Hypovitaminosis D and its relationship to nasal polyposis

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Hypovitaminosis D and Its Relationship with Nasal Polyposis

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Abstract

Background: Chronic rhinosinusitis with polyposis is histopathologically characterized by dense infiltration of eosinophils along with cascade of inflammatory cytokines. This study aimed to discover the link between serum vitamin D levels and sinonasal polyposis.

Patients and methods: This cross-sectional study was carried out at Otolaryngology Department, Cairo University, Egypt. It included 72 participants divided into two groups: 36 cases of chronic rhinosinusitis with polyposis and 36 healthy volunteers. Serum vitamin D3 level was estimated by high-performance liquid chromatography technique, and disease severity in computed tomography was evaluated by Lund–Mackay scoring.

Results: A significant statistical difference was noted between patients and healthy individuals regarding serum 25-hydroxyl vitamin D3. Moreover, the lower the serum vitamin D3 (ng/ml), the higher the Lund–Mackay score.

Conclusion: This study shows that levels of 25-hydroxyl vitamin D3 are low in patients with sinonasal polyposis compared with that in healthy volunteers and lower levels of vitamin D are associated with more severe form of disease in computed tomography.

Keywords: 25-hydroxyl vitamin D3, High-performance liquid chromatography, Lund–Mackay score, Nasal polyposis

1. Background

Chronic rhinosinusitis (CRS) is classified into chronic rhinosinusitis with nasal polyps (CRSwNP) and chronic rhinosinusitis with no polyps (CRSsNP). CRSwNP is histopathologically characterized by dense infiltration of eosinophils along with cascade of inflammatory cytokines [1].

Two chemical molecules of vitamin D are known: vitamin D2 (ergocalciferol), which is produced from yeasts' ergosterol, and 25 (OH) vitamin D3 (cholecalciferol), which is synthesized from 7-dehydrocholesterol. Sunlight plays a role in 90% of humans' requirements of vitamin D [2].

Vitamin D has a precise role in regulation of calcium-phosphate metabolism and bone turnover [3].

This study aimed to discover an association between serum vitamin D levels and sinonasal polyposis and relation of serum vitamin D levels with age, sex, and extent of disease severity in computed tomography (CT).

2. Patients and methods

This cross-sectional observational study was conducted at Otolaryngology Department, Cairo University, Egypt. The study included 72 participants who were divided into two groups: cases group consisting of 36 cases of CRSwNP and control group consisting of 36 healthy volunteers.

Ethics approval and consent to participate: this study has been approved by ethical committee of ENT.
Department, Cairo University. Written informed consents from were obtained.

Inclusion and exclusion criteria were applied on patients for the study till reaching the calculated total sample size.

2.1. Inclusion criteria

For the case group, patients diagnosed with CRSwNP were included.

For the control group, age-matched and sex-matched healthy controls without CRSwNP and with healthy sinus mucosa were included.

2.2. Exclusion criteria

Pregnancy; patients diagnosed with diseases like rheumatoid arthritis, osteoporosis, parathyroid gland diseases, cystic fibrosis, and rickets; patients with allergic fungal sinusitis or earlier history of sinus surgery; and patients taking systemic steroid or vitamin D for at least 6 months were excluded.

Participants were subjected to the following:

(1) Measurement of 25(OH) vitamin D level in laboratory by high-performance liquid chromatography technique (Table 1).

(2) Endoscopic nasal evaluation to reach the diagnosis of CRSwNP for the patient group using European guideline definition (EPOS2020) [5].

(3) We reviewed patient’s CT according to the Lund–Mackay scoring system [6].

3. Results

The present study showed statistically nonsignificant difference between patient and healthy groups regarding age and sex. The mean age was 34.29 ± 13.59 and 37.51 ± 13.25 years among healthy individual and patient groups, respectively, and male predominance was 72.2 and 55.6% among healthy individuals and patients, respectively (P = 0.318 and 0.141 for age and sex, respectively) (Table 2).

A statistically significant difference was noted between patients and healthy individuals regarding vitamin D serum level. The mean vitamin D Level was 24.82 ± 8.93 and 15.32 ± 5.89 ng/ml in patients and healthy individuals, respectively (P = 0.000) (Table 3).

We reported vitamin D Level deficiency in 13.9 and 61.1% of control and patient groups, respectively, whereas insufficiency in 19.4 and 30.6% of control and patient groups, respectively, and normal vitamin D level in 66.7 and 8.3% of control and patient groups, respectively (P = 0.000) (Fig. 1).

The mean Lund–Mackay score was 19.20 ± 5.70 (6–24). Table 4 shows a statistically significant negative correlation between vitamin D level (ng/ml) and Lund–Mackay score (−0.426, P = 0.011) (Fig. 2).

4. Discussion

NP accounts for 1–4% of the population [7]. Vitamin D3 is recognized as a steroid hormone that has antiproliferative actions. Cases with CRSwNP have been tested to be vitamin D3 deficient [8].

There is rising evidence that fibroblasts have a role in assortment of inflammatory cells in CRS. The vitamin D receptors have been discovered on the surface of these fibroblasts [9].

Chinese and Indian patients with CRSwNP showed deficiency in serum vitamin D3 levels [10,11].

This study reported a statistically nonsignificant difference between patient and healthy groups regarding age and sex. In prior similar studies that included 160 individuals, comprising 50% of patients with NP and 50% of healthy controls, no significant difference was noted between both groups regarding age and sex [11,12].

A previous work included 117 individuals who were divided into three groups: chronic rhinosinusitis with polyps 27%, chronic rhinosinusitis with no polyps 30%, and healthy controls 43%. There was a statistically similar result to our finding [13].

This study reported a highly statistically significant difference between patients and healthy control individuals regarding vitamin D Level. The same was previously reported by Bavi et al. [12] and Habibi et al. [13].

This study also reported vitamin D level deficiency in 13.9 and 61.1% of healthy and patient groups, respectively, whereas insufficiency was reported in 19.4 and 30.6% of healthy individual and patient groups, respectively, and normal vitamin D Level was reported in 66.7 and 8.3% of healthy and patient groups, respectively (P < 0.001).

<table>
<thead>
<tr>
<th>Vitamin D (ng/ml)</th>
<th>Severe deficiency</th>
<th>Deficiency</th>
<th>Insufficiency</th>
<th>Normal</th>
<th>Excess</th>
<th>Intoxication</th>
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<td></td>
<td>&lt;5</td>
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<td>15–20</td>
<td>20–80</td>
<td>100–150</td>
<td>&gt;150</td>
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</table>

Table 1. Clinical definitions of 25(OH) vitamin D levels [4].
Similar to us, a prior study reported vitamin D deficiency in 45.5% of patients with CRSwNP patient and in 6.3% of patients with CRSsNP [10].

Mean Lund–Mackay score for the studied patients in the current study was 19.20 ± 5.70 (6–24). This study found a similar result to other authors who reported that the mean Lund–Mackay score in patients with CRSwNP was 19.4, whereas the median was 11 (2–20), which was less than the current results [11,12].

In this study, there was a highly negative correlation between 25 (OH) vitamin D Level (ng/ml) and Lund–Mackay score ($P = 0.011$).

In parallel to the current results, some authors reported significant results between 25 (OH) vitamin D Level and Lund–Mackay score ($P = 0.005$ and $P < 0.0001$, respectively) [11,12].

It was found in a previous study that vitamin D3 levels were insufficient in 55% of all patients with CRSwNP included in their study (80% of dark skin race and 38% of whites) [14].

### 4.1 Limitations and recommendations

Serum vitamin D can be altered by many conditions such as skin color, nutritional status, sun exposure, and liver and kidney conditions, so it is of value to evaluate all these factors in next studies to avoid bias.
Future studies are needed to help add vitamin D supplement for medical treatment of patients with sinusonal polyposis.

4.2. Conclusion

This study indicated serum levels of vitamin D3 are much lower in patients with sinusonal polyposis than in healthy control, and the lower the levels of vitamin D in serum, the more severe the disease in CT.

Conflicts of interest

There are no conflicts of interest.

References