Addis Ababa University College of Health Science

Department of Surgery

30-day perioperative outcome and associated factors for morbidity and mortality of patients that undergo elective surgical intervention for colonic cancer in Tikur Anbesa and Zewditu Memorial hospital: A cross-sectional study. 2024

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Full title of the research project	30 day perioperative outcome and associated factors for morbidity and mortality of patients that undergo elective surgical intervention for colonic cancer in Tikur Anbesa and Zewditu memorial hospital: A cross-sectional prospective study.
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Name of Advisor(s)	Dr. Abel Shiferaw (Consultant General and colorectal Surgeon)
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APPROVAL SHEET

COLLEGE HEALTH SCIENCE SCHOOL OF ALLIED SCIENCES DEPARTMENT OF SURGERY

I, the undersigned general surgery resident, declare that I have submitted my original work on a title 30-day perioperative outcome and associated factors for morbidity and mortality of patients that undergo elective surgical intervention for colonic cancer in Tikur Anbesa and Zewditu Memorial hospital: A cross-sectional study for the examination.

Submitted by:

Adamzer Mulugeta	Signature	Date

This thesis work has been submitted for examination with my approval as an advisor.

Approved by:

Dr Abel Shiferaw	Signature	Date

Statement of the Author

I hereby declare that this thesis is my original work and has not been presented for a degree in any other university and all sources of material used for this thesis have been duly acknowledged.

Name: Adamzer Mulugeta (MD)

Signature: _____

Date:_____

Acknowledgment

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List of abbreviations

Ca: Cancer

POC: Post-operative complications

ERAS: Enhanced Recovery after Surgery

DM: Diabetes Mellitus

HTN: Hypertension

BMI: Body Mass Index

HNPCC: Hereditary Nonpolyposis Colon Cancer

SSI- Surgical Site Infection

Abstract

Background

Colorectal cancer remains a significant global health challenge, particularly in Ethiopia, where the incidence is rising. With this rise has come the increment of surgeries being done with curative intent with subsequent implications on morbidity and mortality of patients.

Objectives

This cross-sectional study aims to evaluate the 30-day perioperative outcomes of patients undergoing elective surgical interventions for colonic cancer at Tikur Anbesa Specialized Hospital and Zewditu Memorial Hospital in Addis Ababa to assess the prevalence and risk factors of postoperative complications and mortality.

Method

Data from 36 patients, aged over 18 years, who were admitted to the two hospitals on elective bases were analyzed to assess the prevalence and risk factors of postoperative complications and mortality.

Result

Findings indicate a 22.2% complication rate and a 5% mortality rate within 30 days post-surgery. Female patients demonstrated a significantly higher risk of complications or death compared to males (RR=4.6). Other critical risk factors included prolonged operative time, significant intraoperative blood loss, and low preoperative albumin levels, all associated with adverse outcomes.

Conclusion

Most complications were surgical site infections, underscoring the need for stringent infection control measures. While death occurred from medical complications, majorly hospital-acquired pneumonia. Addressing preoperative nutritional deficiencies and optimizing surgical techniques will lead to good patient perioperative outcomes.

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1. Introduction

1.1. Background

Colorectal cancer, also known as colon cancer or CRC, is a significant type of cancer characterized by high incidence and mortality rates in developed nations. Within the United States, colorectal cancer stands as the third most prevalent diagnosis and cause of cancer-related deaths among both sexes. On a global scale, this condition maintains its position as the third most common malignancy, yet it holds the second spot in terms of mortality rates, just behind lung cancer. (25)

The majority of colon cancer cases are considered sporadic, while around 5 percent can be attributed to an inherited genetic mutation, primarily stemming from conditions like Lynch syndrome (hereditary nonpolyposis colon cancer or HNPCC) and familial adenomatous polyposis (FAP). The progression from normal colon epithelium to invasive cancer typically unfolds over several years and commonly follows a series of events marked by the accumulation of genetic mutations, adenoma formation, and eventual carcinogenesis (known as the adenoma-carcinoma sequence). However, certain cancers may deviate and follow alternative pathways, such as those involving DNA mismatch repair (MMR) and the BRAF gene.(26,27,28,29)

Colon adenocarcinoma stands out as the predominant form of colonic malignancy, accounting for over 90% of cases, while neuroendocrine and gastrointestinal stromal tumors, as well as lymphomas, make up the remaining cases. The pathologic diagnosis is often established through biopsy and further refined based on the final pathology in cases where the patient undergoes definitive resection. (30)

The manifestation and severity of symptomatic colonic cancers vary depending on the location and size of the tumor. Symptoms that typically prompt diagnostic colonoscopies include rectal bleeding (37%), abdominal pain (34%), and anemia (23%). Right-sided tumors commonly present with anemia, whereas left-sided lesions are more likely to cause defecation disturbances. In some instances, patients may experience acute surgical emergencies resulting from tumor-related issues like obstruction, perforation, or bleeding. Advanced stages of the disease can introduce a range of symptoms, contingent on the affected organ. (33)

For localized early-stage colon cancer, surgical resection serves as the primary treatment modality. The pathological stage represents a critical prognostic factor, guiding the necessity for additional

therapies such as chemotherapy, immunotherapy, or occasionally radiation. Post-treatment surveillance plays a crucial role in detecting metastatic disease and local recurrence, which could potentially be managed through multimodality therapy. Palliative systemic therapy is typically reserved for cases of nonresectable or widely metastatic disease, aiming to enhance the quality of life and extend survival rates. (31,32)

1.2. Statement of the problem

In the past few decades, there has been a notable increase in the incidence of colorectal cancers, a trend that is projected to escalate significantly over the next two decades.

This surge in colorectal cancer cases has prompted a rise in surgical interventions with curative intent in Ethiopia, a developing country, particularly due to advancements in surgical training and the establishment of chemo-radiotherapy centers across the nation. Consequently, our patients, surgeons, and healthcare facilities are grappling with the escalating burden of this disease daily.

The majority of our patients face challenges associated with low socioeconomic status, leading to a higher prevalence of comorbid conditions such as hypertension, diabetes mellitus, low body mass index, adult-onset malnutrition, and immunosuppression from various causes, all of which could adversely impact surgical outcomes.

Given the increasing diagnoses of colorectal cancer, surgeons are increasingly tasked with performing surgical interventions at a growing rate. However, the exposure to essential surgical techniques required for effective treatment has only recently begun to receive significant emphasis in training programs. As the number of patients undergoing colonic surgery rises, there is a pressing need for studies to assess the efficacy of the surgical interventions being administered. Despite this urgency, there is a paucity of research examining the short and long-term outcomes of patients undergoing surgical procedures at a national level. Therefore, the primary objective of this study is to evaluate the morbidity and mortality rates among patients who have undergone colorectal surgeries at Tikur Anbesa Specialized Hospital, the foremost center for colorectal surgery in the region, as well as at Zewditu Memorial Hospital, where colorectal surgeries are performed by physicians from the colorectal surgical unit at Tikur Anbesa.

1.3. Significance of the study

With the disparity between the patient condition, exposure of surgeons, and institutional limitations from the Western setups, the operative outcome of patients undergoing surgical treatment remains largely unevaluated in Ethiopia.

Assessing the operative outcome of patients will allow the institutions and surgeons involved to have institution-level knowledge that can be used to give insight into the level of care that is being given and will push for more research with specific goals in the increment of quality of care.

2. Literature review

Incidence rates of Colonic cancer have shown a tendency to remain high in developed countries, although recent trends suggest a stabilization or even a decrease in some instances. (1) There has been an increase in the occurrence of these cancers in certain low- and middle-income countries, possibly signaling a shift towards the adoption of more westernized lifestyles. Colorectal cancers are the third most common malignancy in sub-Saharan Africa. (2,3,21)

Advancements in diagnostic and therapeutic sciences have allowed early diagnosis and treatment of cancer. Colorectal cancer is one of the most commonly reported cancers, particularly in elderly patients. Methods Open and laparoscopic surgeries are used for the removal of the tumor, along with chemotherapy, depending on the stage of cancer. (5)

The incidence of CRC in Ethiopia is rising, with an estimated rate of 8.5 and 6.3 per 100,000 for men and women, respectively in 2019. (4) In Addis Ababa, CRC is the most common cancer among men, accounting for 12.4% of all cancers, and the fourth most common cancer among women, accounting for 5.4% of all cancers. (22) CRC also accounts for 12% of cancer cases at the oncology ward at Tikur Anbesa Specialized Hospital (TASH), and 7.7% of all cancer cases in Addis Ababa. (23,24)

Data indicates that minimally invasive colectomy procedures, including both laparoscopic and robotic approaches, have demonstrated fewer complications and shorter hospital stays when compared to traditional open surgery methods. All three surgical techniques have shown similar effectiveness in treating primary resectable colon cancer, with variations in outcomes mainly noticeable in the early postoperative phase. (6,7)

Laparoscopic right colon resection for colon cancer has been linked to reduced operative trauma and faster recovery rates in contrast to open surgery. This assertion is supported by evidence such as shorter hospital stays and decreased blood loss during laparoscopic interventions. Notably, the research did not reveal significant discrepancies in severe complications, reoperations, readmissions, or mortality rates between patients undergoing laparoscopic versus open surgery, suggesting comparable postoperative outcomes in terms of complications and patient safety. (6,7)

The presence of postoperative complications remains a significant determinant of the length of a patient's hospital stay following colonic cancer surgery. In a study aimed at characterizing the nature, frequency, severity, and consequences of in-hospital postoperative complications (POCs)

in elderly individuals, medical POCs were found to be more prevalent than surgical POCs. Among the most common surgical POCs reported were surgical site infections, wound dehiscence/bleeding, anastomotic leaks, and surgical site bleeding. Postoperative mortality occurring during hospitalization was primarily attributed to septic shock and cardiopulmonary causes. (8,9)

Various factors influence the outcomes of colorectal surgical procedures, including the quality of care provided, patient-specific characteristics, preoperative risk factors, and specific details related to the operation. Factors such as body mass index (BMI), duration of surgery, and the experience of the surgeon stand out as key risk factors that play a significant role in determining the occurrence of complications in the majority of cases. (10)

Obesity is widely recognized as a significant risk factor that leads to elevated rates of complications in a diverse array of surgical procedures. Studies have shown that an increased Body Mass Index (BMI) is independently linked to surgical site infections (SSI), portal vein thrombosis, and deep vein thrombosis. The incidence of complications tends to rise with longer operative durations, a relationship that has been consistently demonstrated in various medical investigations. (10)

Notably, prolonged operative time has been identified as a distinct risk factor for the occurrence of anastomotic leak following colorectal surgery, highlighting the critical impact of surgical duration on postoperative outcomes. (11,12)

Conversely, malnutrition and hypoalbuminemia represent additional factors that can significantly influence the operative results of patients undergoing surgeries for colonic cancer. The presence of low albumin levels has emerged as a crucial indicator for identifying patients who are at heightened risk for complications subsequent to colorectal cancer surgery, including anastomotic leak, surgical site infections, and other medical issues. (13,16)

According to studies, there is not a significant difference in the rate of early postoperative complications in patients above the age of 75 and below 75 despite the increased operative risk in those above the age of 75. (14) However, young adults who are diagnosed with colorectal cancer tend to present with more advanced-stage disease and experience poorer survival rates compared to older individuals, underscoring the importance of age as a prognostic factor in this patient population. (15)

In the context of colorectal cancer surgery, excessive blood loss during the surgical procedure may pose a greater threat to patient survival than the actual transfusion of allogeneic red blood cells. It is theorized that preoperative anemia plays a pivotal role in necessitating blood transfusions during the perioperative period, potentially exacerbating both mortality and morbidity risks for the patient. The intricate interplay of various physiological factors underscores the complexity of managing patients undergoing colorectal cancer surgeries and highlights the multifaceted nature of postoperative outcomes. (17)

When considering the development of postoperative complications, patient-specific factors are found to play a far more substantial role than the influence of individual surgeons or healthcare facilities. Patients with underlying comorbidities have been shown to contribute significantly more to the likelihood of experiencing complications following surgical interventions, emphasizing the importance of comprehensive preoperative patient assessments and risk stratification. This patient-centered approach underscores the need for personalized care plans that address individual medical needs and optimize surgical outcomes. (18)

Over the past two decades, the implementation of Enhanced Recovery after Surgery (ERAS) protocols has demonstrated favorable outcomes across various surgical specialties. Research examining the outcomes of patients undergoing colorectal surgery over a four-year period revealed that while major complications and rates of anastomotic leakage were comparable between ERAS and non-ERAS groups, the ERAS cohort exhibited significantly shorter mean lengths of hospital stay (9.2 days versus 12.7 days) and reduced costs per case. These findings underscore the potential benefits of adopting ERAS protocols in enhancing postoperative recovery and optimizing resource utilization in healthcare settings. (19)

Similarly, a study conducted in France among hospitals adhering to ERAS protocols found that higher levels of compliance were associated with decreased hospital stays following elective colectomy for cancer, highlighting the positive impact of standardized perioperative care pathways on patient outcomes. (21) In a separate study in the United States that aimed to investigate socioeconomic disparities in patients from low- and high-income backgrounds, the implementation of an ERAS program helped mitigate outcome discrepancies in patients from economically disadvantaged neighborhoods, although disparities in length of hospital stay persisted. These findings emphasize the importance of addressing social determinants of health and implementing evidence-based interventions to promote equitable healthcare outcomes for all patient populations. (22)

3. Objectives

3.1. General

To assess the 7 and 30-day perioperative outcome of patients who undergo surgical intervention for colonic cancer

3.2. Specific

1. To identify the main 7-day perioperative outcomes during the study period.

2. To uncover the major risk factors for patient mortality and morbidity post-surgery 30-day study period.

4. Methods

4.1. Study area

Tikur Anbesa Specialized Hospital and Zewditu Memorial Hospital, Addis Ababa, Ethiopia.

4.2. Study design

This study is an institution-based Cross-sectional study to be conducted in a 6-month period from June 1 to November 30 2024 G.C.

4.3. Source population

Surgical colorectal patients were admitted to Tikur Anbesa Specialized Hospital and Zewditu Memorial Hospital surgical unit during the study period.

4.4. Study population

All patients were admitted on an elective basis with the diagnosis of colonic cancer in the study period.

4.5. Inclusion criteria

Patients aged>18 were admitted on elective bases in the selected government hospitals with the diagnosis of colonic cancer, and who gave informed consent to participate in the study.

4.6. Exclusion criteria

- Patients admitted and operated on an emergency basis.
- Patients who did not undergo surgical intervention either due to medical or surgical reasons.
- Patients who do not consent to participate in the study.

4.7. Study Variables

4.7.1. Independent variables

Patient Characteristics: Age, Sex, length of complaint, colonic cancer, preoperative albumin, preoperative hemoglobin level, patient comorbidities (HTN, DM, Obesity), operation time, blood transfusion.

Type of surgical intervention: Laparoscopic or open

4.7.2. Dependent Variables

Discharged improved, Developed complications, and Expired in the hospital.

4.8. Data collection method and procedure

Data will be collected during working hours and this will be conducted by three personnel for an estimated 6 months at Tikur Anbesa Specialized Hospital and Zewditu Memorial Hospital. We will review electronic or paper-based medical records of patients who have undergone elective surgical treatment for colonic ca and additional interview questions will be used.

4.9. Data management and analysis

The data collected will be coded and entered into a computer using SPSS version 29 for analysis and interpretation. Descriptive and analytic (bivariate and multivariate) logistic regression analysis will be implemented to explore and determine the relationship between predictors on outcome variables. Multiple logistic regression analysis will be used to control confounders.

4.10. Data quality control measures

After carefully adopting other published journal articles into our current context, structured questions have been drafted. The Checklist is checked thoroughly for completion, objective orientedness, and variable-based. Finally, data will also be checked for consistency and completeness before entry into computer software for analysis

4.11. Ethical Consideration

Ethical clearance will be obtained from the research ethics committee of Addis Ababa University Faculty of Medicine before data collection. The objective of the study and its implication for the community will be explained.

To keep the anonymity of study participants, code numbers rather than personal identifiers will be used and all questionnaires will be sealed with post-following data collection at each department. Finally, all questionnaires will be locked after data entry completion and will be destroyed at the end of the study.

4.12. Data dissemination and utilization of results

After approval, the study results will be presented to AAU, TASH Department of General Surgery.

For future reference, a copy of the article will be kept in the College of Health Science library at AAU.

5. Result

5.1 Sociodemographic characteristics of the study participants

Most of the study participants were in the age group of 41-60 years with mean and SD age of 53.2±11.86 respectively. More than half of the participants were male and 61.1% had <1 year duration illness. Thirty-nine percent of the participants had comorbid disease. Of those comorbid diseases, hypertensive disease accounts for 54.5%. Concerning the occurrence of complications/death during the 30-day perioperative period, the majority of the complications/deaths occur in the age group of 41-60 years. The majority of the complications/deaths occur in females and 30.8% of the complications occur from those having duration of illness 1-3 years duration. Of those having comorbidities, 21.4% had developed complications/death. The sex of the study participants was the statistically significant factor for complications/death during perioperative outcomes.

Table 1. The sociodemographic characteristics

Variable	Total (%)	30 days perioperative outcome		p-value
		improved	Complicated/death	
Age in years				
18-40	5(13.9)	3(60)	2(40)	0.692
41-60	23(63.9)	18(78.3)	5(21.7)	
61-75	7(19.4)	6(85.7)	1(14.3)	
>75	1(2.8)	1(100)	0	
Sex				0.024
Male	19(52.8)	17(89.5)	2(10.5)	
Female	17(47.2)	11(64.7)	6(35.3)	
Duration of illness in years				0.594
<1	22(61.1)	18(81.8)	4(18.2)	
1-3	13(36.1)	9(69.2)	4(30.8)	
>3	1(2.8)	1(100)	0	
Presence of comorbidity				0.927
Yes	14(38.9)	11(78.6)	3(21.4)	
No	22(61.1)	17(77.3)	5(22.7)	
Comorbidities				0.810
Hypertension	6(54.5)	4(66.7)	2(33.3)	
DM	4(36.4)	3(75)	1(25)	
Asthma	1(0.9)	1(100)	0	
RVI	3(27.3)	3(100)	0	

5.2 The preoperative health condition of the study participants

Sixty-one percent of the participants had a body mass index of 20-25kg/m2 and 80.6% had a preoperative hemoglobin level of 10-15gm/dl. Almost fifty-six percent of the participants had albumin levels of 3.5-4mg/dl and 25% of the participants received neoadjuvant. Fifty-three percent of the participants had stage-II tumors and 11.1% of the participants had prior abdominal surgery. The 30th day's perioperative outcome characteristics as shown in Table 2 below. Albumin level was a statistically significant factor for complication/death of the study participants

Table 2. The preoperative health condition of the study participants

Variable	Total (%)	30 days perioperative outcome		p-value
		improved	Complicated/death	
BMI				0.465
<20	14(38.9)	10(71.4)	4(28.6)	
20-25	22(61.1)	18(81.8)	4(18.2)	
Pre hemoglobin				0.574
8-10	7(19.4)	6(85.7)	1(14.3)	
10-15	29(80.6)	22(75.9)	7(24.1)	
ALB (gm/dl)				0.014
3-3.5	11(30.6)	7(63.6)	4(36.4)	
3.5-4	20(55.6)	18(90)	2(10)	
>4	5(13.9)	3(60)	2(40)	
Neoadjuvant				0.355
Yes	9(25)	6(66.7)	3(33.3)	
No	27(75)	22(81.5)	5(18.5)	
Stage of the tumor				0.685
I	2(5.6)	2(100)	0	
II	19(52.8)	15(78.9)	4(21.1)	
III	15(41.7)	11(73.3)	4(26.7)	
Prior abdominal surgery history in relation to the Tumor				0.887
Yes	4(11.1)	3(75)	1(25)	
No	32(88.9)	25(78.1)	7(21.9)	

5.3 Intra-operation-related characteristics of the study participants

In this study, 55.6% of the procedure took 2-4 hours and 44.4% of the participants had an estimated blood loss of 200-500ml. Sixty-seven percent of the participants had anastomosis and 11.1% were transfused blood. No patients used vasopressor. A higher percent of complications or death were seen with those of duration of surgery 1-2 hours and 6 complication/death cases were from those of 200-500 blood loss. Almost all cases of complication or death were from those having anastomosis and also anastomosis was statistically significant for the 30-day perioperative complication/death outcome.

Table 3. Intraoperative related characteristics of the study participants

Variable	Total (%)	30 days perioperative outcome		p-value
		improved	Complicated/death	
Duration of surgery in hours				0.043
1-2	6(16.7)	3(50)	3(50)	
2-4	20(55.6)	18(90)	2(10)	
>4	10(27.8)	7(70)	3(30)	
Estimated blood loss in ml				0.223
<200	4(11.1)	4(100)	0	
200-500	16(44.4)	10(62.5)	6(37.5)	
500-1000	14(38.9)	12(85.7)	2(14.3)	
>1000	2(5.6)	2(100)	0	
Anastomosis				0.016
Yes	24(66.7)	17(70.8)	7(29.2)	
No	12(33.3)	11(91.7)	1(8.3)	
Blood transfusion				0.887
Yes	4(11.1)	3(75)	1(25)	
No	32(88.9)	25(78.1)	7(21.9)	
Vasopressor				
No	36(100)	28(77.8)	8(22.2)	

5.4 Postoperative condition of the participant's related characteristics

During the seventh day peri-operative period, 30.6% (n=11) developed complications, while 69.4%(n=25) were improved and discharged.

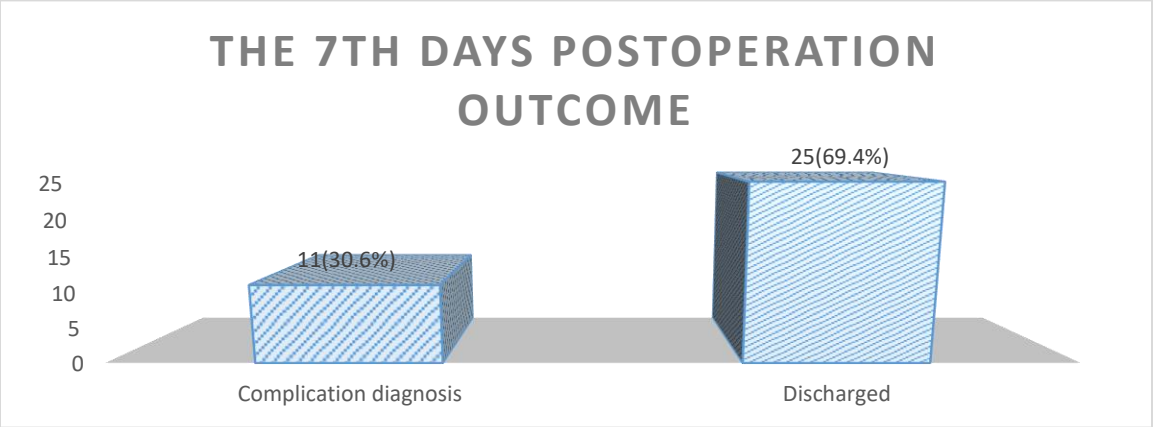

Figure 1. The 7th-day perioperative day's outcome of the study participants.

Seventy-two percent of the study participants had a post-operation hemoglobin level of 10-15mg/dl and from those having complications, SSI accounts for 81.8%. Two cases had a medical diagnosis and all cases had a medical diagnosis of Hospital-acquired pneumonia.

Table 4. Postoperative condition of the participants' related characteristics

Variable	Total (%)	30 days perioperative outcome		p-value
		improved	Complicated/death	
Post-operative hemoglobin gm/dl				0.274
8-10	10(27.8)	9(90)	1(10)	
10-15	26(72.2)	19(73.1)	7(26.9)	
Types of complication in the 7th days post op (n=11)				0.454
Anastomotic leak	2(18.2)	1(50)	1(50)	
SSI	9(81.8)	8(88.9)	1(11.1)	
Medical diagnosis				0.437
Yes	2(5.6)	2(100)	0	
No	34(94.4)	26(76.5)	8(23.5)	
Types of medical diagnosis				
Pneumonia	2(100)	2(100)	0	
Death on the seventh-day post-operation				
yes	1(2.8)	0	1(100)	
No	35(97.2)	28(80)	6(20)	
Cause of death				
Septic shock	1(100)	0	1	

5.5 The patient status at the 30th perioperative period

The 30-day post-operation patient status revealed that 17% of the participants had developed complications, 5% of the patients had died, and 78% had surgical improvement.

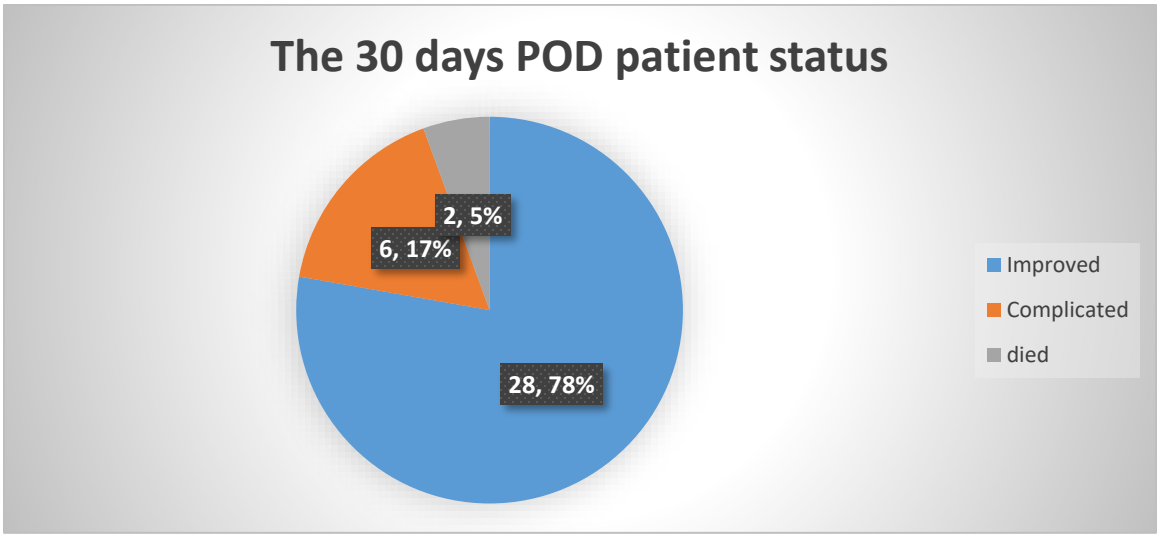

Figure 2. The patient status at the 30th perioperative period

5.6 The risk factors of 30 days perioperative complication or death

The risk ratio of the findings of the study revealed that participants whose sex female was 4.6 folds increased risk of developing complication/death compared to male participants (RR=4.6, 95%CI=1.79, 27.24), and participants having anastomosis had 3.5 folds increased risk of developing complication/death compared to its opposite compartment (RR=3.5, 95%CI=1.48, 25.28).

Table 5. The relative risk of the independent variable for the occurrence of developing Complications /death

variable	Complication/death	improved	RR	95%CI
Sex				
Male	1	17	ref	
female	6	11	4.6	1.79, 27.24
BMI				
<20	4	10	ref	
20-25	4	18	0.56	0.11, 2.72
Anastomosis				
Yes	7	17	3.5	1.48, 25.28
no	1	1	ref	

6. Discussion

In this study, 36 cases were undertaken in the study and from those 36.9% (n=11) developed complications in the 7th post-operation period. Of those SSI accounts for 81.8% of them. The finding of this study was supported by the study done in the Department of General Medical Oncology, University Hospitals Leuven, Leuven, Belgium, and Colentina General Surgery Clinic, Carol Davila University of Medicine and Pharmacy, Bucharest, Romania (8, 9). This may be due to the fact that colonic surgeries are inherently "clean-contaminated" or "contaminated" due to the presence of intestinal bacteria. Other hand, Poor nutritional status is common in cancer patients and impairs wound healing.

The relative risk of the study found that the female sex increased risk of developing complications/death compared to male participants (RR=4.6, 95%CI=1.79, 27.24). This may be due to females having additional pelvic organs compared to males. This anatomical feature can make colonic surgeries, especially those involving the rectum, technically more challenging and increase the risk of complications such as anastomotic leakage or nerve injury. The other reason may be due to females often having a higher percentage of subcutaneous fat, which can predispose them to SSI due to decreased vascularity in adipose tissue, resulting in impaired wound healing. Estrogen and other hormonal factors can also affect immune response and tissue healing.

During the 30th day perioperative period 22.2%(n=8) of the participants developed complications/death and from those 6 cases were complicated and 2 cases had died. The finding was in line with the study done by Thiago et al (20). Duration of surgery was a statistically significant factor using the chi-square test for developing complication/death. This finding was in line with the study done by Manilich, E. et al, Dimick JB et al and Procter LD (10-12). This may be due to longer surgeries increasing the duration of open exposure, allowing for bacterial contamination of the surgical site. Even with strict sterile techniques, the risk of breaches in sterility increases with time. Furthermore, a longer operation allows more time for bacteria from the gastrointestinal tract or skin to invade the surgical field.

The finding of the study also found that low albumin level was a statistically significance factor for the occurrence of complication/death. This finding was supported by the study finding of the study done by David, W. et al and Cruse PJ, et al (13, 16). This is due to low albumin often

reflecting underlying malnutrition, which is common in cancer patients due to reduced intake, or metabolic demands of the tumor. Malnutrition leads to reduced energy reserves, decreased healing capacity, and increased susceptibility to complications.

In this study, most of the complications occurred in the age of below 60 years. This finding was supported by the study finding of the study done by Newton., T, et al (15). This might be due to the rarity of colonic cancer in younger individuals leading to symptoms being misattributed to benign conditions, leading to delayed diagnosis and more advanced disease, which increases the complexity of surgical intervention.

The finding also revealed that all the complications developed with those of the case having intraoperative bleeding of >500ml. The finding was congruent with the study done by Christina, et al (17). This may be due to controlling bleeding adding time to the procedure, which itself is a known risk factor for postoperative complications, including infections and anastomotic leakage.

7. Conclusion and Recommendations

In this study, the overall 30-day perioperative outcome of our patients is good with a low number of complications and deaths. But for those in whom complications/Death occurred, Duration of surgery and low albumin level were a statistically significance factor. Hence preoperative nutritional rehabilitation and decreasing the operative time will help in the decrement of complications/death in our elective colorectal surgical patients.

8. Limitation

As the number of Patients that were included in the study were low, further research and investigations are needed to see the grand picture of our patient's operative outcome.

9. References

1. H. Sung, J. Ferlay, R.L. Siegel, M. Laversanne, I. Soerjomataram, A. Jemal, F. Bray Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries CA Cancer J. Clin., 71 (2021), pp. 209-249

2. Arnold M, Sierra MS, Laversanne M, et al. Global patterns and trends in colorectal cancer incidence and mortality. Gut 2017;66:683-91. 10.1136/gutjnl-2015-310912

3. Siegel RL, Torre LA, Soerjomataram I, Hayes RB, Bray F, Weber TK, Jemal A. Global patterns and trends in colorectal cancer incidence in young adults. Gut 2019; 68: 2179-2185

4. Sung H, Ferlay J, Siegel RL, et al. Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA Cancer J Clin. 2021; 71(3): 209-249.

5. Haleh, Pak., Leila, Haji, Maghsoudi., Ali, Soltanian., Farshid, Gholami. Surgical complications in colorectal cancer patients.. Annals of medicine and surgery, (2020).;55:13-18. Doi: 10.1016/J.AMSU.2020.04.024

6. Jonathan, B., Yuval., Hannah, Thompson., Floris, S, Verheij., Megan, Fiasconaro., Sujata, Patil., Maria, Widmar., Iris, H, Wei., Emmanouil, P., Pappou., J., R., Smith., Garrett, M., Nash., Martin, R., Weiser., Philip, B., Paty., Julio, Garcia-Aguilar. Comparison of Robotic, Laparoscopic, and Open Resections of Nonmetastatic Colon Cancer.. Diseases of The Colon & Rectum, (2022). doi: 10.1097/DCR.0000000000002637

7. Basil, J, Ammori., Hanna, Kakish., Huthaifa, Asmer., Hani, Al-Najjar., Osama, H, Hamed., Ali, Al, Ebous., Ali, Dabous., Faiez, Daoud., Mahmoud, Al-Masri. A Case-matched Comparative Study of Laparoscopic Versus Open Right Colonic Resection for Colon Cancer: Developing Country Perspectives.. Surgical Laparoscopy Endoscopy & Percutaneous Techniques, (2021).;31(1):56-60. doi: 10.1097/SLE.0000000000000843

8. Katleen, Fagard., J., Casaer., Albert, Wolthuis., Johan, Flamaing., Koen, Milisen., Jean-Pierre, Lobelle., Hans, Wildiers., Cindy, Kenis. Postoperative complications in individuals aged

70 and over undergoing elective surgery for colorectal cancer.. Colorectal Disease, (2017).;19(9) doi: 10.1111/CODI.13821

9. Monika, Kozłowska., Stanisław, Głuszek. Analysis of complications after surgery for colorectal cancer with particular consideration to anastomotic leakage. (2015).;31(2):82-89. doi: 10.5114/MS.2015.52905

10. Elena, Manilich., Jon, D., Vogel., Ravi, P., Kiran., James, M., Church., Dilara, Seyidova-Khoshknabi., Feza, H., Remzi. Key factors associated with postoperative complications in patients undergoing colorectal surgery.. Diseases of The Colon & Rectum, (2012). doi: 10.1097/DCR.0B013E31827175F6

11. Dimick JB, Ghaferi AA, Osborne NH, Ko CY, Hall BL. Reliability adjustment for reporting hospital outcomes with surgery. Ann Surg. 2012;255:703–707

12. Procter LD, Davenport DL, Bernard AC, Zwischenberger JB. General surgical operative duration is associated with increased risk-adjusted infectious complication rates and length of hospital stay. J Am Coll Surg. 2010;210:60–65.e1

13. David, W., Larson., Mohamed, A., Abd, El, Aziz., William, Perry., Anne-Lise, D., D'Angelo., Kevin, T., Behm., Kellie, L., Mathis., Fabian, Grass. Additional Value of Preoperative Albumin for Surgical Risk Stratification among Colorectal Cancer Patients.. Annals of Nutrition and Metabolism, (2019).;76(6):422-430. doi: 10.1159/000514058

14. Jacek, Wydra., Wiesław, Janusz, Kruszewski., Wojciech, Jasiński., Mariusz, Szajewski., Maciej, Ciesielski., Jarosław, Szefel., Jakub, Walczak. Is Age a Risk Factor of Postoperative Complications in Colorectal Cancer? Polish Journal of Surgery, (2013).;85(9):491-495. doi: 10.2478/PJS-2013-0076

15. L, Newton., T, Munro., M, Hamid., J, Shabbir. Colorectal cancer in the young - outcomes following surgical management. Annals of The Royal College of Surgeons of England, (2021).;103(9):661-665. doi: 10.1308/RCSANN.2021.0049

16. Cruse PJ, Foord R. A five-year prospective study of 23,649 surgical wounds. Arch Surg. 1973;107:206

17. Christina, Jenkins., Albert, B., Lowenfels. Blood transfusion and colorectal cancer outcome.. Annals of Surgery, (2015).;261(3) doi: 10.1097/SLA.0000000000000615

18. Bamdad MC, Brown CS, Kamdar N, Weng W, Englesbe MJ, Lussiez A. Patient, Surgeon, or Hospital: Explaining Variation in Outcomes after Colectomy. J Am Coll Surg. 2022Mar 1;234(3):300-309. doi: 10.1097/XCS.0000000000000063. PMID: 35213493; PMCID: PMC10369366

19. Julian, Süsstrunk., Bettina, H, Müller-Stich., Alexander, Wilhelm., Daniel, C., Steinemann. Implementation of an Enhanced Recovery After Surgery (ERAS) Program in Colorectal Surgery: The Benefits of Late Adoption. British Journal of Surgery, (2023).;110(Supplement_5) doi: 10.1093/bjs/znad178.023

20. Thiago, Perez, Bernardes, de, Moraes., Groβe, Christian., Keranda, Pajarakan. A Breakthrough Improvement Collaborative Significantly Reduces Hospital Stay After Elective Colectomy for Cancer Across a Healthcare System. Annals of Surgery, (2022).;276(5):890-896. doi: 10.1097/sla.0000000000005646

21. Apostolos, Gaitanidis., Eric, Feliberti. Impact of Enhanced Recovery after Surgery Protocol on Reducing Disparity in Perioperative Outcomes in Low-Income Patients Undergoing Colorectal Surgery. Journal of The American College of Surgeons, (2022).;235(5): S46-S46. doi: 10.1097/01.xcs.0000893260.94960.d5

22. Memirie ST, Habtemariam MK, Asefa M, et al. Estimates of cancer incidence in Ethiopia in 2015 using population-based registry data. J Glob Oncol. 2018; 4: 1-11.

23. Feuchtner J, Mathewos A, Solomon A, et al. Addis Ababa population-based pattern of cancer therapy, Ethiopia. PLOS One. 2019; 14(9):e0219519.

24. Wondemagegnhu T. Pattern of cancer in Tikur Anbessa specialized hospital oncology Center in Ethiopia from 1998 to 2010. Int J Cancer Res Mol Mech. 2015; 1(1): 1-5.

25. Siegel RL, Miller KD, Wagle NS, Jemal A. Cancer statistics, 2023. CA Cancer J Clin. 2023 Jan;73(1):17-48.

26. Xiao JB, Leng AM, Zhang YQ, Wen Z, He J, Ye GN. CUEDC2: multifunctional roles in carcinogenesis. Front Biosci (Landmark Ed). 2019 Mar 01;24(5):935-946.

27. Gajendran M, Loganathan P, Jimenez G, Catinella AP, Ng N, Umapathy C, Ziade N, Hashash JG. A comprehensive review and update on ulcerative colitis. Dis Mon. 2019 Dec;65(12):100851.

28. Sokic-Milutinovic A. Appropriate Management of Attenuated Familial Adenomatous Polyposis: Report of a Case and Review of the Literature. Dig Dis. 2019;37(5):400-405.

29. Fabregas JC, Ramnaraign B, George TJ. Clinical Updates for Colon Cancer Care in 2022. Clin Colorectal Cancer. 2022 Sep;21(3):198-203

30. Schaad N, Berezowska S, Perren A, Hewer E. Impact of template-based synoptic reporting on completeness of surgical pathology reports. Virchows Arch. 2024 Jan;484(1):31-36.

31. Ven Fong Z, Chang DC, Lillemoe KD, Nipp RD, Tanabe KK, Qadan M. Contemporary Opportunity for Prehabilitation as Part of an Enhanced Recovery after Surgery Pathway in Colorectal Surgery. Clin Colon Rectal Surg. 2019 Mar;32(2):95-101.

32. PDQ Adult Treatment Editorial Board. PDQ Cancer Information Summaries [Internet]. National Cancer Institute (US); Bethesda (MD): Apr 25, 2024. Colon Cancer Treatment (PDQ®): Health Professional Version.

33. Menon G, Recio-Boiles A, Lotfollahzadeh S, et al. Colon Cancer. [Updated 2024 Apr 20]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan-.

Annex

Check List

In hospital perioperative outcome of patients with colonic carcinoma follow-up check-list

Part 1. Demographic data	
Age	1. 18-40 yrs 2. 41-60 yrs 3. 60-75 yrs 4. >75 yrs
Sex	1. Male 2. Female
Duration of illness	----------
Comorbidities	1. Hypertension 2. Diabetes 3. Asthma 4. Cardiac illness 5. Cirrhosis 6. Renal disease 7. RVI

Part two: Pre-operative conditions

BMI	1. <20 2. 20-25 3. >25
Hgb	1. 10-15 gm/dl 2. 8-10 gm/dl 3. <8 gm/dl
Albumin	1. 3.5-4 gm/dl 2. 3-3.5 gm/dl 3. 2.5-3 gm/dl 4. <2.5 gm/dl
Neoadjuvant chemotherapy	1. Yes 2. No
Staging of tumor	1. Stage I 2. Stage II 3. Stage III
Prior abdominal surgery history in relation to the Tumor	1. Yes 2. No

Part Three: Intra-op conditions

Operation time	1. 1-2 hrs 2. 2-4 hrs 3. > 4 hrs
Estimated Intra-op bleeding	1. <200 ml 2. 200 ml – 500ml 3. 500 ml – 1000 ml 4. > 1000 ml
Anastomotic surgery done	1. Yes 2. No
Any need for a transfusion	1. Yes 2. No
If yes how many	1. < 2 units 2. 2 – 4 units 3. > 4 units
Any need for vasopressors	1. Yes 2. No

Part Four: Post-Operative course

Post-operative Hgb	1. 10-15 gm/dl 2. 8-10 gm/dl 3. <8 gm/dl
7-day post-operative condition	1. Complication diagnosed 2. Discharged from the hospital 3. Patient died
Post-operative complications diagnosed	1. Anastomotic leak 2. Surgical site infection 3. Wound dehiscence 4. Bleeding 5. Medical complications
If diagnosed with a medical complication, what was the diagnosis?	1. Pneumonia 2. Deep vein thrombosis 3. Stroke 4. Myocardial infarction 5. Other
Possible Cause of death	1. Septic shock 2. Hemorrhagic shock 3. Myocardial ischemia 4. Pulmonary embolism

Approval of Advisors

Name of Clinical Advisor: _____

Signature: _____

Date: _____