

Serum Calcium Level in HIV Patients at Federal Medical Center Yenagoa, Bayelsa State, Nigeria

Bright E. Shadrack¹, Dr. Kesta A. Digban², Dr. Adamu A. Ishiaku³, Dr. Debola Olayinka⁴, Dr. Patrick Nguku⁵, Lucky E. Bright³

1, 3, 4, 5Nigeria Field Epidemiology and Laboratory Training Programme (NFELTP), Abuja, Nigeria

²Department of Basic Medical Sciences, Igbinedion University, Okada, Edo State Nigeria

⁶Ministry of Sports, Yenagoa, Bayelsa State, Nigeria

¹Post primary Schools Board, Ministry of Education Bayelsa State, Nigeria

²Department of Community Medicine, Ahmadu Bello University, Zaria, Nigeria

Abstract: ***Background:** Results have indicated significantly lower levels of calcium, potassium, magnesium and sodium in all analyzed biological samples (blood, serum and scalp hair) of male patients with Acquired Immune Deficiency Syndrome (AIDS) in comparison to healthy controls (Beck A. et al 2012). Drugs that stabilize calcium homeostasis such as vitamin-D supplementation can help protect neurons against toxic effects of gp120 and Tat, by altering; voltage-dependent calcium channels, glutamate receptor channels and membrane transporters and levels of parathyroid hormone, bone mineral loss and consequently provide adequate calcium needed for regulation of the nervous system (Gus, 2009). We evaluated serum calcium levels in HIV patients as residents of this geographical area are mainly fishermen whose main source of protein diet is from fish and other fish products at Federal Medical Center, Yenagoa. **Methods:** The study was a cross sectional study design conducted at the HIV Clinic at Federal Medical Center, Yenagoa, Bayelsa State in 2012. The target population were patients attending regular HIV Clinic and community members. Inclusion criteria Patients confirmed HIV positive and negative for hepatitis who gave informed consent formed the cases. The control constituted community members tested negative for HIV and Hepatitis B and C that gave informed consent. Exclusion criteria for cases and controls are hepatitis positive and CD4 < 100cell/mm3 Risk level of the serum calcium was taken as >7mmol/L as it was found to be higher than the median value of serum calcium for the population under study. **Result:** 384 samples were collected by systematic sampling technique with replacement from an existing sample frame and divided into equal parts of cases and controls. Among the 192 case, 57.00% were female. HIV patients (Cases) have 16.98 odds of exposure to serum calcium > 7mmol/L when compared to the HIV negative (control) and the attributable risk % of exposure to serum calcium > 7mmol/L is given as 60%. HIV patients (cases) have about 70% of its serum calcium values >7mmol/L. **Conclusions:** HIV patients have higher serum calcium and administration of drugs that regulate calcium homeostasis may reduce serum calcium level to about 48%. We recommend further research on diet and calcium levels and advocate that calcium analysis for HIV patients by Physicians in this region.*

Keywords: Serum, Calcium Level, HIV Patients, Yenagoa Nigeria

1. Background

Human immuno-deficiency virus (HIV) neurotoxic proteins are the coat protein, glycoprotein (gp) 120 and the transcription regulator, (Tat). These proteins are responsible for inducing HIV dementia or encephalitis in acquired immune deficiency syndrome (AIDS) patients. Each of this protein can induces apoptosis of cultured neurons and render it vulnerably excitotoxic with oxidative stress (Haugley and Mattson 2002). The viral proteins also cause neuronal dysfunction and death in rodents in vivo, and disrupt neuronal calcium homeostasis by perturbing calcium-regulating systems in the plasma membrane and endoplasmic reticulum (Braunwald et al, 2001). This leads to calcium overload, oxyradical production and mitochondrial dysfunction (Haugley and Mattson, 2002). Results have indicated significantly lower levels of ionic calcium, potassium, magnesium and sodium in all analyzed biological samples (blood, serum and scalp hair) of male patients with Acquired Immune Deficiency Syndrome (AIDS) in comparison to healthy controls (Beck A. et al 2012). Drugs that stabilize calcium homeostasis such as vitamin-D supplementation can help protect neurons against toxic effects of gp120 and Tat, by altering; voltage-dependent calcium channels, glutamate receptor channels and membrane transporters and levels of parathyroid hormone, bone mineral loss and consequently provide adequate calcium needed for regulation of the nervous

system (Gus, 2009). WHO policy documents have identified priorities for handling HIV/AIDS aimed at pursuing the goal of “universal access, to comprehensive prevention programs, treatment, care and support” by the year 2010 [WHO, 2006]. current data indicates that about 70% of the burden of HIV is in Sub-Saharan Africa with Nigeria contributing about 9%, and having a national prevalence of 4.1% by 2010 [WHO, 2013]. Coupled with the low standard of living amongst vulnerable groups to HIV and the non-availability of data on serum calcium for HIV patients there is need to evaluate the risk of serum calcium in HIV patients in order to mitigate complication due to serum calcium deficiency in patients. The study evaluated serum calcium levels in HIV patients using simple derived base line index of a value slightly higher than the median levels of the samples as residents of this geographical area are mainly fishermen whose main source of protein diet is from fish and other fish products at Federal Medical Center, Yenagoa, Bayelsa State.

2. Methods

- **Study Area:** The HIV Clinic at Federal Medical Centre, Yenagoa, Bayelsa State offers a comprehensive HIV counseling and testing service. It is the first and major secondary health facility located at the City Centre.
- **Study Design:** This study is a cross sectional study design.

- **Study Period:** This study was conducted in August to October, 2012.
- **Study Population:** is a state in southern Nigeria in the core Niger Delta region, between Delta State and Rivers State. Its capital is Yenagoa. The four main languages spoken are Izon, Nembe, Epie-Atissa, and Ogbia and generally English. Her headquarters is Yenagoa which is the major and largest city. In 1996, the state was formed from part of Rivers State with a total population of 1.998, 349 and the target population were patients attending regular ART clinic and community members.
- **Eligibility Criteria:** Patients confirmed HIV positive attending the ART clinic that were negative for hepatitis who gave informed consent formed the cases. The control constituted community members who tested negative by rapid ELISA methods for HIV and Hepatitis B and C that gave informed consent. Exclusion criteria for cases and controls are hepatitis positive and $CD4 < 10\text{cell/u.l}$. Inclusion criteria were patients age greater than two years who gave informed consent. While exclusion criteria was age less than two year and refused to sign consent form. Both criteria applied to cases and controls.
- **Sample Size and Sampling Technique:** A total of 384 samples were collected after determination of the size by Epi-Info 7 Stat Cal for cross sectional studies at 80% power with a 5% statistical error level using a prevalence of 5% for serum calcium amongst the control at equal ratio of 1 for cases and control. The sampling technique was systematic sampling with replacement from an existing sample frame after dividing the sampling frame with half the sample size to obtain my constant k.
- **Methods of Data Collection and Analysis:** Data was collected by semi- structure questionnaire for demographic characteristics and blood specimen for laboratory analysis.
- Data analysis was done using Epi-Info 7 software for ordinal and categorical variable by univariate and

bivariate analysis at a p-value of 5% comparison. Risk level of the serum calcium exposure was taken as $>7\text{mmol/L}$ as it was found to be higher than the median value of serum calcium for the population under study.

- **Study Limitation:** The study did not look at the duration of infection on the patients or their $CD4+$ values alongside the serum calcium levels in other to find if a relationship exist. It also did not categorise cases in terms of their ART status or exposure neither did it assess the effects of calcium stabilizing therapy on HIV patients.

3. Results

Table 1: Sex and Diagnostic Characteristics of Sample Summary Data

Characteristic.	HIV Status no. (%)		Total (%)
	Positive	Negative	
Female	126 (57.53)	93 (42.47)	219 (57.00)
Male	66 (40.00)	99 (60.00)	165 (43.00)
Parameters			
Serum Calcium $>7\text{mmol/L}$	134 (69.79)	23 (11.98)	157 (31.00)
Serum Calcium $<7\text{mmol/L}$	58 (30.21)	169 (88.02)	227 (69.00)

Table 2: Median and Range of Sample Parameters separated into Status

Parameters	Median (Range)	
	Positive	Negative
Sample Age (yrs)	40 (7-67)	31 (2-95)
Female Age (yrs)	39 (7-59)	28 (2-95)
Male Age (yrs)	47 (7-67)	36 (1-75)
Sample S/Calcium (mmol/L)	8 (4-17)	5 (4-8)
Serum Calcium for Male	10 (8-17)	8 (4-8)
Serum Calcium for Female	8 (4-17)	6 (4-8)

Table 3: 2 by 2 Table of Serum Calcium of HIV Positive and HIV Negative

Exposure	Status		Odds Ratio (95% CI)	P-value
	Cases	Control		
Serum Calcium $>7\text{mmol/L}$	134	23		
Serum Calcium $<7\text{mmol/L}$	58	169	16.98 (9.96-28.94)	<0.001

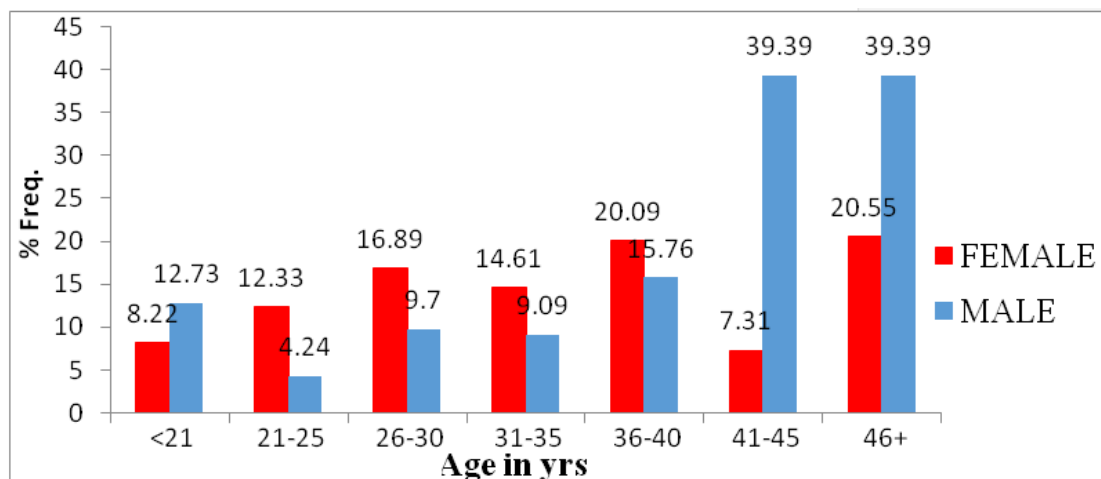


Fig 1 % Distribution of Samples by Age and Sex

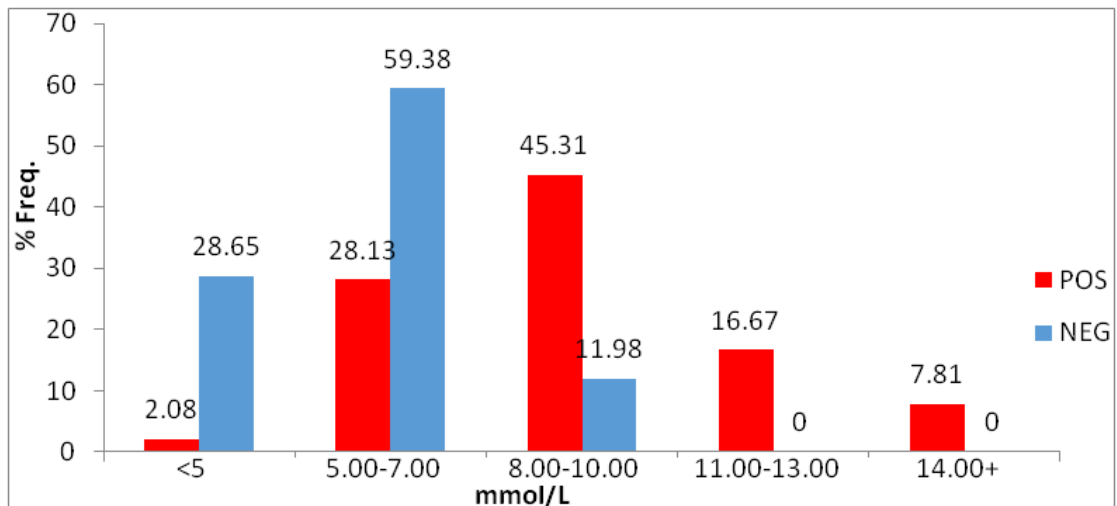


Fig. 2 %Distribution of serum calcium levels by Status

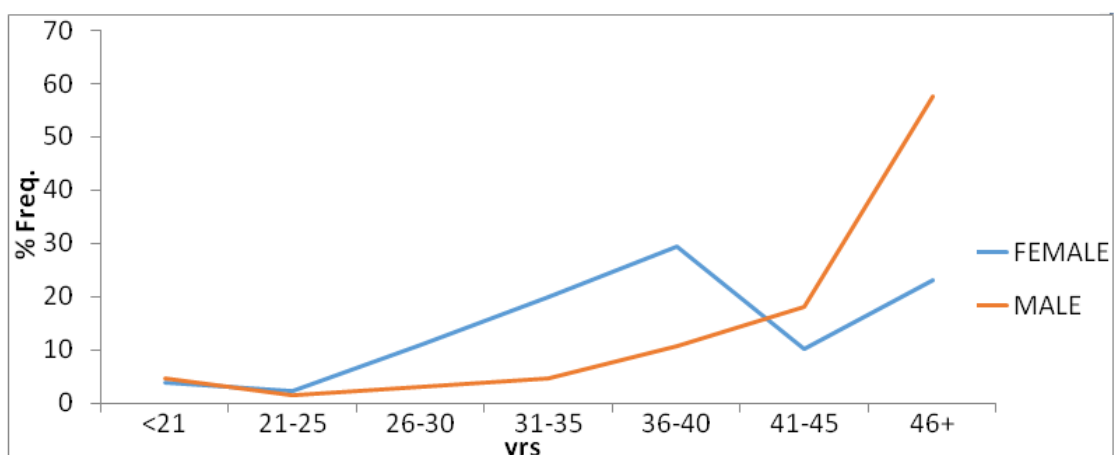


Fig. 3 %Distribution of HIV Positive Cases by Age and Sex

4. Conclusion and Recommendation

4.1 Conclusion

People living with HIV have a 16.98 odds of exposure to serum calcium > 7mmol/L when compared to the control. The attributable risk % of exposure to serum calcium > 7mmol/L is given as 60% which infers that drugs that stabilize calcium homeostasis will be able to reduce complications due to serum calcium overload by about 60% for this population (Bech, *et al*, 2013). However, the population attributable risk % was given as 48% which infers that about half of the population under study that are positive for HIV had their serum calcium level > 7mmol/L as a result of the infection with the virus (Gus, 2008). Thus administration of drugs can regulate serum calcium homeostasis by about 50% when administered early enough to cases (Gus, 2008). But from the data set, cases have about 70% of its serum calcium > 7mmol/L with only about 30% < 7mmol/L.

4.2 Recommendation

We recommend that care or management of HIV patients in this region should include routine assessment of serum calcium irrespective of their ART status as this test is seldom requested by the clinicians managing the patients.

That Calcium regulating drugs be administered to patients with elevated serum calcium levels above the regional reference range for HIV patients irrespective of their ART status. That more studies be carried out on serum calcium levels in HIV patients using different study designs.

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