Journal of Biomedical Investigation, 2007; 5(2):49-52.

Electrolyte and renal status of HIV seropositive individuals on ART: a short-term follow-up study.

[1]Onochie A.U, [2]Okaka. A.N.C., [3]Onyenekwe, C.C, [4]Meludu, S.C, [4]Ezegwunne I.P, [1]Ifemeje, J.C.

(1) Dept of Biochemistry, Anambra State University, Uli, (2) Dept of Applied Biochemistry, Nnamdi Azikiwe University, Awka, (3) Dept of Medical Lab Sciences; (4) Department of Human Biochemistry, College of Health Sciences. Nnamdi Azikiwe University Nnewi Campus, Anambra State. Nigeria.

ABSTRACT

The study was designed to assess the renal and electrolyte status of HIV seropositive subjects during antiretroviral therapy follow up for 4 months. For this study, 20 HIV seropositive subjects were randomly recruited before commencement of anti-retroviral therapy and followed-up into 4 months of anti-retroviral therapy. Blood samples were collected before and bi-monthly during anti-retroviral therapy. The result of the present study showed that before anti-retroviral therapy, the serum levels of potassium and bicarbonate were the only electrolytes that showed significant increase compared with corresponding values in the control subjects ($p<0.05$ in each case). However, the serum concentrations of urea and creatinine were consistently raised in the HIV seropositive subjects before and during the ART compared with values observed in the control subjects ($P<0.05$ in each case). The findings of the present study suggest impaired kidney functions in HIV seropositive subjects with no immediate improvement within 4 months of ART.

Keywords: Infection; drugs; organs.

INTRODUCTION:

About 4.8 million Nigerians are infected with HIV while only 50% of this population has access to Antiretroviral therapy (ART)[1]. HIV infection is known to progress to acquired immunodeficiency disease (AIDS) if ART is not administered. Both HIV infection and ART have been shown to result in functional impairment of some tissues/organs[2,3,4,5,6]. Some of these organs like the kidneys are actually involved in the regulation of acid-base balance and electrolyte balance in the body. Other complications of HIV infection such as proteinuria, excessive vomiting, and diarrhoea[7,8] among other things may also contribute to electrolyte imbalance in HIV infected subjects. Electrolytes are needed by all cells in the body for normal functioning and maintenance of body fluid. Hence evidence of imbalance in electrolytes may signal functional impairment. The present study was designed to assess the electrolytes and renal status of HIV infected subjects within few months of ART.

MATERIALS AND METHODS:

SUBJECTS: 20 HIV seropositive subjects were randomly recruited amongst those about to commence ART at the HIV clinic, Nnamdi Azikiwe University Teaching Hospital (NAUTH) Nnewi and followed up bi-monthly for 4 months during ART and referred to as test subjects while 20 HIV seronegative subjects randomly recruited at the Voluntary Counseling and Testing (VCT) unit NAUTH served as the control subjects. The antiretroviral combination Stavudine, Lamivudine and Neviraprine were administered orally at recommended dosage of 40mg twice daily, 150mg twice daily and 200mg daily respectively. Blood sample was collected from the test subjects for analysis of serum electrolytes (Sodium, Potassium, Chloride bicarbonate), serum urea and creatinine during bimonthly visit while blood sample was collected once from the control subjects. The subjects gave informed consent and the ethical committee approved the study design.

METHODS:

Determinations of electrolytes such as Sodium and Potassium were by flame photometer, chloride by mercuric nitrate titrimetric method and bicarbonate by titrimetric method as described in Tietz[9].

For correspondence: onochietonny@yahoo.com

Determination of serum creatinine concentration: Serum creatinine was performed using VITROS Blood Chemistry Analyzer (USA). The procedure described briefly, unto DT 6011 module (slide) properly labeled for each participant was placed serum sample on the pipette location on the slide. The DT 6011 module was used to determine the serum creatinine value of the samples.

Determination of serum urea concentration: Serum urea was performed using VITROS Blood Chemistry Analyzer (USA). The procedure described briefly, unto DTSC module (slide) properly labeled for each participant was placed serum sample on the pipette location. The DTSC module was used to determine the serum urea value of the samples.

RESULTS:

The mean serum sodium concentration (mmo/l) in the test subjects during the pre- and post ART era was not significantly different from that observed in the control subjects ($p>0.1$). The mean serum potassium concentration (mmol/l) in Test subjects (7.8 ± 2.7) pre-ART was significantly raised compared with corresponding value in control subjects (4.1 ± 0.4) ($p<0.05$). However, the post ART serum concentration of potassium in the test subjects was similar to values observed in the control subjects. The mean serum concentration of thloride in test subjects during the pre- and post ART era was not significantly different from that observed in the control subjects ($p>0.1$). The mean serum concentration (mmol/l) of HCO_3^- in the test subjects of 24 ± 5 during pre-ART era was significantly higher than 21 ± 2 observed in control subjects ($P<0.05$). However, the post ART serum concentration of bicarbonate in the test subjects was similar to value observed in the control subjects ($p>0.1$). See table 1. The mean serum concentration (mmol/l) of urea in the test subjects during pre-ART (4.2 ± 3.2) was significantly raised compared to 2.4 ± 0.7 observed in the control subjects ($p<0.05$). By 2months and 4months into ART the mean serum concentrations of urea in the test subjects were 6.2 ± 10.2 and 3.8 ± 2.8; these values are significantly higher than that observed in the control subjects ($p<0.05$ in each case). Similarly, the mean serum creatinine concentration (nmol/1) in the test subject during pre-ART (110 ± 80) was significantly higher compared with 77 ± 7 observed in the control subjects ($p<0.05$). By 2 months and 4months into ART the mean serum concentrations of creatinine in the test subjects were 101 ± 53 and 99 ± 44; these values are significantly higher than that observed in the control subjects ($p<0.05$ in each case).

DISCUSSION

The present study observed mild alteration in serum potassium and bicarbonate concentration in HIV seropositive subjects. The high mean serum potassium level in these subjects could not be.., explained however the wide deviation from the mean thus suggested that some of the HIV seropositive subjects might at the time of presentation acquired some level of impairment in regulation of their electrolytes. Similarly, there was increase in serum bicarbonate level in these subjects. However, both alterations seem corrected within 2 months of antiretroviral therapy.

Studies have shown different reports regarding the electrolyte status of HIV infected subjects. Afhami et al[10] reported no alteration in electrolyte balance in HIV infected subjects. However, another study has reported evidence of alteration in electrolyte status of HIV infected subjects[11]. Considering the finding in the present study and other earlier reports, accurate definition of the clinical status of these HIV infected subjects and level of HIV associated complications at presentation may help to actually note possible variables that affect or control electrolyte balance in HIV infected subjects.

In the present study serum urea and creatinine were used as markers of renal function. The mean serum values of these markers were significantly raised in the HIV infected subjects. The mean serum value of urea was almost double in HIV infected subjects. Upon administration of ART a further three fold increase in serum urea was observed by 2 months into ART but dropped to two fold increase by 4 months into ART. Studies using different markers for assessment of renal function have shown either non-impairment in renal function[6,10] or impaired renal function in HIV infected subjects[3,6,12,13]

The present study concludes that there are possibilities of development of electrolyte imbalance and renal dysfunction in both HIV infected subjects with or without ART.

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Table 1: mean SD serum concentrations of sodium (mmol/l), potassium (mmol/l), chloride (mmol/l), bicarbonate (mmol/l), urea (mmol/l) and creatinine (nmol/l) in control subjects and HIV seropositive subjects pre-ART and during ART.

Parameters	+Control Subjects (n =20)	*pre-ART Subjects (n20)	**2 months ART subjects (n20)	***4months ART subjects (n20)	p-value
Sodium	134±5	137±13	135±11	135±11	+VS*p>0.1 +vs** p>0.1 +vs***p>0.1
Potassium	4.1±0.4	7.8±12.7	4.0±0.4	4.1±0.5	+vs * p<0.05 +vs ** p>0.1 +vs ***p>0.1
Chloride	100±4 -	101±13	101±8	99±4 -	+vs*p>0.1 +vs ** p>0.1 +vs*** p>0.1
Bicarbonate	21±2	24±5	22±5	22±2	+vs * p< 0.05 +vs **p <01 +vs p>0.1
Urea	2.4±0.7	4.2±3.2	6.2±10.2	3.8±2.8	+vs * p< 0.05 +Vs** p< 005 +Vs*** p< 0.05
Creatinine	77±7	110±80	101±53	99±44	+vs * p<0.05 +vs** p< 0.08 +vs*** p< 0.05