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Salivary Alkaline Phosphatase level as Diagnostic marker for periodontal disease

Randhir Kumar[*] Geeta Sharma[†]

*M.D.S, Senior Lecturer, Dept of Periodontology, Sarjug. Dental College & Hospital, Darbhanga, Bihar, [†]M.D.S, Senior Lecturer, Dept of Oral & Maxillofacial Patholgy, Santosh Dental College & Hospital, Ghaziabad, India.
Contact: drrandhirmds@gmail.com

Abstract:

The measurement of specific salivary enzyme activity may be valuable in the diagnosis of human periodontal disease. Alkaline phosphatase has often been measured as possible indicators of gingival inflammation and bone metabolism. It has been found that untreated adult periodontitis patients exhibited higher level of alkaline phosphatase in whole saliva than did healthy control. Alkaline phosphatase levels change in relation to gingival inflammation and bone loss. 30subjects (each having at least 20 teeth) in the age18-55 years (10 subjects with healthy periodontium, 10 with generalized gingivitis and 10 with generalized periodontitis) were randomly selected. Unstimulated whole saliva collected from each subject was transferred to auto analyzer to measure the salivary alkaline phosphatase levels. The quantitative analysis of salivary alkaline phosphatase levels of samples obtained from subjects with healthy periodontium, generalized gingivitis, generalized periodontitis showed, 18.50±5.07 IU, 39.49± 9.97IUand 85.18±16.85IU (mean± standard deviation), respectively. The present results showed the potential value of salivary alkaline phosphatase level as indicator for periodontal disease status

Keywords: Saliva, Alkaline phosphatase, Periodontitis, Plaque

Introduction:

Periodontal disease is one of the most common bacterial infections in human affecting 5-30% of adult population. Natural history of periodontitis follows a

discontinuous pattern of exacerbation and remission. It is characterized by disease-active and inactive sites. Biomarkers can be a useful tool in predicting ongoing or future disease activity. They may also possess the ability to determine the current activity status of historically diseased sites

The possible biomarkers are: 1.Bacteria and their products, 2.Inflammatory and immune products, 3.Enzymes released from host cells. 4. Connective tissue degradation products, 5.Products of bone resorption.

Whole saliva, gingival crevicular fluid, plaque and serum can be used as source of specimen for these markers. 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[1]. The whole saliva can be collected more easily, in larger amounts with less discomfort when compared to gingival crevicular fluid[2].

As the whole saliva contains secretions from gingival crevicular fluid, it contains enzymes released by host cells in periodontal pocket during periodontal infections.

Untreated chronic periodontitis patients exhibit higher level of alkaline phosphatase in whole saliva than did healthy control[3]. Ishikawa and Cimasony[4] showed positive correlation in alkaline phosphatase in periodontitis patients with pocket depth. Alkaline phosphatase is released by secondary granules of neutrophils and its concentration increases significantly with plaque accumulation and increasing inflammation. So this enzyme should be considered to be the best indicator for periodontal disease. Thus this study was planned.

The present study aimed:

- To measure the salivary alkaline phosphatase levels of three groups of subjects- group I healthy, group II - generalized gingivitis and Group III generalized periodontitis.
- To establish the correlation of salivary alkaline phosphatase levels with the periodontal status of the patient.

Materials and Methods:

Selection of subjects

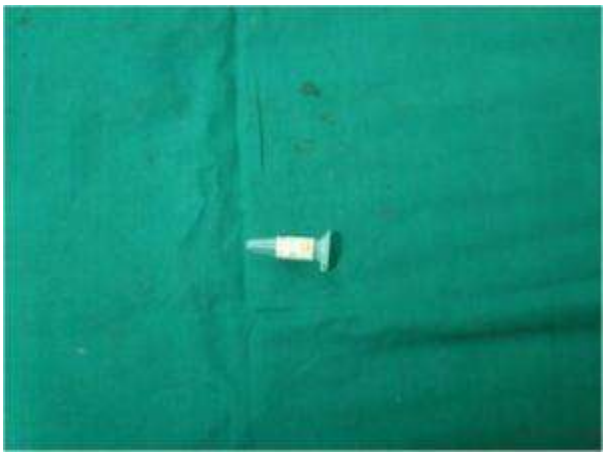
- Subjects of age group 18-55 having at least 20 teeth were included in the study.
- Subjects were selected randomly from among out patients who reported to dept. of periodontology (random sampling).
- Smokers, subjects taking medicines known to affect periodontal conditions or gingival secretion, having cardiac disease, hepatobiliary disease, diabetes, thyroid and parathyroid abnormalities, Viral, fungal or bacterial infection, having recent trauma or tooth extractions pregnant or lactating women, history of systemic antibiotic therapy within 6 months were excluded from study.

Clinical protocol

Ethical approval was obtained from localized ethical committee. Thirty subjects (each having at least 20 teeth) in age18-55 were randomly selected from out patients who visited the department of periodontology. These patients satisfied all inclusion criteria and were equally divided into three groups (10 subjects with healthy periodontium, 10 with generalized gingivitis and 10 with generalized periodontitis)

A detailed case history of each subject was taken and informed consent obtained. Unstimulated whole saliva was collected by micropipette and stored in to sterile capsules and clinical findings were noted on a specially designed performa. Clinical recordings were done as per the following indices

Plaque index (Turesky- Gilmore-Glickman modification of Quiegly Hein plaque index)[5], Gingival index (Loe and Silness)[6], Bleeding index[7], Probing depth with the help of William's graduated probe and stent was noted[8]. Subsequently the salivary samples were sent to



the laboratory for the quantitative analysis of alkaline phosphatase levels.

Armentarium used Micro pipette- for collection of salivary sample, sterile capsule-for transferring salivary sample and Auto Analyzer- for measurement of alkaline phosphatase levels

Statistical analysis

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

Results

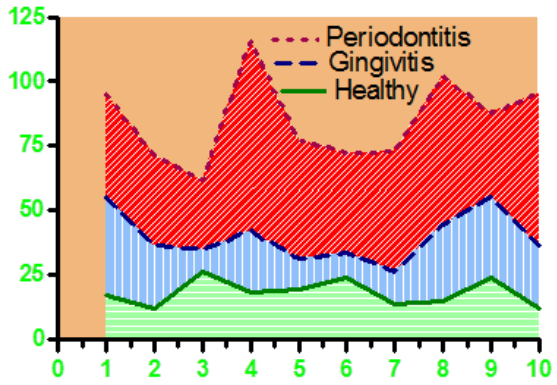
Unstimulated whole saliva collected from each subject was transferred to auto analyzer to measure the salivary alkaline phosphatase levels. Table 1 show the maximum values, minimum values, mean values, standard deviation and standard error of all the three groups. In quantitative analysis, samples with healthy periodontium, generalized gingivitis, generalized periodontitis showed, 18.50±5.07 IU, 39.49± 9.97and 85.18±16.85 (mean± standard deviation), respectively. The groups statistical differed from each other ($p<0.05$). Statistical analysis showed that salivary alkaline phosphatase levels exhibit significantly higher activity in diseased periodontal condition than healthy. The present results showed the potential value of salivary alkaline phosphatase level as indicator for periodontal disease status. The quantitative levels of salivary alkaline phosphatase may distinguish varying periodontal condition.

Discussion:

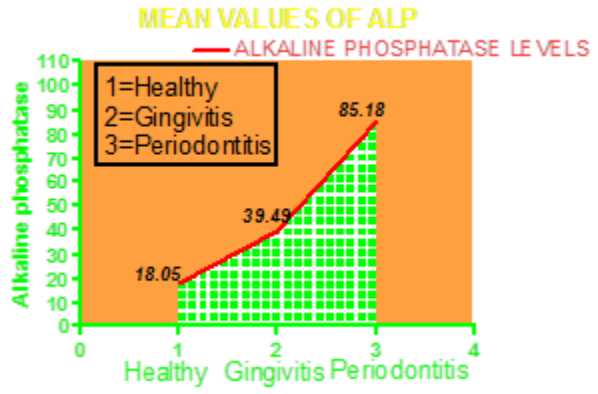
In present study it was found that salivary alkaline phosphatase level increases with increase in periodontal destruction. Total amount of alkaline phosphatase levels were significantly higher in periodontitis as compared to healthy and gingivitis sites, and were significantly and positively correlated with probing depth and gingival index. Similar observations were made by Nakamura M and Slots J[3] in their study. Ishikawa and Cimasoni[4] showed positive correlation of alkaline phosphatase in periodontitis patient with increased pocket depth. This observation also coincides with the observations of the present study. Chapple IL, Chemiluminescent[9] also made similar observations when investigating

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

	Healthy	Gingivitis	Periodontitis
Number of subjects	10	10	10
Minimum values	12.10	26.10	61.60
Maximum values	26.20	55.40	115.80
Mean values	18.50	39.49	85.18
Std. Deviations	5.07	9.97	16.85
Std. Error	1.60	3.09	5.32



Graph 1 shows variation of alkaline phosphatase levels in healthy, gingivitis and periodontitis group



Graph 2 shows mean values of alkaline phosphatase levels in healthy, gingivitis and periodontitis group

alkaline phosphatase levels in human gingival crevicular fluid with an experimental gingivitis model[10, 11]. These observations suggest that a significant amount of alkaline phosphatase levels present in saliva is produced locally by diseased periodontal tissues. Alkaline phosphatase levels can be considered as potential markers for periodontal disease[12, 13]. It is also evident that the quantitative analysis of salivary alkaline phosphatase may distinguish varying periodontal conditions[14]. Patient with higher salivary alkaline phosphatase level should be closely monitored for progression of periodontal disease.

Conclusions:

Our results revealed that periodontal destruction such as periodontal pockets, gingival bleeding and suppuration are related to higher alkaline phosphatase levels in saliva. Salivary alkaline phosphatase levels could be used as a useful marker for monitoring periodontal disease. The increase in salivary alkaline phosphatase levels activity in periodontitis demonstrated could be associated with alveolar bone loss, a key feature of periodontal disease. More studies are necessary to evaluate which specific clinical, microbiological and histological characteristics of periodontal disease are associated with elevated levels of alkaline phosphatase levels in saliva.

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