ejpmr, 2022,9(8), 96-99

SJIF Impact Factor 6.222

EUROPEAN JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH

www.ejpmr.com

Research Article

ISSN 2394-3211

EJPMR

NURITIONAL STATUS OF CANCER PATIENTS ATTENDING CLINICS IN NNAMDI AZIKIWE UNIVERSITY TEACHING HOSPITAL, NNEWI, ANAMBRA STATE. SOUTHEAST NIGERIA

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Article Received on 14/06/2022 **Article Revised on 04/07/2022** **Article Accepted on 24/07/2022**

ABSTRACT

Malnutrition leads to immune impairment and worsens the effect of cancer. This study assessed nutritional status of cancer patients in a tertiary Hospital clinics in Anambra State Nigeria. Fifty (50) cancer patients (25 drug naïve and 25 on drug treatment) and 25 apparently healthy controls were recruited for the study. Clinical status of the patients was obtained from Hospital records. A questionnaire and subjective global nutritional assessment (SGNA) form were used to obtain anthropometric and nutritional status of the subjects. Serum proteins, and haemoglobin were assayed spectrophotometrically while elements were assayed using AAS. CD4+ count of the patients was done by flow cytometer. The results showed body mass index, BMI (19.78±1.67kg/m^2), MUAC, (1.70m^2 ±0.21 m), albumin (1.86±0.13g/dl), Hb (10.52±1.62g/dl), iron (0.65±0.0.10ppm), zinc (0.69±0.14ppm) and selenium (0.54±0.08ppm) of drug naïve patients were significantly lower than those of on-treatment group; BMI-(22.05±1.61kg/m^2), MUAC, (1.93m^2 ±0.15 m),albumin (2.50±0.36g/dl), Hb (12.01±1.02g/dl), serum iron (0.91±0.16ppm), zinc (1.08±0.13ppm), and selenium (0.63±0.08ppm) and control group; BMI – (24.77±2.59kg/m^2), MUAC, (2.54m^2 ±0.60 m), albumin – (3.44±0.36g/dl), Hb – (13.80±1.23g/dl), iron – (1.18±0.14ppm), zinc – (1.18±0.15ppm), selenium – (1.06±0.14ppm), (p = 0.00). These parameters of the on-treatment group were also significantly lower than those of the control group (p = 0.00). However, total protein (9.14±1.42g/dl), and copper (1.32±0.19ppm) of the drug naïve patients were not significantly higher than on-treatment (8.72±1.66g/dl, 1.21±0.16ppm), (p > 0.05) but differed significantly with the control groups (7.05±0.84g/dl, 0.77±0.09ppm), (p = 0.00). Those of the on-treatment group were also higher than the control (p – 0.00).Subjective Global Assessment index showed that 53% and 60% respectively of the drug naïve and on-treatment cancer patients were undernourished. Cancer patients studied were undernourished and this can hinder effective management. Adequate nutrition deserves even greater attention in the management of cancer patient especially in economically poor setting.

KEYWORDS: "Nutrition", "nutritional status", "malnutrition", "Cancers", "trace elements".

INTRODUCTION

Malnutrition is a term used to denote under- or over-nutrition as a result of insufficient or too much nutrient in the diet and can lead to health problems.[1,2] Malnutrition is a leading cause of global burden of disease[3]. It is a major health problem in southern Asia and sub-Saharan Africa.[3] Over-nutrition can result to life threatening conditions such as obesity and metabolic syndrome while under-nutrition can cause protein energy malnutrition (PEM).

Cancer and cancer treatment may affect nutrition making it difficult to eat well[3] (NCI, 2015). Malnutrition can lead to immune suppression that may contribute to mortality and morbidity while cancer affects nutrition through loss of appetite, increases in resting energy expenditure, reduction in food intake, nutrient malabsorption and loss, and complex metabolic alterations seen in cancer.[4] Cancer treatment can impoverish the sufferers predisposing them to poor quality of life. Nutrition plays a major role in cancer. Treatment side effects in cancer can be combatted with appropriate diet therapy.[5] Eating too much food is one of the main risk factors for cancer. This can be shown two ways: by the additional risks of malignancies caused by obesity, and by the protective effect of eating less food. There is evidence for associations between a large range of dietary factors and risk of cancer.[6,7]

MATERIALS AND METHODS

This cross-sectional study was carried out in Nnamdi Azikiwe University Teaching Hospital Nnewi, Anambra

State, Nigeria. It involved 50 cancer patients selected randomly and 20 apparently healthy subjects who served as controls; all were aged between 21 and 65 years. Only already diagnosed cancer subjects aged ≥21 years were recruited.

Ethical approval was obtained from the Ethic Committee of the Nnamdi Azikiwe Teaching Hospital and informed consent obtained from subjects before sample collection. Sample size was calculated using a prevalence rate of 3.2%.[8] and Naing formula, (2003)[9] Data were collected through the use of questionnaire, Subjective Global Nutritional Assessment (SGNA)[10] form, anthropometric measurements (height, weight and mid upper arm circumference) and laboratory analyses of 5 ml blood samples collected from each subject. Serum total protein, albumin and haemoglobin were assayed by spectrophotometry using Cromatest® reagents while iron, copper, zinc and selenium were assayed using AAS. The counts and SGNA of the control were not done. Statistical analyses were performed using SPSS version 22 for Windows and p-value <0.05 was considered significant.

RESULTS

The BMI of the drug naïve cancer subject, (19.78 ±1.67) differed significantly from those of the on-treatment, (22.05 ±1.61) and control (24.77 ±1.49) subjects ($p<0.005$). However the MUAC of the drug naïve, (1.70 ±0.21) and on-treatment (1.93 ±0.15) subjects did not differ significantly though the former was less than the later.

The total protein of the drug-naïve subjects, (9.14±1.42) was higher than that of the on-treatment though not significant (8.72 ±1.66; $p = 0.655$) and the control (7.05±0.85, $p = 0.001$). The on-treatment group had significantly higher total protein than the control, ($p = 0.000$).

Albumin and haemoglobin increased significantly with drug treatment but still lower than the control values ($p<0.05$).

The trace elements iron, zinc an selenium followed the pattern of changes in albumin and haemoglobin while copper followed a reverse pattern, highest in drug-naïve subjects.

More cancer subjects on treatment were malnourished (60%) than the drug-naïve ones (53%).

Table 1: Showing the results of anthropometric, biochemical and Subjective Global Nutritional Assessment parameters of drug naïve, on-treatment Cancer subjects and control subjects. Mean (±SD).

Groups	BMI kg/m^2	MUAC (m)	TP g/dl	ALB g/dl	Hb g/dl	Fe (ppm)	ZN (ppm)	Cu (ppm)	Se (ppm)	SGNA % (Number)		
										WN	MM	SM
Drug-naïve **A**	19.78 (1.67	1,70 (0.21	9.14 (1.42	1.86 (0.13	10.52 (1.62	0.65 (0.10	0.69 (0.14	1.32 (0.19	0.54 (0.08	47 (7)	33 (5)	20 (3)
Drug Treated. **B**	22.05 (1.61	1.93 (0.15	8.72 (1.66	2.50 (0.36	12.01 1.02	0.91 0.16	1.08 0.13	1.21 0.16	0.62 0.08	40 (6)	40 (6)	20 (3)
Control. **C**	24.77 1,49	2.54 0.60	7.05 0.85	3.44 0.36	13.80 1.23	1.18 0.14	1.18 0.15	0.77 0.09	1.06 0.14	nil	nil	nil
F-value	44.61	19.87	12.91	115.1	27.42	65.10	56.79	70.69	113.8			
P-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000			
A vs B	0.001	0.290	0.655	0.001	0.008	0.000	0.000	0.098	0.093			
A vs C	0.000	0.000	0.001	0.000	0.001	0.000	0.100	0.000	0.000			
B vs C	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000			

DISCUSSIONS AND CONCLUSION

Cancer is one of the leading causes of death worldwide.[11] Its treatment exacerbates malnutrition. In this study, treatment seemed not to improve nutritional status of cancer subjects since more cancer subjects on treatment were malnourished than the drug-naïve ones. This may due to the effect of cancer drugs to cause nausea, vomiting, diarrheoa, trouble in swallowing and loss of apatite,[3] and affect taste and ability to eat. People with cancer are advised to stick to healthy balanced diet that includes plenty of lean protein, healthy fat, fruits, vegetables and whole grains and minimize the intake of sugars, caffeine, salt, processed food and alcohol.[5] Effectiveness of cancer chemotherapy also depends on adequate nutrition to boost immunity which play crucial role in the process. Some researchers also recommend exercise as beneficial in the treatment of cancer.[12] There is muscle wasting occasioned by both the disease and its chemotherapy, the former being more pronounced than the later and it manifests as reduced BMI. The effect of the disease but not the effect of treatment on MUAC is significant since there was no significant difference between the MUAC of the drug-naïve and on-treatment subjects while significant differences exist between the MUAC of the patients and the control. This contrasts with BMI which was significantly affected by both the disease and treatment. However MUAC is a measure of nutritional status while BMI is a measure of body weight. Several studies have reported significant correlation between the BMI and MUAC of adults.[13,14,15] and that makes the finding of this study worthy of note.

Total protein of patients was higher than those of the control. The increased level of total protein occurs as a result of the inflammatory process with increased antibody production initiated by the immune system.[16] Serum albumin level is responsive to both the disease and its treatment. It was used to determine nutritional status but is now known to be influenced by other factors than nutrition.[17] Inflammation associated with cancer is thought to be a more dominant factor in the hypoalbuminaemia than malnutrition,[18,19] Inflammation causes the release of cytokines and growth factors which shift the hepatic synthetic apparatuses to production of C-reactive proteins and decrease their production of albumin.[20] It has also been shown that there is an increase in vascular permeability in patients with cancer and hence increase in albumin flux across the capillary wall towards the extravascular compartment.[21] Also a disproportionate increase in albumin degradation without a corresponding increase in synthesis can cause hypoalbuminaemia.

The cancer subjects possess disturbances in the level of trace elements. They play essential roles in eg as active centers of enzymes or as trace active substances. Their deficiency or excess may cause the failure of antioxidant defense thereby leading to oxidative stress and failure of enzymes eg superoxide dismutase, catalase, glutathione peroxidases, that limit oxidation of lipids, nucleic acids or proteins, which are in cancers.[22,23] Deficiency of trace elements give rise to a decrease in immune response and favour the development of various malignancies.[24,25]

Selenium is a mineral with anti-cancer properties. It is present in the active site of many enzymes, including thioredoxin reductase, which catalyze oxidation-reduction reactions. These reactions may encourage cancerous cells to under apoptosis. Selenium can decrease the rate of tumor growth[26] Its level has been reported to be reduced in cancer as shown in this work.[27] Zinc is transported in blood plasma bound mostly to albumin. The low level of zinc might be as a result of the decreased albumin synthesis and poor dietary intake as already suggested.[28] The high level of copper may be as a result of the release of nuclear and cytosolic copper into the extracellular compartment as reported by Obiageli *et al*, (2015).[29]

In conclusion diet is a crucial factor in the treatment of cancer patients. Dietary factors such as adequacy of nutrition and trace element status of patients need to be monitored during treatment for optimum chemotherapeutic outcome.

Author Disclosure Statement

The authors declared no competing financial interests exist.

Authors' contributions

ISIO, MNA, designed the study and drafted the manuscript. UMC and OCC participated in the sample collection and analysis; EIN, ICOC reviewed the manuscript. All authors read and approved the final version of the manuscript.

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