

# Association of Vitamin D Deficiency in Newly Diagnosed Pulmonary Tuberculosis

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## ABSTRACT

**Aim:** Relationship between Vitamin D deficiency and pulmonary tuberculosis.

**Methodology: Study duration:** November 2020 to April 2021

**Sampling technique:** A case-control study

**Setting:** Hayatabad Medical Complex, Peshawar

It included 30 adult newly identified sputum-quality pulmonary tuberculosis patients and 30 age and sex matched healthy cases as controls. All cases had undergone a thorough medical examination and repeated laboratory tests, including vitamin D, calcium, and sputum for AFB and X-ray chest.

**Results:** Majority were males (88%). In the Study group, BMI decreased significantly i.e. 19.0 vs 23.5. Serum vitamin D concentrations were significantly lower in the tuberculosis group i.e. 17.9ng/dl than in the control group 24.8ng/dl. Mean of serum albumin in the control group was 3.9 ng/dl whereas 2.9 ng/dl in the study group.

**Conclusion:** Hypovitaminosis D was associated with more severe medical symptoms, increased sputum smear positivity and large lesions on chest radiographs in patients with pulmonary tuberculosis.

**Keywords:** Vitamin D, Pulmonary Tuberculosis, Sputum

## INTRODUCTION

Vitamin D, known as calciferol holds an important part in the medical science<sup>1</sup>. The active form of 25(OH)D is 1,25(OH)<sub>2</sub> D and active form takes place in the kidneys and this process is facilitated by the enzyme Hydroxy vitamin D-1 $\alpha$  hydroxylase<sup>3</sup>. Vitamin D is very essential and holds a very sensitive role in providing immunity against Tuberculosis. Vitamin D produces cathelicidin that is an antimicrobial peptide. The function of cathelicidin is to inhibit the multiplication of mycobacterium in the macrophages<sup>2</sup>. In the patients of tuberculosis, high levels of Vitamin D concentrations were present in their blood and also with hypercalcemia. If the levels of calcitriol are higher it means that there are activated macrophages in the granulomas<sup>4</sup>.

## METHODOLOGY

The experimental study comprised of 60 cases. One group contained 30 cases with sputum smear positive for TB. The other group comprised of 30 healthy subjects as controls. Permission was taken from the Ethical committee of the institution and informed consent was taken.

**Inclusion criteria:** Patients of TB positive with >18 years of age.

**Exclusion criteria:**

- Patients of HIV, Diabetes mellitus, cancer of any type
- Patients with chemotherapeutic pills, corticosteroids, supplements for vitamins and calcium, anticonvulsants and diuretics

- Patients suffering from renal sickness, sarcoidosis, extra pulmonary TB, parathyroid issues, chronic liver disease.

The laboratory tests included glucose levels, HBsAg (ELISA), sputum samples from the TB patients and chest radiography. For data analysis SPSS software 25.0 was used.

## RESULTS

The detail of results is given in tables 1,2,3,4,5

Table 1: BMI in both groups

BMI	n	Mean	SD
Study group	30	19.09	1.439
Control	30	23.55	1.656

Table 2: Serum 25(OH)D in both groups

25(OH)D	n	Mean	SD
Study group	30	17.97	2.076
Control	30	24.87	3.014

Table 3: Serum Albumin in both groups

Albumin	n	Mean	SD
Study group	30	2.96	0.524
Control	30	3.98	0.517

Table 4: Serum Calcium in both groups

Calcium	n	Mean	SD
Study group	30	9.23	0.489
Control	30	9.65	0.573

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Table 5: Statistical analysis of two groups

	BMI	Serum albumin	Serum 25.OH.D	Serum calcium
Mann-Whitney U	0.00	77.50	19.00	256.50
Wilcoxon W	465.0	542.50	484.00	721.50
Z	-6.65	-5.51	-6.39	-2.86
2-tailed	0.00	0.00	0.00	0.004

## DISCUSSION

Vitamin D is a fat-soluble vitamin that plays a critical role in the host's immune response to Mycobacterium TB. Calcitriol is the biologically active form of vitamin D that stimulates the production of a peptide called cathelicidin. Cathelicidin is a microbic peptide that inhibits the growth of Mycobacterium tuberculosis. Vitamin D administration has been shown to increase cathelicidin peptide production in macrophages, hence enhancing innate immunity in tuberculosis patients<sup>5</sup>.

The current study discovered that vitamin D deficiency was substantially more prevalent in tuberculosis patients than in the healthy control group. In a study in Vietnam which included 166 tuberculosis patients and 219 control subjects and Vit. D deficiency was observed in 35.4% of men with TB as compared to control group i.e. 19.5%. Moreover, in a study on African people, vitamin D levels were lower in tuberculosis patients<sup>6</sup>. Even in India, Sashidharan et al. discovered significantly low vitamin D levels in tuberculosis patients compared to healthy controls in Kerala<sup>6</sup>.

Yuvaraj et al<sup>10</sup> conducted a cross-sectional study in India, which included 65 sputum AFB positive patients and 65 controls. They found a critical relationship between vitamin D insufficiency and expanded sputum smear inspiration. As indicated by the investigation, the lower the vitamin D level, the more the Mycobactium tuberculosis burden. Moreover, we distinguished a negative association between vit. D levels and both the level of sputum smear positivity and the measure of sputum positivity in the current examination. Salahuddin et al<sup>7</sup> discovered a negative connection between vitamin D levels and the intensity of chest X-ray involvement in a randomised, double-blinded, multicentric research. Additionally, they showed that correcting vitamin D deficiency improved clinical and radiographic improvement in all tuberculosis patients.

Khandelwal et al<sup>8</sup> reported that more than half of individuals with intrathoracic tuberculosis developed progressive pulmonary tuberculosis (56%). The remaining participants (30.5%) had primary pulmonary complexes and pleural effusions (13.5%). Additionally, they discovered that just 9% had adequate vitamin D levels.

In our study, patients with low vitamin D levels had more sputum smear positivity and larger lesions on chest radiographs, both of which were indicative of more severe tuberculosis. Rathore et al<sup>9</sup> reported in a cross-sectional study involving 354 MDR-TB patients that MDR-TB patients have considerably reduced vitamin D and serum calcium levels.

## CONCLUSIONS

Vitamin D deficiency is widespread in Positive TB patients and that vitamin D levels must be maintained in order to maintain immunity.

**Conflict of interest:** Nil

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