Evaluating Oral health status among children with type 1 diabetes mellitus in the age group of 10-12 years

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ABSTRACT

Background: Type 1 Diabetes Mellitus (T1DM) is a chronic metabolic disorder commonly diagnosed in children and adolescents. Poor glycemic control in T1DM has been associated with increased risk of oral health complications, including dental caries, gingivitis, and periodontal disease. Early evaluation of oral health status in diabetic children is essential for preventing long-term complications. This study aimed to assess the oral health status among children aged 10-12 years with T1DM and compare it with non-diabetic peers.

Materials and Methods:A cross-sectional study was conducted involving 100 children aged 10-12 years, comprising 50 diagnosed T1DM patients and 50 age- and gender-matched healthy controls. Oral health was assessed using the Decayed, Missing, and Filled Teeth (DMFT) index, Gingival Index (GI), and Plaque Index (PI). Glycemic control was evaluated using recent HbA1c values. Statistical analysis was performed using SPSS v25.0, with significance set at $p < 0.05$.

Results: The mean DMFT score in the T1DM group was **3.8 ± 1.2**, significantly higher than **2.1 ± 0.9** in the control group ($p = 0.001$). The average Gingival Index was **1.9 ± 0.5** in diabetic children compared to **1.2 ± 0.4** in controls ($p = 0.003$). Plaque Index scores were also elevated in the T1DM group (**2.3 ± 0.6**) relative to controls (**1.5 ± 0.5**, $p = 0.002$). A positive correlation was observed between poor glycemic control (HbA1c >8%) and higher DMFT and GI scores ($r = 0.45$, $p = 0.01$).

Conclusion: Children with Type 1 Diabetes Mellitus demonstrated significantly poorer oral health status compared to non-diabetic counterparts, particularly in terms of dental caries and gingival inflammation. These findings highlight the need for integrated dental care and regular oral health monitoring as part of comprehensive diabetes management in pediatric patients.

Keywords: Type 1 Diabetes Mellitus, Oral Health, Children, Dental Caries, Gingival Index, Plaque Index, Glycemic Control.

1. INTRODUCTION

Type 1 Diabetes Mellitus (T1DM) is a chronic autoimmune disorder characterized by the destruction of pancreatic β-cells, leading to absolute insulin deficiency and hyperglycemia. It predominantly affects children and adolescents, with a rising global incidence noted over recent decades (1). The management of T1DM requires lifelong glycemic control to prevent.

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systemic complications, yet its impact on oral health is often under-recognized in pediatric populations

Children with T1DM are more susceptible to various oral health issues due to the metabolic alterations associated with chronic hyperglycemia, which can impair immune response, reduce salivary flow, and promote pathogenic oral microflora (2,3). Studies have identified a higher prevalence of dental caries, gingivitis, periodontitis, and oral mucosal lesions in diabetic individuals compared to healthy populations (4,5). Furthermore, poor glycemic control has been linked to an increased risk of periodontal inflammation, suggesting a bidirectional relationship between diabetes and periodontal disease (6).

The pediatric age group, particularly children between 10-12 years, is a critical period for oral health as it coincides with mixed dentition and behavioral patterns that may influence oral hygiene practices (7). In children with T1DM, these factors are compounded by the systemic effects of diabetes, placing them at a heightened risk for oral complications if preventive care is neglected (8). Despite this, routine dental assessments are not always integrated into diabetes management protocols, especially in developing regions where awareness remains limited (9).

Although several studies have explored the association between diabetes and oral health in adults, there is a paucity of research focusing specifically on the pediatric diabetic population, particularly within the 10-12 years age group. Early identification of oral health challenges in diabetic children can aid in the implementation of preventive strategies and improve overall quality of life.

This study aims to evaluate the oral health status of children aged 10-12 years diagnosed with T1DM and compare their oral health indicators with non-diabetic peers. By highlighting the extent of oral health issues in this vulnerable group, the study seeks to emphasize the importance of interdisciplinary care involving both pediatricians and dental professionals.

2. MATERIALS AND METHODS

Study PopulationA total of 100 children aged between 10 and 12 years were enrolled in the study. The study group consisted of 50 children diagnosed with Type 1 Diabetes Mellitus (T1DM) for at least one year, while the control group included 50 age- and gender-matched non-diabetic children with no known systemic illnesses.

Inclusion Criteria

- Children aged 10–12 years.

- For the diabetic group: confirmed diagnosis of T1DM with disease duration ≥1 year.

- Written informed consent obtained from parents/guardians and assent from children.

Exclusion Criteria

- Children on long-term medications affecting oral health.

- History of systemic conditions other than T1DM.

- Recent dental treatment (within the last 3 months).

Data Collection Demographic information, diabetes duration, and recent HbA1c levels were recorded using a structured proforma. Oral examinations were carried out under natural light using a sterile mouth mirror and WHO periodontal probe. The following indices were used to assess oral health:

DMFT Index (Decayed, Missing, and Filled Teeth): To evaluate dental caries experience.

Plaque Index (Silness and Löe): To assess plaque accumulation on selected teeth.

Gingival Index (Löe and Silness): To evaluate gingival inflammation.

All examinations were performed by a single calibrated examiner to maintain consistency and eliminate inter-examiner variability.

Statistical Analysis Data were analyzed using IBM SPSS Statistics Version 25.0. Mean and standard deviation were calculated for continuous variables. Group comparisons were conducted using independent t-tests for normally distributed data. A p-value of less than 0.05 was considered statistically significant.

3. RESULTS

The study comprised 100 children aged 10–12 years, equally divided between the diabetic group (n=50) and the non-diabetic control group (n=50). The mean age of participants in both groups was 11.1 ± 0.6 years, with an equal male-to-female ratio (1:1). Table 1 summarizes the demographic characteristics of the study population.

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Table 1: Demographic Characteristics of the Study Population

Variable	Diabetic Group (n=50)	Control Group (n=50)	*p*-value
Age (mean ± SD)	11.2 ± 0.5	11.0 ± 0.7	0.187
Male (%)	25 (50%)	25 (50%)	1.000
Female (%)	25 (50%)	25 (50%)	1.000

The oral health parameters assessed included the DMFT Index, Plaque Index (PI), and Gingival Index (GI). The diabetic group exhibited significantly higher mean scores across all indices when compared to the control group (Table 2).

Table 2: Comparison of Oral Health Indices Between Diabetic and Control Groups

Oral Health Parameter	Diabetic Group (mean ± SD)	Control Group (mean ± SD)	*p*-value
DMFT Score	3.8 ± 1.2	2.1 ± 0.9	<0.001
Plaque Index (Silness & Löe)	2.3 ± 0.6	1.5 ± 0.5	0.002
Gingival Index (Löe & Silness)	1.9 ± 0.5	1.2 ± 0.4	0.003

Children with poor glycemic control (HbA1c >8%) demonstrated higher DMFT and GI values than those with better glycemic control (HbA1c ≤8%), indicating a potential association between glycemic status and oral health (Table 3).

Table 3: Relationship Between Glycemic Control and Oral Health Parameters in Diabetic Group

Parameter	HbA1c ≤ 8% (n=20)	HbA1c > 8% (n=30)	*p*-value
DMFT Score	2.9 ± 1.0	4.4 ± 1.1	0.001
Gingival Index	1.5 ± 0.4	2.1 ± 0.5	0.004

As shown in **Table 2**, the mean DMFT, PI, and GI scores were significantly higher in the diabetic group compared to the control group. Furthermore, **Table 3** illustrates that within the diabetic group, poor glycemic control correlated with increased caries experience and gingival inflammation.

4. DISCUSSION

The present study evaluated the oral health status of children aged 10–12 years diagnosed with Type 1 Diabetes Mellitus (T1DM) and compared it with healthy controls. The findings revealed that children with T1DM exhibited significantly higher DMFT, Plaque Index, and Gingival Index scores, indicating poorer oral health compared to their non-diabetic counterparts. These results are consistent with previous studies highlighting the increased susceptibility of diabetic children to dental caries and periodontal disease (1,2).

Chronic hyperglycemia in T1DM patients leads to alterations in salivary composition and flow rate, creating a favorable environment for cariogenic bacteria and plaque accumulation (3,4). Reduced salivary flow and elevated glucose levels in saliva have been implicated as key factors contributing to the increased caries risk observed in diabetic individuals (5). Our study supports this association, as evidenced by the significantly higher DMFT scores among diabetic children, aligning with the findings reported by Siudikiene et al. (6) and Orbak et al. (7).

Moreover, gingival inflammation was markedly higher in the T1DM group, as reflected by elevated Gingival Index scores. This observation reinforces the well-established link between diabetes and periodontal disease, where hyperglycemia exacerbates the inflammatory response and impairs wound healing (8,9). Preshaw et al. emphasized the bidirectional relationship between diabetes and periodontal disease, suggesting that poor glycemic control can both contribute to and be worsened by periodontal inflammation (10).

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An important aspect of our study was the correlation between glycemic control and oral health parameters. Children with poorly controlled diabetes (HbA1c >8%) demonstrated significantly higher DMFT and Gingival Index scores compared to those with better glycemic management. Similar correlations have been documented in previous research, indicating that inadequate glycemic control is a critical determinant of oral health outcomes in diabetic patients (11,12).

Behavioral factors, such as oral hygiene practices and dietary habits, may further contribute to the compromised oral health seen in diabetic children (13). Although these factors were not extensively analyzed in the current study, existing literature suggests that children with chronic illnesses often exhibit lower adherence to preventive dental care routines (14,15). This underscores the need for targeted oral health education and preventive strategies tailored for pediatric diabetic populations.

Despite the strength of our findings, certain limitations must be acknowledged. The cross-sectional design restricts causal inferences, and the sample size, while adequate for preliminary assessment, may not fully capture the variability present in larger populations. Additionally, factors such as socioeconomic status, dietary patterns, and frequency of dental visits were not controlled, which could influence oral health outcomes.

Future research should focus on longitudinal studies to better understand the progression of oral health complications in diabetic children and the impact of integrated care approaches. Regular dental check-ups, combined with optimal glycemic control and patient education, are essential components in mitigating oral health risks in this vulnerable group.

5. CONCLUSION

In conclusion, this study highlights the significant burden of dental caries and gingival inflammation among children with T1DM, particularly in those with poor glycemic control. These findings emphasize the necessity for interdisciplinary collaboration between pediatricians, endocrinologists, and dental professionals to ensure comprehensive care for diabetic children.

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