A STUDY OF BIDIRECTIONAL RELATIONSHIP BETWEEN DIABETES MELLITUS AND PERIODONTAL DISEASES IN CHILDREN

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ABSTRACT

Although periodontitis does not belong to clinical manifestations of any type of diabetes mellitus, it is still being labeled as "the sixth chronic complication of diabetes. It has been confirmed that, in individuals with diabetes, there is about a three times higher risk of periodontitis. Thus, diabetes is considered to be a predisposing factor for periodontitis .In the diabetic patients, the periodontal disease develops at a younger age than in the healthy population. The aim of this study was to prove the bidirectional relationship between periodontal diseases and diabetes type 1 in children. Patients and Methods: this study was conducted on 40 children with age range from 8-13 years, for evaluation of periodontal diseases "Gingival Index (GI), Plaque Index (PI) and Clinical Attachment Loss (CAL)" were used, and "Glycosylated hemoglobin (HbA1c %)" for the evaluation of blood glucose level and after application of the dental treatment program the patients were reevaluated after 3months, 6months and 9months. Results: the results show that both periodontal diseases and diabetes type 1 had a bidirectional relationship.

INTRODUCTION

Type 1 diabetes mellitus is a chronic metabolic disease of an autoimmune origin with early manifestation predominantly in the childhood[1-4] .

Among the inflammatory disorders, periodontal disease-PD represents gram-negative anaerobic infections that involve tooth supporting tissues, (gingiva, alveolar ligament, root cementum, and alveolar bone)[5].

Some studies show relationship between the duration of diabetes and severity of periodontitis[6,7]. On the other hand, it was confirmed that there is a negative effect of periodontitis on blood glucose levels. This is due to an increased insulin resistance of tissues in reaction to systemic inflammatory mediators [8]. There was a presumption that treatment of periodontitis results in an improved metabolic control of diabetes[8]. Although some earlier studies did not support this hypothesis[9-11] .

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PATIENTS AND METHODS

This study included 40 children who were previously diagnosed as T1DM patients according to ADA[12]. They were selected from the diabetes outpatients' clinic, Maternal and Children Minia University Hospital. Their ages range from 8 – 13 years and both sexes were presented.

After fulfillment of inclusion criteria the selected patients were divided into two groups, each group with different degree of periodontal alteration;

Group I: included 20 patients with good controlled-diabetes.

Group II: included 20 patients with poor controlled diabetes.

Study design:-

After the agreement of the patient on the informed consent, all our patients were subjected to:

I. **Thorough history taking** (age, sex, residence, duration of diabetes, presence of any complication of diabetes, History of any dental consultation in the last 6 months).

II. **Clinical examination** (Anthropometric measurement ''weight, height, and body-mass index (BMI)'', **Systematic examination** ''chest, heart and abdomen'', **Intraoral examination** ''Gingival index GI, Plaque index PI, Clinical attachment loss CAL'').

III. **Special investigations** (Glycosylated hemoglobin (HbA1c %), Renal and liver function tests.

IV. **Dental treatment program** (Dental program involved both curative and preventive parts **Curative** was carried out to meet all child's treatment needs and included dental prophylaxis and providing restorative care for children. **Preventive** part included mechanical and chemical control of periodontal diseases: Health education (mechanical control)A-Tooth brushing , B-Flossing (Chemical control): Topical antimicrobial agent application (Cuteca "oral solution") in the clinic, and then how to applicate oral solutions three times daily.

V. **Patient's re-evaluation** (after 3monthes, 6monthes and 9monthes).

RESULTS

Table (1) shows that group I (good controlled) had significant lower gingival index scores than group II (poor controlled) at the base and at 3rd month of the study, where (p=0.03). On the other hand, there were insignificant difference between them at 6th months, 9th months of follow up periods where (p>0.05). As regard separate groups, there were significant reduction of GI score at different periods of follow up in both of them where (p=0.001) for both.

TABLE (1): Comparison between the studied groups as regard GI at different follow up periods

GI Follow up period	Group I Mean± SD	Group II Mean± SD	P value
At base	1.7±0.3	1.9±0.3	0.03*
At 3rd month	1.3±0.3	1.6±0.4	0.03*
At 6th month	1.01±0.2	1.2±0.4	0.1
At 9th month	0.6±0.3	0.8±0.4	0.1
P value	0.001*	0.001*	

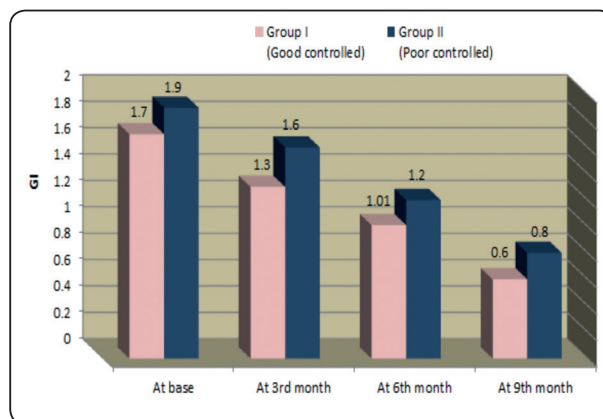**p<0.05 is statistically significant*

Fig. (1): Comparison between the studied groups as regard GI at different follow up periods

According to the plaque index(PI), there was insignificant difference between different groups during the whole study periods but on the other hand, there was significant improvement in each group in the plaque index through the whole periods of the study until 9th ms (p>0.001) **(Table 2)**.

TABLE (2): Comparison between group I and II as regard Plaque Index (PI) scores at different follow up periods

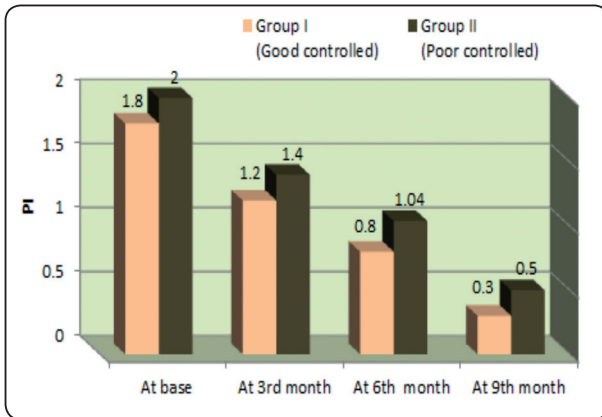| PI Follow up period	Group I Mean± SD	Group II Mean± SD	P value
At base	1.8±0.3	2±0.3	0.2
At 3rd month	1.2±0.3	1.4±0.4	0.09
At 6th month	0.8±0.1	1.04±0.4	0.1
At 9th month	0.3±0.2	0.5±0.4	0.2
P value	0.001*	0.001*	

p<0.05 is statistically significant

Fig. (2): Comparison between group I and II as regard Plaque Index (PI) scores at different follow up periods

In this table the clinical attachment level (CAL) had insignificant difference between groups during the whole study periods. Concerning separate groups there were significant results of CAL at different periods of follow up **(Table 3)**.

TABLE (3): Comparison between group I and II as regard Clinical Attachment Level (CAL) scores at different follow up periods

CAL(mm) Follow up period	Group I Mean± SD	Group II Mean± SD	P value
At base	4.5±0.6	4.5±0.6	0.9
At 3rd month	3.5±0.6	3.6±0.5	0.7
At 6th month	2.4±0.6	2.5±0.7	0.5
At 9th month	1±0.8	1.7±0.8	0.5
P value	0.001*	0.001*	

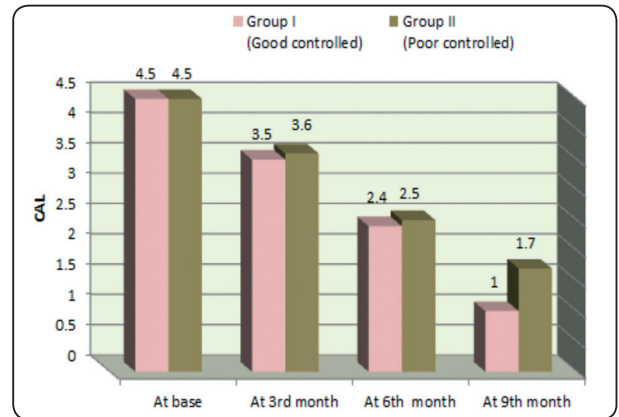** p < 0.05 is statistically significant*

Fig. (3): Comparison between group I and II as regard Clinical Attachment Level (CAL) scores at different follow up periods

In this table group II (poor controlled group) had significant higher levels of HbA_{1c}% than group I (good controlled group) at different durations of follow up (at base, at 3rd month, 6th month and 9th month). Moreover, within every group there were significant reduction of HbA1c% levels at different durations of follow up where (p=0.006 and p=0.001) **(Table 4)**.

TABLE (4): Comparison between group I and group II regarding HbA1c% at different follow up periods

Follow up periods	Group I		Group II		P value
	Range	**Mean ± SD**	**Range**	**Mean ± SD**	
At base	6.1-7.9	7.4±0.4	8.1-13	10.4±1.6	0.001*
At 3rd month	7-11.2	8.2±1.1	7.9-14	10.2±1.6	0.001*
At 6th month	7-10.8	8.1±0.9	7.2-13.9	9.2±1.6	0.0065
At 9th month	6.5-10.8	7.5±0.9	7.1-13	8.3±1.6	0.01*
P value	0.006*		0.001*		

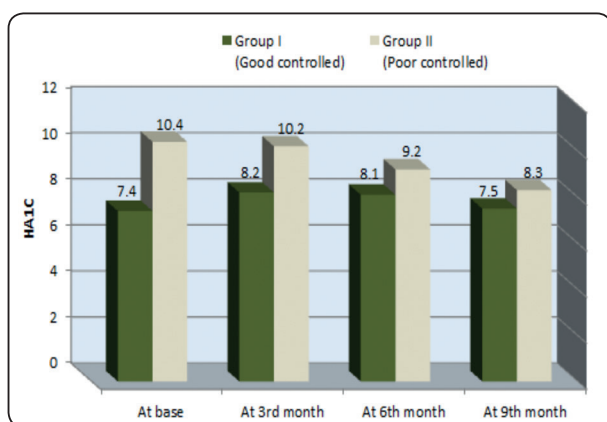**p<0.05 is statistically significant*

Fig. (4): Comparison between group I and group II regarding HbA$_{1c}$% at different follow up periods

DISCUSSION

Inflammation is a central feature of both diabetes and periodontal disease, and inflammatory processes are up-regulated in periodontal tissues in diabetic patients. There is a wide range of mechanisms by which diabetes adversely affects the periodontium and, vice versa, how periodontitis influences control of diabetes, so in the current study we will discuss the results to improve the bidirectional relationship between diabetes and inflammatory periodontal diseases in children.

As regard the tested clinical parameters the results showed that the mean value of gingival index scores was significantly higher in poor controlled group than in good controlled one (1.9±0.3 versus 1.7±0.3) this finding agree with the study on a group of diabetic children aged 5–9 years, the mean value of gingival inflammation index was(1.54 ± 0.5 versus 1.14 ± 0.5) for the control group , and also agreed with a group of diabetic children aged 10–14 years where the mean value of gingival inflammation index versus the control group was(1.98 ± 0.6 and 1.17 ± 0.5) respectively[13].

As regard plaque index the current results reveled that poorly controlled (2±0.3) versus the good controlled group (1.8±0.3). These scores were lower than ***Joo & Lee ;2007*** [14] who recorded (3.2 ± 1.0) for poorly controlled diabetic patients and (2.8 ± 0.8) for good controlled diabetic children.

As regard clinical attachment level the current results reveled that we have high scores in the beginning of the study (4.5±0.6) in both groups which then had a significant improvement until the 9th month of treatment because of the reduction of the microbial causative agents of the periodontal diseases by application of the dental program treatment of the study.

Moreover, the poor controlled group had significant higher levels of HbA1c% than good controlled group at different durations of follow up **(Table 4)**. However, within each group there was significant reduction of HbA1c% levels at different durations of follow up. In the poor controlled group the mean HbA1c% reduced from 10.4±1.6 to 8.3±1.6 at the end of follow up period. This reduction was higher than that recorded in meta-analysis of five studies which reported mean reduction in HbA1c of 0.40% over a follow-up period of 3–9 months after periodontal therapy[15] this can be related to the dental health program that was followed by the patients in the current study.

CONCLUSION

We concluded that: All the dental clinical parameters were higher in poorly controlled diabetic group and also had higher levels of HbA1c% than good controlled group. Improvements of dental clinical parameters were associated with improvement of HbA1c%.

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