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Periodontal health status and biochemical study of Saliva among diabetics and non diabetics (Comparative study)

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Abstract

Background: The aim of this study is to determine the relative influence of diabetes mellitus on periodontal parameters and to correlate between glucose content of saliva and blood in diabetics and non diabetics

Material and method: Total samples composed of 105 participants. Group I composed from 35 healthy subjects, group II composed from 35 patients were well controlled diabetics and 35 patients were moderately and poorly controlled diabetics. The periodontal parameters which included Plaque Index (PL.I) and gingival index (G.I) were recorded.

Whole saliva samples were collected for determination of glucose and total protein.

Results: The mean value of glucose in saliva was higher in group II (1.769 ± 0.972) and in group III (4.054 ± 2.851) compared to group I (0.993 ± 0.331). Inter group comparison for PL.I showed that there was a significant difference between group I and group II, while was no significant difference between group II and group III at $P\text{-value} > 0.05$.

The mean G.I in group II and group III were elevated compared with group I. There was weak or no correlation between periodontal and biochemical parameters.

Conclusion: Diabetic groups showed significant difference in periodontal parameters compared to control group with significant difference between group II and group III. Also significant increase in glucose and total protein of saliva in diabetic groups compared to control group.

Key word: Diabetes mellitus, periodontal parameters, saliva.

Introduction

Diabetes mellitus (DM) is syndrome characterized by chronic hyperglycemia and relative insulin deficiency, resistance or both. It affect more than 120 million people world wide , and it is estimated that it will affect 220 million by the year 2020 ⁽¹⁾ . Periodontal disease has been reported as the sixth complication of diabetes along with neuropathy, nephropathy, retinopathy and micro and macro

vascular disease ^(2, 3)

Epidemiological studies showed that subjects with diabetes had higher prevalence of periodontal disease than non- diabetic. Using either periodontal attachment loss or radiographic bone loss indicated that diabetes is a risk factor for periodontal disease. ^(4, 5, 6, 7)

It has been shown that uncontrolled or poorly controlled diabetics have the greater incidence of sever periodontal disease compared with those patients who are well controlled or have no

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diabetes mellitus, this has been more prevalence in persons with type 2 diabetes. ^(8, 9, 10)

Studies have provided evidence that control of periodontal disease has an impact on improvement of glycemic control evidence by decrease in demand for insulin and decreased glycosylated hemoglobin A1c (HbA1c) levels. ^(11, 12)

Salivary components may suffer variation that can be detected by chemical determination, diminished Salivary flow rate and excess usually present in saliva of diabetic patient ⁽¹³⁾. Total serum urea and total protein were greater in diabetic patient than control ^(14, 15).

Aim of the study

To determine the relative influence of diabetes mellitus on periodontal parameters including plaque Index (PLI), Gingival Index (GI). To estimate glucose and protein content of saliva in well controlled diabetics and in moderately and poorly controlled diabetic to compare between them and with control group, and to correlate between biochemical and periodontal parameters.

Material and method

Total samples composed of 105 participants, they were carefully informed about the aim of the investigation and they were free to accept or refuse to be examined, all of them were selected from subjects attending specialized center of endocrinology and diabetes mellitus. The samples were divided into three groups these are.

Group I: - including samples of 35 healthy male without any history of any systemic disease. The HbA1c was rang between 4.2- 6.0 %.

Group II: - including samples of 35 male with well controlled type 2

diabetes mellitus. The HbA1c was rang between 6.1 - 7.5 % had received oral hypoglycemic agent for treatment and visited the centre of endocrinology every two months for following up and adjustment of diabetes treatment.

Group III: - including samples of 35 male with moderate and poorly controlled type 2 diabetes mellitus. The HbA1c was > 7.5% had received oral hypoglycemic agent for treatment and visited the centre of endocrinology every two months for following up and adjustment of diabetes treatment.

Salivary sample and salivary test:-

Five mls of unstimulated whole saliva was collected before the clinical examination and after taking blood sample. This sample was collected after an individual was asked to rinse his mouth thoroughly with distal water to insure the removal of any possible debris or discarded to allow clearance over a fifteen minutes a period at least half an hour of 10 a-m and 1 p.m

The collected saliva was centrifuged at 3000 r.p.m for 15 minutes and then the centrifuged clear supernatant saliva kept frozen and stored at - 20° until glucose determination by using trinder GOD - POD kit for quantitative determination of glucose. Estimation of salivary total protein by using Biuret colorimetric kits

The periodontal examination were performed on dental chair it was recorded on four sites (mesial, buccal, lingual, distal) for all teeth except for 3rd molar which was excluded.

The periodontal parameter included Plaque index PLI (Silness and Loe 1964) ⁽¹⁶⁾ and Gingival index G. I (Loe and Silness 1967) ⁽¹⁷⁾

For statistical analysis, mean and standard deviation (S.D) were used for descriptive analysis while t- test, Chi-

square and person (r) were used for inferential statistic.

Result

The mean and S.D of HbA1c and Fasting blood sugar (F.B.S) for all groups was shown in table 1

The biochemical analysis of saliva indicate that the mean of salivary glucose (S.G) and salivary total protein (S.P) was higher in group II and III in compare to group I as shown in table 2

Inter group comparison for HbA1c, F.B.S and salivary glucose was shown in table 3 and there was highly significant difference between group I group II and there was significant difference for salivary total protein at p - value < 0.05 . Comparison between group II and group III was illustrated in table 4 and it showed a highly significant difference for HbA1c, F.B.S and salivary glucose while there was no significant difference for salivary total protein.

Table 5 showed that there was highly significant difference for HbA1c, F.B.S and salivary glucose while there was significant difference for salivary total protein in comparison between group I and group III.

Correlation between salivary glucose and F.B.S was highly significant with strong correlation in all groups while correlation between salivary glucose and HbA1c was highly significant with weak correlation in all groups as shown in table 6, also this table showed that correlation between salivary total protein, F.B.S. and HbA1c was highly significant with weak correlation between them in all groups.

For periodontal parameters the mean and S.D for PL.I was shown in table 7 it was clearly shown that the mean was elevated in group II and III in compared to group I. Also this table showed that the mean and S.D of G.I in

group II and III were elevated compared with group I.

The inter-group compared for PL-I showed that there was significant difference between group I and group II, then was highly significant difference between group I and group III, while there was no significant difference between group II and group III as shown in table 8.

The inter group comparison for G.I showed significant difference between group I and group II and between group II and group III while there was highly significant difference between group I and III as shown in table 9

There was no or weak inter group correlation between clinical and biochemical parameters for all group as shown in table 10.

Discussion

Hyperglycemic conditions result in a decreased cellular proliferation and growth of periodontal ligament, fibroblast and collagen synthesis. Patients with diabetes have an increase in gingival cervical fluid colloques activity when compared with non diabetics⁽¹⁸⁾

Salivary glucose was significantly higher in group II and III than in group I and it was significantly correlated with fasting blood sugar and this was in agreement with other studies which found that saliva and serum glucose was significantly higher in diabetic patients than in Control^(19, 20) But not such correlation had been found by others^(21, 22)

Weak correlation was found between HbA1c and salivary glucose this was in agreement with others^(23, 24). A high HbA1c value indicates that the patients have hyperglycemic periods during the past 6 to 8 weeks but this value didn't give information about the actual situation at the time when salivary test was performed

which explains why no direct relationship between salivary factors and HbA1c values was observed. In support of this Darwazeh⁽²⁵⁾ who found that glucose level in unstimulated mixed saliva correlated with actual blood glucose level but not with HbA1c values.

The level of salivary glucose was higher in group III compared to group II, these results are in agreement with Karalaincen⁽²³⁾ who reported that salivary level decreased after beginning insulin treatment in both children and adolescents.

There was non-significant difference between salivary glucose, PLI and G. I with weak correlation between them while comparison between PLI and G.I were highly significant with correlation between them this was in agreement with others^(24, 26).

Inter - group comparison for salivary total protein were significantly higher in the diabetic groups than in control group this was in agreement with others studies^(15,26), while it was disagreement with Belazi⁽²⁷⁾ who found no significant difference in serum and salivary total protein between diabetic and non-diabetic patients, their finding are due to that the patients were of newly diagnosed type I IDDM children, or a significantly lower salivary protein concentration in diabetic group when compared to the controls.

No significant difference in salivary total protein was found between well controlled diabetics and moderately and poorly controlled diabetics, it is agree with Kerstezs⁽²⁹⁾, this may be due to that most of diabetic's patients were dehydrated due to increase urination and they usually complain of xerostomia or dry mouth, so this will be an important cause of increasing salivary total protein.

Inter group comparison of salivary total protein and fasting blood sugar and HbA1c was highly significant in all group with weak correction between them, this due to increase concentration of protein with increasing level of fasting blood sugar and HbA1c

For clinical parameters, a significant difference was found between group I and II and highly significant difference was found between group III and I this was in agreement with Pinson⁽³⁰⁾. Statistically no significant difference existed in the mean PLI between group II and III and there for plaque can only in part explain the differences in attachment and bone loss, which are indicators of true periodontal tissue destruction, this was in agreement with others^(31,32) and it was disagreement with Harrison⁽²⁰⁾. There in no obvious reasons for this discrepancy it is possible that the health and psychological status of diabetics lead them to ignore their personal hygiene.

There was significant difference in gingival index between group I and group II, highly significant difference between group I and group III, this was in agreement with Hugoson⁽³³⁾, and disagreement with Ervasti⁽³⁴⁾ who reported that there is a correlation between gingival condition and HbA1c, but the diabetics with worst control had a similar gingival condition to the non-diabetic control group, suggesting that the changes observed might not be the result of abnormal glucose metabolism but may be related to some thing else, possibly to personality. A significant difference was found between group II and III this was in agreement with Ervasti⁽³⁴⁾, The inflammatory reaction are intensified during poorly controlled subjects compared to well control ones

There was weak or no correlation between clinical parameters and

biochemical parameters this was because the diabetic patient may be predisposed to periodontal disease based on the production of advanced glycation end products (AGE), which bind to receptors on specific cells as monocytes.

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Table 1: The mean and SD of HbA1c and FBS for all groups

	Group I	Group II	Group III
mean±SD HbA1c	4.950 ±0.488	6.683±0.257	9.962±1.417
mean±SD FBS	85.0 ±11.916	139.5±32.06	219.69±62.68

Table 2: The mean and SD for salivary glucose (S.G) and salivary total protein (S.P) mg/dL in all groups

	Group I	Group II	Group III
mean±SD S.G	0.993 ±0.331	1.769±0.972	4.054±2.851
mean±SD S.P	121.8 ±52.6	156.0±51.7	175.2±64.0

Table 3: The comparison for HbA1c, FBS, salivary glucose (S.G) and salivary total protein (S.P) between group I and group II

Group I & Group II	t-test	P value	Significant
HbA1c	18.09	0.000	HS
FBS	9.371	0.000	HS
S.G	4.461	0.000	HS
S.P	2.645	0.036	S

Table 4: The comparison for HbA1c, FBS, salivary glucose (S.G) and salivary total protein (S.P) between group II and group III

Group II & Group III	t-test	P value	Significant
HbA1c	12.304	0.000	HS
FBS	6.687	0.000	HS
S.G	5.803	0.000	HS
S.P	0.728	0.473	NS

Table 5: The comparison for HbA1c, FBS, salivary glucose (S.G) and salivary total protein (S.P) between group I and group III

Group I & Group III	t-test	P value	Significant
HbA1c	18.066	0.000	HS
FBS	12.009	0.000	HS
S.G	9.324	0.000	HS
S.P	2.645	0.013	S

Table 6: Correlation of salivary glucose (S.G), salivary total protein (S.P) with HbA1c, FBS in group I, group II and group III

	P value	(r) Group I	(r) Group II	(r) Group III
S.G & FBS	0.000 HS	0.714	0.614	0.588
S.G & HbA1c	0.000 HS	0.328	0.365	0.337
S.P & FBS	0.000 HS	0.181	0.45	0.256
S.P & HbA1c	0.000 HS	0.124	0.176	0.215

Table 7: The mean and SD of PL.I and G.I for all groups.

	Group I	Group II	Group III
PL.I	1.727±0.508	2.132±0.555	2.350±0.367
G.I	1.346±0.388	1.503±0.441	1.858±0.401

Table 8: Inter group comparison for mean PL.I

	t- test	P value	significant
Group I & group II	3.236	0.003	S
Group I & group III	6.188	0.000	HS
Group II & group III	1.747	0.091	NS

Table 9: Inter group comparison for mean G.I

	t- test	P value	significant
Group I & group II	3.919	0.001	S
Group I & group III	5.316	0.000	HS
Group II & group III	1.158	0.046	S

Table 10: Intra group correlation between clinical parameters and biochemical parameters for all groups

		HbA1c	FBS	SG	SP
Group I	PL.I	0.096	0.014	0.085	0.117
	G.I	-0.001	-0.016	0.094	0.157
Group II	PL.I	-0.025	-0.417	-0.369	0.254
	G.I	0.154	-0.174	-0.328	0.357
Group III	PL.I	0.002	0.244	0.116	0.057
	G.I	0.163	0.024	0.103	0.103