A Clinical Study of Salivary Alkaline Phosphatase In Periodontal Diseases

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Abstract

Context: Periodontal disease is one of the common inflammatory diseases with complex etiology and is multifactorial in origin. Several enzymes have been evaluated for the early diagnosis of periodontal disease. The enzyme Alkaline Phosphatase (ALP) plays a role in bone metabolism. In the periodontium, ALP is a very important enzyme as it is a part of normal turnover of periodontal ligament, root cementum, and bone homeostasis. Saliva is an easily collected fluid that contains locally and systemically derived markers of periodontal Disease. **Aim:** The purpose of this study was to evaluate the level of alkaline phosphatase activity in salivary sample from healthy subjects & patients with gingivitis & periodontitis.

Materials and method: The study included 60 patients referred to Department of Oral & Maxillofacial Pathology and Microbiology, Santosh Dental College, Santosh University, Ghaziabad, U.P. They were divided into three groups, 20 healthy subjects, 20 subjects with gingivitis and 20 subjects with periodontitis. The clinical parameters including plaque index (PI), gingival index (GI), probing pocket depth (PPD) and clinical attachment loss (CAL) were recorded and salivary samples were collected for analysis of alkaline phosphatase (ALP) levels. Alkaline Phosphatase levels was analysed by autoanalyzer.

Results: A highly significant increase in mean value of clinical parameters was found in patients with periodontal disease (gingivitis and periodontitis) compared to healthy subjects. Also a highly significant increase in the mean value of alkaline phosphatase activity was illustrated as the severity of periodontal disease increased.

Conclusion: Salivary alkaline phosphatase could be used as a useful marker for monitoring periodontal disease.

Key words: Gingivitis, Periodontitis, Alkaline Phosphatase, Bone metabolism.

Introduction

Periodontal disease is one of the common inflammatory disease with complex etiology and multifactorial origin. The disease state ranges from gingivitis to periodontitis. Gingivitis is characterized by inflammation of the gingiva caused by plaque deposits, with possible bleeding while brushing or probing, while periodontitis is an inflammatory disease affecting the supporting tissues of the teeth, leading to progressive destruction of connective tissue attachment and alveolar bone[1].

Diagnosis of periodontal disease has been primarily based upon clinical and radiographic measures of periodontal tissue destruction. These parameters provide a measure of past destruction and are of limited use in early diagnosis. Traditional periodontal diagnostic procedures are not precise and only allow retrospective assessment of attachment loss. Considerable improvement and advances have been achieved in improving the accuracy of traditional clinical diagnostic procedures and in developing new diagnostic techniques. Continuing efforts have been directed to improve effectiveness of these diagnostic strategies, which in addition to diagnosis can be extremely useful in evaluating treatment outcomes and patient monitoring for disease recurrence.

Saliva has been used as a diagnostic fluid in medicine and

dentistry [2,3]. There are various enzymes present in saliva in which one of them is salivary alkaline phosphatase (ALP) that helps in early detection of periodontal diseases. The enzyme ALP plays a role in bone metabolism. In the periodontium, ALP is a very important enzyme as it is part of normal turnover of periodontal ligament, root cementum, and bone homeostasis. The enzymes released from host cells can be easily obtained within the oral cavity either from gingival crevicular fluid or from whole saliva. The whole saliva is composed of secretions from salivary gland as well as from gingival crevicular fluid, desquamated epithelial cells, microorganisms, and leucocytes. The whole saliva can be collected more easily, in larger amounts with less discomfort when compared to gingival crevicular fluid [2,4].

The present paper emphasizes the role of salivary alkaline phosphatase level in periodontal diseases from unstimulated whole saliva.

Aim: To evaluate the level of alkaline phosphatase activity in salivary sample from healthy subjects & patients with gingivitis & periodontitis.

Objectives: To establish salivary alkaline phosphatase as a biochemical marker of the functional condition of periodontal tissues.

Materials & Method

Materials used for study

1. Autoanalyzer (Figure 1)
2. Alkaline phosphatase kit (Figure 2)
3. Micropipette with tubes (Figure 3)
4. Laboratory centrifuge machine (Figure 4)

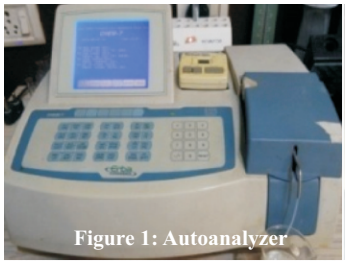


Figure 1: Autoanalyzer

Figure 2: Alkaline phosphatase kit

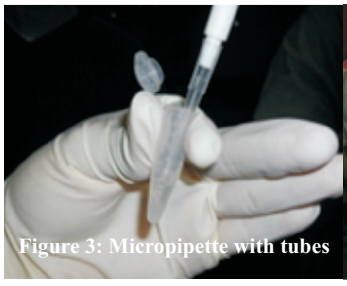


Figure 3: Micropipette with tubes

Figure 4: Laboratory centrifuge machine

Method

Kinetic method was used for analysis of samples. 60 patients from the age group of 20-60 yrs were selected for the study (Figure 6). Unstimulated whole saliva samples were collected. Three groups were divided in which control group comprised of 20 Healthy Individuals, 2nd group comprised of 20 Gingivitis patients and 3rd Group comprised of 20 Periodontitis patients.

Figure 5: Unstimulated Salivary Sample collection with the help of micropipette

Sample of saliva was collected from all 60 subjects with the help of micropipette (Figure 3 & 5). Alkaline phosphatase reagent (Figure 2) was mixed with distilled water in a test tube. All salivary samples were then centrifuged with the help of laboratory centrifuge machine (Figure 4) and supernatent saliva is then added to the test tube containing reagent and distilled water. All samples were subjected to autoanalyzer (Figure1).

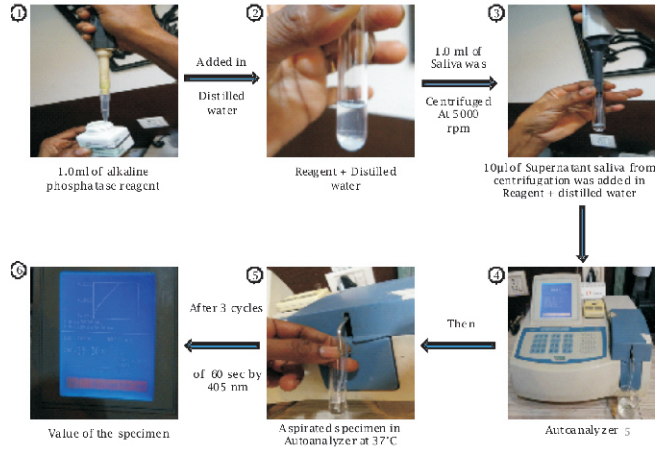


Figure 6: Method used for the analysis of salivary alkaline phosphatase with the help of autoanalyzer

Statistical Analysis

Statistical analysis was done for alkaline phosphatase levels of all the three groups. ANOVA was performed for the data obtained.

Results

The obtained results showed that the activity of the examined enzyme in the unstimulated whole saliva of the patients with periodontal disease was significantly higher in relation to the control group. The established differences showed a statistical significance of a high level ($P<0.001$). The order of Salivary alkaline phosphatase in different group was

as follows:

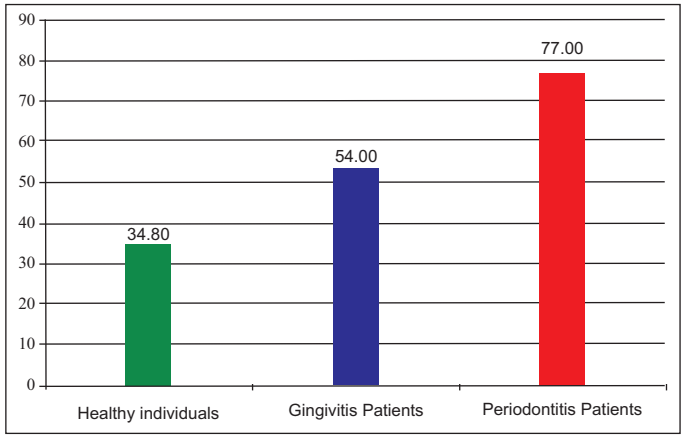
Healthy<Gingivitis<Periodontitis.

Table 1: Showing result of ANOVA test of salivary alkaline phosphatase levels in all three groups (all values are in international unit IU)

	N	Mean	Std. Deviation	Minimum	Maximum
Healthy	20	34.80	3.46	30.00	40.00
Gingivitis	20	54.00	3.18	50.00	60.00
Periodontitis	20	77.00	4.03	70.00	84.00
Total	60				

F=699.823; p<0.001

Graph1: Showing Salivary Alkaline Phosphatase Levels in healthy, gingivitis and periodontitis patients.



Discussion

The increased activity of alkaline phosphatase (ALP) in periodontal disease may be due to an increase in the inflammation & bone turnover rate. This is probably a consequence of pathological process in periodontal tissues as ALP is produced by PMNs, osteoblasts, macrophages, fibroblasts & plaque bacteria within periodontal tissues or periodontal pocket.

In the present study, results were analysed statistically with the help of ANOVA test (Table1 & Graph1) which shows the maximum level of salivary alkaline phosphatase in periodontitis patients and the minimum level in the healthy individuals. Kumar R & Sharma G also found that salivary alkaline phosphatase level increases with increase in periodontal destruction. Total amount of alkaline phosphatase levels were significantly higher in periodontitis as compared to healthy and gingivitis sites[5]. Enzymes are indicators of higher levels of cellular damage and their increased activities in saliva are a consequence of their increased release from the damaged cells of the soft tissues of the periodontium and are a reflection of metabolic changes in inflamed gingiva. There are enough studies available in the literature, correlating the levels of these enzymes in saliva with the severity of periodontal disease[6]. Nakamura & Slots have noted higher enzyme activity in individuals with periodontal diseases[7].Todorovic et al have revealed an increased activity of salivary ALP in patients with periodontal diseases[8] .Plagnat et al (2002) studied ALP in GCF from implants with and without peri-implantitis and suggested that ALP could be a promising marker of bone loss around dental implants[9] .Gilbert et al (2003) studied ALP activity in serum from patients with chronic periodontitis and showed a relationship between loss of attachment in periodontal disease and ALP activity in serum[10].Perinetti et al (2002) suggested that ALP amount in GCF reflects the biologic activity in the periodontium during orthodontic movement[11].The potential value of ALP as a biomarker of periodontal disease was identified by Ishikawa and Cimasoni[12]. The present study also revealed salivary alkaline phosphatase can be used as a biomarker to determine periodontal diseases.

Conclusion

Total amount of Salivary Alkaline Phosphatase levels is significantly higher in periodontitis as compared to healthy & gingivitis individuals. Salivary Alkaline Phosphatase level increases with increase in periodontal destruction from unstimulated whole saliva. However, more studies are necessary to evaluate which specific clinical, microbiological and histological characteristics of periodontal disease are associated with elevated level of alkaline phosphatase in saliva.

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