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Research Article

Mortality Associated with Laparoscopic Surgery for Colon Cancer in a Tertiary Care Institution in Norte de Santander, Colombia: A Retrospective Analysis from 2020 to 2024 (Period A)

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Abstract

Colon cancer is a major cause of mortality worldwide. This study evaluates postoperative mortality and associated risk factors in patients undergoing laparoscopic resection, highlighting the benefits of this approach and the need to investigate outcomes and recurrence. The objective was to evaluate postoperative mortality in colon cancer treated laparoscopically, identify associated factors, the most frequent histopathologies, and the predominant location of the tumor in patients in a high-complexity hospital located in Norte de Santander, Colombia. A quantitative, descriptive, retrospective, and cross-sectional study was conducted, analyzing data from patients treated between 2020 and 2024 based on medical records. Risk factors, comorbidities, and postoperative complications were assessed. Statistical tests such as Chi-square, Student's t-test, Kaplan-Meier, and Receiver Operating Characteristic curves were applied to evaluate the efficacy and safety of laparoscopic management. Postoperative mortality in the laparoscopic group was 12.24%. The most common comorbidities were hypertension (19.80%) and diabetes mellitus (14.85%). Moderately differentiated adenocarcinoma was present in 44.90% of cases, with tumor distribution evenly distributed between the right and left colon (45.92% in each case). Clinical stage IIB was present in 22.11% of patients, and 42.11% were classified as T3. Postoperative mortality was 12.24%, primarily due to tumor progression. Factors associated with higher mortality included stage IIB, lymph node involvement (50.55%), and comorbidities such as hypertension and diabetes. Early staging and control of comorbidities are crucial to improve postoperative outcomes.

Keywords

Mortality, Laparoscopy, Surgical Management, Minimally Invasive Surgery, Risk Facto

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1. Introduction

Colon cancer is one of the most prevalent and lethal malignant neoplasms worldwide, with a multifactorial etiology that includes both genetic and environmental components. The standard treatment remains oncologic colectomy with negative margins, traditionally performed through open or laparoscopic approaches [1].

In recent decades, laparoscopy has proven to be a safe and effective alternative, associated with lower postoperative morbidity rates, faster recovery, and improved quality of life. However, questions remain regarding its long-term efficacy in terms of overall survival and tumor recurrence, including the possibility of neoplastic implantation at trocar entry sites [2, 3].

This study aims to evaluate mortality in patients undergoing laparoscopic resection for colon cancer and to analyze associated risk factors that may impact surgical outcomes [4].

2. Materials and Methods

A descriptive, cross-sectional study was conducted, taking data directly from the medical records of patients who underwent laparoscopic surgery for colon cancer treatment at a high-complexity, tertiary-level hospital between 2020 and 2024. The objective was to evaluate the safety and efficacy of laparoscopic management.

Data were extracted from the constantly updated database to analyze clinical and demographic variables (age, sex, risk factors) associated with mortality in patients with colon cancer treated laparoscopically.

Patients with complete medical histories, diagnosed with colon cancer by histopathological confirmation and treated laparoscopically, and over 18 years of age were included due to differences in surgical management and prognosis between pediatric and adult populations.

3. Results

From 2020 to the first half of 2024 (June), data were collected from 98 patients treated with laparoscopy for colon cancer. 53 (54.08%) were women and 45 (45.92%) were men. The proportion of female patients is the same as their male counterparts. The overall mean age of the patients was around 62.7 years, with a standard deviation of 15.05 years and a coefficient of variation (CV) of 23.99%, indicating homogeneity in the ages of this sample.

Two age groups or categories are established, in accordance with the guidelines of the World Health Organization (WHO): adulthood and older adults, as highlighted in Table 1. The category with the highest proportion of individuals is older adults, accounting for 61.22% of the sample.

Table 1. *Age Groups (years).*

Age (years)	Patients	%
Adulthood	38	38,78
Older adult	60	61,22
	98	100

The distribution of patients treated for CRC is uniform throughout the study period, except for 2024, which only includes data from half the year, with a representation of 10 cases, 10.20% (Table 2).

Table 2. *Percentage distribution by year of patients treated for colon cancer at HUEM.*

Year	Patients	%
2020	23	23,47
2021	23	23,47
2022	21	21,43
2023	21	21,43
2024	10	10,20
	98	100,00

Table 3. *Descriptive statistics of body mass index (BMI) (kg/m²). Overall, by age group and sex.*

	Mean	Deviation	C.V. (%)	Mínimum	Máximum
Overall	26,0	4,39	16,88	17,2	38,1
	Age group				
Adulthood	26,5	4,40	16,60	17,2	35,7
Older Adult	25,7	4,38	17,04	17,3	38,1

	Mean	Deviation	C.V. (%)	Mínimum	Máximum
	patient's gender				
Female	26,4	4,89	18,52	17,2	38,1
Male	25,5	3,70	14,51	17,3	33,1

The overall mean BMI observed in the studied population was 26.0 kg/m², a value that falls within the overweight range according to the criteria established by the World Health Organization (Table 4). This mean is accompanied by a standard deviation of 4.39 kg/m² and a coefficient of variation of 16.88%, indicating moderate dispersion and relative homogeneity in the weight-height relationship within the evaluated group. The extreme values ranged from a minimum of 17.2 kg/m² to a maximum of 38.1 kg/m², highlighting the presence of patients with both underweight and significant obesity.

Table 4. *Body mass index classification according to the World Health Organization.*

Underweight: BMI less than 18.5 kg/m²
Normal weight: BMI between 18.5 and 24.9 kg/m²
Overweight: BMI between 25 and 29.9 kg/m²
Obesity: BMI equal to or greater than 30 kg/m²

When disaggregating the data by age group, it was found that younger adults had an average BMI of 26.5 kg/m², while older adults had a slightly lower mean of 25.7 kg/m². In both cases, the values fall within the overweight range, although there is a trend toward lower BMI in older patients.

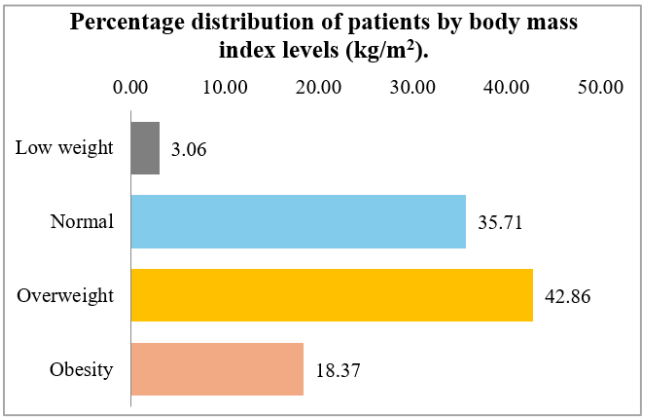

Figure 1. *Categorization of body mass index (BMI) (kg/m²).*

Regarding sex, it was observed that women had a higher average BMI of 26.4 kg/m², compared to men, who had an average of 25.5 kg/m². Both groups fall within the overweight category, with a slight but clinically relevant difference, considering that excess weight is a significant risk factor in the progression of colorectal cancer and the development of comorbidities such as hypertension, type 2 diabetes mellitus, and cardiovascular disease.

Table 5. *Categorization of body mass index (BMI) (kg/m²).*

Level	Patients	%
Underweight to normal	38	38.78%
Overweight to obesity	60	61.22%
Total	98	100%

Figure 1 shows the percentage distribution of patients according to body mass index (BMI) levels. The majority of patients fall within the overweight category, accounting for 42.86% (n=42), followed by those with a normal BMI (35.71%). About 18.37% (n=18) of patients are classified as obese, while only 3.06% (n=3) are underweight.

Complementarily, Table 5 groups these categories into two levels:

1) Underweight to normal, including 38 patients (38.78%)
2) Overweight to obesity, with 60 patients (61.22%)

This indicates that more than half of the evaluated patients are overweight, which may be associated with metabolic or cardiovascular risks and warrants preventive clinical attention.

Table 6. *Relationship between age groups and patient sex (%).*

Patient Sex by Age Group

Age (years)	Female	Male	Total
Adulthood	22.45%	16.33%	38.78%
Older Adult	31.63%	29.59%	61.22%
Total	54.08%	45.92%	100.00%

Table 7. *Relationship between age groups and BMI categories (%). BMI.*

Categories by Age Group

Age (years)	Underweight to Normal	Overweight to Obesity	Total
Adulthood	12.24%	26.53%	38.78%
Older Adult	26.53%	34.69%	61.22%
Total	38.78%	61.22%	100.00%

We can observe (Tables 6 and 7) that male patients aged 60 and over, or older adults, are more likely to have a BMI in the underweight to normal range, as their odds ratios (OR) are greater than zero (1.67 and 1.10, respectively). Similarly, adult patients and females are more likely to fall into the overweight to obesity category, with the same magnitude.

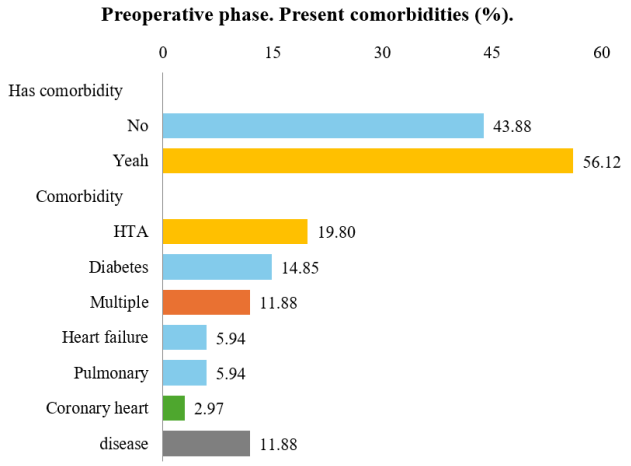

Figure 2. *Preoperative phase. Present comorbidities.*

It was observed that 56.12% (n=55) of the patients presented with at least one comorbidity. Considering the total sample of 98 patients, the most common comorbidities were hypertension, diabetes, and multiple conditions (Figure 2).

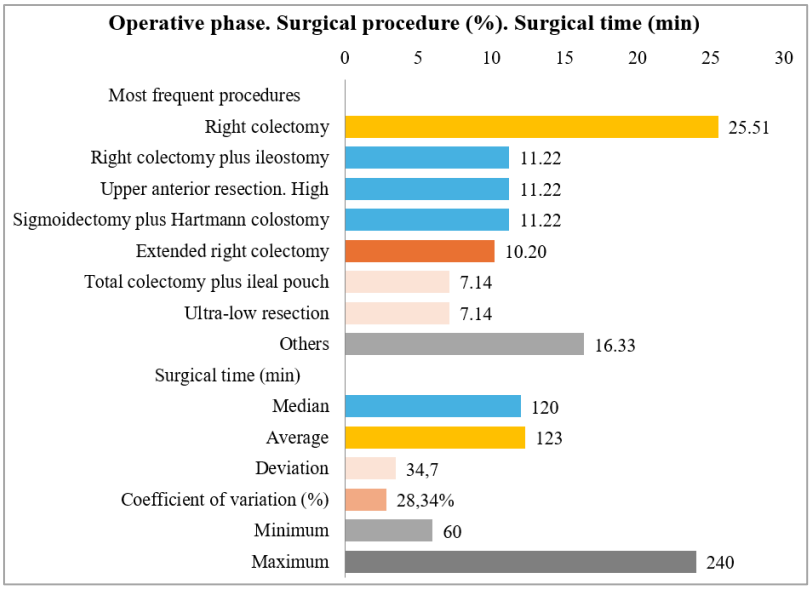

Figure 3. *Operative phase. Surgical procedure. Surgical time (minutes).*

Figure 3 illustrates the most frequent surgical procedures, among others. Right colectomy, at 25.51% (n=25), is the most commonly performed procedure on patients with CRC. It also summarizes the surgical time in some important statistics. The mean duration is 123 minutes; the median is 120 minutes, indicating that 50% of the surgeries take less and 50% take more than this time. The minimum time required for a surgical procedure was 60 minutes, while the maximum was 240 minutes.

Table 8. *Operative phase. Surgical conversion. Indication for conversion. Previous surgery. Which previous surgery?*

Items	Response	Patients	%
Surgical Conversion	No	93	94.90%

Items	Response	Patients	%
	Yes	5	5.10%
	Total	98	100%
Indication for Conversion	Adhesions	1	20.00%
	Technical difficulty	1	20.00%
	Tumor size	1	20.00%
	Infiltration to others	2	40.00%
	Total	5	100%
Previous Surgery	No	72	73.47%
	Yes	26	26.53%
	Total	98	100%
Which Previous Surgery?	Kocher incision	8	30.77%
	Pfannenstiel	5	19.23%
	Laparotomy	4	15.38%
	Infraumbilical midline	4	15.38%
	Supraumbilical midline	3	11.54%
	Rocky Davis	2	7.69%
	Total	26	100%

During the operative phase, a low surgical conversion rate (5.10%) was observed (Table 8), reflecting the high technical feasibility of laparoscopy in the management of colon cancer. The main causes of conversion were infiltration to other organs (40%), followed by adhesions, technical difficulty, and tumor size (each accounting for 20%), highlighting the importance of preoperative evaluation in cases at risk of local invasion or with a history of previous surgeries.

On the other hand, 26.53% of patients had a history of previous abdominal surgery, with Kocher incision (30.77%) and Pfannenstiel incision (19.23%) being the most frequent. Although these conditions may pose a technical challenge, they were not a determining factor for conversion in most cases. This finding supports the safety of laparoscopy even in patients with prior surgeries, provided that proper surgical planning is in place.

Table 9. *Operative phase. Bleeding. American Society of Anesthesiologists (ASA).*

Items	Response	Patients	%
Bleeding	0 - 100 ml	73	74.49%
	101 - 200 ml	18	18.37%
	201 - 500 ml	7	7.14%
	Total	98	100%
ASA Classification	(II) Mild to moderate systemic disease, medically well controlled without functional limitation	83	84.69%
	(III) Severe systemic disease resulting in functional limitation	15	15.31%
	Total	98	100%

The amount of bleeding during colon cancer surgery can vary depending on the type of procedure and other factors. In 74.49% of the patients, bleeding ranged from 0 to 100 ml (Table 9).

The American Society of Anesthesiologist (ASA) classification reported only two categories for these patients treated at HUEM. The majority, 84.69%, were classified as ASA II: mild to moderate systemic disease, medically well controlled without functional limitation.

In the analysis of the American Society of Anesthesiologist (ASA) classification, it was observed that older adults had a higher proportion of patients with mild to moderate systemic disease (ASA II) at 46.94%, and 14.29% with severe systemic disease with functional limitation (ASA III), compared to adults, where 37.76% were ASA II and only 1.02% ASA III.

When evaluating the relationship with BMI, overweight or obese patients showed 55.10% in ASA II and 6.12% in ASA III, while those with low or normal BMI had 29.59% and 9.18%, respectively.

Finally, patients with comorbidities exhibited 41.84% in ASA II and 14.29% in ASA III, in contrast to those without comorbidities, where 42.86% were ASA II and only 1.02% ASA III.

These results indicate that advanced age, altered nutritional status, and the presence of comorbidities are associated with a higher degree of systemic disease, which could directly influence surgical risk and postoperative mortality.

In the postoperative phase, 87.76% (n=86) of patients did not require reoperation, while 12.24% (n=12) did require a second surgical intervention. Among these, the laparoscopic approach was used in 66.67% (n=8) of cases, surpassing the open approach, which was used in 33.33% (n=4).

Regarding the indications for reoperation, the most frequent cause was "other" at 41.67% (n=5), followed by anastomotic dehiscence at 25% (n=3), residual peritonitis at 16.67% (n=2), intra-abdominal collection at 8.33% (n=1), and hemoperitoneum at 8.33% (n=1).

These findings reflect a low reoperation rate and a predominance of the laparoscopic approach as the preferred method, which may be associated with reduced surgical trauma and improved postoperative recovery.

Table 10. *Postoperative phase. Tumor location. Malignant histology.*

Items	Response	Patients	%
Tumor Location	Right colon cancer (total)	45	45.92%
	Right colon tumor	31	31.63%
	Proximal colon tumor	8	8.16%
	Right colon tumor extending to hepatic flexure	6	6.12%
	Left colon cancer (total)	45	45.92%
	Left sigmoid colon	18	18.37%
	Left colon: rectum and mid-rectum	14	14.29%
	Left sigmoid colon and rectosigmoid junction	9	9.18%
	Descending colon cancer	4	4.08%
	Right colon plus left colon	8	8.16%
	Total	98	100%
Malignant Histology			
Moderately differentiated adenocarcinoma		44	44.90%
Well-differentiated adenocarcinoma		30	30.61%
Mucinous adenocarcinoma		7	7.14%
Poorly differentiated		6	6.12%
Other		11	11.22%
Total		98	100%

Table 10 shows tumor location, with cases distributed equally between the right and left colon, each accounting for 45.92% of the total number of patients who underwent surgery.

Within the right-sided group, the most frequent was the right colon tumor (31.63%), followed by proximal colon tumors (8.16%) and tumors extending to the hepatic flexure (6.12%).

For left-sided tumors, the most common were located in the left and sigmoid colon (18.37%), followed by tumors in the mid-rectum (14.29%) and those involving both the left colon and rectosigmoid junction (9.18%). Less frequent tumors included those in the descending colon (4.08%) and those affecting both the right and left colon simultaneously (8.16%).

Regarding malignant histology, the most common type was moderately differentiated adenocarcinoma, observed in 44.90% of patients.

Table 11. *Postoperative phase. Number of lymph nodes. Involved lymph nodes.*

Items	Response	Patients	%
Number of lymph nodes	< 8	1	1.09%
	8-11	17	18.48%
	> 11	74	80.43%
	Total	92	100%
Involved lymph nodes	0 (None)	51	52.58 %
	1	16	16.49%
	2-3	9	9.28%
	4-6	5	5.15%
	≥ 7	16	16.49%
	Total	12	100%

In the postoperative phase, analysis of the number of re-sected lymph nodes (Table 11) showed that in 80.43% of cases, more than 11 lymph nodes were obtained, which re-flects adequate compliance with oncologic resection stand-ards. A total of 18.48% of patients had between 8 and 11 lymph nodes, while only 1.09% had fewer than 8 nodes re-trieved.

Regarding lymph node involvement by metastasis, 52.58% of patients showed no lymph node involvement. In 16.49% of cases, only one positive node was identified, and 9.28% had between two and three positive nodes. More extensive involvement—four to six positive nodes or seven or more—was found in 5.15% and 16.49% of cases, respectively.

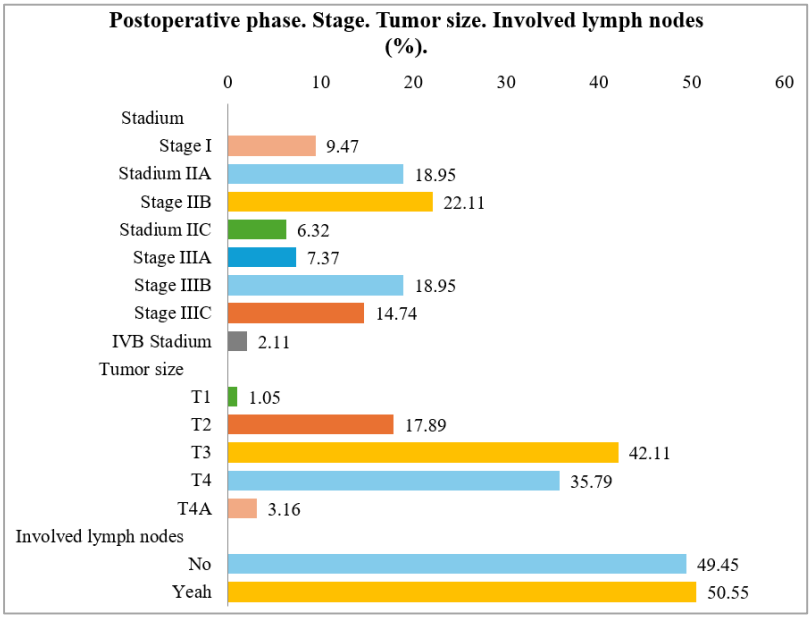

Figure 4. *Postoperative phase. Stage. Tumor size. Involved lymph nodes.*

In the postoperative analysis of patients operated on for colon cancer, most were found to be in intermediate stages of the disease. A total of 22.11% (n=21) of patients were classified as stage IIB. The most frequent tumor size was T3, observed in 42.11% (n=40) of cases, and 50.55% (n=46) of patients had lymph node involvement (Figure 4).

Table 12. *Postoperative phase. ICU admission, readmission, and pathology.*

Items	Response	Patients	%
ICU Admission	No	68	69.39%
	Yes	30	30.61%
	Total	98	100%
Readmission	No	93	94.90%
	Yes	5	5.10%
	Total	98	100%

In the postoperative phase of laparoscopic management of colon cancer during the period 2020-2024, it was observed that 30.61% of pa-tients required admission to the Intensive Care Unit (ICU), while 69.39% did not. Regarding readmis-sion, 5.10% of patients were rehospitalized after surgery, compared to 94.90% who did not require rehospitalization (Table 12).

Table 13. *Postoperative Phase. Status. Death by Other Causes. Cause of Death.*

Items	Response	Patients	%
Status	Alive	86	87.76%
	Deceased	12	12.24%
	Total	98	100%
Death due to other causes	No	2	16.67%
	Yes	10	83.33%
	Total	12	100%
Cause of death	Tumor extension	6	60.00%
	Paraneoplastic syndrome	2	20.00%
	Mesenteric is-chemia	1	10.00%
	Sepsis + paralytic ileus	1	10.00%
	Total	10	100%

In the postoperative phase (Table 13), 12.24% of the patients died. Of these, 83.33% died from disease-related causes, with tumor extension being the most frequent (60%), followed by paraneoplastic syndrome (20%), mesenteric ischemia (10%), and sepsis with paralytic ileus (10%). Only 16.67% of deaths were due to unrelated causes.

Among the total patients undergoing laparoscopic Surgery,

51.02% of older adults survived compared to 36.73% of adults. Mortality was higher in older adults (10.20%) than in adults (2.04%). This indicates that although most older adults survive, they present a higher mortality risk compared to younger adults.

The results show that 48.98% of the living patients were female, while 38.78% were male. On the other hand, among the deceased patients, 5.10% were women and 7.14% were men. This distribution suggests that, within the laparoscopically treated population, women have a higher survival rate compared to men.

It was observed that 46.94% of the living patients had comorbidities, while 40.82% did not. Among the deceased patients, 9.18% had comorbidities and only 3.06% did not. This indicates that mortality was three times higher in patients with comorbidities (9.18%) compared to those without comorbidities (3.06%), showing an association between pre-existing diseases and increased postoperative mortality risk.

It was evidenced that 42.86% of the living patients had lymph node involvement, while 46.15% did not. Among the deceased patients, 7.69% had lymph node involvement compared to 3.30% who did not. These data show that mortality was more than double in patients with lymph node involvement (7.69%) compared to those without (3.30%), suggesting a possible relationship between nodal involvement and higher postoperative mortality risk.

Regarding the relationship between patient status and ASA classification, it was found that 76.53% of living patients were classified as ASA II, while only 11.22% were ASA III. Among the deceased patients, 8.16% were ASA II and 4.08% ASA III. These results show that although most living patients had lower anesthetic risk (ASA II), mortality was proportionally higher in ASA III patients (4.08%) compared to ASA II (8.16%), suggesting a possible association between higher ASA classification and worse postoperative prognosis.

In relation to the need for reintervention, 80.61% of patients who did not require a second surgery remained alive, while only 7.14% of them died. On the other hand, among patients who were reoperated on, 7.14% survived and 5.10% died. These data suggest that most patients with favorable outcomes did not require reintervention, while mortality was slightly higher among those needing a second surgery, which may indicate a relationship between reintervention and poorer clinical outcomes.

It is observed that most living patients were overweight or obese (55.10%), while 32.65% had a low to normal BMI. Among deceased patients, both groups (low to normal and overweight to obese) had equal proportions (6.12%), suggesting a trend toward higher survival in overweight or obese patients.

Table 14. *Kaplan-Meier Survival Table. Five-Year.*

Variable	Category	Survival	Survival (%)	P-value
Overall	All	0.670	67.0	
Age groups	Adult	0.758	75.8	0.063 *
	Older adult	0.591	59.1	
Sex	Female	0.676	67.6	0.599 ns
	Male	0.653	65.3	
BMI categories	Low to normal	0.603	60.3	0.378 ns
	Overweight to obese	0.714	71.4	
Comorbidity	Absent	0.756	75.6	0.190 ns
	Present	0.612	61.2	
Lymph node involvement	Absent	0.899	89.9	0.133 ns
	Present	0.400	40.0	
ASA classification	II	0.689	68.9	0.010 *
	III	0.495	49.5	
Reintervention	Absent	0.713	71.3	0.000 **
	Present	0.298	29.8	

The 5-year survival estimate using the Kaplan-Meier method showed statistically significant differences related to ASA classification (p = 0.010) and the need for reoperation (p = 0.000). Patients with higher anesthetic risk (ASA III) and those who required a second surgery had lower survival rates, at 49.5% and 29.8%, respectively. Although not statistically significant, there was a trend toward lower survival in older adults compared to younger adults (59.1% vs. 75.8%; p = 0.063). Variables such as sex, BMI, presence of comorbidities, and lymph node involvement did not show statistically significant differences, although they may have clinical relevance (Table 14).

4. Discussion

Colorectal cancer (CRC) remains a highly relevant neoplasm in public health. According to GLOBOCAN (2020), it accounts for approximately 10% of global cancer cases, being the third most frequent cause in men and the second in women, with an estimated mortality rate of 7.2 per 100,000 inhabitants. The findings from a high-complexity, tertiary care hospital are consistent with this trend, highlighting 2020 as the year with the highest incidence during the 2020-2024 period [5].

In Colombia, CRC ranks third in incidence and mortality, representing 10% of new cancer cases. The National Cancer Institute reported that 8.3% of diagnosed tumors correspond to colorectal adenocarcinomas, making it the second most common gastrointestinal neoplasm in men. Although national literature indicates a higher prevalence in men (ratio 1.4:1), our study revealed a slight female predominance, with a difference of eight cases in a sex-homogeneous sample. This finding aligns with another Colombian study that also reported a higher incidence in women (p = 0.009), possibly explained by genetic, hormonal, and behavioral factors [6, 7].

Age is a key factor in CRC development. In our population, the mean age was 62 years, with a predominance in individuals over 50, consistent with national studies that place the average age of diagnosis between 57 and 70 years. This pattern is associated with the decline of genetic repair mechanisms linked to aging [8].

A high frequency of comorbidities was identified: 56.12% of patients had at least one chronic disease, with arterial hypertension (19.80%) and diabetes mellitus (14.85%) being the most prevalent. These findings are comparable to those described by Qiu et al., who also highlighted hypertension, diabetes, prostatic hyperplasia, COPD, and ischemic heart disease as the most common comorbidities in CRC patients [9, 10].

Obesity and overweight were also significant factors in our sample, associated with metabolic, hormonal, and inflammatory alterations that promote carcinogenesis. As demonstrated in other national studies, we confirmed a direct relationship between excess weight and CRC development, reinforcing the need for preventive strategies focused on lifestyle modification [11].

In the histopathological analysis, the most frequent malignant finding was moderately differentiated adenocarcinoma (44.90%). This result is consistent with that reported by Flores Monserrat et al., who also found a predominance of this histological grade, although it differs from Charúa-Guindic et al., who reported a higher frequency of well-differentiated adenocarcinomas (up to 70%) [12, 13].

Regarding tumor location, our sample showed an even distribution: 45.92% in the right colon and 45.92% in the left colon, while 8.16% involved both sides. Although studies such as those by Kalantzis et al. and the American Cancer Society report a higher incidence in the left colon (51% vs. 42% in the right) [13, 14], our data indicate that in some populations, laterality may not show a clear predominance, underscoring the importance of a comprehensive diagnostic evaluation of the entire colon.

In terms of staging, 22.11% of patients were classified as clinical stage IIB. T3 was the most prevalent tumor category (42.11%), and 50.55% showed lymph node involvement. These findings are consistent with those reported by Bannura et al., who found T3 in 80.9% of cases and N2 lymph node involvement in 26% [15]. In a subsequent study by the same author, stage IIIB was the most common among patients with nodal involvement (71%), reinforcing the association between advanced clinical stages and greater lymphatic burden.

In the postoperative phase analysis, a mortality rate of 12.24% was found in patients undergoing laparoscopic surgery. Most deaths (83.33%) were related to causes directly attributable to tumor progression or treatment complications, with tumor extension (60%) being the most frequent, followed by paraneoplastic syndrome (20%), mesenteric ischemia (10%), and sepsis with paralytic ileus (10%). Only 16.67% of deaths were due to causes not directly related to CRC or the surgical procedure. These findings support the safety of the laparoscopic approach, as severe surgical complications accounted for a minor percentage of deaths. Moreover, they highlight the importance of proper preoperative staging and comprehensive oncologic evaluation. This is consistent with international studies, which emphasize that while the minimally invasive approach offers advantages in recovery and morbidity, the disease stage remains the main determinant of postoperative survival [16].

5. Conclusions

The mortality associated with the laparoscopic approach in the treatment of colon cancer at a high-complexity hospital during the period 2020-2024 was 12.24%, reflecting a controlled surgical risk. Most deaths were attributable to tumor progression, while a smaller proportion was linked to surgical complications. Factors associated with increased mortality included advanced clinical stage at diagnosis (particularly stage IIB), lymph node involvement (observed in 50.55% of cases), and comorbidities such as hypertension (19.80%),

diabetes mellitus (14.85%), and obesity. These elements negatively influenced postoperative outcomes. The predominant histopathological finding was moderately differentiated adenocarcinoma, present in 44.90% of patients who underwent laparoscopic surgery. Regarding tumor location, a symmetrical distribution was observed between the right and left colon, each accounting for 45.92%, highlighting the need for thorough evaluation of the entire colon during the diagnostic process. These findings underscore the importance of early staging and comprehensive management of comorbidities to improve postoperative outcomes in patients with colon cancer.

Abbreviations

CRC	Colorectal Cancer
COPD	Chronic Obstructive Pulmonary Disease
ASA	American Society of Anesthesiologist
ROC	Receiver Operating Characteristic
WHO	World Health Organization

Author Contributions

Guerrero Contreras Pierina Monserrat: Investigation, Methodology, Writing - original draft

Julio Blanco Cesar David: Investigation, Methodology, Writing - original draft

Hernández Martínez Hender: Project administration, Methodology, Resources, Writing - review & editing

Bahamón Floréz Alexander: Project administration, Methodology, Resources, Writing - review & editing

López Melo Deyvis: Project administration, Methodology, Resources, Writing - review & editing

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Data Availability Statement

The data supporting the findings of this study were obtained from confidential patient medical records at a high-complexity hospital in Norte de Santander, Colombia, and are not publicly available due to privacy and institutional restrictions.

Conflicts of Interest

The authors declare no conflicts of interest.

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