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PLASMA UREA AND ELECTROLYTES PROFILE IN DIFFERENT STAGES OF HIV INFECTION IN EKPOMA, NIGERIA

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Abstract

Aim: Human Immune Deficiency Virus (HIV) is one of most dreaded diseases today. This study aims at the determination of electrolyte profile (Na^+, K^+, Cl^- and HCO_3^-), urea levels and CD_4 count of patients diagnosed with HIV infection in Ekpoma, Nigeria.

Methods: Sixty patients and 40 apparently healthy individuals as controls were examined from January 2013- September 2014. Electrolytes were assayed using flame photometry and titration method for Na^+, K^+, Cl- and HCO_3^- respectively. Urea was determined using Urease-berthlot method and CD_4 count by partec cyflow counter.

Results: The mean values of K^+; 3.59±0.43, Na^+; 133.48±3.79, HCO_3^-; 23.44±3.78, and CD_4 count; 502.77±317.74 were decreased and showed a significant difference ($p<0.05$) when compared to controls; 3.98±0.28, 137.18±2.44, 27.40±2.40 and 847.98±69.25 respectively. The level of urea; 22.2±8.95 was raised but showed no statistical significance ($p>0.05$) when compared to the control; 20.87±6.49 while that of Cl^-; 100.08±1.93 was decreased but showed no statistical significant difference ($p>0.05$) when compared to the control; 100.55±2.01.

Conclusion: This study has shown that decreased K^+, Na^+, Cl^-, HCO_3^-, CD_4 count and raised urea level may be a valuable index in the diagnosis and monitoring of HIV infected patients.

Keywords: Serum urea, Electrolytes, HIV, Infection

Introduction

Human Immune Deficiency Virus (HIV) has been the leading cause of death among young adults and has a devastating impact on people in developing countries (Horowitz et al., 1998). Previous reports indicate that renal disease is becoming increasingly prevalent in HIV-infected patients (Roling et al., 2006). There was also an early observation of focal segmental glomerular sclerosis and renal failure associated with HIV infection (Roa, 1998). Kidney disease is now widely recognized as a frequent complication of HIV infection (Gupta et al., 2005). The Kidney is a relatively small bean shaped organ that perform many important functions like cleaning wastes from blood, managing fluid in the body, controlling blood pressure, making red blood cells, balancing acidity and mineral composition. Renal disorders are encountered at all stages of HIV infection, and they range from the fluid and electrolyte imbalances commonly seen in hospitalized patients to end- stage renal disease (Okuonghae et al., 2011). Viruses therefore may be capable of damaging the kidney in a number of ways that are often peculiar to the specific infection (Emokpae et al., 2013). Acute renal failure, which is common among hospital patients with HIV is associated with chronic

kidney disease, liver disease and increased mortality (Wyath et al., 2006) although, death rates in HIV have declined since the introduction of highly active antiretroviral therapy (HAART), the number of deaths due to renal disease has increased (Gupta et al., 2005). Chronic renal disease can be caused by many pathological mechanisms that bring about HIV-associated neuropathy (Gardenwartz et al., 1984). Patients with HIV infection may develop a bewilder variety of electrolyte and acid-base disturbances. Hyponatremia from many causes is common and associated with increase mortality. Potassium disorders are frequent, with hyperkalemia, even to a life-threatening level (Farizo et al., 1992). Fluid electrolyte disorders are common in patients with advanced HIV infection. Hyponaetremia is a frequent finding among HIV-infected persons, with a reported prevalence of 30-60% in hospitalized patients and occurs in the setting of both hypovolemia and euvolemia. It is a marker of severe illness that is associated with increased mortality in HIV infected patients. Hypovolemia which usually occurs as a result of gastro intestinal fluid loses is the most common cause of hyponatremia among these groups of patients (Adrogue et al., 2000). Excessive loss of sodium resulting in hyponatremia, euvolemia and hypotension can occur via dieresis, Addison's disease, severe vomiting or diarrhoea. Hyperkalemia and hyponatremia may be a manifestation of miner corticoid deficiency resulting from adrenal insufficiency or the syndrome of hyporeninemic hypoaldosteronism. Acute or chronic kidney disease also may contribute to potassium retention (Kalin et al., 1999). An excessive concentration of chloride in the plasma occurs in water depletion, dehydration, decreased bicarbonate concentration or metabolic acidosis. Excess of chloride in the blood occurs as a result of fluid deficit for which the kidney attempts to compensate by reabsorbing large amounts of water and chloride dissolved in it (Kleyman et al., 2006). Drugs are an important cause of fluid and electrolyte disorder in HIV-infected patients and can mimic the abnormalities associated with adrenal dysfunction (Burton and Theodore, 2001). This study was aimed at evaluating the serum urea and electrolytes in different stages of HIV infection in Ekpoma, Nigeria.

Materials and Methods

Area of Study

This study was carried out at Ekpoma, the headquarters of Esan West Local Government Area of Edo State, Nigeria. The plasma urea and electrolyte profile of 60 patients diagnosed with HIV and 40 apparently healthy individuals as control were studied from January 2013 to September 2014 in Irrua Teaching Hospital, Irrua-Ekpoma.

Sample Collection

Five millilitres of venous blood were collected from the subjects into lithium heparin bottle after a verbal informed consent. Samples were then spurned and the plasma obtained stored at 2-8^{o}C prior to analysis.

Ethical Clearance

This was obtained from the ethical committee of Irrua Specialist Teaching Hospital, Irrua-Ekpoma.

Exclusion and inclusion criteria

Subjects of HIV in any of the four stages of CD4 count shown in the table below were included in the study those while confirmed AIDS (Acquired Immune Deficiency Syndrome) patients were excluded.

	Subjects	
Stages of HIV	No. of Patients(n)	CD4 Count
I	7	>500
II	33	<500
III	10	<200
IV	10	<100

Sample analysis

Plasma sodium and potassium were estimated by Flame Photometry method of Korsum, (2006). Plasma chloride was estimated by Schales and Schales Method (1971). Plasma bicarbonate was estimated by Titration Method of Van Slyke (1985). Plasma urea was estimated

by Urease Berthelot Method of Weather burn (1993). Estimation of CD4 was carried out with Partec Cyflow Counter of Partec flomax software (2005).

Statistical Analysis

The results obtained in this study were analyzed statistically. The mean and standard deviation were calculated in each case. Student's t-test statistical method was employed for comparison using a computer programme (SPSS) for ''Windows Release 16.0'' and ANOVA (analysis of variance). The comparison was done at 95% confidence level, a p-value equal to or less than 0.05 ($p<0.05$) was considered statistically significant.

RESULTS

The tables below show the mean + S.D of plasma electrolytes, urea and CD_4 count in HIV patients compared to control subjects. The result obtained from the study indicates a significant difference ($p<0.05$) in the mean values of K^+, 3.34 ± 0.30mmol/L, Na^+; 131.02 ± 2.19mmol/L, Cl^-; 99.76 ± 1.83mmol/L, and CD_4 count 272.63 ± 177.73 µl in HIV patients when compared with those of the normal subjects; 3.98± 0.28mmol/L, 137.18 ± 2.44mmol/L, 100.55 ± 2.01mmol/L, 27.40 ± 2.04mmol/L, and 847.98 ± 69.25 µl respectively. However, there was no statistically significant difference ($p<0.05$) in the mean value of urea; 23.11 ± 10.23mg/dl though there was an increase observed in urea level of HIV patients when compared wiht that of the control, 20.87 ± 2.04mg/dl (Table:1). Table 2: reveals the mean values of plasma K^+; 3.59± 0.43mmol/L, Na^+: 133.48±3.79mmol/L, $HCO3^-$; 23.44±1.93mmol/L and CD_4 count; 502.77± 317.74µl in all the four stages of HIV patients were statistically significant ($p<0.05$) when compared with the control subjects; 3.98±0.28mmol/L, 137.18± 2.44mmol/L, 27.40± 2.04mmol/L and 847.98± 69.25µl respectively. However, there was no significant difference ($p>0.05$) in the level of Cl^-; 100.08±1.93mmol/L when compared with the control; 100.55±2.01mmol/L though there was a decrease in the mean value. The level of urea; 22.22±8.95mg/dl was statistically not significant ($p>0.05$) when compared with the control; 20.87±6.4mg/dl although there was an increase in the mean value.

Table1: Plasma electrolytes, urea level and CD_4 count in HIV infected patients

Parameter	Patients n=60	Control n=40	t-values	p-values
K^+	3.34±0.30*	3.98±0.28	10.5	<0.05
Na^+	131.02±2.19*	137.18±2.44	13.1	<0.05
Cl^-	99.76±1.83*	100.55±2.01	2.0	<0.05
Hco_3-	20.80±1.88*	27.40±2.04	16.5	<0.05
Urea	23.11±10.23	20.87±6.49	1.2	>0.05
CD_4	272.63±177.73*	847.98±69.25	19.4	<0.05

Table2: Comparative study of plasma electrolytes, urea level and CD_4 count in all stages of HIV infected patients

	Control	Stage 1	Stage II	Stage III	Stage IV	Mean HIV patients	f-	P-
K^+	3.98±0.28	3.78±0.21*	3.32±0.25***	3.31±0.21***	3.31±0.29****	3.59±0.43	40.9	<0.05
Na^+	137.18±2.44	132.43±3.55*	130.94±1.93**	130.10±0.99***	131.20±2.48****	133.48±3.79	44.8	<0.05
Cl^-	100.55±2.01	100.57±2.57	99.63±1.67	99.40±1.17	100.00±2.35	100.08±1.93	1.4	>0.05
HCO_3	27.40±2.04	21.85±2.11*	20.66±1.79**	20.50±1.77***	20.80±2.14****	23.44±3.78	68.8	<0.05
Urea	20.87±6.49	19.57±7.32	21.63±8.33	23.70±8.43	29.90±16.21	22.22±8.95	2.4	>0.05
CD_4	847.98±69.25	632.22±126.65*	301.94±67.95**	155.40±29.18***	41.40±26.24****	502.77±317.74	509.7	<0.05

DISCUSSION

Results obtained from this study showed a statistically significant difference ($p<0.05$) in the mean values of K^+, Na^+, Cl^-, CD4, urea and $HC03^-$ when compared with the normal subjects. This is in consonance with the findings of Ansger (2007), Ross and Klothman (2004) who observed that HIV infection may present as fluid electrolytes and acid-base abnormalities, acute renal failure, glomerulopathy directly related to underlining HIV infection at different stages. The observed low level of plasma K^+ in this study may be attributed to the dilution of the extracellular space, movement of K^+ into cells or loss from the body or kidney usually associated with HIV infections as earlier reported by Ziegler (1996). Also the hyponatraemia and hypocarbonaemia seen in HIV patients agreed with the findings of Adrogue et al., (2000) who reported that in HIV patients gastrointestinal fluid looses usually occur as a result of diarrhoea and vomiting. The mean value of plasma chloride in this study was not statistically significant ($p>0.05$) even when it was low and compared to the normal subjects. This may be due to heavy sweating, vomiting, adrenal and kidney disease, pyelonephritis, diarrhoea and dehydration as reported by Kleyman et al .,(2000). However, the urea level was raised and observed to be statistically not significant ($p>0.05$) when compared with normal subjects. Ross (2004) and Farizo et al., (1992) reported that in HIV patients, kidney function is compromised as a result of decrease in the number of functional nephrons which will reduce the glomerular filtration rates and cause major decrease in renal excretion of electrolytes. The low level of mean CD4 cells observed in this study when compared to normal subjects may be due to acute HIV infection which leads to conditions such as lymphoadenopathy, weight loss, vomiting nausea and neurological symptoms as previously reported by Khan and Walker (1998). Finally, the electrolytes profile pattern, urea level and CD4 counts of patients diagnosed with HIV is a major predisposing factor to the development of HIV infection, in addition to complications especially malabsorption, weight loss, wasting and severe alterations in the body metabolizing and electrolyte balance. These balances are mostly determined and can be changed by medications, food choices and adequate hydration. It is therefore suggested to routinely carry out electrolyte profile, urea level and CD4 counts in HIV management.

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