ISSN- O: 2458 - 868X, ISSN –P: 2458 - 8687

International Journal of Medical Science and Innovative Research (IJMSIR)

IJMSIR : A Medical Publication Hub

Available Online at: www.ijmsir.com

Volume – 3, Issue –1, February - 2018, Page No. : 312 - 316

Comparison of serum CEA and ALP levels in Colorectal Cancer Patients

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Type of Publication: Original Research Paper

Conflicts of Interest: Nil

Abstract

Introduction

Colorectal cancer is the third most commonly diagnosed malignancy in men (663,000 cases, 10%) and second in women (5710, 00 cases, 9.4%) worldwide as per data available till 2014 by ICMR. In India Colorectal cancer incidence is lower than that in the western countries, and it is the 10th leading cancer in India.

Cancer is an abnormal growth of cells which tends to proliferate in an uncontrolled way and in certain cases depending upon the stage, cancer may metastasize involving adjacent organs and lymph nodes. Like many other cancers, colorectal cancer is usually curable when diagnosed early. Several tumor markers have been developed to find colorectal cancer early, as well as adenomas and other polyps. Tumor markers are biochemical substances present in blood, urine, or body tissues which are increased in different types of cancers.Tumor markers may play an important role to descry, diagnose and grapple with some type of cancers, when combined with other tests such as biopsies.

Objective: The aim of this study is to correlate the values of Carcinoembryonic antigen (CEA) and Alkaline phosphatase (ALP) in colorectal cancer patients.

Material and Methods: This was a case control study of clinically diagnosed100 colorectal cancer patients and 100 age and sex matched healthy controls were analyzed for CEA and ALP. Colorectal cancer patients were diagnosed histopathologically after a colonoscopy guided biopsy.

Results: The mean CEA levels (7.30 ± 3.350 vs 1.40 ± 0.625, p<0.001) and Alkaline phosphates (118.28 ± 21.68 vs 72.08 ± 12.65, p<0.000) were significantly higher in

colorectal cancer patients as compared with healthy controls.

Conclusion: Carcinoembryonic antigen is elevated in colorectal cancer patients. While as ALP levels were frequently elevated in CRC patients with liver metastases. ALP may be used as an indicator of disease progression of liver metastases.

Keywords: Carcinoembryonic antigen, Alkaline phosphatase, Colorectal.

Running title: CEA and ALP in CRC patients.

Introduction

Colorectal cancer is the third most commonly diagnosed malignancy in men (663,000) and second in women (5710, 00) worldwide as per data available till 2014 by ICMR[1]. In India, the annual incidence rates (AARs) for colon cancer and rectal cancer in men are 4.4 and 4.1 per 100000, respectively.[1] The AAR for colon cancer in women is 3.9 per 100000. Colon cancer ranks 8th and rectal cancer ranks 9th among men. For women, rectal cancer does not figure in the top 10 cancers, whereas colon cancer ranks 9th.

In India rectal cancer incidence is lower than that in the western countries, and it is the tenth leading cancer in India[2]. Most colorectal cancers, regardless of etiology arise from adenomatous polyp. A polyp is a benign but premalignant growth having capability of changing into a cancer depending upon the kind of polyp.[2] Colorectal cancers most commonly spread first to local lymph nodes before travelling to distant organs. Once local lymph nodes are involved, spread to the liver, the abdominal cavity and the lung are the next most common destinations of metastatic spread[2].

Like many other cancers, colorectal cancer is usually curable when diagnosed early. Several tumor markers have been developed to find colorectal cancer early. Tumor markers are biochemical substances present in blood, urine, or body tissues which are increased in different types of cancers. Tumor markers may play an important role to descry, diagnose and grapple with some type of cancers, when combined with other tests such as biopsies[3]. The most ubiquitously used tumor marker in patients with colorectal cancer is the Carcinoembryonic antigen (CEA) [4].After radical surgery; it is used as an early diagnostic index for recurrence during follow-ups. To identify colorectal cancer patients with high probability of having liver metastasis several investigators have tried to use serum tests. In metastatic colorectal cancer serum alkaline phosphatase (ALP) levels are frequently elevated. Elevation of ALP levels more than three times of normal range is considered significant for evaluation of colorectal hepatic metastases. Increased ALP is seen in specific disorders, including malignant biliary obstruction, primary biliary cirrhosis, primary sclerosing cholangitis, and hepatic lymphoma.[5]

Material and Methods

The present study was conducted on 100 subjects of colorectal cancer patients in the department of Biochemistry, Faculty of Medical Science SGT University Budhera Gurugram Haryana. In this case control study patients attending SGT Hospital from 2014 to 2017 were included. The total number of subjects was 200 which were divided into two equal groups: Group (1) included 100 colorectal cancer patients which were diagnosed histopathologically after a colonoscopy guided biopsy. Group (2) included 100 age and sex matched healthy controls.

A written informed consent was also taken from the cases. Ethical Clearance was obtained from SGT University Ethical Committee. Colorectal cancer patients included in this study were subjected to the following: Full history and complete clinical examinations, patients with biopsy of colorectal cancer tissues for histopathological

examinations to confirm the diagnosis. Venous 5 ml blood sample was collected using aseptic techniques. Serum was separated from the blood by centrifugation at 3000 rpm for 10 mints. Serum was stored at -80 ^{0}C until analysis. The repeated thawing and freezing of serum was avoided. Serum samples were analyzed for CEA and ALP levels. All parameters were quantitatively estimated in serum by using enzyme-linked immunosorbent assay (ELISA).

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. The present study was conducted on 100 colorectal cancer patients in the age group 23-75 years.

The mean age group of colorectal cancer patients was 52.9 ± 10.54 and control was 48.7 ± 11.04, no significant p value (Table 1). Among the 100 patients 75 (75%) were male and 25 (25%) were female. Similarly in the case of 100 healthy controls 69 (69%) were male and 31 (31%) were female (Table 2).

Mean of CEA in colorectal cancer patients was significantly higher than healthy controls (7.30 ± 3.350 vs 1.40 ± 0.625, p< 0.001) (Table 3). ALP level showed highly significant differences in mean of colorectal cancer patients and healthy controls (118.28 ± 21.68 vs 72.08 ± 12.65, p<0.000) (Table 3).

Table 1: Showing mean age (years) among cases and controls

Age (years)	N	Mean	SD	Range	P-value
Cases	100	52.9	10.54	23-75	0.787
Controls	100	48.7	11.04	20-63	

Table 2: Gender distribution

Gender	Cases		Controls		P-value
	No.	%age	No.	%age	
Male	75	75%	69	69%	0.345
Female	25	25%	31	31%	
Total	100	100%	100	100%	

Table 3: Comparison based on CEA and ALP among cases and controls

Parameter	Cases		Controls		P-value
	Mean	SD	Mean	SD	
CEA	7.30	3.350	1.40	0.625	0.001
ALP	118.28	21.68	72.08	12.65	0.000

Discussion

In India colorectal cancer incidence is lower than that in the western countries, and it is the tenth leading cancer in

India[6]. Colorectal cancers most commonly spread first to local lymph nodes before travelling to distant organs. Once local lymph nodes are involved, spread to the liver, the abdominal cavity, and the lung are the next most common destinations of metastatic spread[2]. Colorectal cancer is usually curable when diagnosed early. Colorectal cancer is a multifactorial disease with genetic predispositions and dietary life style. The risk of CRC begins to increase above the age 50 to 55 years (American cancer society 2010)[7]. In the present study, the mean age of CRC patients was 52.9 years[7]. Maximum incidence was between 23 to 75 years. In agreement with the present study results, Youssef EMI et al (2013)[8] and EI Bolkieny et al (2006)[9] reported the mean age of CRC patients in Egypt was 50.63 years and 51 years respectively. A slightly higher mean age of 55 years of CRC patients was reported by Ibrahim et al[10]. However, in Western countries CRC is considered the disease of elder population. Max et al (2005)[11] reported the mean age of CRC patients about 65 years in the west. For predicting liver metastases in colorectal cancer patients, we analyzed serum alkaline phosphatase and Carcinoembryonic antigen levels. Serum alkaline levels of colorectal cancer patients was significantly high ($p<0.000$) compared to healthy controls. Our results are in concordance with Paul I et al (1980)[12] as they concluded elevated levels of ALP in 58-85% of patients with liver metastasis. Our findings of increase in serum ALP level in colorectal patients is in agreement with observation of M.Wasif Seif et al (2005)[5] who found that ALP levels were frequently elevated in CRC patients with liver metastases. Carcinoembyronic antigen discovered in 1965 has been the choice of marker in asymptomatic patients for early diagnosis of recurrent disease in CRC patients[4]. CEA has taken center stage as a validated and guideline recommended tumor marker in colorectal cancer. In this study, CEA levels were significantly higher in CRC patients than healthy controls ($p<0.001$). The same results were reported by Zhao et al (2005)[13], Grotowski et al (2001)[14], Guadagni et al (1995)[15]. A Spilla et al (2001)[16] reported that CEA showed positive sensitivity and remain the marker of choice in monitoring colorectal cancer.

Conclusion: For the detection of liver metastases ALP showed the highest significant value when compared with CEA. Both CEA and ALP are low cost and relatively sensitive but cannot be used as screening test for patients with liver metastases.

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