



Pattern of serum total calcium, magnesium and zinc in human immunodeficiency virus disease/acquired immunodeficiency syndrome patients of Saki-West Local Government Area of Oyo state –Nigeria

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Abstract

Fifty HIV disease/AIDS seronegative subjects aged 23.6 ± 16.5 years (female=25: male =25) were recruited as normal control subjects. Thirty HIV disease/AIDS seropositive patients that presented with the symptoms of AIDS especially, aged 19.2 ± 10.7 years (female: 15 aged 22.0 ± 12.1 years: males = 15 aged 20.6 ± 11.3 years) were used as test subjects. Serum total calcium, magnesium and zinc were analysed using atomic absorption spectrophotometry and HIV tests were carried out on each of the subjects. There was no significant gender difference in the mean values of serum total calcium, magnesium and Zinc obtained from the HIV disease/AIDS seropositive females compared with those observed in their male counterparts ($p>0.05$). A lower significant mean value of serum total calcium, magnesium and Zinc was observed in the HIV disease/AIDS seropositive subjects compared to the mean values of the parameters observed in the normal control subjects ($p<0.05$). This work has therefore been used to study the pattern of serum total calcium, magnesium and Zinc in HIV/AIDS patients of Saki West local Government area through the analysis of the stated parameters. It has been found that the study of the parameters has further contributed to the understanding of the pathophysiology and the effect of the disease condition/syndrome on the mineral/nutritional status of HIV disease/AIDS seropositive subjects.

Key words: HIV/AIDS, Pattern, Minerals, Serum

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INTRODUCTION

The Human Immunodeficiency Virus (HIV), a retrovirus identified in 1983 causes progressive impairment of the body's cellular immune system, leading to increased susceptibility to infections and tumours, and the fatal condition known as Acquired Immunodeficiency Syndrome [AIDS]. Human immunodeficiency virus has been described as the etiologic factor of acquired immunodeficiency syndrome [1].

Acquired immunodeficiency Syndrome represents one of the major public health problems of the 21st century [1,2]. At the end of 1998, the joint United Nations Programme on HIV/AIDS (UNAIDS) estimated that globally there were 33.4 million people living with HIV/AIDS; more than 95% of those infected live in developing countries, about 70% in sub-Saharan Africa [1]. Anaemia (82%), Leucocytosis (53%), hypoalbuminaemia (43%), hyperglobulinaemia (88%), elevated liver enzymes such as aspartate transaminase [AST], alanine transaminase [ALT] and hyponatraemia (57%) were reported as the frequent laboratory findings in the study carried out earlier (3). The clinical manifestations of infections associated with AIDS tend to fall into well-recognized patterns of presentation, including pneumonia, dysphagia/odynophagia, diarrhoea, neurological symptoms like dementia, fever, wasting, anaemia, and visual loss. Commonest pathogens when there is immunodepression especially due to HIV disease/AIDS infection include *Candida albicans*, *Pneumocystis carinii*, *Mycobacterium tuberculosis*, *Toxoplasma gondii*, *Cryptococcus neoformans*, *Mycobacterium avium* intracellular and *Cytomegalovirus* [4]. The destruction of the immune system (and poor nutritional status due to malabsorption and anorexia) by the virus result in opportunistic infection, as well as an increased risk of autoimmune disease and malignancy such as *kaposi's sarcoma* and non-*Hodgkin's lymphoma* [1, 4].

Deficiency of proteins, calories, fatty acids, Pyridoxine, folate, vitamins A, C and E and Zinc affect the immune function [5]. Low serum calcium concentrations are found in

gastrointestinal disease that interferes with the absorption of vitamin D and or calcium and in conditions of low serum protein [5-9].

Hypomagnesaemia is also frequently associated with gastrointestinal disorders such as malabsorption, prolonged diarrhoea, bowel or kidney fistulas and acute pancreatitis found in HIV disease/AIDS patients. [6,8,10,11].

This work was designed to study the pattern of the serum levels of total calcium, magnesium and zinc in human immunodeficiency virus disease/Acquired immunodeficiency Syndrome patients.

MATERIALS AND METHODS

Subjects/Study area

(a) Thirty AIDS patients aged 20.6 ± 11.3 years (female = 15 aged 19.2 ± 10.7 years; male = 15 aged 22.0 ± 12.1 years) living (for not less than ten years) in Saki-West Local Government Area of Oyo State-Nigeria; that presented with the symptoms associated with AIDS especially; loss of weight; chronic diarrhoea, malabsorption, anorexia and pyrexia/fever were recruited into the study from the medical out patient Department of Baptist Medical Center, Saki-Oyo State-Nigeria as test subjects.

(b) Fifty HIV seronegative subjects aged 23.6 ± 16.5 years (female = 25, male = 25) were recruited as normal control subjects.

Sample:

Five milliliters of venous blood was collected from each of the subjects in the two subject groups into specimen bottles without anticoagulant. The serum was extracted for the analysis of serum total calcium magnesium and zinc, and HIV tests by spinning the clotted blood using bench centrifuge at 1000rpm for 10mins [1,12,13]. Each of the subjects was tested for HIV/AIDS.

Methods:

HIV/AIDS tests were carried out on each of the subjects using HIV screening by the Genie II-HIV 1/2-9 a dual recognition Enzyme

immunoassay (EIA): a kit of bioRad, 3-boulevard Raymond Poincare 92430 Marnes-la-Coquette-France and western blot assay was used for confirmation. All subjects were pre and post-test counseled. Serum total calcium, magnesium and zinc were analysed by Atomic Absorption spectrophotometry (Perkin-Elmer Corporation, Norwalk CTO 6856). The parameters were analysed by deproteinizing the serum, followed by the dilution of the deproteinised serum [for zinc serum was diluted five fold with deionized water; for calcium serum was diluted fifty fold in 0.1% Lanthanum Chloride; and for magnesium 1:50 with deionized water] and aspirated into the spectrophotometer following the procedure of Perkin Elmer spectrophotometer [6;12 ;13].

Principle:

Monochromatic light for a particular element is produced by means of a hollow cathode lamp using that element as the cathode. The monochromatic light is beamed through a long flame into which is aspirated the solution to be analysed. The heat energy dissociates the molecules and convert the components to atoms; although some atoms are activated, most atoms remain in the ground state at the temperatures commonly used. The ground state atoms of the same elements as in hollow cathode cup absorb their own resonance lines; the amount of light

absorbed varies directly with their concentration in the flame. The transmitted light that is not absorbed reaches the monochromator which passes only the wavelength close to the selected resonance lines of the particular element to be assayed. The transmitted light strikes a detector, and the decrease in transmitted light is measured [6].

Statistical analysis:

This was carried out using Student 't' test described by Norman, 1994 [14]

RESULT

The results of this study are as shown in tables 1 and 2 below. There was no significant difference in the mean values of serum total calcium, magnesium and zinc in the results obtained from the HIV/AIDS seropositive female subjects aged compared to the mean values of these parameters observed in the HIV/AIDS seropositive male subjects. Higher significant mean values of calcium, magnesium and zinc were observed in the HIV/AIDS seronegative control subjects than mean values of serum total calcium, magnesium and zinc observed in the HIV/AIDS seropositive subjects.

TABLE 1: The mean and standard deviation ($\bar{x} \pm S.D$) of the serum level of Calcium, Magnesium and Zinc of the test and the control subjects

	N	Ca (mmol/L)	Mg (mmol/L)	Zn (μ mol/L)	Age (years)
HIV/AIDS Seropositive females	15	1.75 ± 0.2	0.58 ± 0.15	10.2 ± 1.2	19.2 ± 10.7
HIV/AIDS Seropositive males	15	1.73 ± 0.2	0.58 ± 0.14	10.1 ± 1.1	22.0 ± 12.1
HIV/AIDS Seropositive Test subjects [Females and males]	30	1.74 ± 0.19	0.58 ± 0.14	10.2 ± 1.1	20.6 ± 11.3
HIV/AIDS Seronegative control subjects	50	2.1 ± 0.13	0.71 ± 0.16	14.6 ± 3.0	23.6 ± 16.5

TABLE 2: 't' test and 'probability (p) values of the subject groups.

HIV/AIDS seropositive subjects Vs HIV/AIDS seronegative control subjects	't'	9.0	3.3	9.4	0.96
	'p'	P<0.05 significant	P<0.05 significant	P<0.05 significant	P>0.05 Not significant
HIV/AIDS seropositive females Vs HIV/AIDS Seropositive males	't'	0.27	0	0.23	0.7
	'p'	P>0.05 Not significant	P>0.05 Not significant	P>0.05 Not significant	P>0.05 Not significant

DISCUSSION

The significantly reduced serum levels of calcium, magnesium and Zinc found in HIV disease/AIDS seropositive subjects compared with the control can be attributed to the frequent chronic diarrhoea, anorexia and probably malabsorption of food substances associated with HIV disease/AIDS infection [5,6,7,9].

The reduced serum levels of magnesium and calcium in the test subject compared with the control is also consistent with the report of [6] that hypomagnesaemia and low total calcium level in the serum can be associated with gastrointestinal disease such as malabsorption and diarrhoea common in HIV disease/AIDS patients.

Low calcium, magnesium and zinc serum levels in the HIV/AIDS seropositive subjects is also attributable to the low level of the binding protein (hypoalbuminaemia) found in HIV/AIDS seropositive subjects [3,6,9]. Decreased concentration of the serum level of zinc in the test subjects compared with the HIV/AIDS seronegative subjects is consistent with the findings of [3, 9] that reported deficiency of zinc in HIV/AIDS patients.

The result of this study is also consistent with the fact that poor nutritional status which may result from malabsorption, loss of appetite, diarrhoea and vomiting common in HIV disease/AIDS patients, is one of the major contributing factors for patients to be immunodeficient [1, 5, 9].

The present work has therefore been used to study the pattern of serum levels of calcium, magnesium and zinc in HIV disease/AIDS. The study is therefore useful in the understanding of the pathophysiology of Acquired Immunodeficiency Syndrome and the effect of the syndrome on the parameters studied.

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