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Relationship between VITAMIN D and chronic periodontitis

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A B S T R A C T

Introduction: Chronic periodontitis is a multifactorial disease primarily caused by plaque microorganisms, modified from the immune inflammatory response to chronic infection, which leads to the destruction of periodontal tissues in a susceptible host. It is very well known that vitamin D plays a vital role in bone homeostasis and immunity. There can be a biologic rationale to suspect that Vitamin D deficiency could negatively affect the periodontium. Present study was conducted to investigate any relationship between periodontitis and vitamin D.

Material and method: The clinico-biochemical relationship study was carried out in 168 subjects with Chronic Periodontitis. Plaque Index (PI), Gingival Index (GI), Probing Pocket Depth (PPD), Clinical Attachment Level (CAL) are correlated with serum level of Vitamin D.

Results: Statistically significant relationship between serum 25(OH) D level and periodontal parameters namely GI, PPD and CAL were observed.

No relationship between 25(OH) D levels and PI was observed.

This study also revealed overall low levels of serum Vitamin D in patients with chronic periodontitis but the levels of Vitamin D did not decrease with the increase in the severity of periodontitis.

Conclusion: A statistically significant relationship between serum 25(OH) D level and periodontal parameters namely GI, PPD and CAL were observed. No relationship between 25(OH) D levels and PI was observed.

1. Introduction

The relationship between periodontitis and systemic diseases has been recognized due to the fact that periodontal pathogens might affect distant sites and organs and thus affect an overall health.[1] Vitamin D plays a crucial role in bone maintenance and immunity, there can be a biologic rationale to suspect that Vitamin D deficiency could negatively affect the periodontium. It is hypothesized that vitamin D status could modify the risk for periodontal disease.[2–4]

Besides its role in calcium homeostasis, the biologically active form of vitamin D, 1,25$(OH)_2$D has been demonstrated to be a potent immuno-modulator due to its anti-inflammatory effect through inhibition of cytokine production by immune cells and stimulation of monocytes or macrophages to secrete peptides with potent antibiotic activity and therefore, be beneficial for the treatment of periodontal diseases. A diagnosis of vitamin D deficiency is made through serum analysis of 25(OH) D level. The normal range of serum 25(OH) D level is 20–74 ng/ml.[5]

Few studies have investigated the association between Vitamin D status, assessed with a blood biomarker, and periodontal disease. This present study aims to determine the possible relationship between vitamin D and Chronic Periodontitis.

1.1. Materials and methodology

The clinico-biochemical relationship study was carried out in 168 subjects with Chronic Periodontitis in Department of Periodontology, King George's Medical University (KGMU), Lucknow in collaboration with Department of Medicine and Department of Biochemistry, King George's Medical University (KGMU), Lucknow.

1.2. Inclusion criteria

Patients with features of mild, moderate or severe chronic periodontitis irrespective of sex were included.

1.3. Exclusion criteria

1) Pregnant and lactating females
2) History of medications that might affect bone and mineral metabolism and/or periodontal health
3) Taking multivitamin and food supplement which contain vitamin D
4) Diabetic patient
5) Malabsorption syndrome or patient with chronic diarrhoea
6) Treatment with bisphosphonates in the past 12 months or lifetime

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exposure to bisphosphonates for more than 3 years.

An informed consent and a thorough medical and dental history were taken from all the participants. Ethical clearance was obtained from the Institutional Ethical Committee.

1.4. Periodontal parameters to be assessed

1. Plaque index (PI)
2. Gingival index (GI)
3. Probing pocket depth (PPD)
4. Clinical attachment level (CAL)

Estimation of VITAMIN D {25(OH)D} level in serum by ELISA kit.

1.5. Statistical tools employed

The statistical analysis of the data was done using Statistical Package for Social Sciences (SPSS, Version 15.0) software. The data was analyzed using chi-square test for categorical variables and analysis of variance for continuous variables. Within group change was assessed using paired "t"-test. The confidence level of the study was kept at 95%, hence a "p" value less than 0.05 indicated a statistically significant association.

1.6. Observation and result

In the present study mean PI of the subjects was 1.71 with the relationship coefficient of −0.08 with vitamin D which was not significant. With GI mean score was 2.08 with Relationship coefficient of −0.45 which was significant PPD and CAL had a mean value of 3.88, 3.92 with Relationship coefficient of 0.23 and 0.36 respectively, both of which were significant (Table 1).

Patients with mild periodontitis had a mean vitamin D level of 21.70while it was 20.18 with moderate and 20.27 for severe periodontitis. These values were not statistically significant with each other (Table 2).

44% of the total patients were deficient in vitamin D status, 23.8% suffered from insufficiency, 12.5% were severely deficient. Only 19.6% were sufficient with respect to Vitamin D status but none showed toxicity (Table 3).

A statistically significant relationship between serum 25(OH)D level and periodontal parameters namely GI, PPD and CAL were observed.

No relationship between 25(OH)D levels and PI was observed.

This study also revealed overall low levels of serum Vitamin D in patients with Chronic Periodontitis but the levels of Vitamin D did not decrease with the increase in the severity of periodontitis.

2. Discussion

It is well known fact that Vitamin D has bone-protecting capacity and immunomodulatory effects, so it was hypothesized that serum 25(OH)D levels would be inversely associated with the extent of infection in the periodontium.[6,7] According to the Nordic nutrition recommendations,[8] serum 25(OH)D levels of 30 ng/ml is adequate for oral health while the US National Institutes of Health (2014)[9] recommended a level of ≥20 ng/ml to be adequate for bone and overall health.

Overall, periodontal health (mPI = 1.71 ± 0.20, mGI = 2.08 ± 0.38, mPPD = 3.88 ± 0.43,mCAL = 3.92 ± 1.02) of periodontitis cases in the population studied was mainly attributable to restrictions of smoking, and Diabetes Mellitus (DM) individuals. For validity reasons, individuals with DM, smokers, and elderly people were excluded from this study. Individuals with DM were excluded because of the complex interrelations between periodontitis and DM,[10] smokers were excluded because of residual confounding related to smoking,[11] and elderly individuals (> 65 years) were excluded to eliminate the possible effects of age-related confounding factors, a relatively fair oral hygiene (mPI = 1.7)cases of periodontitis were included in this present study and this might be a reason for no relationship between Vitamin D and Plaque Index (PI) (Vitamin D and PI r = −0.08,p = 0.16).

Our findings were in agreement with the result reported by (Abreu OJ et al., 2016 and Laky M et al., 2016)[12,13] that low Vitamin D was significantly associated with periodontitis as the overall Vitamin D levels in our study was found low.

There was statistically no significant association between 25(OH) D levels and severity of periodontitis (p = 0.84) which was in accordance of Antonoglou GN et al. 2015[14.] The possible explanation for the weakness or nonexistence of an association between serum 25(OH)D levels and clinical attachment loss may be due to overall low levels of serum 25(OH)D in the present individuals. The strength of the association between Vitamin D and various health outcomes, including periodontal infection, is dependent on population characteristics, such as the overall serum Vitamin D levels[15] environmental factors mainly smoking[16] and genetic profile of the population[17.] It was also seen that in individuals with moderate to poor oral hygiene, the effect of plaque overwhelmed the beneficial effect of serum 25(OH)D on the periodontium.[14]

Correcting vitamin D deficiency may have a large beneficial impact on chronic disease prevalence whether through diet or supplementation; it could be a safe, effective, and inexpensive method of reducing periodontal disease prevalence. But additional studies are needed to examine to what extent vitamin D plays a role in protecting periodontal tissues from inflammatory breakdown and evaluating the effects of Vitamin D supplementation on periodontal health in prospective controlled clinical trials. The optimal dosage of Vitamin D supplementation has also to be determined and its impact on prevention of periodontitis needs to be assessed.

Table 1
Distribution of clinical parameters among the cases.

Clinical parameters	(Mean ± SD)	Relationship coefficient	p-value[1]
PI	1.71 ± 0.20	−0.08	0.16
GI	2.08 ± 0.38	−0.45	0.001*
PPD	3.88 ± 0.43	−0.23	0.002*
CAL	3.92 ± 1.02	−0.36	0.0001*

[1]ANOVA test.
*Significant, p = 0.0001 (Post hoc tests).

Table 2
Comparison of vitamin D level with severity of periodontitis among the cases.

Severity of CAL	Vitamin D level (Mean ± SD)
Mild	21.70 ± 10.66
Moderate	20.18 ± 10.14
Severe	20.27 ± 9.33
p-value[1]	0.84

[1]ANOVA test.

Table 3
Distribution according to vitamin D status.

Vitamin D status	No.(n = 168)	%
Severe deficiency	21	12.5
Deficiency	74	44.0
Insufficiency	40	23.8
Sufficiency	33	19.6
Toxicity	0	0.0

3. Conclusion

A statistically significant relationship between serum 25(OH)D level and periodontal parameters namely GI, PPD and CAL were observed. No relationship between 25(OH)D levels and PI was observed. This study also revealed overall low levels of serum Vitamin D in patients with Chronic Periodontitis but the levels of Vitamin D did not decrease with the increase in the severity of periodontitis. Low serum Vitamin D level in this study may be due to the disease process rather than the low Vitamin D levels, which might act as a cause for Chronic Periodontitis. So, multicenter studies with large sample size should be needed to confirm Vitamin D as a risk factor as well as etiologic factor for Chronic Periodontitis.

Assuming the role of Vitamin D in inflammatory responses and integrity of the innate immune response, Vitamin D supplementation may be beneficial in the treatment of periodontal diseases and this can open a new therapeutic approach for periodontal therapy.

Conflicts of interest

None.

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Appendix A. Supplementary data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.jobcr.2018.07.001.

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