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Evaluation of electrolyte imbalance among tuberculosis patients receiving treatments in Southwestern Nigeria

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KEYWORDS

Tuberculosis;
Tubercule bacilli;
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Abstract *Background:* Electrolyte disturbances have been reported in both tuberculosis (TB) infection alone and TB-HIV co-infected patients.
Objectives: To evaluate the effects of treatments on the imbalance of some electrolytes among patients infected with *Mycobacterium tuberculosis* in Osogbo Southwestern Nigeria.
Methodology: A total of one hundred and ten patients participated in this study. They were divided into four groups as follows: group 1 contains 50 normal patients without TB or HIV infection (M = 25; F = 25), group 2 20 new positive cases of TB patients without HIV infection (M = 13; F = 07), group 3 20 new positive cases of tuberculosis co-infected with HIV infection (M = 10; F = 10), and group 4 20 positive cases of TB patients on anti tuberculous drugs (M = 11; F = 09). All patients were screened for the presence and absence of TB, HIV and the level of some electrolytes in plasma (sodium, potassium, chloride and bicarbonates) were determined using standard methods.
Results: Levels of sodium in TB patients on drugs (TBD) were significantly lowered compared to new case tuberculosis (NCT) patients (134.80 ± 5.83 mmol/L vs 142.10 ± 6.68 mmol/L) while potassium levels were significantly elevated in TB patients on drugs compared with their new case counterparts (3.75 ± 0.15 mmol/L vs 3.07 ± 0.42 mmol/L) $P < 0.05$ respectively. Chloride levels

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were significantly decreased in TB patients on treatment compared to new case tuberculosis NCT (99.26 ± 6.85 mmol/L vs 108.76 ± 8.42 mmol/L) while serum bicarbonate levels were significantly elevated in TB patients on drug (TBD) compared to their NCT counterparts (24.00 ± 1.81 mmol/L vs 21.00 ± 2.05 mmol/L, $P < 0.05$, respectively).

Conclusion: Hyponatraemia, hyperkalaemia, and hypochloremia characterized some of the electrolyte imbalance among TB patients receiving treatments. The raised level of bicarbonate may be attributed to overcorrection of respiratory acidosis often found in patients with tuberculosis. Monitoring electrolytes is therefore an important component of TB management.

1. Introduction

Tuberculosis is a major cause of morbidity, disability and death.[1] It accounts for 2–3 million deaths per annum, globally.[1,2] One third of the World population has been exposed to the TB bacterium, and new infections occur at a rate of one per second.[3] In 2006, a total of 1.7 million people died of TB including 231,000 people with HIV.[3] Nigeria has the fourth highest burden of Tuberculosis (TB) in the world, with an annual incidence of 311 cases per 100,000 population and a mortality rate of 81 per 100,000 population in 2006.[4] In Nigeria, about 21% of all TB patients are dually infected with TB and HIV.[4,5]

Factors contributing to the resurgence of tuberculosis in developing countries include co-infection with HIV; emergence of multiple resistant tuberculosis, inadequate treatment, poverty, malnutrition, overcrowding, armed conflict and increasing numbers of displaced persons. diarrhea, vomiting, and excessive sweating, are common features of HIV/AIDS and Tuberculosis infections and have been described as possible cause of loss of water and electrolyte. However, reports showed that the frequency and nature of renal and electrolyte abnormalities in HIV patients vary considerably from centre to centre.[6] Fluid-electrolyte and acid-base derangements frequently encountered in AIDS and TB, have been found to be major factors for the development of acute renal failure.[7]

In view of this associated water and electrolyte derangement and associated cytochemical changes in Tuberculosis and HIV infections, this study was designed to determine the effect of treatment on common electrolytes and free radical status in patients with tuberculosis and those with co-infection with HIV. Comparing electrolyte values in controls with pulmonary tuberculosis patients not on treatment, comparing electrolyte values in controls with pulmonary tuberculosis patients on treatment, and electrolyte in pulmonary tuberculosis patient on treatment with those not on treatment could all contribute to the body of knowledge on electrolyte disturbances associated with these diseases. The overall objectives of this study are to evaluate the effects of treatments on the imbalance of some electrolytes among patients infected with *Mycobacterium tuberculosis* in Osogbo Southwestern Nigeria

2. Methods

2.1. Study location

The study location was Osogbo, the capital city of Osun State. With a population of about half a million, HIV prevalence of 25% was reported among TB positive in 2010, though HIV prevalence in the state was a bit lower than the national average of 4.1.[8] There are numerous health facilities providing care at different levels of health care. There are two non governmental organizations whose presence could be felt in the areas of HIV and TB in the city.

2.2. Study design

Descriptive cross sectional study among various categories of TB infected patients.

2.3. Study population

Include 4 categories of patients, recruited from four TB management centres in Osogbo. The categories are

(a) Group 1: 50 normal patients without TB or HIV in the sex ratio of 1:1.
(b) Group 2: 20 new positive cases of *M. tuberculosis* patients without HIV in the ratio of M:F of 2:1.
(c) Group 3: 20 new positive cases of tuberculosis co-infected with HIV in a sex ratio of 1:1.
(d) Group 4: 20 positive cases of *M. tuberculosis* patients on anti tuberculous drugs with 11 males and 09 females.

2.4. Exclusion criteria

Patients with symptoms of malaria fever, Diabetes Mellitus, severe malnutrition, patients with intestinal infection which could lead to dysentery, women using contraceptives, patients on corticosteroid therapy, pregnant women and patients with symptoms of jaundice were excluded from this study.

2.5. Ethical approval

The study received approval of the ethics review committee of LAUTECH Teaching Hospital Osogbo. Written informed consent was obtained from each subject after the study has been explained to them.

2.6. Sampling procedure

Two Primary Health Care (PHC) centers were randomly selected from the list of primary health facilities to complement