



AENSI Journals

Australian Journal of Basic and Applied Sciences

ISSN:1991-8178

Journal home page: www.ajbasweb.com



Electrolyte Disturbances in HIV infected South Indian patients treated in a Tertiary Teaching Hospital- Cross Sectional Study

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ARTICLE INFO

Article history:

Received 19 September 2014

Received in revised form

19 November 2014

Accepted 29 November 2014

Available online 27 December 2014

Keywords:

HIV, Electrolyte Imbalance, Sodium, Potassium.

ABSTRACT

Background & Objective: The purpose of this study is to access the prevalence of the electrolyte disturbances among HIV -Infected patients admitted in Medicine and STD Departments, Govt Rajaji Hospital, Madurai. **Materials and methods:** This is a Prospective Cross Sectional Study conducted among patients with AIDS related complex and AIDS admitted in Government Rajaji Medical College Hospital, Medicine and STD wards between November 2008 and April 2009. CD4 Counts, Serum Sodium, Serum Potassium, Blood Urea, Sugar, Creatinine and Blood Urea Nitrogen were all estimated. Descriptive analysis of the result was done using the SPSS version 17 write the main objective for your paper. **Results:** Of 150 patients, 39 were male and 111 were female. 34.7% showed hyponatremia. The correlation was seen between CD4 counts and Serum Sodium. Hypokalemia and Hyperkalemia were seen in 18.7% and 9.3% respectively. No correlation noted between CD4 count and potassium. **Conclusion:** Hyponatremia, Hypokalemia and Hyperkalemia are common electrolyte disorders with HIV infected patients. Because of the high incidence of the electrolyte disturbances with HIV infected patients, close monitoring and aggressive management are mandatory.

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To Cite This Article: Ragunathan Ranganathan, Tamil Selvan, Pugazhenthana Thangaraju, Aravindan Ulaganathan, Sajitha Venkatesan, Sivasubramani Bharati, Electrolyte Disturbances in HIV infected South Indian patients treated in a Tertiary Teaching Hospital- Cross Sectional Study. *Aust. J. Basic & Appl. Sci.*, 8(18): 629-634, 2014

INTRODUCTION

In 1981, few cases of unexplained Pneumocystis jiroveci among five homosexual men of Los Angeles and Kaposi sarcoma with or without pneumonia (Pneumocystis jiroveci) among 26 homosexual men of New York and Los Angeles was reported by Centre for Disease Control and Prevention (CDC). After few months the disease was diagnosed in male and female intravenous drug abusers, in hemophiliacs and in blood transfusion recipient. Based on epidemiological pattern it was clear that the infectious agent was transmitted by sexual contact (both homo and heterosexual group) and through contaminated blood and blood products [1].

Human immunodeficiency virus (HIV) was isolated in a person with lymphadenopathy in 1983. Later in 1984 it was proved to be the causative agent for AIDS. The advent of Enzyme linked immuno-sorbant assay (ELISA) led to a new scope and thorough evolution of HIV epidemic in U.S and many other countries throughout the world (Cohen *et al.*, 2011).

In 1983, Luc Montanier identified and named the causative organism as LAV-2 (Lymphadenopathy associated virus) (Horowitz *et al.*, 1998). In 1984 it was renamed as HTLV-3 (Human T lymphotropic virus 3). Both these names were redesignated as Human immunodeficiency virus by the International committee on Taxonomy of virus.

HIV causes AIDS which can spread through sexual contact, sharing of contaminated needles, certain blood products and other body fluids. AIDS is one of the leading causes of death among young people in U.S and many other countries. Clinical features include pyrexia, pneumonia, weight loss, night sweats, cough, lymphadenopathy, chronic diarrhea, anemia, itchy maculopapular rash, hairy leukoplakia (Kelly, 1998, Llyed *et al.*, 1996, Zacharof *et al.*, 2001, Manca *et al.*, 1990)

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Totally 33 million people are affected by HIV throughout the world. More than a third of sexually active adult are affected in central Africa and east Africa. In the late 80's HIV began to spread in Asian continent mostly via bidirectional heterosexual spread. Many other cofactors such as number of sexual partners, presence of genital ulcers, general health status, and relative lack of circumcision also favours the spread of HIV (Krieger.,2011)

Incidence in India(WHO data.,2012):

Globally, 35.3 million [32.2–38.8 million] people were living with HIV at the end of 2012 (0.8%). Adult HIV prevalence (15-49) in South East Asia is 0.3 % (0.3-0.4%) in 2012. In 2009, the Government of India estimates 2.40 million Indians are living with HIV with an adult prevalence of 0.31%. Children's less than 15 years account for about 3.5% of all infections and 83% are in the age group of 15-49 years. Women contributes around 39 % (930,000). The four high prevalence states of South India were Andhra Pradesh contributing 500,000 followed by Maharashtra around 420,000, Karnataka with 250,000 and Tamil Nadu contributing 150,000 and accounting for major 55% of all HIV infections in India. The evolution of HIV pandemic provided wide range of information regarding etiopathogenesis, treatment and prophylaxis of both the disease and also opportunistic disease, development of the vaccines. Thus the information regarding the disease is enormous, making it more important for the health care specialist. The purpose of this study is to present the prevalence of the electrolyte disturbances among HIV -infected patients admitted in medicine and STD Dept. 's, Govt.· Rajaji Hospital, Madurai.

MATERIALS AND METHODS

This is a Cross sectional study conducted in Medicine Department, Govt. Rajaji Hospital, Madurai Medical College, Madurai. 150 patients admitted with HIV infection in the medical and STD wards, Govt. Rajaji Hospital from July to December 2008 formed the study group after getting the ethical clearance from the institute and informed consent. All patients with HIV infection, admitted in both medical and dept. of STD are included in this study which includes both AIDS related complex and AIDS. Since only symptomatic patients and patients with opportunistic infections (e.g. T.B meningitis, chronic diarrhea, are getting admitted in wards, asymptomatic patients were not included in this study. 111 male and 39 female patients were included in this study. Most patients were newly detected and some patients received anti retro viral therapy. Separation was not done. All 150 patients were HIV-1 positive for ELISA (Enzyme Linked Immuno Sorbant Assay). Test repeated and confirmed for all patients.

Tests for CD4+ count, blood sugar, blood urea, serum creatinine, Serum sodium, serum potassium done for all patients and were recorded properly. CD4+ count was done using flow cytometry. Blood Sugar, Blood Urea, Serum Creatinine, Serum Sodium, Serum Potassium are done by using automated analyzer. BUN (Blood Urea Nitrogen) values were calculated by using formula (BUN=blood urea/2.13). Since impaired renal function itself can alter the Serum Electrolytes, patients with elevated renal parameters were not included in this study.

Statistical Analysis:

The data were collected and entered in the Ms Excel .Data were analysed using SPSS Version 17. Frequency and percentage were calculated for the quality variables. The quantity variables were expressed as mean and standard deviation. The Pearson's Correlation is used evaluate the relationship between CD4Counts and Serum sodium and Potassium.

Kruskul Wallis test was used to test the significance of difference between quantitative variables. The p value of less than 0.05 was considered as statistically significant.

Results:

111 male and 39 female patients were included in this study. Sex distribution is shown in figure 1. It is shown in table 1 that the mean age,CD4 count, serum sodium and potassium levels were around 30.85 ± 4.78 years, $209.45 \pm 80.88/\mu\text{l}$, 136.65 ± 6.00 Meq/litre and 4.01 ± 0.95 Meq/litre respectively.

Table 1: Demographical and Laboratory Data.

	Mean	Std. Deviation	Range
Age	30.85	4.78	24-39
CD4 Count	209.45	80.88	75-349
Blood Sugar	78.28	15.45	60-100
Blood Urea Nitrogen	16.39	1.84	12.67-20
Creatinine	0.99	0.14	0.6-1.2
Serum Sodium	136.65	6.00	125-146
Serum Potassium	4.01	0.96	2.5-7.4



Fig. 1: Gender distribution

Among 150 patients, 52(34.7%) had hyponatremia and 98(65.3%) patients had normal sodium levels (Figure2). Among the 52 patients, female patients are 29(19.33%) and males are 23(15.33%) (Figure 3).

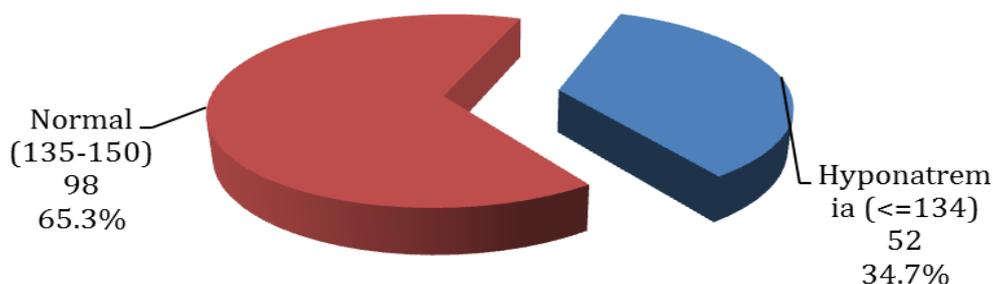


Fig. 2: Distribution of serum sodium level.

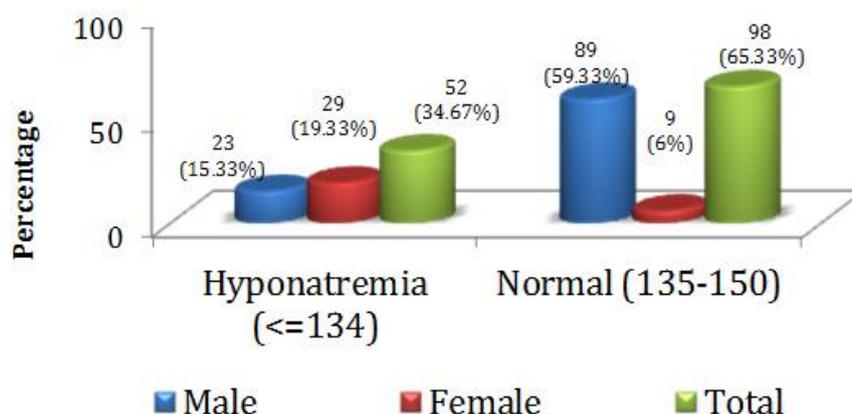


Fig. 3: Gender wise distribution of serum sodium levels.

There is a significant correlation between Serum sodium levels and CD4+ cell count (Pearson correlation is 0.622) (figure 4). Correlation is significant at the 0.05 level (2 tailed). Among 150 patients, 28 (18.7%) had hypokalemia and 108(72%) patients had normal potassium levels, 14(9.3%) patients had hyperkalemia (Figure 5).

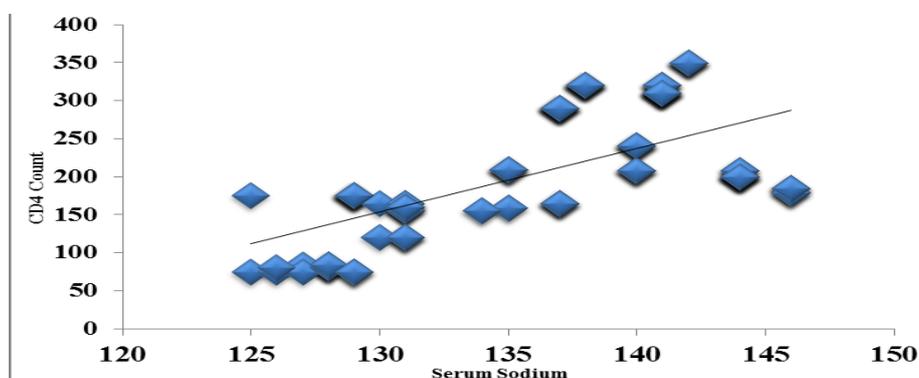


Fig. 4: Correlation between CD4 Count and Serum Sodium.

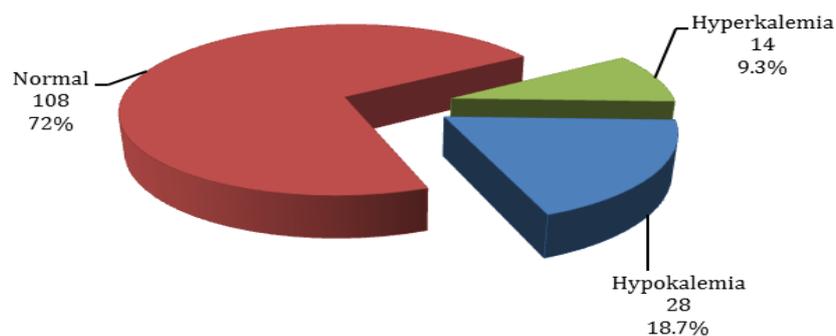


Fig. 5: Distribution of Serum Potassium levels.

All patients with Hypokalemia are males. Among 108 patients with normal potassium levels female and male patients are 33(22%), 75(50%) respectively (figure 6).

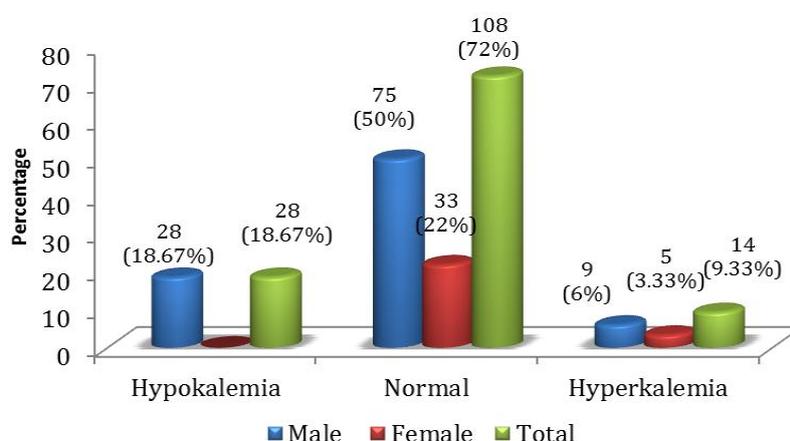


Fig. 6: Gender wise distribution of Serum Potassium Level

Among 14 patients with hyperkalemia 9(6.7%) patients are males and 5(3.3%) patients are females. There is no significant correlation between serum potassium levels and CD4+ cell count (Pearson correlation is 0.042) (figure 7).

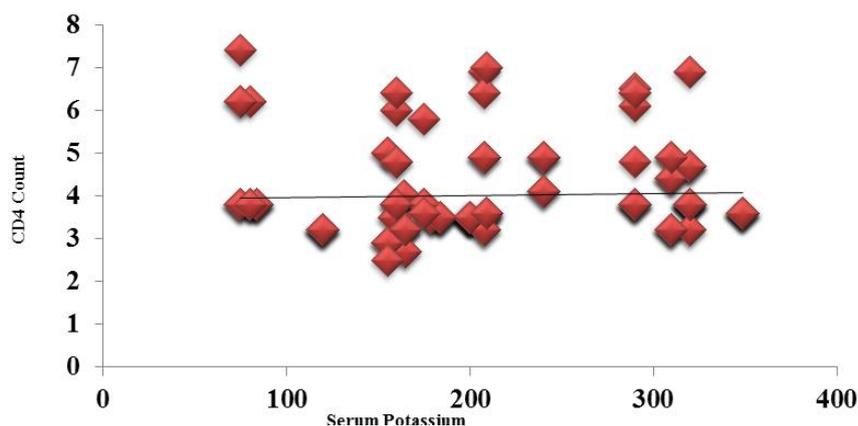


Fig. 7: Correlation between CD4 Count and Serum Potassium.

Discussion:

Hyponatremia, hypokalemia and hyperkalemia are common electrolyte disorders with HIV infected patients. It describes here a high incidence of electrolyte disorders among HIV infected patients admitted in Govt. Rajaji Hospital, Madurai. Numerous factors might have contributed to such high rates of electrolyte disturbances.

Among 150 patients, 52 patients had hyponatremia contributing 34.7%. The high incidence of hyponatremia may be due to volume depletion caused by diarrhea or vomiting (Agarwal *et al.*, 1989), persistent

release of antidiuretic hormone resulting from infections(Phair *et al.*,2011), the syndrome of inappropriate antidiuretic hormone (SIADH) (Agarwal *et al.*,1989). Persistent vomiting and the syndrome of inappropriate antidiuretic hormone (SIADH) will cause hyposmolar hyponatremia. But in SIADH the volume status will be euvolemic(Vitting *et al.*,1990).In one study, Burton D Rose *et al* found that Hyponatremia and hyperkalemia are the two major electrolyte disorders that may be associated with HIV infection(Burton *et al.*,2007). In addition, lactic acidosis, hyperuricemia, and hypophosphatemia have been described(Burton *et al.*,2007) and they have found that the incidence of hyponatremia in hospitalized HIV-infected patients has been reported to be between 35 and 55 percent. The results were comparable to this study. SIADH in HIV infection may be associated with common pulmonary and intracranial diseases such as *Pneumocystis jiroveci* pneumonia, toxoplasmosis, and tuberculosis, since most of the patients were admitted for their opportunistic infections. Hyponatremia due to volume depletion caused by diarrhea or vomiting can be distinguished from the SIADH by the low urine sodium concentration (usually below 15 mEq/L) and correction of the hyponatremia with fluid repletion(Burton *et al.*,2007). Defective renal sodium conservation due to HIV infection of the kidney itself can cause hyponatremia(Cusano AJ *et al.*,1990). There is a significant correlation between serum sodium levels and CD4+ cell counts (Pearson correlation is 0.622). Correlation is significant at the 0.01 level (2-tailed). This is probably because that the opportunistic infections are more common with lower CD4+ cell counts. Among 150 patients, 28(18.7%) had hypokalemia and 108(72.0%) had normal potassium levels, 14 had hyperkalemia (9.3%) (Figure 5). Both hypokalemia and hyperkalemia are common with HIV infection. In this study Hypokalemia (18.7%) more common than hyperkalemia (9.3%). There is no significant correlation between serum potassium levels and CD4+ cell count (Pearson correlation is 0.058). Hypokalemia may be because of gastrointestinal infections causing vomiting or diarrhea(karras *et al.*,2003,Verhelst *et al.*,2002,coca *et al.*,2002). Amphotericin B, frequently use to treat fungal infections in patients with AIDS; can cause tubular dysfunction resulting in hypokalemia. Tenofovir has been associated with proximal tubular dysfunction resulting in an electrolyte wasting state, including life- threatening Hypokalemia(karras *et al.*,2003,Verhelst *et al.*,2002,coca *et al.*,2002).Drug-induced hyperkalemia is common among patients receiving either high-dose Trimethoprim-Sulfamethoxazole or intravenous pentamidine(velazque *et al.*,1993,kleyman *et al.*,1995). In a manner similar to the action of potassium-sparing diuretics such as amiloride, both drugs inhibit distal nephron sodium transport, leading to a decrease in potassium secretion(velazque *et al.*,1993,kleyman *et al.*,1995). Hyperkalemia and hyponatremia also may be a manifestation of mineralocorticoid deficiency resulting from adrenal insufficiency or the syndrome of hyporeninemic hypoaldosteronism(marks *et al.*,1991,kalin *et al.*,1987). Adrenal causes of hyperkalemia often respond clinically to treatment of the underlying disorder, loop diuretics, or fludrocortisones(kalin *et al.*,1987)

Conclusion:

Hyponatremia, hypokalemia and hyperkalemia arc common electrolyte disorders with HIV infected patients. Because of the high incidence of the electrolyte disturbances with HIV infected patients, close monitoring and aggressive management are mandatory.

Limitation of the study:

This study does have certain limitations, including a limited sample size. WESTERN BLOT could not be performed because of limited resources. Patients with symptomatic and asymptomatic electrolyte disturbances were not grouped. The etiology of the electrolyte disturbances could not be found out because of limited resources.

ACKNOWLEDGEMENT

We thank Mr.Eswaran,Mr.Vinod for their valuable contribution.

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