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Short Communication

ALKALINE PHOSPHATASE – A DIAGNOSTIC MARKER OF PERIODONTITIS IN POSTMENOPAUSAL WOMEN – A BIOCHEMICAL STUDY

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Abstract:

Background and objective: Periodontal disease is one of the common inflammatory diseases with complex etiology and is multifactorial in origin. Several enzymes are evaluated for the early diagnosis of periodontal disease. The enzyme ALP plays a role in bone metabolism. In the periodontium, ALP is very important enzyme as it is part of normal turnover of periodontal ligament, root cementum, and bone homeostasis. The deficiency of estrogen in women at menopause is contributing factor to osteoporosis and considered one of the risk factors for periodontal disease. It has been hypothesized that osteoporosis decreases alveolar bone density and in turn increases its susceptibility to resorption due to periodontal inflammation. Accelerated bone loss in menopause is related to increased bone turnover. This is accompanied by increased levels of biochemical markers such as Alkaline Phosphatase. Alteration in salivary Alkaline Phosphatase levels might be expected as an indication of periodontal disease activity.

Methods: The study included 40 subjects, 20 in each group in the age group of 50-60 years. Group 1 comprised of 20 Postmenopausal women without chronic periodontitis. Group 2 comprised of 20 Postmenopausal women with chronic periodontitis. Each saliva sample was estimated for ALP levels.

Results: The present study showed significant increase in Alkaline Phosphatase in postmenopausal women with periodontitis (Group 2) with p value <0.0001.

Interpretation and conclusion: Alkaline phosphatase can be used as a diagnostic marker of Periodontitis in postmenopausal women. However ALP cannot be solely responsible for Periodontitis but it can be used as a additional aid in diagnosing Periodontitis.

Keywords: Alkaline phosphatise, Periodontitis.

Introduction:

Periodontal disease is one of the common inflammatory diseases with complex etiology and is multifactorial in origin. Salivary components for periodontal diagnosis include enzymes and immunoglobulins, hormones of host origin, bacteria and bacterial products, ions, and volatile compounds. Several enzymes that are evaluated for the early diagnosis of periodontal disease are aspartate and alanine aminotransferase (AST, ALT), lactate dehydrogenase (LDH), creatine kinase (CK), alkaline phosphatase and acid phosphatase (ALP, ACP).The enzyme ALP plays a role in bone metabolism. It is a membrane-bound glycoprotein produced by many cells, such as polymorphonuclear leukocytes, osteoblasts, macrophages, and fibroblasts within the area of the periodontium and gingival crevice.

In the periodontium, ALP is very important enzyme as it is part of normal turnover of periodontal ligament, root cementum and maintenance, and bone homeostasis. The deficiency of estrogen in women at menopause is contributing factor to osteoporosis and considered one of the risk factors for periodontal disease.It has been

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hypothesized that osteoporosis decreases alveolar bone density and in turn increases its susceptibility to resorption due to periodontal inflammation. Accelerated bone loss in menopause is related to increased bone turnover. This is accompanied by increased levels of biochemical markers such as Alkaline Phosphatase. Alteration in salivary Alkaline Phosphatase levels might be expected as an indication of periodontal disease activity.

Materials and methods:

Patient selection:

The study was a case control study comprising of 40 subjects, 20 in each group.

- Group 1: 20 Postmenopausal women without chronic periodontitis, in the age group of 50-60 years.
- Group 2: 20 Postmenopausal women with chronic periodontitis, in the age group of 50-60 years.

The subjects were selected from the Department of Periodontics, A.B. Shetty Memorial Institute of Dental Sciences, Mangalore. A written informed consent was taken from each subject.

The ethical clearance was obtained from ethical board of NITTE UNIVERSITY. The study was conducted from June 2012 to November 2012.

Clinical examinations:

The clinical evaluation of all study participants were carried out to characterize their gingival and periodontal conditions. It included the evaluation of clinical attachment loss (mm) which was recorded using a William's graduated periodontal probe. Probing was performed at 6 sites per tooth (mesiobuccal. distobuccal, mesiolingual, distolingual, midbuccal, midlingual and Gingival index scores given by loe and silness. The samples were coded before being sent for laboratory investigations All data describing the clinical characteristics were collected by the same examiner.

Saliva collection:

1 ml of whole saliva sample in a sterile disposable plastic container, patients were instructed not to eat 1 hour before collection of sample.

Estimation of Alkaline Phosphatase:

For analysis, each saliva sample was centrifuged at 5000 rpm for 10 minutes. Reagents added to about

10microlitre of supernatant sample by auto analyzer and the value of ALP estimated in U/L.

The reagents used in estimation of saliva ALP are:

Reagent 1(R1)	Diethanolamine Buffer, (pH 10.2) Magnesium Chloride
Reagent 2(R2)	p- Nitrophenyl Phosphate

Statistical analysis:

The result obtained were tabulated and subjected to statistical analysis by Maan-whitney U-test. P values were considered to be statistically significant ($p < 0.0005$).

Table 1 shows the comparison between values of Alkaline Phosphatase in group 1 (without periodontits) and group 2 (with periodontitis). The mean rank for periodontitis group was 27.98 and for group 1 (without periodontitis) is 13.02. The results obtained were highly statistically significant with p-value <0.0001.

Fig-1 shows the comparison between range and median of group 1(without periodontitis) and group 2 (with periodontits). The results obtained were highly statistically significant with p-value <0.0001.

Discussion :

The processes responsible for destruction of human periodontium are highly complex and vast range of biological substances are involved. In the periodontium, ALP is very important enzyme as it is part of normal turnover of periodontal ligament, root cementum and maintenance, and bone homeostasis. Hence ALP plays a major role in bone metabolism. The present study was done to evaluate the effect of Alkaline Phosphatase on postmenopausal women. Data of our study suggested that the mean rank of ALP in group 1 (without periodontitis) was 13.02 and that of group 2(with periodontitis) 27.98.

The comparison of these two groups shows highly significant results. This may be attributed to the fact that Periodontitis is a chronic destructive periodontal disease

which leads to resorption and destruction of alveolar bone, as a consequences of resorption, breakdown products are released in the periodontal tissue, which migrate towards the gingival sulcus and gather in whole saliva. It is also a known fact that fluctuations of sex hormones during menopause have been implicated as factors in inflammatory changes in the human gingival.

Hence the high level of ALP levels in saliva in our study(Group 2) may be due to increase in inflammation and bone turnover rates as ALP is produced by Osteoblasts, macrophages, PMNs, fibroblast, and plaque bacteria within periodontal tissues. The activity of ALP enzyme is mainly recorded in gingival crevicular fluid but technique of collecting GCF is very complicated, hence we selected saliva as its procedure of sampling is easier and comfortable for patients.

Our study is in accordance with the study done by S. Desai who concluded that there is a significant positive correlation between clinical parameters and ALP concentrations on saliva. Study done by Ozlem Daltaban in postmenopausal women showed a positive statistical correlation between total ALP levels and probing depth.

Conclusion:

In this present study it was found out that Alkaline Phosphatase levels are increased in Postmenopausal women with Periodontitis. As there are various hormonal changes in postmenopausal women and numerous etiological factors causing Periodontitis.ALP aggrevates the bone loss. Hence periodontitis can progress rapidly. However ALP cannot be solely responsible for Periodontitis but it can be used as a additional aid in diagnosing Periodontitis. Hence Alkaline phosphatase can be used as a diagnostic marker of periodontitis in postmenopausal women. However further studies with larger sample size are required to conclude the exact role of Alkaline Phosphatase.

Table - 1 : In table no. 1 comparison between values of Alkaline Phosphatase in group 1 (without periodontits) and group 2 (with periodontitis) is mentioned.

Mann-Whitney Test

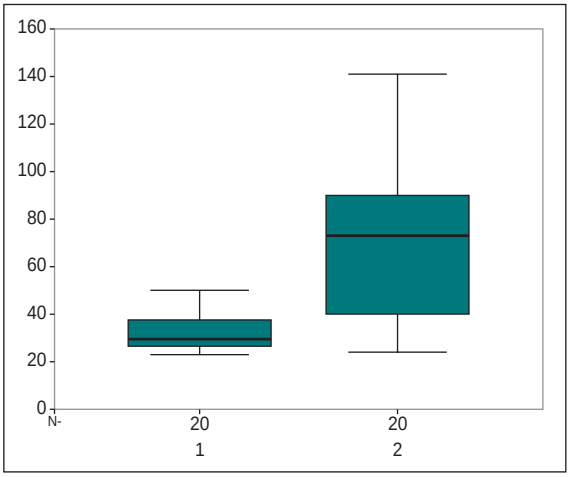
Ranks

	GROUP	n	Mean Rank	Sum of Ranks	Z	p-value
VALUES	1	20	13.02	260.50		
	2	20	27.98	559.50	-4.044	<0.0001
	Total	40				

The p-value obtained in this table is <0.0001. Hence the results obtained are highly statistically significant.

Figure 1 : In table no.2 comparison between range and median of group 1(without periodontitis) and group 2 (with periodontits) is mentioned.

Box-plots showing Range & Median (p<0.0001)



The p value mentioned in this table is <0.0001. Hence the results obtained are highly significant.

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