0.01$) (32).

2. MORTALITY

Anastomotic leaks are among the most dreaded complications after colorectal surgery. However, problems with definitions and the retrospective nature of previous analyses have been major limitations. Surgeons are all too familiar with the potentially devastating consequences of an anastomotic leak. Patients classically develop agonizing abdominal pain, tachycardia, high

fevers, and a rigid abdomen, often accompanied by hemodynamic instability. And biochemical markers; such as C-reactive protein, cytokines and radiologic studies showing fluid collections or gas containing collections and intra-operative findings. CT scan with rectal contrast has Sensitivity and specificity in this group was 78% and 94%, respectively(24). In these cases, urgent return to the operating room for peritoneal washout and fecal diversion is generally required; prolonged stays in the intensive care unit and death are not uncommon. The mortality rate for an anastomotic leak in the literature is typically in the 15%-65 % range.

By the study of G.jumbi and R.T. Kuremu the global surgical mortality rate of sigmoid volvulus from consecutive PubMed literature review, for the purposes of comparison shows between 0-21% over (15). The study by M. M. Z. U. Bhuiyan et al in South Africa over a period from 1997 – 2004 84 patients underwent emergencies and 9 electives, surgical mortality was 6% and from this study mortality of elective was 0% and emergency was 6% showing emergency surgery is associated with high mortality(18) A retrospective study in Royal Victoria Teaching Hospital with a total of 48 patients, 45 (93.8%) males and 3 (6.3%) Two (4.2%) had rectal tube detorsion followed by elective sigmoidectomy and primary anastomosis on the same admission, while 24 (50%) had emergency laparotomy, one-stage resection and primary anastomosis, 22 (45.8%), underwent resection and Hartmann's procedure. There were 5 deaths, giving a mortality rate of 10.4% all was emergency (19). But descriptive study conducted at Rajshahi during the period from 2009 to 2011 involving 50 patients 46 male, 4 female of emergency primary resection and anastomosis shows 0% mortality(20). By six years period (between year 2000-2005) reviews of G.jumbi and R.T. Kuremu Ninety two case files of Sigmoid volvulus over the same period with a mean age of 47.3 years Mortality was three(3.3%)(15). In our country Ethiopia a study done by Gersam Abera Mulugeta and Seble Awlachev from 2012 to 2017 with total of 131 patients managed for acute sigmoid volvulus the overall mortality rate was 4.5%(9). Surgical morbidity reaches from 15.8 % (open elective) Seoul S.Korea(5) to 37.2 % Turkey(12). The main causes of morbidity (complications) are wound sepsis; wound dehiscence, anastomotic leak urinary tract and chest infection. Many series shows that these complications are more common in emergency as compared to elective and from emergency with gangrenous sigmoid is more pronounced

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4. CONCEPTUAL FRAMWORK

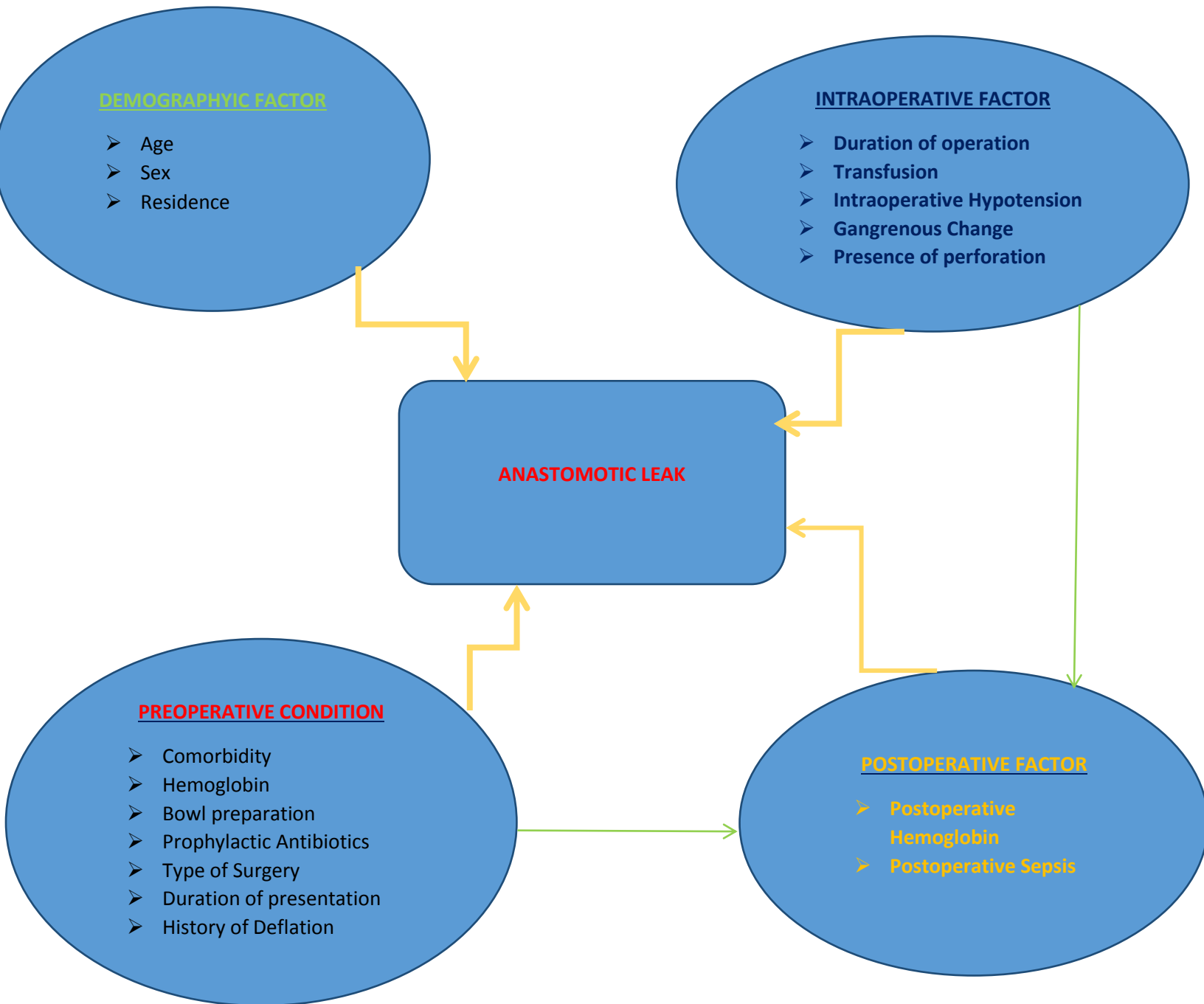


Figure 1

Figure 4. 1: Conceptual framework of anastomotic leak and associated factor after sigmoidectomy and colo-colic anastomosis done at Bahir-Dar public tertiary hospitals from 2020- 2023

Source: developed after extensive literature review

5. OBJECTIVES

5.1.GENERAL OBJECTIVE

To Assess the magnitude of anastomosis leak and associated factor after emergency and elective resection of sigmoid colon and colo colic anastomosis for patients with Acute sigmoid volvulus and redundant sigmoid in TGSH and FHRH from 2020 to 2023

5.2.SPECIFIC OBJECTIVES

- ✓ To determine magnitude of anastomosis leak among emergency and elective Sigmoidectomy and colo-colic anastomosis done for patients with Acute sigmoid volvulus and redundant sigmoid in TGSH and FHRH from 2020 to 2023
- ✓ To identify factors affecting anastomosis leak among emergency and elective Sigmoidectomy and colo-colic anastomosis done for Acute sigmoid volvulus and redundant sigmoid in TGSH and FHRH from 2020 to 2023

6. METHOD

6.1. STUDY DESIGN AND PERIOD

A Hospital-based retrospective cross-sectional study design was employed from August 1, 2020 to September 30, 2023

6.2. STUDY SETTING

The study was conducted in TGS and FHRH public referral hospitals in Bahirdar. Bahirdar is the capital city of Amhara regional state, 587km away northwest of Addis Ababa the capital city of Ethiopia. The city has 3 sub cities and 16 Kebeles. According to the city administration the total population of the city is 649,429 by 2012. There is one public comprehensive specialized hospital and one University comprehensive specialized hospital in the city. In both Felege Hiwot referral hospital (FHRH) and TGS the catchment population is estimated to be 5-7 million people. Major surgery is among the services provided in these two hospitals.

6.3. POPULATION

6.3.1. SOURCE POPULATION

All acute sigmoid volvulus and elective redundant sigmoid patients who have laparotomy done for from 2020 to 2023 in TGS and FHRH hospitals

6.3.2. STUDY POPULATION

All emergency acute sigmoid volvulus and elective redundant sigmoid patients with Sigmoidectomy and anastomosis of colon done for acute sigmoid volvulus and redundant sigmoid from 2020 to 2023 in TGS and FHRH hospitals.

6.4. INCLUSION CRITERIA AND EXCLUSION CRITERIA

6.4.1. INCLUSION CRITERIA

All emergency acute sigmoid volvulus and elective redundant sigmoid patients with Sigmoidectomy and anastomosis of colon done from 2020 to 2023 in TGS and FHRH hospitals were included.

6.4.2. EXCLUSION CRITERIA

Patients who had Hartman's procedure, had sigmoidectomy and primary colo colic anastomosis for other than acute sigmoid volvulus and redundant sigmoid, lost chart, incomplete documentation was excluded

6.5. SAMPLE SIZE DETERMINATION AND SAMPLING PROCEDURE

6.5.1. SAMPLE SIZE ESTIMATION

The required sample size for this first objective was determined by using a single population proportion formula by taking an assumption confidence level of 95% which gives $Z_{\alpha/2} = 1.96$ (type I error), $P =$ proportion of anastomosis leak among emergency acute sigmoid volvulus and elective redundant sigmoid patients with Sigmoidectomy and anastomosis of colon. Where $P = 10.8\%$ taken from similar study by Daniel et al done at Tikur Anbessa Specialized Hospital and Menilik II Memorial Hospital (22)

$$n = \frac{z_{\alpha/2}^2 p(1-p)}{w^2}$$

$$n = (1.96)^2 \times 0.108(1-0.108) / (0.05)^2$$

$$n = 0.3700843776 / 0.0025$$

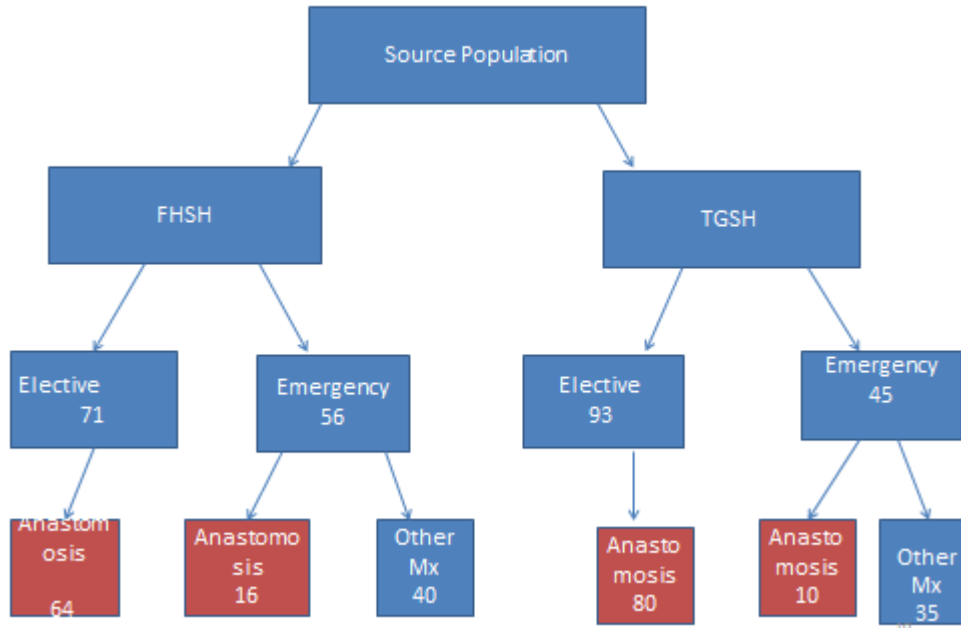
$$n = 148$$

15% non-response rate = 22 so

$$n = 22 + 148$$

$$n = 170$$

6.6. SAMPLING PROCEDURE



Due to poor chart keeping and recording, small number of case,Census was used to collect data.

6.7. STUDY VARIABLES

6.7.1. DEPENDENT VARIABLES

Anastomosisleak is the outcome variable (Yes/ No)

6.7.2. INDEPENDENT VARIABLE

Socio-demographic and behavioral factor Such as Age ,sex ,place of residence From Pre-operative factors Comorbid disease,pre-operative HCT, time of presentation ,History of detorsion. And fromIntra-operative factors (Intra operative vital sign, operative time, blood transfusion, type of surgery, Gangrenous bowel) were independent variables. Unfortunately nutritional status, ASA,total duration of illnesshistory of alcohol and smokingPost-operative factors were not well documented.

6.8. OPERATIONAL DEFINITION

Anastomosis leakage—is defined as a diagnosis of anastomosis leak by the attending physician, and a documented re-operation note or discharge note against medical advice (re-laparotomy).

Redundant Sigmoid- a patient who has previous history detorsion for acute viable sigmoid volvulus and operated on elective basis

Acute Sigmoid volvulus – air and fecal filled redundant sigmoid which rotated around axis of mesentery and caused acute large bowel obstruction

6.9. DATA COLLECTION PROCEDURE AND QUALITY ASSURANCE

6.9.1. DATA COLLECTION TOOLS AND PROCEDURES

Data was collected from patients' charts using a structured checklist. The data extraction sheet is designed based on study objectives and developed by reviewing national and international literature and by observing patient charts. Two supervisors and six data collectors were involved in the data collection process.

6.9.2. DATA QUALITY CONTROL ASSURANCE

Data collectors and supervisors were trained for one day regarding technique and data collection process by the principal investigator before the actual data collection. A 5% preliminary chart review will be conducted in TGSB before the actual data collection and amendments will be considered based on the result of a preliminary chart review. Frequent and timely supervision of data collectors will be undertaken by the principal investigator. The collected data was checked out for its completeness during data collection by the principal investigator and supervisor. Missing was managed by running frequencies.

6.10. DATA MANAGEMENT AND ANALYSIS

Data were coded and then entered, edited, and cleaned using EPI data version 3.1 and exported to SPSS—26 statistical software for analysis. Descriptive statistics was used to describe the socio-demographic characteristics of the respondents, and the magnitude of anastomotic leakage. Text and tables used to present the findings. The binary logistic regression model was used to assess the association between dependent and independent variables. A variable with a p-value of less than 0.25 was considered for multivariable logistic regression analysis. In the multivariable analysis, a P-value of less than 0.05 and odds ratio with 95% CI were used to declare the presence and the strength of association between the independent and outcome variable. The Hosmer and Lemeshow test were used to diagnose the model fitness and the models

wereadequate. The presence of Multicollinearity between independent variables was assessed by using the Variance Inflation Factor (VIF).

7. ETHICAL APPROVAL AND CONSENT TO PARTICIPATE

Ethical approval were obtained from the ethical review committee of the department of surgery on behalf of the Institutional Review Board (IRB) of the BahirdarUniversity. Permission wereobtained from the clinical director of each hospital. As the study uses secondary data, there the need of consent is waived. To ensure confidentiality, personal Identifiers will not be used on the data collection form. All data will be kept strictly confidential and used only for study purposes.

8. INFORMATION DISSEMINATION & UTILIZATION PLAN

The results of this study will be communicated to the concerned staff or workers of the Hospital and governmental and non-governmental agencies involved. The results of this study will also be communicated through annual student and staff research conference at the Bahirdar University and possibly other conferences. Finally, the manuscript will be prepared and be sent to the reputable journal for publication and then become accessible for any concerned bodies.

9. RESULT

9.1. SOCIODEMOGRAPHIC FACTOR

From the total of 170 Patients who undergo Sigmoidectomy for either Acute Sigmoid or for redundant sigmoid ,44.1 %found in the age group between 40 and 60 which made it the commonest age group. The Mean Age is 55.05.The maximum age is 84 years and the minimum age 18 years

About 94.1 % (160) of patients are male and 5.9 % (10) Patients are female with male to female ratio 16: 1.

Table 1: Socio demographic characterizes of patients operated for Sigmoidectomy and colo colic anastomosis done at Bahir-Dar public tertiary hospitals from 2020- 2023 G.C

VARIABLE	CATEGORYN	NUMBER	PERCENT
Age	18-40	34	20.0
	41-60	75	44.1
	>60	61	35.9
	Total	170	100.0
Sex	Male	160	94.1
	Female	10	5.9
	Total	170	100.0
Place of residency	Urban	16	9.4
	Rural	154	90.6
	Total	170	100.0

According to place of residency 90.6 % (154) are from Rural and 9.4% (16) patients from Urban

9.2. PREOPERATIVE HEMODYNAMIC

About 165 (97.1%) of patients PR are between 60 and 100 with mean of 79.09 but 5 (2.9 %) of the patient have PR of >100 beat per minute. And 77.1 % (131) has Systolic BP between 90mmHg-120mmHg and 22.9 % (39) has Systolic BP >120mmHg. While 155 patients (91.2 %) has Diastolic BP between 60mmHg and 90 mmHg but 15 (8.8%) patients has a Diastolic BP of ≥ 90 mmhg

Table 2: Frequency table of pre-operative hemodynamic condition of patients operated for sigmoidectomy and have colo-colic anastomosis done at Bahir-Dar public tertiary hospitals from 2020- 2023

VARIABLE	CATEGORY	NUMBER	PERCENT	MEAN	REMARK
PR	60-100	165	97.1	79.09	Normal
	>100	5	2.9		Tachycardic
	Total	170	100.0		
Systolic BP	90-120	131	77.1	117.47	Normal
	>120	39	22.9		Hypertensive
	Total	170	100.0		
Diastolic BP	60-90	155	91.2	76.71	Normal
	≥ 90	15	8.8		Hypertensive
	Total	170	100.0		

9.3. COMORBIDITY

From 170 patients 23 patients which is 13.5 % has comorbidities. And 144 (84.7 %) patients haven't comorbidities but 3 of the patients (1.8%) comorbid condition is Unknown

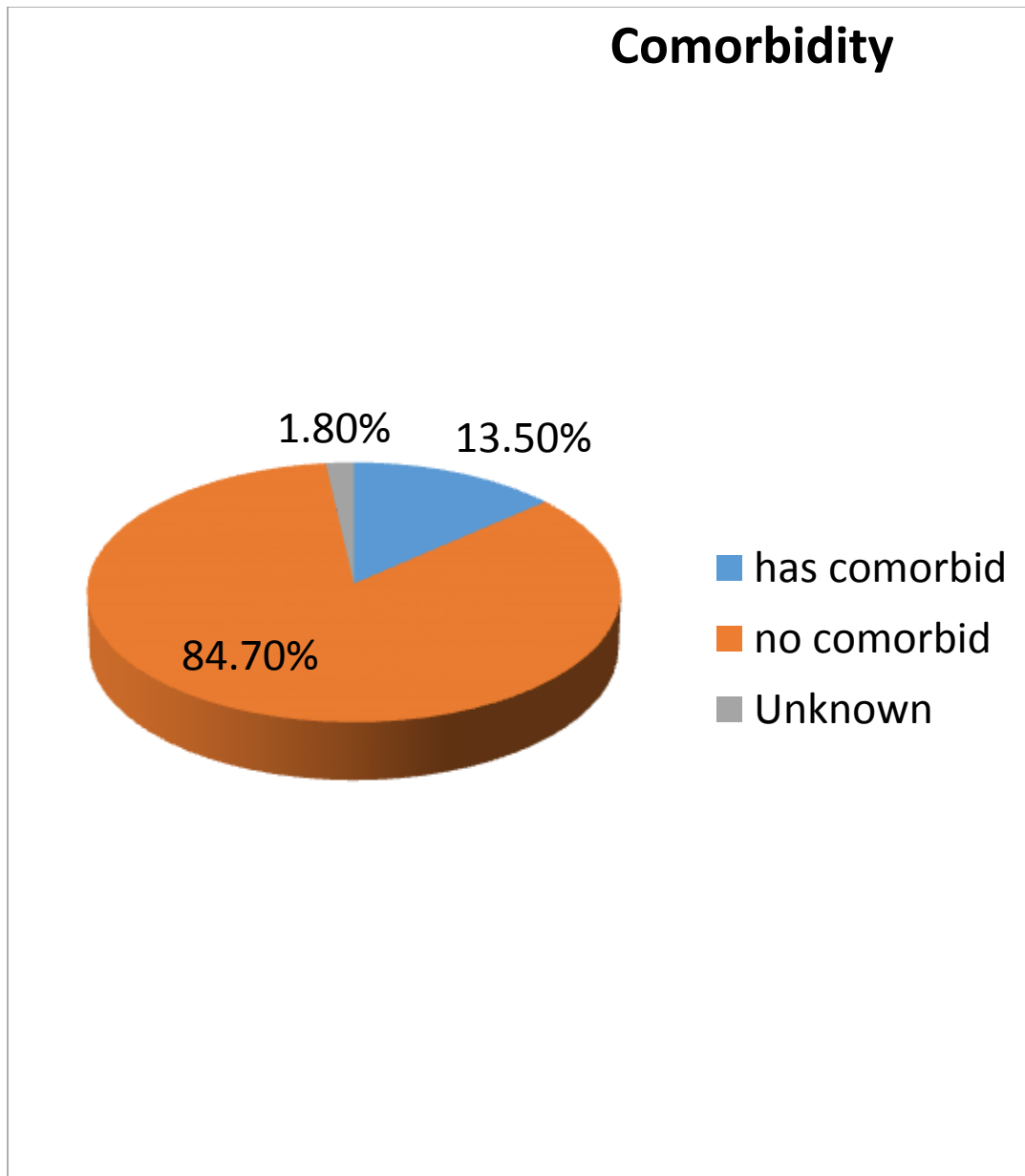


Figure 2 Pie chart of comorbid factor for anastomotic leak and associated factor for patients operated for sigmoidectomy and have colo-colic anastomosis done at Bahir-Dar public tertiary hospitals from 2020- 2023 G.C

Of 23 patients with comorbidity 20 of the patient has HTN ,2 of them have DM, 1 of them has DM and HTN

Table 2: Frequency table of comorbid factor for anastomotic leak and associated factor for patients operated for sigmoidectomy and have colo-colic anastomosis done at Bahir-Dar public tertiary hospitals from 2020- 2023 G.C

VARIABLE	CATEGORYN	NUMBER	PERCENT
Comorbidity	Hypertension	20	11.8
	DM	2	1.2
	DM+HTN	1	.6
	None	144	84.7
	Un Known	3	1.8
	Total	170	100.0

9.4. HISTORY OF DEFLATION

Table 3: Frequency table of History of deflation of patients operated for sigmoidectomy and have colo-colic anastomosis done at Bahir-Dar public tertiary hospitals from 2020- 2023

VARIABLE	CATEGORY	NUMBER	PERCENT
History of Deflation	Yes	152	89.4
	No	18	10.6
	Total	170	100.0

From 170 Patients during the study period 152 (89.4 %) patients has history of deflation with mean defalation history of 3.01 but 18 (10.6 %) patients didn't have deflation history

Table 4 cross tabulation table of Sex and type of patients operated for sigmoidectomy and have colo-colic anastomosis done at Bahir-Dar public tertiary hospitals from 2020- 2023

DEFLATION		YES	NO
SEX	Male	146	14
	Female	6	4
	Total	152	18
Type of Surgery	Emergency	8	18
	Elective	144	0
	Total	152	18

From 152 patient who had history of Deflation, 146 patient were male and females were 6. All elective sigmoidectomy and anastomosis group has history of deflation but only 8 patients (30.8 %) of emergency sigmoidectomy and anastomosis group has history of deflation

9.5. CBC PROFILE

All patients in the study group has hemoglobin of above 10 with a mean hemoglobin of 13.95g/dl

Table 5: Frequency table for CBC profile for patients operated for sigmoidectomy and have colo-colic anastomosis done at Bahir-Dar public tertiary hospitals from 2020- 2023

VARIABLE	CATEGORY	NUMBER	PERCENT
Hemoglobin	≥ 10	170	100.0
WBC	$< 4000 \text{mm}^3$	19	11.2
	$4000 \text{mm}^3 - 11000 \text{mm}^3$	131	77.1
	$> 11000 \text{mm}^3$	20	11.8
	Total	170	100.0

Of the total of 170 patient in the study group 19 (11.2 %) patients has leukopenia which are all from elective group and 20(11.8%) patients has leukocytosis where 16 patients are from emergency and 4 patients are from elective group.

Table 6; cross tabulation table of Type of surgery Vs WBC profile for patients operated for sigmoidectomy and have colo-colic anastomosis done at Bahir-Dar public tertiary hospitals from 2020- 2023

WBC		$< 4000 \text{mm}^3$	$4000 \text{mm}^3 - 11000 \text{mm}^3$	$> 11000 \text{mm}^3$	Total
Type of surgery	Emergency	0	10(38.5%)	16(61.5%)	26(100%)
	Elective	19(13.2%)	121(84%)	4(2.8%)	144(100%)
	Total	19(11.2%)	131(77.1%)	20(11.8%)	170(100%)

9.6. SURGICAL INTRA OPERATIVE CONDITION

From total study group of 170 patient 144 (84.7%) patients under went elective surgery and 26 (15.3%) patients underwent emergency surgery.

The duration of surgery ranges from 55 minute to 190 minute with mean of 112.18 minute. Otherwise no intraoperative hypotension and transfusion documented.

Table 7 ; *Frequency table for Surgical Intra operative condition of patients operated for sigmoidectomy and have colo-colic anastomosis done at Bahir-Dar public tertiary hospitals from 2020- 2023 G.C*

VARIABLE	CATEGORY	NUMBER	PERCENT
Type of Surgery	Emergency	26	15.3
	Elective	144	84.7
	Total	170	100.0
Prophylactic anti biotic	Given	170	100.0
Intra op hypotension	None	170	100
Intraoperative Transfusion	None	170	100
Duration of operation	≤120min	127	74.7
	>120min	43	25.3
	Total	170	100.0

9.7. POST OPERATIVE

9.7.1. ANASTOMOTIC LEAK

From 170 anastomosis of colon with rectum after sigmoidectomy for acute sigmoid volvulus and Redundant sigmoid there was total of 16 patients which is 9.41 % with anastomotic leak. And 154 patients that is 90.6 % have no anastomotic leak. And of them 15 patients were male which comprise 9.4 % of male patient in the study group and only 1 female patient develop anastomotic leak from a total of 10 female patient in the study group and comprise 10%.

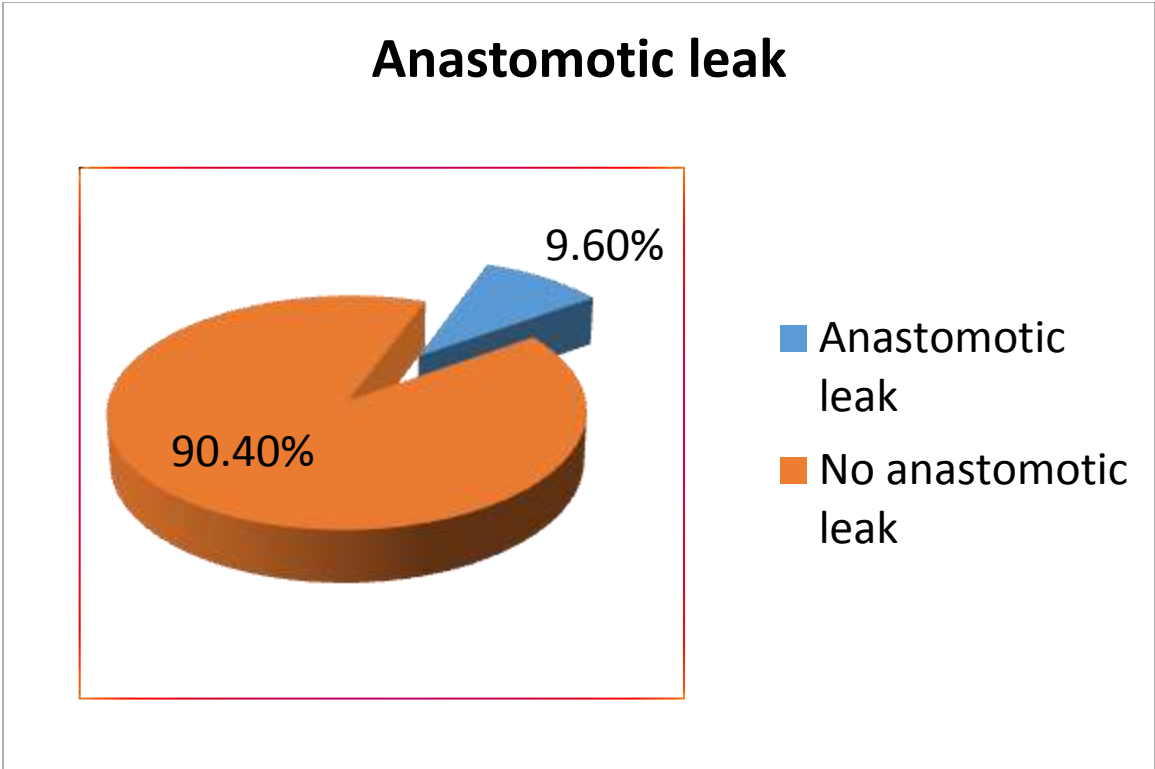


Figure 3: Pie chart of Anastomotic leak of patients operated for sigmoidectomy and have colo-colic anastomosis done at Bahir-Dar public tertiary hospitals from 2020- 2023

There were 26 patients who underwent Emergency Sigmoidectomy and colorectal anastomosis for acute Sigmoid Volvulus of which 3 patients develop anastomotic leak and this comprise 11.5% of Patients who underwent Emergency Sigmoidectomy and colorectal anastomosis for acute Sigmoid Volvulus in the study group and 13 patients develop anastomotic leak in the patient who underwent elective group sigmoidectomy and colorectal anastomosis for Redundant sigmoid and this comprises 9% the study group of patients that underwent elective sigmoidectomy and colorectal anastomosis for Redundant sigmoid . Otherwise there were 131 patients on the study group after elective sigmoidectomy and colorectal anastomosis for Redundant sigmoid and this comprises 91 % of elective surgery study group

Table 8; cross tabulation table of anastomotic leak Vs sex and type of surgery for patients operated for sigmoidectomy and have colo-colic anastomosis done at Bahir-Dar public tertiary hospitals from 2020- 2023

Anastomotic leak		Yes	N0	Total
Sex	Male	15 (9.4%)	145(90.6)	160(100)
	Female	1(10%)	9(90%)	10(100%)
	Total	16 (9.4)	154(90.6)	170(100%)
Type of surgery	Emergency	3(11.5%)	23(88.5%)	26(100%)
	Elective	13(9%)	131(91%)	144(100%)
	Total	16(9.4%)	154(90.6%)	170(100%)

10. Mortality

There were no mortality documented within 30 days post-operative but there were two patients who had ICU Admission both of the patients were from Anastomotic leak group

Table 9; cross tabulation table of Anastomotic leak Vs ICU admission for patients operated for sigmoidectomy and have colo-colic anastomosis done at Bahir-Dar public tertiary hospitals from 2020- 2023

Anastomotic leak		Yes	N0	Total
ICU Admission	Yes	2	0	2
	No	14	154	168
	Total	16	154	170

Table 10: *Bivariable and multivariable logistic regression analysis for factors (predictors) associated with anastomotic leak for patients operated for sigmoidectomy and colo-colic anastomosis done at bahir-dar public tertiary hospitals from 2020- 2023 G.C*

<i>VARIABLE</i>	<i>CATEGORY</i>	<i>Anastomotic Leak</i>			<i>COR (95%CI)</i>	<i>P-value</i>	<i>AOR (95%CI)</i>	<i>p-value</i>
		<i>Yes</i>	<i>No</i>	<i>Total</i>				
Age	18-40	2	32	32				
	40-60	6	69	75	2.415(0.483-12.087)	0.283		
	>60	8	53	61	1.736(0.568-5.306)	0.333		
Sex	Male	15	145	160	1.074 (0.127-9.128)	0.948		
	Female	1	9	10				
	Emergency	3	23	26	0.761(0.201-2.880)	0.687		
	Elective	13	131	144				
Duration of operation	≤120 min	3	124	127	17.91(4.798 - 66.861)	0.000		
	>120 min	13	30	43			22.556. (5.467-93.058)	0.0006
Systolic BP	90mmHg-120mmHg	8	123	131	3.968 (1.380 - 11.409)	0.011		
	>120mmHg	8	31	39			4.787 (1.140-20.092)	.032

11. DISCUSSION

Knowledge of prevalence and associated factors for anastomotic leak after gastrointestinal anastomosis has paramount importance for prevention, early detection, and intervention. The prevalence of anastomotic leak in this study was 9.6%. Which is slightly higher than other studies done by Gersam et al. and Gutema et al. both at Addis Abeba (9; 29). The usually acceptable range 2% and 10% (22) and is lower prevalence as compared to studies done by Daniel et al at Addis Abeba

The male pelvic cavity is relatively narrow, which increases the difficulty making it difficult to expose the surgical field, makes dissection and anastomoses easily damages surrounding blood vessels and tissues, thus affecting the blood supply of the anastomotic site. Furthermore, this will lead to high tension levels at the anastomosis site, which will lead to inadequate blood supply (26).

In this study, prevalence is almost equal in both male and female 9.4% and 10% respectively. COR was 1.074, p-value of 0.948. This is true in most other studies (29,34); however some reported leak rate is more in male (26; 33).

According to this study, there is no difference among different age group (p value 0.441, COR 0.986). Studies showed AL can occur in any group but advanced age has been reported as a risk factor for AL in studies by Chi Zhou et al China. (37)

The fact that age in itself in otherwise healthy and fit patients does not seem to be a contraindication for primary anastomosis. Increased age may increase the risk for comorbidity, but still many elderly patients may be perfectly healthy. (29)

There is no difference in anastomotic leak in this study in patients operated on emergency (11.5%) basis for acute sigmoid and elective cases (9%). Though Emergency surgery, which intuitively should put patients at a higher risk for adverse postoperative events, was indeed reported to be associated with AL by other studies (22; 29) In our study, emergency surgery were found among limited statistical power of this assessment in our analysis (COR 0.761, p-value 0.687). This is also Supported by other studies too (22; 34).

Operation time is also a recognized risk factor for AL, especially when the surgery is difficult or when the surgeon is unfamiliar with the procedure and its duration depends partly on the proficiency of the surgeon and partly on the difficulty of the surgery. The contamination rate of peritoneal fluid will increase. Therefore, the prolongation of the operation time will inevitably increase bacterial exposure and the risk of anastomotic bacterial infection, thereby affecting the healing of the anastomosis (26; 32). In our study, 43 (23.5%) patients had an operative time of 120 min or more; among them, 13 patients had AL. Univariate analysis showed that a duration of operation >120 min was

significantly different between the two groups (81.3% vs 18.8%, COR 9.625 $P < .000018$). Multivariate logistic regression analysis showed that a duration of operation ≥ 120 min was an independent risk factor for AL (AOR = 22.556., 95% CI = 5.467-93.058 $P = 0.000016$).

Therefore, for patients with longer operative times, distal rectal irrigation should be used prior to delivery of the proximal colon through the rectum to minimize the risk of contamination. In addition, a temporary ileostomy can be considered when necessary (26)

This study shows that 50% of anastomotic leak is in patients with a Systolic BP greater than 120mmHg. Univariate analysis showed that a Systolic BP of 120mmHg or more was significantly different patients with BP of 90mmHg-120mmHg (COR 3.968 (1.380 - 11.409) $P < .011$). Multivariate logistic regression analysis showed that Systolic BP greater than 120mmHg was an independent risk factor for AL (AOR-4.787, CI (1.140-20.092) P value.032).

It also showed that high Blood pressure is a risk factor for anastomotic leak and postoperative mortality, confirming the results suggested by others. Ischemia of anastomotic tissues is advocated as a cause of anastomotic leak, but the fact that, during anesthesia, blood pressure tends to decrease resulting in episodes of intraoperative hypotension and micro vascular ischemia is often underestimated. Hypertensive patients are prone to experience intraoperative hemodynamic instability, which can affect postoperative outcomes, such as increasing anastomotic leak, poor graft function after transplantation and postoperative mortality (33).

Hence, this study suggested a role for rehabilitation in patients with high blood pressure in the perioperative phase of colorectal surgery, and warranted the need to investigate further the potential effects of inotropes/vasopressors. Regulating their use during surgery might be useful to optimise blood flow and pressures as well as splanchnic vasoconstriction, tissue hypoxia and any possible risk factor for anastomotic leak(33).

CONCLUSION

Anastomotic leak remains a frequent clinical problem in our society. Prolonged intra operative time and uncontrolled preoperative Hypertension is associated with overall adverse outcome.

RECOMENDATION

We recommend for surgical society to have Patients with longer operative times, distal rectal irrigation. And also Prehabilitation in patients with high blood pressure in the perioperative phase of colorectal surgery, and warranted the need to investigate further the potential effects of inotropes/vasopressors.

We recommend for both TGSH and FHRH to have improvement on chart keeping and documentation patient data.

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