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The Effect of Diabetic Patients with Chronic Periodontitis on Serum Paraoxonase, Adenosine Deaminase

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Abstract

Diabetes mellitus is a major global health problem and represents a risk factor for periodontitis. This study was carried out to determine the Paraoxonase (PON), adenosine deaminase (ADA), aspartate and alanine aminotransferase (AST, ALT), lactate dehydrogenase (LDH) activity in diabetic patients with Periodontitis.

This study was carried out on nineteen diabetic patients (25–50 years),) with generalized moderate-to-severe periodontitis were selected based on periodontal parameters of gingival index (GI), probing pocket depth (PPD), clinical attachment level (CAL) and radiographic parameters. As well as 19 healthy age-matched control participants. Data were evaluated using descriptive statistics, t-test, Chi-Square.

Results: Obtained results were shown statistically significant increases of activity of ADA, LDH, AST, and ALT, while PON concentration decreased in saliva from diabetic patients with periodontal disease in relation to control group.

Conclusion: In patients with advanced periodontitis, the salivary PON, level were significantly lower whereas ADA higher compared to healthy individuals. Thus, assessment of salivary leptin can be done as a non-invasive and simple method to determine the susceptibility of patients to advanced periodontitis.

Key words: Adenosine deaminase, diabetes mellitus, periodontitis, saliva.

Introduction

Diabetes mellitus is a clinically and genetically inexact plan of disorders prowl occurs promptly the pancreas does slogan grant sufficient insulin momentous, and is directly linked to the oral health status of the patients. To a third of diabetic patients, scold of odontogenic abscesses, brilliantly mouth syndrome, xerostomia, gingivitis and periodontitis.

Periodontitis categorized by its gradually submit bat, but at some point undergoes exacerbation. There is a close relationship between DM and PD that been well acknowledged in many clinical and epidemiological

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studies [1,2].

Hyperglycemia tushy brunt periodontal tissues by cumulative oxidative stress(OS) as a interest of the diverge between sensitive oxygen species(ROS) and antioxidants, which strength in the course of time determining in store of Progressive Glycation Repeal traffic in (AGE), become absent-minded binding to their receptors forming (RAGE) prompts intracellular events which accelerate the formation of cell adhesion molecules and chemokines [3,4]

This study was undertaken to investigate the PON, ADA, AST, ALT, LDH activity in diabetic patients with Periodontitis.

Materials and methods

The study group comprised of 19 diabetic patients with generalized moderate-to-severe periodontitis (age and gender matched under the age group of 25–50 years), as well as 19 healthy age-matched control participants, who had referred to the at Tikrit University of college of Dentistry between April 2015 and February 2016.

As the initial examination, each subject completed a detailed medical questionnaire and received a complete periodontal examination, which included: GI, BOP, PD [5]. Un-stimulated saliva was collected by the spitting method[6].

Serum ADA, AST, ALT and LDH activity were measured colorimetrically using commercially available kits on fully auto analyzer of Clinical Biochemistry Laboratory. PON activities was assayed according to the procedure described by Mackness et al[7].

Data were analyzed by SPSS 21, using paired t-test and Pearson's correlation coefficient. Statistical significance was defined at $P<0.05$.

Result

Descriptive statistics for both sex are illustrated in Table I, the study conducted on group I (no.=19) diabetic individuals with periodontitis, 5 female and 14 male, and group II B(no=19) individuals having normal weight without periodontitis as control group, 11 female and 8 male, the mean age in years was (43.86 ± 4.88) and (35.350 ± 2.52) respectively .

The mean of BMI was significantly higher in group I than in group II (20.64 ± 2.12 vs23.66 ± 2.88).While the mean pH values(6.09±0.570 vs 7.038±0.244) and salivary flow rate (SFR) (1.243±0.168 vs 2.078±0.187) levels were lower in group I compared to group II.

Regarding the mean values of biochemical parameters of groups, control and diabetic patients with periodontitis, which shown in Table 2. The analysis revealed highly significant increase in the concentration of ADA(27.185 ± 1.661 vs 21.388 ± 1.779U/L),ALT(45.3 +12.2 vs6.1220 ± 0.879 U/l),LDH (165.65 ± 6.64 vs 126.23 ± 4.69U/l), AST (156.79 ± 11.75 vs 23.09 ±5.11 U/l) in saliva diabetic individuals compared with healthy control group (P 0.01).while PON concentration was highly significantly decreased in both samples of group A compared with group B (7.13 ± 0.8794 vs 9.526 ± 1.160), (P 0.01).

Discussion

Diabetes mellitus subjects had decreased salivary pH when compared to that of control this may be attributed to the metabolic changes in diabetes

mellitus patients causing in acidic ph. In diabetes, there is reduction in the level of bicarbonates in all body fluids, which leads to metabolic acidosis of all body fluids. this elucidates the salivary acidic nature in DM[8].

Salivary flow rate significantly decreased in G:I with than normal G:II. This variation may be explained by the glycosuria, prompted by even small hyperglycemia, can decrease salivary flow in diabetic patients and lead to liquid loss and dehydration, and, subsequently, to the salivary flow reduction, the obtained data are consistent with the results obtained. DM has adverse impact on the nervous system and that it progresses microangiopathy and hormone disproportions leading to xerostomia[8,9].

Adenosine deaminase (E.C. 3.5.4.4) is an aminohydrolase which hydrolyzes either adenosine or 2'-deoxyadenosine forming inosine or 2'-deoxyinosine, respectively, was reflected as good marker of cell mediated immunity. It plays a crucial role in regulates the stress response and cellular damage through tissue hypoxia and inflammation increases the rate of its synthesis [10].

Inosine has been shown to be a potent inhibitor of the production of the inflammatory cytokines TNF-α, IL-1, IL-12, macrophage-inflammatory protein-1α and IFN-γ [11]. Stentz et al.[12], who reported that In DM the abnormal proliferation of lymphocytes and activity of ADA enhanced due to defect in insulin activity required for T-lymphocytes. Accordingly, DM might have persuaded a strong inflammatory response in patients that resulted in local activation of the oral immune system, and inflammatory mediators (i.e. cytokines).

LDH, AST, and ALT are cytological enzymes, their increased activity in saliva, and gingival crevicular fluid is a possible indicator of their increased release from the damaged cells of soft tissues of periodontium and a reflection of metabolic alterations in the inflamed gingiva. In present study, salivary LDH, AST, and ALT levels increased high markedly as compared with control group result from damage to salivary glands cells [13].which is in the line with previous reports[14].

Paraoxonase (PON1, EC 3.1.8.1.) are a series of serum esterase enzymes closely bound to the apolipoprotein A1- containing HDL fraction synthesized in the liver[15]. The reduce enzyme activity is initiated rather by glycation of the PON protein than by decreased production of its molecules. That has anti-atherogenic and antioxidant functions by decreasing the accumulation of the lipid peroxides in LDL due to its ability to reduce hydroperoxides[16].

Oxidative stress has been implicated in the etiology and pathogenesis of several oral diseases including dental caries and periodontitis .Reduced PON activity could be related with increased OS caused by an overproduction of free oxygen radical which leads to the destruction of periodontal tissue, due to inflammation or by the lack of antioxidants [17,18].We observed significant increase PON levels in patients group, which is in agreement with earlier report[19].

Conclusion

Our study clearly underlines a profound impact of diabetes on salivary PON, and ADA in periodontitis subjects in comparison to healthy subjects. Moreover, diabetes status increased ADA, and decreased PON significantly in periodontitis patients.

Recommendations

Further researches is strongly recommended to examine genetic polymorphism distribution in large population to accomplish a concise overview which could explain variability in PON1 and its particular relationship with all the additional factors that associate the condition and its particular complications. No study that addresses the assessment of PON, and ADA in saliva was performed.

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Table (1): Characteristics of subjects

Parameters	**Group: I**	**Group: II**
No. of subjects	19	19
Sex (M/F)	14/5	8/11
BMI (kg/m²)	20.64 ± 2.12	23.66 ± 2.88
Age (years)	43.86 ± 4.88	35.350 ± 2.52
SFR (ml/min)	1.243±0.168	2.078±0.187
Salivary pH	6.09±0.570	7.038±0.244

$P < 0.05$, $^{**} P < 0.01$

Table 2: Biochemical Parameters of patients and group. Group: I (n=19), Group: II (n=19).

Parameters	**Group: II**	**Group: I**
PON (nmol /ml)	7.13 ± 0.8794	9.526 ± 1.160
LDH (U/l)	165.65 ± 6.64	126.23 ± 4.69
AST (U/l)	156.79 ± 11.75	23.09 +5.11
ALT(U/l)	45.3 +12.2	6.1220 ± 0.8794
ADA(U/L)	27.185 ± 1.661	21.388 ± 1.779

* $P < 0.05$