



## ASSESSMENT OF NUTRITIONAL STATUS OF COLORECTAL CANCER PATIENTS DURING CHEMOTHERAPY; RELATIONSHIP WITH DEMOGRAPHIC PROFILE AND LIFE STYLE

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### ABSTRACT

The present study was undertaken to assess the nutritional status of colorectal cancer patients from Cancer and Research Department of Aditya Birla Memorial Hospital, Pune Maharashtra. About 50 hospitalized colorectal patients were randomly selected. The data on demographic profile, lifestyle, nutrient intake, anthropometric measurements and biochemical parameters were collected using interview schedule. The results showed that about 56% patients had colon cancer whereas 30% and 14% had colorectal and rectum cancers respectively. About 54% and 46 % patients had third and second grade of cancer respectively. About 44% had undergone one to four chemotherapy cycles and 56 % had four to eight cycles. The mean age of patients was 50.20 + 10.40 years. Among the patients, 58 % were males and 42 % were females. The mean nutrient intake of patients (except fat in females) was found to be 45 to 88% as compared to recommended intake as suggested by ICMR. Except for C- reactive protein levels, hemoglobin, serum albumin and total proteins were very low in comparison with the reference value. The mean weight of the patients were found to be low as compared to NCHS however, the mean Body Mass Index (20.42 + 2.65 Kg/m<sup>2</sup>) was within normal limits. Occupation showed significant correlations coefficient with weight (p= 0.030), calcium, (p= 0.009), iron (p= 0.019) and antioxidant intake (p= 0.003). The significant correlation coefficient were also observed between alcohol consumption and serum albumin (p= 0.001); dietary habit and weight (p= 0.013) and BMI (p= 0.02); type of cancer and protein intake (p= 0.054) ; and period of diagnosis and iron intake (p= 0.023). It can be concluded that life style management and good dietary habits are crucial for management of colorectal cancers.

**Keywords:** Demographic profile, colorectal cancer, C reactive protein, haemoglobin, serum albumin, total protein



## INTRODUCTION

Colorectal cancer is a complicated multi-factorial, multifaceted and multi mechanistic disease. Colorectal cancer causing agents (carcinogens) can be present in food and water, in air and in chemicals and sunlight that people are exposed to (Alison, 2001). Among all these factors, diet plays an important role in the causation of cancer. The National Cancer Institute estimates that roughly one third of colorectal cancer deaths may be diet related. Several dietary factors may inhibit/enhance initiation, promotion and progression of cancer cells (Donaldson, 2004).

India is witnessing a rise of 1.2% in the number of the colorectal cancer patients annually. There are 28 lakh cancer patients in which 15 lakhs cases are of colorectal cancer in the country at any point of time as per data collected by population based cancer registry functioning under the National Cancer Registry Programme of Indian Council of

Medical Research (ICMR) in March, 2010 (Behera *et al.*, 2012).

There is an increasing awareness both with the scientific community and public that diet has an important role to play in the etiology of colorectal cancer. In the last two decades, several studies whether ecological and experimental suggest strong association between dietary factors and carcinogenesis. The overall impact of diet on colorectal cancer appears to be significant projecting 30- 40 per cent of colorectal cancers in men and upto 60 per cent of colorectal cancers in women could be attributed to the dietary factors. The relative risk of colorectal cancers in chewers and smokers is higher when subjects are on low intake of milk, fish and vegetables, while use of *chilli* powder identified as risk factor for all sites of cancers with dose response effects; diet related facts and lifestyle play a very important role. High intake of total and saturated fat is associated with increased risk of colorectal cancer. High fat diets are associated with



obesity, which is also linked the colon and rectum. Animal fat (from meat and dairy) is associated with increased risk of colorectal cancer (Lophatananon *et al.*, 2010).

Epidemiological studies indicate that nutritional and environmental factors play a major role in the etiology of colorectal cancer. An increased risk for developing colorectal *cancer* has been associated with the smoking and chewing of tobacco, consumption of alcoholic beverages, salt cured, and salt pickled and mouldy foods. The moulds which can contaminate foods include members of the *Fusarium* species, which produce several toxins and *Geotrichum candidum* which promotes the formation of N-nitrosamine compounds which are probable etiological factors in all types of cancer in high incidence areas. Eating more fruits and vegetables, reducing the intake of red meat and definitely not smoking can reduce the incidence of colorectal cancer. Green tea also improves

the metabolic biomarker. The daily intake of green tea reduces the risk of colorectal cancer as well as overweight (Hollis *et al.*, 2010).

Keeping these facts in view, the present study was undertaken to assess the dietary habits, lifestyle pattern and nutritional status of people suffering from colorectal cancer. An attempt was made to assess the relationship between them.

## **MATERIALS AND METHODOLOGY**

For the present study 50 hospitalized colorectal cancer patients in the Cancer unit of Aditya Birla Memorial Hospital, Pune, Maharashtra were randomly selected. Before selection of the patients, their medical records were checked and confirmed from the treating doctors. A written consent was obtained from all the selected respondents to participate in the study.

A pre-tested well-structured interview schedule was developed to elicit data on various aspects of respondents. It included



demographic profile, information about disease, life style, nutrient intake, anthropometric measurements and biochemical parameters. The information about the disease included family history of disease, diseases history of respondent if any, which existed prior to diagnosis of colorectal cancer, co-existence of any other disease with colorectal cancer etc. Food habits and Life style pattern information collected from patients included habits like smoking, tobacco, alcohol consumption. 24 hour recall method was used for assessing the diet and nutrient intake of patients. The nutrient intake was compared with Recommended Dietary Allowances of 2010. Anthropometric measurements viz., weight and height was measured using standard techniques and Body Mass Index was calculated. Biochemical parameters viz., hemoglobin, c reactive protein and total proteins, serum albumin were recorded from the hospital records. The data was analysed for frequency, mean, standard

deviation, percentage, t test, F test and correlation coefficient. The data was analysed using SPSS version 20. The confidence interval was set at 95%.

## **RESULTS AND DISCUSSION**

### **Demographic Profile and Details of Cancer**

The demographic profile showed that the mean age of patients was 50.20 + 10.40 years. Among the patients, 58 % were males and 42 % were females. About 48% and 28% patients were employed and self-employed respectively whereas 12 patients were homemakers. About 16% patients had education up to SSC and 16% up to HSC. About 32 % patients were graduate and 36 % were postgraduate. About 50 % patients were alcoholic and about 80 % were smoker. The majority patients were (68 %) were non-vegetarian. The majority patients had colon cancer (56%) whereas 30% and 14% had colorectal and rectum cancers respectively. Majority patients (52 %) were diagnosed recently where as 48% were diagnosed before six month. A majority patients (54%) had third



grade of cancer and about 46 % had second grade of cancer. About 48 % of cases were post-operative. About 44% had undergone one to four chemotherapy cycles where as 56 % had four to eight cycles. About 42% patients reported to be suffering from other health disorders too and 36 % patients had familial history of cancers.

### **Nutrient Intake of Cancer Patients**

The mean nutrient intake of patients in comparison with Recommended Dietary Allowances has been presented in Table 1.

Table 1 shows the mean nutrient intake of patients suffering from colon cancer. The mean energy, protein and fat intake of male patients were found to be 1242.45 + 210.98 Kcal, 38.70 ± 10.21 gm and 22.05 ± 4.45 gm respectively. The minerals viz., calcium and iron intake of male patients were 477.41 + 56.36 mg and 12.69 ± 4.27 mg respectively. The mean energy, protein and fat intake of female patients were found to be 1294.24 + 189.11 Kcal, 38.29 ± 7.96 gm and 21.71 ± 3.48 gm

respectively. The minerals viz., calcium and iron intake of male patients were 446.41 + 104.64 mg and 9.81 ± 4.16 mg respectively. The percent adequacy of nutrients ranged between 53.55 % to 88.2 % in males and 46.28 % to 108.57 % in females. The lowest adequacy in males was calorie intake (53.55%) whereas in females it was in iron intake (46.28%). The adequacy of rest of the nutrients ranged between 60 to 70 %. Except for iron (p=0.021) and antioxidants intakes (p= 0.023), none of the nutrients showed significant difference between the means with respect to gender of the patients.

### **Biochemical Parameters of the Patients**

The mean biochemical parameters of the patients viz., haemoglobin, total protein, serum albumin and C – Reactive Protein have been presented in Table 2.

The mean haemoglobin of males were 8.27 mg/dl and females were 8.48 mg/dl, but an insignificant difference (p = 0.618) was observed between them. The mean total proteins, serum



albumin, C reactive proteins were found to be  $5.09 \pm 0.76$  mg/dl,  $2.90 \pm 0.53$  mg/dl and  $2.55 \pm 0.716$  mg/dl respectively. Except for C- reactive protein levels, all the biochemical parameters were very low in comparison with the reference value. (Table 2)

### **Anthropometric Measurements of Patients**

The mean anthropometric measurements of patients' viz., height weight and Body Mass Index (BMI) have been presented in Table 3.

The mean height of males was higher than female patients but no significant difference ( $p=0.071$ ) was observed between them. The mean weight of the patients were found to be low as compared to NCHS standards, may be due to poor food intake in chemotherapy. The mean weight of males was significantly higher than females ( $p=0.000$ ). However, the mean Body Mass Index ( $20.42 + 2.65$  Kg/m<sup>2</sup>) was within normal limits (Table 3).

According to Rio *et al.*, 2010 a common problem in colorectal cancer patients is the significant

malnutrition which results from the neoplastic disorders and/or treatment. Malnutrition in hospitalized patients is generally related to increasing morbidity and mortality and length of stay during chemotherapy. There is a marked reduction in the oral food intake in cancer patients due to anorexia that stems from the malignancy itself as well as from psychological, emotional, therapeutic and other disease complications such as pneumonia during chemotherapy. The incidence of malnutrition and wasting can be prevented or reversed by the application of various nutritional modalities including special naso-gastric tube feeding, feeding by gastrastomy or jejunostomy or intravenous hyperalimentation.

The outcomes of another study has also show that involuntary weight loss and malnutrition continued to be prevalent among hospitalized patients. It could be said that weight loss and malnutrition have a great impact on the healthcare system, resulting in reduced



quality of life for the affected patients, compromised recovery and added financial costs to the institution where the patient is receiving care (Collins, 2000).

### **Associations between different variables**

The mean nutrient intake, biochemical parameters and anthropometric measurements of the patients were computed with factors associated with demographic profile and cancer and has been presented in Table 8.

Table 10 denotes the significant difference between the means of nutrient intake, anthropometric measurements and biochemical parameters with variables like occupation, specific type of cancer, alcohol consumption, cigarette smoking, dietary habits, duration of diagnosis and grade of cancer.

Self-employed patients showed significantly higher mean weight ( $p= 0.030$ ) as compared to patients who were employed or homemakers. The housewives had significantly lowest mean weight as compared to other patients. The mean calcium intake of employed

patients was significantly higher ( $p= 0.009$ ) than self-employed or patients who were housewives. The mean iron intake of self-employed patients was significantly higher ( $p= 0.019$ ) than employed or patients who were housewives. The mean antioxidant intake of housewife patients was significantly higher ( $p= 0.003$ ) than self-employed or patients who were employed.

Prince *et al.*, 2010 reported that much of increase in incidence of colorectal cancer in India has been associated with greater urbanization and changing of life style. Higher education level and income are shown to be significant reasons for an increased risk in women group. That is because economic independence may encourage women to remain single or marry late thereby increasing their risk of getting the disease (15.9%).

The mean serum albumin levels ( $p= 0.001$ ) were found to be significantly less in alcoholic patients whereas high in the patient who do not take alcohol.



The mean calcium intake ( $p=0.040$ ) were found to be high cigarette smoking patients where as low in the patient who do not smoke. Patel *et al.* (2001)) have also suggested the role of tobacco in decreasing levels of vitamin A and E and increasing cancer risk. Lower levels of vitamin E and  $\beta$ -carotene were observed in tobacco users. Smoking with deficiency of vitamin A, increases the chance of developing squamous cell carcinoma. Deficiency of retinoids leads to squamous cell transformation and there is increased  $\beta$  (a) -P DNA adduct formation.

There is enough evidence to show that cancers share with major key risk factors such as tobacco use (smoking and chewing), unhealthy dietary habits, and physical inactivity, alcohol use, infection and behavioral risk factors (Murthy and Mathew, 2004).

Tobacco is the single most important risk factor for cancer. In addition to above, increasing trends in cancer incidence have

also been noted for several other cancers such as colon, rectum, gall bladder, lung, breast, ovary, prostate, brain and leukemia (Murthy, 2008).

The mean weight ( $p=0.013$ ) and body mass index ( $p=0.02$ ) of vegetarian patients were found to be significantly less as compared to those in non-vegetarians. The mean protein intake of colon patients ( $p=0.054$ ) were found to be significantly low as compared to the cancers of rectum and colorectal. The mean iron content of the recently diagnosed patients ( $p=0.023$ ) were found to be low as compared to the cases who were diagnosed six month before. The mean calcium intake ( $p=0.00$ ) were found to be significantly slightly higher in third grade cancer. According to Hu FB *et al.* (2002), the impact of diet on chronic disease risk has become increasingly more common during the past 15 years. Dietary patterns have gained favor as a comprehensive method of examining diet that better captures the *in vivo* interrelationship of



nutrients as they are consumed within a population. Dietary patterns are particularly useful for the investigation of diet and chronic disease development,

because chronic disease often is influenced by many interacting variables that modify each other's impact.

Table 1: Mean nutrient intake per day of patients suffering from Colon Cancer

Nutrient Intake	Gender	N	Mean	Std. Deviation	RDA Percent Adequacy	T value	Significance value
Energy (kcal)	Male	29	1242.45	210.99	53.55	-.894	.376
	Female	21	1294.24	189.11	68.1		
Carbohydrates (gm)	Male	29	173.91	180.92	----	.835	.408
	Female	21	140.76	16.12	--		
Proteins (gm)	Male	29	38.71	10.21	64.51	.157	.876
	Female	21	38.29	7.96	63.8		
Fats (gm)	Male	29	22.06	4.45	88.2	.295	.769
	Female	21	21.71	3.48	108.57		
Calcium (mg)	Male	29	477.41	56.36	79.56	1.367	.178
	Female	21	446.05	104.64	74.34		
Iron (mg)	Male	29	12.69	4.28	74.41	2.378	.021
	Female	21	9.81	4.16	46.28		
Dietary Fibre (gm)	Male	29	29.21	5.36	73.75	-.495	.623
	Female	21	29.90	4.23	73.75		
Tocopherol (mg)	Male	29	4.97	1.48	61.25	-.341	.735
	Female	21	5.10	1.09	63.62		
Selenium (microgm)	Male	29	29.41	4.93	72.5	1.618	.112
	Female	21	27.10	5.10	62.75		
Antioxidants	Male	29	310.28	34.17	77.5	-2.342	.023
	Female	21	335.00	40.28	83.75		



Table 2: Mean biochemical parameters of patients suffering from Colon Cancer

Parameter	Gender	N	Mean	Std. Deviation	Reference Value	t test	Sig. (2-tailed)
Haemoglobin (mg/dl)	Male	29	8.27	1.03	M:13 -17 mg/dl	-.502	.618
	Female	21	8.48	1.84	F: 12-15 mg/dl		
Total Protein mg/dl		50	5.09	0.76	6.2-8 mg/dl		
Serum Albumin mg/dl		50	2.90	0.53	3.5 mg/dl-5 mg/dl		
C-reactive protein mg/dl		50	2.55	0.71	0-5 mg/dl		

Table 3: Mean anthropometric measurements of patients

AM	Gender	N	Mean	Std. Deviation	T value	Sig. (2-tailed)	NCHS	Percent Of NCHS
Height (cm)	Male	29	165.17	6.698	1.848	.071	170	97.05
	Female	21	161.95	5.094			160	101.21
Weight (kg)	Male	29	52.72	3.963	4.510	.000	60	87.86
	Female	21	46.71	5.469			55	84.92
BMI (Kg/m <sup>2</sup> )		50	20.42	2.65			18.50-24.99	

Table 8: Variables showing significant difference between means

Independent Variables	Dependent variables	Categories	N	Mean	Standard Deviation	F/ t value	P value
Occupation	Weight	Employed	24	50.79	5.357	F = 3.765	.030
		Self-employed	14	52.14	4.312		
		Housewife	12	46.75	5.817		
		Total	50	50.20	5.492		
	Calcium Intake	Employed	24	498.67	67.612	F = 5.154	.009
		Self-employed	14	442.14	68.482		
		Housewife	12	421.17	93.543		
		Total	50	464.24	80.800		
	Iron	Employed	24	12.33	3.919	F =	.019



	intake	Self-employed	14	12.64	4.343	4.326		
		Housewife	12	8.42	4.379			
		Total	50	11.48	4.423			
	Antioxidant intake	Employed	24	305.50	39.216	F= 6.448		.003
		Self-employed	14	321.79	27.266			
		Housewife	12	349.67	32.925			
		Total	50	320.66	38.490			
Alcohol Consumption	Serum Albumin	Yes	25	2.660	.4472	t= - 3.591	.001	
		No	25	3.152	.5189			
Cigarette Smoking	Calcium Intake	Yes	40	475.88	66.052	t= 2.107	.040	
		No	10	417.70	116.751			
Dietary Habits	Weight	Vegetarian	16	47.44	5.633	t= - 2.576	.013	
		Nonvegetarian	34	51.50	4.992			
	BMI	Vegetarian	16	18.8019	2.17430	t= - 3.233	.002	
		Nonvegetarian	34	21.1838	2.53845			
Type of Cancer	Protein Intake	Colon	28	35.768	8.5217	F = 3.099	.054	
		Rectum	7	42.571	6.6297			
		Colorectal	15	41.800	10.2762			
		Total	50	38.530	9.2485			
Diagnosed When	Iron Intake	Recently	26	10.92	4.232	t= 2.342	.023	
		Six month before	24	12.08	4.634			
Grade of Cancer	Calcium Intake	Second Stage	23	464.17	85.380	t= 3.753	.000	
		Third Stage	27	464.30	78.332			

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