

PRESENCE OF HYPONATREMIA IN PULMONARY TUBERCULOSIS AMONG PARTICIPANTS IN A TERTIARY CARE CENTER

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Abstract

Background information

Tuberculosis (TB) is one of the major public health problems in Pakistan. Our country ranks fifth in tuberculosis high, burden countries worldwide. Hyponatremia is considered as one of the most common and important electrolyte abnormality in Pulmonary TB (P TB) patients. This study will show the prevalence of hyponatremia in PTB in our population. This study was planned to determine the presence of hyponatremia in pulmonary tuberculosis among adults and to correlate its severity.

Materials and Methods

It is a hospital based cross sectional study conducted with 65 patients. Symptomatic microbiologically confirmed case of pulmonary tuberculosis, admitted in Yenepoya Medical College Hospital and are willing to participate in the study will be enrolled after counselling. The study will be explained to participants and care providers after which informed consent will be taken from each participant. The study period is for 5 months.

Results

A total of 63 study participants were included in the study. The mean age of the study participants was 47.94 years with standard deviation of 17.160 years ranging between 16 to 72 years. Predominantly, patients were males (69.8%). The most observed symptom was cough (92.1%) followed by breathlessness (49.2%) and fever (30.2%). 47.6% had diabetes, 22.2% had hypertension, 7.9% had asthma and 23.8% had COPD. Out of total, 33.3% had positive sputum AFB. It is observed that 42.6% had positive hyponatremia had positive sputum AFB. The association between Hyponatremia and sputum AFB was statistically significant (p value =0.002)

Conclusion

The present study explained a high prevalence of hyponatremia in TB patients. A strong association between hyponatremia and sputum AFB was also observed. This aspect should be a matter of concern in TB management as hyponatremia can have its own consequences.

Keywords - Hyponatremia, Tuberculosis, Tuberculosis Complications

Introduction

Worldwide TB is one of the top ten causes of death and the leading cause from a single infectious agent. Globally, 10.0 million people developed TB disease in 2017: 5.8 million men, 3.2 million women and 1.0 million children Tuberculosis is one of the most common infections in India and is associated with high mortality. India ranks 14th out of top 22 countries who are burdened with TB infections. (1)

Hyponatremia is one of the most common and important electrolyte abnormalities in clinical practice, so it must be considered in all seriously ill hospitalized participants. (2) Hyponatremia is observed in 15- 20% of emergency participant admissions and it occurs in up to 20% of critically ill participants. (3) It is important to identify because of its potential morbidity and also it can be a marker of the underlying disease. (4)

The syndrome of inappropriate secretion of antidiuretic hormone (SIADH) is the most common cause of hyponatremia and is characterized by hyponatremia, inappropriately elevated urine osmolality, excessive urine sodium and decreased serum osmolality in a euvolemic participant without edema. SIADH can be associated with malignancy, pulmonary disorders, neurosurgical conditions, cardiac, liver, and renal failure. TB can induce hyponatremia by various mechanisms like local invasion to the adrenal glands, local invasion to hypothalamus or pituitary gland, meningitis and inappropriate (5).

Materials and Methods

Study Design

Hospital based cross sectional study

Materials and Methods

Approval of the Institutional ethics committee will be taken before conducting the study.

The study will be conducted in accordance with the ethical norms as laid down in the Declaration of Helsinki. Written informed consent will be taken from the subjects by the primary investigator in the hospital before enrolling them for the study. If the participant is on mechanical ventilator or with low GSC, consent will be obtained from legally authorized representative, and later Reconsent will be taken from the participant after he

improved. Participants are included in the study according to the inclusion criteria. Participants history, investigation finds are noted. Data are collected and tabulated in excel sheet and analysed. The collected data will be stored in a private laptop with strict confidentiality. All information provided will remain confidential and will only be reported as group data with no identifying information. All data will be kept in a secure location and only those directly involved with the research will have access to them.

Population of interest

Symptomatic microbiologically confirmed case of pulmonary tuberculosis, admitted in Yenepoya Medical College Hospital and are willing to participate in the study will be enrolled after counselling. The study will be explained to participants and care providers after which informed consent will be taken from each participant.

The study period is for 5 months.

The study will be carried out with participants more than 18 years of age attending Yenepoya Medical College Hospital after obtaining the Ethical Committee clearance.

Inclusion Criteria

- Microbiologically confirmed cases of pulmonary tuberculosis
- Age group between 18 to 60 years

Exclusion Criteria

- Mechanically ventilated participant
- Diagnosed case of kidney disease
- Diagnosed case of Malignancies
- Participants on diuretics
- Drugs related to SIADH
- Pregnant ladies.
- Road traffic accidents

SAMPLE SIZE

The sample size is calculated using G* Power software

According to a study conducted in Department of Internal Medicine, Saheed Laxman Nayak Medical College and Hospital, Koraput, Odisha. (6) Among 65 participants, 26 (40%) participants had low sodium levels which was less than 135mmol/l .number of participants for the study to attain 95% power {p} and 5% level of significance **n = 63**.

STATISTICAL ANALYSIS:

Data will be entered in Microsoft excel and analyzed using SPSS version 27. The categorical data will be presented as frequency and percentage whereas continuous variables will be reported as mean and standard deviation. Kolmogorov Smirnov test will be used to check the normality of the data. Pearson correlation will be used to analyze the severity of pulmonary tuberculosis and hyponatremia as well as sputum bacillary load and hyponatremia. p value <0.05 will be considered statistically significant

Results

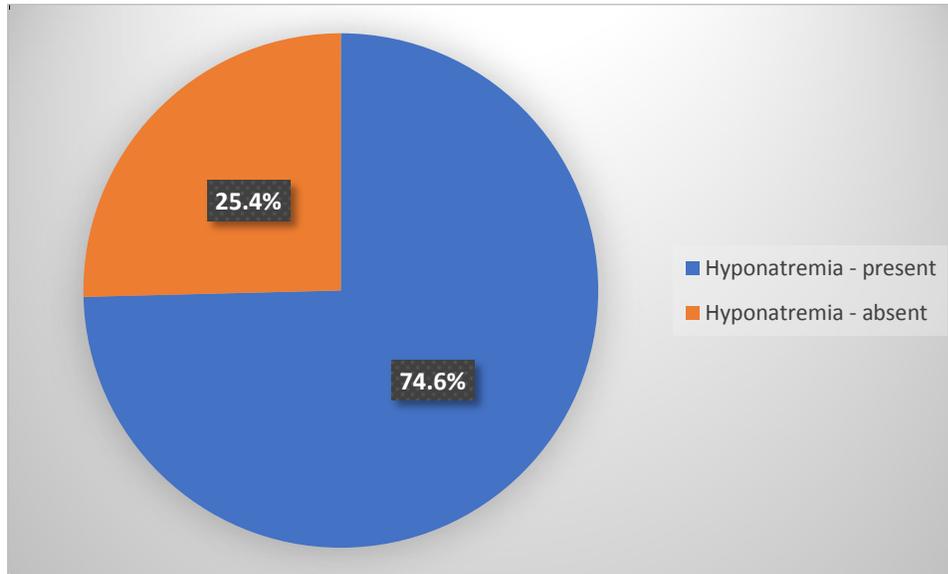
Table 1: Baseline characteristics of the study participants

Baseline characteristics		Frequency (n=63)	Percentage
Age (mean ±SD)		47.94 ± 17.160	
Gender	Female	19	30.2
	Male	44	69.8
Symptoms	Cough	58	92.1
	Fever	19	30.2
	Breathlessness	31	49.2
	Chest pain	5	7.9
Comorbidities	Diabetes	30	47.6
	Hypertension	14	22.2
	Asthma	5	7.9
	COPD	15	23.8

A total of 63 study participants were included in the study. The mean age of the study participants was 47.94 years with standard deviation of 17.160 years ranging between 16 to 72 years. Predominantly, patients were males (69.8%). The most observed symptom was cough

(92.1%) followed by breathlessness (49.2%) and fever (30.2%). 47.6% had diabetes, 22.2% had hypertension, 7.9% had asthma and 23.8% had COPD.

Figure 1: Distribution of study participants according to Hyponatremia



The Prevalence of hyponatremia was 74.6%. Hyponatremia was seen higher among males (79.5%) compared to females (62.3%). The mean serum sodium concentration was 132.41 ± 5.025 mmol/L.

Table 2: Association of Hyponatremia and Baseline characteristics of the study participants

Baseline characteristics		Hyponatremia		Test statistics	P value
		Present (n=47)	Absent (n=16)		
Gender	Female	12(62.3)	7(36.8)	1.881	0.170
	Male	35(79.5)	9(20.5)		
Cough	No	3(60.0)	2(40.0)	0.611	0.434
	Yes	44(75.9)	14(24.1)		
Fever	No	33(75.0)	11(25.0)	0.012	0.912
	Yes	14(73.7)	5(26.3)		

Breathlessness	No	22(68.8)	10(31.2)	1.176	0.278
	Yes	25(80.6)	6(19.4)		
Chest pain	No	42(72.4)	16(27.6)	---	---
	Yes	5(100.0)	0		
Diabetes mellitus	No	19(57.6)	14(42.4)	10.605	0.001*
	Yes	28(93.3)	2(6.7)		
Hypertension	No	35(71.4)	14(28.6)	1.173	0.279
	Yes	12(85.7)	2(14.3)		
Asthma	No	42(72.4)	16(27.6)	---	---
	Yes	5(100.0)	0		
COPD	No	32(66.7)	16(33.3)	---	---
	Yes	15(100.0)	0		

Test used: Chi square test/ Fisher exact test

*p value <0.05 is considered to be statistically significant

Table 2 shows that Diabetes mellitus is associated with increases risk of hyponatremia (p value = 0.001). Other variables such as gender, cough, fever, breathlessness, chest pain, hypertension, asthma and COPD had no statistically significant association with hyponatremia.

Table 3: Association of Hyponatremia and sputum AFB of the study participants

Sputum AFB	Hyponatremia		Total	Test statistics	P value
	Positive	Negative			
1+	17(36.2)	11(68.8)	28(44.4)	7.645	0.022*
2+	10(21.3)	4(25.0)	14(22.2)		
3+	20(42.6)	1(6.2)	21(33.3)		
Total	47(100.0)	16(100.0)	63(100.0)		

Test used: Fisher exact test

*p value <0.05 is considered to be statistically significant

Out of total, 33.3% had positive sputum AFB. It is observed that 42.6% had positive hyponatremia had positive sputum AFB. The association between Hyponatremia and sputum AFB was statistically significant (p value =0.002)

Table 3: lab details

lab details	Mean	Std. Deviation
Sodium	132.41	5.025
Potassium	10.68	28.306
Hb	10.79	2.057
TLC	9.94	3.167
Platelets	353.38	192.983
Urine spot sodium	62.84	16.714
Urine osmolarity	267.51	150.712
TSH	4.76	3.041
T4	3.35	3.506
T3	1.57	0.777
Creatinine	0.73	0.745
Urea	25.51	21.080
Serum osmolarity	336.65	116.014

Lab parameters		Frequency	Percentage
Hb levels	<13.2	58	88.9
	13.2-16.6	7	11.1
Normal urine osmolarity	50-1200	63	100.0
TSH	<0.5	0	0
	0.5-4.5	32	50.8

	>4.5	31	49.2
Total T4	<5.4	51	81.0
	5.4-11.5	10	15.9
	>11.5	2	3.2
T3	<82	0	0
	82-220	63	100.0
	>220	0	0

Discussion:

The current study was performed to find the prevalence of hyponatremia in pulmonary tuberculosis patients. The mean age of the total 63 patients of the study was 47.94 years and 69.8% were males. A similar observation of male predominance was observed in earlier documented works as well (1,2). We observed a high prevalence of hyponatremia (74.6%) in pulmonary tuberculosis patients. This finding of ours is slightly different from earlier documented studies where the degree of prevalence was around 50% (2-4). Syndrome of inappropriate ADH secretion (SIADH) is one of the common findings in pulmonary TB patients (5). SIADH in TB patients may be due to the damage to hypothalamus that may cause leakage of ADH into circulation or may be due to resetting of the osmoreceptors of hypothalamus (6). Serum ADH levels were less than detectable range in patients with antitubercular drugs (7). Antitubercular drugs were known to cause adrenal crisis by alternative of cortisol metabolism (1). This may be the possible reason for hyponatremia being observed in TB patients who are on treatment. Hyponatremia in TB may be associated with hyperkalemia, which may also be of equal concern (8).

Most common symptom of the study participants was cough and breathlessness was found in about half of the total study participants. However, in a study conducted by Vinnard et al, most of the hyponatremia patients were asymptomatic. (8). Most common comorbidity associated was

DM which was observed in 30 participants. Glucose intolerance was associated with TB. People with DM have a higher risk of developing TB. On the contrary, in TB patients, temporary glucose intolerance was observed which dissolved after treatment (9). Serum osmolality increases due to hyperglycemia in DM, water from the cells extravasate leading to dilutional hyponatremia. Thus DM, TB and hyponatremia have multifactorial association.

We observed an association between hyponatremia and sputum AFB, where the association with AFB 3+ was very strong. About half of the hyponatremia patients showed AFB at the grade 3+. Our study is in agreement with an earlier document by Arya et al., (10), where more than half of the study participants with AFB 3+ had hyponatremia. In a South Indian study on the prevalence of hyponatremia in pulmonary tuberculosis, 84% of the TB patients with mild hyponatremia (serum sodium levels of 130-134 mmol/L) had sputum AFB positive (11).

Acute hyponatremia may cause brain injury ranging from impaired taste, weakness to severe seizures; whereas mild chronic hyponatremia may increase mortality, attention deficit, gait instability and other complications (12)

Conclusion:

The present study explained a high prevalence of hyponatremia in TB patients. A strong association between hyponatremia and sputum AFB was also observed. This aspect should be a matter of concern in TB management as hyponatremia can have its own consequences.

Limitations:

The small sample size and omission of grading hyponatremia were the limitations of the present study.

Assessment of serum potassium level may be more useful in the management of hyponatremia.

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