Dimas irfan

250728_DMJ_for_turnitin.docx

Class A - No repository 7

Class B

Herat University

Document Details

Submission ID

trn:oid:::1:3304123876

Submission Date

Jul 28, 2025, 6:54 PM GMT+4:30

Download Date

Jul 29, 2025, 5:47 PM GMT+4:30

File Name

250728_DMJ_for_turnitin.docx

File Size

53.1 KB

5 Pages

2,753 Words

17,082 Characters

10% Overall Similarity

The combined total of all matches, including overlapping sources, for each database.

Match Groups

26 Not Cited or Quoted   10%
Matches with neither in-text citation nor quotation marks

0   Missing Quotations   0%
Matches that are still very similar to source material

0   Missing Citation   0%
Matches that have quotation marks, but no in-text citation

0   Cited and Quoted   0%
Matches with in-text citation present, but no quotation marks

Top Sources

7%   🌐 Internet sources

8%   📖 Publications

2%   👤 Submitted works (Student Papers)

Match Groups

🔴 **26** Not Cited or Quoted   10%
Matches with neither in-text citation nor quotation marks

🟠 **0** Missing Quotations   0%
Matches that are still very similar to source material

🟡 **0** Missing Citation   0%
Matches that have quotation marks, but no in-text citation

🟢 **0** Cited and Quoted   0%
Matches with in-text citation present, but no quotation marks

Top Sources

7%   🌐 Internet sources

8%   📖 Publications

2%   👤 Submitted works (Student Papers)

Top Sources

The sources with the highest number of matches within the submission. Overlapping sources will not be displayed.

1   Publication

Philip H. Gordon, Santhat Nivatvongs, Lee E. Smith, Scott Thorn Barrows et al. "N...   **<1%**

2   Internet

www.surgeryscience.com   **<1%**

3   Internet

ejournal3.undip.ac.id   **<1%**

4   Internet

ejournal2.undip.ac.id   **<1%**

5   Internet

www.frontiersin.org   **<1%**

6   Internet

studenttheses.uu.nl   **<1%**

7   Internet

turkishneurosurgery.org.tr   **<1%**

8   Publication

John Biun, Raahib Dudhia, Himanshu Arora. "The influence of metal artifact reduc...   **<1%**

9   Internet

caelum.ucv.ve   **<1%**

10   Internet

eurjther.com   **<1%**

11	Internet	
journal.unhas.ac.id		<1%

12	Publication	
Charles M. Balch, Alan N. Houghton, Arthur J. Sober, Seng-jaw Soong, Michael B. A...		<1%

13	Publication	
Ephraim E Ng'weshemi, Furaha Serventi, Esther Majaliwa, Mary Mosha. "Prevalen...		<1%

14	Publication	
E Eswarvikram, A Abdul Wahid, E Arunbabu, A V Akshaya Prabha, P Gilbert Johnso...		<1%

15	Publication	
"Free papers (posters)-pt.3", Journal of Gastrointestinal Surgery, 2004		<1%

16	Internet	
www.mdpi.com		<1%

17	Publication	
Gowhar Rashid, Deena Elsori, Rana Ahmed Youness. "Colorectal Cancer - From Pa...		<1%

18	Internet	
c.coek.info		<1%

19	Student papers	
Sultan Agung Islamic University		<1%

Impact of Chemotherapy and Other Treatment Modalities on Colorectal Cancer Patients: A Multifaceted Perspective

ABSTRACT

Background: Although recent studies have highlighted the benefits of multimodal therapies for colorectal cancer, the role of neoadjuvant chemotherapy remains limited and underexplored in Indonesia. The effects of combining surgery, chemotherapy, and radiotherapy on clinical and patient-centered outcomes warrant further investigation. **Objective:** This study examines the impact of different treatment modalities on carcinoembryonic antigen (CEA) levels, nutritional status, pain, functional status, and survival in advanced-stage colorectal cancer patients. **Methods:** A quantitative observational study was conducted to assess outcomes among patients receiving combinations of surgery, chemotherapy (neoadjuvant or adjuvant), and radiotherapy. Clinical parameters were analyzed and compared across groups. **Results:** Neoadjuvant chemotherapy significantly reduced CEA levels (median 2.6 ng/mL vs. 7.5 ng/mL) and improved one-year survival (96% vs. 79%). However, radiotherapy was associated with poorer nutritional outcomes, with 52.2% of patients classified as underweight. Pain scores were higher in the adjuvant chemotherapy group. Despite intensive treatment, functional status remained stable, suggesting good patient adaptation. **Conclusion:** Neoadjuvant chemotherapy offers clear benefits in tumor marker reduction and survival. However, radiotherapy and adjuvant chemotherapy may negatively affect nutrition and pain levels. These findings emphasize the importance of supportive care and may inform evidence-based clinical guidelines for colorectal cancer in Indonesia.

Keywords: Carcinoembryonic Antigen, Chemotherapy, Colorectal Cancer

1. Introduction

Colorectal cancer (CRC) is a major global health burden, ranking as the third most commonly diagnosed malignancy and the second leading cause of cancer-related deaths worldwide [1]. According to the World Health Organization data from 2023, over 1.9 million new CRC cases and approximately 930,000 related deaths were recorded globally. In Indonesia, colorectal cancer ranks fourth among the most prevalent cancers, with an incidence of 12.8 per 100,000 adults and a mortality rate of 9.5% [2]. The disease is often diagnosed at an advanced stage, significantly reducing the chances of curative treatment and increasing the burden on the healthcare system [3].

Standard treatment for CRC is multidisciplinary and stage-dependent, often involving surgery, chemotherapy (adjuvant or neoadjuvant), and radiotherapy [2]. Among these, neoadjuvant chemotherapy has shown promising results in improving survival in patients with stage III and IV colorectal cancer, especially in rectal cancer, by reducing tumor burden and enhancing resectability [4]. Moreover, carcinoembryonic antigen (CEA) is widely used as a biomarker to assess treatment response, where decreased post-treatment levels correlate with better prognosis and lower recurrence risk [5].

Despite global advancements, the application of neoadjuvant chemotherapy in Indonesia remains limited. Contributing factors include healthcare infrastructure limitations, high treatment costs, lack of public awareness, and delays in diagnosis and referral [2]. These challenges result in the predominance of late-stage diagnoses, limiting curative treatment options and increasing morbidity and mortality. Furthermore, patient-centered outcomes such as pain intensity, nutritional status, and functional capacity are frequently overlooked in clinical evaluations, despite their strong influence on quality of life and treatment adherence.

Existing studies have investigated the relationship between CRC therapy and changes in CEA levels or survival rates; however, there is a notable gap in the literature regarding the broader impact of treatment on multidimensional outcomes. For instance, Jelski and Mroczko [6] emphasize biochemical markers such as CEA, but do not fully address how therapeutic regimens affect pain and nutritional status. Similarly, Munawaroh [7] and Zielińska et al. [8] highlight the emergence of neuropathic pain as a treatment side effect, yet few studies integrate these findings with survival and functional outcomes. Moreover, most existing research is conducted in high-resource settings, limiting generalizability to low- and middle-income countries like Indonesia.

This study seeks to address these gaps by evaluating the impact of chemotherapy, radiotherapy, and surgery on five key clinical and quality-of-life indicators: CEA levels, nutritional status, pain intensity, functional performance, and survival duration among advanced-stage colorectal cancer patients at Sultan Agung Islamic Hospital, Indonesia. By assessing not only survival metrics but also patient-centered outcomes, this study offers a more comprehensive understanding of treatment effectiveness in real-world clinical settings.

The findings are expected to inform the development of evidence-based clinical guidelines

tailored to the Indonesian context. Additionally, they aim to increase awareness among clinicians and policymakers about the need for integrated, multidisciplinary cancer care that balances tumor control with quality of life. Ultimately, this research contributes to the global discourse on CRC management while addressing local healthcare challenges and disparities.

2. Methodology

This study used an observational analytic design with a cross-sectional approach to assess the impact of chemotherapy and other treatment modalities on colorectal cancer patients. The method was selected based on the recommendations of Setia [9], which support cross-sectional studies for evaluating associations in defined clinical populations. The research was conducted from June to November 2024 at Sultan Agung Islamic Hospital and Ken Saras Hospital, using medical records from 2018 to 2024. Eligible participants were stage III colorectal cancer patients aged 19–64 years who had undergone complete therapy and had comprehensive medical documentation. Patients with other malignancies, incomplete treatment, or CT-confirmed metastases were excluded.

Data were obtained from hospital records following ethical approval. Variables analyzed included CEA levels (measured via immunohistochemistry), nutritional status (assessed by BMI), pain intensity (using the Numerical Rating Scale), functional status (using the Karnofsky Performance Index), and survival duration and status. Records were systematically reviewed and coded by trained personnel.

Data analysis was performed using SPSS version 27. The Shapiro-Wilk test assessed normality for continuous variables. Due to non-normal distribution, the Mann-Whitney U test was used to compare independent groups, with significance set at $p < 0.05$. For categorical variables such as survival status, Fisher's Exact Test was applied, with the same significance threshold. This methodological framework allowed for a structured evaluation of treatment effects across multiple clinical outcomes relevant to colorectal cancer care.

3. Results

Based on the secondary data analysis of medical records from 56 stage III rectal cancer patients, the combination of surgery and chemotherapy, as well as surgery, chemotherapy, and radiotherapy, resulted in relatively similar CEA levels, as shown in Tabel 1. The proportion of patients with abnormal CEA levels (>5 ng/ml) was 63.6% in the surgery and chemotherapy group and 60.9% in the group that also received radiotherapy. The Mann-Whitney U Test revealed no significant difference between the two groups ($p = 0.405$).

Tabel 1. CEA levels in patients with surgery + chemotherapy and surgery + chemotherapy therapy

CEA Levels (ng/ml)	Surgery + Chemotherapy		Surgery + Chemotherapy + Radiotherapy	
	n	%	n	%
Normal (0–5)	12	36.4	9	39.1
Abnormal (>5)	21	63.6	14	60.9

For 52 patient records undergoing surgery and chemotherapy, neoadjuvant chemotherapy resulted in a significantly lower median CEA level (2.6 ng/ml) compared to those without neoadjuvant chemotherapy (7.5 ng/ml), as shown in Tabel 2. This difference was statistically significant ($p < 0.001$) based on the Mann-Whitney U Test.

Tabel 2. CEA levels in patients with and without neoadjuvant chemotherapy

Neoadjuvant Chemotherapy	n	%	CEA Levels (ng/ml) Median (Min –Max)
With	27	51.9	2,6 (1–6,3)
Without	25	48.1	7,5 (1,2–48,5)

Patient nutritional status, measured by BMI and presented in Tabel 3, revealed that the surgery and chemotherapy group had the highest distribution in the normal category (42.4%) and underweight category (30.3%). Meanwhile, the surgery, chemotherapy, and radiotherapy group exhibited a higher proportion of underweight patients (52.2%). The difference in nutritional status between the two groups was statistically significant ($p < 0.001$) based on the Independent Samples T-Test.

Tabel 3. BMI in patients with surgery + chemotherapy and surgery + chemotherapy therapy

BMI (kg/m²)	Surgery + Chemotherapy		Surgery + Chemotherapy + Radiotherapy	
	n	%	n	%
Underweight (< 18.5)	10	30.3	12	52.2
Normal (18.5-22.9)	14	42.4	7	30.4
Overweight	5	15.2	3	13

(23-24.9)			
Obesity I (25-29.9)	4	12.1	0	0
Obesity II (≥ 30)	0	0	1	4.3

The analysis of survival status and duration among colorectal cancer patients is summarized in Table 4. The Fisher's Exact Test indicated no significant difference in survival status between the neoadjuvant chemotherapy group (survival rate of 96%) and the non-neoadjuvant group (survival rate of 79%), with p = 0.341. The median survival duration was 7 months for the neoadjuvant group and 6 months for the non-neoadjuvant group. The Mann-Whitney U Test showed no significant difference in the mean survival time (p = 0.35).

Table 4. Survival status and duration in patients with and without neoadjuvant chemotherapy

Neoadjuvant Chemotherapy	Survival Status				CEA Levels (ng/ml) Median (Min – Max)
	Survive		Not Survive		
	n	%	n	%	
With	26	96.3	1	3.7	7 (5–12)
Without	22	88.0	3	12.0	6 (0–12)

Pain scale analysis, conducted on 69 samples and summarized in Table 5, revealed that patients receiving neoadjuvant chemotherapy had an average pain score of 3.18 (mild pain), whereas those with additional adjuvant chemotherapy had a similar average score but a higher mean pain level (moderate pain). The Mann-Whitney U Test showed a statistically significant difference between the two groups (p < 0.001), indicating that both neoadjuvant and adjuvant chemotherapy affected the pain levels in colorectal cancer patients.

Table 5. Pain level and KPI in patients with neoadjuvant chemotherapy and neoadjuvant + adjuvant chemotherapy

Chemotherapy	n	%	Pain Level Mean (SD)	KPI (%) Mean (SD)
Neoadjuvant	34	49.3	3.18 (0.46)	71.76 (10.86)
Neoadjuvant + Adjuvant	35	50.7	3.71 (0.52)	73.71 (10.31)

Functional status analysis, assessed using the KPI and presented in Table 5, showed an average KPI score of 71.76% in the neoadjuvant chemotherapy group and 73.71% in the group with additional adjuvant chemotherapy. No statistically significant difference was observed (p = 0.438) based on the Mann-Whitney U Test, suggesting that the addition of adjuvant chemotherapy had little impact on patients' functional status.

4. Discussion
4.1 Comparison of Treatment Modalities

Colorectal cancer treatment modalities, including surgery, chemotherapy, and radiotherapy, are often combined to achieve optimal outcomes. This study shows that surgery, as the primary treatment, is effective in reducing CEA levels, particularly when followed by neoadjuvant chemotherapy as demonstrated in other studies [10,11]. However, it was found that there was no significant difference in abnormal CEA levels (>5 ng/ml) between patients who received surgery and chemotherapy (63.6%) and those who received surgery, chemotherapy, and radiotherapy (60.9%), consistent with previous studies that yielded similar results [12].

In contrast, the significant reduction in CEA levels observed in the neoadjuvant chemotherapy group (median 2.6 ng/ml) compared to the group without neoadjuvant therapy (median 7.5 ng/ml) indicates the effectiveness of this approach in suppressing tumor activity early in treatment. These findings align with previous research highlighting the role of neoadjuvant chemotherapy in improving the prognosis of advanced-stage colorectal cancer patients [5].

Radiotherapy, often combined with chemotherapy, plays a critical role in reducing local recurrence risk, particularly in advanced-stage rectal cancer. However, its impact on nutritional status warrants attention. This study found that patients receiving surgery, chemotherapy, and radiotherapy had a higher proportion of underweight cases (52.2%) compared to group that receive surgery and chemotherapy only (30.3%). Previous research has indicated that patients who received radiation therapy had lower BMI levels compared to those who did not receive radiation therapy [13].

Intensified therapy can negatively impact patient quality of life. The adjuvant chemotherapy group exhibited higher pain levels, reflecting cumulative side effects from intensive treatment. Chemotherapy-related neuropathic pain, often caused by peripheral nerve damage, can persist long-term, significantly affecting patient well-being [7].

4.2 Nutritional Status and Its Implications for Treatment

Nutritional status is a crucial factor influencing tolerance to therapy and treatment outcomes in colorectal cancer patients. This study revealed that poor nutritional status, particularly underweight, was more prevalent among patients undergoing a combination of surgery, chemotherapy, and radiotherapy. Such conditions increase the risk of complications and reduce therapy effectiveness. Patients with low BMI have a higher mortality risk compared to those with normal nutritional status [14,15].

Nutritional interventions, such as supplementation with protein and energy-dense diets, can help improve patient outcomes and recovery post-therapy. Regular nutritional monitoring using tools like the Patient-Generated Subjective Global Assessment (PG-SGA) enables early detection of malnutrition and timely interventions, improving tolerance to therapy and reducing common side effects like nausea, vomiting, and fatigue associated with chemotherapy and radiotherapy [16,17].

4.3   CEA Levels as a Prognostic Indicator

CEA is often used as an indicator of malignancy or cancer in a person, with levels increasing in line with the severity of the malignancy, such as in colorectal cancer [18]. CEA level reduction post-therapy serves as an active biomarker for assessing treatment response and disease stage [19]. This study found that neoadjuvant chemotherapy significantly reduced CEA levels, reflecting not only a favorable treatment response but also improved survival. Persistently high CEA levels after therapy may indicate residual tumors or metastases requiring further intervention to reduce it to normal level [20,21].

The utility of CEA as a predictive tool for therapy success is supported by previous studies demonstrating consistent CEA reductions after multiple chemotherapy cycles as an indicator of therapeutic effectiveness [21]. Periodic CEA monitoring also enables early detection of recurrence, as rising CEA levels often precede clinical manifestations. Incorporating CEA monitoring into clinical guidelines is essential for evaluating treatment success and guiding subsequent therapeutic steps.

4.4   Patient Survival and Duration

Survival duration is a key parameter in evaluating colorectal cancer treatment efficacy. Although no statistically significant difference in survival rates was observed between groups with and without neoadjuvant chemotherapy, the neoadjuvant group showed a higher survival rate (96% vs. 88%). The slightly longer median survival duration in the neoadjuvant group (7 months vs. 6 months) suggests that additional chemotherapy may improve long-term outcomes, such as local recurrence and overall survival [22]. Patients who received neoadjuvant chemotherapy statistically achieved higher survival rates, both 5-year survival rates and 10-year survival rates, compared to those who did not receive such chemotherapy [4].

4.5   Quality of Life: Pain and Functional Status

Quality of life in colorectal cancer patients is influenced by pain levels and functional abilities, measured through the Karnofsky Performance Index (KPI). This study found significant differences in pain levels but no significant impact on KPI scores between the chemotherapy groups. Mild pain in the neoadjuvant chemotherapy group and moderate pain in the adjuvant chemotherapy group may result from early nerve damage caused by chemotherapy, leading to neuropathic pain [7].

Despite these differences, KPI values remained high (>70%) across groups, indicating a generally good quality of life. This aligns with previous findings that adjuvant chemotherapy is associated with improved performance status by targeting residual cancer cells [23]. Adjuvant chemotherapy aims to eliminate remaining cancer cells, further enhancing functional performance and quality of life [24].

4.6   Significance and Position in Literature

This study contributes significantly to understanding the impact of various therapies on colorectal cancer patients' health. Neoadjuvant chemotherapy demonstrated superior efficacy in reducing CEA levels and maintaining patient quality of life. It is recommended for advanced-stage patients to enhance treatment response and quality of life [16].

However, this study also highlights challenges in managing therapy-related side effects, such as malnutrition and pain, which require greater attention to ensure a holistic and individualized therapeutic approach. These findings provide a foundation for developing improved clinical guidelines and underscore the importance of early detection and comprehensive management of colorectal cancer patients in Indonesia.

5.   Conclusion

This study demonstrates that the combination of surgery, chemotherapy, and radiotherapy is effective in managing colorectal cancer, with neoadjuvant chemotherapy significantly reducing CEA levels and improving patient survival rates. Although the average survival duration did not differ significantly between groups, early therapeutic intervention

provided clear benefits in terms of treatment response.

However, the intensity of therapy, particularly with the addition of radiotherapy, negatively impacted patients' nutritional status, while pain levels were higher in the neoadjuvant-adjuvant chemotherapy group. Despite these challenges, patients maintained stable functional status, underscoring the importance of a holistic approach to treatment. Effective management of side effects, including nutritional support and pain control, is essential for improving the quality of life during therapy.

These findings highlight the need for individualized and comprehensive treatment strategies for colorectal cancer patients, emphasizing the integration of supportive care into standard therapy protocols to optimize outcomes.

Ethical Approval

This study was conducted with the approval from the Health Research Ethics Committee of Sultan Agung Islamic Hospital (RSI Sultan Agung) Semarang: No. 134/KEPK-RSISA/VII/2024, No. 135/KEPK-RSISA/VII/2024, No. 140/KEPK-RSISA/VII/2024.

Conflicts of Interest

The authors declare no conflict of interest.

Author Contributions

VME and ES conceptualized the study; VME and C designed the methodology; AL, LU, and RS was responsible for data curation, formal analysis, writing the article, and project administration; ES and C wrote the original draft preparation, reviewed and edited the article.