

Study of Assessment of Vitamin D Status of Patients with Pulmonary Tuberculosis and Normal Healthy Adults At a Tertiary Care Hospital

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ABSTRACT

Background: Tuberculosis continues to be a global health challenge, despite the existence of well-established and widely disseminated strategies for its prevention and treatment. Vitamin D, initially classified as a vitamin in the early 20th century, is now understood to function as a prohormone. Hence; the present study was conducted for assessment of vitamin D status of patients with pulmonary tuberculosis and normal healthy adults at a tertiary care hospital.

Materials & Methods: A total of 50 patients with confirmed diagnosis of pulmonary tuberculosis and 50 healthy controls were enrolled. Complete demographic and clinical details of all the patients were obtained. All the patients were recalled in the morning. Blood samples were obtained. All the samples were sent to the laboratory. Auto-analyzer was used for evaluation of serum vitamin D levels. All the results were compiled in Microsoft excel sheet.

Results: The mean age of the patients of the pulmonary tuberculosis group and control group was 39.5 years and 40.7 years respectively. Majority proportion of patients were males. Among the patients of the pulmonary tuberculosis group and control group, 4 patients and 5 patients respectively were diabetic. The mean vitamin D levels among patients of the

pulmonary tuberculosis group and control group were 28.3 ng/ml and 39.4 ng/ml respectively. Significant results were obtained while comparing vitamin D levels among two study groups.

Conclusion: Pulmonary tuberculosis is associated with significantly reduced vitamin D levels.


Key words: Vitamin D, Tuberculosis.

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INTRODUCTION

Tuberculosis continues to be a global health challenge, despite the existence of well-established and widely disseminated strategies for its prevention and treatment. The enduring prevalence of this disease can be largely attributed to factors such as poverty and the HIV epidemic. This paper examines the diagnostic approaches, therapeutic interventions, and preventive measures associated with tuberculosis. The traditional manifestations of pulmonary tuberculosis—such as cough, sputum production, hemoptysis, dyspnea, weight loss, loss of appetite, fever, malaise, and severe wasting—have been described in literature. It is important to note that these symptoms are not exclusive to tuberculosis. In contemporary developed nations, it is relatively rare for patients with pulmonary tuberculosis to exhibit

the full range of symptoms; conversely, healthcare professionals in developing countries frequently encounter such cases.¹⁻³

Vitamin D, initially classified as a vitamin in the early 20th century, is now understood to function as a prohormone. A distinctive characteristic of vitamin D is its ability to be synthesized by the human body through exposure to sunlight, which complicates the establishment of dietary reference intake values due to its dual sources. Vitamin D, or calciferol, consists of a group of fat-soluble seco-sterols, with the two primary forms being vitamin D₂ and vitamin D₃. Vitamin D₂ (ergocalciferol) is predominantly synthesized artificially and is often added to various food products, while vitamin D₃ (cholecalciferol) is produced in human skin from 7-dehydrocholesterol and can also be obtained through the

consumption of animal-derived foods. Both forms, D2 and D3, are commercially synthesized and are available in dietary supplements or fortified foods.⁴⁻⁶

Hence; the present study was conducted for assessment of vitamin D status of patients with pulmonary tuberculosis and normal healthy adults at a tertiary care hospital.

MATERIALS & METHODS

A total of 50 patients with confirmed diagnosis of pulmonary tuberculosis and 50 healthy controls were enrolled.

Complete demographic and clinical details of all the patients were obtained. All the patients were recalled in the morning. Blood samples were obtained. All the samples were sent to the laboratory. Auto-analyzer was used for evaluation of serum vitamin D levels. All the results were compiled in Microsoft excel

sheet and were subjected to statistical analysis using SPSS software. Chi-square test and student t test were used for evaluation of level of significance. P-value of less than 0.05 was taken as significant.

RESULTS

The mean age of the patients of the pulmonary tuberculosis group and control group was 39.5 years and 40.7 years respectively. Majority proportion of patients were males.

Among the patients of the pulmonary tuberculosis group and control group, 4 patients and 5 patients respectively were diabetic. The mean vitamin D levels among patients of the pulmonary tuberculosis group and control group were 28.3 ng/ml and 39.4 ng/ ml respectively. Significant results were obtained while comparing vitamin D levels among two study groups.

Table 1: Demographic data

Demographic data	Pulmonary tuberculosis group	Control group
Mean age (years)	39.5	40.7
Males	31	28
Females	19	22
Diabetic	4	5
Hypertensive	3	3

Table 2: Comparison of vitamin D levels

Vitamin D levels (ng/ml)	Pulmonary tuberculosis group	Control group
Mean	28.3	39.4
SD	8.4	10.8
p-value	0.001 (Significant)	

DISCUSSION

Mycobacterium tuberculosis continues to be a predominant infectious agent responsible for significant morbidity and mortality, despite the existence of affordable and effective antibiotic therapies. Recent global estimates reveal that tuberculosis (TB) accounts for approximately 9.3 million new cases and 1.8 million fatalities annually. The rise of multidrug-resistant tuberculosis (MDR TB), defined by resistance to at least isoniazid and rifampin—two critical antibiotics in TB treatment—poses an additional obstacle to global TB control initiatives. The World Health Organization reported 489,000 new cases of MDR TB in 2006, representing 4.8% of all new cases, an increase from 424,000 cases (4.3% of all new cases) in 2004. Although enhanced surveillance efforts have led to a more thorough understanding of the global impact of drug-resistant TB, the patterns of emergence and transmission of MDR TB in high-burden regions remain inadequately defined.⁷⁻⁹ The prevalence of vitamin D supplementation for the prevention and management of various health conditions has markedly increased over the past ten years. Epidemiological studies have established a correlation between vitamin D deficiency and a range of health issues, including autoimmune disorders, various cancers, cardiovascular diseases, mental health conditions such as depression and dementia, infectious diseases, and musculoskeletal deterioration.¹⁰ Hence; the present study was conducted for

assessment of vitamin D status of patients with pulmonary tuberculosis and normal healthy adults at a tertiary care hospital.

The mean age of the patients of the pulmonary tuberculosis group and control group was 39.5 years and 40.7 years respectively. Majority proportion of patients were males. Among the patients of the pulmonary tuberculosis group and control group, 4 patients and 5 patients respectively were diabetic. The mean vitamin D levels among patients of the pulmonary tuberculosis group and control group was 28.3 ng/ml and 39.4 ng/ ml respectively. Significant results were obtained while comparing vitamin D levels among two study groups. Friis H et al assessed the role of pulmonary TB (PTB) and HIV as correlates of S-25(OH)D. PTB patients were categorized as sputum negative (PTB-) and positive (PTB+) by culture. Non-TB controls were randomly selected among age-sex-matched neighbours to PTB+ patients. Height, weight, arm circumference and triceps skinfold were measured, and body mass index (BMI), arm fat (AFA) and muscle area (AMA) computed. HIV status, and S-25(OH)D, C-reactive protein (S-CRP) and α1-acid glycoprotein (S-AGP) were determined. S-25(OH)D data were available on 97.8% (1570) of 1605 participants. Mean (SD) S-25(OH)D was 84.4 (25.6) nmol/L with 39.6% <75 nmol/L among 347 non-TB controls. Time of recruitment, sex, PTB and HIV, and elevated S-AGP were correlates of S-25(OH)D. S-25(OH)D was 24.8 nmol/L higher in PTB compared to controls among females, but only 9.8 nmol/L

among males (interaction $p < 0.0001$). Females had 13.8 nmol/L lower S-25(OH)D than males, and HIV infected individuals had 8.5 (95% CI:4.9;12.1) higher S-25(OH)D compared to uninfected. Elevated S-AGP was a positive correlation of S-25(OH)D. Low BMI was associated with S-25(OH)D, but not with infections or S-AGP in the model. While S-25(OH)D may decline transiently during a mild acute phase response, it may increase if the acute phase response leads to loss of fat.¹¹

Chaudhary S et al conducted a study to evaluate the vitamin D status in patients diagnosed with type 2 diabetes and those with sputum-positive pulmonary tuberculosis. The study included a total of 155 participants, comprising 46 individuals with type 2 diabetes, 39 healthy non-diabetic controls, 30 patients suffering from pulmonary tuberculosis, and 40 patients who had both pulmonary tuberculosis and type 2 diabetes. Measurements of vitamin D levels (25 OH vitamin D) were performed across all four groups. The findings indicated no significant differences in mean vitamin D levels among the groups affected by tuberculosis, diabetes mellitus, or both conditions. However, the incidence of severe vitamin D deficiency was notably higher in the cohort with both diabetes and tuberculosis (45%) compared to those with only tuberculosis (26.66%), only diabetes (17.39%), and healthy controls (7.69%). This suggests that individuals with concurrent type 2 diabetes and pulmonary tuberculosis are at a greater risk of severe vitamin D deficiency than those with either condition alone, highlighting the vulnerability of this population to pulmonary tuberculosis.¹²

CONCLUSION

Pulmonary tuberculosis is associated with significantly reduced vitamin D levels. Vitamin D supplementation may be administered alongside conventional antituberculosis medications to enhance the therapeutic response.

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