Review Article

Colorectal Cancer: Accuracy of CT in Determination of Staging and Management

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Abstract

Colorectal cancer (CRC) is one of the most common cancers worldwide, CRC is the third furthermost common cancer and the fourth principal reason of cancer-related death. Colorectal cancer incidence varies globally, with developed countries having higher rates than developing countries. Colorectal cancer is associated with a lower socioeconomic status The following databases were searched: PubMed, Science Direct, Web of Science, EBSCO, and the Cochrane Library. Using Rayyan QCRI, included studies were screened by heading and abstract before being subjected to a full-text evaluation. This review investigates the published literature regarding the causes, diagnosis, and management of Colorectal cancer. This study comprised 7 trials with a total of 3,134,223 colorectal cancer patients, Most cases were diagnosed by computed tomography and only one study depended on surgery. The included studies used MRI also. CT defines the staging of CRC as the TNM staging [tumor, nodal, and metastases staging. Understanding the unique gene modifications is widely expected to lead to more accurate and tailored care for persons with polyps and malignancies, driven by molecular characterisation of the individual's colon tumour.

Keywords: *Colorectal cancer, Causes, Diagnosis, Staging, Management, Systematic review*

Introduction

Colorectal cancer (CRC) is the third record widespread tumor and the fourth furthermost common reason of cancer-related mortality, with 700,000 fatalities each year; only lung, liver, and stomach cancers are more common.[1-3] Cancer of the colon (CRC) is the second most frequent cancer in women (9.2%) and the third most common cancer in males (10%).[4] From 1990 to 2012, the number of new cases of CRC increased by more than 200,000 per year. The majority of CRC cases are found in Western nations (55%), however this pattern is shifting as a result of certain countries' fast progress in recent years.[5] Toxicity has also been identified as one of the most prevalent negative effects of EGFR inhibitors. KRAS, NRAS, and BRAF gene mutations are linked to tumour differentiation, invasion, and metastasis.

We present in a period of rising universal regular living values and expanded contact to quality healthcare, which has resulted in tremendous advances in illness detection and treatment. These measures have had an impact on the majority of the world's regions' average life expectancy. However, whereas communicable illness mortality rates have reduced internationally due to medical breakthroughs, cancer-related mortality has climbed by about 40% in the previous 40 years. Cancer deaths are anticipated to rise by 60% over the next 15 years, with 13 million people dying from the disease by 2030.[6]

Colorectal cancer incidence varies globally, with developed countries having higher rates than developing countries. Colorectal cancer is associated with a lower socioeconomic status; The rectum has the strongest relationship, whereas the right colon has the least. This is believed to be attributable to high-risk behaviour and a lack of medical attention. Early detection and improved treatment modalities have resulted in a 51% decrease in CRC mortality in the United States between 1975 and 2014. According to the National Cancer Institute, 65% of all CRC patients will be alive after 5 years.[7, 8]

New therapies for primary and metastatic colorectal cancer comprise laparoscopic operation for primary illness, excision of metastatic disease and neoadjuvant and palliative chemotherapy].

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Colorectal cancer, like other types of cancer, can be caused by mutations in specific genes. These mutations have been discovered in oncogenes, tumour suppressor genes, and DNA repair genes.[9] Based on the derivation of the mutation, colorectal tumors are classed as sporadic, hereditary, or familial.

Materials and Methods

This systematic review was carried out in accordance with the established principles

Study design

A qualitative systematic review was conducted in October 2022.

Study condition

This review looks at recent material on the aetiology, diagnosis, and treatment of colorectal cancer.

Search strategy

A complete literature exploration was directed in five main databases, including PubMed, Science Direct, Web of Science, EBSCO, and Cochrane Library, to discover applicable material. Our search was limited to the English language and was tailored to each database. The following keywords were used to find the applicable papers in PubMed: "colorectal cancer," "colon cancer," "causes," "aetiology," "diagnostic," "therapy," and "management." The relevant keywords were combined with the "OR" and "AND" Boolean operators. The search results included full-text publications in English, freely available papers, and human trials.

Selection criteria

Inclusion criteria

The participants were selected for inclusion constructed on their significance to the study, which includes the following principles: patients with colorectal cancer who have been studied. There were no age restrictions.

Exclusion criteria

All further publications, recurrent research, and research reviews that did not have one of these topics as their primary goal were ignored.

Data extraction

Rayyan (QCRI)[10] was used to detect duplicate exploration approach results. The researchers assessed the relevance of the titles and abstracts by clarifying the combined search results using a set of inclusion/exclusion standards. The reviewers appraised the whole texts of the papers that met the inclusion criteria. The writers discussed any disagreements that needed to be resolved. To incorporate the qualifying study, a data extraction form was created. The authors gathered information on the research titles, authors, study year, study design, contributor number, gender, likely aetiology of colorectal cancer, diagnosis, management, and key findings.

Risk of bias assessment

The qualitative data amalgamation used the non-randomized studies ROBINS-I method[11] to measure the quality of the included research. The reviewers investigated and lectured any flaws in the superiority evaluation.

Strategy for data synthesis

To provide a qualitative overview of the included research components and findings, summary tables containing information acquired from eligible studies were created. After the data extraction procedure for the systematic review was completed, decisions about how to make the most of the data from the included study articles were made. Studies that satisfied the full-text inclusion criteria but did not include any clinical data on Colorectal cancer patients were excluded.

Search results

The systematic search yielded 779 study papers, after which 85 duplicates were deleted. A total of 682 papers were screened for title and abstract, with 390 being eliminated. Only 10 items were not retrieved despite the fact that 93 reports were searched. Finally, 83 studies were screened for full-text evaluation; 52 were excluded due to incorrect study outcomes. This systematic review comprised seven research publications.

Characteristics of the included studies

As illustrated in **Table 1**, this study comprised 7 trials with a total of 3,134,223 colorectal cancer patients. Four investigations were carried out in Europe,[11] the United States,[9] Poland,[12] Germany,[13] India,[14] and the Netherlands[15]. In terms of study designs, four research were cross-sectional,[9, 11, 12, 16] one perspective,[13] one was a clinical trial,[15] and one was a retrospective study.[14] Most cases were diagnosed by computed tomography and only one study depended on surgery. The included studies used MRI also. CT defines the staging of CRC as the TNM staging [tumor, nodal, and metastases staging].

Table 1. Summarises the features of the collected research publications.

Study	Country	Design	Participant	Age	Outcome
Rawla *et al*., 2018[12]	Europe	Cross sectional	576,000 men and 521,000 women	0-74 years	This incidence represents a 1.51% cumulative risk of colon cancer in males and a 1.12% risk in women. Rectal cancer will be diagnosed in around 430,000 men and 274,000 women. Their total lifetime risks are 1.2% and.65%, respectively.
Lotfollahzad *et al.*, 2020[13]	United States	Cross-sectional	135,439 patient	<50 years	30% are due to rectal cancer per year. Amongst all tumor sites, colorectal tumors collective are the second principal cause of mortality.
Sawicki *et al.*, 2020[14]	Poland	Cross-sectional	1.9 million case	<90 years	Colorectal cancer is responsible for almost 935,000 cancer deaths. Its mortality prevalence is increasing up to 11% of all cancer diagnoses
Gökden *et al.*, 2022[15]	Germany	Prospective study	47 patients	47-92 years	Bright red blood per rectum, anaemia of unknown aetiology, abnormal bowel habits, or positive faecal occult blood test findings led to the patient's hospitalisation. Patients were included if an optical colonoscopy revealed that they had primary colorectal cancer.Surgery is done after PET/CT Colonography staging
Singla *et al.*, 2017[16]	India	retrospectivee	31 patients	61—70 years	Disease prevalence is 38.7%. CT had 83.3% sensitivity, 92% specificity, and 71.4% positive predictive value
Leufkens *et al*., 2011 [17]	netherla nd	Clinical practice	759 patients		The accuracy of CT for TN-staging of colon cancer is fair; nevertheless, the usefulness of CT lies in its high accuracy in detecting distant metastases.
Reali *et al*., 2021 [18]	England	Cross-sectional	948 patient	32-69 years	clinical and radiological staging tend to underreckoning the tumor TNM. CT with IV contrast is the pillars of the staging of CRC.

Results and Discussion

The second and third most common cancers in both men and women, respectively, are both colorectal cancers. Globally, colorectal cancer was diagnosed in 614,000 women (9.2% of all new cancer cases) and 746,000 men (10.0% of new cancer cases) in 2012.[19]

The primary risk factor for colorectal cancer is age: the chance of developing CRC grows dramatically after the fifth decade of life, whereas the beginning of colorectal malignance before the oldness of 50 years is unusual (apart from hereditary malignancies).[20] Other intrinsic risk factors, in addition to age, cannot be modified. A personal history of colorectal malignancy the risk in persons with ulcerative colitis is raised up by 3.7%,[21] while people with Crohn's disease have a 2.5% greater chance of acquiring colorectal malignancy.[22]

The persistent inflammation caused by IBD typically culminates in dysplasia, or abnormal cell development. Although dysplastic cells are not yet malignant, they are more prone to evolve into anaplastic cells and eventually become tumours. A positive familial history of CRC in relatives, particularly those under the age of fifty at the time of diagnosis, can also be included in this group. Both inherited genes and environmental factors can contribute to an elevated risk owing to family history.[23]

Other lifestyle risk factors can be minimised by making simple modifications to one's food and physical activity habits. Sedentary lifestyles, for example, are assumed to increase the chance of getting colorectal cancer, however the link between colorectal cancer and inactivity is not well understood. Moderate physical activity, on the other hand, boosts metabolic rates and gastrointestinal motility, and so improves metabolic efficiency and decreases blood pressure in the long run.[24]

Colorectal cancer treatment can aim for cure or palliation. Several variables impact the decision on which aim to pursue, counting the individual's health and partialities, as well as the stage of the tumour.[25] Assessing patients in multidisciplinary teams is a crucial element of assessing if they are a good candidate for surgery.[26] Surgery can be curative if colorectal cancer is detected early. When it is discovered at a later stage (with metastases present), This is less frequent, and therapy is generally centred on palliation, which seeks to alleviate tumor-related symptoms and keep the patient as comfortable as possible.[27]

Colorectal cancer can be removed at an early stage during a

colonoscopy using one of many procedures, such as endoscopic mucosal resection or endoscopic submucosal dissection.[28] To get a cure, persons with localised cancer should have thorough surgical excision with sufficient margins. The procedure of high-quality is a partial colectomy, in which the afflicted area of the colon or rectum is removed together with parts of its mesocolon and blood flow to allow for the removal of draining lymph nodes. Depending on the individual and lesion factors, this can be accomplished through an open laparotomy or laparoscopically.[27] The colon may then be reconnected, or a colostomy may be performed.[28]

If there are only a scarce metastases in lungs or liver, they might also be detached. Chemotherapy might be administered prior to surgery to counselor cancer before endeavoring to remove it. Colorectal cancer recurrence is most commonly found in the liver and lungs.[27] To try to eradicate peritoneal carcinomatosis, cytoreductive surgery, often in combination with HIPEC, might be utilised.[29]

Conclusion

Colorectal cancer has become one of the most frequent malignancies in recent decades, and its incidence is predicted to climb much more in the coming years. Colorectal cancer mortality remains high, despite major breakthroughs in therapy, with 40-50% of patients dying as a result of their condition. Colorectal cancer occurs as a result of environmental and genetic variables combining to form colon polyps that proceed to colorectal cancer, as previously indicated. The polyp-to-cancer development sequence is now recognised as a diverse process predominantly driven by gene mutations and epigenetic changes at the cellular level. Understanding the unique gene modifications is widely expected to lead to more accurate and tailored care for persons with polyps and malignancies, driven by molecular characterisation of the individual's colon tumour.

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Conflict of interest
None.

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Ethics statement
None.

References

1. Alhomayani FK, Althumali AM, Alhamyani A, Alsufyani AA, Alharthi NA, Almalki MS. Awareness of hemodialysis patients regarding symptoms of cancer at king Abdul-Aziz specialized hospital, Taif city. Arch Pharm Pract. 2020;11(2):69-80.
2. Aloqbi AA. Gum Arabic as a natural product with antimicrobial and anticancer activities. Arch Pharm Pract. 2020;11(2):107-12.
3. Eskander HG, Morsy WY, Elfeky HA, Ali AM. Impact of pharmacovigilance educational intervention on critical care nurses' performance at cancer hospital, Egypt. J Adv Pharm Educ Res. 2021;11(4):15-23.
4. Stewart B, Wild CP, editors. World Cancer Report. IARC; Lyon, France. 2014.
5. Brody H. Colorectal cancer. Nature. 2015;521(7551):S1. doi:10.1038/521S1a
6. Kuipers EJ, Rösch T, Bretthauer M. Colorectal cancer screening--optimizing current strategies and new directions. Nat Rev Clin Oncol. 2013;10(3):130-42. doi:10.1038/nrclinonc.2013.12
7. Araghi M, Soerjomataram I, Jenkins M, Brierley J, Morris E, Bray F, et al. Global trends in colorectal cancer mortality: projections to the year 2035. Int J Cancer. 2019;144(12):2992-3000.
8. Garfinkle R, Wong-Chong N, Petrucci A, Sylla P, Wexner SD, Bhatnagar S, et al. Assessing the readability, quality, and accuracy of online health information for patients with low anterior resection syndrome following surgery for rectal cancer. Colorectal Dis. 2019;21(5):523-31.
9. Al-Gharaibeh NS, Shively SB, Vortmeyer AO. Characterization of Microscopic Multicellular Foci in Grossly Normal Renal Parenchyma of Von Hippel-Lindau Kidney. Medicina (Kaunas). 2022;58(12):1725. doi:10.3390/medicina58121725
10. Ouzzani M, Hammady H, Fedorowicz Z, Elmagarmid A. Rayyan-a web and mobile app for systematic reviews. Syst Rev. 2016;5(1):210. doi:10.1186/s13643-016-0384-4
11. Heemskerk-Gerritsen BA, Rookus MA, Aalfs CM, Ausems MG, Collée JM, Jansen L, et al. Improved overall survival after contralateral risk-reducing mastectomy in BRCA1/2 mutation carriers with a history of unilateral breast cancer: a prospective analysis. Int J Cancer. 2015;136(3):668-77.
12. Rawla P, Sunkara T, Barsouk A. Epidemiology of colorectal cancer: incidence, mortality, survival, and risk factors. Prz Gastroenterol. 2019;14(2):89-103. doi:10.5114/pg.2018.81072
13. Lotfollahzadeh S, Kashyap S, Tsoris A, Recio-Boiles A, Babiker HM. Rectal Cancer. 2022. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan–.
14. Sawicki T, Ruszkowska M, Danielewicz A, Niedźwiedzka E, Arłukowicz T, Przybyłowicz KE. A Review of Colorectal Cancer in Terms of Epidemiology, Risk Factors, Development, Symptoms, and Diagnosis. Cancers (Basel). 2021;13(9):2025. doi:10.3390/cancers13092025
15. Gökden Y, Özülker F, Özülker T. Prevalence and Clinical Significance of Incidental Focal ^{18}F-FDG Uptake in Colon on PET/CT Imaging. Mol Imaging Radionucl Ther. 2022;31(2):96-103. doi:10.4274/mirt.galenos.2022.38247
16. Singla SC, Kaushal D, Sagoo HS, Calton N. Comparative analysis of colorectal carcinoma staging using operative, histopathology, and computed tomography findings. Int J Appl Basic Med Res. 2017;7(1):10-4. doi:10.4103/2229-516X.198501
17. Engelmann BE, Loft A, Kjær A, Nielsen HJ, Berthelsen AK, Binderup T, et al. Positron emission tomography/computed tomography for optimized colon cancer staging and follow up. Scand J Gastroenterol. 2014;49(2):191-201.
18. Reali C, Bocca G, Lindsey I, Jones O, Cunningham C, Guy R, et al. Influence of incorrect staging of colorectal carcinoma on oncological outcome: are we playing safely? Updates Surg. 2022;74(2):591-7. doi:10.1007/s13304-021-01095-3
19. World Health Organization, International Agency for Research on Cancer. Globocan, 2012. Available from: http://globocan. iarc. fr/Default. aspx.
20. Zhang H, Wu J, Ji D, Liu Y, Lu S, Lin Z, et al. Microbiome analysis reveals universal diagnostic biomarkers for colorectal cancer across populations and technologies. Front Microbiol. 2022;13. doi:10.3389/fmicb.2022.1005201
21. Kihara T, Kuwahara R, Kusunoki K, Minagawa T, Horio Y, Uchino M, et al. Rectal carcinoma with dual differentiation toward enteroblastic and neuroendocrine features arising in a patient with ulcerative colitis: a case report. World J Surg Oncol. 2022;20(1):371. doi:10.1186/s12957-022-02838-1
22. Fiorillo C, Schena CA, Quero G, Laterza V, Pugliese D, Privitera G, et al. Challenges in Crohn's Disease Management after Gastrointestinal Cancer Diagnosis. Cancers (Basel). 2021;13(3):574. doi:10.3390/cancers13030574

23. Zhang N, Sundquist J, Sundquist K, Ji J. Proguanil and atovaquone use is associated with lower colorectal cancer risk: a nationwide cohort study. BMC Med. 2022;20(1):439. doi:10.1186/s12916-022-02643-3
24. Robertson DJ. ABC of colorectal cancer. Gastroenterology. 2012;143(3):868-9. doi:10.1053/j.gastro.2012.07.090
25. Stein A, Atanackovic D, Bokemeyer C. Current standards and new trends in the primary treatment of colorectal cancer. Eur J Cancer. 2011;47 Suppl 3:S312-4. doi:10.1016/S0959-8049(11)70183-6
26. Chiorean EG, Nandakumar G, Fadelu T, Temin S, Alarcon-Rozas AE, Bejarano S, et al. Treatment of Patients With Late-Stage Colorectal Cancer: ASCO Resource-Stratified Guideline. JCO Glob Oncol. 2020;6:414-38. doi:10.1200/JGO.19.00367
27. Chen K, Chen Z, Ou M, Wang J, Huang X, Wu Y, et al. Clinical significance of circulating tumor cells in predicating the outcomes of patients with colorectal cancer. Clinics (Sao Paulo). 2022;77:100070. doi:10.1016/j.clinsp.2022.100070
28. Rashad N, Abdulla M, Farouk M, Elkerm Y, Eid Salem S, Yahia M, et al. Resource Oriented Decision Making for Treatment of Metastatic Colorectal Cancer (mCRC) in a Lower-Middle Income Country: Egyptian Foundation of Medical Sciences (EFMS) Consensus Recommendations 2020. Cancer Manag Res. 2022;14:821-42. doi:10.2147/CMAR.S340030
29. McCarthy K, Pearson K, Fulton R, Hewitt J. Pre-operative chemoradiation for non-metastatic locally advanced rectal cancer. Cochrane Database Syst Rev. 2012;12:CD008368.