

ORIGINAL RESEARCH

Salivary Biomarker In Periodontitis And Diabetes Mellitus

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Received: 29 September, 2023

Accepted: 31 October, 2023

Abstract

Background: Our modern lifestyle nowadays creating many hormonal disturbances one which is Diabetes Mellitus (DM) which is causing predisposition to many other diseases. Hence, it is necessary to detect these changes in their early stages.

Aim: To establish correlation between periodontitis and diabetes mellitus patients by measuring alkaline phosphatase (ALP) in saliva.

Material and Methodology: The saliva sample collected from patients and normal individual were analyzed biochemically using Spin react alkaline phosphatase (ALP) kit.

Result: The ALP level increased in patients with diabetes mellitus and chronic periodontitis and was peaked in Diabetes mellitus type 2 with chronic periodontitis.

Conclusion: As the ALP levels increased, it can be concluded that ALP has marked activity in diabetes mellitus and chronic periodontitis patients as these disease caused bone health to be compromised.

Keywords: Salivary biomarker, Periodontitis, Diabetes Mellitus

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Introduction

Saliva is the most non-invasive method for biochemical analysis. Salivary biomarkers can help in diagnosis and monitoring of numerous diseases. Saliva has traces of microbes and their products, inflammatory products, nucleic acids, antibodies, proteins and cell degradation products from various disease of bone, liver, respiratory tract, gut and even cancer. Biomarker can be any substance/chemical which can be evaluated/detected in body due to any pathological condition. One of which is ALP(Alkaline phosphatase). It is one of the hydrolytic enzymes active in alkaline medium of 10. It is found on the cell membrane of almost all cells and active in physiologic bone formation. Magnesium and zinc are coenzyme for its activity. ALP enzyme is primarily seen in bone and liver. There are small amounts produced by cells lining the intestines, the placenta, and the kidney, also they concentrated in mature or immature leukocytes, as neutrophil ALP (NAP).⁽¹⁾ 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.⁽²⁾ Diabetes

mellitus (DM) is a clinical syndrome characterized by abnormal metabolism of carbohydrate, protein and fat resulting in hyperglycemia due to absolute or relative deficiency of insulin ending up in vascular complications. It can be divided into two main categories. Insulin Dependent Diabetes Mellitus (IDDM) now labelled as type-1 Diabetes Mellitus (T1DM) and Non-insulin Dependent Diabetes Mellitus (NIDDM) known as type-2 Diabetes Mellitus (T2DM).⁽³⁾ Therefore, the aim of the present study is to measure the level of salivary ALP in patients with T1DM and T2DM with and without periodontitis.

Aim

To estimate the level of salivary alkaline phosphatase level in controls and in patients with hormonal disturbances (Diabetes mellitus)

Objectives

To estimate level of salivary alkaline phosphatase in patients with chronic periodontitis, T1DM with chronic periodontitis, T1DM without chronic periodontitis, T2DM with chronic periodontitis and T2DM without chronic periodontitis and establish the correlation between them.

Materials and Methods

For the present study, patients who were clinically diagnosed for chronic periodontitis, T1DM and T2DM between the ages of 30-60 years were selected with informed consent. Patients were selected from outpatient department of college of dental sciences and research center, Ahmedabad. Patients taking antibiotics, vitamin and mineral supplements, undergone periodontal treatment and aggressive periodontitis were excluded.

The study is a in-vivo study that involves collection of 5ml of saliva from control group and study groups, and to analyze salivary ALP levels with Spinreact alkaline phosphatase (ALP) kit and Erba Chem 5x semi auto analyzer instrument. Study samples comprise of 90 samples that were diagnosed T1DM, T2DM, chronic periodontitis out of which 15 are healthy controls. The chronic generalized severe periodontitis patients were established based on the findings like gingival inflammation and clinical attachment loss of minimum 2-3 mm and pocket depth of more than 4 mm at 3 or 4 sites in more than fourteenth in each quadrant with radiographic evidence of bone loss. Periodontally healthy controls should have absence of clinical signs of gingival inflammation and no evidence of bone loss. The principle of the procedure was that the alkaline phosphatase (ALP) catalyses the hydrolysis of p-nitrophenyl phosphate at pH10.4, liberating p-nitrophenol and phosphate, according to the following reaction:

ALPp-Nitrophenyl-P+H₂O→p-

Nitrophenol+Phosphate The rate of p-nitrophenol formation, measured photometrically, is proportional to the catalytic concentration of alkaline phosphatase present in the sample. ^[49,50]

Results

This study was carried out among 90 samples containing control, T1DM with chronic periodontitis and without chronic periodontitis, T2DM with and without chronic periodontitis and chronic periodontitis group, each sample groups comprise of 15 samples.

Salivary ALP Mean ± SD values of control groups, Chronic periodontitis (CP), Diabetes mellitus type1 with chronic periodontitis(DM1+CP), Diabetes mellitus type1 without chronic periodontitis (DM1-CP), Diabetes mellitus type 2 with chronic periodontitis (DM2+CP) and Diabetes mellitus type 2 without chronic periodontitis (DM2-CP) were 34.07+11.13, 72.33+12.71, 179+14.15, 133.73+11.05, 166.67+14.47 and 127.73+13.05 respectively. Hence the mean value for study groups were increased compared to controls. (Table 1)

Table no.2 shows comparison of diabetics with healthy candidates which was highly significant with p value P<0.001 when analyzed using unpaired t-test and one way anova test.. And comparing the ALP levels in diabetics with chronic periodontitis patients also showed significant difference with p value of <0.001. Hence the ALP levels are increased significantly in diseased group compared to healthy group.

Table 1: Salivary alkalinephosphatase levels in control group and study group

Groups	Mean±SD
Control group (C)	34.07+11.13
Chronic periodontitis (CP)	72.33+12.71
Diabetes mellitus type1 with chronic periodontitis (DM1+CP)	179+14.15
Diabetes mellitus type1 without chronic periodontitis (DM1-CP)	133.73+11.05
Diabetes mellitus type 2 with chronic periodontitis (DM2+CP)	166.67+14.47
Diabetes mellitus type 2 without chronic periodontitis (DM2-CP)	127.73+13.05

Table 2: Comparison of salivary alkalinephosphatase levels between control group and diabetes mellitus groups

	DM1+CP	DM1-CP	DM2+CP	DM2-CP
MEAN±SD	179+14.15	133.73+11.05	166.67+14.47	127.73+13.05
UNPAIRED T TEST	P<0.001	P<0.001	P<0.001	P<0.001
ONE WAY ANOVA TEST	P<0.001	P<0.001	P<0.001	P<0.001

Table 3: Comparison of salivary alkalinephosphatase levels between chronic periodontitis group and diabetes groups

	DM1+CP	DM1-CP	DM2+CP	DM2-CP
MEAN±SD	179+14.15	133.73+11.05	166.67+14.47	127.73+13.05
UNPAIRED T TEST	P<0.001	P<0.001	P<0.001	P<0.001
ONE WAY ANOVA TEST	P<0.001	P<0.001	P<0.001	P<0.001

Discussion

Periodontitis is one of the complication of diabetes or say 6th after retinopathy, nephropathy, neuropathy, macrovascular disease and altered wound healing. Oral

complication like gingivitis, periodontitis, dry mouth, salivary hypofunction are more common in diabetics.^(4,5) The presence of anaerobic Gram-negative bacteria in microbial plaque causes a local

inflammatory response that becomes chronic and progressive; this inflammation of the gingiva causes alveolar bone destruction and loss of the tissue attachment to the teeth, which induces an initial infiltrate of inflammatory cells, such as lymphocytes, macrophages, and polymorphonuclear leukocytes (PMNs).⁽⁶⁾ ALP is released by cells like PMNs, leukocytes, bacterial fibroblast and osteoblast which are predominant in periodontal environment. So it is one of the marker for periodontal disease.⁽¹⁾

The salivary ALP levels in the present study showed an increase in chronic periodontitis patients as compared to the control group. This is in correlation with the study conducted by AmitDe et al., 2019,⁽⁷⁾

The salivary ALP were found higher in T1DM mellitus patients with chronic periodontitis as compared to control group, this is in correlation with Sridharan S et al.⁽⁸⁾ Mean Salivary alkaline phosphatase levels in T2DM with chronic periodontitis greater compared to control group and T2DM without chronic periodontitis similar study conducted by Shaheen et al.⁽⁹⁾ The results of the present study are in accordance with the study done by Kumar and Sharman 2011⁽¹⁰⁾ and Nakamura & slots⁽¹¹⁾ in their respective studies. In the present study, we found that the salivary ALP was high in chronic periodontitis and in T1DM, T2DM with and without chronic periodontitis patients than control group. Ishikawa and Cimasoni⁽¹²⁾ showed a positive correlation of alkaline phosphatase in periodontitis patients with increase in pocket depth. The results of our study are well in accordance with this study. We found significantly increased levels of salivary ALP levels in type 1 and type 2 DM with chronic periodontitis.

Summary and conclusion

Saliva, which is often looked upon as the blood stream of tooth, can be used as non-invasive diagnostic tool and hence, can be easily collected without patients' discomfort. Statistical analysis is performed to compare results of healthy participants with those of patients. On the basis of the results of this study, it can be concluded that Salivary alkaline phosphatase enzyme was significantly greater in diabetes mellitus subjects compared to systemically healthy individuals; and chronic periodontitis patients.

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