

ORIGINAL RESEARCH

Estimation and Comparison of Calculus Formation and Serum Calcium Levels: A Clinicobiochemical Study

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ABSTRACT

Introduction: The rate of calculus formation varies between individuals with certain people exhibiting calculus formation faster than the others. Hence, individuals have been classified as heavy, moderate, mild, and non-calculus formers. Various factors affect the rate of calculus formation.

Aim: The current study was designed to estimate and compare the calculus scores in periodontitis subjects with serum calcium levels.

Materials and Methods: Subjects diagnosed with periodontitis with generalized pockets were assessed for their calculus scores using the CI-S component of the Oral Hygiene Index-Simplified. Three groups of 25 subjects each with generalized periodontitis were selected. Group A was mild calculus formers, Group B was moderate calculus formers, and Group C was severe calculus formers. Two milliliters of blood sample collected were analyzed biochemically for the calcium levels. The results were statistically analyzed.

Results: Results obtained show a statistically significant increase in the levels of serum calcium in Group B and Group C as compared to Group A which correlated with calculus index score.

Conclusion: Based on the results, a significant association between calculus formation and serum calcium levels in subjects with periodontitis was noted.

Keywords: Calculus formers, Calculus score, Periodontitis, Serum calcium.

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INTRODUCTION

Periodontal disease is a chronic inflammatory disease affecting the supporting structures of the tooth. Inflammatory periodontal diseases are among the most prevalent chronic diseases of humans and are a major cause of tooth loss.^[1] There are certain factors such as diet, genetics, and lifestyle choices which are thought to contribute to the disease progression. Among the minerals, calcium is one of the most abundant found in the body. It is found in food, certain diet supplements, and some medications. Calcium is required for muscle, nerve functions, vascular, and intracellular signaling. Serum calcium is regulated through calcitonin and parathyroid hormone using the bone as a reservoir.^[2] The recommended dietary allowances or requirement of calcium ranges from 1000 to 1300 mg/day for an average adult. Various articles describe that Vitamin D and calcium deficiencies result in bone loss and increased inflammation which are among the symptoms of periodontal disease. It is seen that low intakes of calcium may lead to a negative calcium balance which causes a secondary increase in serum calcium removal from the bone, including the alveolar bone. Thus, such a bone loss may contribute to the weakening of the tooth attachment apparatus.^[3] The complete role of calcium in the prevention or progression of periodontal disease still needs further research. The rate of calculus formation varies between individuals with certain people exhibiting calculus formation faster than the others. Hence, individuals have been classified as heavy, moderate, mild, and non-calculus formers. Various factors affect the rate of calculus formation such as dietary, serum calcium levels, and salivary calcium levels.

MATERIALS AND METHODS

The current study was designed to estimate and compare the calculus scores in generalized periodontitis subjects with serum calcium levels. A total of 75 subjects of both sexes (age 22–55 years) were selected from the outpatient department of the Department of Periodontology, Jaipur Dental College, Jaipur.

Inclusion

The study was conducted on 75 systemically healthy subjects age between 22 and 55 years who visited the department. They were informed about the study and

a written informed consent was obtained and their inclusion was voluntary.

Exclusion

Patients with a history of treatment for moderate-to-severe periodontitis, systemic diseases, systemic antibiotics, and any history of medication for the past 6 months were excluded from the study.

Study Design

Subjects diagnosed with periodontitis with generalized pockets were assessed using Williams graduated periodontal probe for calculus scores using the CI-S component of the Oral Hygiene Index-Simplified (Greene and Vermillion, 1964). Based on the score, they were divided into three groups of 25 subjects each. Group A was mild calculus formers, Group B was moderate calculus formers, and Group C was severe calculus formers. Two milliliters of blood sample collected from antecubital region were analyzed biochemically using an analyzer for the serum calcium levels. The results were statistically analyzed.

RESULTS

The results were statistically analyzed using the SPSS software version 21.

The mean serum calcium was significantly greater in severe calculus formers compared to moderate and mild and significantly greater in moderate compared to mild calculus formers.

1. The mean calculus score comparison among mild, moderate, and severe calculus formers using

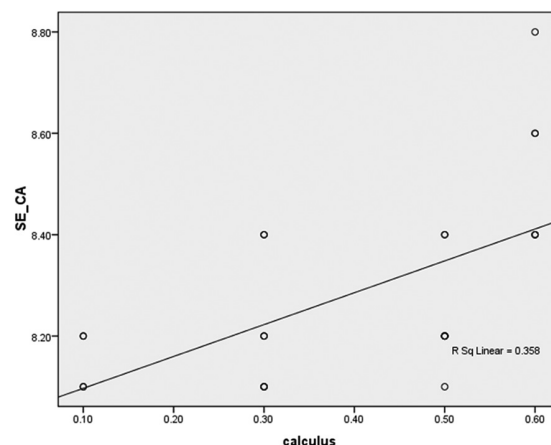
one-way analysis of variance and *post hoc* performed using Tukey test [Table 1].

2. The mean serum calcium comparison among mild, moderate, and severe calculus formers using one-way analysis of variance and *post hoc* performed using Tukey test [Table 2].

Explanation: The mean serum calcium is significantly greater in severe calculus formers compared to moderate and mild and significantly greater in moderate compared to mild calculus formers.

Correlation

Overall calculus and serum calcium



Mild calculus and serum calcium

CI_MILD	SC_MILD
Pearson correlation	0.599**
Sig. (two tailed)	0.002
n	25

**Correlation is significant at the 0.01 level (two tailed). Significant moderate correlation between mild calculus and serum calcium values

Table 1: The mean calculus score was compared among mild, moderate, and severe calculus formers using one-way analysis of variance and *post hoc* performed using Tukey test

Calculus	n	Mean	Standard deviation	P	95% confidence interval for mean		Minimum	Maximum	Post hoc
					Lower bound	Upper bound			
Mild	25	0.4040	0.17673		0.3310	0.4770	0.10	0.60	
Moderate	25	1.5240	0.22038	<0.001	1.4330	1.6150	0.80	1.80	Severe*>Moderate*>Mild
Severe	25	2.5480	0.20841		2.4620	2.6340	2.10	2.80	
Total	75	1.4920	0.90386		1.2840	1.7000	0.10	2.80	

P<0.05 is considered statistically significant

Table 2: The mean serum calcium was compared among mild, moderate, and severe calculus formers using one-way analysis of variance and *post hoc* performed using Tukey test

Serum calcium	n	Mean	Standard deviation	P	95% confidence interval for mean		Minimum	Maximum	Post hoc analysis
					Lower bound	Upper bound			
Mild	25	8.2880	0.18556		8.2114	8.3646	8.10	8.80	
Moderate	25	9.7160	0.65427	<0.001	9.4459	9.9861	8.20	10.80	Severe*>Moderate*>Mild
Severe	25	10.0640	0.43768		9.8833	10.2447	9.20	10.80	
Total	75	9.3560	0.90034		9.1489	9.5631	8.10	10.80	

P<0.05 is considered statistically significant

DISCUSSION

When the mean calculus score and serum calcium level of Group A (mild calculus former) were compared to Group B (moderate calculus formers), it was found to be statistically significant ($P < 0.05$). Similarly, when Group A was compared to Group C (severe calculus formers) and Group B to C, it was found to be statistically significant ($P < 0.05$). Results are in agreement with the studies done by Nishida *et al.*, 2000,^[4] Pushparani and Nirmala, 2014,^[5] and Harsha *et al.*, 2015.^[6]

The sample consisted of periodontitis subjects and with an aim to study the relationship between serum calcium levels and calculus formation. The results of the study found a positive correlation and can be attributed to bone loss occurring, following bacterial infections in periodontal diseases resulting in elevated serum calcium levels.

The elevated serum calcium and salivary calcium levels are readily utilized by the maturing plaque-forming calculus, contributing to the progression of periodontitis.

The normal serum calcium range is 8.1–10.4 mg/dl. Hence, in the current study, higher serum calcium levels were related to the higher calculus index scores.

In the current study, one of the shortcomings was that the dietary intake of calcium was not noted, hence, in the sample size studied, there could have been subjects with low dietary calcium intake. In such subjects,

the parathyroid hormone has been noted to be activated causing increased serum calcium levels.

CONCLUSION

Periodontal diseases are inflammatory conditions resulting in various changes in host which can be evaluated by various biomarkers. The present study concludes a relationship between elevated serum calcium levels and calculus scores. Further studies on calcium homeostasis and its mineralized regulatory mechanism in periodontitis patients can be researched.

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