

## Original Research Article

# A prospective study of serum electrolyte disorders and their clinical manifestation in HIV patients

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### ABSTRACT

**Background:** Present study was conducted to evaluate the serum electrolyte disorders and their clinical manifestation in HIV positive patients.

**Methods:** Total 100 patients who were known to be HIV positive or those who were found to be HIV positive were taken. HIV infection was diagnosed by one ELISA and two E/R/S test. All clinical diagnosis medication and routine chemical profiles were recorded along with detailed history and physical examination. Fluid depletion was inferred from the findings like decreased skin turgor, dry mucus membrane; fluid overload was ascertained by presence of jugular venous distension and dependent pulmonary rales. Hyponatremia was defined as a serum sodium concentration less than 135mmol/L and hypokalemia was defined as potassium concentration less than 3.5mmol/L.

**Results:** Eighty percent patients had disorders of electrolyte imbalance. Most common electrolyte was hyponatremia (58%) and hypokalemia (28%). The mean serum sodium concentration was  $133.48 \pm 7.06$  and potassium concentration was  $3.87 \pm 0.63$ . Neuromuscular manifestation and neuropsychiatric manifestation were present in 58% and 49% respectively.

**Conclusions:** Patients with HIV infection may develop a bewildering variety of electrolyte and acid-base disturbances. Hyponatremia and hypokalemia from many causes is common and associated with an increased mortality.

**Keywords:** Acquired immunodeficiency syndrome, HIV, Serum sodium level, Serum potassium level

### INTRODUCTION

AIDS (Acquired immunodeficiency syndrome) is a multifactorial disorder caused by infection with human immunodeficiency virus (HIV) which is a member of retrovirus family.<sup>1</sup> There are two types of human immunodeficiency virus HIV and HIV.<sup>2</sup> HIV is predominantly a sexually transmitted viral infection. The receptors for the virus are a CD4 antigen cells and hence the HIV virus can affect any cell that carry CD4 antigen on their cell surfaces, which are mainly T4 cells. HIV infections causes both decrease in absolute number and also suppression in immunological functions and therefore produce a noticeable dampening of cells

mediated immune reaction. The clinical sign of HIV infection are not mainly due to viral cytopathology but the secondary to the failure of immune responses, which renders the patients at risk to the innumerable of opportunistic infection and malignancies.<sup>3</sup>

For clinical evaluation of any patients with HIV infection the CD4 cell count is an important investigation, as it helps to fix on the disease status and stages.<sup>4</sup>

At present HIV infection has now become a worldwide pandemic and the second most leading cause of disease burden globally. An estimated 35.3 million people were living with HIV in 2012 worldwide. Increases from

previous years as more and more people are getting the life saving antiretroviral therapy. Nearly 2.3 million new HIV infections were estimated worldwide, demonstrating a 33% reduction in the number of new HIV infections from 3.4 million in 2001.<sup>5</sup>

A number of electrolyte and fluid abnormalities can arise in advanced HIV infection, yet these receive little attention in literature.<sup>6,7</sup>

Various conditions encountered commonly with HIV infected patients that may lead to electrolyte disorders are: Gastrointestinal loss due to vomiting, diarrhea, syndrome of inappropriate ADH secretion, adrenal insufficiency, renal involvement and drugs intravenous fluids etc.<sup>8</sup>

Sodium is the principal cation in extracellular fluid and is the main determinant of plasma osmolality.<sup>9</sup> Hyponatremia is defined as serum sodium of less than 135mmol/L and true hyponatremia usually reflects a hypotonic state. Hypernatremia, serum sodium of more than 145mmol/L, results from impaired water ingestion, although increased water losses are often contributory.<sup>10</sup>

Potassium is the major intracellular cation. Serum potassium less than 3.5mmol/L is hypokalemia; more than 5.0 mmol/L is hyperkalemia. Significant disturbance of potassium homeostasis are often unrecognized and may cause considerable morbidity and mortality.<sup>11</sup>

A study by Tang et al, reported hyponatremia in hospitalized patients with acquired immunodeficiency syndrome and AIDS related complex, and concluded that it is a common electrolyte disorder in such patients, associated with gastrointestinal losses or SIADH as well as increased morbidity and mortality.<sup>12</sup> In other study conducted by Kalin et al, also reported that hyporeninemic hypoaldosteronism associated with AIDS after four patients with persistent unexplained hyperkalemia were studied.<sup>13</sup> Electrolyte disorders can produce numerous clinical manifestations that may result in considerable morbidity and even mortality. However, most such manifestation is reversible if appropriate treatment is instituted.<sup>14</sup>

HIV infected persons have repeated episodes of illness and impairment requiring clinical management including occasional hospitalization.<sup>15</sup> Since many of the comorbid conditions occurring with HIV infections are known to cause disorders of electrolyte, it is crucial to evaluate the HIV positive patients for serum electrolyte abnormalities and to correlate them with their clinical condition.<sup>16</sup>

Studies on electrolyte disorders in HIV infected patients have previously been done in western nations; however, there is a pressing need for elaborate studies on the same in India as there are obvious difference not only in the clinical profile of patients with HIV in India. With AIDS

already being a leading cause of disease burden, it is essential to determine factor that increase morbidity and mortality.

**METHODS**

The present study was conducted in The Jawahar Lal Nehru Medical College and Hospital, Ajmer. This study evaluated prospectively hospitalized patients who were known to be HIV positive or those who were found to be HIV positive during the course of their hospitalization. Total of 100 patients whose informed consent was taken after pretest counseling were include. All diagnostic criteria were defined prospectively.

Study included HIV positive patients (Seropositive for HIV1 andHIV2) registered at ART center or admitted in Department of Medicine. HIV infection was diagnosed by one ELISA and two E/R/S tests. All clinical diagnosis medication and routine chemical profiles were recorded along with detailed history and physical examination. Fluid depletion was inferred from the findings like decreased skin turgor, dry mucus membrane; fluid overload was ascertained by presence of jugular venous distension and Dependant pulmonary rales. Hyponatremia was defined as a serum sodium concentration less than 135mmol/L and hypokalemia was defined as potassium concentration less than 3.5mmol/L. Data analysis done using appropriate statistics.

**RESULTS**

Present study was conducted in JLN medical college, Ajmer on 100 HIV positive patients. The mean age of the patients was 39.2±9.71 years. Males were slightly higher than in the study population (80%) and females were only 20% of the studied population. The most common presenting complaints of the patients was delirium/irritability/psychosis (54%), second most was diarrhea and fever (44%), cough was present in 35% patients, weakness and anorexia were present in nearly 28% studied population. Lastly, a complaint about seizures was present only in 8% patient population (Table 1).

**Table: 1 Age, sex and complaints of HIV patients.**

Patient's criteria	Mean
Age	39.2±9.71 years
Sex	Males (80); Females (20)
Complaints	Delirium/ Irritability/Psychosis (54), diarrhea (44), Fever (44), Cough (35), Weakness (27), Anorexia (28), Seizure (8).

Fourteen patients had both hyponatremia and hypokalemia, 42 patients had hyponatremia and normokalemia, and only 2 patients had hyponatremia and hyperkalemia. 11 patients had normonatremia and hypokalemia, 20 patients had normonatremia and normokalemia and only 3 patients had normonatremia

ang hyperkalemia. Only 3 patients had hypernatremia and hypokalemia, 5 had normokalemia and hypernatremia and 0 had hyperkalemia and hypernatremia.

Out of 100 patients, only 40 patients were found to have clinical hypovolemia. Only 8 patients had severe hyponatremia and only 1 patient had severe hypokalemia. Mostly patients had moderate or mild type of hyponatremia or hypokalemia. Table 3 show neuromuscular and neuropsychiatric manifestation in HIV patients. We found total 58 patients having neuromuscular manifestation, out of them 46 patients had

sodium electrolyte disorders and 12 patients had neuromuscular manifestation having normonatremia. 49 patients having neuropsychiatric manifestations out of them 36 had sodium electrolyte disorders and 13 patients had neuromuscular manifestation having normonatremia. Out of these 58 patients having neuromuscular manifestation, 19 had potassium electrolyte misbalance and 39 had normokalemia. Similarly, out of these 49 patients having neuropsychiatric manifestation, 21 had potassium electrolyte misbalance and 28 had normokalemia.

**Table 2: Prevalence of electrolyte disorders in HIV patients.**

	Hypokalemia	Normokalemia	Hyperkalemia	Total
Hyponatremia	14	42	2	58
Normonatremia	11	20	3	34
Hypernatremia	3	5	0	8
Total	28	67	5	100

**Table 3: Neuromuscular and neuropsychiatric manifestation in HIV patients.**

	Neuromuscular	Neuropsychiatric
Sodium electrolyte disorder	46	36
Normonatremia	12	13
Total	58	49
Potassium electrolyte disorder	19	21
Normokalemia	39	28
Total	58	49

**Table 4: Mortality in hyponatremic and hypokalemic patients.**

	Number	Percentage
Hyponatremic patients who died (n=58)	17	29.30
Normonatremic patients who died (n=34)	3	8.82
Hypokalemic patients who died (n=28)	14	50
Normokalemic patients who died (n=67)	6	8.95
Total patients died (n=100)	20	20

Out of 58 hyponatremic patients 17 died, out of 34 normonatremic patients 3 died, out of 28 hypokalemic patients 14 died and out of 67 normokalemic patients 6 died. Thus Table 4 show that mortality in hyponatremic and hypokalemic group was higher than in the normonatremic and normokalemic group.

**DISCUSSION**

The vast spectrum of illness and co-morbid conditions in HIV infected individual predispose them to variety of fluid and electrolyte disorders. There has been an explosion of information in the field of HIV/AIDS through a precedent research program and several studies

have documented the electrolyte abnormalities in HIV positive patients.

The present study attempted to investigate the prevalence of sodium and potassium disorders in hospitalized HIV positive patients and to study their clinical associations.

In the present study, majority of patients were of relatively young age. The mean age of patients in this study was 39.2±9.71, reflecting the epidemiology of HIV infections which affects primarily the young. This is comparable to similar studies in HIV infected patients. The study of hyponatremia in AIDS by Agrawal et al, had an average age of 34.5 years.<sup>17</sup> Similarly, the mean

age of patients in the study of hyponatremia and AIDS by Tang et al was  $36 \pm 1$  years.<sup>12</sup>

In this study there was a preponderance of males. Out of 100 patients, 80 were males and 20 were females. In study Tang et al, in 1993 on hyponatremia on hospitalized patients with AIDS, there were 206 men and 6 women.<sup>12</sup>

In the present study, the most common presenting complaints were weight loss (55), altered sensorium (54), Diarrhea (48) and fever (48). This is in comparison with the report of Gupta et al, of 8200 cases reported to NACO by the end of July 99 in which the most common symptoms were weight loss diarrhea, fever and cough.<sup>18</sup>

Gennari GF, reported that hypokalemia is found in over 20 of hospitalized; Mandal AK has mentioned that hyperkalemia is not as common as hypokalemia and that its incidence is rather insignificant.<sup>19,11</sup> Similarly, Vitting et al, studied 71 hospitalized AIDS patients retrospectively and 48 patients prospectively had found hyponatremia in 52 and 56 respectively.<sup>20</sup> The current study also obtained similar results; out of total of 100 hospitalized HIV positive patients, 58 patients were found to have hyponatremia. In the current study too, out of total 100 patients 28 patients were found to have hypokalemia.

Hypokalemia was an electrolyte abnormality that was found to be much less common patients with advanced HIV disease at the San Francisco General Hospital.<sup>6</sup> This was also true in the current study, in which hyperkalemia was present in 5 patients out of 100.

In the current study, the range of serum sodium concentration was from 119-152mmol/L; and the mean was  $133.5 \pm 7.24$ . The mean serum sodium concentration in the hyponatremic patients was  $128.41 \pm 3.14$  and in the normonatremic patients it was  $138.64 \pm 2.67$ . This was similar to the values obtained in the study by Tang et al, ( $128 \pm 1$  and  $138 \pm 1$  respectively).<sup>12</sup>

The range of potassium in the current study was from 1.9-5.9; the mean was  $3.87 \pm 0.66$ . The mean serum potassium in the hypokalemic patients was  $3.11 \pm 0.29$  and in the normokalemic patients it was  $4.08 \pm 0.34$ . In the current study, an attempt was made to classify the hospitalized HIV positive patients according to their fluid status by clinical examination. Previous studies have also used similar means, in their study of hyponatremia in AIDS/AIDS related complex; Tang et al, classified patients based on clinical assessment of extracellular fluid volume.<sup>12</sup> They used the following criteria-historical evidence of volume depletion (like diarrhea) and one of the following physical findings-orthostatic hypotension, poor skin turgor, and or dry mucus membranes.

Vitting et al, also used similar criteria in their study, further fluid overload was suggested by presence of

jugular venous distension, dependent pulmonary rales, third heart sound, ascities/ pleural effusion or dependent edema.<sup>20</sup> The present study found 40 patients out of 100 to be hypovolaemic. No patient was found to have fluid overload by the clinical criteria used in this study.

The present study also attempted to associate electrolyte disorders in the hospitalized HIV positive patients with neuromuscular and neuropsychiatric manifestation. Vitting et al, had reported that was difficult to assess the morbidity from hyponatremia per se in a group of patients with many non-specific and constitutional symptoms and frequent nervous system disease with its attendant symptomatology.<sup>20</sup>

For the present study, the presence or absence of neuromuscular manifestation-cramps, weakness, abnormal deep tendon reflexes, seizures and coma; and 3 neuropsychiatric manifestation-Delirium, irritability and psychosis were considered.

The present study revealed a higher prevalence of neuromuscular manifestation in patients with serum sodium abnormalities when compared with patients with normal serum sodium; this was statistically significant. No association could be drawn between potassium disorders and neuromuscular manifestation because of a smaller sample size and co-existing sodium disorders in patients with normal and disordered potassium levels.

Finally, the present study attempted to assess whether there was an association between sodium/potassium disorders and mortality. Out of 100 patients, 20 patients died. Out of them 17 were hyponatremic, 3 were normonatremic, 14 were hypokalemic and 6 were normokalemic. This difference between the hyponatremic-normonatremic group and hypokalemic-normokalemic group was statistically significant. The study by Tang et al, had also made a similar observation, where the mortality in the hyponatremic group and hypokalemic group was significantly higher than normal groups.<sup>12</sup>

However, as the serum electrolyte levels of all patients in the study could not be obtained immediately on admission, a limitation of this study was that it could not assess the role of intravenous fluids and medicine with regard to electrolyte disorders.

## CONCLUSION

Patients with HIV infection may develop a bewildering variety of electrolyte and acid-base disturbances. Hyponatremia and hypokalemia from many causes is common and associated with an increased mortality. Acid-base disorders also complicate the clinical course of AIDS and, as with the electrolyte perturbations, may result from HIV infection itself, the illnesses associated with AIDS, or medications. Hyponatremia hypokalemia are the marker of severity of HIV-disease but not an

independent risk factor for mortality. HIV-patients with low serum sodium or potassium at baseline might benefit from a close follow-up to improve outcomes.

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