Chapter 5

Dental Caries and Quality of Life Among Preschool Children

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1. Introduction

Dental caries (tooth decay) is an adverse oral condition with a multifactor etiology involving genetic, behavioral and environmental aspects (Reisine and Psoter, 2001; Petersen *et al.*, 2005). Socioeconomic factors have been associated with caries experience and the distribution of this condition among individuals (Pereira *et al.*, 2007; Traebert *et al.*, 2009). Understanding the influence of lifestyle and social aspect on the occurrence and progression of dental caries can contribute to improvements in preventive and restorative treatment (Petersen *et al.*, 2005).

Although not a fatal condition, dental caries can lead to pain as well as problems with sleeping, eating, socializing and self-esteem. Thus, tooth decay can exert a negative impact on activities of daily living and, consequently, quality of life (Patel *et al.*, 2007). Quality of life is often evaluated by means of the investigation into the consequences of an adverse health condition and its treatment from the standpoint of the affected individual (Tamanini *et al.*, 2004). The association between oral health and quality of life is considered by many researchers to be a complement to clinical indicators (Martins-Júnior *et al.*, 2012a).

There are few assessment tools for measuring the impact of oral problems on the quality of life of children. As adults are responsible for decisions involving the health of their children (Pahel *et al.*, 2007), evaluating the perceptions of parents/caregivers regarding oral health problems that affect the quality of life of children is fundamental to planning health promotion strategies.

2. Problem statement

The concept of oral health-related quality of life (OHRQoL) regards the impact that oral problems have on the performance of activities of daily living, wellbeing and quality of life (Slade, 1997). It is therefore important to assess OHRQoL in different populations to understand the oral health problems that affect individuals and design public health programs and strategies directed at prevention and treatment.

Despite the growing interest and consequent increase in the number of publications on this issue, the evaluation of the impact of dental caries in preschool children has only recently been the focus of investigation. As young children may not be capable of remembering events that occurred more than 24 hours earlier (Rebok *et al.*, 2001) and have limitations regarding the expression of emotions and anguish (Talekar *et al.*, 2005), this investigation is often performed with the aid of parents/caregivers. It is therefore important to explore the perceptions of parents/caregivers that affect the preventive care children receive at home as well as the use of dental services (Filstrup *et al.*, 2003). Moreover, the perceptions of parents/caregivers may offer insight into some of the reasons why preschool children often do not receive the dental treatment they need.

The Early Childhood Oral Health Impact Scale (ECOHIS) was developed for parents/caregivers of young children (Pahel *et al.*, 2007). The use of this questionnaire in epidemiological studies has allowed broadening knowledge on adverse oral conditions that affect the quality of life of children as well as strengthening scientific evidence on this issue and demonstrating the need for oral health programs directed at preschool children.

Based on evidence that children aged four to six years can reliably report on their own quality of life (Filstrup *et al.*, 2003), the Scale of Oral Health Outcomes for Five-Year-Old Children (SOHO-5) has recently been developed in the United Kingdom (Tsakos *et al.*, 2012). However, studies employing this instrument have been limited to evaluating its reliability and validity.

Dental caries is the oral condition most often associated with a negative impact on the quality of life of preschool children (Abanto *et al.*, 2011; Scarpelli *et al.*, 2012; Ramos-Jorge *et al.*, 2014), the consequences of which include pain, decreased appetite, difficulty chewing, difficulty eating some foods and drinking hot or cold beverages, weight loss, difficulty sleeping, changes in behavior and a poor academic performance (Abanto *et al.*, 2011; Acs *et al.*, 1992; Ayhan *et al.*, 1996; Filstrup *et al.*, 2003; Feitosa *et al.*, 2005; Oliveira *et al.*, 2008; Martins-Júnior *et al.*, 2012b). Studies carried out in China (Wong *et al.*, 2011) and Brazil (Abanto *et al.*, 2011; Scarpelli *et al.*, 2012; Martins-Júnior *et al.*, 2012b) using the ECOHIS report that dental caries has a negative impact on the quality of life of preschool children and their parents/caregivers and this impact is greater in the presence of six or more carious lesions.

A study conducted in Canada found that dental surgery is the most common surgical procedure at most pediatric hospitals (Canadian Paediatric Decision Support Network, 2004), which indicates that the treatment of dental caries in children is costly. Moreover, the need for restorative treatment can lead to the establishment of a repetitive restorative cycle (Elderton *et al.*, 1990), which further raises treatment costs (Zero *et al.*, 2011). However, caries can be

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detected in the early stages, when restorative treatment is not necessary. The International Caries Detection and Assessment System (ICDAS) allows the standardization and diagnosis of dental caries in different settings and situations (Pitts, 2004). The integration of criteria from other caries detection and diagnostic systems involving non-cavitated enamel lesions and the staging of the disease process (Ekstrand *et al.*, 1997; Fyffe *et al.*, 2000; Chesters *et al.*, 2002; Rickets *et al.*, 2002) led to the current system, denominated ICDAS II (Shoaib *et al.*, 2009), which contributes to the preventive management of tooth decay.

Despite the decline in the prevalence of dental caries beginning in the 1970s, the control of this condition continues to pose a challenge to public health authorities (Petersen *et al.*, 2005; Dye *et al.*, 2007). Moreover, increasing polarization is seen due to social inequalities in oral health (Sabbah *et al.*, 2007), which has led to a greater prevalence rate of dental caries in some minorities (Antunes *et al.*, 2004).

The difficulty in controlling dental caries affects both developed and developing nations. Successive national child dental health surveys in the United Kingdom have shown little change in the prevalence of caries among five-year-old children over the last 20 years (Lader *et al.*, 2004). Data from the United States of America tells a similar story, as no significant changes in the prevalence of dental caries among children aged two to 11 years was found from 1988-1994 to 1999-2002 (Beltran-Aguilar *et al.*, 2005).

The monitoring of the early stages of caries progression requires the assessment of a dentist. However, this is not a common occurrence among preschool children. Indeed, a Brazilian study found that only 13.3% of a sample of 1092 children aged zero to five years had visited a dentist at least once (Kramer *et al.*, 2008). This low rate of access to dental treatment can contribute to the greater prevalence of severe tooth decay in comparison to less advanced stages of progression (Ramos-Jorge *et al.*, 2014). Furthermore, among older preschoolers, the negative impact on OHRQoL (Ramos-Jorge *et al.*, 2014) seems to stem from the fact that these individuals have caries in more advanced stages of decay and also have a greater capacity to communicate the effect of oral health conditions on their quality of life to parents/caregivers (Ramos-Jorge *et al.*, 2014). Consequently, the prevention and management of dental caries should begin at an early age, as this is an evident public health problem among preschool children.

The diminished appetite, difficulty chewing, weight loss and difficulty sleeping stemming from dental caries can compromise growth and development. Moreover, children with severe caries appear to be at significantly greater odds of having low vitamin D status compared to their caries-free counterparts and are likely malnourished, as they display significantly lower levels of calcium and serum albumin as well as higher levels of PTH compared to a control group (reference).

OHRQoL assessment tools designed for preschool children are useful for the evaluation of public oral health strategies and interventions. Such tools should have properties that enable the detection of clinical changes following treatment. Responsiveness is a key technical property that allows researchers to choose the most appropriate measures for clinical trials, provides a basis for estimating sample sizes and facilitates the interpretation of changes occurring after treatment (Guyatt *et al.*, 2002; Malden *et al.*, 2008).

The aim of health interventions should be to improve quality of life. Despite the tendency to consider oral health as a separate concept, it is an integral part of general health (Cunningham and Hunt, 2001). Thus, the complex multidimensional interrelationship between general and oral health is essential to quality of life (Kieffe and, Hoogstraten, 2008). In this context, the use of subjective measures considering individual viewpoints has become increasingly important to the evaluation of general and oral health (Kieffer and Hoogstraten, 2008).

3. Application area

The findings of studies on OHRQoL and dental caries in preschool children are useful to the fields of pediatrics and pediatric dentistry and can be employed by public health administrators for the definition of strategies directed at improving the oral health status of this population.

4. Research course

According to a large number of the aforementioned studies, scientific evidence indicates that dental caries has a negative impact on quality of life among preschool children, especially those with six or more carious lesions or lesions in a more advanced stage of progression. The aim of the study reported herein was to evaluate the association between different stages of dental caries and the impact on the quality of life of preschool children.

5. Method used

A population-based, cross-sectional study was conducted involving preschool children. The inclusion criteria age between three and five years, enrolment in a preschool/daycare center in the city of Diamantina, Brazil, and parents/guardians fluent in Brazilian Portuguese who live with the child at least 12 hours per day. The exclusion criteria were current orthodontic treatment, systemic disease, having all carious lesions treated satisfactorily and the presence of tartar. The sample size was calculated using a 37.8% prevalence rate of impact from dental caries on the quality of life of preschool children (Martins-Júnior *et al.*, 2013), a 95% confidence interval and 5% standard error. The minimum sample was defined as 346 preschool children. A 1.2 correction factor was applied to enhance the precision and an additional 84 children were added to compensate for possible losses, resulting in a sample of 499 preschool children. To ensure representativeness, the sample was stratified based on the type of preschool (public or private) and the distribution of the sample was proportional to the total population enrolled in private and public preschools in the city.

Parents/caregivers were asked to answer the Brazilian version of the ECOHIS (B-ECOHIS) (Martins-Júnior *et al.*, 2012) and fill out a form addressing socio-demographic information,

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such as mother's schooling (years of study), whether the mother worked outside the home, monthly household income (categorized based on the Brazilian minimum wage = US$304.38), duration of salary (in weeks), family provider and number of individuals who depend on the income.

The B-ECOHIS was used to assess the negative impact of the progression stage and activity of dental caries on the quality of life of the preschool children. This questionnaire is composed of 13 items distributed in a Child Impact Section (CIS) and Family Impact Section (FIS). The former section has four domains (symptoms, function, psychology and self-image/social interaction) and the latter has two domains (parental distress and family function). The scale has five response options for recording how often an event has occurred in a child's life. The CIS and FIS scores are calculated through a simple sum of the scores on all items in each section, ranging from 0 to 36 and 0 to 16, respectively. The total score ranges from 0 to 52, with higher scores denoting greater oral health impact and poorer OHRQoL.

The clinical oral examination of the children was performed by a single dentist who had undergone a calibration exercise at a public preschool, during which inter-examiner and intra-examiner Kappa values were greater than 0.8 for all oral conditions evaluated. The examination was carried out after brushing performed by the dentist, with the aid of a head lamp (PETZL®, Tikka XP, Crolles, France), mouth mirrors (PRISMA, São Paulo, SP, Brazil), WHO probes (Golgran Ind. e Com. Ltda., São Paulo, SP, Brazil) and dental gauze for drying the teeth. During the examination, the children remained lying on a portable stretcher.

The ICDAS II criteria and Activity Lesion Assessment, which measures visual appearance, local susceptibility to plaque buildup and surface texture, were used for the determination of dental caries. Dental caries was recorded as follows: distinct visual change in enamel – ICDAS code 2 (active and inactive); localized enamel breakdown – ICDAS code 3 (active and inactive); underlying dentin shadow – ICDAS code 4 (active and inactive); distinct cavity within visible dentin – ICDAS code 5 (active and inactive); and extensive cavity within visible dentin – ICDAS code 6, without pulp exposure (active and inactive), with pulp exposure (with absence or presence of fistula and root remnants). The first visual change in enamel (ICDAS code 1, when there is no pigmentation) is detected only after drying with compressed air. As drying was performed with dental gauze in the present study, the decision was made to exclude the evaluation of this condition. When the characteristic pigmentation of this stage of carious lesion was detected on any face with the tooth either wet or dried with gauze, the tooth was recorded as "sound".

Malocclusion, traumatic dental injury (TDI) and physiological tooth mobility were evaluated as possible confounding variables. Malocclusion was recorded in the presence of anterior open bite, posterior open bite, increased overjet, deep bite, anterior crossbite or posterior crossbite. The clinical diagnosis of TDI was performed using the criteria proposed by Andreasen (Andreasen et al., 2007) and the assessment of tooth discoloration. Physiological tooth mobility was considered only when the tooth was nearing exfoliation. All confounding variables were categorized as absent or present.

Statistical analysis was performed using the SPSS 20.0 program for Windows (SPSS Inc, Chicago, IL, USA). Descriptive analysis (including frequency distribution) was performed for mean total B-ECOHIS scores. Scores for the individual domains were analyzed for differences between oral conditions and socioeconomic/demographic factors. In cases of children with a tooth exhibiting different stages of dental caries, the worst condition was considered. Poisson regression analysis with robust variance was performed to associate the mean total B-ECOHIS score with each clinical oral condition, socioeconomic factor and characteristic of the child. Prevalence rates (PR) and 95% confidence intervals (95% CI) were calculated.

6. Status

This study was completed and published in Community Dentistry and Oral Epidemiology.

7. Results

A total of 499 preschool children were initially enrolled in the study, 451 (90.4%) of whom participated through to the end of the study. The main reason for losses was the absence of a questionnaire filled out by the parents. Mean age (standard deviation) of the preschool children was 4.25 (0.83) years. The female sex accounted for 53.9% of the sample. The prevalence of untreated caries was 51.2%. A total of 60.6% of the teeth with caries exhibited severe decay. Malocclusion, TDI and physiological tooth mobility were present in 28.4%, 17.5% and 2.0% of the preschool children, respectively.

The majority of parents/caregivers reported no impact on quality of life (52.8%) (i.e., B-ECOHIS score: 0). The most frequently reported items were pain, difficulty eating and drinking, irritability, trouble sleeping and smiling.

In the final multivariate model, negative impact on quality of life was associated with the age of the child and a lower level of mother's schooling. More advanced stages of caries were associated with an increased negative impact on the quality of life of the children. Among inactive lesions, only extensive cavity without pulp exposure had an increased negative impact on quality of life (PR = 3.68; 95% CI: 1.74 to 7.81; p = 0.001).

8. Further research

Future investigations should be conducted to evaluate the results of intervention strategies on both the individual and population levels.

9. Conclusion

Dental caries exerts a negative impact on the quality of life of preschool children, especially those with a greater number of carious lesions or lesions in a more advanced stage of progression.

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