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Research Article

EVALUATION OF SERUM CALCIUM LEVELS IN PATIENTS WITH PERIODONTITIS

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A B S T R A C T

Aim: This study aims to evaluate the association between serum calcium levels and periodontitis.
Background: Available literature suggests that there is a scarcity of information emphasizing the role of Serum calcium levels in periodontal disease when compared to dietary calcium levels.
Materials and Methods: 45 patients of both genders with periodontitis were selected as study subjects. Demographic variables were recorded. Periodontal Parameters such as oral hygiene index (OHI-S) and probing pocket depth (PPD) ≥ 5mm were recorded. Venous blood sample was also collected to analyse the serum calcium levels.
Results: The results suggests the significant positive correlation of age ($p<0.001$), OHI-S ($p<0.01$) and PPD ($p<0.001$) with serum calcium level.
Conclusion: This study concludes that there is an increase in serum calcium levels in periodontitis and its progression. Serum calcium level may be a useful tool to assess the periodontal host response.

INTRODUCTION

Periodontitis is defined as 'an inflammatory disease of the supporting tissues of the teeth caused by specific micro-organisms or groups of specific micro-organisms, resulting in progressive destruction of the periodontal ligament and alveolar bone, with increased probing depth formation, recession or both (Newman MG *et al*,2012). It induces both inflammatory and immune host responses which may even contribute to systemic diseases. Though there are various diagnostic and therapeutic approaches to evaluate and treat periodontal diseases, its multifactorial etiology, numerous risk factors and complicated pathophysiology, makes it challenging for the clinicians. Advances in oral and periodontal disease diagnostic are moving towards methods whereby the periodontal risk can be assessed by detecting various biomarkers (Rahul kathariyaa *et al*, 2013). These biomarkers are diagnostic markers which serve as a basis and provide data about various processes involved in the disease. These biomarkers may also be considered as reliable indicators in the progression of disease.

Calcium is the fifth most abundant element next to oxygen, carbon, hydrogen and nitrogen (Guyton *et al*, 2011). It is very essential for many activities in the body such as teeth and bone formation, cardiac activity, cell division, cell growth and blood coagulation. It also acts as a second messenger affecting enzyme activity and secretion of hormones (D.S.Pushpa Rani *et al*, 2012). In a normal young healthy adult, there is about 1200g of calcium in the body. 98% of calcium is present in bones, teeth and the rest is present in the plasma. The normal serum calcium level ranges between 8.5-10.5 mg/dl for a healthy individual (H Kenneth Walker *et al*, 1990).

Previous scientific literature suggested that calcium deficiency results in bone loss and increased inflammation which are specific characteristic features of periodontitis. To maintain the homeostasis, a negative calcium balance mechanism gets stimulated, thus the secretion of parathyroid hormone removes calcium from the bone including alveolar bone, which in turn, leads to increase in serum calcium levels. Such bone loss invariably contributes to weakening of periodontal structures (Neeli Vasavi *et al*, 2016). The current study aims to evaluate the association between serum calcium level and periodontitis.

AIM

The aim and objective of this study is to evaluate the relationship between the serum calcium levels and patients with generalized chronic periodontitis.

MATERIALS AND METHODS

It is a prospective case control study done at Priyadharshini dental college and hospital, Pandur, Thiruvallur, India. The

power analysis is done; it showed 80% of power with 41 subjects in a study group.

Single Mean - Hypothesis testing - one population mean
Standard Deviation = 7.6071, Sample mean = 11.688, Population mean = 15.0
Alpha Error (%) = 5, Power (%) = 80, Sided = 2, Effect Size = .4354
Number needed (n) = 41
Power analysis shown in table – 1

Table-1 Power analysis calculation

Sample Size (n)	Power (%)	Alpha Error (%)
51	70	
62	80	1
79	90	
33	70	
41	80	5
55	90	
25	70	
32	80	10
45	90	

Thus the sample size of 45 subjects was included in the study group.

Ethical clearance was obtained from the institutional ethics committee and review board, following which, the nature and design of the study were informed to the patient and written informed consent was obtained.

Patients who were willing to participate in the study, healthy patients of both the genders between 32-65 years of age group, patients with minimum of 10 natural teeth and patients with inflamed gingival tissue with the evidence of bleeding, local factors and pocket depth≥5mm in 30% or more of the teeth sites assessed, were included in the study. Smokers, pan chewers, alcoholics, pregnant or lactation women, patients with concomitant medical therapy, known osteoporotic patients and patients who take antibiotics or periodontal therapy 6 months prior to the sample collected were excluded in the study.

Chronic periodontitis was diagnosed as per the guidelines and classification outlined by the American Academy of Periodontology (AAP task force, 2015). Periodontal parameters such as OHI-S index (Greene JC *et al*, 1960) and probing pocket depth (PPD) were recorded.

15 ml of venous blood sample was obtained by venipuncture from each participant of the study, and serum was separated by centrifugation, and analyzed for quantitative determination of serum calcium level by OCPC (ortho-cresolphthalein complexone) method using Chempak serum calcium analysis kit (Reckon Diagnostics Pvt. Ltd., India).

The procedure was carried out according to manufacturer's instruction protocol. The absorbent of the test was determined using colorimeter and the calcium concentration (mg/dl) was calculated. The processed samples were discarded according to the standard protocol and guidelines. The results were documented and statistically analyzed.

RESULTS

Table - 2 shows the mean and standard deviation of age,OHI-S, PPD and serum calcium level as 48.80±9.59, 1.95±0.54, 7.98±1.58 and 11.26±1.60 respectively.

Table- 2 Descriptive statistics of various parameters with serum calcium level

N	Standard deviation	Mean	
45	9.595	48.80	Age
45	.5400	1.958	Ohi-s
45	1.588	7.98	Probing pocket depth
45	1.6083	11.262	Serum calcium level

Table -3 Correlation between various parameters and serum calcium level

Serum Calcium Level	Probing Pocket Depth	Ohi-S	AGE		
.636**	-.058	-.005	1	Age	Pearson correlation
.000	.703	.975			Sig.(2 tailed)
45	45	45	45		N
.440**	.727**	1.000	-.017	Ohi-s	Spearman's rho correlation coefficient
.002	.000	.	.913		Sig (2- tailed)
45	45	45	45		N
.502**	1	.767**	-.058	Probing	Pearson correlation
.000		.000	.703	Pocket	sig (2- tailed)
45	45	45	45	Depth	N

**. Correlation is significant at the 0.01 level (2 tailed)

Table - 3 shows the correlation of various parameters such as age, OHI-S and PPD with serum calcium level using Pearson and Spearman's rho analysis. It suggests that increase in age and probing pocket depth shows a proportionally significant increase in serum calcium level (p value <0.001). It also suggests a significant increase in serum calcium level (p value <0.01) as the oral hygiene index scores increases.

Fig 1, Fig 2 and Fig 3 shows the linear positive correlation of age, OHI-S and PPD with serum calcium level respectively.

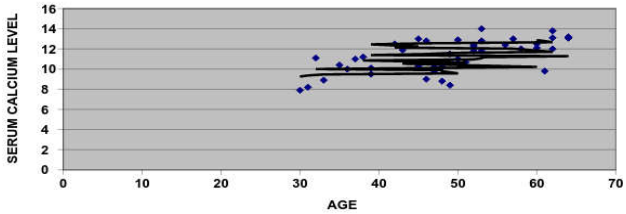

Fig 1 Correlation of age and serum calcium level

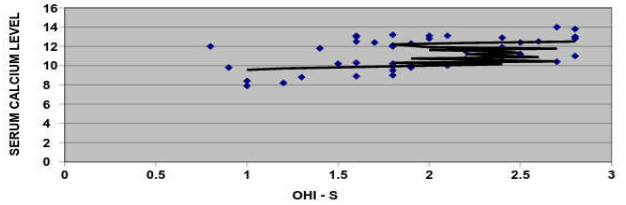

Fig 2 Correlation of OHI-s and serum calcium level

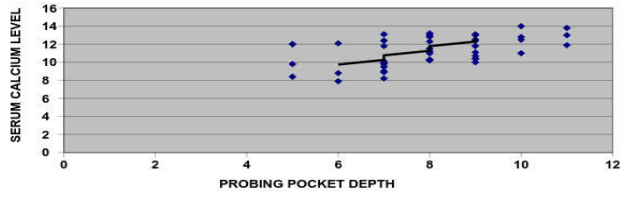

Fig 3 Correlation of Probing pocket depth and serum calcium level

DISCUSSION

Periodontitis is a multifactorial inflammatory disease of supporting periodontal tissue characterized by a systemic inflammatory host response. Although periodontal disease was initially thought to be caused only by microorganisms, later, Hennrikson(1968) suggested that nutritional deficiency of calcium could also be an etiology of periodontal disease. He elucidated osteolytic demineralization of bone, specifically alveolar bone. This was demonstrated in beagles with low calcium and high phosphorous diet by provoking secondary hyperparathyroidism (Hennrikson, 1968). Various studies have assessed the role of calcium in periodontal disease by evaluating serum calcium, salivary calcium and dietary calcium levels (Erik Uhrbom *et al*, 1984). Despite the proven fact that it has a role in pathogenesis of periodontitis, there exists a constant debate regarding serum calcium level and the prevalence of periodontitis.

Our present study aimed to evaluate the possible relationship between serum calcium level and periodontitis. This study showed an increase in serum calcium level with advancing age, which is in accordance with the study done by Najith *et al* (Najith *et al*, 2008). Poor oral hygiene along with periodontal destruction and deeper probing pocket depth were associated with increased serum calcium levels in this study. Thus, periodontitis patients exhibited a significant increase in serum calcium levels which may be due to the negative calcium balance mechanism, as explained earlier. These results were in correlation with the previous similar study (Harsha *et al*, 2015).

We could not compare our present study results with other studies in literature since our study did not include the assessment of calcium intake. This limits the scope of comparison of calcium intake and serum calcium levels. Additionally, the present study compared the serum calcium levels of chronic periodontitis patients with the baseline reference value as it does not include control group patients. This can be viewed as limitation of our present study

To summarize, the results of this study suggests a significant increase of serum calcium levels in generalized chronic periodontitis, and the various clinical periodontal parameters also exhibited a positive correlation with serum calcium levels.

CONCLUSION

The present study suggests that there is an elevation of serum calcium level in periodontitis and its progression. Thus alteration in serum calcium level could be considered as a useful factor to assess the periodontal host immune response. Further studies have to be done by considering these scientific findings to prove its role and its importance in periodontal disease.

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