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RESEARCH ARTICLE
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A DESCRIPTIVE STUDY TO ASSESS SERUM 25-OH VITAMIN D LEVELS IN PATIENTS WITH TUBERCULOSIS: A CLINICAL EVALUATION

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ABSTRACT

Introduction-Tuberculosis (TB) is a major public health problem worldwide. Vitamin D plays a crucial role in immune regulation and has been implicated in the pathogenesis of TB. However, the relationship between serum 25-OH vitamin D levels and TB is not well understood .To assess the serum 25-OH vitamin D levels in patients with TB and to evaluate the clinical characteristics of patients with TB in relation to their serum 25-OH vitamin D levels. **Methods-** An observational, cross-sectional study in Tertiary care hospital, NIMS, Jaipur (Rajasthan). 100 patients diagnosed with pulmonary TB, aged 18-60 years. **Results-** In our study, we found that among 100 cases, 73% had VDD (i.e., <20 ng/mL), 21% (n=30) had vitamin D insufficiency (i.e., 20–30 ng/mL), therefore 94% (95% CI: 89.51%–97.63%) of the total 100 cases had suboptimal status of vitamin D (deficiency and insufficiency).According to gender, It was found that 66% (n=40) males had deficient serum 25-OH vitamin D level, 26% (n=16) had insufficient level, and rest 8% (n=5) had normal level of serum 25-OH vitamin D. Among females, 80% (n=31) of them had deficient levels, 15% (n=6) had insufficient levels, and rest 5% (n=2) had normal vitamin D level. **Conclusions-** This study has provided significant information on the relationship between serum 25-OH vitamin D levels and pulmonary TB, which will aid in the development of strategies for the management and of TB.

Keywords: Tuberculosis (TB), Pulmonary TB, Vitamin D, 25-OH vitamin D

INTRODUCTION

Tuberculosis (TB) is a major public health problem worldwide. According to WHO report (2015) every 3 minutes two people die of TB worldwide. [1]

Vitamin D (25-OH vitamin D) functions as a hormone in the body and plays a vital role in the overall metabolism of the bony skeleton. Vitamin D deficiency (VDD) is now a globally recognized pandemic.[2]

The leading cause of VDD is lack of sunlight exposure, sunscreen use, winter, latitude, malabsorption, and use of medications like glucocorticoids, rifampicin, antiretroviral therapy, etc. Several studies have suggested possible links between vitamin D and cardiovascular disease risk, [3,4] diabetes, [5,6] hypertension,[7] and dyslipidemia. [8,9]
Vitamin D plays a crucial role in immune regulation and has been implicated in the pathogenesis of TB. Several studies have suggested that vitamin D is a potent immunomodulator of innate immune responses [10,11] by acting as a cofactor to induce antimycobacterial activity.[12]

A study by **Rook GA** showed that VDD has long been implicated in tuberculosis (TB) activation.[13]Currently immunomodulator-based therapy become attractive with emergence of MultiDrug Resistant Tuberculosis (MDR-TB) and Extensively Drug Resistant Tuberculosis (XDR-TB) for which existing chemotherapy is mainly ineffective. However, the relationship between serum 25-OH vitamin D levels and TB is not well understood.

In the light of above perspective, this study was undertaken to evaluate the level of 25-OH vitamin D in patients suffering from TB and to find a correlation between the level of acid-fast bacilli (AFB) in respiratory samples and the level of 25- OH vitamin D level in them.

Aims & Objectives
Aim: To study serum 25-OH Vitamin D levels in tuberculosis patients and their clinical implications
Objectives:
1. To assess the serum 25-OH vitamin D levels in patients with TB.
2. To evaluate the clinical characteristics of patients with TB in relation to their serum 25-OH vitamin D levels.

MATERIALS & METHODS:
Study Design: An observational, cross sectional study.
Study Setting: Department of Respiratory Medicine, Tertiary care hospital, National Institute of Medical Science, NIMS University, Jaipur (Rajasthan)
Study Duration: 12 months (October 2023-September 2024)
Study Population: All newly diagnosed patients with pulmonary TB.
Sample Size: 100 patients.
Inclusion Criteria:
- Newly diagnosed patients pulmonary with TB,
- Aged 18-60 years
- Both Gender- males & females
- Willing to give consent

Exclusion Criteria:
- History of TB or history of antitubercular drug intake and on Anti Retroviral Therapy (ART),
- Patients with liver or kidney disease,
- Malabsorption syndrome, or
- Taking vitamin D supplements.

- Any chronic skin diseases or immunotherapy
- Not willing to give consent

Data Collection:

Total 100 diagnosed TB patients were enrolled after consideration of inclusion and exclusion criteria of study. Detailed history and examination were made. History included an inquiry about adequate exposure to sunlight.

All basic details including age, occupation, income etc. Including clinical characteristics, body mass index (BMI), and disease severity recorded. Laboratory parameters CBC, ESR, and serum 25-OH vitamin D levels has measured using ELISA.

Data Analysis: Descriptive statistics are used to summarize the data. Inferential analysis has performed to evaluate the relationship between serum 25-OH vitamin D levels and clinical characteristics.

RESULTS:

This study included 100 TB patients, 61 males and 39 females making male: female ratio as 1.56:1. On considering age, the most of them were belonged to age groups 18 to 29 years (37%) and 30 to 39 years(31%), followed by 40 to 49 years(19%) and rest 13% were 50 and above years.

Table 1: Gender distribution of Study Subjects

Vitamin D status	Overall	Male	Female
Vitamin D deficiency	73%	66%	80%
Vitamin D insufficiency	21%	26%	15%
Normal vitamin D levels	6%	8%	5%

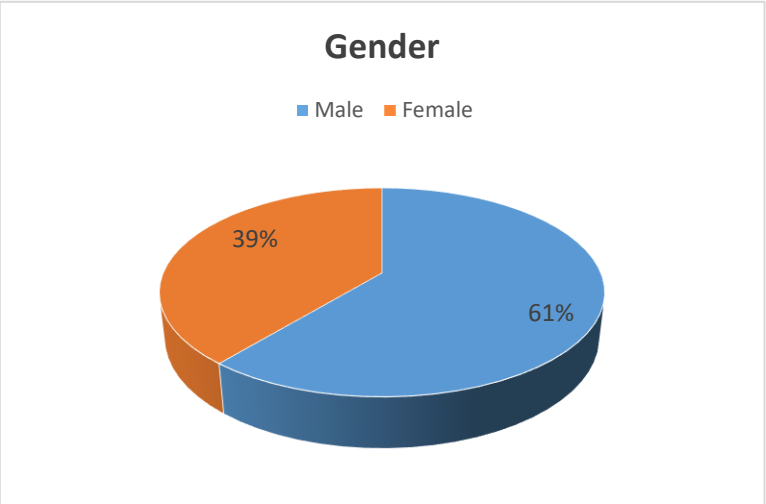

Figure1: Gender distribution

Prevalence of Vitamin D deficiency was 73% (95% confidence interval [CI]: 64.72–79.57%). The prevalence of vitamin D insufficiency was 21% (95% CI: 12.63–26.23%). Prevalence of vitamin D suboptimal status was 94% (95% CI: 79.51–87.63: total number of deficient and insufficient cases).

According to gender, It was found that 66% (n=40) males had deficient serum 25-OH vitamin D level, 26% (n=16) had insufficient level, and rest 8% (n=5) had normal level of serum 25-OH vitamin D. Among females, 80% (n=31) of them had deficient levels, 15% (n=6) had insufficient levels, and rest 5% (n=2) had normal vitamin D level.

Table 1: Distribution of Vitamin D levels among study patients

Vitamin D status	Overall	Male	Female
Vitamin D deficiency	73%	66%	80%
Vitamin D insufficiency	21%	26%	15%
Normal vitamin D levels	6%	8%	5%

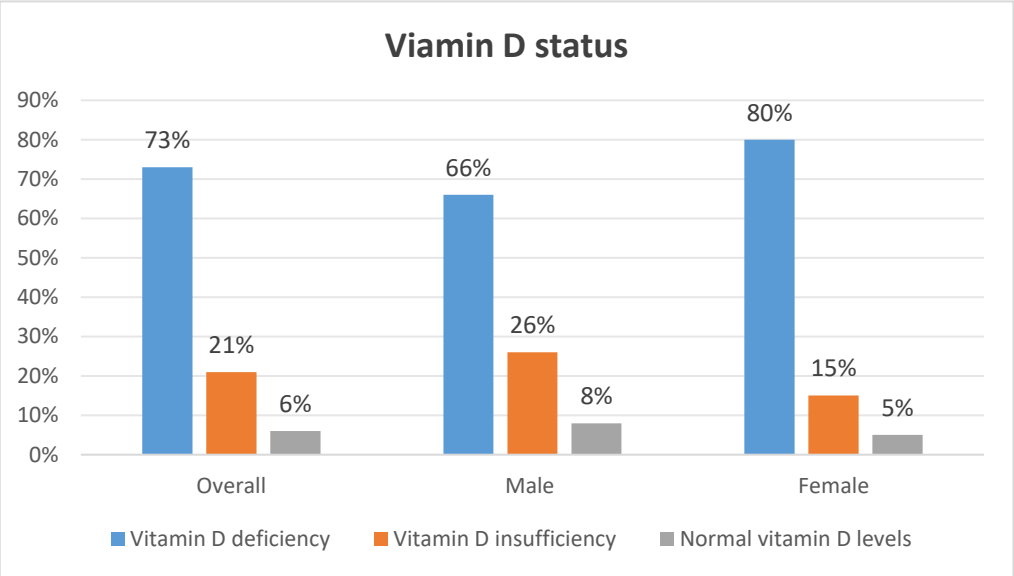

Figure2: Distribution of Vitamin D levels among study patients

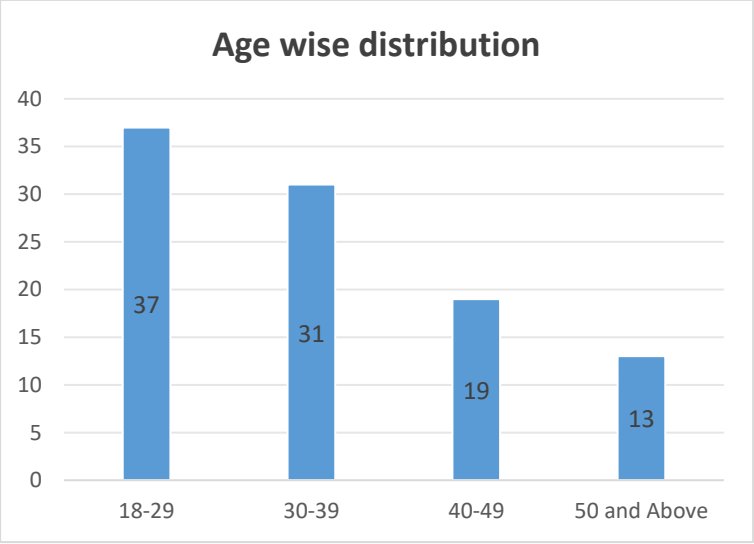

Figure3: Distribution of Vitamin D levels among study patients

On considering serum 25-OH vitamin D level among the study patients, In the case of males, the average mean ± standard deviation (SD) value of serum 25-OH vitamin D level was 17.54 ± 7.964 ng/mL. The lowest value was 3.4 ng/mL, whereas the highest was 43.93 ng/mL, with a median of 16.45 ng/mL. Among females, the average mean ± SD of serum 25-OH vitamin D level was 14.48 ± 7.846 ng/mL. The lowest value was 3.2 ng/mL, whereas the highest was 41.01 ng/mL, with a median of 13.61 ng/mL.

Only 27% of the total cases had adequate sunlight exposure, that is, 30 minutes of exposure of the skin over the arms and face to sunlight, and sunscreen, preferably between 10 am and 2 pm daily. In this group, the average mean ± SD of serum 25-OH vitamin D level was 18.15 ± 8.061 ng/mL. Rest, that is, 73% had inadequate exposure. The average mean ± SD of serum 25-OH vitamin D level was 15.49 ± 7.935 ng/mL.

DISCUSSION:

In our study, we found that among 100 cases, 73% had VDD (i.e., <20 ng/mL), 21% (n=30) had vitamin D insufficiency (i.e., 20–30 ng/mL), therefore 94% (95% CI: 89.51%–97.63%) of the total 100 cases had suboptimal status of vitamin D (deficiency and insufficiency).

A prospective study by **Davies et al. [14]** in the UK, comprising 50 consecutive patients presenting with TB showed that patients had lower serum concentrations of vitamin D than healthy matched controls on average. According to the Mann–Whitney U test, the difference between patients (range: 0.9–29.7, median: 6.4 ng/mL) and matched controls (range: 3.6–53.0, median: 10.9 ng/mL) was highly significant (P <0.005).

A study by **Sasidharan et al. [15]**in Kerala showed that the mean value of 25-OH vitamin D3 in patients with TB was 10.7 ng/mL compared to the control group, which had a mean value of 19.4 ng/mL, and the difference was statistically significant (P <0.005).

However, a study by **HoPham et al. [16]** on the Vietnamese population showed that the prevalence of vitamin D insufficiency was 35.4% in men with TB and 19.5% in controls (P=0.01). In women, there were no significant differences in serum vitamin D between tubercular patients and controls. The prevalence of vitamin D insufficiency in women with TB is 45.3%, and without TB, 47.6% (P=0.91).

The major limitation of our study was that it was a cross-sectional observational study, not a case–control study. The study was conducted only on the adult population, with the period of study limited to 1 year and the total number of cases only 100. Hence it cannot be projected to the general population.

CONCLUSION

This descriptive study aims to provide a comprehensive description of serum 25-OH vitamin D levels in patients with TB. The findings of this study has provided significant information on the relationship between serum 25-OH vitamin D levels and pulmonary TB, which will aid in the development of strategies for the management.

Ethical consideration

This study has been conducted after approval from institutional ethical committee. Informed consent was obtained from patients before collecting blood samples.

Conflict of interest- None

Funding- None

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