

VOLUME 9

ISSUE 1

2023

ISSN 2454 – 3055



**INTERNATIONAL
JOURNAL OF
ZOOLOGICAL
INVESTIGATIONS**

*Forum for Biological and
Environmental Sciences*

Published by Saran Publications, India



International Journal of Zoological Investigations

Contents available at Journals Home Page: www.ijzi.net

Editor-in-Chief: Prof. Ajai Kumar Srivastav

Published by: Saran Publications, Gorakhpur, India



ISSN: 2454-3055

CEA Tumor Relationship in Patients with Colorectal Carcinoma

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Received: 2nd March, 2023; **Accepted:** 27th March, 2023; **Published online:** 5th April, 2023

<https://doi.org/10.33745/ijzi.2023.v09i01.069>

Abstract: Cancer is the name given to abnormal and unregulated growth of cells which multiply in an uncontrolled and unabated way and, in some cases, to metastasize. Colorectal cancer (CRC) is a dreadful health problem worldwide. Tumor markers are assuming an important role in all aspects of cancer care and have an impact on early diagnosis, prognosis and screening for malignancy in asymptomatic groups. There is no “universal” tumor marker that can detect all types of cancer. Our study was case control study including patients attending to Department of Surgical Oncology and Biochemistry, Faculty of Medicine, West Kazakhstan Marat Ospanov State Medical University Aktobe Kazakhstan. 50 CRC patients, with no other cancer, 19 males (38%) and 31 females (62%), their ages between 20-70 years were studied. The present study demonstrated that the mean age value for 50 studied CRC patients was 52.9 ± 10.54 years. Carcinoembryonic antigen (CEA) showed a highly statistically significant difference between cases and controls. In the present study, the serum levels of tumor marker CEA were statistically higher in diagnosed cases of colorectal carcinoma as compared to the controls showing the importance of the CEA marker in colorectal cancer. Findings of this study further strengthen the position of tumor markers in diagnosis, prognosis and detection of recurrences of the tumor.

Keywords: Colorectal cancer, Tumor marker, Caner, Carcinoembryonic antigen, Polyp

Citation: Bhat Sajad Ahmad, Musayev Abdugani, Seralin G.A., Ainur Nuftieva, Baibatshanov Mukhtar and Aizhan Danyshbayeva: CEA tumor relationship in patients with colorectal carcinoma. Intern. J. Zool. Invest. 9(1): 620-623, 2023.

<https://doi.org/10.33745/ijzi.2023.v09i01.069>



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Introduction

Colorectal cancer (CRC) is a multifactorial disease with dietary life style and environmental exposure on one hand and genetic predisposition on other hand. Cancer is the name given to abnormal and unregulated growth of cells which multiply in an uncontrolled and unabated way and, in some cases, to metastasize. Colorectal cancer is a dreadful health problem worldwide. Irrespective of the etiology, most colorectal cancers arise from pre-existing adenomatous polyp (American Cancer Society, 2014). A polyp is a benign, non-cancerous growth of cells in the intestinal cell lining. Only a few progress to malignant transformation, most remain innocuous. The propensity of changing into a malignant growth depends upon the nature of the polyp (American Cancer Society, 2014). Nearly all cancers are believed to originate from a single cell; this colonic origin is a distinguished feature which differentiates between neoplasia and hyperplasia (Dan, 2012). For the evolution of a tumor from normal to a fully malignant tumor, multiple internally additive mutational events are required. In terms of molecular genetics, colon cancer is probably one of the most multivalent cancer (Dan, 2012). Tumor markers are assuming an important role in all aspects of cancer care and have an impact on early diagnosis, prognosis and screening for malignancy in asymptomatic groups (Howlader *et al.*, 2012). There is no “universal” tumor marker that can detect all types of cancer. Tumor markers are biochemical substances produced by tumor cells and associated with a malignancy. Carcinoembryonic antigen (CEA) is now one of the most widely used tumor markers worldwide and certainly the most frequently used marker in colorectal cancer (Michael, 2001). Gold and Freedman identified an antigen molecule in the serum which was present only in the serum of patients with cancer and in embryonic tissue. The use of CEA extends to detecting recurrence and prognosis of colon cancer, increased levels may precede clinical evidence. Well differentiated adenocarcinoma is accompanied with higher CEA serum concentration. Concentration of CEA

antigen is normal in tumor with smaller size; tumors more than 3 cm are associated with high concentration of CEA antigen of recurrence by as much as 6 months. The sensitivity for detecting recurrence is 97% in patients whose CEA was elevated preoperatively, but only 66% in those with normal preoperative levels (Michael, 2001). There is no “universal” tumour marker that can detect any type of cancer. Tumor markers are biochemical substances produced by tumour cells and associated with a malignancy. In present oncological discourse, nearly 20 different tumour markers have been tabulated and are in clinical use. Some, like CEA in colorectal carcinoma, are specific for only one type of cancer; whereas others, like CA 19-9, are associated with two or more cancer types and sometimes non-cancerous conditions. There is no “universal” tumour marker that can detect any type of cancer.

The ideal characteristics of tumour markers are that it should be: (1) Organ specific and tumour specific; (2) Positive only when malignancy is present; (3) Positive early in the development of malignancy tumour; and (4) Easy to measure in blood (Michael, 2001).

Materials and Methods

Subject:

This study was carried out on 50 subjects in the Department of Surgical Oncology and Biochemistry, Faculty of Medicine, West Kazakhstan Marat Ospanov State Medical University Aktobe Kazakhstan. Our study was case control study including patients attending to department of surgical oncology. 50 colorectal cancer patients were studied which were diagnosed histopathologically after a colonoscopy guided biopsy with no other cancer, 19 males (38%) and 31 females (62%), their ages were between 20-70 years. A written informed consent was also taken from the cases. Ethical Clearance was obtained from West Kazakhstan Marat Ospanov State Medical University Ethical Committee.

Methods:

CRC patients included in the study were subjected to the following: Full history taking and complete clinical examinations. Radiological investigations include: Abdominal ultrasound and CT, and lower gastrointestinal endoscopy (colonoscopy) and biopsy of colorectal cancer tissue for histopathological examinations to confirm the diagnosis. 5 ml blood samples were collected using aseptic techniques. Serum was separated from the blood by allowing it to complete clot and centrifuged at 3000 rpm for 10 min. Serum was stored at -80°C until analysis. Repeated freezing and thawing of serum samples was avoided. Serum of each sample was evaluated for CEA tumor marker. The CEA analyzed by Chemiluminescent Microparticle immunoassay.

Results

The recorded data was compiled and entered in a spreadsheet (Microsoft Excel) and then exported to data editor of SPSS Version 20.0 (SPSS Inc., Chicago, Illinois, USA). Continuous variables were summarized in the form of means and standard deviations. Comparison between groups was done using the Chi-square test. The present study demonstrated that the mean age value for 50 studied CRC patients was 52.9 ± 10.54 years. On comparing the mean of the tumor markers CEA, between control subjects and cases, it was found that among the cases, the mean of CEA was 360. CEA showed a highly statistically significant difference between cases and controls.

Discussion

Researchers from the West Kazakhstan University, assessing the dynamics of cancer incidence and mortality in the Aktobe for the period 2000-2010, found out an increase in colon cancer (from 5.5 to 6.5) throughout the period and more than twofold rise in rectum cancer incidence (from 2.1 up to 5.6) (Bekmukhambetov *et al.*, 2015). CRC begins to increase above the age 50 to 55 years (Devita *et al.*, 2008). Our study population consisted of slightly more females than males. There is a heavy cancer burden in Aktobe region of West

Kazakhstan and cancer is more likely to occur in elderly people. In our study the mean age was 53 years. In Western countries CRC is considered the disease of elder population whereas Max *et al.* (2005) reported the mean age of CRC patients about 65 years in the western countries. Research of so many years from the procurable world data has shown that the reasons which are associated with carcinogenesis is the life style, the type of diet, smoking as well as the influence of the surrounding environment in which man lives and works are possible factors contributing to increased rates of colorectal cancer among people younger than 50 years. Obesity is a major risk factor for CRC in men and, to a lesser extent, for colon cancer in women (Larsson and Wolk, 2007). Interestingly rates for colorectal cancer among males increased possibly due to westernized diet, some studies also support that pickled and baked food and increased intake of meat can lead to colorectal cancer ((Squires *et al.*, 2010). To reach an early diagnosis, prognososis and recurrence of colorectal cancer several screening tests have been developed. Tumor marker CEA have emerged as an imperative, non-invasive diagnostic tool for the clinician as it can easily detect colorectal cancer associated antigen (Dan, 2012). This test allows growths to be detected early that might otherwise become cancerous and hence, amenable to early treatment. Tumor markers are biochemical substances produced by tumor cells and associated with a malignancy. This study showed the higher mean values of CEA in the CRC patients as compared to healthy individuals which was similar to the findings of Zhao *et al.* (2005), Guadagni *et al.* (1993), Grotowski *et al.* (2001) and Youssef *et al.* (2013), as they reported that CEA showed positive sensitivity and remain the marker of choice in monitoring colorectal cancer. In the present study, CEA levels were significantly higher in CRC patients than healthy controls ($P < 0.001$). CEA is still the best marker both for primary diagnosis and post treatment monitoring of patients with colorectal cancer. CEA is a novel unique tumor associated epitope characterized by higher tumor specificity and

sensitivity colorectal antigens as compared to other markers.

Conclusion

In the present study, the serum levels of tumor marker CEA were statistically higher in diagnosed cases of colorectal carcinoma as compared to the controls showing the importance of the CEA marker in colorectal cancer. Findings of this study further strengthen the position of tumor markers in diagnosis, prognosis and detection of recurrences of the tumor.

Acknowledgements

The authors thank Mrs. Zhanylsyn Nurbolatovna for her work in statistical processing of the results.

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