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NURITIONAL STATUS OF PEOPLE LIVING WITH HIV/AIDS ATTENDING CLINICS IN NNAMDI AZIKIWE UNIVERSITY TEACHING HOSPITAL, NNEWI, ANAMBRA STATE. SOUTHEAST NIGERIA

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ABSTRACT

Malnutrition leads to immune impairment, worsens HIV infection and can contribute to more rapid progression to AIDS. This study assessed the nutritional status of people living with HIV/AIDS (PLWHA) attending Nnamdi Azikiwe University Teaching Hospital Nnewi in Anambra State, Southeast Nigeria. Fifty (50) PLWHA (twenty five [25] drug naïve and twenty five [25] on treatment) were recruited for the study. Clinical status of the subjects were obtained from the hospital records. A questionnaire and Subjective Global Assessment form were used to obtain nutritional status of the subjects. Serum total protein, albumin and haemoglobin were assayed spectrophotometrically while iron, copper, zinc and selenium were assayed using AAS. CD4+ count of the patients was done by flow cytometer. The results showed that body mass index, BMI (19.20±2.04kg/m^2), mid upper arm circumference, (MUAC) 1.88m^2 ±0.14 m, CD4+ count (309±140), albumin (2.30±0.27g/dl), Hb (11.92±1.10g/dl), serum iron (0.54±0.0.05ppm), zinc (0.58±0.09ppm) and selenium (0.57±0.06ppm) of drug naïve patients were significantly lower than those of on-treatment group; BMI-22.74±2.59kg/m^2, CD4+ count 486± 119, albumin 2.68±0.27g/dl, Hb 12.82±1.12g/dl, serum iron 0.63±0.08ppm, zinc 0.75±0.11ppm, and selenium 0.72±0.09ppm and control group; BMI -22.74±2.59kg/m^2, albumin – 3.44±0.36g/dl, Hb – 13.58±0.21g/dl, iron -18±0.14ppm, zinc - 1.18±0.15ppm, selenium - 1.06±0.14ppm, (p = 0.00). The parameters of the on-treatment group; BMI-(22.74±2.59kg/m^2), CD4+ count (486±119), albumin (2.68±0.27g/dl), Hb (12.82±1.12g/dl), serum iron (0.63±0.08ppm), zinc (0.75±0.11ppm) and selenium (0.72±0.09ppm) as well as mid upper arm circumference (2.11±0.35m) were also significantly lower than those of the control group (p = 0.00). However, serum total protein (9.63±1.71g/dl), and copper (1.35±0.17ppm) of the drug naïve patients were significantly higher than those of the on-treatment (8.48±1.93g/dl, 0.81±0.12ppm) and control groups (7.05±0.84g/dl, 0.77±0.09ppm), (p = 0.00) while those of the on-treatment group were also higher than the control (p – 0.00).Subjective Global Assessment index showed that 56% and 40% respectively of the drug naïve and on-treatment HIV/AIDS patients were undernourished. PLWHA studied were undernourished and this can hinder effective management. Abnormal trace element levels seems to be basically due to the presence of the HIV in the host and might not be corrected by drug treatment alone. Adequate nutrition deserves even greater attention in the management of PLWHA especially in economically poor setting.

KEYWORDS: "Nutrition", "nutritional status", "malnutrition", "HIV/AIDS", "trace elements".

INTRODUCTION

Nutrition is the science that interprets the interaction of nutrients and other substances in food in relation to maintenance, growth, reproduction, health and disease of an organism. It includes the study of absorption, assimilation, biosynthesis, catabolism and excretion of ingested food substance.

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).

There is a strong relationship between nutrition and HIV/AIDS.[4] Malnutrition can lead to immune suppression that may contribute to mortality and morbidity while HIV infection affects nutrition through increases in resting energy expenditure, reduction in food intake, nutrient malabsorption and loss, and complex metabolic alterations that finally lead to weight loss and wasting common in AIDS.[5] Malnutrition is associated

with increased mortality and poor clinical outcomes among people living with HIV/AIDS.[6] Treatment of same can exacerbate malnutrition through loss of appetite, diarrhea, increased nutrient/energy requirement, nutrient malabsorption and loss. There is a significant increase in the burden of malnutrition in Nigeria.[7] Despite increasing interest in nutrition, there is paucity of studies to assess nutrition in HIV/AIDS in the study population.

MATERIALS AND METHODS

This cross-sectional study was carried out in Nnamdi Azikiwe University Teaching Hospital Nnewi, Anambra State, Nigeria. It involved 50 known PLWHA selected randomly and 20 apparently healthy subjects who served as controls; all aged between 21 and 65 years.

Ethical approval was obtained from the Ethics Committee of the 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) form, anthropometric measurements and laboratory analyses of 5 ml blood samples collected from each subject. Serum total protein, albumin and haemoglobin were assayed by spectrophotometry with Cromatest® reagents while iron, copper, zinc and selenium were assayed using AAS. CD4+ count of the patients was done by flow cytometer. The counts and SGNA of the control were not done. Statistical analyses were performed using SPSS version 22 for Windows.

RESULTS

Seventy-six percent (76%) of the drug-naïve and 40% of the treatment PLWHA were undernourished giving a pooled prevalence of 58%. The body mass index, (BMI), 19.20±2.04kg/m^2 mid upper arm circumference, (MUAC), 1.88± 0.14m, CD4+ count (309±140), albumin (2.30±0.27g/dl), Hb (11.92±1.10g/dl), serum iron (0.54±0.0.05ppm), zinc (0.58±0.09ppm) and selenium (0.57±0.06ppm) of drug naïve patients were significantly lower than those of on-treatment group; BMI-22.74±2.59kg/m^2, CD4+ count 486± 120, albumin 2.68±0.27g/dl, Hb 12.82±1.12g/dl, serum iron 0.63±0.08ppm, zinc 0.75±0.11ppm, and selenium 0.72±0.09ppm and control group; BMI - 22.74±2.59kg/m^2, albumin – 3.44±0.36g/dl, Hb – 13.58±0.21g/dl, iron -18±0.14ppm, zinc - 1.18±0.15ppm, selenium - 1.06±0.14ppm, (p = 0.00).

The parameters of the on-treatment group; BMI-(22.74±2.59kg/m^2), CD4+ count (486±119), albumin (2.68±0.27g/dl), Hb (12.82±1.12g/dl), serum iron (0.63±0.08ppm), zinc (0.75±0.11ppm) and selenium (0.72±0.09ppm) as well as mid upper arm circumference (2.11±0.35m) were also significantly lower than those of the control group (p = 0.00). However, serum total protein (9.63±1.71g/dl), and copper (1.35±0.17ppm) of the drug naïve patients were significantly higher than those on treatment (8.48±1.93g/dl, 0.81±0.12ppm) and control groups (7.05±0.84g/dl, 0.77±0.09ppm), (p = 0.00) while those of the on-treatment group were also higher than the control (p – 0.00). Nutritional assessment showed that 11(44%), 8(32%) and 6(24%) of the drug naïve patients were well nourished, moderately malnourished and severely malnourished respectively, Corresponding figures for the on-treatment group were; 15(60%), 6(24%), and 4(16%) respectively. (Table 1).

Table 1: Showing the results of anthropometric, biochemical and Subjective Global Nutritional Assessment parameters of drug naïve, on-treatment PLWHA 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)	CD4 Count/µl	SGNA %		
											WN	MM	SM
Drug-naïve **A**	19.20 ±2.04	1.88 ±0.14	9.63 ±1.71	2.30 ±0.27	11.92 ±1.10	0.54 ±0.05	0.58 ±0.09	1.35 ±0.17	0.57 ±0.06	309 ±140	11 (44%)	8 (32%)	6 (24%)
Drug Treated. **B**	22.74 ±2.59	2.11 ±0.35	8.48 ±1.93	2.68 ±0.27	12.82 ±1.12	0.63 ±0.08	0.75 ±0.11	0.81 ±0.12	0.72 ±0.09	486±120	15 (60%)	6 (24%)	4 (16%)
Control. **C**	24.65 ±1.32	2.66 ±0.58	7.05 ±0.84	3.44 ±0.36	13.58 ±0.21	1.18 ±0.14	1.18 ±0.15	0.77 ±0.09	1.06 ±0.14	nil	nil	nil	nil
F-value	40.08	15.53	14.44	84.64	14.99	293.2	145.0	143.7	138.0				
P-value	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
A vs B	0.00	0.00	0.03	0.00	0.02	0.00	0.00	0.00	0.00	0.00			
A vs C	0.00	0.00	0.01	0.00	0.02	0.00	0.00	0.00	0.00				
B vs C	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				

BMI = Body mass index. MAUC = mid upper arm circumference. TP. = total protein concentration. Serum ALB = albumin concentration. Hb. = Haemoglobin concentration. Fe. = Serum iron concentration. Zn. = Serum zinc concentration. Cu. = Serum copper concentration. Se. Serum selenium concentration. SGNA = Subjective Global Nutritional Assessment. WN. = Well nourished. MM. = Moderately malnourished. SM. = Severely malnourished.

DISCUSSIONS AND CONCLUSION

HIV/AIDS predisposes to malnutrition. PLWHA studied were undernourished and this can hinder effective management. The effects of HIV/AIDS and malnutrition are interrelated in cyclic pattern.[10] Both HIV/AIDS and malnutrition are intrinsic factors that can lead to immunodeficiency thereby making the host vulnerable to opportunistic infections.[11] People living with HIV/AIDS are more likely to become malnourished due to reduced food intake, poor absorption of nutrients, and changes in the way the body uses nutrients it receives or has stored.[12] The CD4+ count of the drug naïve PLWHA was less than 350 cells/μl and this group accounted for 56% of the undernourished PLWHA while corresponding figures for those on treatment were 486 cells/μl and 40%. This agrees with the report that PLWHA with CD4+ count <350 cells/μl were more likely to be undernourished than their counterparts.[13,14]

The low levels of BMI, MUAC, albumin, HB and iron recorded in this study was said to be due to anorexia, malabsorption, and anaemia present in HIV infection.[10,15] Evidence indicates that even relatively small losses in weight are associated with decreased survival rate.[7] The increased level of total protein occurs as a result of the inflammatory process with increased antibody production initiated by the immune system.[16] The observed disturbances in trace elements such as copper, zinc and selenium may be due to chronic inflammatory processes that usually occur in HIV/AIDS patients.[17] The increased serum level of copper could be due to increase in ceruloplasmin which is an acute phase protein.[18] Zinc and selenium are antioxidants. The observed low level of zinc may be due to the fact that zinc serves as a structural component of zinc fingers that are part of transcription factors which recognize DNA base sequence during the replication and transcription of DNA and interact with HIV and promote its transcriptional activity.[19] Also HIV trans-activating protein has a high affinity for zinc.[20] Dietary zinc supplementation has been observed to reduce PEM morbidity and mortality.[21] The low selenium level may be due the incorporation of the element by HIV into viral seleno-proteins thereby depleting the host selenium.[22] Selenium has an inhibitory effect on HIV in vitro through antioxidant effects of glutathione peroxidase and other selenoproteins. Low plasma selenium level has been documented.[23] Drug treatment was able to minimize many of the abnormalities. However significant differences still existed between patients on drugs and control subjects despite very significant increase in the number of patients receiving adequate nourishment (from 11% to 60%). It would appear then that most of these abnormalities/deficiencies were primarily due to the disease condition and would only normalize when the condition resolve completely or near so. The treatment of HIV/AIDS can exacerbate malnutrition through loss of appetite, diarrhea, increased nutrient/energy requirement and nutrient malabsorption.[6] These patients may, therefore, need trace element supplementation even while on treatment and the levels of these elements may serve to monitor treatment in HIV/AIDS.

Abnormality in trace element levels seems to be basically due to the presence of the HIV in the host and might not be corrected by drug treatment alone. As long as HIV infection persiss, inflammatory response would continue and the remaining immune capacity of the host will continue to produce antibodies, selenium would continue to be incorporated into the viral seleno-protein synthesis and zinc used for viral replication. If this were to be the case, the levels of these trace elements would correlate with the host viral count. CD4+ count which correlates with viral count has been reported to be an independent factor significantly associated with nutritional status of people living with HIV/AIDS.[14]

Though measuring nutritional status is an essential part of anti-retroviral therapy programme, adequate nutrition deserves even greater attention in the management of PLWHA especially in resource limited settings in order to correct nutrient imbalance due to the presence of the HIV.

Author Disclosure Statement

The authors declared no competing financial interests exist.

Authors' contributions

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

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