

Relationship between type-I diabetes mellitus and oral health status and oral health-related quality of life among children of Saudi Arabia

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ABSTRACT

Introduction: The study was conducted to assess the impact of oral health status on the oral health-related quality of life (OHRQOL) of children between 12 and 15 years with type-1 diabetes mellitus (IDDM) in Saudi Arabia and compare these findings to age and gender matched medically fit children. **Materials and Method:** A total of 40 children aged between 12 and 15 years with (IDDM) group presenting to the pediatric endocrinology clinic of the KSMC, Riyadh were age and gender matched to a control group of children reporting for a routine dental checkup at the dental clinics of the REU. The oral health of all children was recorded using WHO examination criteria. Parental perception of the OHRQoL was recorded using the validated Arabic version of the short-form child oral health impact profile—short-form COHIP-19. The independent samples t-test was used to compare the DMFT, Gingival index, and COHIP19 domains of the two groups. **Results:** Individuals with IDDM had higher Gingival Index and DMFT scores; however, the differences were not statistically significant. The IDDM group showed higher COHIP scores across all domains. However, the differences were only statistically significant for the oral health domain ($P = 0.003$). **Conclusion:** Children with IDDM had better oral health both in terms of dental caries and gingival status when compared to their age-matched controls. However, they had significantly higher oral health domains that suggest a poorer overall OHRQoL in children with IDDM.

Keywords: Adolescents, diabetes mellitus, oral health, oral health-related quality of life

Introduction

Type-1 diabetes mellitus formerly referred to as insulin-dependent diabetes mellitus (IDDM) is an autoimmune disorder that results in the destruction of the beta cells of the islets of Langerhans.^[1] The disease is manifested as early-onset diabetes, wherein little or no insulin is produced by the child.^[2-4] Recent literature has even termed the incidence of type-1 diabetes mellitus in Saudi

Arabia an epidemic.^[1,4] It is estimated that the prevalence of the disease ranges from 27.2 per 100000 live births to as high as 102 per 100000 live births with evidence suggesting that females and young adolescents are at a higher risk for the disease.^[1,5,6]

The dental manifestations of type-1 diabetes include xerostomia, skin and mucosal changes, bone loss, and periodontal disease.^[7-9] Patients with type-1 diabetes mellitus are at a greater risk for the development of oral disease, especially periodontal disease when compared to their age-matched counterparts.^[10-12] The World Health Organization suggests that the age group 12–15 years is an important follow-up period to monitor early-onset periodontal

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disease (WHO, 2013). This fact combined with the increased risk for the onset of type-1 diabetes mellitus makes this the ideal age for our study. Oral Health-Related Quality of Life (OHRQoL) is a personal evaluation report of one oral health, emotional welfare, functional welfare, expectations, fears, and care satisfaction through a multidimensional survey.^[13]

The short form Child Perceptions Questionnaire (CPQ-8) is a questionnaire that has been successfully translated and validated in Arabic for child's oral health.^[14] To the best of our knowledge, no data on the impact of oral health on OHRQoL among type-1 diabetes mellitus patients in Saudi Arabia. The aim of this study was to assess the oral health status of children between 12 and 15 years with type-1 diabetes mellitus in Saudi Arabia and determine its impact on their oral health-related quality of life. The study sought to compare these findings to age and gender matched medically fit children who served as the control group.

Material and Method

The proposal was registered with the research center of the Riyadh Elm University and ethical approval was obtained from the institutional review board (IRB) of the institution (RC/IRB/2019/94). Informed consent was obtained from the parents of all the children screened to participate in this study and verbal assent was obtained from the children before the examination of the oral cavity. The power of the sample for the quantitative assessment was based upon the number needed for a regression model with four regressors (comorbidity, socioeconomic status, glycemic control, and age of the patient) and an effect size of 0.2 was 40 participants in each group. Children aged between 12 and 15 years were recruited in the study.

The diabetes mellitus group comprised of children diagnosed with type-I diabetes mellitus and presenting to the pediatric endocrinology clinic of the King Saud Medical City, Riyadh. These children were age and gender matched to a control group of children reporting for a routine dental checkup at the dental clinics of the Riyadh Elm University. The oral health of all the children was recorded using WHO examination criteria. The teeth were examined using WHO category II criteria—clinical examination with lighting and without radiographs.

Parental perception of the oral health-related quality of life was recorded using the validated Arabic version of the short-form child oral health impact profile—short form COHIP-19,^[15] an 18 question tool designed to assess the OHRQoL in three major domains: oral health, functional wellbeing, and socioemotional wellbeing.

Statistical analysis

The independent samples t-test was used to compare the overall differences in Gingival Index, DMFT, and domains of the COHIP19 between the IDDM and control groups. The level of significance for all tests was set at $P < 0.05$. All statistics were done using the SPSS ver. 21 data processing software (IBM-SPSS, IBM Corp. Armonk, NY USA).

Results

The sample comprised of 40 children with diabetes mellitus (24 male, 16 female) aged between 12 and 15 years of age (mean age 13.27 years, SD +/- 1.09 years), age and gender matched to 40 medically fit children. The males (mean age 13.12 years, SD +/- 1.07 years) were slightly younger than the females (mean age 13.18 years, SD +/- 1.10 years); however, the difference between them was not statistically significant ($t = 0.454$, $P = 0.653$). When the sociodemographic profile of the two groups was compared, it was observed that while the control group had a significantly higher economic status, other differences between the groups were not statistically significant [Table 1].

When the decayed missing and filled permanent teeth (DMFT) was compared between the groups, it was observed that children with diabetes mellitus had a lower DMFT score than the control children. Children with diabetes mellitus also had lower gingival index scores than the control group. However, the differences between the groups were not statistically significant [Table 2].

When the different oral health-related quality of life domains was compared between the groups [Table 3], it was observed that while there was no overall significant difference in the COHIP-SF; children with diabetes mellitus had significantly higher oral health domain scores than the controls [Table 4].

Discussion

There has been an increase in the incidence of diabetes mellitus among children and adolescents across the globe. This increase has included both type-1 (IDDM) and early onset type-2 diabetes mellitus.^[1,6] The current study aimed to examine the impact of type-1 diabetes mellitus on the oral health-related quality of life (OHRQoL) of children aged 12–15 years in Saudi Arabia. Although type-1 diabetes mellitus presents in childhood, we chose to study the impact on OHRQoL in preadolescent children. The rationale for this decision was based on the fact that this age group shows significant physiological and psychological changes.^[12,16,17] The imminent onset of adolescence has been shown to raise significant challenges to glycemic control in patients with IDDM.^[5,16]

Age group of 12-15 years is the age in which mostly children learns about the oral hygiene maintenance and also maximum permanent teeth have erupted by now. There have been several scales developed for the measurement of OHRQoL in children and adolescents.^[18-20] While many scales are designed for parental reporting of OHRQoL, it has been repeatedly demonstrated that children over the age of 12 are capable of valid and reliable reporting of their own OHRQoL. The short-form Child Oral Health Impact Profile was designed to allow for reporting by either children or their parents. In this study, we chose to use a validated Arabic version of the COHIP-19 that has previously been used in a similar age group.^[18]

Table 1: Sociodemographic Profile of the sample

| Variables | | Control | | Diabetic | | Chi Square | P |
|------------------------------|-----------------|---------|-------|----------|-------|------------|-------|
| | | Count | n% | Count | n% | | |
| Gender | Male | 24 | 60% | 24 | 60% | 0 | 1 |
| | Female | 16 | 40% | 16 | 40% | | |
| Family Income (in Rs) | Below 3000 | 2 | 5.0% | 8 | 20.0% | 23.13 | 0.03* |
| | 3000-5000 | 4 | 10.0% | 8 | 20.0% | | |
| | 5000-10000 | 8 | 20.0% | 11 | 27.5% | | |
| | 10000-20000 | 20 | 50.0% | 12 | 30.0% | | |
| | more than 20000 | 6 | 15.0% | 1 | 2.5% | | |
| Age of the Father (in years) | 18-24 | 3 | 7.5% | 3 | 7.5% | 3.59 | 0.28 |
| | 25-34 | 5 | 12.5% | 6 | 15.0% | | |
| | 35-44 | 19 | 47.5% | 12 | 30.0% | | |
| | 45-54 | 7 | 17.5% | 11 | 27.5% | | |
| | 55-64 | 3 | 7.5% | 8 | 20.0% | | |
| | 65+ | 3 | 7.5% | 0 | 0.0% | | |
| Age of the Mother (in years) | 18-24 | 1 | 2.5% | 0 | 0.0% | 2.69 | 0.46 |
| | 25-34 | 18 | 45.0% | 13 | 32.5% | | |
| | 35-44 | 14 | 35.0% | 15 | 37.5% | | |
| | 45-54 | 5 | 12.5% | 11 | 27.5% | | |
| | 55-64 | 1 | 2.5% | 1 | 2.5% | | |
| | 65+ | 1 | 2.5% | 0 | 0.0% | | |

* Statistically significant

Table 2: Overall oral health of the subjects

| Variables | Group | Mean | SD | t-test | P |
|----------------|----------|------|------|--------|------|
| Gingival Index | Control | 6.88 | 4.49 | -1.48 | 0.14 |
| | Diabetic | 8.28 | 3.93 | | |
| DMFT | Control | 1.50 | 2.39 | -1.47 | 0.15 |
| | Diabetic | 2.25 | 2.19 | | |

Table 3: Comparison of OHRQoL between the groups

| Variables | Group | Mean | SD | t-test | P |
|--------------------------|----------|-------|-------|--------|--------|
| Oral Health | Control | 10.63 | 2.84 | -3.076 | 0.003* |
| | Diabetic | 12.67 | 3.06 | | |
| Functional Wellbeing | Control | 8.33 | 4.01 | 0.217 | 0.828 |
| | Diabetic | 8.12 | 4.22 | | |
| Socioemotional Wellbeing | Control | 15.30 | 6.07 | -0.336 | 0.738 |
| | Diabetic | 15.85 | 8.378 | | |
| COHIP-SF | Control | 34.25 | 9.51 | -1.049 | 0.297 |
| | Diabetic | 36.89 | 12.72 | | |

* Statistically significant

The impact of oral health on the OHRQoL in Saudi Arabia has been documented previously in the literature.^[21] Dental caries in children and adolescents in Saudi Arabia is a serious problem as the literature suggesting that the incidence and severity of dental caries approaches the level of an epidemic.^[22,23] Although dental caries is a multifactorial disease, most authors agree that sugar consumption is one of the key factors for the development of dental caries in children.^[24,25] There are several studies that suggest that children with type-1 diabetes have a restricted diet since early childhood.^[2,4] This could explain the lower dental caries levels observed in the study group when compared to the control subjects. The increased concern over oral health, as reflected in

the oral health component of the COHIP-19, may also explain the reduced caries rate.

In the present study, children with diabetes mellitus had significantly higher oral health domain scores than the controls. Similar results were reported by Ulfah *et al.*^[26] in their study. Verhulst *et al.*^[27] in their study revealed that oral health-related QoL was impaired by caries-related problems. Perceived oral health problems are relatively common in patients with T2DM at the Dutch family physician offices. In sum, 82% of all subjects of the current study population was suffering from at least one of the following self-reported oral health problems: pain in the mouth, xerostomia, bad breath, and periodontitis. Verhulst *et al.*^[28] in their another study mentioned similar dental complications among diabetic patients.

However, the current study should be viewed keeping in mind certain limitations. The relatively small sample size makes the findings of the current study difficult to generalize. The age group selected, while representative of the changes in adolescence, cannot provide the same level of detail as a longitudinal cohort study. Despite these limitations, the study provides a snapshot of oral disease and its impact on OHRQoL in children with type-1 diabetes in Saudi Arabia.

Importance of study for primary care physicians in their practice

Based on the results of this survey, it seems that OHRQL is adversely affected among the subjects having diabetes mellitus as compared to non-diabetic subjects. It seems that dentists and physicians play an important role in improving diabetic patients' knowledge regarding oral complications and their effect on their quality of life. In addition, it is recommended that referring to a dentist could be a part of a diabetes treatment protocol.

Table 4: Relationship between oral health and the different domains of COHIP-SF

| Group | Variables | | Oral Health | Functional Wellbeing | Socioemotional Wellbeing | COHIP-SF |
|-------------------|-----------|----------------------|-------------|----------------------|--------------------------|----------|
| Diabetes Mellitus | DMFT | Spearman Correlation | 0.119 | -0.235 | -0.225 | -0.207 |
| | | <i>P</i> | 0.463 | 0.144 | 0.163 | 0.201 |
| | GI | Spearman Correlation | 0.496 | 0.231 | 0.391 | 0.514 |
| | | <i>P</i> | 0.001* | 0.152 | 0.013* | 0.001* |
| Control | DMFT | Spearman Correlation | 0.454 | 0.060 | -0.023 | 0.381 |
| | | <i>P</i> | 0.004* | 0.712 | 0.888 | 0.016* |
| | GI | Spearman Correlation | -0.248 | -0.110 | 0.122 | -0.038 |
| | | <i>P</i> | 0.128 | 0.498 | 0.453 | 0.820 |

* Statistically significant

Conclusion

Within the limitations of the study, we can conclude that children with IDDM had better oral health both in terms of dental caries and gingival status when compared to their age-matched controls. However, they had significantly higher oral health domains and suggest a poorer overall OHRQoL in the current sample of children with IDDM. There is a need for longitudinal cohort studies to further explore the long-term impact of oral health on OHRQoL in children with type-1 diabetes mellitus.

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None

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patients/guardians have given their consent for patient images and other clinical information to be reported in the journal. The patients/guardians understand that patients' names and initials will not be published and due efforts will be made to conceal identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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