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Influence of Diet Counseling on Anemia in Cancer Patients

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ABSTRACT

Anemia is a common occurrence in patients with cancer. Aim of the study is to know the impact of anemia in cancer patients and the role of nutrition in the management of anemia in cancer patients. For this study 200 patients were selected. Nutritive values were calculated from various food groups, before, during and after diet counseling. In the present study 98% of the patients observed fall in low socioeconomic group (less than Rs5000/month), and 89% of them are illiterates. This indicates that economic status & illiteracy are major contributing factors to anemic condition in cancer patients. The patients are grouped under three categories based on the hemoglobin (HB) levels viz., that requires balanced iron rich food diet alone (HB above 10g/dl), Iron supplementation (HB 8g/dl to 10g/dl), Blood transfusion (below 8g/dl). Before diet counseling their hemoglobin levels were low compared to after diet counseling. Intake of suggested diet counseling regarding iron rich balanced diet improvement was observed substantially after diet counseling and iron supplementation period. After diet counseling their hemoglobin levels, mean nutrient intake of the cases were improved and the number that requires blood transfusion decreased. Guidelines for anemia management regarding diet modification, and consideration of further outcomes such as survival and cognitive function, may help to ensure that the cancer patient receives the best possible course of supportive care.

Keywords: Anemia, cancer, iron deficiency, diet counseling.

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INTRODUCTION

Anemia, among the most prevalent major side effects of cancer and cancer treatment [1,2] is associated with poor prognosis & treatment outcomes [3,5] and impaired quality of life and occurring in over 50% of patients [3,6,7]. It is defined as an inadequate circulating level of Hemoglobin or RBCs, and may arise as a result of the underlying disease, chemotherapy, or radiation therapy [8]. Anemia often increases symptoms such as fatigue, weakness and dyspnea; thus, it may worsen quality of life & performance status in cancer patients. [9,10,12]. Anemia can also affect prognosis in cancer patients, resulting in high mortality [11]. Anemia in cancer patients is associated with a decline in energy levels, activity levels and quality of life, and these variables improve when Hemoglobin levels rise. Fatigue, a prevalent problem in oncology patients, is also linked to anemia and is a key component of physical function [13-15]. Furthermore, recent research has revealed potentially important implications of anemia as a variable that has impact on the efficacy of cancer therapies including radiation therapy, [16, 17] chemotherapy [8] and combined- modality treatment [19-21].

The exact prevalence of anemia in Indian cancer patients is not well documented, especially in those presenting for radiotherapy treatment but about 60-75% of the cancer patients invariably developed anemia, most of them were at advanced stages where treatment options were limited and mainly palliative [25]. The National Cancer Institute (NCI) defines anemia as a hemoglobin level less than 12g/dl. Hemoglobin levels between 10 and 12 g/dl, 8 and 10 g/dl, 6.5 and 7.9 g/dl, and less than 6.5 g/dl are graded as mild, moderate, severe, and life threatening anemia respectively [22].

Causes of Anemia in Cancer Patients:

- A deficiency of either a single or several essential nutrients and other from conditions that are not related to nutrition such as infections.
- Erythropoiesis is a dynamic process that maintains the number of circulating erythrocytes under changing physiologic conditions [23]. However, during treatment particularly many chemotherapy agents affect erythropoietin and consequently interfere with erythropoiesis, resulting in a high incidence of anemia in cancer patients [24].

Cancer therapeutics such as radio and chemotherapies act as alkylating agents and lead to progressive depletion of hematopoietic stem cells in the bone marrow. This may lead to long-term anemia, which make the treatment less effective. Some chemotherapeutic drugs, such as anthracyclines, can damage mature red cells by oxidation, there by shortening the red cell life span by 60 and 90 days [26]. The factors responsible for anemia in cancers include, the neoplastic process itself, due to products of the cancer circulating in the blood or may be due to the cancer treatment (Table I). These effects may be reflective of a paraneoplastic syndrome [27] or intercurrent infections, clonal disorders of hematopoiesis, gastrointestinal blood loss,

autoimmune hemolysis, microangiopathy, excessive marrow fibrosis and displacement, Iron, folate, vitamin B12 deficiency and renal impairment etc [28].

Table I: Anemia due to known products of cancer [27]

Substance	Mechanism	Neoplasm
Amyloid	Marrow replacement	Plasma cell dyscrasia
Antibodies	Immune hemolytic anemia	Chronic lymphocytic leukemia,
		lymphoma, adenocarcinomas
Procoagulant	Microangiopathic hemolytic anemia	Gastrointestinal malignancies
Proteins		(mucin), prostate cancer

The underlying issues that contribute to this suboptimal care may be related to the failure of many clinicians to recognize the impact that anemia has on the lives of their patients and the inadequacies of current treatment options. However, the continuing development of novel erythropoietic agents [29], progress in defining parameters to better predict a patient's response to anemia treatment [30,31], along with emerging data that consider the effect of anemia on end points such as survival and cognitive function [32,33], may help to overcome these issues. Such initiatives suggest a promising future for the optimal management of anemia in the cancer patient [34].

Impact of Anemia on the Cancer Patient

As will be discussed later in this article, it is well established that patients with anemia may experience reduced health-related quality of life (HRQOL) as a result of the often debilitating symptoms of anemia, and that raising hemoglobin with erythropoietic proteins can improve HRQOL [35-38]. Results from both prospective and retrospective studies in patients with head and neck cancer undergoing radiation therapy or combined modality therapy have indicated that anemia may be associated with decreased overall survival and reduced locoregional control [39-46]. It has also been suggested that anemia may be an independent prognostic factor in cancer patients undergoing radiation therapy [39,41,42].*Warde et al*., in a retrospective analysis, found evidence that pretreatment hemoglobin level was one of several independent prognostic factors for local failure after radiation therapy [42]. Although the most extensive pool of results on the effect of anemia on treatment and clinical outcomes exists for patients with head and neck cancer, data for other tumor types are available. One study in rectal cancer patients has recently indicated that anemia (hemoglobin <11 g/dl) may reduce overall survival after combined therapy [47]. A retrospective study in ovarian cancer patients indicated that a pretreatment hemoglobin value <12 g/dl was an independent prognostic factor for patients with stage I and II disease, but the association did not reach statistical significance in patients with stage III and IV disease [48]. A study of patients with cancer of the cervix has additionally suggested that an average weekly nadir hemoglobin level of <12 g/dl may be associated with inferior radiation therapy outcomes compared with a hemoglobin level ≥12 g/dl [49].

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Pathophysiology of Anemia in Cancer

It is clear from the presented evidence that anemia is a common occurrence in cancer patients and has a significant impact on clinical and HRQOL outcomes. It is, therefore, important to understand the underlying etiology of anemia in cancer in order to provide the correct and most effective treatment for individual patients. Factors including the type and stage of malignancy, duration of tumor growth, regimen and intensity of chemotherapy or radiation therapy, and complications of treatment, such as infection or sepsis, may contribute to the development of anemia [7,50]. A high incidence of anemia (50%-60%) occurs in patients with lymphomas, multiple myeloma, lung tumors, and gynecologic or genitourinary tumors, and while the occurrence of anemia in patients with solid tumors is less than that observed for hematological malignancies, incidence of mild-to-moderate anemia can be high [7,50,51].

MATERIALSAND METHODS

Study Group and sample Collection

For this study 200 cancer patients were selected. Aged 30-70years in both sexes (male-63, female-137) from the department of Radiotherapy, Government GeneralHospital, Guntur. Blood samples were collected from the patients at the various time intervals during treatment. Standard procedure Sahli's acid haematin method [52] was used for hemoglobin estimation. Questionnaire was prepared to collect general information and dietary consumption pattern (24hours recall method) of the cancer patients. And counseling were given for the patients regarding low cost high nutritious diet to control the effect of anemia on cancer patients. Anemia was classified as mild, moderate, or severe as per national cancer institute (NCI) criteria [22].

How is cancer-related anemia treated?

There are four main options for treating cancer-related anemia. A combination of approaches may be used. For example, in addition to receiving medical treatments, advised to change modification of the diet.

1. Diet Modification

It is important that people with cancer try to eat a healthy, balanced diet that provides adequate amounts of the nutrients essential for good health. Iron, vitamin B12 and folic acid (folate) are particularly important for people with anemia, as they are needed for the production of red blood cells. some good dietary sources of these nutrients.

Iron Eggs, fish, liver, meat, poultry, green leafy vegetables, whole grains, enriched breads and cereals

Vitamin B12 Cheese, egg yolks, fish, legumes, meat, milk, poultry, spinach, whole grains, yogurt

Folic acid Barley, beef, bran, brewer's yeast, brown rice, cheese, chicken, dates, green leafy vegetables, lamb, legumes, lentils, liver, milk, mushrooms, oranges, split peas, pork, root vegetables, salmon, tuna, wheat germ, whole grains Over-the-counter (non-prescription) iron, vitamin B12 and folic acid supplements are also available. Before taking any supplement. They have to take suggestion of their doctor and pharmacist

2. Iron Supplements

If the level of iron in your blood is low, the bone marrow cannot manufacture more red blood cells. If changing their diet does not increase in iron level sufficiently or quickly enough, that time they may be prescribed an iron supplement. Iron supplements can be taken in the form of pills or through injection. The doctor will prescribe the amount and type of iron according to the patients need. Over-the-counter (non-prescription) iron supplements are also available.

3. Medications to Stimulate Red Cell Production

There are prescription medicines that stimulate the bone marrow to make more red blood cells.

4. Blood Transfusions

Blood transfusions may be used to treat severe, chronic, cancer related anemia. A blood transfusion is the fastest way to increase your hemoglobin levels. A transfusion is usually given in the hospital and may take several hours.

RESULTS AND DISCUSSION

Table II shows the characteristics of patients under study. 200 cancer patients were selected in the age group of 30-70years (Male-63, Female-137). Mean age 50years. 98% of the cases were low income group (>Rs5000/per month) only 2% of the cases were middle income group (Rs5000-10000/per month). And most of the cases were illiterates (89%) and only 11% of the cases were able to read and write. In the present study all the cases were nutritionally illiterates. Lack of awareness on their nutritional matter and low socioeconomic status may be the major contributory factors for the present condition.

In 200 cancer patients 39.5% of the cases were cervical cancer patients, 17% of the cases were Head & Neck, 7% of the cases were Breast Cancer, 4.5% of the cases were Liver Cancer, 1.5% of the cases were Lung cancer, 7.5% of the cases were Anal & rectal cancer, 4.5% of the cases were Gastrointestinal cancer, 4.5% of the cases were NHL and 14% of the cases were other types of cancer.

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TableII: Characterestics Of Patients Under Study (n-200)

Age	30-70 Years	
Mean Age	50Years	
Males	63	
Females	137	
Socioeconomic Status	98% Of The Cases were less than Rs5000/monthonly 2% of the cases were Rs 5000-10000/month	
Illitrates	89%	
litrates	11%	
Cancer Type		**Number**
Cancer Cervix		79
Head and Neck		34
Cancer Breast		14
Cancer Liver		9
Lung Cancer		3
Anal & Rectal cancer		15
Gastro intestinal		9
NHL		9
Others		28

Table III- Percent Of Different Cancer Patients Planed For Balanced Diet Alone, Iron Supplementation along with Balanced Diet, and Blood Transfusion along with Balanced Diet:

Cancer Type	**Total No of Patients**	**Balanced Diet with Iron Rich Foods alone along with Balanced Diet**	**Received Iron supplementation along with Balanced Diet**	**Blood Transfusion**
Cancer Cervix	79	39(19.5%)	37(18.5%)	3(1.5%)
Head and Neck	34	22(11%)	10(5%)	2(1%)
Cancer Breast	14	9(4.5%)	5(2.5%)	0
Cancer Liver	9	2(1%)	6(3%)	1(0.5%)
Lung Cancer	3	2(1%)	1(0.5%)	0
Anal & Rectal cancer	15	5(2.5%)	9(4.5%)	1(0.5%)
Gastro intestinal	9	3(1.5%)	6(3%)	0
NHL	9	7(3.5%)	2(1%)	0
Others	28	13(6.5%)	10(5%)	5(2.5%)

Table III shows the percent of different cancer patients planed for balanced diet alone, balanced diet along with iron supplementation and balanced diet & blood transfusion. 50% of the cases were planed for balanced iron rich food diet because their hemoglobin levels between 10 to 12g/dl, 43% of the cases planed for balanced diet along with iron supplementation because their hemoglobin levels between 8 to 10g/dl and 7% of the cases planed for blood transfusion because their hemoglobin levels below 8g/dl.

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TableIV: Hemoglobin Levels of 200 Cancer Patients Before and After Diet Counseling:

Hemoglobin levels	Before Diet Counseling	
Total number Of Patients	200 (100%)	After Diet Counseling
12-13g/dl	2(1%)	2(1%)
10-12g/dl	63(31.5%)	75(37.5%)
8-9.9g/dl	135(67.5%)	121(60.5%)
<8	10(5%)	2(1%)

Table IV shows the hemoglobin levels in percent of cancer patients before and after diet counseling. Before diet counseling patients hemoglobin levels were low than the required values for cancer treatment. Most of the cases (69%) were below 8 to 10g/dl, only 31% of the cases were 10 to 12g/dl and 1% of the cases were normal hemoglobin level. The optimum hemoglobin level in cancer patients is considered to be 12g/dl. Anemia in cancer patients, a major contributory factor may be poor pre-treatment nutritional status, bleeding from tumors, and chemotherapy and radiotherapy. Cancer related anemia and anemia of chronic disease are responsible for low hemoglobin levels in a significant number of such patients. Anemia is an established prognostic marker in head and neck, bladder, cervix, and anal cancer patients [53]. After diet counseling and iron supplementation patients hemoglobin levels were improved. 60% of the cases showed 8 to 10g/dl, 37.5% of the cases 10 to 12g/dl & 1% of the cases shows 12 to 13g/dl.

TableV: Mean Nutrient Intake Of Cases Before, During And After Diet Counseling

Nutrients	Male			Female		
	Before	During	After	Before	During	After
Energy(k.cal)	2050±230.2	1534.6±401.3	1800.5±524.1	2180±184.6	1235.8±167	1700.2±549.3
protein(gms)	45.7±24.4	30.6±11.4	60.3±22	48.8±3.7	28.9±13.2	57.4±24.5
fats(gms)	30.2±12.6	28.9±10.8	25.4±12.8	39.7±14.2	31.2±10.9	28.5±14.8
carbohydrates(gms)	303.6±89.7	218.7±111.8	250.55±134.8	380.1±103.7	231.8±42.3	270.5±124.5
Iron(gms)	10.8±9.2	7.3±3.9	13.5±11.5	9.8±6.04	7.1±2.5	11.9±5.7
β carotene(µg)	1130.2±1020.2	730.6±265.3	1542±1130.1	996.7±839.4	409.3±337.8	1100±854.3
Thiamine(mg)	1.7±0.3	1.1±0.5	1.8±0.8	1.3±0.6	0.8±0.6	1.7±0.2
Riboflavin(mg)	1.6±0.7	0.9±0.3	1.9±0.6	1.3±0.9	0.7±0.2	1.8±0.6
folic acid(mg)	130±42	122.4±96	138±59	132.3±68	120.4±85	138.2±23
Vit.C	35±29	28.3±15.4	41±19.1	30.8±21.3	26.8±11.9	38.2±15.2
Zinc (mg)	4200±33	4001±38.5	4390±20.1	4350±40.1	4203±29.5	4398±63.9

Table V shows the mean nutrient intakes of cancer patients before, during and after diet counseling in both sexes. Micro and macro nutrients were calculated from the food groups. There is no significant difference between mean nutrient intakes of the cases before, during and after diet counseling, but improvement were observed after diet counseling. Perfect diet counseling & dietary modification improves patient's awareness about low cost high nutritious diets because in our study most of the cases are low socioeconomic group, consciousness about health care & healthy food habits.

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Dietary Recommendations

Dietary recommendations must integrate the goal of overall avoidance of disease and maintenance of health, and thus should not focus singularly on cancer prevention. The strength of the evidence and magnitude of the expected benefit should also be considered in recommendations.

- *Consume lots of fruits and vegetables.* Frequent consumption of fruits and vegetables during adult life is not likely to have a major effect on cancer incidence. But will reduce the risk of cardiovascular disease.
- *Consume whole grains and avoid refined carbohydrates and sugars.* Regular consumption of whole grain products instead of refined flour and low consumption of refined sugar lower the risk of cardiovascular disease and diabetes. The effect on cancer risk is less clear.
- *Regular physical activity.* Physical activity is primary method of weight control and it also reduces risk of several cancers, especially colon cancer, through independent mechanisms. Moderate to vigorous exercise for at least 30 minutes on most days is a minimum and more will provide further benefits.
- *Limit alcohol consumption.* Alcohol consumption contributes to the risk of many cancers and increases the risk of accidents and addiction, but low to moderate consumption has benefits for coronary heart disease risk. The individual family history of disease as well as personal preferences should be considered.
- *Consume low Fat and a balanced ratio of omega3 & omega6 fatty acids:* There is sufficient evidence that high fat consumption is linked to increased incidence of certain common cancers (notably breast and colon cancer) and that low fat intake is associated with a lower incidence of these cancers.
    - Unsaturated fats, found in plant foods, such as legumes
    - Vegetable oils that are high in monounsaturated fats, such as olive (Greek women who tend to eat a diet rich in olive oil have a very low incidence of breast cancer) and canola oil. A 2000 study showed that men who eat less animal fat and more vegetable fat in their diets had less prostate cancer.
    - Seafood, such as salmon and tuna, that is high in omega 3 fatty acids
    - Oils that contain more omega 3 than omega 6 fatty acids, such as flaxseed, pumpkin seed, canola, soybean (not hydrogenated), walnut, safflower, sunflower, sesame, and virgin olive oils. (Heating vegetable oils at high temperatures can change fatty acids and make them carcinogenic. Peanut oil and extra virgin olive oil stand up best to cooking, but try not to boil them. It helps to keep stirring stir-fry's so the oil doesn't get burnt.)
- *Avoidance of salt-pickling:* In some parts of the world, especially China, India, Japan, and Iceland, populations that frequently consume salt-cured (including salt-pickled) or smoked foods have a greater incidence of cancers at some sites, especially the esophagus and the stomach. In addition, some methods of smoking and pickling foods seem to produce higher levels of polycyclic aromatic hydrocarbons and N –

nitrosocompounds. These compounds cause mutations in bacteria and cancer in animals, and are suspected of being carcinogenic in humans. Therefore, the committee recommends that the consumption of food preserved by salt-curing (including salt-pickling) or smoking be minimized.

- Minimize exposure to aflatoxin in foods
- Do not consume foods or drinks when they are at a very hot (scalding hot) temperature

Does

- Plan for their meals
- Prepare a shopping list
- Prepare foods and meals when they feeling better
- Have a positive attitude
- Remember, that during this time, they may be eating differently. If while under treatment the need for energy temporarily overrides other needs that this is OK. Remember that after treatment they have time to adjust their diet.
- Realize that this symptom may only be temporary and a few days, weeks or months from now they will be focusing on only the joy you are receiving from life.
- Lastly, Bon appetite!

CONCLUSION

In this study showing a relationship between hemoglobin levels and affect of dietary modification and patient QOL supports a shift in the threshold for anemia intervention. The traditional approach of allowing patients to keep hemoglobin in the 8 g/dl range may have consequences beyond physiological ones. Management of anemia can improve these outcomes, but it is apparent that anemia may not be optimally managed in cancer patients at this time. However, new approaches and novel therapies that may shift the balance to a more promising future for cancer patients with anemia are on the horizon. The attention to cancer-related fatigue in these studies has further led to investigations regarding its epidemiology, other etiologies in addition to anemia, and practical interventions. Continued research into anemia and discussion and understanding of the impact that even mild-to-moderate anemia can have on patient outcomes will ultimately contribute to the optimization of anemia management.

A number of issues may be determinants of this suboptimal management of anemia. These include limitations of current therapies for anemia, varying practice strategies, and the lack of guidelines on how to treat anemia. Additionally, clinicians may underestimate the importance of health-related quality of life for their patients. It is vital that these issues are addressed, which, together with the development of novel erythropoietic agents.

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