ORIGINAL RESEARCH PAPER
VOLUME-6 | ISSUE-5 | MAY - 2017 | ISSN No 2277 - 8179 | IF : 4.176 | IC Value : 78.46
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

EVALUATION AND COMPARISON OF SERUM ELECTROLYTES IMBALANCE AMONG PATIENTS WITH PULMONARY TUBERCULOSIS, HIV, HIV CO-INFECTED WITH PULMONARY TUBERCULOSIS & CONTROLS.

Pulmonary Medicine

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ABSTRACT

Electrolyte disturbance reported in PTB, HIV and HIV-PTB patients. We conducted a prospective study in 172 patients, to evaluate & compare electrolyte imbalance in PTB, HIV & HIV-PTB. All patients were screened for PTB, HIV & levels of serum Sodium, Potassium & chloride Levels Using Standard methods. Study showed Lower mean values of sodium in HIV-PTB, PTB, HIV Vs Control. Lower mean values of potassium in PTB Vs HIV-PTB, HIV. Higher mean values of potassium in HIV, Chlorides in HIV-PTB was found compared to controls. Lower mean values of chloride were found in PTB Vs Control, HIV-PTB. This study showed Hyponatremia, Hypokalemia, hypochloremia in PTB patients. Hyperkalemia in HIV patients & Hyperchloremia in HIV-PTB were seen. Strict Monitoring of serum electrolytes in PTB, HIV-PTB, and HIV is recommended, as early detection and treatment will enhance the quality of life of patients.

KEYWORDS:

PulmonaryTuberculosis, HumanimmunodeficiencyVirus, Electrolytes.

Introduction

Tuberculosis (TB) remains a major global health problem, responsible for ill health among millions of people each year. TB ranks as the second leading cause of death from an infectious disease worldwide, after the human immunodeficiency virus. In 2014 there were 9.6million new TB cases of which 1.2 million were among people living with HIV and 1.5 million TB deaths (1.1 million among HIV-negative people and 0.4 million among HIV-positive people.[1]

Electrolyte abnormality result from common complication of disease like sepsis, dehydration and other nephrotoxic drugs commonly used in AIDS treatment. Serum electrolyte abnormality and altered mineral metabolism in patients with HIV/AIDS/PTB have found to contribute to bone disease, cardiovascular disease and other clinical problem resulting in increased morbidity and mortality.[2] Recent studies reported that fluid and electrolyte imbalance frequently encountered in HIV/AIDS and TB, have been found to be major factor for morbidity and mortality[3,4]. Electrolyte disturbances is one of the most challenging complication because of paucity of presenting symptom & potential morbidity associated with this disorder thus monitoring of serum electrolyte level is very necessary for early detection & treatment of these abnormalities will improve the quality of life of individual. Although variation in the concentration of essential elements was reported in several pathological condition but their levels in sera of TB with or without HIV co infection is not well documented. In-view of this, associated water & electrolyte derangements & a cytochemical changes in TB & HIV infections, this study is designed to determine common electrolyte abnormality in patients with TB , HIV & those co infected with HIV.

Materials and methods:

Study Design: The present study was conducted from September 2015 to December 2016 in Kamla Nehru Chest Hospital, Dr.S.N.Medical College, Jodhpur, a tertiary care centre for respiratory diseases in western part of Rajasthan. This was a cross sectional descriptive study done to see the electrolyte abnormalities in patients with PTB, HIV and HIV-PTB attending Chest Hospital.

Sample Size: Patients of all ages admitted in Department of Tuberculosis & Respiratory Diseases of our Hospital, who presented with signs, symptoms and history suggestive of Pulmonary Tuberculosis, HIV and willing to participate in the study were enrolled after proper counselling. The protocol was explained to the patient/care provider before enrolment and informed consent was taken from each patient. 263 patients were screened and 91 patients were excluded because they were not fulfilling the inclusion criteria. All 172 patients underwent complete clinical workup.

Study Population: Included 4 Categories of patients, recruited from Department of Pulmonary Medicine and Infectious Diseases, Kamala Nehru Chest Hospital Jodhpur.

GROUP1: 30 New HIV co infected with PTB (M = 21; F=09)
GROUP2: 32 New PTB patients (M = 23; F = 09)
GROUP3: 30 New HIV patients (M =22; F = 08),
GROUP4: 80 Normal patients without PTB & HIV Infection (M=50; F=30)

Eighty (80) controls for the study were recruited among volunteers who were on routine medical check up at Department of pulmonary Medicine and Infectious disease KNCH. They were matched for age and sex with the cases. All controls were screened for HIV and pulmonary Tuberculosis and confirmed Negative.

Study Method: Study method included Detailed History, examination, chest x-ray, sputum smear by ZN staining, Serum Electrolytes (sodium, potassium, chlorides), CD4 Count and other

baseline tests like CBC, ESR, LFT. T3, T4, TSH in patients with symptoms of hypothyroidism. Blood Sugar, serum albumin, HIV, ECG were performed in Kamla Nehru Chest Hospital and Mahatma Gandhi Hospital, Jodhpur.

Pulmonary tuberculosis was diagnosed based on history, clinical features, sputum ZN Staining (AFB Positive and Negative) and chest X-Ray as per RNTCP Guidelines.

HIV was diagnosed using history, clinical features and ELISA card test, Western blot as per NACO guidelines.

Inclusion Criteria: Newly Diagnosed patients with pulmonary tuberculosis (AFB positive and Negative), HIV and those HIV co-infected with pulmonary tuberculosis.

Exclusion Criteria

1. On Diuretics, steroid therapy
2. Cardiac Disease
3. Diabetes mellitus
4. Thyroid disease
5. Adrenal disorder
6. Renal insufficiency / Failure.
8. Abnormal mental status
9. Pregnant women
10. e/o TB Meningitis
11. Patients with jaundice
12. Diarrhea

STATISTICAL ANALYSIS: Data was entered using Microsoft Excel 2007 and analyzed using Software SPSS 24th Version dated 15th March 2016. Statistical analysis was done by using Chi square test /Fischer Exact Test and student unpaired t test.

Ethical committee approval: The study received approval of ethics review committee of Dr.S.N. Medical College, Jodhpur.

RESULTS:

TABLE I: DEMOGRAPHIC PROFILE OF PATIENTS UNDER STUDY

Parameters		HIV-PTB N=30	PTB N=32	HIV N=30	CONTROLS N=80
Age (Years) Mean±SD		39.83±10.59	42.81±11.93	39.83±9.42	41.37±10.42
SEX	MALE	21	23	22	50
	FEMALE	09	09	08	30
OCCUPATION	STONE CUTTER	04	09	01	21
	FARMER	06	09	07	13
	PRIVATE JOB	13	04	07	07
	HOUSE WIFE	01	07	07	12
	OTHERS	02	03	07	05
	NIL	03	00	01	18
ADDICTION	SMOKER	12	18	18	27
	TOBACCO CHEWING	04	06	07	15
	ALCOHOL	13	09	11	18
	OPIUM	05	03	00	08
BMI(Kg /m2)	19.58±3.08	19.71±3.13	20.24±4.23	23.82±3.54	

TABLE II: SUMMARY MEAN (X) ± STANDARD DEVIATION OF ELECTROLYTES

PARAMETER	(n)	SODIUM (Meq/L)	POTASSIUM (Meq/L)	CHLORIDES (Meq/L)
HIV-PTB	30	131.53±7.89	3.82±0.64	103.89±10.24
PTB	32	131.71±7.98	3.32±0.83	96.81±6.26
HIV	30	134.13±5.28	3.95±0.47	95.86±5.42
CONTROL	80	136.36±4.59	3.62±0.49	100.05±4.74

TABLE III: COMPARISON OF SERUM ELECTROLYTES OF HIV-PTB, PTB, HIV VERSUS CONTROL

PARAMETER	HIV-PTB Vs CONTROL			PTB Vs CONTROL			HIV Vs CONTROL		
	SODIUM	POTASSIUM	CHLORIDE	SODIUM	POTASSIUM	CHLORIDE	SODIUM	POTASSIUM	CHLORIDE
t-Value	3.97	1.67	2.68	3.856	1.428	2.96	2.173	3.11	3.96
P-Value Unpaired student t test	<0.05	>0.05	<0.05	<0.05	>0.05	<0.05	<0.05	<0.05	<0.05
Level of Significance	Lower Significant	Not Significant	Higher Significant	Lower Significant	Lower Significant	Lower Significant	Lower Significant	Higher Significant	Lower Significant

HIGHER SIGNIFICANT - Means higher levels of electrolytes compared to control was statistically significant. Similarly for Lower Significant.

TABLE IV:COMPARISON OF SERUM ELECTROLYTES (NA+,K+,CL-) OF HIV-PTB VERSUS HIV & PTB, PTB VS HIV

PARAMETER	HIV-PTB Vs HIV			HIV-PTB Vs PTB			HIV Vs PTB		
	SODIUM	POTASSIUM	CHLORIDE	SODIUM	POTASSIUM	CHLORIDE	SODIUM	POTASSIUM	CHLORIDE
t-Value	0.09	2.11	3.3	1.49	0.907	3.79	1.393	3.253	0.63
P-Value Unpaired student t test	>0.05	<0.05	<0.05	>0.05	>0.05	<0.05	>0.05	<0.05	>0.05
Level of Significance	Not Significant	Lower Significant	Higher Significant	Not Significant	Not Significant	Higher Significant	Not Significant	Lower Significant	Not Significant

Discussion

The lower mean values of sodium was significant in patients with PTB co-infected with HIV,HIV when compared to controls(131. 53± 7.89 Vs 136.36±4.59,134.13±5.28 Vs 136.56±4.59, P<O .O5) is consistent with other study by Kaile et Al.[5,12] This can be attributed to loss of sodium in urine, sweat, deficient intake due to malnutrition as presented by 61.4% patients with Low BMI(Underweight).Similar lower significant Mean Values were found in other studies by Adebimpe Wasiu Olalekan(6) & Olaniyan M.Folaranmi [7].

The Lower mean values of sodium was significant in patients with PTB when compared with controls (134.13±5.28 Vs 136.36±4.59, P<0.05) is attributable to dehydration due to vomiting, muscle Wasting, Fever and because sweat is hypotonic compared to plasma the same reason may also hold good for HIV infected patients, and findings of low sodium in PTB are consistent with other study.[6,12].

The Lower mean values of potassium was significant in patients with PTB when compared to Controls(3.32±0.83 Vs 3.62±0.49) agrees with the facts reported earlier, that in stress due to severe illness(with moderate and far advanced disease in chest X ray) there is increased catabolism of body protein leading to movement of potassium from the intracellular compartment to the plasma and consequently excreted in Urine, Sweat and vomiting without any compensatory replacement through food due to anorexia, a common feature of pulmonary Tuberculosis. [6,7]

The higher mean value of potassium was significant in patients with HIV when compared to controls (3.95±0.47 Vs 3.62±0.49,P<0.05) is

attributed to fact that in HIV/AIDS infection there is killing of cells by Virus, High grade pyrexia/fever {causing destruction of cells} and therefore leading to the efflux of potassium from the cells to the plasma.[9,10,11]. The higher mean value of potassium was found in HIV-PTB patients when compared to controls(3.82±0.64 Vs 3.62±0 .49,P>0.05)but was statistically not significant.

The Lower mean value of chlorides was significant in patients with HIV and PTB (96.81±6.26, 95.86±5.42 Vs 100.05±4.74,P<0.05) gave the same pattern as the level of sodium and is consistent with the other study,[6] because sodium is always (in most cases) is in association with chlorides, therefore the same reason for the level of sodium holds good for this. Due to unknown reason, Higher Significant values of chlorides was found in HIV-PTB when compared with the PTB and controls(103.89±10.24 Vs 96.81±6.26,100.05±4.74, P<0.05), findings are consistent with the other study by Olalekan Et al[6].., The Lower mean value of potassium was significant in patients with HIV-PTB when compared with HIV(3.82±0.64 Vs 3.95±0.47,P<0.05)[6,7] , same reason as above holds good. The findings suggest that lower mean values of potassium in HIV-PTB are more than in HIV. The Lower mean value of potassium was significant in patients with HIV when compared with PTB (3.95±0.47 Vs 3.32±0.83,P<0.05),same reason as above holds good. This finding suggests that lower mean values of potassium in HIV are more than in PTB.

The limitations of our study were:

1) Sputum culture was not done.
2) We could not investigate the patho-physiology of electrolyte abnormalities any further in these patients so we recommend further evaluation on electrolyte abnormalities in Pulmonary Tuberculosis, HIV and HIV-PTB.

Conclusion

The findings of our study demonstrate that serum electrolytes abnormalities occur in HIV-PTB,HIV and PTB Patients. Hyponatremia being most common in HIV, PTB & HIV-PTB Co-infection, hyperkalemia in HIV, Hypokalemia in PTB, Hypochloremia in PTB and HIV, Hyperchloremia in HIV-PTB patients which may get aggrevated after initiation of therapy or development of other co-morbidities during these chronic illness.Thus Pulmonary Tuberculosis and HIV patients should be screened and monitored for electrolyte imbalance as this can prevent complications due to electrolyte imbalance and reduce morbidity of disease, and improve quality of life.

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