

ORAL HEALTH STATUS OF CHILDREN WITH TYPE 1 DIABETES MELLITUS: A COMPARATIVE STUDY

Abdul Wahab Norallah¹, Malek Kassis²

1. Associate Professor at Department of Pediatric Dentistry- Faculty of Dentistry- Tishreen University- Lattakia- Syria.

2. Master Student at Department of Pediatric Dentistry- Faculty of Dentistry- Tishreen University, Lattakia, Syria,

ABSTRACT:

Aim of study: The aim of this study was to compare the oral health status of children with type 1 diabetes mellitus with healthy controls.

Materials and methods: This comparative study involved 140 children, 70 children with type 1 diabetes mellitus and 70 healthy controls. Oral health examination was conducted using WHO criteria. Dental caries experience was recorded using DMFT/dmft index. and periodontal parameters were assessed using gingivitis index.

Dental caries and periodontal parameters between the two groups were compared statistically.

Results: The mean of DMFT, MGI was significantly higher in diabetic group than in control group ($P < .05$), While there were no significant differences in dmft values between both groups, ($P > .05$), there was a correlation between MGI values and the glycemic control level in the diabetic group. There was no correlation between (dmft / DMFT) values and both of the glycemic control level and the duration of the disease in the diabetic group.

Conclusions: type 1 diabetes mellitus was a risk factor for a high frequency of dental caries in the permanent dentition and also a high frequency of gingivitis in young diabetic patients, where The prevalence of dental caries in the permanent dentition and gingival inflammation were higher in children with type 1 diabetes mellitus comparing with control group.

Keywords: caries; children; oral health; periodontal health; type 1 diabetes



INTRODUCTION:

Diabetes mellitus is a chronic metabolic disease, with two basic types, which are insulin-dependent diabetes mellitus (type 1) and non-insulin-dependent diabetes mellitus (type 2).⁽¹⁾

Type 1 diabetes mellitus is an endocrine metabolic disease, characterized by hyperglycemia as a cardinal biochemical feature.⁽²⁾

The disease is a recognized chronic disease with a high incidence in Europe and a low incidence in Asia.⁽³⁾

There is concern over a rising incidence of children with type 1 diabetes in many countries.^(4,5)

The current concept of diabetes management includes blood glucose monitoring, insulin administration, modified lifestyle and diet, The glycosylated hemoglobin (HbA1c) level provides a reliable index for measurement of glycemic control in diabetes. HbA1c reflects the average blood glucose concentration of the patient with diabetes in the past few

months, with a lower HbA1c level indicating better metabolic control ⁽²⁾

When compared to the healthy population, individuals with type 1 diabetes have a higher risk of dying prematurely or within a few years after diagnosis. ⁽⁶⁾and have lower health-related quality of life (HRQOL). Patients with type 1 diabetes are associated with numerous comorbidities with a high mortality rate.⁽⁷⁾

One of the complications of diabetes mellitus is microangiopathy, which affects tissues with rich capillary vessels. ⁽⁸⁾

This effect was also evident in oral tissues and oral health. ⁽⁹⁾

The association between diabetes mellitus and periodontal health has long been studied and it is suggested that individuals with type 1 diabetes mellitus are at an increased risk of developing periodontal disease. ⁽⁸⁻¹⁰⁻¹¹⁾

On the other hand, the association between type 1 diabetes mellitus and dental caries has been given less attention with conflicting evidence among studies. While some studies have reported higher caries experience among children with diabetes⁽¹²⁻¹³⁾ , others reported no significant difference in caries experience between the healthy children and children with diabetes. ⁽¹⁴⁻¹⁵⁾

With these conflicting evidences on the oral health of children with type 1 diabetes, the aims of this study were to

compare the caries experience and periodontal parameters between children with type 1 diabetes and healthy age group - and sex-matched controls.

MATERIALS AND METHODS:

The study sample consisted of 70 patients aged 6-12 years with type 1 diabetes mellitus, were selected from the auditors of the Diabetes Center of the Lattakia Health Directorate, The control group consisted of 70 healthy children of the same age group and gender, were selected from the auditors of Department of Pediatrics. Faculty of Dentistry, Tishreen University.

On the day of clinical examination, both the parents and individuals with diabetes were given the patient information sheet and were informed about the aims and nature of the, study before signing the consent form.

Dental examination

Dental examination was performed by a single trained and calibrated examiner in a dental chair using a dental mirror, dental explorer and periodontal probe under light from the dental chair. All the data were recorded on a clinical form for each participant.

Dental caries:

The dental caries status of the participants was assessed using DMFT/dmft index.⁽¹⁶⁾

All the primary and permanent teeth were examined for caries using visual examination. No bitewing radiographs were taken and no laser-assisted caries detector was used to assess dental caries. DT/dt referred to the number of decayed permanent/primary teeth, MT/mt referred to the missing permanent/primary teeth due to caries and FT/ft denoted the filled permanent/primary teeth, respectively.

Periodontal parameter:

The periodontal parameters of the participants were measured using the modified gingival index MGI.⁽¹⁷⁾

Statistical analysis: All the collected data were analyzed using SPSS version 19.0 software (SPSS Inc, Chicago, IL, USA). The means and standard deviations were calculated for the continuous data. Differences in the caries experience and gingival status between the diabetics and the controls were compared using T test , ANOVA test following normal data distribution.

Variation in oral health status with regards to metabolic control level of the diabetic children was determined using the ANOVA test. Statistical significance was considered when $p < 0.05$.

RESULTS:

Overall, 140 children (70 cases suffering from type 1 diabetes mellitus and 70 healthy subjects) were investigated. As two groups were matched in terms of gender composition, each of them was

composed of 38 males and 32 females. Moreover, the average age of the case group was 9.51 yr with a standard deviation of 1.76 yr, and the average age of the control group was equal to **8.97** yr with a standard deviation of **1.60** yr. In order to check the consistency of age between two groups, independent sample t-test was employed. There was no significant age difference between two groups ($p > 0.05$).

Baseline dental and periodontal characteristics of the study population are summarized in Table 1.

DMFT, MGI index values were found significantly higher in diabetic group in comparison with the control group. (**P=0.016 , 0.002** respectively).Whereas, compared with the diabetic group dmft index was higher in control group but with no significant differences (**P=0.062**). MGI index increased with getting worse of diabetes control (increased HbA1C) with a significant differences (**P=0.00**),but apart from MGI; no significant difference was found with other indexes(dmft,DMFT).(**P=0.065 , 0.204** respectively).

There was a positive and statistically significant association between MGI and mean mean HbA1C (**P=0.000**).

The association between(MGI, DMFT,dmft) indices and duration of diabetes was not significant statistically (**P=0.002, and P=0.00** respectively).

there was no statistically significant association between gender of children in both group and (MGI, DMFT,dmft) indices.

The results of diabetes-related variables for the case group are given in Table 2.

DISCUSSION:

Periodontal disease is a major complication of diabetes mellitus and treating periodontal conditions results in improved metabolic control. On the other hand, importance of oral health and its impact on glycemic control is unknown for many patients and practitioners.⁽¹⁸⁾

The objective of this study was to describe the associations between oral health variables and T1DM.

In this study, MGI index was found significantly higher in diabetic group compared to healthy control subjects.

Siudikiene et al.⁽¹¹⁾ found a higher prevalence of gingivitis in young patients with T1DM in Lithuania (27% versus 13%). Similarly, Pinson M et al⁽¹⁹⁾, found that young cases with T1DM had significantly increased severity of inflammatory gingival disease compared with age-matched control group.

Bissong et al ⁽²⁰⁾, observed a larger number of gingivitis (23.5%); periodontitis (24.8%) dental caries (19.5%) and oral candidiasis (21.5%) in 149 diabetic population in comparison healthy subjects.

Our findings also showed that subjects with poor glycemic control as evident by the higher HbA1c had greater gingival inflammation, similar to previous studies.⁽²¹⁻²²⁻²³⁾

It can be assumed that sustained high blood sugar levels over time appears to increase destruction of periodontal tissues as a result of microvascular effects of advanced glycosylation end products and chronic inflammatory mediator secretion or abnormally high degree of inflammation.⁽²⁴⁾

Uncontrolled diabetics may decrease salivation and change in the composition of saliva.⁽²⁵⁾

Hyposalivation may be involved in the pathogenesis of periodontal disease. Contrary to our study, Pinson et al⁽¹⁹⁾ and Busato et al.⁽²⁶⁾ did not find a positive correlation between the glycemic control and studied oral hygiene.

Interestingly, a higher DMFT index was observed in the case group. This means that the incidence of missed, decayed, or filled permanent teeth is high in patient with type 1 diabetes mellitus. Educational efforts must be reinforced mainly in children and adolescents, emphasizing the importance of oral and periodontal health. Therefore, health care providers should pay more attention to this issue.

emphasizing the lack of awareness of young diabetic patients about this important health issue. We assume that diabetic patients and their family are often involved in management and treatment of blood

glucose and hence, other aspects of general health including oral hygiene and oral health are under consideration. Therefore, there is need to increase the general information of young diabetic patients in this respect.

Results of this study are limited by the small sample size and short diabetes duration. Further studies with larger sample size and longer follow up periods involving the oral health status of young T1DM may reveal different results.

CONCLUSION:

REFERENCES:

1. Karam JH. Pancreatic hormones and diabetes mellitus. In: Greenspan FS, Strewler GJ, editors. *Basic and clinical endocrinology*. 5th ed. New Jersey: Appleton and Lange, 1997:595–663.
2. Alemzadeh R, Wyatt D. Diabetes mellitus. In: Behrman RE, Kliegman RM, Jenson HB, editors. *Nelson textbook of pediatrics*. 17th ed. Philadelphia, PA: WB Saunders, 2004:1947–72.
3. Karvonen M, Tuomilehto J, Libman I, LaPorte R. A review of the recent epidemiological data on the worldwide incidence of type 1 (insulin-dependent) diabetes mellitus. World Health Organization DIAMOND Project Group. *Diabetologia* 1993;36:883–92.
4. Harjutsalo V, Sjoberg L, Tuomilehto J. Time trends in the incidence of type 1 diabetes in Finnish children: a cohort study. *Lancet* 2008;371:1777–82.
5. Cherian MP, Al-Kanani KA, et al. The rising incidence of type 1 diabetes mellitus and the role of environmental factors—three decade experience in a primary care health center in Saudi Arabia. *J PediatrEndocrinol Metab* 2010;23:685–95.
6. Castle WM, Wicks AC. A follow-up of 93 newly diagnosed African diabetics for 6 years. *Diabetologia* 1980;18:121–3..
7. Jayashree M, Singhi S. Diabetic ketoacidosis: predictors of outcome in a pediatric intensive care unit of a developing country. *Pediatr Crit Care Med* 2004;5:427–33.
8. Orbak R, Simsek S, Orbak Z, Kavrut F, Colak M. The influence of type-1 diabetes mellitus on dentition and oral health in children and adolescents. *Yonsei Med J* 2008;49:357–65.
9. Listgarten MA, Ricker FH Jr, Laster L, Shapiro J, Cohen DW. Vascular basement lamina thickness in the normal and inflamed gingiva of diabetics and non-diabetics. *J Periodontol* 1974;45:676–84.
10. Al-Khabbaz AK, Al-Shammari KF, Hasan A, Abdul-Rasoul M. Periodontal health therefor, periodic assessment of oral health status of patients should be promoted as integral components of diabetes management and the dentist should be a part of the multidisciplinary team that assists individuals with T1DM. In addition, diabetic patients should receive oral hygiene instructions.

of children with type 1 diabetes mellitus in Kuwait: a case-control study. *Med Princ Pract* 2013;22:144–9.

11. Siudikiene J, Maciulskiene V, Dobrovolskiene R, Nedzelskiene I. Oral hygiene in children with type I diabetes mellitus. *Stomatologija* 2005;7:24–7.
12. Alves C, Menezes R, Brandao M. Salivary flow and dental caries in Brazilian youth with type 1 diabetes mellitus. *Indian J Dent Res* 2012;23:758–62.
13. Siudikiene J, Machiulskiene V, Nyvad B, Tenovuo J, Nedzelskiene I. Dental caries and salivary status in children with type 1 diabetes mellitus, related to the metabolic control of the disease. *Eur J Oral Sci* 2006;114:8–14.
14. Tagelsir A, Cauwels R, van Aken S, Vanobbergen J, Martens LC. Dental caries and dental care level (restorative index) in children with diabetes mellitus type 1. *Int J Paediatr Dent* 2011;21:13–22.
15. El-Tekeya M, El Tantawi M, Fetouh H, Mowafy E, Abo Khedr N. Caries risk indicators in children with type 1 diabetes mellitus in relation to metabolic control. *Pediatric dentistry*. 2012;34(7):510–6. .
16. WHO. Oral health surveys-basic methods. 3rd ed. Geneva: World Health Organization 1987.
17. LOBENE, R.R; WEATHERFORD, T; ROSS, N.M.; LAMM, R.A; MENAKER, L. A modified gingival index for use in clinical trials. *Clinical Preventive Dentistry USA*, 1986, Vol.8, No.1, 3-6.
18. Umezudike KA, Iwuala SO, Ozoh OB, Ayanbadejo PO, Fasanmade OA. Association between periodontal diseases and systemic illnesses: A survey among internal medicine residents in Nigeria. *Saudi Dent J*. 2016;28(1):24-30.
19. Pinson M, Hoffman WH, Garnick JJ, Litaker MS. Periodontal disease and type diabetes mellitus in children and adolescents. *J Clin Periodontol*. 1995;22(2):118-123.
20. Bissong M, Azodo C, Agbor M, Nkuo-Akenji T, Fon P. Oral health status of diabetes mellitus patients in Southwest Cameroon. *Odontostomatol Trop*. 2015;38(150):49-57.
21. Dakovic D, Pavlovic MD. Periodontal disease in children and adolescents with type 1 diabetes in Serbia. *J Periodontol*. 2008;79(6):987-992.
22. Parihar AS, Sood M, Singh P, Singh N. Relationship between severity of periodontal disease and control of diabetes (glycated hemoglobin) in patients with type 1 diabetes mellitus. *J Int Oral Health*. 2015;7(Suppl 2):17-20. .
23. Rafatjou R, Razavi Z, Tayebi S, Khalili M, Farhadian M. Dental Health Status and Hygiene in Children and Adolescents with Type 1 Diabetes Mellitus. *J Res Health Sci*. 2016; 16(3):122-126.
24. Perrino M. Diabetes and periodontal disease: an example of an oral/systemic relationship. *N Y State Dent J*. 2006;73(5):38-41.
25. Salvi GE, Beck JD, Offenbacher S. PGE₂, IL-1 β , and TNF- α responses in diabetics as modifiers of periodontal disease expression. *Ann Periodontol*. 1998;3(1):40-50.
26. Busato IMS, Bittencourt MS, Machado MÂN, Grégio AMT, Azevedo-Alanis LR. Association between metabolic control and oral health in adolescents with type 1 diabetes mellitus. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*. 2010;109(3): e51-e5

TABLES:

MGI	dmft	DMFT	Parameters	
70	53	68	n	diabetics
1.214	4.74	2.16	Mean	
0.790	3.329	1.672	SD	
0	0	0	min	
2.87	13	5	max	
70	66	70	n	Non-diabetics
0.800	5.77	1.54	Mean	
0.764	2.682	1.304	SD	
0	0	0	min	
2.58	14	4	max	

Table 1: Oral hygiene indices for the case and control groups

HbA1c(%)	Duration of diabetes (yr)	Patients' age (yr)	Parameters	
70	70	70	n	diabetics
10.500	3.145	9.513	Mean	
1.9726	2.384	1.7631	SD	
6.5	0.3	6.0	min	
14.3	9.0	12.0	max	
		70	n	Non-diabetics
		8.97	Mean	
		1.60	SD	
		6.0	min	
		12.0	max	

Table 2: Characteristics of control group obtained from patients, guardians and their medical records