



Anti inflammatory efficacy of Vitamin D and Calcium supplementation on clinical effects of patients with chronic periodontitis – A cross sectional pilot study

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Abstract

Background: Periodontal disease has been associated with vitamin D deficiency in numerous populations. A possible role of vitamin D in periodontal health is also supported by findings that polymorphisms of the vitamin D receptor gene are associated with periodontitis. Hence the aim of our study was to determine anti inflammatory effects of calcium and vitamin D oral supplementation in subjects with chronic periodontitis undergoing scaling and root planning.

Methodology: 30 patients were selected from patients attending department of periodontology were randomized into 2 groups (control and experimental group). All patients were assessed pre operatively for clinical parameters PI (Plaque index), Gingival index, Probing Depth and bleeding index. Then scaling and root planning were done to both the groups. Vitamin D and calcium tablets were given for 1 month following scaling and root planning in experimental group patients.

Results : ANOVA was used to compare the clinical parameter between the groups in between baseline, 15 days and 1 month follow up period. There was no statistical significant reduction in clinical parameters between the groups.

Conclusion : There was reduction in the clinical parameters between the two groups even though no statistical difference was found. Hence we recommend based on the study results that calcium and vitamin D can be given as an adjunct to SRP for better periodontal outcomes.

Keywords: Anti inflammation, Calcium, Chronic periodontitis, Vitamin D

Introduction

Periodontal disease is a multifaceted microbial disease, which involves the disruption of oral homeostasis and is characterized by gingivitis that leads to progressive loss of tooth-supporting tissues.¹ This disease results from an imbalance between the oral microbiota and an individual's inflammatory response; it contributes to dysbiosis.² If untreated, can lead to tooth loss, and may also affect systemic health.³

The major predictors of tooth loss in patients with periodontal disease include the presence of plaque associated bacteria, older age, poor compliance with dental care, smoking, and diabetes.⁴ Vitamin D and calcium supplementation can have a optimistic effect in the management of periodontal disease, when used as an adjunct to non-surgical periodontal treatment; moreover, vitamin D and calcium supplementation may reduce tooth loss and alveolar ridge resorption.⁵

Periodontal disease has been associated with vitamin D deficiency in numerous populations, although the mechanism by which this occurs is not known.⁶ This may be due to the effect of vitamin D on both the innate immune activity of the gingival epithelium against periodontal pathogens to maintain microbial homeostasis and the inhibition of pro-inflammatory cytokines.⁷

Vitamin D is best known as a principal factor that maintains calcium homeostasis and is required for bone development and maintenance. However, it is becoming clear that vitamin D has profound effects on immunity and inflammation as well.⁸ The active form of vitamin D, 1,25(OH)₂D₃, can induce the expression of antimicrobial peptides and other innate immune mediators in a variety of cell types.⁹ Furthermore, 1,25(OH)₂D₃ exhibits anti-inflammatory activity through the inhibition of pro-inflammatory cytokine gene expression.¹⁰

Average vitamin D and calcium intakes in the general population are below current recommendations of 400 to 600 IU and 1,000 to 1,200 mg daily, respectively.¹¹ It was estimated that 1 billion people worldwide have vitamin D deficiency or insufficiency.¹² Hildebolt suggested that vitamin D and/or calcium intake results in reduced alveolar bone loss, gingival inflammation, and/or attachment loss.¹³

A possible role of vitamin D in periodontal health is also supported by findings that polymorphisms of the vitamin D receptor gene are associated with periodontitis, alveolar bone loss, clinical attachment loss, and/or tooth loss.¹⁴ Though, there are evidences pointing to a impending role of vitamin D and calcium intake on dental health; however, the possible effects of such dietary supplementation on periodontal disease parameters and outcomes have not been addressed.

Hence the aim of our study was to determine anti inflammatory effects of calcium and vitamin D oral supplementation in subjects with chronic periodontitis undergoing scaling and root planning by assessing the clinical parameters like plaque index, gingival index, Probing Depth and CAL .

Materials and methods:

30 subjects reporting to the department of Periodontics, Vivekanandha Dental College for women with the age group of 18-60 years were selected for the study. The study was performed only after obtaining the institutional ethical clearance.

The inclusion criteria consisted of patients willing to participate in the study, patients with chronic periodontitis, having at least 20 natural teeth, probing depth around 4 -6mm, gingival index > 1 with clinical attachment loss & radiographic bone loss. Patients taking antibiotics in the past 3 months, patients who have received any periodontal therapy in the past 6 months, continuous exposure to direct sunlight for more than three hours a day, patients with systemic disease and medically compromised conditions, patients with habits like smoking, drinking alcohol etc were excluded from the study.

30 patients were divided into two groups, control group (n=15) and the experimental group (n=15). All patients were assessed pre operatively for clinical parameters PI (Plaque index), Gingival index, Probing Depth and CAL. Then scaling and root planning were performed to both the groups and Calcium and Vitamin D tablets (Maxical-500, Calcium-500mg, Vitamin D-250IU) were given as oral supplementation (1 tablet a day after food as morning dose) for 1 month following scaling and root planning in experimental group patients.

All patients will be assessed post operatively for clinical parameters after 1 month and then the data were subjected to statistical analysis. ANOVA was used to compare the clinical parameter between the groups in baseline, 15 days and 1 month follow up period.

Results:

Graph 1 represents the percentage of the study objects, 48% in both the groups and 4% of the subjects failed to attend the follow up procedures.

Graph 1: Graphical representation of the Study Subjects

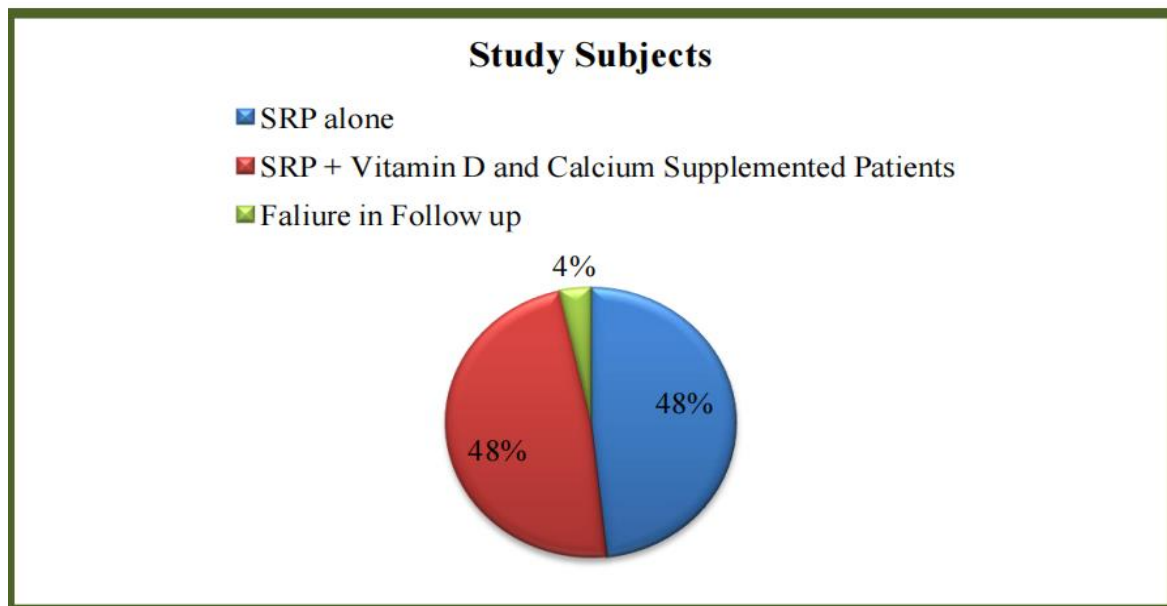


Table 1 represents the comparison of pocket depth between the two groups on baseline, 15th day and 1 month, experimental group showed the reduction in the mean value of pocket depth in baseline, 15th day and 1 month but no significant reduction in the pocket depth between the groups. (0.647,0.240,0.061)

Table 2 showed the comparison of plaque index between the two groups on baseline, 15th day and 1 month, experimental group showed the reduction in the mean value of pocket depth in baseline, 15th day and 1 month but no significant reduction in the pocket depth between the groups. (0.699, 0.305, 0.461)

Table 1: Comparison of the clinical effect of Pocket Depth between and within the two groups during baseline , 15th day and 1 stmonth of the Study

Groups	Pocket depth					
	Baseline		15th Day		1 month	
	Mean	SD	Mean	SD	Mean	SD
Control Group	5.21	0.802	4.14	0.864	3.64	0.497
Vitamin D and Calcium Supplemented Patients	5.07	0.829	3.79	0.699	3.29	0.469
F- value	0.215		1.444		3.824	
ANOVA p-value	0.647		0.240		0.061	

Table 2: Comparison of the clinical effect of Plaque amount between and within the two groups during baseline , 15th day and 1 stmonth of the Study

<i>Groups</i>	<i>Plaque index</i>					
	Baseline		15th Day		1 month	
	Mean	SD	Mean	SD	Mean	SD
Control Group	2.71	0.469	1.50	0.760	0.86	0.770
Vitamin D and Calcium Supplemented Patients	2.64	0.497	1.14	1.027	0.64	0.745
F- value	0.153		1.094		0.560	
ANOVA p-value	0.699		0.305		0.461	

Table 3: Comparison of the clinical effect of Gingivalfeatures between and within the two groups during baseline , 15th day and 1 st month of the Study

<i>Groups</i>	<i>Gingival index</i>					
	Baseline		15th Day		1 month	
	Mean	SD	Mean	SD	Mean	SD
Control Group	2.57	0.514	1.21	0.893	0.57	0.514
Vitamin D and Calcium Supplemented Patients	2.50	.519	1.14	0.864	0.36	0.497
F- value	0.134		0.046		1.258	
ANOVA p-value	0.717		0.831		0.272	

Table 4: Comparison of the clinical effect of Bleeding between and within the two groups during baseline , 15th day and 1 st month of the Study

Groups	<i>Bleeding index – mombelli oosten</i>					
	Baseline		15th Day		1 month	
	Mean	SD	Mean	SD	Mean	SD
Control Group	2.71	.469	1.57	0.646	0.64	0.497
Vitamin D and Calcium Supplemented Patients	2.50	.519	1.21	0.699	0.36	0.497
F- value	1.315		1.970		2.311	
ANOVA p-value	0.262		0.172		0.141	

Table 3 compared the gingival index between and within the two groups on baseline, 15th day and 1 month, experimental group showed the reduction in the mean value of pocket depth in baseline, 15th day and 1 month but no significant reduction in the pocket depth between the groups. (0.717, 0.831, 0.272)

Comparison of the bleeding index between and within the two groups during baseline , 15th day and 1st month had no statistically significant reduction (0.262, 0.172 and 0.141 respectively) even though there was difference in the mean values and SD.(Table 4)

Discussion :

Periodontal disease is a chronic disease with causal bacterial etiology. The bacterial etiology of periodontal disease is complex, with a diversity of organisms responsible for the initiation and progression of the disease.¹⁵ The rate of disease progression is regulated by the impact of local, systemic or environmental factors that sway the normal host–bacterial interaction.¹⁶ There are several factors affecting the host immunity in inflammatory conditions, which also includes deficiency of vitamin D and calcium. Vitamin D influences the expression of inflammation related cytokines and plays an important role in many chronic inflammatory diseases.¹⁷

In the present study, anti inflammatory effects of vitamin D and calcium supplementation on chronic periodontitis patients were studied. Four clinical parameters were assessed namely pocket depth, plaque index, gingival index and bleeding index both pre and post operatively in both the groups. Plaque index assessed based on Silness and Loe¹⁸ , Gingival index was assessed using the criteria given by Loe and Silness¹⁸ , Bleeding index by Mombelli oosten and the probing depth was determined using the Williams probe.

This study focuses on the changes of inflammatory load in periodontal disease with the supplementation of vitamin D and calcium. In support with, suppressing effect of vitamin d on the production of different proinflammatory cytokines such as TNF α , IL-6,8,12, and MMPs.¹⁹

The study of Hiremath et al (2013) evaluated the anti-inflammatory effect of vitamin D on gingivitis at various doses which revealed that there was a dose-dependent anti-inflammatory effect of vitamin D on gingivitis and concluded that vitamin D was a safe and effective anti-inflammatory agent in doses ranging from 500 IU to 2000 IU, whereas in the present study the anti inflammatory effect of Vitamin D and calcium in the single dose was effective than the control group.²⁰

Miley et al did a Cross-Sectional Study of Vitamin D and Calcium supplementation effects on Chronic Periodontitis and concluded that supplement takers had shallower probing depths, fewer bleeding sites,

lower gingival index values, fewer furcation involvements, less attachment loss, and less alveolar crest height loss.²¹ Krall evaluated vitamin D and calcium supplementation in adults aged ≥ 65 years over a 3-year period; 13% of the supplemented patients lost teeth, compared with 23% of the non-supplemented patients.²²

Periodontal disease is common; affected individuals can benefit from supplementation with both vitamin D and calcium. However, there are barriers to the achievement of adequate vitamin D supplementation. These barriers may include lifestyle changes that result in less sun exposure and less ingestion of vitamin D-containing food than in previous generations.²³ The study also has certain limitations like limited sample size, shorter duration and the effects would have been better analysed using serum Vitamin d and calcium levels before and after supplementation.

Conclusion :

Periodontal disease is associated with colonization of pathogenic bacteria vitamin D may have a profound effect in prevention of this colonization with direct antimicrobial activity, as well as enhancement of the natural innate immune response . Our results of the study recommend that calcium and vitamin D can be given as an adjunct to SRP for better periodontal outcomes.

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