



Survival Rates of Colorectal Cancer in Academic Hospital Universitas Gadjah Mada, Yogyakarta: A Cohort Study

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Abstract

Background: Colorectal cancer (CRC) is the third most common cancer worldwide. It poses a significant challenge to healthcare systems, including those in Indonesia. This study investigates CRC survival rates and their association with prognostic factors at the Academic Hospital Universitas Gadjah Mada (UGM), Yogyakarta.

Methods: This is a cohort-retrospective study. All patients who were diagnosed with CRC and treated in the Surgery Division of Academic Hospital UGM from January 2019 to December 2023 were enrolled. Kaplan-Meier survival curves were used to estimate overall survival, and the log-rank test was used to compare overall survival between prognostic groups.

Result: The study included 110 patients with CRC. The median follow-up was 713 days. The estimated 1-year overall survival of all CRC patients treated at Academic Hospital UGM was 66.75%. The average Overall Survival (OS) was 752.335 days. Log-rank analysis showed p-values of 0.485, 0.468, 0.437, and < 0.001 for sex, age, cancer stage, and treatment, respectively. Treatment type significantly impacted survival. Patients who underwent surgery alone had a lower OS compared to those treated with surgery plus chemotherapy. Patients who received surgery alone also had 10-fold higher mortality than those who received combination therapy (HR 10.288; CI 95%, 3.603–29.387, $p < 0.001$).

Conclusion: Survival outcomes for colorectal cancer patients vary based on sex, age, stage, and treatment type. Surgery combined with chemotherapy was associated with better OS in CRC patients.

Keywords: colorectal cancer, survival rate, prognostic factors

1. INTRODUCTION

Colorectal cancer (CRC) is a major public health concern globally and in Indonesia, ranking as the third most common malignancy and the second leading cause of cancer-related death worldwide. In Indonesia, CRC is the fifth cause of cancer mortality, accounting for 7.7% of cancer deaths. The incidence and burden of CRC are rising, including in Yogyakarta, as indicated by increasing local case numbers. The Academic Hospital Universitas Gadjah Mada (RSGM UGM), a primary teaching and referral center, serves a

diverse patient population, offering a unique opportunity to evaluate local CRC outcomes.

The overall survival (OS) rate is a key metric for evaluating the effectiveness of cancer treatment. It shows the proportion of people alive at a specific time after diagnosis or treatment, including all causes of death (6). CRC survival rates vary because of factors such as age, histopathology, tumour stage at diagnosis, and chosen interventions. Lifestyle and environmental factors, such as frequent smoking, alcohol use, obesity, a Western diet, less physical

activity, and early antibiotic exposure, are also believed to raise susceptibility to CRC (3,7).

In the United States, people over 65 are three times more likely to be diagnosed with CRC than those aged 50–64. They are approximately 30 times as likely as those aged 25–49 (8). SEER data show that men have a slightly lower 5-year relative survival rate (64%) than women (65%). However, this gap varies by age and tumour location (9). The TNM staging system classifies tumours based on size (T), lymph node involvement (N), and metastasis (M). It remains the gold standard for stratifying patients into prognostic subgroups and for guiding treatment (10). Patients with early-stage (I–II) and stage IIIA–B have better survival than those with advanced stages (IIIC–IV) in the US. Treatment options for non-resectable CRC include surgical resection, radiotherapy, chemotherapy, immunotherapy, and combinations (11). In advanced (stage IV) CRC, initial chemotherapy can give a 2-year survival similar to, or better than, primary tumour resection, especially in patients under 75 years (12).

In Indonesia, a cohort study on CRC was conducted in Jakarta and Makassar. In Makassar, the average OS rate for CRC was 3.973 years (95% CI, 3.835–4.110). In RSCM Jakarta, the 5-year survival rate was 43% (7,13). However, no comprehensive evaluation of CRC survival rates has been conducted at the Universitas Gadjah Mada (UGM) Academic Hospital. This study aims to evaluate the hospital survival rate for CRC and its association with key prognostic factors. Understanding these factors is critical for enhancing treatment outcomes and guiding clinical decision-making.

2. MATERIALS AND METHODS

This is a cohort retrospective survival analysis study. All patients diagnosed with CRC

and treated in the Surgery Division of UGM Academic Hospital from January 2019 to December 2023 were included. Data on patient age, sex, tumour stage (TNM staging system), therapy received (surgery alone or surgery combined with chemotherapy), and tumour histopathological characteristics were extracted from the medical record.

Exclusion criteria included surgery at another hospital, loss to follow-up with incomplete data, or another confirmed malignancy. The primary outcome was overall survival, measured from diagnosis to death from any cause, or to the censoring date for those still alive at last follow-up. Patients who had not visited the outpatient clinic since December 2023 were contacted through family to confirm survival status. If information could not be obtained, patients were censored at their last known contact date.

Kaplan-Meier survival curves were used to estimate overall survival, and the log-rank test was used to compare survival across prognostic groups; p-values <0.05 were considered statistically significant. The data were analysed using SPSS software Version 28.

3. RESULTS

a. Descriptive analysis

Subjects were selected from the medical records from January 2019 until December 2023 by the diagnosis “colorectal cancer”, “colon cancer”, and “rectal cancer”. Of the 169 data sets extracted, 110 patients met the inclusion & exclusion criteria. The patient’s characteristics are shown in Table 1. The following section details these characteristics before presenting survival outcomes.

Table 1. Patient’s Characteristics

Clinical	n	%
Age		
< 40	8	7.3

40-49	9	8.2
50-59	31	28.2
60-69	37	33.6
70-79	21	19.1
>80	4	3.6
Sex		
Male	60	54.5
Female	50	45.5
Stage		
I	17	15.5
II	20	18.2
III	53	48.2
IV	20	18.2
Therapy Received		
Surgery	54	49.1
Surgery & Chemotherapy	56	50.9
Histopathology		
Adenocarcinoma	96	87.3
Mucinous Carcinoma	10	9.1
Signet Ring Cell Carcinoma	3	2.7
Adenocarcinoma Mix Signet Ring Cell Carcinoma	1	0.9

Of the included patients, most (84.5%) were aged ≥ 50 years. The highest diagnosis rate was in the 60-69 age group (33.6%), followed by the 50-59 years (28.2%). Males accounted for 54.5% of cases and females 45.5%. Advanced-stage diagnoses were more common: 48.2% at stage III and 22.9% at stage IV. Early-stage cases (stages I and II) made up 33.7%. For treatment, 49.1% had surgery alone, while 50.9% received both surgery and chemotherapy. Adenocarcinoma was the most frequent histopathology, present in 96 of 110 patients (87.3%).

b. Overall Survival

The median follow-up time was 713 days. Among 110 patients, 33 (30%) died, with an average overall survival (OS)—the average time from diagnosis to death—of 752.335 days (95% confidence interval [CI], 579.239-925.431). The estimated one-year survival rate—the percentage alive one year after diagnosis—was 66.75% (Figure 1).

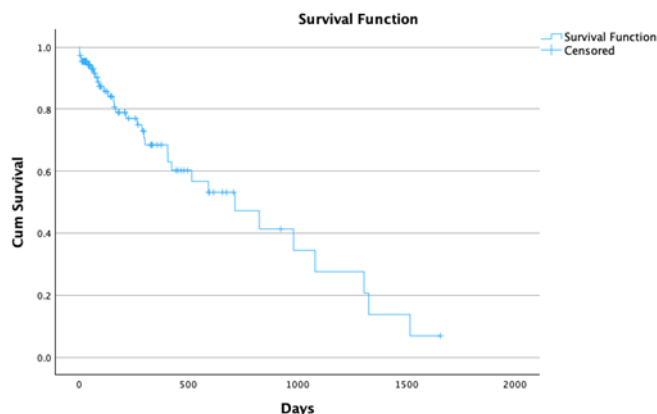


Figure 1. Overall survival

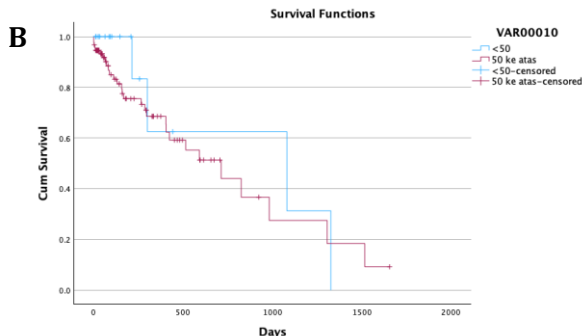
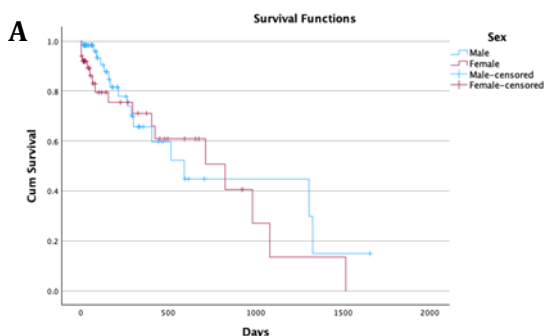
c. Bivariate Analysis

The log-rank test was used to analyse the association between prognostic factors and overall survival (OS)—the time from diagnosis to death from any cause (Figure 2). The average OS was slightly higher in males (810.4 days; 95% confidence interval [CI], 554-1066.7) than in females (709.29 days; 95% CI, 486.1-932.4). However, the relationship between sex and OS was not statistically significant ($p=0.485$, where a p -value >0.05 means the result is not statistically significant ($p=0.485$)).

We grouped age by early-onset (18–49 years) and late-onset CRC (≥ 50 years). The <50 years group had higher overall survival, with an estimated OS of 850.66 days (95% CI, 380.9–1320.3), compared with 735 days (95% CI, 536.2–933.8) in those aged 50 and older. This difference was not statistically significant ($p=0.4$).

The OS (overall survival, or time from diagnosis to death) rates varied across different cancer stages. Stage I had an OS of 628.857 days, stage II 463.094 days, stage III 740.177 days, and stage IV 633.914 days. Despite these differences in survival times, the relationship between cancer stage and OS did not reach statistical significance ($p=0.437$; p -value >0.05 means not statistically significant ($p=0.437$)).

Patients who underwent definitive surgery alone had an OS of only 373.9 days (95% CI, 227.8–520.0). In contrast, those who received definitive surgery combined with adjuvant chemotherapy experienced a significantly longer OS of 1185.2 days (95% CI, 904.9–1465.5). The relationship between treatment and OS was statistically significant ($p < 0.001$), highlighting the importance of adjuvant chemotherapy in improving survival.



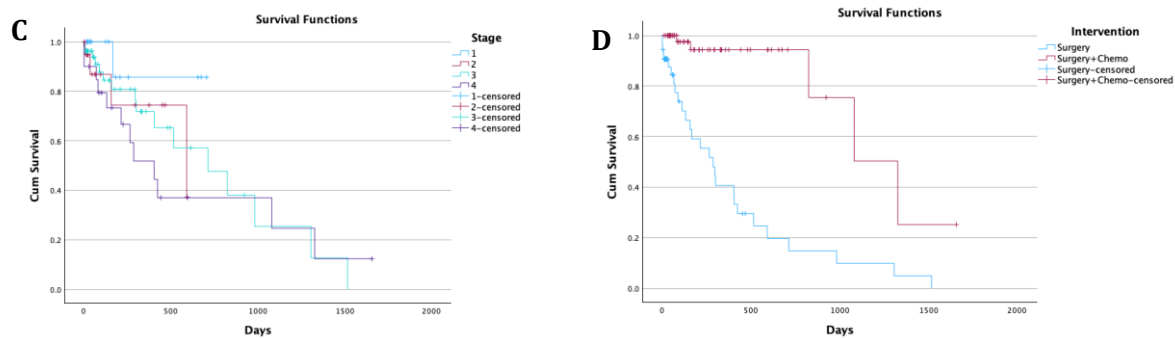


Figure 2. Log-rank analysis and OS. A. between sex, B. between age, C. between stage, D. between therapy received

Cox regression was used to assess the association between predictors and mortality. In our study, the Hazard Ratio (HR) for mortality was not significant for age, sex, or stage ($p > 0.001$). However, the intervention variable was

significant ($p < 0.001$), with patients who underwent surgery alone experiencing a 10-fold higher risk of mortality (HR 10.288; 95% CI, 3.603-29.387) compared to those who received both surgery and chemotherapy (Table 2).

Table 2. Hazard Ratio (n=110)

Variable	Non-survive (n = 77)	Survive (n = 33)	HR	CI 95%	p
Age					
< 50	4	13			
≥ 50	29	64	1.326	3.602 – 29.387	0.678
Sex					
Male	16	44	1.071	0.483 – 2.375	0.867
Female	17	33			
Stage					
I	1	16			
II	4	16	1.784	0.152 - 20.958	0.645
III	16	37	2.168	0.208 - 22.584	0.517
IV	12	8	4.664	0.465 - 46.753	0.190
Histopathology					
Adenocarcinoma	29	67			
Mucinous Carcinoma	3	7	2.272	0.477 - 10.826	0.303
Signet Ring	1	2	0.276	0.031 - 2.444	0.247
Carcinoma					
Signet Mix Adenoca	0	1	0.00	0.00	0.984
Intervention					
Surgery	28	26	10.288	3.603-29.387	
Surgery-Chemotherapy	5	51			<0.001

4. DISCUSSION

Overall Survival (OS) is recognised as the benchmark for assessing the clinical effectiveness of experimental cancer treatments. In our study, OS was defined as the number of days from the diagnosis to death from any cause, with survival times for patients still alive at analysis censored at their last recorded follow-up (14,16).

This study had a median follow-up period of 713 days. Out of the 110 patients included, 33 (30%) had died by the end of the study period, resulting in an average OS of 752.3 days (95% CI, 579.2-925.4), and an estimated one-year survival rate was 66.75%. This was consistent with Malaysian National Cancer Registry data, which reported a 1-year CRC survival rate of 68.5% (13). On the other

hand, estimates of 1-year survival for colorectal cancer are notably higher in high-income countries, such as 78% in England and 84% in Sweden between 2010 and 2012 (16). This aligns with GLOBOCAN data (2018), which show that CRC mortality rates were 17% higher in low- and middle-income countries (age-standardised mortality rates: 10.6/100,000 and 3.9/100,000, respectively) (17).

Across all ages and nations, males have about a 1.5-fold higher chance of developing CRC than females (8). Gender distribution of patients included in this study was predominantly male, with 54.5% male and 45.5% female. This also aligns with the data from the CRC Cancer Registry at RSUP Dr Sardjito in Yogyakarta, which reported a male predominance of 52,8% (18). In this study, the average OS was slightly longer for males (722.1 days; 95% CI, 456.2-988.1) than for females (691.4 days; 95% CI, 486-896.8). However, we found that the relationship between sex and OS was not statistically significant ($p=0.949$).

Among the patients included in this study, the majority (84.5%) were late-onset, with the highest proportions diagnosed in the 60-69 (33.6%) and 50-59 (28.2%) age groups. Patients under 50 years had a longer OS, with an estimated OS of 850.66 days (95% CI, 380.9-1320.3), compared to an estimated 735 days (95% CI, 536.2-933.8) for those aged 50 and older. This study was in line with the previous data, which showed that in the United States, those over 65 years old are about three times more likely to be diagnosed with CRC than those 50-64 years old, and about 30 times more likely to be diagnosed than those 25-49 years old [8]. Nevertheless, the relationship between OS and age was not found statistically significant ($p=0.468$).

The OS rates varied across cancer stages: stage I had an OS of 628.857 days, stage II had a slightly lower OS of 463.094 days, stage III had a more favourable OS of 740.177 days, and stage IV had the lowest OS of 633.914 days. The relationship between cancer stage and OS is not statistically significant ($p=0.437$). Stage II patients had lower OS than stage III patients. Possible reasons for this anomaly include a small sample size and an uneven distribution of patients across cancer stages; confounding factors from other

chronic diseases are not addressed in this paper due to insufficient data. The number of patients diagnosed in stage III was the highest at 53 (48.2%). This means that our patients came at a relatively late stage. Compared to the earlier stage, which was 15.5% and 18.2% for stages I and II, respectively. A Cancer Registry in Yogyakarta also stated that nearly 40% of CRC patients present at stage IV (18). The study in the US stated that the relative five-year survival rate for stage I small intestine cancer is approximately 92%, while the rates for stage IIA and stage IIB are 87% and 65%, respectively. Conversely, the five-year survival rates for stage IIIA and stage IIIB are slightly higher at 90% and 72%, respectively. Stage IIIC has a survival rate of 53%, whereas stage IV, or metastatic CRC, has a dismal 5-year survival rate of only 12% (8).

The most common histopathology was adenocarcinoma, which was observed in 96 patients (87.3%), followed by mucinous carcinoma in 9.1% patients. This study is relevant to another finding from a tertiary hospital in Yogyakarta: nearly 81,7% of CRC patients present with adenocarcinoma (18). Adenocarcinomas, which account for >90% of CRC cases worldwide, are malignant neoplasms originating from colorectal mucosal epithelial cells within glands or glandular structures. The second most common subtype globally is mucinous carcinoma, characterised by extracellular mucinous pools in at least 50% of the tumour volume (19). In Cox regression analysis, mucinous adenocarcinoma showed an HR of 0.276 (95% CI, 0.031-2.444, $p=0.247$) compared with adenocarcinoma. This study aligns with previous research, indicating that mucinous adenocarcinoma has worse OS than adenocarcinoma and is a negative prognostic factor for OS, with a HR of 1.78 (95% CI, 1.35-2.35) (22).

Patients who underwent definitive surgery alone had an OS of only 373.9 days (95% CI, 227.8-520.0). In contrast, those who received definitive surgery combined with adjuvant chemotherapy experienced a significantly longer OS of 1248.7 days (95% CI, 965.9-1531.5). The relationship between treatment and OS was statistically significant ($p < 0.001$), highlighting the importance of adjuvant chemotherapy in

improving survival. These results align with a previous study that chemotherapy improves the short-term (43 months) survival benefit of stage II colon cancer patients who received radical surgery (20). Previous data also showed that chemotherapy as initial treatment offers 2-year survival similar to or better than primary tumour resection, with a greater survival benefit among patients younger than 75 years with stage IV CRC (12). Our study also conveyed a 10-fold higher mortality risk of patients who only received surgery compared to those who received combination therapy (HR 10.288; 95% CI, 3.603–29.387, $p < 0.001$). This result aligns with a previous study on stage III CRC, which found that patients who did not receive chemotherapy had higher mortality than those who did (HR 1.808; 95% CI, 1.018–1.827, $p = 0.04$) (21).

This study has limitations due to potential bias in data recording, as several prognostic variables, such as lifestyle, nutritional status, and CEA, were not recorded in detail; thus, they could not be included in the analysis. Although the researchers had contacted the patient's family members, variations in follow-up time among patients can also affect the survival analysis results, especially if some patients have older or more complete data than others. Variations in follow-up time were handled using time-to-event analysis, allowing patients with shorter follow-up to contribute data through their last point of contact. The findings of this study were also limited to CRC patients treated at Academic Hospital UGM; therefore, they may not reflect the CRC population outside of this context.

5. CONCLUSION

Survival outcomes for colorectal cancer patients vary substantially based on sex, age, cancer stage, and treatment type. Surgery combined with chemotherapy was significantly associated with improved OS for CRC patients at Academic Hospital UGM.

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