Colorectal cancer (CRC) is the third most common malignancy in men and the second in women worldwide [1]. Despite advancements in screening programs and treatment modalities reducing mortality rates in developed countries, approximately 20% of CRC patients present with synchronous metastasis at primary diagnosis, and more than half eventually succumb to the disease. The incidence of CRC in individuals under 50 years of age is notably increasing, highlighting the need for ongoing research and improved treatment strategies [2]. Patients with CRC often exhibit symptoms such as rectal bleeding, altered bowel habits, tenesmus, fatigue, and mucus discharge [3]. Diagnosis is confirmed through clinical evaluations, including digital rectal examination, proctoscopy, and colonoscopy with histopathological biopsy [4]. Staging of CRC involves methods such as ERUS, CT scans, MRI with localizing coils, and PET/CT [5]. There is emerging evidence that inflammation plays a critical role in the development and progression of CRC. Conditions like inflammatory bowel disease, characterized by localized inflammation, are linked to a higher risk of CRC. However, the role of systemic inflammation in colon carcinogenesis is less clear [6]. Systemic inflammation is known to promote cancer through the production of pro-inflammatory cytokines and reactive oxygen species, which activate tumor-promoting transcription factors [7]. In CRC, systemic inflammation often leads to increased production of proteins like CRP by the liver and manifests as fever, anemia, fatigue, and loss of appetite, eventually resulting in cachexia. Key inflammation markers, such as...
Methods

The cross-sectional study was conducted in the Department of Surgery, surgical unit-II, Liaquat University Hospital, Hyderabad/Jamshoro. It was carried out over six months following the approval of the synopsis, from January 2022 to June 2022. The non-probability consecutive sampling method was chosen due to the specific inclusion criteria and the need to enroll all eligible patients within the study period, ensuring a comprehensive assessment of the target population within the constraints of the study’s timeframe and resources. Inflammatory and prognostic markers were measured using standardized laboratory procedures, with specific assays for each marker, ensuring accuracy and reliability in the obtained results. The sample size was determined to be 112 patients, calculated using the prevalence of raised inflammatory markers as 24.8%, with a margin of error of 8%, using the formula for sample size calculation [9]:

\[ n = \frac{Z^2 \times P \times (1-P)}{d^2} \]

where: \( n \) is the sample size, \( Z \) value (1.96 for 95% confidence level), \( P \) is the prevalence (24.8% or 0.248), \( d \) is the margin of error (8% or 0.08). Patients included in the study were between 20 to 60 years old, of either gender, with a history of bleeding per rectum or mucous discharge, tenesmus, altered bowel habits, and weight loss for at least one month, and diagnosed with colorectal cancer through histopathological reports, regardless of stage and grade. Excluded from the study were elderly patients with ASA-3 and 4, known cases of other GI malignancies, cirrhosis, malabsorption syndrome, those already on corticosteroids, immunosuppressive therapy, albumin or antibiotic therapy, patients with chronic renal failure, nephrotic syndrome, pregnant and lactating women, vitally unstable patients due to intestinal obstruction or perforation, and those already on iron supplements and recurrent blood transfusions. Data were collected from patients admitted to the surgery ward after obtaining informed consent. A brief clinical history was taken, and relevant physical examinations were performed. Baseline investigations and specific investigations (colonoscopy and biopsy, CT scan of the chest, abdomen and pelvis, and transrectal ultrasound) were advised, and the history of associated co-morbidities was recorded. Diagnosed cases of colorectal cancer were further explored for inflammatory markers (white blood cell count, serum albumin, erythrocyte sedimentation rate, serum C-reactive protein, fibrinogen, and cytokines including interleukin-6 and tumor necrosis factor) and prognostic markers (serum LDH and ferritin). These were measured pre-operatively and post-operatively on the third day, and CEA levels were measured after one month by taking a 2-cc venous blood sample in a 5 cc disposable syringe and sending it to the laboratory for analysis. All maneuvers, including history taking, physical examination, sampling, and data collection, were conducted by the principal researcher. Data were collected using a pre-designed proforma, and the financial burden of the study was borne by the researcher. Biopsy specimens and biochemical analyses were performed by a senior pathologist with over five years of experience. Patients were kept in the ward for 5–7 days according to their status and the quantity of drainage, and were observed for in-hospital outcomes. The collected data were analyzed using SPSS version 21.0. The frequency and percentage of inflammatory markers, gender distribution, associated co-morbidities, and effect modifiers were computed. The mean and standard deviation were calculated for quantitative variables such as age, duration, WBC count, ESR, serum albumin, ferritin, LDH, and CRP levels. The study was conducted following ethical guidelines, and approval was obtained from the Research Ethics Committee, Liaquat University of Medical and Health Sciences, Jamshoro (LUMHS/REC/-203).

Results

A total of 112 cases were studied with a mean age of 45.16±10.52 years (range: 25–67 years). The gender distribution was 51.8% males and 48.2% females. Most patients were urban residents (53.6%), while 36.4% were rural residents. The majority of patients presented with abdominal pain, per rectal bleeding, and weight loss (Table 1). According to comorbidities, 67.9% of the patients had hypertension, 44.6% were diabetics, 49.1% were smokers, 29.5% were obese, 24.1% had dyslipidemia, and 89.3% had anemia (Table 1).

Table 1: Socio-Demographic and Clinical Characteristics of Patients (n=112)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (Mean ± SD)</td>
<td>45.16 ± 10.52</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>58 (51.8)</td>
</tr>
<tr>
<td>Female</td>
<td>54 (48.2)</td>
</tr>
<tr>
<td>Residence</td>
<td></td>
</tr>
<tr>
<td>Urban</td>
<td>60 (53.6)</td>
</tr>
<tr>
<td>Rural</td>
<td>52 (46.4)</td>
</tr>
</tbody>
</table>
Tumor grading revealed that 58.0% had a tumor grade of T2N1M0, 37.5% had T2N0M0, 2.7% had T1N0M0, and 1.8% had T3N1M0 (Table 2). Surgical procedures included right hemicolectomy (23.2%), left hemicolectomy (11.6%), sigmoidectomy (11.6%), transverse colectomy (11.6%), high anterior resection (11.6%), low anterior resection (15.2%), abdomino-perineal resection (1.8%), and extended hemicolectomy (13.4%). Tumor locations were predominantly in the colon (71.4%) and rectum (28.6%). Surgical intent was curative in 84.8% of cases and palliative in 15.2% (Table 2).

The hospital outcomes showed that 30.4% of patients had a normal recovery, while 18.8% experienced postoperative wound infections. Reoperation was required in 7.1% of cases, and 12.5% had sepsis, wound infection, and prolonged hospital stay. Mortality was 3.6% (Table 4).

**DISCUSSION**

This study investigated the socio-demographic characteristics, tumor grading, surgical procedures, inflammatory markers, and hospital outcomes of 112 patients with colorectal cancer at Liaquat University Hospital, Hyderabad/Jamshoro. The mean age of the patients was 46.16±10.52 years, with a slight predominance of males (51.8%). Elderly people with a high burden of coexisting disorders may be less likely to pay attention to cancer symptoms, may put off treating them, or may have other medical issues masking the warning signals of cancer (masked symptomatology not visible to patients or physicians). When it comes to the elderly, colon disruption is frequently thought to come with getting older [10-12]. The reason for this age related alteration in gut morphology might be due to the mitochondrial changes, oxidative stress, DNA damage and microbial damage in the intestinal epithelium [10,12]. Most patients resided in urban areas (53.6%). The primary presenting complaints were abdominal pain, per rectal bleeding, and weight loss (Table 1). The prevalence of hypertension (67.9%), diabetes (44.6%), smoking (49.1%), obesity (29.5%), dyslipidemia...
(24.1%), and anemia (89.3%) among the patients is consistent with comorbidity patterns observed in other studies on colorectal cancer. These comorbidities can complicate treatment and affect prognosis, emphasizing the need for comprehensive management strategies [15]. For instance, the study by Yancik R et al., in 1998 highlights that comorbid conditions like hypertension and heart problems significantly increase early mortality risks in colon carcinoma patients [14,15]. Our findings similarly underscore the high prevalence of comorbid conditions, which necessitates careful consideration during treatment planning. Several studies report the presence of these comorbidities among CRC patients [16-20]. Tumor grading in our study showed that the majority of patients had T2N0M0 (58.0%) or T2N1M0 (37.5%) tumors, which is comparable to other studies reporting early-stage colorectal cancer as the most common diagnosis at initial presentation [21]. Surgical interventions were diverse, with right hemicolectomy being the most frequent procedure (23.2%), followed by left hemicolectomy, sigmoidectomy, and transverse colectomy (each 11.6%). The distribution of surgical procedures reflects standard practice in colorectal cancer management and is supported by existing literature. The study by Vissers PA et al., in 2016 suggests that lifestyle factors and BMI significantly affect health-related quality of life (HRoQL) in colorectal cancer patients [22]. Obesity is reported to be a common risk factor and affects prognosis in colorectal cancer. Obese patients displayed more comorbidities, more pain after cancer surgery, worse coping, and more depression and perceived less social support than nonobese patients [23]. This finding is relevant to our study, as we observed a high prevalence of obesity (29.5%) and smoking (49.1%), which are critical lifestyle factors influencing patient outcomes. The study by Abualkhair WH et al., in 2020 further supports our findings by demonstrating a significant increase in colorectal cancer incidence from ages 48 to 50, correlating with the onset of average-risk screening [24]. This steep increase indicates a high prevalence of undetected preclinical cases, suggesting that earlier screening could benefit those under 50. Our patient demographics reflect a need for heightened awareness and potential earlier screening interventions to detect colorectal cancer at more treatable stages. The study found significant pre-operative and post-operative elevations in inflammatory markers, such as WBC, CRP, ESR, ferritin, and LDH. Raised WBC (59.8% pre-operative, 92.9% post-operative, p < 0.001) and CRP (87.5% pre-operative, 94.6% post-operative, p = 0.03) were particularly notable. These markers are associated with systemic inflammation and have been linked to poorer prognosis in colorectal cancer patients. Elevated inflammatory markers may indicate a more aggressive disease course and a higher likelihood of complications, reinforcing the importance of monitoring these parameters during patient management. The study by Yancik et al., in 1998 also emphasizes that comorbidity and inflammation increase the complexity of cancer management and affect survival duration, which is consistent with our findings [14, 22]. Longitudinal studies with extended follow-up periods are necessary to evaluate the long-term prognostic significance of raised inflammatory markers in colorectal cancer. Additionally, investigating the potential therapeutic benefits of targeting inflammation in colorectal cancer could provide valuable insights into improving patient outcomes. Studies should also consider including detailed assessments of lifestyle factors and their interactions with comorbidities and inflammatory markers to develop more comprehensive treatment strategies.

**CONCLUSIONS**
The study demonstrates that serum inflammatory markers, both pre-operative and post-operative, play a significant role in influencing the prognosis and outcomes of patients with colorectal carcinoma. Elevated levels of markers such as WBC, CRP, ESR, ferritin, and LDH, along with decreased serum albumin, were associated with adverse surgical outcomes including wound infections, pneumonia, sepsis, and prolonged hospital stays. The mortality rate was noted to be 3.6%. These findings underscore the importance of monitoring inflammatory and prognostic markers in managing colorectal carcinoma to predict and potentially mitigate complications, ultimately improving patient outcomes.

**Authors Contribution**
Conceptualization: AIM
Methodology: SR, HK, N., SHI
Formal analysis: AIM
Writing, review and editing: AIM, AMB,

All authors have read and agreed to the published version of the manuscript.

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**REFERENCES**
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