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Original Research Article

Study of Vitamin D Levels in Chronic Rhino Sinusitis in Rajasthan Population

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Abstract

Background: Chronic rhinosinusitis (CRS) is highly heterogeneous chronic inflammation of the upper respiratory tract caused by immune dysfunction. Hence, the status of vitamin D is studied in CRS patients because vitamin D directly regulates a variety of cells, including monocytes, macrophages, epithelial cells, dendritic cells, and T-cells.

Method: Out of 90 (ninety) adult patients, 45 were CRS and the remaining 45 were the controlled (normal) group. Fasting venous blood (5 ml) was collected from all participants in the early morning to study vit. D levels and serum was separated by centrifugation at 3000 rpm for 10 minutes and stored at 80°C until analysis of serum 25 (OH) D concentration was measured using chemiluminescent immunoassay (CLIA). Calcium, phosphorus, alkaline phosphatase, and parathyroid hormone levels were also studied.

Results: Comparison of biochemical parameters between both groups had significant p values ($p<0.001$). Distribution of vitamin D status in both groups was also a highly significant correlation between serum vitamin D levels and disease severity in CRS, which had a significant p value ($p<0.001$). Analysis of CRS with and without nasal poly parameters had a significant p value ($p<0.001$).

Conclusion: Serum vitamin levels are significantly reduced in patients with CRS. These findings suggest the role of vit. D deficiency in the spectrum of CRS.

Keywords: Chemiluminescent Immunoassay (CLIA), serum 25 – hydroxyl vit. D, 25 (OH) D levels, Nasal polyp, SNO-22 Lund-Mackay score.

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Introduction

Chronic rhinosinusitis (CRS) is a disease of the nasal and paranasal mucosa characterized by persistent inflammation with distinctive inflammation cells. It is reported that the prevalence of CRS is 5-15% globally [1].

The specific pathogenesis of CRS is not totally clear. Previously, CRS was considered to be chronic suppurative inflammation caused by bacterial infection [2]. Nowadays CRS is highly heterogeneous chronic inflammation of the upper respiratory tract caused by immune dysfunction in human beings based on the radiological and endoscopic findings [3]. CRS could be divided into distinct clinical phenotypes. CRS with nasal polyps (CRSwNP) and CRS without nasal polys (CRSSNP). The immunological mechanism of these two phenotypes is different. It is believed and considered that vitamin D could maintain the healthy balance of calcium and phosphorous playing an important role in the metabolism and cell proliferation Vitamin D directly regulates a variety of cell types, including monocytes, macrophages, epithelial cells, dendritic cells, and T cells Vit. D influences the process of immune response [4]. Hence, an attempt is made to evaluate the status of vitamin D in CRN (chronic rhinosinusitis).

Material and Method

45 (forty-five) adult patients age between 20-60 years regularly visited the ENT and Dentistry Department of Dr. B. R. Ambedkar, Government Medical College Hospital, Sirohi, Rajasthan-307001 were studied.

Inclusion Criteria: Patients clinically diagnosed as CRS, defined according to the European position

paper on Rhinosinusitis and Nasal polys criteria. The persistent symptoms ≥ 12 weeks and supportive findings on nasal endoscopy and/or computed tomography. The patients who gave their consent in writing for study were selected.

Apart from 45 patients, 45 controlled (normal) groups were also included for comparison.

Exclusion Criteria: The patients known metabolic bone disease, chronic renal or hepatic dysfunction, and malabsorptive gastrointestinal disease. The patients below 18 years and above 60 years of age, use of vitamin D supplement or use of corticosteroid within the preceding 3 months, and active malignancy were excluded from the study.

Method

Fasting venous blood (5 ml) was collected from all participants, including the controlled group, between 8 am to 10 am to minimize diurnal variation in vitamin D levels. The serum was separated by configuration at 300 rpm for 10 minutes and stored at -80°C until analysis. The serum 25(OH) D concentration was measured using a standardized chemiluminescent immunoassay (CLIA) with a documented inter-assay coefficient of variation <8%. Reference ranges were defined as

- Deficient - <20 ng/ml
- Insufficient 20-90 ng/ ml
- Sufficient ≥ 30 ng/ ml

Calcium, phosphorus, alkaline phosphatase, and parathyroid hormone levels were also measured to exclude underlying metabolic disorders.

Clinical Assessment: For CRS cases, symptom severity was quantified using the 22-item Sino-Nasal Outcome Test (SNOT-22). Endoscopic assessment documented the presence of nasal polyps, mucopurulent discharge, and mucosal edema. Lund MACKY scores were recorded from computed tomography scans where available.

The duration of the study was from April 2025 to May 2026.

Statistical Analysis: Various serum biochemical profiles distribution of vitamin D status in both groups, correlation between serum vitamin D levels and disease severity in the CRS patients subgroup analysis: CRS with or without nasal polyps were compared in both groups with a t-test and correlation coefficient test, and significant results were noted. The statistical analysis was carried out using SPSS software. The ratio of males and females was 2:1.

Observation and Results

Table 1: Comparison of Biochemical profile in both groups:

Viz – serum 25 (OH) D (ng/ml)

Phosphorus (mg/dl), alkaline phosphatase

(IU/L), PTH Hormones have significant p value ($p<0.001$).

Table 2: Distribution of vitamin D status in both groups

Deficient <0.20 mg/ml, Insufficient (20-20 mg/m) Sufficient (>30 mg/ml) had significant p value.

Table 3: Correlation between Vit. D level and disease severity in CRS, SNOT scoe, Lund-Mackay score had significant p value ($p>0.001$).

Table 4: Analysis of CRS with and without nasal polys serum 25 (0H), D (ng/dl), SNOT-22 score Lund-mackay score had significant p value ($p<0.001$).

Table 1: Comparison of Biochemical parameters between both groups

Parameters	CRS patients (Mean ±SD) (45)	Controlled group (Mean ±SD) (45)	t test	p value
Serum 25 (OH) D (ng/mL)	18.2 (±3.3)	26.5 (±5.2)	9.04	P<0.001
Serum calcium (mg/dl)	9.2 (±0.5)	9.4 (±0.4)	3.14	P<0.001
Serum phosphorous (mg/dl)	3.8 (±0.04)	3.7 (±0.02)	15.00	P<0.001
Alkaline phosphatise (IU/L)	116.8 (±8.5)	110.5 (±7.4)	3.75	P<0.001
Parathyroid harmone (pg/ml)	59.6 (±11.8)	46.4 (±9.8)	5.77	P<0.001

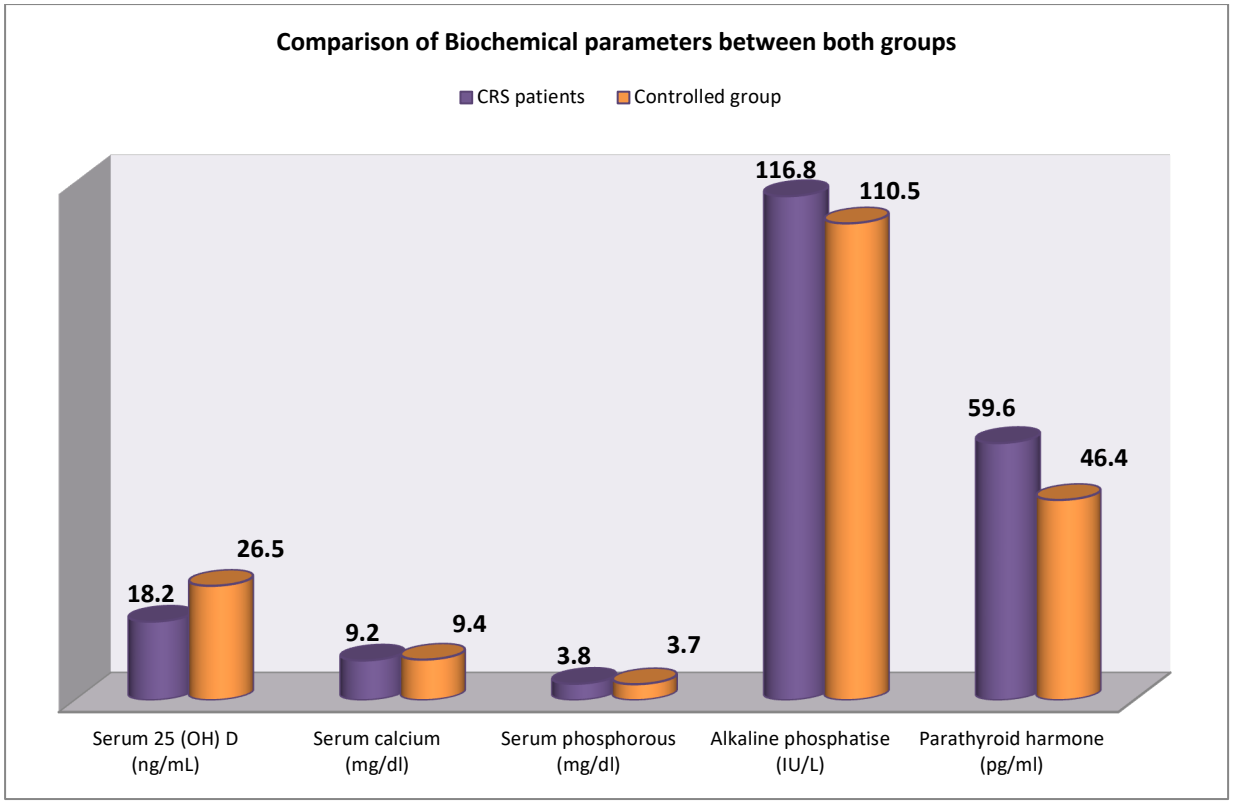

Figure 1: Comparison of Biochemical parameters between both groups

Table 2: Distribution of vitamin D status in both groups

Vit. D status	CRS patients (Mean ±SD) (45)	Controlled group (Mean ±SD) (45)	p value
Deficient <20ng/ml	29 (±64.4)	11 (±24.4)	P<0.001
Insufficient (20-29 ng/ml)	11 (24.4%)	16 (35.5%)	P<0.001
Sufficient (>30 ng/ml)	5 (11.1%)	18 (40%)	p<0.001

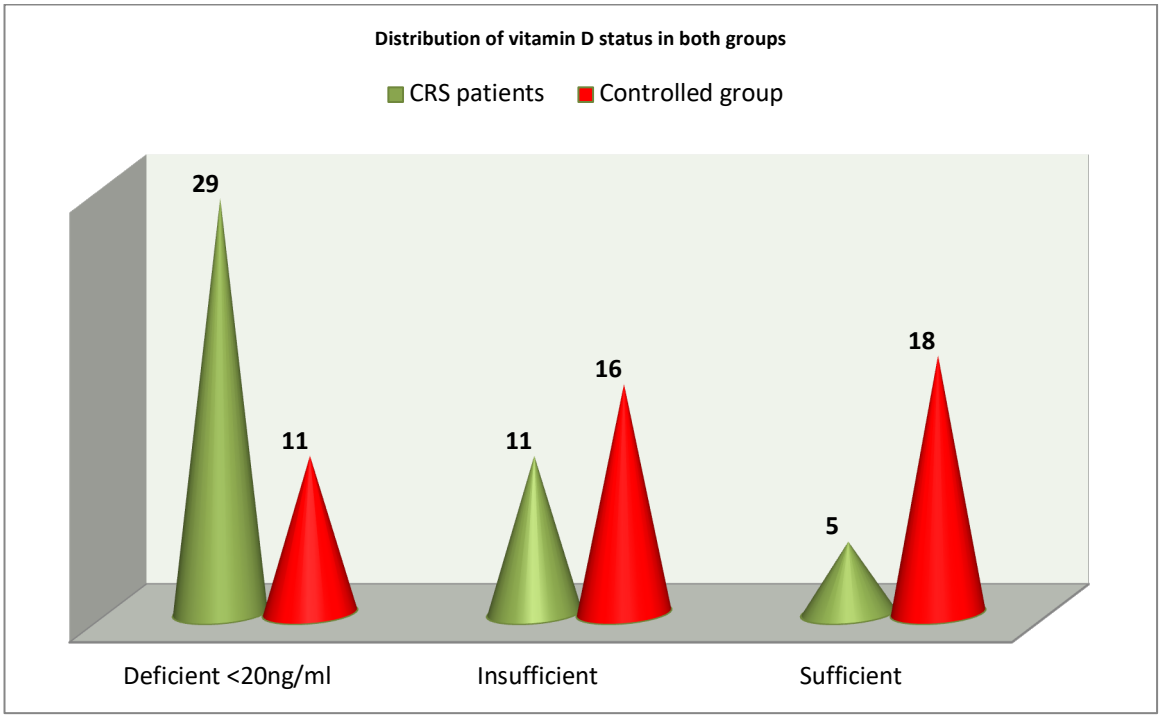

Figure 2: Distribution of vitamin D status in both groups

Table 3: Correlation between serum vit. D levels and disease severity in CRS patients (45 patients)

Variable	Correlation coefficient	p value
SNOT 22 score	**-0.46**	**P<0.001**
Lund Mackay Score	**-0.40**	**P<0.001**

Table 4: Analysis of CRS with and without Nasal Polyps

Parameters	CRS patients (Mean ±SD) (20)	Controlled group (Mean ±SD) (25)	t test	p value
Serum 25 (OH) D (ng/ml)	12.8 (±2.1)	18.2 (±3.2)	6.50	P<0.001
SNOT – 22 score	52.5 (±9.4)	44.2 (±7.2)	4.13	P<0.001
Lund – Mac Kay Score	14.8 (±3.4)	11.5 (±2.2)	3.93	P<0.001

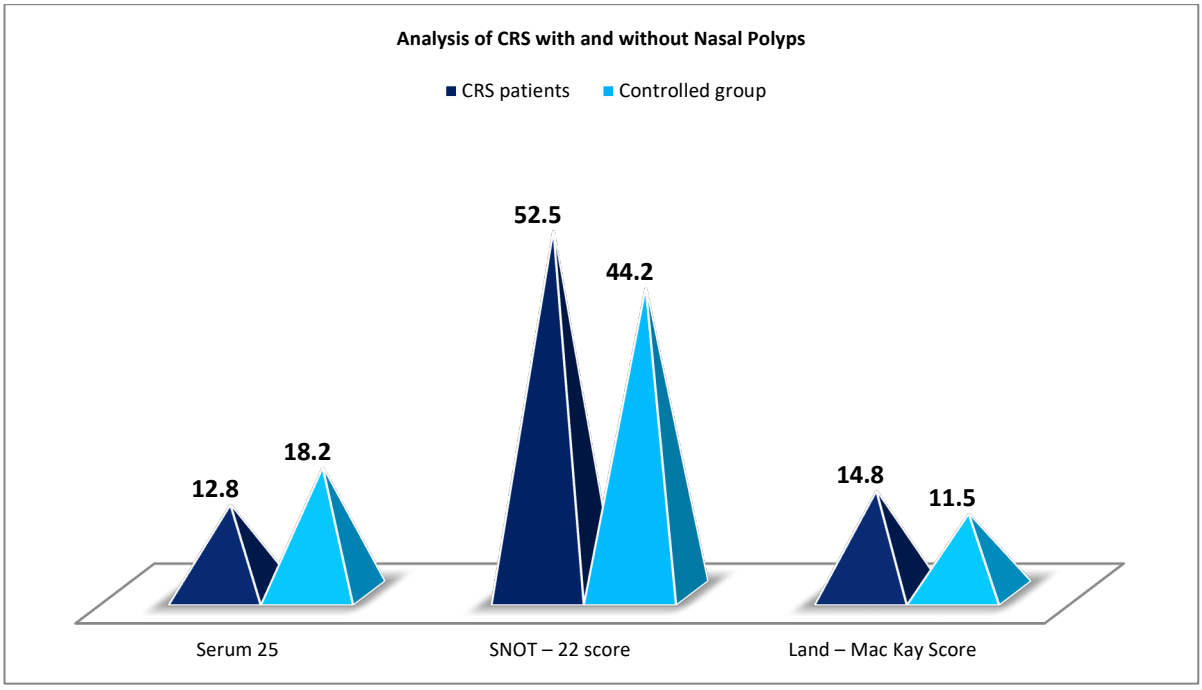

Figure 3: Analysis of CRS with and without Nasal Polyps

Discussion

Present study of vitamin D levels in chronic rhinosinusitis in Rajasthan population. In the comparative study of biochemical parameters, serum in CRS patients and parameters groups serum 25 (OH) D ng/ml, serum calcium (mg/dl), alkaline phosphatase (IUL), PTH (pg/ml) had significant p value (p<0.001) (Table 1).

Distribution of vitamin D levels in both groups had a significant p value (p<0.001) (Table 2). Correlation between serum vitamin D levels and disease severity in CRS patients and significant o value of CRS of value (Table 3). Analysis of CRS with nasal polyps and without nasal polyps parameters had a significant p value (p<0.001) (Table 4). These findings are more or less in agreement with previous studies [5,6,7].

Playing on essential role in anti-inflammation and anti-proliferation vit. D is known as an immune modulator. After initial hydroxylation in the liver vit. D transforms to the prohormone calcidiol 25(OH)D_3, which would circulate and be activated to calcitriol (1.25(OH)D_3) by 1α-hydroxylase in peripheral tissues. After binding to the intracellular vitamin D receptor (VDR), a number of cell signaling pathways are activated [8]. It is reported that, 1.25 (OH) D3 reduces the expression of pro-inflammatory cytokines by human's sinonasal epithelial cells. Moreover vitamin D is necessary to T-regulatory cell activity and T-cell responses to infection [9]. Hence, vitamin D is considered to be one of the important factors that could influence the pathogenesis of CRS.

In the CRS patients significantly reduced vit. D levels are noted. The result indicated that low vit. D level might interfere with the natural mechanism to limit the mucosa inflammation and anti-proliferative and anti-angiogenic properties, leading to episodes of CRS. It is also suggested that reduced vitamin D levels may increase susceptibility to sinusitis, as vitamin D plays a protective role in immune function and mucosal health. Meanwhile, the symptoms and signs are relieved by administration of vitamins D [10]. Various studies have reported that vitamin D status

is associated with systemic expression of dendritic cells, activation of T cells, and basic fibroblast growth factor in patients with CRSWNP (with polyp). It might play an anti-inflammatory function in CRS without a polyp, also reducing the proliferation of nasal polyp fibroblasts and secretion of matrix metalloproteinases and cytokines [11].

Summary and Conclusion

The present study of vitamin D levels in chronic rhinosinusitis has significantly reduced the level of vitamin D that has because, it plays an essential role in anti-inflammation and anti-proliferation in CRS patients.

The present study demands future research because CRS is still an undervalued disease and represents a large socioeconomic burden. The specific pathogenesis of CRS is still unclear.

Limitation of study: Owing to remote location of research centre, small number of patients lack of latest techniques we have limited findings and results. This research work was approved by the ethical committee of B. R. Ambedkar, Government Medical College Hospital, Sirohi, and Rajasthan-307001.

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