DESIGNED DIET MEDIATED ALLEVIATION OF HAEMOGLOBIN LEVEL AND HEALTH STATUS OF ANAEMIC PATIENTS

Smriti Bajpai[1], Vivek Choudhary[2], Aruna Kumar Tripathy[3] and Gopal Krishna Sahu[4*]

[1]*School of Life Sciences, MATS University, Raipur (C.G.)*
[2]*Department of Radiotherapy, Dr. B.R. Ambedkar Memorial Hospital, Raipur (C.G.)*
[3]*Department of Biochemistry, SPACES Degree College, Payakaraopeta (A.P.)*
[4]*Department of Biochemistry, Pt. J.N.M. Medical College, Raipur (C.G.)*

ABSTRACT : Anaemia is the most common disorder of the blood characterized by reduction in hameglobin level. The disease can be treated through the administration of various drugs. Dietary changes are considered one of the treatments for anaemia. In this work the effect of designed diet on the haemoglobin level and health status of anaemic subjects has been studied. One group of anaemic subjects was treated with only drug and the second group was treated with prescribed drug as well as designed diet simultaneously. The body mass index of drug treated subjects increased from low to normal in case of 17% of the subjects after 60th days treatment where as the BMI shifted to normal value in case of 61% of subjects treated with drug and diet simultaneously. The haemoglobin level of 49% drug treated subjected increased (mean concentration 8.12 g/dl) after 60th days treatment. However, in case of both drug and diet treated subjects the haemoglobin level increased to normal range (mean concentration 10.24 g/dl) in case of 78% subjects after the same period of treatment. Thus the findings of these studies on various health aspects and the effect of diet on elevation of Hb level warrants a screening programme for identifying the anaemic person belonging to various socio-economic groups and the identified anaemic persons may be recommended the designed diet to bring the level of haemoglobin to non-anaemic level.

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

INTRODUCTION

Anaemia is the most common disorder of the blood. It is the condition in which there is a decrease in number of red blood corpuscles (RBCs) or less than the normal quantity of haemoglobin (Hb) in the blood. People with anaemia report feelings of weakness, or fatigue, general malaise, and sometimes poor concentration. Anaemia is diagnosed through counting the number red blood cells and the Hb level. Anaemic patients are characterized by a marked reduction of Hb (5-7g percent) from the normal levels of 11-14 g percent. Since all human cells depend on oxygen for survival, varying degrees of anaemia can have a wide range of clinical consequences (Wians *et al.*,2001). Treatments for anaemia depend on severity of the disease and its causes. It can be treated in different ways such as the administration of oral iron, parenteral iron and erythropoiesis-stimulating agents.

Dietary changes are considered as one of the treatments for all types of anaemia. An anaemia diet is a meal plan that contains iron-rich food source and foods that aid the absorption of iron. It also includes iron supplements taken under a doctor's supervision. Majority of women and children in India are anaemic. Dietary factors play an important role in iron deficiency. Therefore a proper dietary care is all that is required to improve the condition. Dietary diversification results in improvements in iron nutrition. Many a times though the diet is rich in iron its bioavailability is very low. Other nutrients necessary for haematopoiesis may also be deficient. These include folic acid, vitamins A, B_{12} and C, protein and copper and other minerals (FAO/WHO,1998). Though various sample meal plans are being suggested by different persons it is suggested to consult the doctor before adopting a new diet (Escott-Stump,2008 and Mahan & Escott-Stump,2004).

In the present study, diets designed by expert dietician have been given to the anaemic patients to find out the changes in the level of haemoglobin and body mass index (BMI). The Hb level of these patients under dietary treatment has been compared with those patients under drug treatment.

MATERIAL AND METHODS

i) Selection of subjects : The study was carried out on anaemic patients visiting to the Out Patient Department of Dr. B. R. Ambedkar Memorial Hospital (BRAMH) and Ramakrishna Mission Vivekananda Poly Clinic (RMVPC) both located in Raipur city, Chhattisgarh. Due permission for the study was obtained from the concerned authority of both BRAMH and RMVPC. The subjects included 258 anaemic persons, both males and females aged between 15 and 65 years. The personal information, physical characteristics, food habits and other relevant information of the subjects were obtained using the questionnaire in the form of data sheet. Subjects with Hb level less than 10-11 g/dl were included in the study.

ii) Treatment of subjects : The subjects were divided into two groups. One group was treated with only drug and the second group was treated with drugs prescribed by medical doctors as well as designed diet simultaneously. The dose was determined based on the results of the diagnosis. The diet that was recommended for these subjects was based on certain principles. The normal calories required were determined according the age, sex, occupation and condition of the subjects. The subjects were restricted to other type of foods in their diet. All the anaemic subjects were treated with the designed diet. The diet chart was designed such that it contained normal calories, high protein, moderate carbohydrate, low fat and rich in vitamins and minerals (Iron rich). Certain foods such as deep fry foods, alcoholic beverages, and red chili powder were restricted. The details of the diet chart for anaemic subjects have been described in Table.1. The information on the various parameters of the subjects was collected and recorded from the test reports of the subjects that were advised by the concerned physician. These reports were collected on first visit (0 day), after one month (30th days) and two months (60th days) of treatment. The BMI was expressed as kg/m^2 and Hb concentration as g/dl.

iii) Statistical analysis : The data presented in this study is the mean of three independent measurements taken at different times. 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 significance of differences between the parameters measured under the effect of drug treatment and drug and diet combined treatment and also to find the significance of differences between the days of treatment.

Table. 1 Diet chart for anaemic subjects as designed by expert dieticians.

Condition	Recommended calories	Principle of the diet	Menu for whole day	Restrictions
Anaemic	Normal required calories (according to the age, sex, occupation and BMI of the patients)	Normal required calories, high proteins, moderate carbohydrates, low fat, vitamins and minerals rich (Iron rich) diet.	Lemon water : 100-200 ml, wheat grass juice : 100-200 ml, tea-2-3 cup, biscuits-3-4 (threptin biscuits), milk : 300-400 ml, fruits : 200 gm, vegetable : 100-200 gm, soup : 1-2 bowl (spinach, beat root, carrot, tomato), Dal : 2 bowl, Chapatti : 4-6 (100-150 gm) rice : 1 bowl, rice water (Starch) : 100-200 ml, chunat Jaggery, sprouted grains-20 gm	Deep fry alcoholic beverages red chilli powder.

RESULTS AND DISCUSSION

i) Profile of the subjects : In this case the distribution of the patients was heterogonous having varied characteristics within as well as between groups. The distribution pattern of subjects under study has been summarized in Table.2.

Table. 2 Distribution pattern of the anaemic subjects.

Characteristics	Percentage distribution of anaemic patients	
	Drug treated	**Drug + Diet treated**
Male	49	50
Female	51	50
20-30 yrs	19	21
31-40 yrs	39	28
41-50 yrs	21	23
51-60 yrs	40	49
Heavy workers	31	39
Semi sedentary workers	12	20
< 10,000	28	35
10,000 - 20,000	40	39
>20,000	32	26
Vegetarian	33	38
Non-vegetarian	67	62
Alcoholic	07	14
Non-alcoholic	93	86
Exercise	09	07
Non-exercise	91	93
Borderline anaemic	72	79
Severe anaemic	27	20
Hb less than 5 mg/dl	1	1

ii) Effect of drug on BMI and haemoglobin level : The BMI of most of the subjects were either normal or below normal. About 20% of the subjects were having BMI slightly above the normal BMI and 34% patients have shown BMI value below the normal. In rest of the cases the BMI was normal. However, being anaemic the patients were treated with drug for about 60 d to improve their Hb level. It was found that after 30th days of treatment, BMI of 17% of the subjects improved that shifted towards normal value. However, the mean BMI of these patients did not show any significant change after the treatment.

Anaemia patients including both male and female when treated with prescribed drugs to alleviate their Hb level, it was found that after 30th days of continuous treatment Hb level changed towards normal value only in 31% patients. The mean Hb level of these patients increased from 7.43 to 8.12 g/dl after 30th days of treatment. However, when the treatment was extended for another 30th days the increase in Hb was recorded in 49% subjects. The mean Hb level further increased to 9.02 g/dl.

iii) Effect of drug and diet on BMI and haemoglobin level : The anaemic subjects taken for treatment both with drug and diet have shown a mean BMI of 17.65 kg/m^2 which is below the normal vale and may be attributed due to the underweight of the patients. After 30 d of treatment with prescribed drug and recommended diet 45% of these subjects responded to the treatment showing a shifting of the BMI towards normal range. The mean BMI of the patients was observed to be 18.31 kg/m^2. When the treatment was continued for another 30 d it was observed that the BMI improved and shifted towards the normal value in case of 61% of subjects.

The effect of diet on anaemia subjects when treated along with drugs to increase the Hb level, it was noticed that the effect was more pronounced compared to the changes in Hb level when the patients were treated only with drug. The Hb level increased in 64% patients after 30 d of treatment and further increasing the treatment to 60 d, the Hb level increased in 78% of the patients. The mean Hb levels of the subjects were measured as 7.82 g/dl, 9.14 g/dl and 10.24 g/dl at 0, 30 and 60th days of treatment respectively. The effects of only drug and drug and diet together on the BMI of the anaemia subjects have been shown in Fig.1(a&b). Fig.2(a&b) depicts the effect on Hb level of anaemic subjects.

Anaemia is the most common disorder of the blood. This study was conducted to find out the effect of diet on Hb level of anaemic patients irrespective of the cause of the diseases *i.e.* due to lack of iron or chronic immune activation. Dietary iron deficiency is usually the major contributing factor for anaemia. Though there may be many causes of anaemia, nutritional deficiencies (*e.g.* low intakes of folic acid and vitamins A, B$_{12}$ and C) and infectious diseases (*e.g.* malaria and hookworm) also contribute to the prevalence of anaemia. To avoid the deficiency of nutritional factors anaemic patients were treated with the designed diet that consisted of high protein, low carbohydrate and very rich in minerals and vitamins. The menu along with other standard foods consisted of spinach and other leafy vegetables. These patients were also given drugs that was mostly iron rich. Another group of patients were treated only with drugs and were taking their diet as usual. The results of this study revealed that the body weight of a significant number of subjects that were taking both drug and designed diet improved compared to those anaemic patients that were treated with only drug along with their normal diet (Fig.1a). This shows the positive effect of a diet on anaemic subjects. The other important parameter that was studied was Hb content of anaemic subjects. The Hb level of both male and females increased in both the groups. However the level of Hb increased very significantly in 80% individuals after 60 d of diet treatment (Fig.2b). It has been observed that iron deficiency anaemia restricts physical growth and development of humans. Iron deficiency anaemia is known to delay the psychomotor development and impair the cognitive
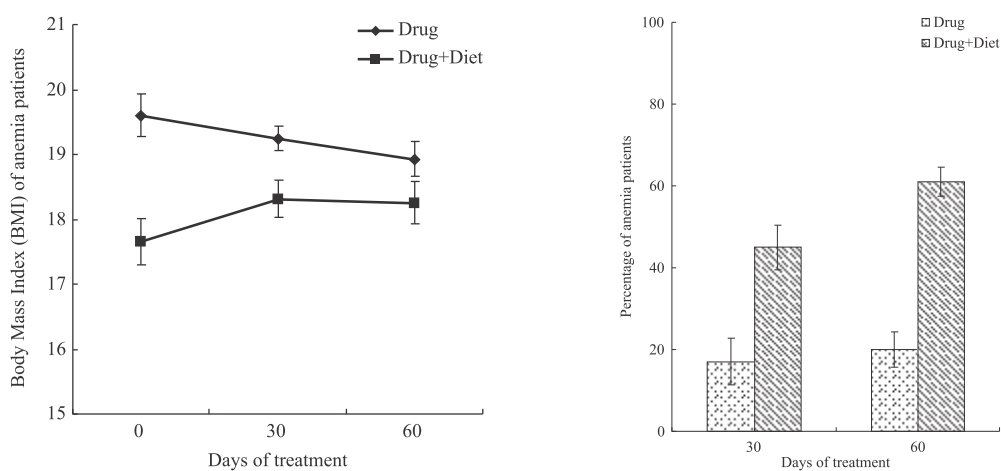

Fig. 1a. Effect of drug and combined treatment (drug + diet) on BMI of anaemic subjects expressed as kg/m^2.
1b. Depicts the effect on percentage of subjects that improved their BMI. Bars represent ± SD.
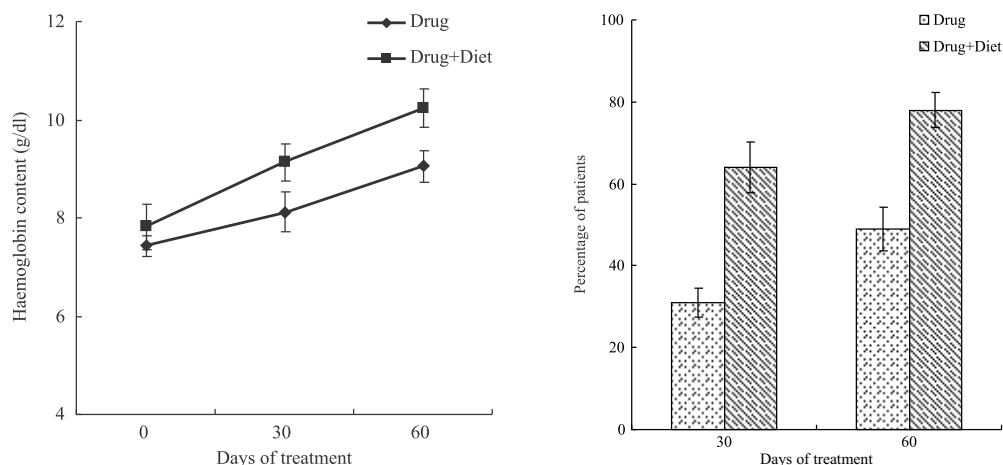**Statistically significant difference at *P ≤ 0.05.**

Fig. 2a. Effect of drug and combined treatment (drug + diet) on Hb concentration of anaemic subjects.
2b. Depicts the effect on percentage of subjects that improved Hb concentration.
Bars represent ± SD. Statistically significant difference at *P ≤ 0.05.

development in children in several countries including India (Seshadri and Gopaldas,1989). It is also known to impair the cognitive development at all stages of life. Studies have shown that anaemic workers are less efficient compared to non-anaemic workers. Diet plays a major role in prevalence of anaemia in pregnant women (Sharma *et al.*,2003).

In our study we have observed that changes in dietary habit has significantly improved the Hb level of pregnant women subjects. Thus the findings of these studies pertaining to the effect of iron deficiency anaemia on various health aspects and the effect of diet on elevation of Hb level as has been observed in the present study warrants a screening programme for identifying the anaemic person belonging to various socio-economic groups due to iron deficiency. Further, the identified anaemic persons may be recommended the designed diet to bring the level of haemoglobin to non-anaemic level.

REFERENCES

Escott-Stump, S. (2008). *Nutrition and Diagnosis-Related Care* : 6th edn. Williams and Wilkins, Lippincott.

FAO/WHO (1998). *Expert Consultation on Human Vitamin and Mineral Requirements*, Bangkok, Thailand.

Mahan, L. K. and Escott-Stump, S. (2004). *Krause's Food, Nutrition and Diet Therapy* : 11th edn. Saunders, Philadelphia.

Seshadri, S. and Gopaldas, T. (1989). *Am. J. Clin. Nutr.*, **50** : 675-686.

Sharma, J. B.; Soni, D.; Murthy, N. S. and Malhotra, M. (2003). *J. Obstet. Gynaecol. Res.*, **29(2)** : 73-78.

Wians, F. H. Jr.; Urban, J. E.; Keffer, J. H. and Kroft, S. H. (2001). *Am. J. Clin. Pathol.*, **115(1)** : 112-118.