

Original Research Article

## Changes in Body Mass Index, Blood Pressure and Haemoglobin Level of Carcinoma Patients: A Study on the Effect of Designed Diet

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### ABSTRACT

Though the role of diet in prevention of cancer has been well known, there is little information pertaining to the effect of diet on the health status of cancer patients. This study aims to investigate the effect of diet on body mass index, blood pressure and haemoglobin content of carcinoma patients. Subjects with in the age range of 21-65 were included in this study and were divided into two groups. One group was treated with only prescribed drug and the second group was treated with prescribed drug as well as designed diet simultaneously. The recommended calorie was 20-25 Kcal/Kg of body weight. The diet chart was designed such that it contains low calories, high protein, moderate carbohydrate, low fat and rich in vitamins and minerals. Certain foods such as deep fry foods, sweets, cream, ghee etc. were restricted. The body mass index, haemoglobin concentration and blood pressure of these subjects were measured after 30 d and 60 d of the treatment. An improvement in body mass index and hemoglobin level of the subjects treated with drug and diet simultaneously was observed compared to the subjects that were treated only with drugs. The result of the study shows that recommendation of healthy diet to cancer patients during the treatment period could increase the health status and cancer survivorship.

**Key words:** Body mass index, Carcinoma, Diet, Haemoglobin.

### INTRODUCTION

About 30-40% of cancers that are caused due to environmental factors are directly linked to diet. Many dietary recommendations have been proposed to reduce the risk of cancer and few of them have significant supporting scientific evidence. The dietary recommendations for cancer prevention typically consist of mainly vegetables, fruit, whole grain and fish and a reduced intake of red meat, animal fat and refined sugar. <sup>[1]</sup> Diets that are low in vegetables, fruits and whole grains, and high in processed or red meats are linked with a number of cancers. <sup>[2,3]</sup> High content of salt in diet is linked

to gastric cancer, aflatoxin B1, a frequent food contaminate, with liver cancer, and Betel nut chewing with oral cancer. <sup>[4]</sup> Consumption of coffee is associated with a reduced risk of liver cancer. <sup>[5]</sup>

A number of diets are known to act against cancer. Some of the anti-cancer diet includes the Breuss diet, Gerson therapy, the Budwig protocol and the macrobiotic diet. Studies in both animals and humans have demonstrated that a ketogenic diet limits the glucose uptake of tumor, and thus retarding the growth of the tumor. <sup>[6]</sup> Provided with high-fat and low-carbohydrate diet, healthy cells convert fatty acids to glucose for energy. However,

cancerous cells cannot respire, without a significant source of glucose from carbohydrates. [7]

Though the above studies have been conducted to find the role of diets for prevention of cancer, there is scanty of information pertaining to the changes of health status and life style of subjects suffering from cancer of various types. In the present study, the effect of diet on body mass index (BMI), blood pressure and haemoglobin (HB) content of carcinoma patients has been studied.

## MATERIALS AND METHODS

### Place of study and selection of subjects

The present study was carried out among selected patients of Indira Gandhi Regional Cancer Centre, Department of Radiotherapy, Dr. B. R. Ambedkar Memorial Hospital (BRAMH) Raipur, Due permission for the study was obtained from the concerned authority of BRAMH.

### The study subjects

The study subjects included both male and female sexes of various age groups (21-65 years). In total an average of 202 patients were studied. Those subjects

confirmed with cancerous cells in biopsy report were included in the present study. The personal information, physical characteristics, habits and other relevant information of the patients were collected through structured questionnaire.

### Design of the diet and menu

The diet given to the carcinoma subjects were designed by expert dieticians and were based on certain principles. The normal calories required were determined according the age, sex, occupation and health condition of the patients. The patients were restricted one or the other type foods in their diet. The recommended calorie was 20-25 Kcal/Kg of body weight or was slightly modified as and when required according to the sex, age, occupation and BMI of the individual persons. The diet chart was designed such that it contains low calories, high protein, moderate carbohydrate, low fat and rich in vitamins and minerals. Certain foods such as deep fry foods, sweets, cream, ghee etc. were restricted. The details of the diet chart for the carcinoma subjects are described in table 1.

Table 1: Diet chart for carcinoma subjects as designed by dietician.

Diet type	Recommended calories	Principle of the diet	Menu for whole day	Restrictions
Liquid diet	Normal required calories (according to the condition of the patients)	Normal required calories, high proteins, moderate carbohydrates, fat, vitamins and minerals rich diet should be given in the liquid diet.	Wheat grass juice –200 ml, milk 600 ml with protein powder, fruit juices, soups Soya soup, egg with coconut water, Dal pani, Starch rice water added Olive oil.	Smoked salted pickled, fried and preserved food, alcoholic beverages, spice food, deep fry recipes.
Soft diet	Normal required calories (according to the condition of the patients)	Normal required calories, high proteins, moderate carbohydrates, fat, vitamins and minerals rich diet should be given.	Wheat grass juice –200 ml, Pannier or Chhana + Olive Oil + Honey 50 gm - 100 gms, Daliya, Khichadi, Dal, Soya soup, egg Fruit Juices, Vegetable Soup, Milk with protein Powder, Curd, Shree Khand, Coffee, Shake.	

### Treatment of the patients

The carcinoma patients were divided into two groups. One group was treated with only drug and the second group was treated with prescribed drug as well as designed diet simultaneously. The drugs were prescribed by specialized Medical Doctors of the hospital. The severity of the disease based on the result of diagnosis determined the doses.

The information of the various parameters of the patients was collected and recorded from the test reports of the patients that were advised by the concerned physician. These reports were collected on first visit (0 d), after one month (30 d) and two months (60 d) of treatment.

### Statistical analysis

The standard deviation (SD) was calculated using MS Excel and the data were presented as mean ± SD. Student's *t*

test was used to evaluate the significant of differences between the parameters measured under the effect of drug treatment and drug and diet combined treatment. Student's *t* test was also used to find the significance of differences between the days of treatment. SPSS 16 (SPSS software Inc Chicago, USA) statistical software was used for analysis.

## RESULTS

### Sample characteristics of subjects

In this study one group of cancer patients were treated with only drug to find the effect of drug whereas the second group was treated with prescribed drug along with designed diet. The distribution of the patients was heterogeneous having varied characteristics within as well as between the groups. The characteristics and distribution pattern of carcinoma subjects are summarized in table 2.

Table 2: Sample characteristics and distribution pattern of carcinoma subjects

Characteristics	No. of subjects	
	Drug treated	Drug + diet treated
Male	64	62
Female	36	40
21-30 years	20	21
31 – 40 years	40	41
41-50 years	22	23
51-65 years	16	17
Vegetarian	10	9
Non-vegetarian	90	93
Alcoholic	85	83
Non-alcoholic	15	19
Regular Exercise	3	8
Non-Exercise	97	94
Underweight	26	17
Overweight	7	8
Normal B.M.I.	63	65
Borderline anemic	74	69
Severely anemic	23	16
Pre-hypertensive	27	43
Stage I hypertensive	14	13

### Effect of drug on carcinoma subjects Effect on BMI

The subjects that were treated with only drugs varied in their BMI. About 63% subjects were in the normal range with mean BMI value 21.26. On treatment with drugs for 30 d there was no appreciable change in BMI of these patients showing that the drugs have no marked effect on reduction of body weight. When the treatment was continued for 60 d, there was

almost no change in the BMI. The mean BMI of these patients was 21.89 after 60 d of treatment.

The second category of patients were having BMI value below the normal range. The mean BMI value was measured as 15.96 before treatment with drugs and did not undergo any change after treatment with drugs for 60 d. The BMI value after 30 d and 60 d of treatment were recorded as 15.79 and 15.68 respectively.

Some of the carcinoma subjects were having BMI above the normal range. The mean BMI of these patients in the beginning of the treatment was observed as 27.63. On treatment with drugs for 30 d the BMI of these patients was measured as 27.42. When the treatment was continued for 60 d the BMI was not changed and was found to be 27.31. The effect of drug on BMI of carcinoma patients has been shown in Fig. 1.

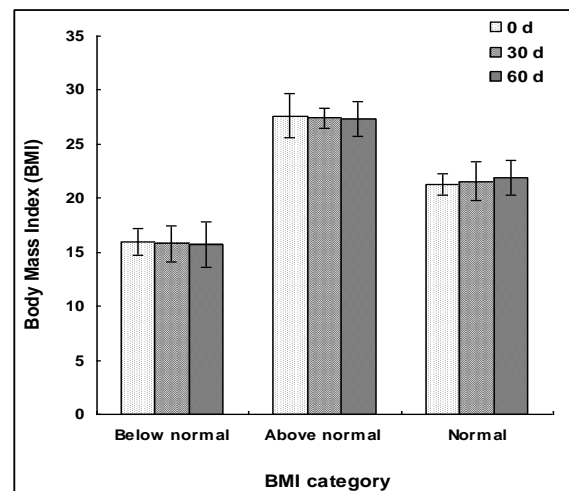


Fig. 1: Effect of drug on BMI of carcinoma patients. Bars represent  $\pm$ SD.

### Effect on haemoglobin concentration

The effect of drug on the HB content of carcinoma patients were studied separately for male and female patients. The level of HB changed only in 8 % and 15% of male patients after 30 d and 60 d of treatment and the mean concentration was observed as 7.37, 8.01 and 8.54 g/dl at 0 d, 30 d and 60 d of treatment respectively. Similarly, the HB concentration changed in 10% and 17% of female patients after 30 d and 60 d of treatment. The mean HB

concentration was noticed to be 6.21, 7.12 and 8.02 g/dl at 0 d, 30 d and 60 d of treatment respectively.

### Effect on blood pressure

In this study, a low blood pressure was observed in 70% carcinoma patients. The blood pressure was high only in 7% patients and was normal in rest of the patients. When subjected to drug treatment, the blood pressure of 25% patients increased from lower to normal value. However the mean blood pressure of the patients did not show any change before and after the treatment.

### Effect on BMI

The BMI of the subjects varied in response to simultaneous treatment of drug and diet. About 65% of the total patients were having BMI in normal range. The mean BMI of these patients at 0 d of treatment was 20.24. When the patients were treated with drug and diet for 30 d there was a slight decrease in body weight and the BMI was observed as 19.41. On treatment for 60 d the BMI was found to be 19.61.

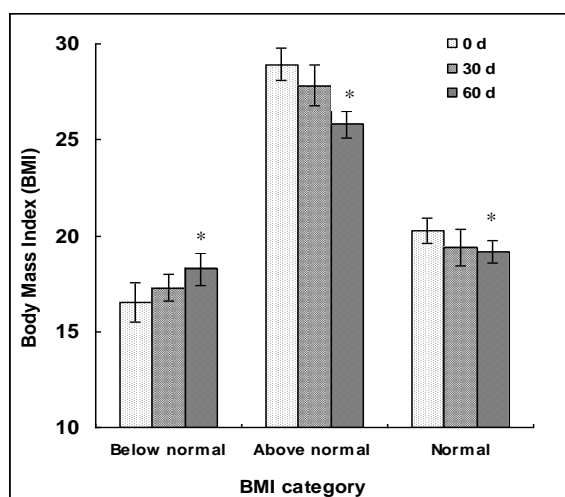


Fig. 2: Effect of combined treatment (drug+diet) on BMI of carcinoma patients. Bars represent  $\pm$ SD. statistically significant difference at  $*P \leq 0.05$ .

The effect of diet when treated along with drug on second category of subjects with BMI below the normal range was very significant. It was noticed that for these subjects there was an increment of body weight and the BMI on 30 d of treatment.

The BMI increased from 16.53 to 17.28 on 30 d of treatment and on continuing the treatment for 60 d the BMI further increased and reached to normal range. The BMI on 60 d of treatment was found to be 18.25.

The third category patients with BMI above the normal range also responded to the treatment and showed a decrease in BMI from 28.93 to 27.82 and 25.79 on 30 d and 60 d of treatment respectively. The effect of simultaneous treatment of drug and diet on BMI of carcinoma patients has been shown in Fig. 2.

### Effect on haemoglobin concentration

Changes in the level of HB in response to combined treatment of drug and diet was studied both in male and female patients. It was observed that the HB level after 30 d and 60 d of treatment changed in 15 % and 21% male patients as compared to 8% and 15% males those were treated only with drugs. The HB level was found to be 7.96, 9.2 and 9.65 g/dl after 0d, 30 d and 60 d of treatment respectively. Likewise, the HB level of female carcinoma patients also increased in 32% and 48% patients after 30 d and 60 d of combined treatment respectively. The mean HB content of the patients was measured as 6.01, 7.51 and 9.1 g/dl at 0 d, 30 d and 60 d of treatments respectively. The effect of drug and combined treatment 9 (drug + diet) on HB level of carcinoma patients has been shown in Fig. 3.

### Effect on blood pressure

When the patients were treated with both drug and diet simultaneously, it was observed that the blood pressure of about 62% subjects that were having lower blood pressure increased to normal value. There was a significant increase in mean blood pressure of these patients. The blood pressure of those patients that were normal remained almost unchanged under treatment. The effect of drug and combined treatment 9 (drug + diet) on blood pressure of carcinoma patients has been shown in table 3.

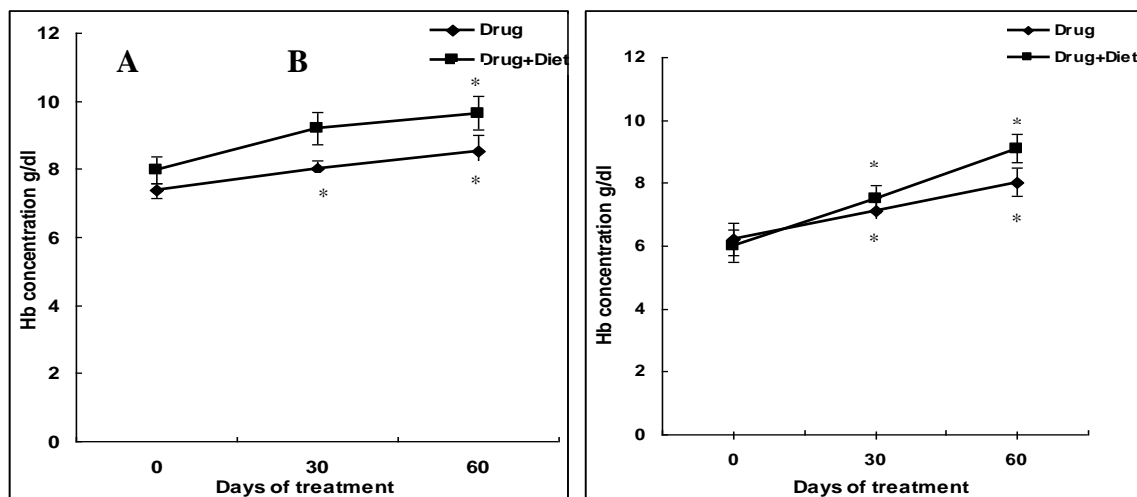


Fig. 3 Effect of drug and combined (drug+diet) treatment on HB concentration of male (A) and female (B) carcinoma patients. Bars represent  $\pm$ SD. statistically significant difference at  $*P \leq 0.05$ .

Table 3: Effects of drug and combined treatment (drug+diet) on blood pressure of carcinoma Subjects. Values in parentheses represent  $\pm$ SD. statistically significant difference at  $*P \leq 0.05$ .

Days of treatment	Drug treated		Drug and diet treated	
	Systolic BP mgHg ( $\pm$ SD)	Diastolic BP mgHg ( $\pm$ SD)	Systolic BP mgHg ( $\pm$ SD)	Diastolic BP mgHg ( $\pm$ SD)
0	113 ( $\pm$ 6.08)	77 ( $\pm$ 3.46)	111 ( $\pm$ 4.64)	72 ( $\pm$ 2.14)
30	111 ( $\pm$ 4.25)	79 ( $\pm$ 4.08)	121* ( $\pm$ 5.13)	81* ( $\pm$ 5.61)
60	111 ( $\pm$ 3.24)	77 ( $\pm$ 3.79)	124* ( $\pm$ 4.23)	84* ( $\pm$ 4.07)

## DISCUSSION

About 80-90% of cancers are caused by environmental factors and half of these are caused due to diet. Several dietary recommendations have been proposed to reduce the risk of cancer and improve the health status of cancer patients. Many observations and experiments have reported that overweight, an unhealthy diet i.e., low in vegetables and fruits and high red meat, alcohol intake, and lack of physical activity greatly influence the risk of developing certain types of cancer. [8,9] In this study, carcinoma subjects were recommended with diets of normal calorie that consisted of moderate carbohydrate, high protein, and rich in vitamins and minerals. The diets were also rich in vegetable and fruit juice. A noticeable difference was observed in BMI, HB level, and blood pressure of the subjects that took the recommended diet as per the advised routine (Fig. 1-3 and table 3). The BMI of the patients increased from below normal to normal value in many cases. This indicated an increase in body weight of these patients. Though increased body weight with adiposity is a risk factor that may reduce the survival of cancer patients,

[10] the maintenance of normal health is desirable for any type of disease including all types of cancers.

Other parameters like HB concentration also significantly increased in the patients. The blood pressure of many of the carcinoma patients shifted to normal range when treated with recommended diets for long term. The role of diet towards cancer varies greatly according to the type of cancers. [11,12] The heavy consumption of red meat is the main cause of several cancers. [13-15] In our study, the recommended diet never consisted of meat and other non vegetarian food items.

## CONCLUSION

In conclusion, recommendation of healthy diet to cancer patients during the treatment period could increase the health status and cancer survivorship. Further, research on well designed studies to find the effect of designed diet and other improved lifestyles both on prevention and control of the disease needs to be carried out.

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