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# COLORECTAL CANCER: OUR EXPERIENCE AT A SINGLE TERTIARY CARE CENTER

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## Abstract

**Background:** Colorectal cancer (CRC) is among the most common gastrointestinal malignancies worldwide, and recent reports describe a rising burden in South Asia, including Pakistan. Robust local outcome data from tertiary centres remain limited.

Objective: To evaluate the clinical characteristics, management, and short-term postoperative outcomes of patients with primary CRC treated at a tertiary care centre.

**Methods:** This descriptive study was conducted in the Department of General Surgery, Hayatabad Medical Complex, Peshawar, over six months following ethical approval. A total of 138 consecutive patients with histopathologically proven primary CRC were enrolled by non-probability convenience sampling. Demographic data, clinical characteristics (presenting symptoms, tumour site, stage, histology), management, and postoperative outcomes (surgical site infection, anastomotic leak, recovery at three months, length of hospital stay) were recorded on a structured questionnaire. Data were analysed using SPSS version

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16. Quantitative variables were expressed as mean ± SD and categorical variables as frequencies and percentages. Chi-square test was applied for effect modifiers with a p-value < 0.05 considered statistically significant.

**Results:** The mean age was 58.7 ± 7.8 years, with a slight female predominance (51.4%). The rectum was the most common tumour site (37.7%), and Stage III disease predominated (62.3%). Right hemicolectomy was the most frequently performed procedure (47.8%), followed by low anterior resection (LAR, 25.4%). The overall surgical site infection rate was 24.6%, anastomotic leak rate was 8.7%, and 87.0% of patients achieved complete recovery at three months. The mean length of hospital stay was 4.7 ± 2.5 days. Surgery type was significantly associated with anastomotic leak ($p < 0.001$), recovery ($p = 0.013$), and length of stay ($p < 0.001$); LAR for rectal cancer showed the highest leak rate (28.6%) and longest mean stay (6.7 days).

**Conclusion:** In our cohort, CRC presented at a relatively younger age than in Western series and was predominantly locally advanced. Postoperative morbidity was concentrated in patients undergoing LAR for rectal cancer, underscoring the need for meticulous patient selection, anastomotic technique, and perioperative care in this subgroup, and supporting structured CRC screening in the region.

## INTRODUCTION

Cancer is now widely recognized as a global problem that unfortunately lacks a global solution (1). Colorectal cancer (CRC) is one of the most common forms of gastrointestinal cancer in the world today, with an incidence of 20.1 and 14.6 per 100,000 per year for men and women, respectively. In recent years it has been noted that CRC is no longer a disease of only developed or more economically viable countries, with approximately 36% of new cases of CRC in the year 2000 occurring outside industrialized countries (2).

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Pakistan, like all other South Asian countries, is placed in a low-risk zone for CRC. However, recent studies have reported a surge in CRC cases for patients above the age of 50 years in Pakistan (3). A meta-analysis from 2018 reported prevalence of CRC to be at 5% in Pakistan (4).

Various risk factors contributing to the development of colorectal cancer, including genetic susceptibility, chronic inflammation, and personal and family history (5). The Predominance of vegetarian dietary habits of people living I the Asia subcontinent protects them against CRC (6). The most frequently observed symptoms of CRC are rectal bleeding, altered bowel habits, weight loss, tenesmus, and changes in stool frequency and consistency (7).

Several screening methods are available for CRC, including fecal occult blood tests, flexible sigmoidoscopy, colonoscopy, and computed tomography (CT) colonography (8). However, the optimal screening strategy for CRC remains controversial, particularly in low- and middle-income countries where resources are limited (9).

There is a growing body of literature investigating the optimal management of CRC, including surgery, radiation therapy, and chemotherapy. However, questions remain regarding the appropriate sequencing of these interventions, the duration of chemotherapy regimens, and the role of targeted therapies (10,11). Survival of CRC patients is influenced by disease stage at diagnosis. The five-year survival rate of patients in whom CRC is detected at a localized stage is as high as 90%. The rate reduces to 70.4% for patients with regional involvement and further reduces to 12.5% for patients with distant metastases (12).

The rationale of this study is to evaluate the clinical characteristics, management and outcomes of patients with Primary CRC treated at tertiary care hospitals. Moreover, the results of this study will be shared with other health professionals for their updated knowledge, better treatment and further recommendations. The results will also be the used for other research publications as well.

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## MATERIALS, METHODS AND STATISTICAL ANALYSIS

This descriptive study was conducted in the General Surgery Department of Hayatabad Medical Complex, Peshawar, over a duration of six months following approval of the synopsis by the Hospital Research and Ethical Committee (IREB Approval No. 1527, dated 06 September 2023). A total sample size of 73 patients was initially calculated using the WHO sample size calculator, keeping an expected proportion of 5% prevalence of CRC in Pakistan with a 95% confidence interval and a 5% margin of error (4); the final analysis was performed on 138 consecutive patients recruited during the study period. Non-probability convenient sampling was employed.

All patients diagnosed with primary colorectal carcinoma having complete medical records were included, irrespective of gender, age, and ethnicity. Patients with metastatic colorectal carcinoma at the time of diagnosis, a history of other malignancies, incomplete medical records, incomplete data on demographic, clinical, or management variables, incomplete or inconclusive histopathological diagnosis of colorectal carcinoma, hereditary colorectal carcinoma syndromes (e.g., Lynch syndrome, familial adenomatous polyposis), and patients who declined or were unable to provide informed consent were excluded from the study.

After approval from the ethical board and research committee of the institution, all patients with primary CRC presenting to the General Surgery Department, HMC, Peshawar, who met the inclusion criteria were included. The purpose and benefits of the study were explained and a written informed consent was obtained from the patient or the patient's guardian. Demographic data, clinical characteristics (presenting symptoms, disease stage, tumour location, and histology), management (type of treatment given) and outcomes (early and late complications, length of hospital stay, recovery after surgery) were recorded on a pre-designed questionnaire.

Operationally, colorectal carcinoma was defined as a malignant tumour arising primarily from the cells lining the colon or rectum, proven by histopathology. Surgical site infection was labelled positive on the basis of the presence of all of the following features detected till the 7th postoperative day: redness detected by naked eye, swelling detected by naked eye, and discharge of pus (yellowish

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fluid coming out from the wound, confirmed by culture test in the laboratory). Anastomotic leak was defined as failure of the anastomosis to heal with the egress of faecal matter from the gut and its collection in the abdominal cavity, diagnosed on the basis of clinical parameters such as fever and pulse, failure to pass stool after surgery, and ultrasonography for possible collection of contents in the abdominal cavity. Length of hospital stay was defined as the number of days a patient remained in hospital after surgery and was recorded in days. Complete recovery was defined as no evidence of presence of tumour at the primary site or lymph nodes after three months, assessed by CT scan or MRI; incomplete recovery was defined as evidence of presence of tumour at the primary site or lymph nodes after three months, assessed by CT scan or MRI.

All data were entered and analysed in SPSS version 16. Mean and standard deviation were calculated for age, length of hospital stay, and BMI. Frequencies and percentages were calculated for gender, stage of tumour, surgical site infection, anastomotic leak, and recovery after surgery. Outcomes were stratified across age, BMI, type of surgery, stage of tumour, and tumour site to assess effect modification. Post-stratification chi-square test was applied, keeping a p-value $< 0.05$ as statistically significant. All results were presented in the form of tables, charts, and graphs.

## RESULTS

### Demographic and risk factor profile

A total of 138 patients with primary CRC were included in the study. The mean age was 58.7 ± 7.8 years (range 39–71 years; one age value was missing). Seventy-one patients (51.4%) were female and 67 (48.6%) were male. Sixty patients (43.5%) were older than 60 years, 56 (40.6%) were aged 51–60 years, and 21 (15.2%) were ≤50 years. Geographically, 48 patients (34.8%) were from Afghanistan, 40 (29.0%) from South KPK, 29 (21.0%) from Central KPK, and 21 (15.2%) from Northern KPK. A family history of cancer was present in 43 patients (31.2%), and 32 patients (23.2%) were active smokers. Comorbid illnesses were recorded in 54 patients (39.1%) and a history of previous pelvic radiation in 36 patients (26.1%). Body mass index was normal in 70 patients (50.7%), overweight

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in 30 (21.7%) and obese in 38 (27.5%). The demographic characteristics are summarised in Table 1.

**Table 1. Demographic and risk-factor characteristics of the study cohort (N = 138).**

| Variable | Frequency (n) | Percentage (%) |
|---|---|---|
| Age ≤ 50 years | 21 | 15.2 |
| Age 51–60 years | 56 | 40.6 |
| Age > 60 years | 60 | 43.5 |
| Gender – Female | 71 | 51.4 |
| Gender – Male | 67 | 48.6 |
| Family history of cancer – Yes | 43 | 31.2 |
| Smoking – Yes | 32 | 23.2 |
| Comorbidities – Yes | 54 | 39.1 |
| Previous radiation – Yes | 36 | 26.1 |
| BMI – Normal | 70 | 50.7 |
| BMI – Overweight | 30 | 21.7 |
| BMI – Obese | 38 | 27.5 |

Clinical, tumour and operative characteristics

Per-rectal bleeding was the predominant presenting symptom, with a mean duration of 7.4 ± 3.5 days before presentation. The rectum was the most frequent primary tumour site (52 patients, 37.7%), followed by the right colon (38 patients, 27.5%), the transverse colon (30 patients, 21.7%),

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and the sigmoid colon (18 patients, 13.0%) (Figure 1). Stage III disease was identified in 86 patients (62.3%) and Stage II in 52 patients (37.7%), indicating that the majority of patients presented with locally advanced tumours.

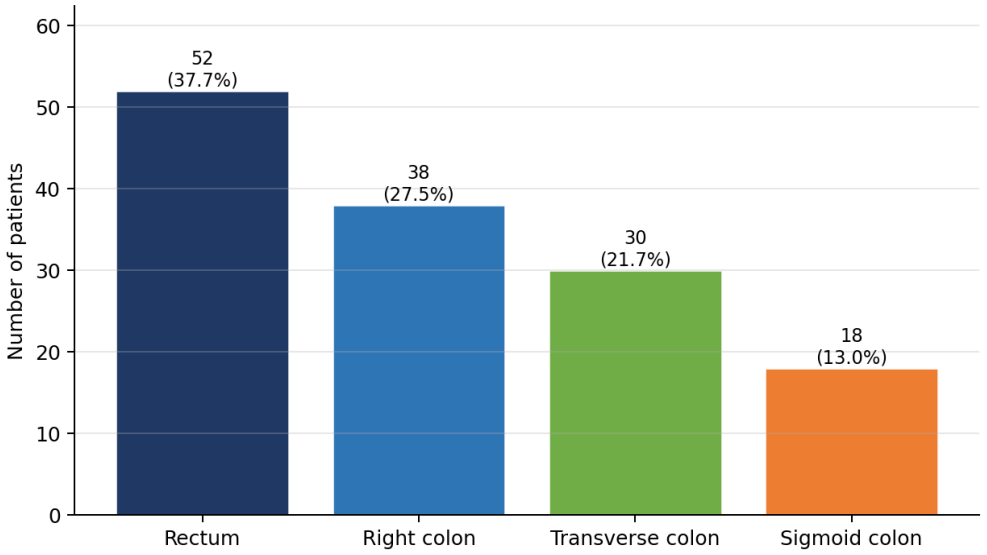


**Figure 1. Distribution of primary tumour site among 138 patients with colorectal cancer.**

Right hemicolectomy (RH) was the most commonly performed operation (66 patients, 47.8%), reflecting the high combined burden of right-sided and transverse colon tumours. Low anterior resection (LAR) was the most frequent procedure for rectal lesions (35 patients, 25.4%), abdominoperineal resection (APR) was performed in 18 patients (13.0%), anterior resection (AR) in 17 patients (12.3%), and left hemicolectomy (LH) in 2 patients (1.4%). Tumour and operative characteristics are summarised in Table 2.

**Table 2. Tumour site, stage and surgical procedures performed (N = 138).**

| Variable | Frequency (n) | Percentage (%) |
|---|---|---|
| Tumour site – Rectum | 52 | 37.7 |

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| Variable | Frequency (n) | Percentage (%) |
|---|---|---|
| Tumour site – Right colon | 38 | 27.5 |
| Tumour site – Transverse colon | 30 | 21.7 |
| Tumour site – Sigmoid colon | 18 | 13.0 |
| Stage – II | 52 | 37.7 |
| Stage – III | 86 | 62.3 |
| Surgery – Right hemicolectomy | 66 | 47.8 |
| Surgery – Low anterior resection | 35 | 25.4 |
| Surgery – Abdominoperineal resection | 18 | 13.0 |
| Surgery – Anterior resection | 17 | 12.3 |
| Surgery – Left hemicolectomy | 2 | 1.4 |

Postoperative outcomes

Surgical site infection developed in 34 patients (24.6%) and anastomotic leak in 12 patients (8.7%). At three months of follow-up, 120 patients (87.0%) had achieved complete recovery on cross-sectional imaging, while 18 patients (13.0%) had incomplete recovery. The mean length of hospital stay was 4.7 ± 2.5 days (median 4 days, range 2–15 days). Outcomes are summarised in Table 3.

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**Table 3. Short-term postoperative outcomes (N = 138).**

| Outcome | Frequency (n) | Rate (%) |
|---|---|---|
| Surgical site infection – Yes | 34 | 24.6 |
| Anastomotic leak – Yes | 12 | 8.7 |
| Complete recovery at 3 months | 120 | 87.0 |
| Incomplete recovery at 3 months | 18 | 13.0 |
| Mean length of stay (days, mean ± SD) | 4.7 ± 2.5 | — |
| Median length of stay (days, range) | 4 (2–15) | — |

**Stratified analysis of outcomes**

On stratification, none of the assessed variables — age group, gender, obesity, surgery type, tumour stage, tumour site, smoking, or comorbidities — showed a statistically significant association with surgical site infection (all $p > 0.05$). In contrast, anastomotic leak was significantly associated with surgery type ($\chi^2 = 23.61$, $p < 0.001$) and tumour site ($\chi^2 = 8.86$, $p = 0.031$). All 12 leaks occurred either after LAR (10 of 35 patients, 28.6%) or after right hemicolectomy (2 of 66 patients, 3.0%); no leaks were recorded after APR, AR, or LH. Rectal cancer carried the highest leak rate (9 of 52 patients, 17.3%), while right-sided colon cancers had no recorded leaks in this series (Figure 2).

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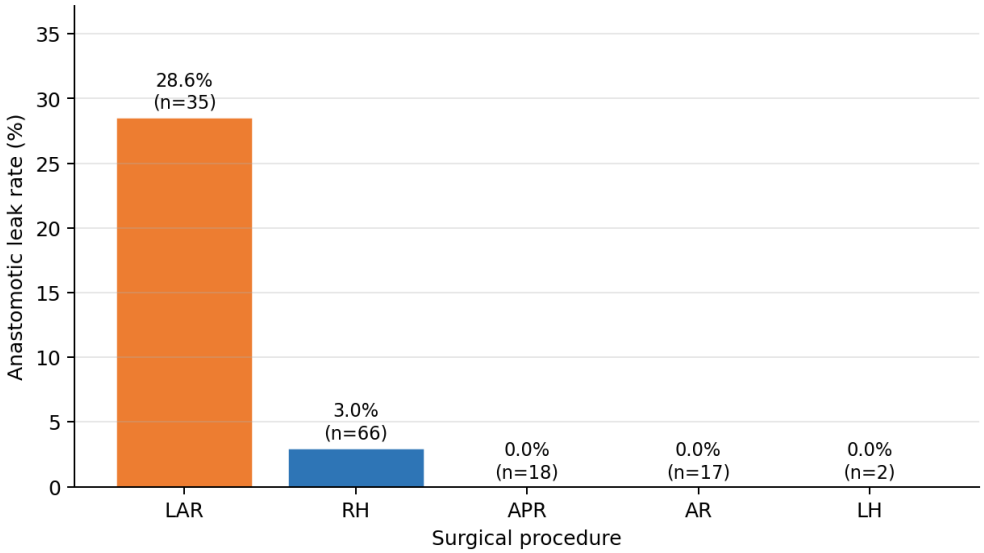


**Figure 2. Anastomotic leak rate by type of surgical procedure ($\chi^2$ = 23.61, p < 0.001). APR = abdominoperineal resection; AR = anterior resection; LAR = low anterior resection; LH = left hemicolectomy; RH = right hemicolectomy.**

Surgery type ($\chi^2$ = 12.72, p = 0.013) and tumour site ($\chi^2$ = 12.08, p = 0.007) were also significantly associated with recovery at three months. Complete recovery was highest after right hemicolectomy (64 of 66 patients, 97.0%) and lowest after APR (13 of 18 patients, 72.2%) and LAR (28 of 35 patients, 80.0%). Length of hospital stay differed significantly by surgery type (ANOVA F = 9.80, p < 0.001) and tumour site (F = 7.15, p < 0.001), with LAR associated with the longest mean stay (6.7 ± 4.0 days) and LH and RH with the shortest stays (3.0 and 3.9 days, respectively) (Figure 3). Patients who developed an anastomotic leak had a significantly longer stay than those who did not (11.8 ± 2.7 vs 4.1 ± 0.9 days, p < 0.001). The stratified analysis is summarised in Table 4.

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Table 4. Stratified analysis of postoperative outcomes (chi-square for categorical outcomes; ANOVA / t-test for length of stay). *Statistically significant at $p < 0.05$.

| Variable | SSI (p) | Leak (p) | Recovery (p) | LOS (p) |
|---|---|---|---|---|
| Age group | 0.419 | 0.764 | 0.858 | 0.627 |
| Gender | 0.695 | 0.684 | 0.163 | 0.093 |
| Body mass index | 0.768 | 0.853 | 0.843 | 0.601 |
| Surgery type | 0.758 | < 0.001* | 0.013* | < 0.001* |
| Tumour stage | 0.177 | 0.989 | 0.087 | 0.129 |
| Tumour site | 0.723 | 0.031* | 0.007* | < 0.001* |
| Smoking | 0.773 | 0.102 | 0.316 | – |
| Comorbidities | 0.628 | 0.904 | 0.424 | – |

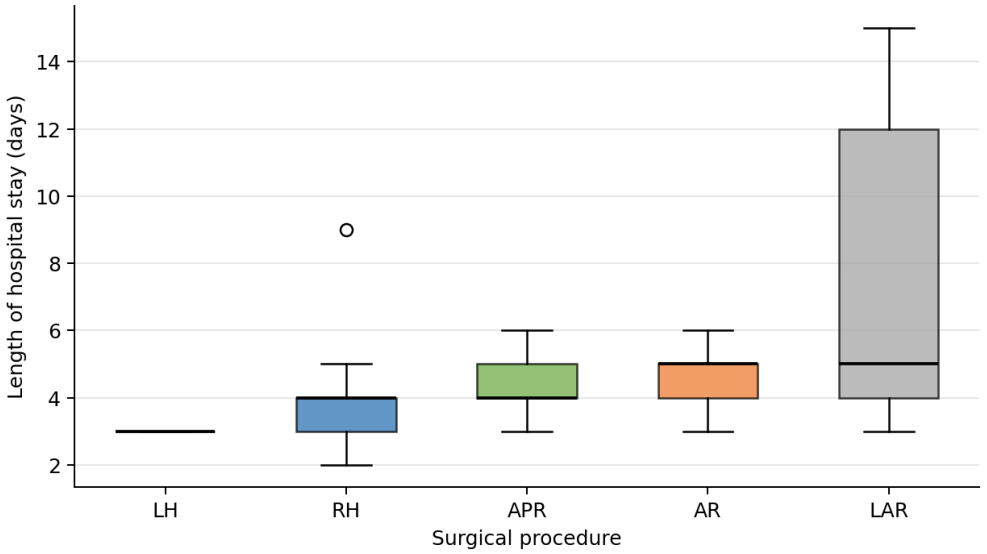


Figure 3. Length of hospital stay by type of surgical procedure (ANOVA $F = 9.80$, $p < 0.001$).

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## DISCUSSION

In this single-centre descriptive study of 138 patients with primary colorectal cancer treated at a tertiary care hospital in Peshawar, we have characterised the clinical, operative, and short-term outcome profile of CRC in our population. Three observations stand out: a relatively young mean age at presentation (58.7 years), a high proportion of locally advanced (Stage III) disease (62.3%), and a clinically meaningful concentration of postoperative morbidity in patients undergoing low anterior resection for rectal cancer.

The mean age of our cohort is approximately a decade younger than the typical Western mean of around 70 years and is comparable to recent regional data. Osama et al. (2025), in a retrospective study of 121 CRC patients at Jinnah Postgraduate Medical Centre in Karachi between 2022 and 2024, reported that the majority of their patients were middle-aged adults and that most presented with Duke stage C disease (42.1%) (13). Similarly, a 2024 tertiary-centre study from Chattogram, Bangladesh, described a comparable shift towards younger CRC presentation in South Asia (14). A 2024 international review and the 2024 Lancet Oncology population-based analysis by Sung et al. have further confirmed a rising incidence of young-onset CRC across multiple regions, with a particular increase in patients under 50 years (15,16). In our cohort, 15.2% of patients were aged ≤ 50 years, a proportion consistent with this regional trend and supporting earlier age-based screening strategies in South Asian populations.

We observed a slight female predominance (51.4%), which contrasts with the male predominance reported by Osama et al. (62% male) and by most Western series, but is consistent with the near-equal sex distribution noted in some other South Asian tertiary-centre reports (13,14). The geographic distribution of our patients — with more than one-third from Afghanistan and almost two-thirds from KPK — reflects the regional referral pattern of Hayatabad Medical Complex and highlights the role of this centre as a major CRC-care hub for both Pakistani and cross-border populations.

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The rectum was the most common tumour site in our series (37.7%), followed by the right colon (27.5%). This rectal predominance differs from the right-sided predominance reported in some Western and Far-Eastern young-onset cohorts but is concordant with regional Pakistani and Bangladeshi data, in which rectal and left-sided lesions remain the most frequent presentations (13,14). The high proportion of Stage III disease (62.3%) is in keeping with the late presentation pattern described in low- and middle-income countries, where structured CRC screening is not yet established and patients typically present only after symptom onset (9,13).

Our overall surgical site infection (SSI) rate of 24.6% is higher than the 7.65% reported in a nine-year Chinese cohort by Han et al. (2023) (17) and the 1.9–4.1% rates reported from high-income countries, but is in line with rates reported from comparable low- and middle-income settings. A 2025 Malaysian referral-centre study by Sangaran et al. documented an SSI rate of 33.6% in colorectal surgery, attributing this to limited adherence to enhanced recovery after surgery (ERAS) protocols and resource constraints (18). The 2024 meta-analysis by Papageorge et al. confirmed that male sex, BMI ≥ 25 kg/m², and ASA score ≥ 3 are consistent independent predictors of SSI in CRC surgery (19); however, in our cohort none of the demographic or comorbidity variables reached statistical significance, almost certainly because of the small number of SSI events (n = 34) and the absence of multivariable modelling. The relatively high overall SSI rate observed here suggests that focused infection-control measures — including standardised antibiotic prophylaxis, mechanical bowel preparation policies, and adoption of ERAS protocols — should be a priority for quality improvement in our setting.

The most clinically important and statistically robust finding in our study was the strong association between surgery type and anastomotic leak ($p < 0.001$). Our overall leak rate of 8.7% is within the 3.4–20% range described in contemporary literature (20) and comparable to the 10.3% leak rate reported after LAR with neoadjuvant chemoradiation in single-practice series (21). When restricted to LAR, our leak rate of 28.6% is higher than commonly reported figures, but is within the spectrum described for high-risk subgroups in recent literature: Hosseini et al. (2022) reported a leak rate of

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up to 15.4% in 136 LAR patients in Iran, with male sex and low anastomotic height being the principal risk factors (20,22). A 2024 systematic review and meta-analysis by Zhao et al. confirmed that reinforcing sutures and proximal diversion materially reduce leak rates, with leak occurring in 11.9% of unreinforced anastomoses compared with 4.4% of reinforced ones (23). The 2022 randomised follow-up by Bao et al. further documented that anastomotic leak after LAR does not appear to compromise long-term oncological survival, but it markedly worsens short-term morbidity (24). Our data are entirely consistent with this evidence: leak more than doubled the length of hospital stay (11.8 vs 4.1 days), supporting the routine use of defunctioning stomas, reinforcing sutures, and meticulous patient selection in patients undergoing LAR at our centre.

Surgery type and tumour site were also significantly associated with incomplete recovery at three months, with APR and LAR for rectal cancer showing the highest proportions of incomplete recovery. This is biologically plausible given the more advanced disease and technical complexity of rectal cancer resections compared with right-sided colectomies, and it reinforces the value of integrated multidisciplinary care — including neoadjuvant chemoradiation, total mesorectal excision, and structured oncological follow-up — in this subgroup, in line with current management standards described in the 2024 international literature (15,23).

None of the demographic risk factors traditionally implicated in CRC outcomes (age, gender, BMI, smoking, comorbidities) reached statistical significance for any outcome in our cohort. This negative finding should be interpreted with caution: with only 12 leaks and 18 incomplete-recovery events, the study is underpowered to detect small or moderate effects, and multivariable adjustment was not feasible. Larger multicentre datasets such as the Turkish national CRC database analysed by Aytaç et al. (2024) have shown that ASA score, rectal tumour location, and stage III disease independently predict SSI even when crude associations appear weak (25). Future prospective studies from our region should aim for larger sample sizes and multivariable models to confirm or refute these signals.

The strengths of this study include prospective data collection on a consecutive sample of patients with histopathologically confirmed primary CRC at a single high-volume tertiary centre, with

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standardised operational definitions for all outcomes and uniform three-month imaging follow-up. The principal limitations are the single-centre design, the modest sample size (n = 138) which limited statistical power for rare outcomes, the short follow-up period (three months) which precludes long-term oncological conclusions such as disease-free or overall survival, the use of non-probability convenience sampling, and the absence of multivariable adjustment. Some surgical subgroups, notably LH (n = 2), are too small for meaningful comparison and were retained for completeness only.

## CONCLUSION

In this single-centre cohort of 138 patients with primary colorectal cancer treated at Hayatabad Medical Complex, Peshawar, patients presented at a relatively young age and predominantly with locally advanced (Stage III) disease. Postoperative morbidity was acceptable overall but was strongly concentrated in patients undergoing low anterior resection for rectal cancer, with surgery type and tumour site emerging as the principal determinants of anastomotic leak, recovery status, and length of hospital stay. These findings reinforce the importance of optimising perioperative care, anastomotic technique, and patient selection in rectal cancer surgery, support the routine use of defunctioning stomas and reinforcing techniques in LAR, and add to the growing case for structured CRC screening and infection-control quality improvement in low- and middle-income settings.

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