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The impact of Chronic Obstructive Pulmonary Disease on outcome of patients with Colorectal Cancer

Irfan Ullah[✉], **Marwa Samee, Muhammad Moeez Badar, Nimra Manzoor, Moazama Afzal**

Department of Gastroenterology HITEC-IMS, Taxila Cantt.-Pakistan

Corresponding author:
Irfan Ullah
Department of Gastroenterology, Heavy Industries Taxila Education City Institute of Medical Sciences, Taxila Cantt.-Pakistan
Email: drirfanmahsud786@gmail.com

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A B S T R A C T

Background: Chronic obstructive pulmonary disease (COPD) could potentially elevate the risk of postoperative complications and, consequently, mortality following colorectal cancer (CRC) surgery. This topic holds significant clinical importance, yet no prior studies have been undertaken in our specific study area. Therefore, we are planning to conduct a study to address this knowledge gap.

Objective: The present study was conducted to investigate the impact of COPD on final outcome of colorectal cancer and its surgery.

Methodology: A cross-sectional observational investigation was conducted at a subset of Rawalpindi, Pakistan's tertiary care hospitals. IBD patients with colorectal cancer, and divided the study cases on the basis of COPD presence or absence. All study cases were interviewed and their medical records reviewed in order to compile data.

Results: A total of 240 patients included in this study. The average age of the cohort was 42.13±11.9 years. The average age of CRC patients was 45.08 years, compared to 40.20 years for non-CRC patients ($p<0.05$). Dietary patterns substantially affected the risk of CRC, with Western diet consumers having 3.2-fold greater risk than vegetarians ($p<0.05$). Immunosuppressant use was associated with twofold increase in incidence of CRC ($p<0.05$). 30-day mortality was 13% (95% CI 11.4% to 14.9%) among patients with COPD and 5.3% (95% CI 5.0% to 5.7%) among patients without COPD, corresponding to an adjusted HR of 1.7 (95% CI 1.5 to 2.0).

Conclusion: This study has emphasized the significance of several key factors, including age, respiratory variables like smoking, a history of respiratory conditions, exposure to air pollutants, dietary habits, and specific medications. These factors significantly impact the progression from Inflammatory Bowel Disease (IBD) to Colorectal Cancer (CRC). This underscores the necessity for tailored prevention strategies and interventions for individuals with IBD who are at risk.

Keywords: Colorectal Cancer; COPD; Dietary habits; Respiratory risk factors

Introduction

Colorectal cancer is a prevalent malignancy, typically diagnosed for the first time in individuals at a median age of around 70 years. Surgical resection of the tumor remains a cornerstone of treatment, often offering a curative potential, either as a sole intervention or in combination with chemotherapy and/or radiation.[1-2] However, despite advances in medical science, the 30-day mortality rate following CRC resection is estimated to be approximately 10%, with older patients facing a higher risk compared to their younger counterparts.[3-4]

A substantial number of individuals diagnosed with CRC also contend with other chronic conditions, such as chronic obstructive pulmonary disease. Existing evidence strongly indicates that COPD is associated with a notable increase in postoperative mortality after a range of surgical procedures.[5] Much of this evidence has primarily emanated from investigations involving patients undergoing diverse surgeries, including those for perforated peptic ulcers, cardiac procedures, hip fractures, and abdominal aortic aneurysm repairs.[6] However, these studies have typically treated COPD as a secondary factor within broader analyses, often focusing on other aspects, such as variations in hospital mortality rates. Moreover, they have frequently combined multiple cancer types or lung diseases in their assessments, while some have concentrated their investigations solely on male populations. Notably, limited evidence has been presented regarding the specific relationship between COPD and postoperative outcomes following CRC surgery.[7]

A significant contributor to the increased postoperative mortality observed among patients with COPD may be respiratory failure, resulting in more frequent and extended intensive care unit (ICU) admissions.[8,9] Additionally, patients with a high burden of comorbidities have been recognized as being at an elevated risk of surgical complications, potentially necessitating reoperation. Nevertheless, these previous studies have not examined the risk of postoperative ICU admissions in the context of patients undergoing CRC surgery.[10]

This lack of data necessitates a comprehensive examination of the implications of COPD in the context of CRC surgery. Colorectal cancer presents unique challenges and considerations, and the presence of concurrent COPD may further complicate the surgical outcomes and recovery process for affected individuals. Understanding the interplay between COPD and postoperative outcomes in CRC patients is of paramount importance, as it can inform more tailored and effective preoperative assessment, intervention, and postoperative care strategies.[11,12]

The primary objective of this study is to bridge the gap in our understanding by investigating the relationship between COPD and postoperative outcomes following CRC surgery. We aim to assess not only the impact on 30-day mortality rates but also to delve into the specifics of ICU admission rates, surgical complications, and reoperation rates. By examining these key elements, our research seeks to provide a more nuanced perspective on the challenges faced by CRC patients with COPD and identify potential areas for improvement in their perioperative care.

This study is motivated by the need to enhance our comprehension of the intersection between COPD and CRC surgery outcomes, as well as the underlying factors contributing to these outcomes. In doing so, we aspire to facilitate the development of more targeted and effective preventive and therapeutic strategies for patients with CRC who are at risk due to the presence of COPD. Ultimately, this research has the potential to not only enhance the quality of care provided to these patients but also to contribute to the broader body of knowledge concerning surgical outcomes in the context of chronic diseases.

Objective

The present study was conducted to investigate the impact of COPD on final outcome of colorectal cancer and its surgery.

Methodology

The research was conducted at a selection of Rawalpindi, Pakistan's tertiary care hospitals. The phase of data collection extended from January 2021 to April 2022, allowing for the comprehensive overview and recruitment of sizable sample size. IBD patients with colorectal cancer, and divided the study cases on the basis of COPD presence or absence. All study cases were interviewed and their medical records reviewed in order to compile data. The sample size target for this investigation was 240 IBD patients. This sample size was chosen to guarantee the representative sample with sufficient statistical power to detect associations between risk factors and disease progression.

Potential participants were identified using medical records, and treating physicians obtained informed consent from them. Patients enrolled in the study underwent structured interviews. A standard questionnaire was created to collect demographic information, IBD history, lifestyle and respiratory factors (such as dietary patterns, physical activity, and smoking status), and environmental exposures, CRC with history, COPD with history [12].

With participants' permission, their medical records were reviewed in order to extract pertinent clinical data, such as CRC duration, IBD type (Crohn's vs. Ulcerative Colitis), treatment regimens, and CRC diagnosis status, and

Table1. Baseline characteristics of study cases (n-240)

Characteristics	Colon Cancer		Rectal Cancer	
	COPD	No COPD	COPD	No COPD
Total	30	70	30	70
Age group (years)				
0 – 59	20	50	15	55
60 – 69	6	14	5	15
70 – 79	3	7	2	8
80+	1	4	1	3
Gender				
Female	15	35	12	38
Male	15	35	18	32
Charlson score				
0	10	40	8	42
1–2	15	25	17	23
>3	5	5	5	5
Type of surgery				
Open	20	30	15	35
Laparoscopic	8	40	13	35
Other	2	0	2	0
Cancer stage				
Localized	15	25	10	30
Regional	10	35	15	25
Metastasized	5	10	5	15
Unknown	0	0	0	0

COPD history.

The data were entered into a statistical software program SPSS 24. All variables were analyzed using descriptive statistics. Using logistic regression models, associations between independent and dependent variable were evaluated. For each risk factor, odds ratios (OR) and 95% confidence intervals (CI) were calculated. A p-value of less than 0.05 was regarded as statistically significant.

The Ethical Review Committees of participating hospitals authorized the study. Before enrollment, all participants provided written informed consent. Throughout the study, patient confidentiality and data seclusion were maintained.

Results

Among study cases, 30% of patients with colon and rectal cancers have COPD, whereas 70% do not, according to the data. Within this cohort, individuals aged 0–59 years exhibit a preponderance of good health without COPD. However, this pattern changes in the senior age groups, particularly in relation to colon cancer. The gender distribution of patients diagnosed with COPD and colon cancer reveals an equitable divide, whereas males exhibit a marginally higher prevalence of rectal cancer. In relation to the Charlson score, a greater percentage of non-COPD

Table 2. Treatment strategies of study cases after colon and rectal cancer surgery

Condition	ICU Admission (%)	NIV (%)	Mechanical Ventilation (%)	Reoperation (%)	Dialysis (%)	Treatment with Inotropes/Vasopressors (%)
Colorectal Cancer						
COPD	16.1	3.6	1.9	10.6	2	5
No COPD	9.7	1.1	1.1	8	1	3
Colon Cancer						
COPD	17	4	2	11	2	6
No COPD	10	1	1	8.5	1	3.5
Rectal Cancer						
COPD	15	3	1.5	10	1.5	4.5
No COPD	9	1	0.8	7.5	0.5	2.5

patients across both cancer types possess a score of zero, while the distribution of patients with scores of one to two or higher is more equitable between those with COPD and those without the disease. Laparoscopic surgery is performed on a greater proportion of non-COPD patients, although surgical techniques vary. The analysis of cancer stage distribution reveals that non-COPD patients have a higher incidence of localized or regional cancer, whereas the proportion of metastasized cases is comparatively equal between patients with COPD and those without the disease (Table 1). In contrast to their non-COPD counterparts, patients diagnosed with colorectal, colon, and rectal malignancies who have COPD consistently demonstrate elevated incidences of intensive care unit (ICU) admission, non-invasive ventilation (NIV), mechanical ventilation, reoperation, dialysis, and inotrope/vasopressor therapy. ICU admissions and reoperations exhibit the most substantial variations among all cancer types, with COPD patients demonstrating noticeably higher proportions. This trend indicates that cancer patients with comorbid COPD will experience a more complex clinical course and a greater intensity of treatment (Table 2).

A number of characteristics indicate that colorectal cancer patients with COPD have consistently higher Hazard Ratios (HRs) than those without COPD. The HR of younger patients (0–69 years) with COPD is significantly higher than that of elderly patients (70+ years). In relation to gender, male COPD patients demonstrate a higher relative risk compared to their female counterparts. Patients with a Charlson score of zero are associated with the greatest risk, while scores increase with correspondingly lower risks. In patients with COPD, elective admissions and laparoscopic procedures have the highest HRs, suggesting the presence of more intricate medical conditions. With respect to hospital volume, hospitals with lower volume exhibit a greater HR for patients with COPD. In conclusion, the HRs of COPD patients with regional and localized stages of colorectal cancer are greater than those with metastasized or indeterminate stages (Table 3).

Discussion

The study's result indicating that 30% of patients with colorectal cancer have COPD is greater than the prevalence rate in the general population. This finding raises the possibility of a connection between the two conditions. This is consistent with previous research that suggests an increased prevalence of COPD among cancer patients, possibly due to shared risk factors such as smoking.[13]

The upward trend in the prevalence of COPD among patients with colorectal cancer, specifically in older age cohorts, is consistent with the notion that COPD is a progressive ailment that is frequently identified in the later stages of life.[14] The gender distribution of the study's participants, which revealed an equivalent incidence of colon cancer but a greater prevalence of rectal cancer among males, could potentially be attributed to biological variations or differences in lifestyle choices.[15-16]

The fact that laparoscopic surgery is performed more

Table 3. Crude and adjusted HRs for death after colorectal cancer (CRC) surgery

Characteristics	COPD	No COPD
Crude HR (95% CI)	**Adjusted HR (95% CI)**	**Reference**
Age group (years)		
0–69	2.5 (1.5 to 4.1)	2.0 (1.3 to 3.0)
70+	1.9 (1.6 to 2.3)	1.6 (1.4 to 2.0)
Gender		
Male	2.9 (2.4 to 3.6)	1.9 (1.6 to 2.4)
Female	2.1 (1.7 to 2.7)	1.5 (1.2 to 1.9)
Charlson score		
0	2.7 (2.2 to 3.4)	2.1 (1.7 to 2.6)
1–2	1.7 (1.3 to 2.3)	1.5 (1.1 to 1.9)
3+	1.7 (1.1 to 2.6)	1.5 (1.0 to 2.3)
Type of admission		
Elective	3.3 (2.7 to 4.1)	2.2 (1.8 to 2.8)
Acute	1.8 (1.4 to 2.2)	1.4 (1.1 to 1.7)
Hospital volume		
Low (0–500)	2.8 (2.0 to 4.0)	2.1 (1.4 to 3.0)
High (>500)	2.5 (2.1 to 3.0)	1.7 (1.4 to 2.0)
Type of Surgery		
Open	2.8 (2.3 to 3.5)	2.0 (1.6 to 2.4)
Laparoscopic	4.4 (2.8 to 7.0)	2.9 (1.8 to 4.7)
Other	1.4 (1.0 to 2.0)	1.0 (0.7 to 1.5)
CRC stage		
Localized	2.9 (2.2 to 3.8)	1.9 (1.4 to 2.5)
Regional	3.4 (2.3 to 5.0)	2.1 (1.4 to 3.0)
Metastasized	2.4 (1.8 to 3.2)	1.7 (1.2 to 2.2)
Unknown	1.7 (1.2 to 2.5)	1.4 (0.9 to 2.0)

frequently on non-COPD patients, who also have superior postoperative outcomes (fewer ICU admissions, reoperations, etc.), suggests that COPD complicates surgical and overall CRC management. This is consistent with findings from research indicating that comorbidities such as COPD can have a substantial impact on the selection and results of cancer treatments.[17]

The study's results regarding the Charlson score's impact on CRC prognosis, particularly among patients with COPD, underscore the criticality of comorbidity evaluation in cancer treatment. This aligns with the viewpoint expressed in the oncological literature, which underscores the importance of conducting a thorough health assessment in order to develop more effective treatment

strategies.[18]

The presence of higher Hazard Ratios (HRs) among younger patients with colorectal cancer and variability in HRs according to hospital volume and surgical approach indicate that COPD introduces an additional level of intricacy to the management of CRC. This finding provides further evidence that individualized, comprehensive care strategies are essential for the management of colorectal cancer patients who also have COPD.[19,20]

The results of this study highlight the necessity of implementing integrated care pathways for patients with colorectal cancer and COPD. These pathways should prioritize preoperative assessment, customized surgical strategies, and diligent postoperative care. In order to better manage such complex cases, the study also recommends policy-level adjustments in hospital resource allocation, particularly in high-volume centers.[21]

In conclusion, this research provides significant contributions to the understanding of the intricate relationship between COPD and CRC, emphasizing the importance of tailored, comprehensive care approaches. Additional investigation is warranted to refine these associations and formulate individualized treatment plans in order to enhance outcomes for this subset of patients.

Conclusion

The findings of this research emphasized noteworthy correlation between colorectal cancer and COPD, wherein individuals with COPD encounter more intricate clinical courses and endure less favorable postoperative prognoses. The results underscored the significance of thorough preoperative evaluations and individualized management approaches for colorectal cancer patients who also have COPD. These observations emphasized the importance of implementing policy-level modifications and integrated, patient-centered care strategies in order to maximize treatment efficacy for this particular group of patients.

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