

A STUDY TO DETECT THE PROPORTION OF ALTERED SERUM CALCIUM, PHOSPHOROUS AND VITAMIN D3 LEVEL IN NEWLY DIAGNOSED PULMONARY TUBERCULOSIS PATIENTS ATTENDING CHEST OPD IN BURDWAN MEDICAL COLLEGE & HOSPITAL

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Abstract

Introduction: Pulmonary Tuberculosis (PTB) is still a very common cause of morbidity & morbidity in India.^[7] Calcium and phosphorus metabolism plays an important role in the healing of lesions in PTB. Vitamin D deficient individuals have a greater susceptibility to develop TB^[14] and worse disease progression if infected with TB.^[15] Due to paucity of studies this study was carried out to estimate the mean value of serum calcium phosphorous and Vitamin D3 level in newly diagnosed PTB patients and find out correlation among the altered values of these biochemical parameters.

Methods: This was an observational cross sectional hospital based study carried out on 120 patients attending Burdwan Medical College over a period of one and a half years. All patients of PTB were included, while patients with Sarcoidosis, hepatitis, chronic kidney disease, post menopausal women were excluded from study. Serum Calcium, Phosphorus and Vitamin D3 were estimated in these patients. Data collected was entered in Excel Spreadsheet, and analysed in SPSS version 19.0 using descriptive statistical methods, percentiles and scatter diagrams.

Main Findings: Serum calcium and phosphorus was not significantly decreased in our study. Moderate prevalence of vitamin D deficiency was found among newly diagnosed PTB patients. Significant correlation was found between altered vitamin D3, serum phosphorus and serum calcium level.

Conclusion: Since Serum vitamin D3 is significantly decreased in pulmonary tuberculosis it is essential to monitor the serum levels of vitamin D3 in PTB patients and provide adequate supplementation of vitamin D3.

Keywords: Pulmonary Tuberculosis, Calcium, Vitamin D3, Phosphorus

Introduction

In India, each year, approx. 220,000 deaths are reported due to Pulmonary Tuberculosis. On March 24, 2019, TB Day, the Ministry of Health & Family Welfare of India notified that 2.15 million new tuberculosis patients has discovered only in 2018.^[1] Pulmonary Tuberculosis (PTB) is still a very common cause of morbidity & morbidity in India.^[2] Keeping in mind its high prevalence all aspects of the disease need to be thoroughly studied. Disturbance in calcium metabolism leading to variations in blood calcium concentration can cause a spectrum of clinical features^[3]. There is need for calcium and phosphorus supplements in tuberculosis patients during Drug therapy. Calcium metabolism and calcification played an important role in the healing of lesions. Phosphorus retention, reduced excretion and also a few reports of increased urinary levels of lipid-bound phosphorus have been reported in patients with tuberculosis.^[4] Vitamin D deficiency is associated with the

risk of tuberculosis (TB) infection^[5]. Vitamin D deficient individuals have a greater susceptibility to developing TB^[6] and worse disease progression if infected with TB.^[7] Peripheral blood mononuclear cells have been shown to express vitamin D receptors. Incubation of macrophages with physiological concentration of 1,25 (OH)D results in inhibition of intracellular growth of Mycobacterium tuberculosis.^[8] Due to paucity of studies investigating the levels of serum calcium, phosphorus and vitamin D3 in patients with newly diagnosed PTB, this study was carried out to estimate the mean value of serum calcium phosphorous and Vitamin D3 level in newly diagnosed PTB patients and find out correlation among correlation between vitamin D3, serum phosphorus and serum calcium levels in these patients.

Methods

This was an observational cross sectional hospital based study carried out on 120 patients attending Department of

Pulmonary Medicine of Burdwan Medical College over a period of one and a half years after approval and clearance by the Institutional Ethical Committee. All patients irrespective of age and sex with newly diagnosed microbiologically confirmed pulmonary tuberculosis with before starting ATD were included in the study. However patients with sarcoidosis, hepatitis, chronic kidney disease, other chest infections, malignancy and post menopausal women were excluded from study. Random blood sample was collected from these patients after taking informed consent and giving 10 minutes of rest, using dispovan syringe, cotton, spirit, tourniquet, clotted vial and serum Calcium (Test done by semi automated analyzer- Erba), serum Phosphorus (Test done by semi automated analyzer-Erba) and serum Vitamin D3(ELISA Method- From outside laboratory) were estimated using ELISA reader and washer, pipette (Automatic) and semi auto analyzer. Blood for estimation of calcium and phosphorus and Vitamin D was collected in plain vials without any anticoagulant through aseptic technique and without using tourniquet. For vitamin D3 vial was wrapped immediately after collecting the blood with a brown color paper / aluminum foil to prevent degradation. All other probable causes of calcium, phosphorus and vitamin D3 imbalance were excluded with necessary investigations as and when required. Data collected was entered in Excel Spreadsheet, and analysed in SPSS version 19.0 using descriptive statistical methods, percentiles, line graphs and scatter diagrams. Normal value of serum calcium: 8.6 - 10.2 mg / dl, normal value of serum phosphorus: 3.4 – 4.5 mg / dl, normal value of Vitamin D3: 30-100ng/mL, (insufficiency 20-<30 ng/mL, deficiency <20ng/mL)^[9]

Results:

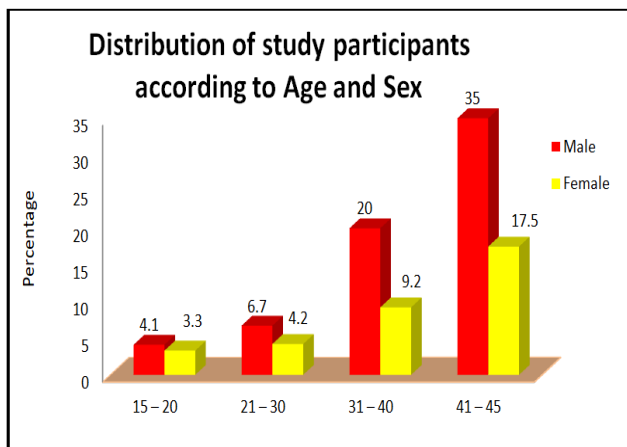


Figure 1: Age and Sex Distribution of the study participants. In our study we observed a male predominance as 65.8% patients were male and 34.2% were female with a male to female ratio of 1:0.51. Majority of the study participants of the present study belonged to the age group of 41-45 years irrespective of sex. This particular age group involved 35% male and 17.5% female patients respectively. The next common age group was 31-40 years involving 20% male and 9.2% female patients.

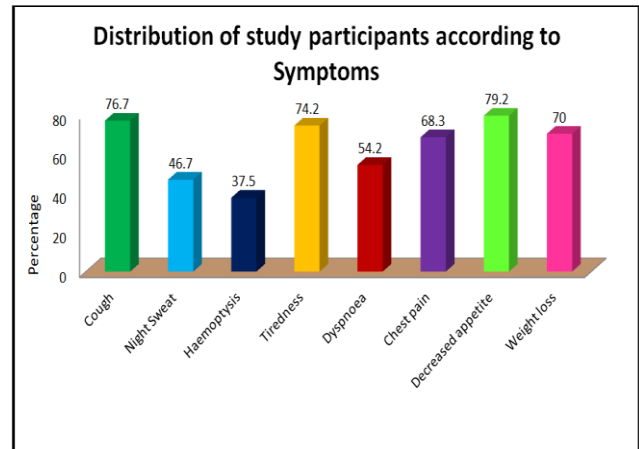


Figure 2: Clinical presentation of the study participants. In our study the most common symptom was decreased appetite involving 79.2% patients, followed by cough (76.7%), tiredness (74.2%), weight loss (70%), chest pain (68.3%) and dyspnoea (54.2%), night sweat (46.7%) and haemoptysis (37.5).

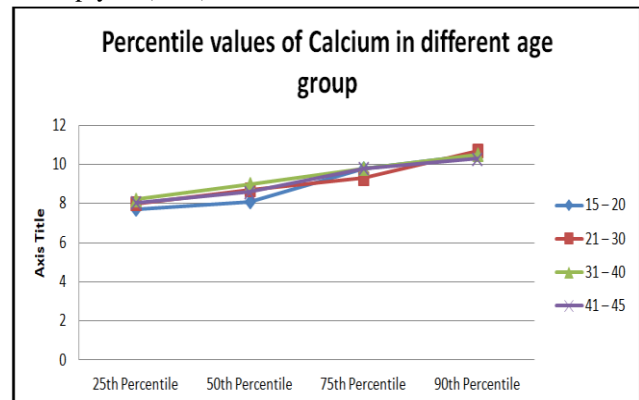


Figure 3: Percentile values of Calcium in different age group of study population. The mean serum calcium level in 15-20 years age group was **8.600**, in 21-30 years age group it was **8.861**, in 31-40 years age group it was **8.938** and in 41-45 years age group it was **8.853**.

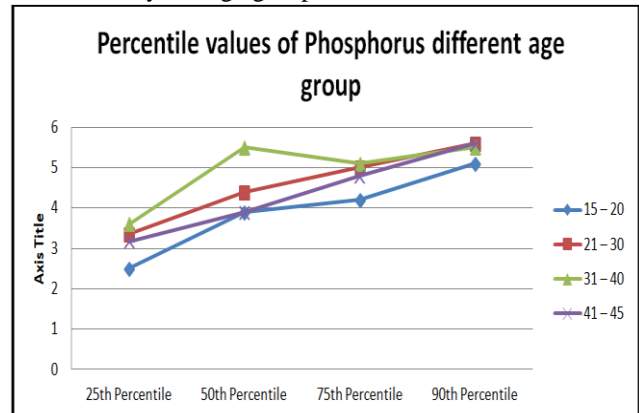


Figure 4: Percentile values of Phosphorus in different age group of study population. The mean serum phosphorus level in 15-20 years age group was 3.577, in 21-30 years age group it was 4.146, in 31-40 years age group it was 4.275 and in 41-45 years age group it was 3.985.

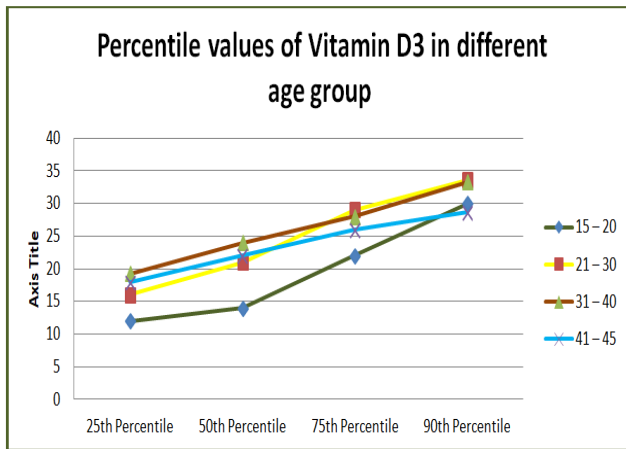


Figure 5: Percentile values of Vitamin D3 in different age group of study population. The mean serum D3 level in 15-20 years age group was 16.888, in 21-30 years age group it was 22.384, in 31-40 years age group it was 24.166 and in 41-45 years age group it was 22.306.

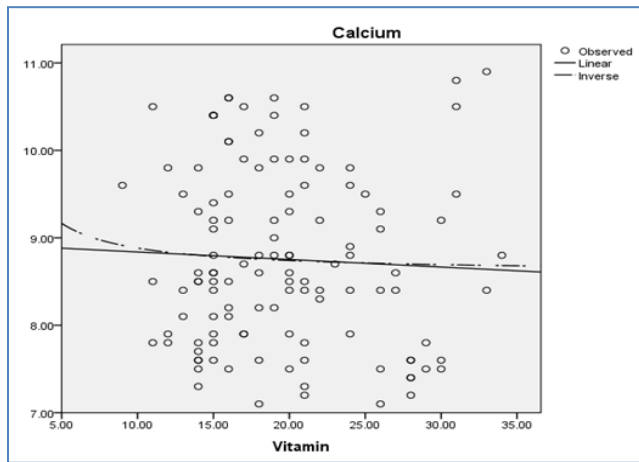


Figure 6: Correlation between Calcium, & Vitamin-D3 among study participants. Significant correlation was found.

Table 1: Significant correlation was found between vitamin D3 and phosphorus level. Significant correlation was also found between serum phosphorus and serum calcium level.

Correlations				
		Vitamin-D3	Phosphorus	Calcium
Vitamin-D3	Pearson Correlation	-	.205	-.048
	p. Value		.025*	.601
	No of Patients	120	120	120
Phosphorus	Pearson Correlation	.205	-	.176
	p. Value	.025*		.055*
	No of Patients	120	120	120
Calcium	Pearson Correlation	-.048	.176	-
	p. Value	.601	.055*	
	No of Patients	120	120	120

*. Correlation is significant at the 0.05 level (p. Value).

Discussion

Serum Calcium abnormalities have been variedly reported in studies carried out on the subject. In a Swedish study hypercalcemia was found in 25% of 67 patients of Pulmonary TB^[10]. In United States 16% to 28% patients of Pulmonary TB have been found to be suffering from hypercalcemia^[11] though lower incidence of hypercalcemia has also been reported from US^[12]. Hypercalcemia was detected in 25% Greek patients^[13] and in 27.5% of the Malaysian patients^[14] with pulmonary tuberculosis, with symptoms of hypercalcemia present in only 5% and 12% of these patients, respectively. Hypercalcemia and hyperphosphataemia in Pulmonary TB has also been reported from Germany^[15]. Albumin Corrected Calcium (ACC) was also found significantly higher in Pulmonary TB patients from Hong Kong despite a lower calcium intake^[16]. However, comparatively low percentage of hypercalcemia was found in another study from Hong Kong's (6%)^[17]. Pulmonary TB has also been found associated with hypocalcaemia in some studies. Wells, DeWitt and Long (1923) referred to a few early reports of phosphorus retention and reduced excretion and also to a few reports of increased urinary levels of lipid-bound phosphorus in patients with tuberculosis. Sharma (1981) observed elevated phosphorus levels in Indian patients who were hypercalcemic but not in those who were normocalcemic. A study showed that phosphorus levels tend to be elevated in Indonesian patients with tuberculosis but whether this finding is common to patients throughout the world and whether it has a primary bearing on the immune pathology of the disease remains to be determined^[18]. Low serum vitamin D levels are associated with higher risk of active tuberculosis. Although more prospectively designed studies are needed to firmly establish the direction of this association, it is more likely that low body vitamin D levels increase the risk of active tuberculosis. In another study, the effect of anti-tuberculosis drug therapy on vitamin D and calcium metabolism shows that standard anti-tuberculosis drug therapy may depress Vitamin D stores.^[19]

Conclusion

Serum calcium and phosphorus is not significantly decreased in our study while there is presence of vitamin D deficiency was found among newly diagnosed TB patients. Significant correlation was found between vitamin D3, serum phosphorus and serum calcium level. Since serum vitamin D3 is significantly decreased in pulmonary tuberculosis it is essential to monitor the serum levels of vitamin D3 in PTB patients and provide adequate supplementation of vitamin D3 in PTB patients.

Limitations:

- Small sample size
- Hospital based study
- All investigations to exclude altered serum calcium, phosphorus and vitamin D3 levels due to other causes may not have been done.

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