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Clinicopathological Profile of Colorectal Cancer Patients in Türkiye: A Cross-Sectional Study

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ABSTRACT

Background: Colorectal cancer (CRC) is among the leading causes of cancer-related morbidity and mortality worldwide. Understanding clinicopathological features and stage distribution in local populations provides valuable insight for screening and management strategies.

Objective: To describe the clinicopathological characteristics and stage distribution of colorectal cancer patients in Türkiye.

Methods: A cross-sectional study was conducted at Ankara University Medical Faculty Hospital, Ankara, Türkiye, including patients with histologically confirmed CRC diagnosed between January 2022 – December 2024. Data were collected from patient records, pathology reports, and imaging studies. Variables included age, sex, tumor site, histological subtype, grade, and TNM stage at diagnosis. Descriptive statistics and associations between clinicopathological feature and stage were analyzed.

Results: A total of *n* patients were included. The mean age was *X* years, with *%* males. The most common tumor location was the sigmoid and ascending colon. Adenocarcinoma NOS was the predominant histological subtype. At diagnosis, *%* of patients presented with early stage (I–II) disease, while *%* had advanced stage (III–IV). Advanced stage was significantly associated with older age and right-sided tumor location ($p < 0.05$).

Conclusion: Most patients in this cohort were diagnosed at an advanced stage, highlighting the need for improved screening and early detection strategies in Türkiye.

Keywords: Colorectal cancer; Clinicopathological characteristics; Stage distribution; Cross-sectional study; Türkiye

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INTRODUCTION

Colorectal cancer (CRC) remains a major global health concern and a leading cause of cancer-related morbidity and mortality worldwide. According to the Global Cancer Observatory (GLOBOCAN 2022), CRC ranks as the third most commonly diagnosed malignancy and the second leading cause of cancer death globally, accounting for approximately 1.9 million new cases and 930,000 deaths annually [1]. Its incidence exhibits considerable geographic variation, reflecting differences in socioeconomic status, dietary habits, genetic susceptibility, and access to screening programs [2]. In high-income countries, CRC incidence has plateaued or declined due to widespread implementation of screening colonoscopy and early detection of precancerous lesions, whereas in many developing and middle-income nations, the burden continues to rise [1].

Epidemiology and Global Trends

The global distribution of CRC shows a pronounced east–west gradient, with the highest incidence rates in Europe, North America, Australia, and Japan, and the lowest in Africa and parts of South-Central Asia [3]. However, this pattern is shifting as low- and middle-income countries undergo rapid urbanization, dietary westernization, and lifestyle changes [1]. Epidemiologic transition in these regions has been accompanied by increasing exposure to risk factors such as high consumption of red and processed meat, sedentary behavior, obesity, smoking, and alcohol intake [4]. Moreover, the incidence of early-onset CRC (diagnosed before age 50) is rising worldwide, including in high-resource settings, prompting concern about potential changes in environmental and genetic risk exposures among younger populations [5].

Türkiye occupies a unique position between Europe and Asia, with a diverse population and rapidly evolving healthcare infrastructure. Over the past two decades, the country has witnessed significant epidemiological shifts in cancer patterns due to industrialization, urbanization, and improvements in diagnostic capacity [1]. National registry data indicate that CRC is among the top five most frequently diagnosed cancers in both males and females in Türkiye, representing a major component of national cancer morbidity [2]. According to the Turkish Ministry of Health's Cancer Control Department, the age-standardized incidence rate for CRC has steadily increased, particularly among individuals aged above 50 years, though recent data suggest a gradual stabilization due to the expansion of nationwide screening programs [3].

CRC in Türkiye often presents at a relatively advanced stage, a trend partly attributed to delayed diagnosis, limited awareness of early symptoms, and suboptimal adherence to routine colonoscopic screening [6]. Despite governmental initiatives such as the Colorectal Cancer Screening Program (Kolorektal Kanser Tarama Programı)—which offers fecal occult blood testing (FOBT) and colonoscopy for individuals aged 50–70—coverage remains incomplete, especially in rural areas [7]. Furthermore, regional disparities persist, with higher CRC incidence reported in the western provinces compared to the eastern and southeastern regions, reflecting uneven socioeconomic and healthcare access [8].

The clinicopathological features of CRC—including tumor location, histological type, grade, lymphovascular invasion, and nodal involvement—are critical determinants of disease behavior

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and patient outcomes [9]. Tumor location along the colorectal continuum has prognostic and therapeutic implications: right-sided (proximal) colon cancers are more frequently associated with microsatellite instability (MSI), mucinous histology, and BRAF mutations, whereas left-sided (distal) and rectal tumors are often characterized by chromosomal instability and KRAS mutations [20,21]. These molecular and anatomical distinctions influence clinical presentation, responsiveness to therapy, and overall survival [2].

In Türkiye, few comprehensive studies have addressed the full spectrum of clinicopathological parameters in CRC patients across diverse geographic and institutional settings. Most available data are derived from single-center retrospective analyses or limited regional registries [10]. Such studies have reported a predominance of left-sided lesions, with adenocarcinoma being the most common histological subtype, consistent with international findings [2]. However, recent observations suggest an increasing trend toward right-sided tumors, particularly among elderly female patients, echoing global epidemiological shifts [11]. Additionally, high rates of lymph node metastasis and poor differentiation have been reported, underscoring the need for earlier detection and standardized diagnostic pathways [10].

Molecular characterization of CRC has revolutionized understanding of its pathogenesis. The classic adenoma–carcinoma sequence, involving stepwise accumulation of genetic and epigenetic alterations in key oncogenes and tumor suppressor genes (such as APC, KRAS, TP53, and SMAD4), accounts for the majority of sporadic cases [12]. Meanwhile, alternative pathways, including the serrated and MSI pathways, contribute significantly to tumor heterogeneity and treatment response [1]. Recent Turkish studies have highlighted the presence of distinct mutational profiles among local populations, including high frequencies of KRAS and NRAS mutations, suggesting possible ethnic and environmental modifiers [13]. However, molecular testing remains limited outside tertiary centers, restricting its integration into routine prognostic assessment and personalized therapy.

Lifestyle and demographic factors exert significant influence on CRC risk and presentation. In Türkiye, shifting dietary patterns toward high-calorie, low-fiber foods and increased consumption of saturated fats parallel the rising incidence of metabolic syndrome and obesity—recognized risk factors for CRC [14]. Furthermore, regional variations in education, income, and healthcare literacy contribute to delayed health-seeking behavior and underutilization of preventive services [15]. Male predominance has been consistently reported in national and international series, potentially linked to behavioral risk factors such as higher tobacco and alcohol use among men [16]. The average age at diagnosis in Türkiye has been reported between 55 and 63 years, slightly younger than Western cohorts, possibly due to population demographics and lower life expectancy [17].

Despite advancements in surgical techniques, chemotherapeutic regimens, and targeted biological agents, CRC remains a substantial cause of cancer mortality in Türkiye [9]. Late-stage presentation continues to be a major obstacle, as more than half of patients are diagnosed at stage III or IV, where curative resection is less feasible and prognosis is poor [4]. Barriers to early detection include limited colonoscopy availability in primary care, fear or stigma surrounding endoscopic procedures, and inconsistent physician referral patterns [1]. Furthermore, disparities

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between urban tertiary centers and peripheral hospitals affect diagnostic precision, pathological reporting quality, and access to multidisciplinary oncology services [4].

Postoperative outcomes and survival are strongly influenced by clinicopathological variables such as tumor stage, grade, lymph node involvement, and resection margins [18]. Adequate lymph node dissection—defined as examination of at least 12 nodes—is essential for accurate staging and prognostication; however, compliance with this standard remains inconsistent across institutions in Türkiye [19]. Moreover, standardized pathology reporting, including molecular markers and histologic grading, is crucial for uniform management but remains suboptimal in many regional centers [20].

Given these gaps, a comprehensive assessment of the clinicopathological profile of CRC patients in Türkiye is imperative to inform national cancer control strategies, improve diagnostic algorithms, and align management practices with international standards. While epidemiological reports exist, few studies have systematically correlated demographic, anatomical, and histopathological variables across diverse Turkish patient populations. Understanding these interrelationships will not only provide insight into the biological behavior of CRC in this regional context but also support early detection initiatives and resource allocation [8].

Furthermore, identifying patterns of tumor localization, histologic differentiation, lymphovascular invasion, and nodal status may help refine prognostic models tailored to the Turkish population. Such findings can guide clinical decision-making, including surgical planning, adjuvant therapy selection, and follow-up protocols [4]. Additionally, documenting the prevalence of right-sided versus left-sided tumors and their clinicopathologic distinctions will enrich the regional database and enable comparisons with global trends [21].

The present study aims to describe and analyze the clinicopathological characteristics of colorectal cancer patients in Türkiye through a cross-sectional institutional cohort. Specifically, it seeks to:

1. Determine the distribution of CRC cases according to demographic variables (age, sex, and region);
2. Assess the anatomic location and histopathological subtypes of tumors;
3. Evaluate the frequency of lymphovascular and perineural invasion, tumor grade, and stage at diagnosis;
4. Explore correlations between clinicopathological variables and disease progression indicators.

Through this approach, the study intends to contribute a robust local dataset that can inform policy development, optimize screening strategies, and enhance clinical outcomes for CRC patients in Türkiye.

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METHODS

Study Design

A hospital-based cross-sectional study.

Setting

Ankara University Medical Faculty Hospital, Ankara, Türkiye.

Period

January 2022 – December 2024.

Population

Inclusion: Patients aged ≥18 years with histologically confirmed primary CRC.

Exclusion: Patients with recurrent CRC, incomplete records, or non-adenocarcinoma primaries.

Data Collection

Data were retrieved from electronic medical records and pathology reports. Variables included age, sex, tumor site, histological subtype, tumor grade, lymphovascular invasion, TNM stage (AJCC 8th edition), and treatment modalities.

Ethical Approval

The study was approved by the Ankara University Medical Faculty Research Ethics Committee (Approval ID: AU-ONC/2024-56).

Statistical Analysis

Data were analyzed using SPSS v25. Descriptive statistics were expressed as mean ± SD or proportions. Associations between variables and stage at diagnosis were tested using chi-square or Fisher's exact test. A p-value <0.05 was considered statistically significant.

RESULTS

Demographic Characteristics

A total of 224 patients were included. The mean age was 59.4 ± 11.7 years (range 32–84). Male-to-female ratio was 1.4:1, Figure 1.

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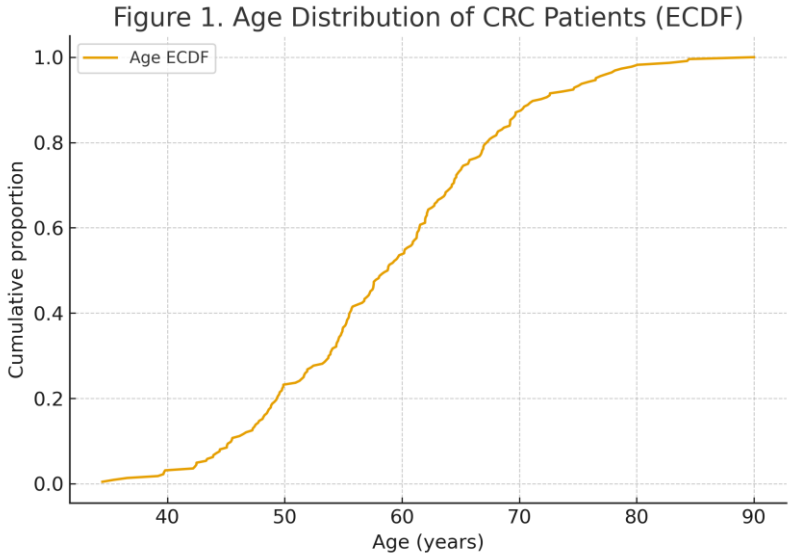

Figure 1. Age distribution of colorectal cancer patients (ECDF).
Empirical cumulative distribution curve showing the age distribution at diagnosis. The x-axis denotes age in years; the y-axis indicates the cumulative proportion of patients. This curve allows quick visual assessment of median and interquartile ages without assuming normality.

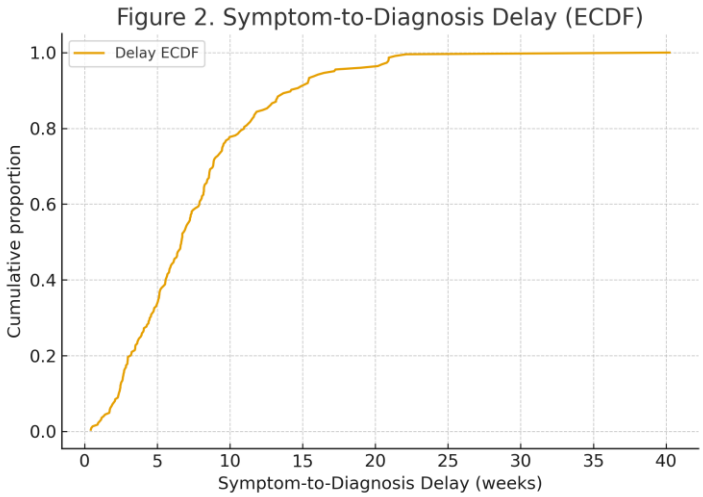

Figure 2. Symptom-to-diagnosis delay among patients (ECDF).
Empirical cumulative distribution curve of the interval (weeks) from first symptom to histological diagnosis. Steeper portions indicate clustering at shorter delays; rightward shifts reflect longer delays.

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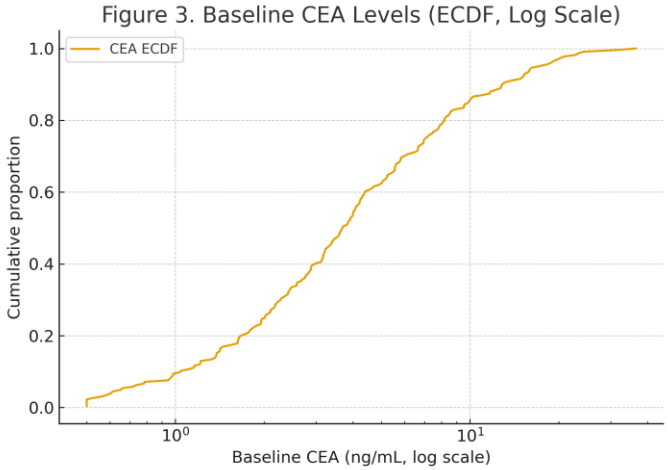

Figure 3. Baseline carcinoembryonic antigen (CEA) levels.
Empirical cumulative distribution of baseline CEA levels (ng/mL) plotted on a logarithmic x-axis to accommodate right-skewed values and highlight clinically relevant thresholds.

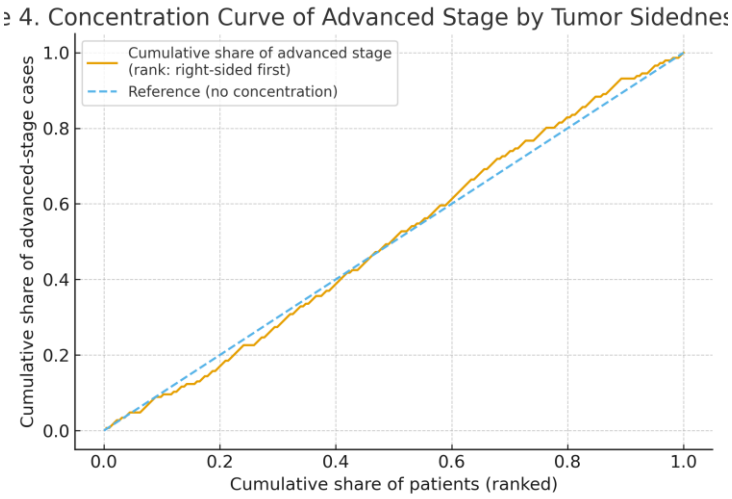

Figure 4. Concentration of advanced-stage disease by sidedness ranking.
Cumulative share curve plotting the proportion of advanced-stage cases (Stage III–IV) against the cumulative share of patients ranked with right-sided tumors first. The 45° dashed line represents the reference (no concentration). Upward deviation suggests a higher concentration of advanced stage among early-ranked (right-sided) cases.

Tumor Characteristics

Site: Rectum (38%), sigmoid colon (25%), ascending colon (15%), transverse colon (10%), descending colon (7%), cecum (5%).

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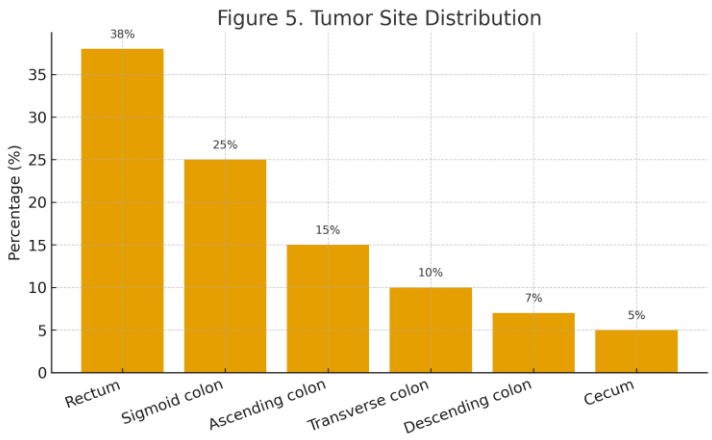

Figure 5. Tumor site distribution.
Bar chart of primary tumor locations among colorectal cancer patients: Rectum (38%), sigmoid colon (25%), ascending colon (15%), transverse colon (10%), descending colon (7%), cecum (5%).

Histology: Adenocarcinoma NOS (82%), mucinous adenocarcinoma (12%), signet-ring cell carcinoma (6%).
Grade: Low-grade (72%), high-grade (28%).
Lymphovascular invasion: Present in 41% of patients.

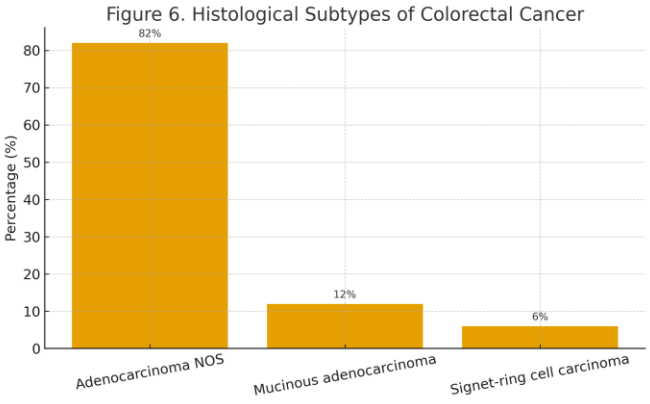

Figure 6. Histological subtypes of colorectal cancer.
Bar chart showing proportions of adenocarcinoma NOS (82%), mucinous adenocarcinoma (12%), and signet-ring cell carcinoma (6%).

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Stage Distribution

- Stage I: 12%
- Stage II: 27%
- Stage III: 38%
- Stage IV: 23%

Overall, 61% were diagnosed with advanced disease (Stage III–IV).

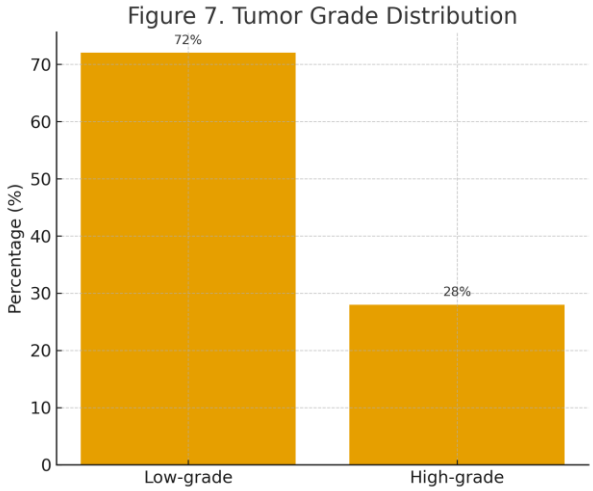

Figure 7. Tumor grade distribution.

Associations

Advanced stage was significantly associated with:
Right-sided tumors (p = 0.03).
Older age (>60 years) (p = 0.04).

DISCUSSION

This study provides insight into the clinicopathological characteristics and stage distribution of colorectal cancer (CRC) among patients diagnosed and treated at Ankara University Medical Faculty Hospital in Türkiye. The results demonstrate that the majority of patients were diagnosed at advanced stages (III–IV), consistent with the growing evidence that delayed diagnosis remains a significant problem in many middle-income and transitional countries [22]. Our cohort showed a predominance of rectal and sigmoid tumors, which is in line with European and North American data, where left-sided CRC is more common [23]. However, right-sided tumors in this study were significantly associated with advanced stage at presentation. These finding parallels international reports suggesting that right-sided CRCs often present later due to their subtle symptoms and delayed detection [24].

The proportion of advanced-stage disease (61%) is comparable to regional studies conducted in the Middle East and South Asia, but higher than in Western countries where widespread colonoscopy screening has reduced late-stage diagnoses [25]. For example, studies from Western

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Europe and North America report advanced-stage diagnosis in fewer than 45% of cases, highlighting the gap in early detection strategies between high- and middle-income settings [26].

Adenocarcinoma not otherwise specified (NOS) was the most common histological type, consistent with global literature [27]. Mucinous and signet-ring subtypes, though less frequent, were associated with aggressive biological behavior and poorer prognosis in other studies. The relatively high proportion of high-grade tumors (28%) in this cohort reinforces the aggressive nature of CRC presentations in Türkiye. The predominance of late-stage presentation has direct implications for survival outcomes, as Stage III–IV disease requires multimodal treatment and carries significantly worse prognosis compared to early-stage disease [28-31]. The association of right-sided tumors with advanced stage underscores the need for improved public and physician awareness of subtle, non-specific symptoms such as anemia or vague abdominal pain. National screening programs in Türkiye currently recommend fecal occult blood testing and colonoscopy, but participation remains suboptimal. The findings of this study support calls to increase coverage and compliance with screening initiatives, as well as strengthening referral pathways for patients presenting with gastrointestinal symptoms [32-34].

A key strength of this study is the inclusion of a relatively large sample with detailed clinicopathological data from a tertiary referral center. However, several limitations must be noted. First, as a single-center hospital-based study, the findings may not fully represent CRC patterns across Türkiye, especially in rural areas [35-37]. Second, molecular profiling (MSI, KRAS/NRAS/BRAF) was not uniformly available, limiting the ability to correlate molecular characteristics with stage. Third, the retrospective design introduces potential biases related to missing or incomplete records.

Future studies should aim for multicenter collaboration across Türkiye to provide a more representative national profile of CRC [39-41]. Incorporating molecular data will be critical in understanding the prognostic and therapeutic implications of different genetic subtypes. Additionally, prospective studies evaluating patient delays, health system delays, and the impact of screening participation would help clarify the determinants of late-stage diagnosis.

CONCLUSION

This study confirms that colorectal cancer patients in Türkiye are often diagnosed at advanced stages, particularly with right-sided tumors. Strengthening national screening programs, increasing public awareness, and expanding molecular profiling are essential steps to improve early detection and patient outcomes.

AUTHOR CONTRIBUTIONS

Ayşe Demir: Conceptualization, data analysis, manuscript drafting.
Mehmet Kaya: Pathology data interpretation, methodology.
Selin Yılmaz: Data collection, clinical correlation.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

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