



SERUM TOTAL ALKALINE PHOSPHATASE ENZYME LEVEL AND SEVERITY OF CHRONIC PERIODONTITIS

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ABSTRACT

Purpose: Conventional diagnosis of chronic periodontitis relying on the clinical probing methods and radiographic evaluation doesn't predict the progression or severity of the disease state. The recent methods to identify the status of disease relies on the biochemical mediators and / or enzyme level measurements. One such commonly used enzyme assay is alkaline phosphatase. Estimation of this enzyme has shown proven results in diseases involving bone. Chronic periodontitis is one such disease where there is an appreciable amount of bone destruction. The purpose of this study was to estimate and compare the levels of alkaline phosphatase enzyme in serum of healthy individual and in chronic periodontitis patients with varying severity.

Materials and Methods: Serum samples were obtained from 67 individuals. 31 are from healthy individuals and 36 from chronic periodontitis patients categorized as mild, moderate and severe based on clinical attachment loss values. The samples were used to determine the total alkaline activity (ALP) level using a fully automated analyzer.

Results: Comparison of the total alkaline phosphatase activity between the control and experimental groups namely mild, moderate and severe chronic periodontitis patients showed an increase in total alkaline phosphatase activity from healthy to mild and moderate. There was a decrease in total ALP level in severe periodontitis patients as compared to moderate chronic periodontitis group.

Conclusion: The measurement of alkaline phosphatase level in serum cannot be considered as a standalone enzymatic assay for evaluating the severity of chronic periodontitis. This may provide useful information towards the disease severity and progression if evaluated repeatedly over a period of time.

Key Words: Alkaline phosphatase, Chronic periodontitis, Severity of chronic periodontitis, Serum enzymatic assay

Chronic periodontitis is a longstanding inflammatory disease affecting the supporting structures of the dentition namely the gingiva, periodontal ligament, cementum and adjacent surrounding alveolar bone. Most routine methods to diagnose chronic periodontitis is by clinical evaluation of affected site and measuring the attachment loss followed by radiographic confirmation by identifying bone loss. These methods do not shed light on the status of progression or regression occurring in the diseased sites and also fail to identify newly developing disease sites. [1,2]

For better evaluation of prognosis and effective treatment, it is important to identify the current status of the

disease. Changes at both cellular levels and sub – cellular levels show us the current status of the disease and are evaluated or identified using biochemical assay. The most common and widely relied enzyme assay for bone disease is alkaline phosphatase (ALP) measurement.

Alkaline phosphatase has been found in various periodontal tissues [3,4] with increased activity noticed during progression of periodontitis. [5,6] Serum level of ALP enzyme can be used as an indicator for bone formation. [7]

The purpose of this present study was to evaluate and compare the alkaline phosphatase enzyme level in serum

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of healthy individuals with the severity of chronic periodontitis.

MATERIALS AND METHODS

This study was done in division of Periodontics, RMDC & H, Annamalai University after ethical clearance. Informed consent were obtained from 67 participants who were selected randomly among the patients who visited the division of Periodontics. 31 individuals in control group and 36 patients in test groups of age 30 -55 years were selected with the criteria's listed below and are grouped as

Group A: Control group – healthy individuals [Clinical attachment loss of 0 mm] and

Group B: Test groups – Chronic periodontitis patients sub categorized as

B₁: Mild (Clinical attachment loss 1 – 2 mm);

B₂: Moderate (Clinical attachment loss 3- 4mm) and

B₃: Severe (Clinical attachment loss \geq 5mm)[8]

Exclusion criteria: Smokers, malnourished, anemic, subjects taking medicines known to affect periodontal conditions or gingival secretion, having cardiac disease, hepatobiliary disease, diabetes, thyroid and parathyroid abnormalities, Viral, fungal or bacterial infection, history of recent trauma or tooth extractions, pregnant or lactating women, women on oral contraceptives, history of systemic antibiotic therapy within 6 months were excluded from the study.

The clinical examination was done following a brief and precise medical and dental history using mouth mirror, dental explorer and William's periodontal probe. The following parameters were recorded: OHI – S (Green and vermillion 1967); Probing pocket depth in mm and Clinical attachment loss in mm.

5ml of blood samples was collected from all participating individuals after overnight fasting and was allowed to clot in a test tube placed slantingly. After an hour the supernatant serum was extracted and sent to biochemical laboratory for assay. Total alkaline phosphatase was evaluated using a fully automated analyzer and the results were expressed in U/L. The values obtained were tabulated and subjected for statistical analysis of data.

Results were tabulated; Sample's mean and standard deviation for the results were determined. Between each study groups, the results were compared using Analysis of Variance (ANOVA) test for the determination of statistical significance. All statistical analysis was performed using standard statistical software. $P < 0.05$ was considered as statistically significant.

RESULTS

67 individuals were screened and evaluated for the total alkaline phosphatase level. 31 individuals in the control group with a mean probing pocket depth of 1.77 ± 0.67 and clinical attachment loss of 0 mm has alkaline phosphatase level of 140.7 ± 3.03 . 12 patients in each subgroups of test group were screened for the alkaline phosphatase level. Group B₁ identified as mild periodontitis patient with probing pocket depth of 2.00 ± 0.47 and clinical attachment loss of 0.99 ± 0.25 has an estimated value of 147.4 ± 1.28 of alkaline phosphatase in serum. The group B₂, designated as moderate periodontitis group with probing pocket depth of 5.11 ± 0.33 and clinical attachment loss of 2.80 ± 0.47 has total alkaline phosphatase level of 163.9 ± 1.55 . The subgroup B₃ categorized as severe periodontitis patients with probing pocket depth of 6.29 ± 0.36 and clinical attachment loss of 5.98 ± 0.32 has a value of 155.4 ± 0.81 alkaline phosphatase in serum [table 1,2,3].

The mean alkaline phosphatase level in the test group showed an increase from mild to moderate group, whereas there was a slight decrease in the alkaline phosphatase level in severe periodontitis subgroup compared to moderate periodontitis group [Fig 1]. However, the overall value in the test group was higher than the control group.

Table 1: Serum alkaline phosphatase level in study groups:

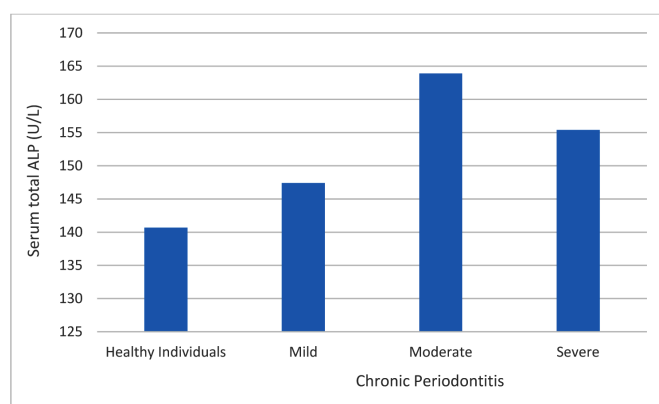
Group	N	Mean	S.D	F-value	p-value
ALP Healthy (U/L) individuals	A 31	140.7	3.03	342.09	0.001 (S)
Mild Periodontitis	B1 12	147.4	1.28		
Moderate Periodontitis	B2 12	163.9	1.55		
Severe Periodontitis	B3 12	155.4	0.81		

Table 2: Probing pocket depth (PPD) in mm among study groups:

Group	N	Mean	S.D	F-value	p-value
PPD Healthy (mm) individuals	A 31	1.77	0.67	270.6	0.001(S)
Mild Periodontitis	B1 12	2.00	0.47		
Moderate Periodontitis	B2 12	5.11	0.33		
Severe Periodontitis	B3 12	6.29	0.36		

Table 3: Clinical Attachment Loss (CAL) in mm:

Group	N	Mean	S.D	F-value	p-value
CAL Healthy individuals	A 31	0	0	1640.5	0.001(S)
Mild Periodontitis	B1 12	0.99	0.25		
Moderate Periodontitis	B2 12	2.80	0.47		
Severe Periodontitis	B3 12	5.98	0.32		

**Figure 1:** Serum ALP level and Severity of chronic periodontitis:

DISCUSSION

In our previous study conducted among the healthy individuals as control and chronic periodontitis patients as test groups, the alkaline phosphatase level in serum was at a higher value for the test group.[9] This was in accordance with the study conducted by Jaiswal et al in 2011.[10] They have concluded the result as increased alkaline phosphatase level noticed among chronic periodontitis patients.

The present study was focused on evaluating the trend of alkaline phosphatase level with severity of chronic periodontitis. There was a constant increase in alkaline phosphatase level among mild and moderate periodontitis patients, suggestive of alkaline phosphatase involvement in bone apposition. This increase in alkaline phosphatase level is in line with the study done by Shaheen et al. in 2009 [11] among diabetes patients with periodontitis. They have also shown that there was a significant increase in alkaline phosphatase level with increase in severity without any sub categorization of severity of chronic periodontitis.

In a study done by Gibert *et. al.* in 2003, [12] there was significant decrease in total serum alkaline phosphatase

level among male patients with increased attachment loss. Similar results were noticed in this study during the late stages of disease with significant attachment loss.

Moreover, there was a significant decrease in serum alkaline phosphatase levels from moderate to severe periodontitis patients, emphasizing the disease state. The decrease in the alkaline phosphatase level among severe periodontitis patient can be correlated to increased bone destruction with reduced apposition of bone.

Considering the fact about the lack of many research in serum alkaline phosphatase with severity of chronic periodontitis, this stands as an initial attempt to suggest the role of serum alkaline phosphatase as a potential biochemical assay for identifying the severity of the disease status on a longitudinal basis.

CONCLUSION

Based on the results of this present study, it is suggestive that serum alkaline phosphatase measurement can provide a useful information towards the disease severity and progression if evaluated repeatedly over a period of time.

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