

CARIES, ORAL HYGIENE AND GINGIVAL HEALTH STATUS IN TYPE 1 DIABETIC SAUDI CHILDREN

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ABSTRACT

The objective of the present study was to determine dental caries, oral hygiene and gingival health status of Type 1 diabetic Saudi children and, and to compare the findings with an age-matched healthy group of children. A total of 134 diabetic children (mean age 9.1 years) and 177 healthy children (mean age 7.9 years) were examined for dental caries, oral hygiene and gingival health status. The mean dmft scores for the diabetic and the healthy groups were 4.87 (SD 3.97) and 7.17 (SD 4.74) respectively. The mean DMFT scores for the diabetic and healthy groups were 3.19 (SD 2.92) and 2.32 (SD 2.62). There was a significant ($p=0.001$) between mean dmft scores of the diabetic and the healthy groups. A great majority (83.6%) of the diabetic children had fair or poor oral hygiene and a similar trend was found in the healthy children. Almost three-fourth (72.4%) of the diabetic children had mild to moderate gingivitis as compared with 60.4% in the healthy group. A strong association ($p=0.001$) was found between poor oral hygiene and gingival status in both the diabetic and healthy groups. In conclusion; the overall caries prevalence and severity were comparatively lower in the diabetic children as compared with healthy children. More diabetic children had mild to moderate gingivitis than the healthy children.

Key Words: Dental caries, oral hygiene, gingival health, diabetic children.

INTRODUCTION

Type 1 diabetes, once known as juvenile diabetes or insulin-dependent diabetes, is a chronic condition in which the pancreas produces little or no insulin, a hormone needed to allow glucose to enter cells and produce energy.¹ Type 1 diabetes mellitus (DM) is the most common endocrine/metabolic disease of childhood and adolescence.² The disease is characterized by a relative or absolute deficiency of insulin which affects the metabolism of carbohydrates, proteins and fats. The most obvious abnormality is high level of blood glucose, especially following meals. The insulin deficiency is produced by environmental, genetic and immunological factors. Once a child is diagnosed with Type 1 DM, a daily injection of insulin becomes necessary in addition

to a regulated carbohydrate diet to prevent ketosis and possible other fatal consequences.

A low daily intake of refined carbohydrates and, a regular and organized oral health care of diabetic children in some countries, could be the reasons behind reports of low caries experience in these children.³ However, there is a general lack of agreement in dental literature whether dental caries is more prevalent in diabetic individuals than in non-diabetics.⁴ Some studies report a low caries experience in diabetics, while others report similar or slightly higher incidence of dental caries in diabetic individuals than normal population.⁵ Several studies in Saudi Arabia have reported a caries prevalence in regular school children,⁶ however, similar information is scarce in Type 1 DM children in Saudi Arabia.

Periodontal disease has often been observed in diabetic individuals with varying degrees of severity.⁷ The degree of diabetic control may influence the biological mechanism which causes increased periodontal disease in diabetic individuals.⁸ There are reports on gingival health of children with other special care needs,^{9,10} however, there is a lack of similar information in Type 1 DM children in Saudi Arabia. A study on oral hygiene and gingival health status of Saudi healthy preschool children has reported a significant association between poor oral hygiene and gingivitis.¹¹

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The objective of the present study was to determine caries, oral hygiene and gingival health status of Type 1 DM Saudi children and, to compare the findings with an age-matched healthy group.

METHODOLOGY

A sample of Type 1 DM children was selected from King Abdulaziz University Hospital and Security Forces Hospital Diabetic Centers. An age-matched group of healthy children was selected from the children attending pediatric dentistry clinics of King Saud University College of Dentistry (KSUCD), Riyadh. Ethical approvals were obtained from all the institutional review boards. Any Type 1 DM child who suffered from other medical conditions (not related to diabetes) was excluded from the study. Similarly, children in the age-matched comparison group who had history of a serious medical condition were not selected in the study. A written consent was obtained from the parents of all participating children before the study. The Type 1 DM group was examined during their routine visits to the two Diabetic Centers and the healthy comparison group was examined in KSUCD clinics. Both groups were clinically examined by one examiner (RA) on a dental chair utilizing a dental mirror and explorer. The examiner was trained and calibrated with a senior KSUCD faculty on 30 children not participating in the main study. The intra-examiner and inter-examiner reliabilities were determined utilizing Kappa method. The data were recorded on a form especially designed for the study. The following indices were used to assess the caries, oral hygiene and gingivitis in the sample.

Dental caries

WHO criteria were used for the diagnosis of dental caries.¹² The caries was diagnosed on visual evidence, after drying and removing the debris from the teeth, using an explorer and mirror. No radiographs were taken. The dmft (decayed, missing and filled primary teeth) and DMFT (decayed, missing and filled permanent teeth) scores were calculated for each child.

Oral hygiene index

The oral hygiene index described by James et al¹³ was utilized by the study. The index has three categories of dental cleanliness.

- **Good:** The teeth are clean. There is no sign of food debris or materia alba.
- **Poor:** The teeth are very dirty. There is considerable long-standing food debris, materia alba.

- **Fair:** This class falls between the two preceding ones. There is some evidence of debris, but not of the degree recognized as poor.

Gingival index

A modified gingival index described by Nanda¹⁴ was utilized in this study. The index is suitable for short duration studies. It adopts a clear classification of severity and is based on naked eye appearance. The severity of inflammation is graded numerically from 1 to 4 according to increasing intensity. Only the anterior maxillary and mandibular labial segments were recorded. It has been shown that these teeth are valid indicators of gingival experience of the entire mouth.¹⁵

- **Normal:** Pale pink color, firm, no bleeding on firm digital pressure. Pointed to slightly rounded contour.
- **Mild gingivitis:** Slight change in color and little loss of contour.
- **Moderate gingivitis:** Swelling, glazing and redness. Tendency to bleed on slight pressure. Papillae or margins become blunted or rounded in contrast to normal tissue.
- **Profound:** Sever inflammation with swelling and redness and spontaneous bleeding. Slight degeneration.
- **Very severe:** A degree more severe than profound including ulceration and sloughing.

The data were then entered into a computer and analyzed utilizing the Statistical Program for Social Sciences (SPSS) version 19. Various means and frequencies were generated. Analysis of Variance (ANOVA) was used to test differences between mean caries scores of the diabetic and healthy children. The Chi-square tests were used to determine if there was an association between health status of the children and oral hygiene/gingivitis; between oral hygiene and gingivitis. Kappa statistic was used to determine inter- and intra-examiner reliabilities.

RESULTS

A total of 134 Type 1 DM and 177 healthy children participated in the study. Among the diabetic group; there were 54 (40.3%) males and 80 (59.7%) females with a mean age of 9.13 years ranging from 4-14 years. In the healthy group, there were 86 (48.5%) males and 91 (51.5%) females with a mean age of 7.87 years ranging from 4-14 years. The intra- and inter-examiner reliability was 0.91 and 0.89 respectively.

The mean dmft score for the diabetic and healthy group together was 6.17 (SD 4.56) with decay (d) component of 4.92 (SD 4.3) missing (m) component of 0.53 (SD 1.18) and filled (f) component of 0.72 (SD 1.58).

TABLE 1: CARIES EXPERIENCE OF THE DIABETIC AND HEALTHY CHILDREN IN PRIMARY TEETH

	Mean dmft Scores (SD)	Mean decay Scores (SD)	Mean missing Scores (SD)	Mean filled Score (SD)
Diabetic Children	4.87 (3.97)	3.85 (3.60)	0.44 (1.1)	0.57 (1.57)
Healthy Children	7.17 (4.74)	5.73 (4.62)	0.9 (1.23)	0.84 (1.59)
P-Value	P=.013	P=.048	P=.098	P=.15

TABLE 2: CARIES EXPERIENCE OF THE DIABETIC AND HEALTHY CHILDREN IN PERMANENT TEETH

	Mean DMFT Scores (SD)	Mean Decay Scores (SD)	Mean Missing Scores (SD)	Mean Filled Score (SD)
Diabetic Children	3.19 (2.92)	2.89 (2.79)	1.5 (0.17)	0.28 (0.86)
Healthy Children	2.32 (2.62)	1.86 (2.24)	1.13 (0.15)	0.45 (1.12)
P-Value	P=.045	P=.037	P=.871	P=.912

TABLE 3: CORRELATION BETWEEN ORAL HYGIENE AND GINGIVAL STATUS

	Oral Hygiene	Gingival health			Total
		Normal (%)	Mild (%)	Moderate (%)	
Diabetic	Good (%)	16 (72.7)	6 (27.3)	0 (0.0)	22 (100.0)
	Fair (%)	20 (22.2)	68 (75.6)	2 (2.2)	90 (100.0)
	Poor (%)	1 (4.5)	17 (77.3)	4 (18.2)	22 (100.0)
	Total	37 (27.6)	91 (67.9)	6 (4.5)	134 (100.0)
Healthy	Good (%)	23 (95.8)	0 (0.0)	1 (4.2)	24 (100.0)
	Fair (%)	41 (38.3)	66 (61.7)	0 (0.0)	107 (100.0)
	Poor (%)	6 (13.0)	33 (71.3)	7 (15.2)	46 (100.0)
	Total	70 (39.5)	99 (55.9)	8 (4.5)	177 (100.0)

P-Values: Diabetic: p=0.001, Control: p=0.001

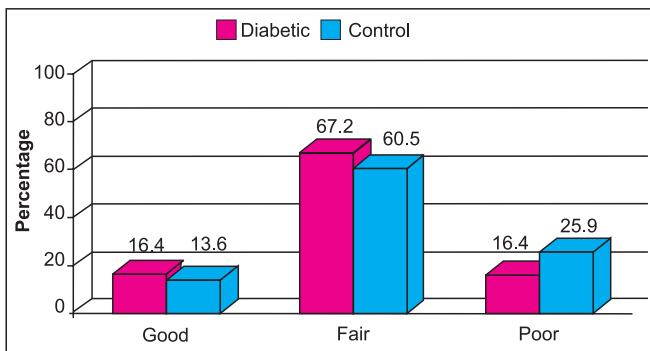


Fig 1: Oral hygiene status in diabetic and healthy children.

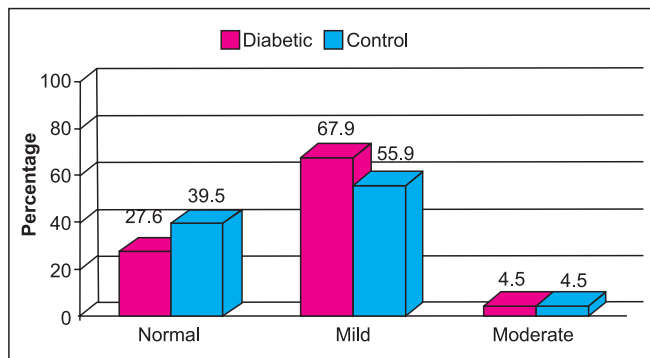


Fig 2: Gingival health status for diabetic and healthy children.

Table 1 presents the comparison of mean dmft scores between diabetic and healthy children. The mean dmft score and its decay component were significantly higher ($p < .05$) in healthy children as compared to the diabetic children.

The combined mean DMFT score for diabetic and control group was 2.69 (SD 2.78) with decay (D) component of 2.30 (SD 2.53) missing (M) component of 1.28 (SD 0.16) and filled (F) component of 0.37 (SD 1.02). In contrast to the primary teeth, the mean DMFT score and its Decay component were significantly higher ($p < .05$) in diabetic children as compared with healthy children (Table 2).

A great majority (83.6%) of the diabetic children had fair or poor oral hygiene and a similar trend existed in the healthy children (Fig. 1). Very few children in both the diabetic group (16.4%) and healthy group (13.6%) had good oral hygiene.

A higher percentage (72.4%) of the diabetic children had mild to moderate gingivitis as compared to that (60.4%) of control children (Fig. 2). A strong correlation was observed between oral hygiene status and gingival health in both diabetic ($p = .001$) and healthy groups ($p = .001$), with majority of children with good oral hygiene had healthy gingivae (Table 3).

DISCUSSION

There has been a general paucity of information on caries, oral hygiene and gingival status in Type 1 DM Saudi children. The present study has provided an interesting insight in these areas. The results of the present study have to be viewed in radiance of its limitations. The children in the diabetic group were all those registered in the two specialized diabetic centers which means closely monitored control of their diabetes. The healthy group consisted of the children attending KSUCD clinics; most of them with some dental problem. Nevertheless, the study has provided useful data for future comparisons, and would assist in planning of preventive and restorative services in these children.

Several studies have been conducted on the caries experience of young diabetic children with considerable variations in their findings.^{4,5} The present study demonstrated a low caries experience in primary teeth of the diabetic children as compared with healthy control children, but a higher caries experience in the permanent teeth. The findings of our study are in agreement with several other studies.¹⁶⁻¹⁸ The diabetic children, with age, are likely to become more independent in their oral hygiene care and dietary practices, resulting in higher caries scores in their permanent teeth. The level of caries in healthy group was very high, though it was not unexpected. A recent systematic review of caries studies in Saudi school children has reported similar high levels of caries.⁶ Nevertheless, the overall dental caries experience of diabetic children in the present study was slightly lower than the healthy group. This is in agreement with a previous Scandinavian study,¹⁹ that reported a low caries experience in diabetic children as compared with healthy children. The lower caries experience in diabetic children could be attributed to low carbohydrate dietary intake. A relation between level of glycemic control and dental caries has been reported in Type 1 DM children; those with poor glycemic control tend to have higher caries experience.⁸ Similarly, a recent study reported a significant association between high salivary triglycerides level in Type 1 DM children and dental caries.²⁰

A majority of the diabetic children had either fair or poor oral hygiene, and same trend existed in the healthy children's group. These results are in agreement with several previous and recent similar studies in diabetic children,^{5,21} and in healthy Saudi children.^{22,23} An association between oral health status (dental caries & gingivitis/periodontitis) and oral hygiene has long been established; those with poor oral hygiene tend to have higher caries experience and poor gingival/periodontal health.^{24,25}

A lower percentage of the diabetic children had normal gingivae than the healthy group. Similar find-

ings have been reported by other studies in diabetic children.⁴ It was worth noting that neither the diabetic nor the healthy group had any case of advance level of gingivitis. It is a well-known fact that advance levels of gingival disease is rare in young children. A strong correlation was found between oral hygiene and gingival health in both the diabetic and control group. This strong relationship between poor oral hygiene and gingivitis also explains a high percentage of children in the present study with mild to moderate gingivitis. This is also in agreement with previous studies that have reported a relationship between poor oral hygiene and gingivitis.^{25,26}

The present study has shown high caries experience, poor oral hygiene and high prevalence of gingivitis in both the diabetic and non-diabetic children. The results underscore a need for purposeful preventive regimens and restorative services in these children, especially in the diabetic group. Pediatricians should be made aware of the relationship between diabetes and dental health. Dentists and dental hygienist should be available in the diabetic outpatient clinics to offer advice and help with the dental care. Diabetic children and their parents should be informed about potential dental problems and encouraged to attend for regular dental check-ups.

CONCLUSIONS

- The caries prevalence and severity were high in both Type 1 diabetic children and their healthy counterparts. However, overall caries experience was lower in the diabetic children than the healthy children.
- The level of gingival health was similar in diabetic and healthy children.
- A strong correlation was found between oral hygiene and gingivitis in both Type 1 diabetic and the healthy group of children.

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