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Review

Oral health of children with type 1 diabetes
mellitus: A systematic reviewAhmad Faisal Ismail^{a,c}, Colman Patrick McGrath^b, Cynthia K.Y. Yiu^{a,*}^a Paediatric Dentistry and Orthodontics, Faculty of Dentistry, The University of Hong Kong, Prince Philip Dental Hospital, 34 Hospital Road, Hong Kong Special Administrative Region^b Dental Public Health, Faculty of Dentistry, The University of Hong Kong, Prince Philip Dental Hospital, 34 Hospital Road, Hong Kong Special Administrative Region^c Kulliyah of Dentistry, International Islamic University Malaysia, Malaysia

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ABSTRACT

Aim: This systematic review investigated the oral health status of children with type 1 diabetes.**Methods:** A systematic search was conducted using PubMed/Medline, Web of Knowledge, SCOPUS and EMBASE. The search included all studies published from inception of database to January 2014. A total of 1179 abstracts were analyzed for selection in 2 phases. The first phase selection was based on the title and abstracts alone. The selected abstracts were then included for second phase, where full articles were obtained. The selection was carried out by 2 independent reviewers (Kappa value = 0.809). Only 37 articles were included for final analysis in this review.**Results:** There is conflicting evidence in the caries experience between children with type 1 diabetes and healthy children. For periodontal health, most studies reported significantly greater plaque accumulation and higher gingival index in children with type 1 diabetes. Cohort studies reported no significant differences in periodontal parameters over time.**Conclusions:** There is conflicting evidence regarding the caries experience of children with type 1 diabetes, but they exhibit poorer periodontal health status with greater plaque accumulation compared to healthy children. Further studies are warranted to assess the oral health status of children with type 1 diabetes.

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1. Introduction

The specific etiological factors for type 1 diabetes remain unknown however genetic and environmental factors have been shown to trigger autoimmune destruction of beta cells that lead to insulin dependence [1]. The classic micro- and macro-vascular complications associated with diabetes include retinopathy, neuropathy, nephropathy, cardiovascular complications and delayed wound healing. Due to its systemic vascular involvement, periodontal disease has been recognized as one of the complications of diabetes [2]. Thus, children with diabetes are at increased risk for developing periodontal disease at an early age [3]. Children with diabetes have also been reported to have accelerated tooth eruption during adolescence [4]. Individuals with diabetes usually exhibit poor oral health with increased plaque accumulation, calculus formation and are at high risk for dental caries. Higher prevalence of oral soft tissue lesions, such ulcers and cheilitis, were noted in diabetic individuals [5]. The other recognized diabetes-related oral conditions are reduced salivary flow, increased microbial count and altered saliva buffering capacity [6].

In the dental literature and epidemiology, DMF and dmf indices have been used for measurement of caries in permanent and primary dentitions, respectively [7]; while plaque index [8], gingival index [9] and gingival bleeding index [10] are used as periodontal parameters. DMFT index is the total number of teeth (T) that are decayed (D), missing (M) or filled (F) due to caries; while DMFS index is the total number of tooth surfaces (S) that are decayed (D), missing (M) or filled (F) due to caries. The total score for DMFT ranges from 0 to 28 or 32; while total score for DMFS ranges from 0 to 128 or 148, depending on whether or not the third molars (wisdom teeth) are included in the score. The same notation applies for primary dentition (dmft or dmfs), but when the primary tooth exfoliates (natural exfoliation), the score is written as df index, as this score only counts for those teeth that are extracted (missing) for caries. While caries experience is limited to DMF/dmf index, periodontal parameters vary widely. Gingival index and plaque index were introduced in 1963 and 1964, respectively. Gingival index is used to assess marginal and interproximal gingival condition; while plaque index measures presence of soft debris and deposits on tooth surfaces [8,9]. Both indices use index tooth for their measurements, and each tooth has 4 surfaces (buccal, lingual, mesial and distal). A score of 0–3 was given to each surfaces and the score was summed and divided by 4 to give the index of the tooth. Gingival bleeding index is

performed through gentle probing of the gingival crevice, and is recorded as positive (presence) or negative (absence) of gingival bleeding within 10 s [10]. The score is expressed as percentages of number of sites with bleeding and it has been shown to correlate with gingival index.

The prevalence of type 1 diabetes exhibits a wide variation in different geographic populations. The incidence of type 1 diabetes is low in Asia and South America, but high in European countries [3]. Current literature suggested there is a steady increase in the incidence of type 1 diabetes worldwide, with the highest rate in Sardina and Finland [11]. The peak incidence of type 1 diabetes is mostly at 10–14 years of age, but onset at an earlier age has been reported in other studies [11].

While the association between oral health and type 2 diabetes is well recognized in the literature [12], there is limited evidence available with regard to type 1 diabetes. There is a considerable gap in knowledge regarding the association between dental caries and periodontal disease with type 1 diabetes. There is a need for physicians to understand the association between oral health and type 1 diabetes, especially for the better overall and long-term patient management. This is particularly important as children with diabetes are at an increased risk of periodontal tissue destruction at an early age [13]. Thus, the purpose of this systematic review was to summarize the available evidence on the oral health status of children with type 1 diabetes and compared to a healthy control population. Specifically, we aimed to answer the following questions:

1. What is the oral health status of children with type 1 diabetes?
2. Do children with type 1 diabetes have higher caries experience than healthy children?
3. Do children with type 1 diabetes have poorer periodontal status than healthy children?

2. Methodology

2.1. Search strategy

A comprehensive search was carried out using the following databases: PubMed/Medline, Web of Knowledge, EMBASE and SCOPUS. The MESH terms used were combination of “(IDDM OR diabetes mellitus, type 1) AND (oral health OR dental caries OR DMF index OR periodontal disease OR preventive dentistry OR oral hygiene OR periodontal index OR salivation OR gingivitis OR dental plaque index)”. All data derived from

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