

Original Article

Comparison of the Mean DMF Index in Type I Diabetic and Healthy Children

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KEY WORDS

Diabetes mellitus;

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ABSTRACT

Statement of the Problem: It is expected that the prevalence of caries would be more in diabetics than in non-diabetic individuals due to the complications subsequent to metabolic changes such as xerostomia and increased glucose level in saliva. On the other hand, the restriction of glucose consumption in the diabetics' diet would be a reason to justify decreasing dental caries in them.

Purpose: The aim of this study was to compare the mean DMF (decayed, missed due to decay, and filled teeth) index in type I diabetic and healthy children.

Materials and Method: The DMF index was assessed in 100 type I diabetic children (9-14 years-old, mean= 12±1.23) and compared with the DMF index in 100 age- and sex-matched metabolically healthy controls. Data were collected through a questionnaire and clinical examinations and analyzed statistically by t-test and one-way ANOVA.

Results: The results showed that there were no significant differences between the mean DMF index of diabetic children and healthy children. The mean DMF was significantly lower in those who regularly used a toothbrush and dental floss than in those who did not use in both groups ($p < 0.05$).

Conclusion: Diabetes did not affect dental condition by itself but adequate oral hygiene had an important role in controlling caries and promoting oral status.

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Introduction

Diabetes is one of the most common metabolic diseases leading to many complications for affected individuals. Diabetes type I is a kind of diabetes caused by autoimmune destruction of β cells in the pancreas. The result of this condition is decreasing the amount of insulin secretion and then increasing the glucose level in the blood. [1-2] The high amount of glucose in the blood can harm different organs in the body. [3-4]

According to the complications that are followed by metabolic changes such as xerostomia and increasing the glucose level in saliva, it is expected that the prevalence of caries would be more in diabetics than in non-diabetic individuals. On the other hand, the restriction of glucose consumption in the diabetics' dietary pattern would be a reason to justify decreasing dental caries in

them. [5]

Some investigations show that dental caries and DMF index are more in type I diabetic children than in control groups. Miralles *et al.* [6] reported that despite similar conditions of oral hygiene and salivary flow in both case and control groups, there was a higher incidence of caries in diabetics. Alavi *et al.* [7] asserted that the higher DMF score in diabetics is due to the poorer oral hygiene. Rai *et al.* [8] found that the decay rate was significantly higher in diabetic children than in control individuals. They showed that the higher decay rate in diabetics was due to the decreased salivary pH and salivary flow rate.

This is while some other studies report there is no significant difference between type I diabetic children and control groups in terms of DMF index. Falk *et al.*'s

[9] investigation showed that there were no significant differences between a long and short duration diabetic group and non-diabetics in the total number of decayed tooth and filled tooth surfaces. Tagelsir *et al.* [10] reported that although a higher decay risk would be expected in diabetic groups because of diabetes-associated biological and behavioral alterations, there was no significant difference in DMF index both at cavity and non-cavity levels between case and control groups. In addition, there are some investigations showing that the prevalence of dental caries is lower in diabetics than in non-diabetic individuals due to dietary restrictions and low carbohydrate intake. [11-12]

There are conflicting reports about the relationship between diabetes and the extent of dental caries and almost no available published papers related to our study were conducted in the Middle East research centers. Therefore, we carried out this investigation to fill this gap and apply the results to improve preventive efforts in the dental and oral health field.

Materials and Method

In this cross-sectional study, 100 type I diabetic children (9-14 years old, mean= 12±1.23) from the Diabetes Mellitus Center of Imam Reza Clinic affiliated to Shiraz University of Medical Sciences were randomly selected as the case group. The diabetics had no other systemic diseases, physical disabilities, and mental disorders. This group was age- and sex-matched to 100 metabolically healthy children who referred to the clinic of Shiraz Dental School for routine annual examinations, as the control group. [13-14] All individuals of both groups were examined by the same dentist. Data were collected by a questionnaire and oral examination. Informed consent was obtained from both the patients and the controls. Moreover, necessary approvals were obtained from the research center of Shiraz Dental School and other related institutions to do this investigation.

A two-part questionnaire was filled out for each subject seeking information such as age, sex, and oral hygiene status (use of the toothbrush, dental floss, and mouthwash). The second part of the questionnaire designated to the diabetic children included two items; the duration of the illness and the result of the HbA1c test, that was obtained from lab records. HbA1c during a period of 6 months prior to the dental examination was

used to determine the level of glycosylated hemoglobin as an index of diabetes control status in patients. [15] According to the lab results, from a diabetes mellitus control point of view, the patients were divided into three subgroups of well ($6\% \leq \text{HbA1c} < 7\%$), intermediate ($7\% \leq \text{HbA1c} < 8\%$), and poor control ($\text{HbA1c} \geq 8\%$).

The oral examination was done using a headlamp while children were sitting on an ordinary upright chair and by a dental mirror and explorer for both case and control groups. Caries was assessed by the DMF index for permanent teeth (F= filled teeth, D=untreated carious teeth, M=Missed teeth due to caries).

Statistical program for social sciences (SPSS) version 17 was used to analyze data by one-way ANOVA and t-test to determine whether there were significant differences between DMF scores of diabetic and healthy children according to basic variables (flossing, brushing, use of mouthwash, age, gender, duration, and metabolic control of illness).

Results

In each group, there were 43 boys and 57 girls with the age ranging from 9 to 14 years old (mean= 12±1.23 years). A total of 48 participants were 9-11 years old and 52 participants were 12-14 years old in each group.

The mean DMF index of total participants was 2.56±1.25. Table 1 indicates that the mean DMF index was 2.60±1.25 in the diabetic group and 2.25±1.26 in the control group. There was no significant difference between DMF index of case and control groups statistically ($p= 0.654$).

Table 1: Comparison of DMF scores in diabetic and control group

	Number	Mean DMF±SD
Diabetic group	100	2.60±1.25
Control group	100	2.52±1.26

p value= 0.65

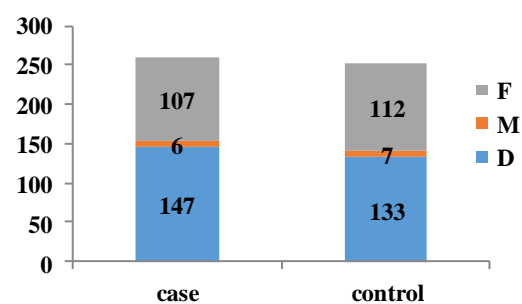


Figure 1: Comparison of the amount of decayed (D), filled (F) and missed (M) between diabetics and control group

Table 2: Comparison of DMF scores in the diabetic and control groups according to the basic variables

Variables	Diabetic group			Control group			Total			
	N	Mean DMF±SD	p Value	N	Mean DMF±SD	p Value	N	Mean DMF±SD	p Value	
Brushing	Yes	52	2.34±1.23	.035	60	2.31±1.18	.049	112	2.33±1.20	.003
	No	48	2.87±1.23		40	2.82±1.33		88	2.85±1.27	
Flossing	Yes	11	1.45±0.93	.001	13	1.76±1.01	.021	24	1.62±0.96	<0.001
	No	89	2.74±1.22		87	2.63±1.26		176	2.68±1.24	
Mouth washing	Yes	2	1.50±0.70	.212	4	2.00±0.81	.405	6	1.83±0.75	.152
	No	98	2.62±1.25		96	2.54±1.28		194	2.58±1.26	
Age(year)	9-11	48	2.41±1.06	.162	48	2.41±1.30	.436	96	2.41±1.19	.122
	12-14	52	2.76±1.39		52	2.65±1.22		104	2.69±1.30	
Gender	Male	43	2.69±1.14	.502	43	2.76±1.30	.090	86	2.73±1.22	.092
	Female	57	2.52±1.33		57	2.33±1.21		144	2.42±1.27	

Table 3: Comparison of DMF scores in the group according to the basic variables

Variables		Diabetic group		p Value
		N	Mean DMF±SD	
Diabetes dura- tion(year)	< 6	48	2.52±1.11	.547
	6≤	52	2.67±1.38	
	[6-7)	30	2.63±1.29	
HbA1c (%)	[7-8)	15	2.33±1.11	.674
	8≤	55	2.65±1.27	

Figure 1 shows the components of DMF index (number of decayed, filled, and missed teeth) in each group. In both case and control groups, the number of decayed teeth (D) was more than the number of filled (F) and missed (M) teeth and the caries was mostly related to the first permanent molar of the mandible.

In the diabetic group, the mean DMF of individuals who used toothbrush regularly was 2.34±1.23 and for those who did not use a toothbrush, it was 2.87±1.23 ($p= 0.035$). The mean DMF of individuals who used dental floss regularly was 1.45±0.93 and for those who did not use dental floss, it was 2.74±1.22 ($p= 0.001$).

In the control group, the mean DMF of individuals who used toothbrush regularly was 2.31±1.18 and it was 2.82±1.33 for those who did not ($p= 0.049$). The mean DMF of individuals who used dental floss regularly was 1.76±1.01 and it was 2.63±1.26 for those who did not ($p= 0.021$). In both groups together, the mean DMF of total participants who used toothbrush regularly was 2.33± 1.20 and it was 2.85±1.27 for those who did not ($p= 0.003$). The mean DMF of participants who used dental floss regularly was 1.62±0.96 and it was 2.68± 1.24 for those who did not ($p< 0.001$). There were no significant differences between the mean DMF of subjects in relation to other assessed variations (Table 2 and 3).

Discussion

Studying the possible link between diabetes and DMF

index seems to be reasonable and necessary. Studies ever conducted in this field show conflicting results.

Rai *et al.* [8] in a study assessed the rate of dental caries and salivary alterations in 100 children with type I diabetes. They concluded that the decay rate was significantly higher in diabetic children than in the controls while no such association was found in our study. Decreasing pH and the salivary flow rate were reported as the possible causes.

Falk *et al.* [9] assessed 94 chronic diabetics (long-term diabetes) and 86 patients with short-term diabetes and compared them with 84 non-diabetic patients. They reported no statistically significant difference between these three groups, which is consistent with the results of our study in this respect. Tagelsir *et al.* [10] carried out a study on 52 diabetic children aged 3-16 years and compared them with 50 healthy children, finding that there was no significant difference in the decay rates between the two groups, which is consistent with the results of our study. It can be stated that appropriate oral hygiene, diet, and even cultural and social factors can weaken the role of diabetes as an independent factor to affect the rate of caries in diabetics.

Nevertheless, there are different opinions about the prevalence of dental caries in diabetics, which would be the consequence of differences in the weighed variables in each study (such as duration of diabetes, metabolic control status, age, and so on). Dental caries is a multifactorial disease; hence, it is necessary to consider all involved factors such as oral hygiene habits, diet, social, and economic conditions when assessing the prevalence of caries. Although there was no significant difference in the decay rate between diabetics and healthy groups in our study, the rate of caries was slightly more in the diabetic children than in the other group.

One of the possible reasons concerning the high caries rate in the diabetic children could be due to their much tendency to have sweets because limiting glucose consumption is more difficult in diabetic children than in adults. Another reason could be the lack of parents' consideration to follow dentistry checkups for their children. This is because they are greatly involved in medical problems of their children, which can distract them from other issues.

In our study, the first permanent molar of mandible had the largest percentage of decay, which is consistent with the results of Alavi *et al.*'s [7] study. It seems that the accumulation of plaque according to its anatomical position, the initial eruption of this tooth, anatomical differences between mandibular and maxillary molar, and situation of this tooth surrounded by food make it more susceptible to decay compared to maxillary molar.

The metabolic control of diabetes by the HbA1c test was the other variable examined in our study. The results showed no statistically significant difference between the level of metabolic control and DMF, which was similar to the result of Miralles *et al.*'s study. [6] Karjalainen *et al.* [16] concluded that a poor diabetes control could be a remarkable factor for caries in children and adolescents with type 1 diabetes. This is not consistent with the results of our study and the difference could be due to the dissimilarities in the method of metabolic control assessment in patients and more importantly, to the multifactorial nature of diabetes. There is no doubt that diabetes control condition has direct impacts on the physiological status of the body and if we could control other variables at the same time, we would have designated the effect of diabetes control condition on caries rate in a more reliable way.

The other part of our study was to investigate the relation between DMF index and oral hygiene status. Our research showed the DMF index in children who had regularly used a toothbrush and dental floss (both in diabetic and control groups) was statistically significantly lower than the DMF index in children who had not used, while there was no significant relationship between DMF index and the use of mouthwash. The most important factor in dental caries is poor oral hygiene according to the Alavi *et al.*'s study. [7] Although oral hygiene has undeniable effects on oral status, in our

study, the role of environmental factors such as oral hygiene was prominent because we did not apply limitation of carbohydrate consumption in the subjects' diet.

In our study, the DMF index was higher in patients who had diabetes over 6 years than in the subjects whose diabetes duration was less than 6 years. Miralles *et al.* [6] obtained the same result in this regard. It could be related to the appearance of diabetes complications in oral cavity over the years although there was no statistically significant relationship between them.

Although the control individuals were selected among children referred to the clinic of Shiraz Dental School only for routine annual examinations and not for designated caries as a chief complaint, it was definitely more reasonable to select the control group from schools rather than dental clinics. This is because the rate of dental caries may be higher in those who refer to dental clinics compared to the normal population that may affect the results. Since diabetes type 1 is a multifactorial disease, to assess the role of diabetes as an individual factor, it would be recommended to control other variables, particularly diet, between both groups in a designated period in future studies.

Conclusion

In conclusion, diabetes did not affect dental condition by itself but adequate oral hygiene had an important role in controlling caries and promoting oral status. Therefore, it is necessary to pay more attention to preventive dentistry to reduce DMF index.

Conflict of Interest

None declared.

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