

Impact of Early Childhood Caries and Parental Oral Health Literacy on the Use of Oral Health Care Services by Children. Caries, Health Literacy and Health Care

Impacto de la Caries de la Primera Infancia y la Alfabetización en Salud Bucal de los Padres en el Uso de los Servicios de Atención de la Salud Oral por Parte de los Niños Caries, Alfabetización en Salud y Cuidado de la Salud

Marina Ferreira Barbosa; Leticia Pereira Martins; Jéssica Madeira Bittencourt;
Saul Martins Paiva & Cristiane Baccin Bendo

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ABSTRACT: The objective of this study was to verify the impact of early childhood caries (ECC) and parental oral health literacy (OHL) on the use of oral health care services by preschool children. A population-based study was conducted with 449 dyads of preschool children aged 4-6 years and their parents/caregivers in the city of Ribeirão das Neves, Brazil. Two examiners performed the diagnosis of ECC using the International Caries Detection and Assessment System (ICDAS-Epi). The Brazilian version of the Hong Kong Oral Health Literacy Assessment Task for Pediatric Dentistry was administered to measure parents' OHL. Parents/caregivers answered the question "When was your child's last visit to the dentist?" to measure the use of oral health care services by the preschool children. The multiple logistic regression ($p < 0.05$) revealed that children with presence of cavitated caries lesions were 1.82-fold more likely to use oral health care services (OR=1.82; 95%CI: 1.23-2.70) compared to those with absence of cavitated caries lesions. Children whose parents/caregivers had lower OHL were 34 % less likely to use oral health care services compared to those whose parents had higher OHL (OR=0.66; 95%CI: 0.45-0.99). Preschool children Dental services are used more by preschool children with presence of cavitated caries lesions and whose parents/caregivers have higher scores of OHL.

KEY WORDS: dental care, health literacy, dental caries.

INTRODUCTION

Oral health is essential to overall health, as it exerts impact on wellbeing of children. Oral health problems can affect the physical, psychological and social domains of an individual (Peres *et al.*, 2019). However, oral diseases remain a global public health problem (Peres *et al.*, 2019). According to the Global Burden of Disease (GBD) 2015 study, there was no improvement in oral health between 1990-2015 (Kassebaum *et al.*, 2017). The prevalence of early childhood caries (ECC) remains high around the world, ranging from 17.0 % to 63.0 % in the age group from one to five years (Tinanoff *et al.*, 2019).

Dental caries is a disease that is not enough just to be treated and restored. When the cause is not detected, dental caries can persist and accompany the individual at all stages of his/her life (Peres *et al.*, 2019). Studies have shown that children with cavitated caries lesion visit the dentist for reasons other than prevention more often than those who are caries-free (Ardenghi *et al.*, 2012; Rodrigues *et al.*, 2014).

In 2010, the worldwide costs for the treatment of oral diseases were estimated at US\$298 billion dollars, which represents about 4.6 % of global health

Department of Paediatric Dentistry, School of Dentistry, Universidade Federal de Minas Gerais, Av. Antônio Carlos 6627, Belo Horizonte, MG, 31270-901, Brazil.

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expenditures (Listl *et al.*, 2015). Thus, it is important to highlight that the early use of oral health care services can contribute to greater oral health guidance, favouring preventive clinical interventions.(Peres *et al.*, 2019). Such behavior results in an improvement in the child's oral health, as well as in the reduction of expenses destined to a clinical interventionist philosophy (Kassebaum *et al.*, 2017; Peres *et al.*, 2019).

Another aspect to be considered is that, in childhood, oral health behaviours are the responsibility of parents/caregivers. It is therefore important for parents/caregivers to have knowledge regarding their child's oral health and understand the importance of dental care (Vann Jr. *et al.*, 2010). In this context, oral health literacy (OHL) becomes an important construct to be considered. OHL is the degree to which individuals have the capacity to understand and absorb information on oral health and use this information to make better health decisions (US Department of Health and Human Services, 2000) Furthermore, the OHL exerts a direct influence on empowerment and the strengthening of critical thinking (Martins *et al.*, 2015). A previous study showed that individuals with low OHL are more likely to not seek dental care than those who have high OHL (McQuistan, 2017). As a result, individuals with low OHL are less likely to take their children to the dentist (Al Agili & Farsi, 2020).

It is important to determine whether presence of cavitated caries lesion and parental OHL are associated with the use of oral health care services by preschool children. Such information can assist in guiding public health actions and improving the planning of public services to meet the needs of preschool children as well as broaden knowledge on the part of parents/caregivers regarding the importance of using oral health care services. To the best of our knowledge, no previous study has investigated the association between the use of oral health care services by preschool children and the OHL of parents/caregivers using a questionnaire that addresses multiple skills in the context of paediatric dentistry.

Therefore, the aim of the present study was to verify the impact of ECC and parental OHL on the use of oral health care services by preschool children. The hypothesis is that preschool children with presence of cavitated caries lesion and those whose parents/caregivers have higher scores of OHL use oral health care services more often.

MATERIAL AND METHOD

This paper conforms to the guidelines of the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement (Malta *et al.*, 2010).

Ethical aspects. This study was conducted in accordance with the ethical precepts of the Declaration of Helsinki and received approval from the institutional review board of Universidade Federal de Minas Gerais (certificate number: 86759218.0.0000.5149). In compliance with the norms governing research involving human subjects stipulated in Resolution 466/12 of the Brazilian National Board of Health, only preschool children whose parents/caregivers signed a statement of informed consent participated in the study. The preschool children also gave their consent to participate.

Study design, sample selection and eligibility criteria. A representative, cross-sectional study was conducted in the city of Ribeirão das Neves in the state of Minas Gerais, MG. The city has three administrative districts, an estimated population of 341,415 inhabitants, (Brazilian Institute of Geography and Statistics, 2018) and a Human Development Index (HDI) of 0.684 (United Nations Development Program *et al.*, 2013).

The sample size was estimated considering the prevalence of the impact of OHL on the children's use of oral health care services to be 50 % (since there are no previous Brazilian studies on this subject) and assuming a 95% significance level and a standard error of 5 %. A correction factor of 1.2 was applied to improve precision, leading to a minimum sample of 461 preschool children, to which 20 % was added to compensate for possible dropouts. Thus, a sample of 576 preschool children was needed.

Preschool children between four and six years of age enrolled at public and private preschools in the city of Ribeirão das Neves were selected using a stratified, randomised, multi-stage selection method. Preschool children with syndromes or mental disorders reported by their parents and those who were absent on the days of clinical exams were excluded. Data collection was conducted from August 2018 to March 2019.

Training and calibration exercises. Two examiners performed the clinical exams after participating in

training and calibration exercises for the diagnosis of ECC. This process was conducted by an experienced paediatric dentist. The theory portion included a discussion of the International Caries Detection and Assessment System (ICDAS epi-merged) index using photographs of teeth with the clinical conditions of interest. For the calibration step, 17 preschool children who were not part of the main study sample were examined by each of the examiners separately to determine inter-examiner agreement using the Kappa statistic. After one week, the preschool children were re-examined for the calculation of intra-examiner agreement. All Kappa coefficients ranged from 0.96 to 0.99.

Pilot study. A pilot study was conducted with a sample of 53 preschool children. This sample was not included in the main study. Some changes to the methods were made: an improvement in the letter sent to the parents/caregivers with an explanation of the objectives of the study and changes to the socioeconomic questionnaire to facilitate the understanding of its content.

Dependent variable. The dependent variable was the use of oral health care services. A questionnaire was self-completed by parents/caregivers with the following question: "When was your child's last visit to the dentist?". This variable was dichotomised as 'never used' or 'used' oral health care services.

Independent variables. The main independent variables were parental OHL and presence of cavitated caries lesion. Socioeconomic class was used as an independent confounding variable.

Parental OHL was measured using the Brazilian version of the Hong Kong Oral Health Literacy Assessment Task for Paediatric Dentistry (BOHLAT-P) to evaluate oral health knowledge, numeracy, and reading comprehension. The total score ranges from 0 to 49, with higher scores denoting higher parental OHL (Firmino *et al.*, 2020). In the present study, the median was used as the cut-off point to dichotomise parental OHL. Parents who obtained scores ≤ 36 points were considered to have low OHL and those who obtained scores > 36 points were considered to have high OHL.

ECC was evaluated using the ICDAS epi-merged, which merges six codes for the assessment of dental caries into three stages of severity, coding the condition of the tooth as 0 (zero) for sound (no

evidence of caries), 1/2 for initial caries (marked opacity, pigmentation retained at bottom of pits and fissures); 3/4 for moderate caries (enamel cavitation or underlying dentine shadow); and 5/6 for extensive caries (cavitation with dentine exposure) (Pitts *et al.*, 2014). This variable was dichotomised as the no cavitated caries lesion (codes 0 and 1/2) or with cavitated caries lesion (codes 3/4 and 5/6).

Socioeconomic class was obtained through a self-administered questionnaire answered by the parents/caregivers with questions addressing the Criteria of the Brazilian Association of Research Companies (Associação Brasileira de Empresas de Pesquisa, 2018). Social class was dichotomised by the median, with families in classes A to C1 considered more favoured and those in classes C2 to consider less favoured.

Clinical examination. Clinical oral examinations were performed at the preschools without affecting the normal functioning of the classes. Examinations were conducted in a reserved room defined by the administration of the preschools under artificial lighting, with the aid of a headlamp (Petzl Zoom head lamp, Petzl America, Clearfield, USA) and sterile clinical mirror (Duflex, Juiz de Fora, Brazil).

Data analysis. Statistical analysis was conducted with the aid of the IBM SPSS Statistics (IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp.). Descriptive statistics were performed to determine absolute and relative frequencies of the variables. Bivariate and multiple logistic regression analyses were performed to test whether parental OHL and presence of cavitated caries lesion were associated with the use dental services by the preschool children. The Hosmer-Lemeshow test was used to assess which multiple model best fit the data, with a higher value denoting a better fit. The significance level was set at 5 % ($p < 0.05$).

RESULTS

The sample was composed of 449 preschool children from four to six years of age and their parents/caregivers residing in the city of Ribeirão das Neves, Minas Gerais. The response rate was 78 %, which was considered satisfactory. Data on the characterization of the sample are described in Table I.

The unadjusted analysis demonstrated that the use of oral health care services was significantly associated with OHL ($p = 0.025$) and ECC ($p = 0.008$). The adjusted logistic regression model revealed that preschool children whose parents/caregivers had lower scores of OHL were 34 % less likely to use dental services compared to those whose parents had higher scores of OHL (OR = 0.66; 95%CI: 0.45-0.99; $p = 0.042$). Moreover, preschool children with cavitated caries lesion were 1.82-fold more likely to use dental services (OR = 1.82; 95%CI: 1.23-2.70; $p = 0.003$) compared to those with no cavitated caries lesion (Table II).

Table I. Sample characteristics distribution, XX, XX (n = 449).

Variables	Frequency n (%)
Sex	
Female	230 (51.2)
Male	219 (48.8)
Age	
4	169 (37.6)
5	222 (49.4)
6	58 (12.9)
Use of oral health care services	
Yes	171 (38.1)
No	278 (61.9)
Oral Health Literacy	
>36 scores	219 (48.8)
≤36 scores	230 (51.2)
ECC	
No cavitated caries lesion	220 (49.0)
With cavitated caries lesion	229 (51.0)
Socioeconomic class	
High	189 (42.1)
Low	260 (57.9)

DISCUSSION

In the present study, preschool children whose parents/caregivers had lower scores of OHL were more likely to have never used dental services. In contrast, use of oral health care services was more common in preschool children with cavitated caries lesion, such as enamel cavitation, underlying dentine shadow, and/or cavitation with dentine exposure. A previous study conducted in Saudi Arabia demonstrated similar results about OHL and use of oral health care services, since low parental OHL was the main reason for the lack of demand for dental care among children (Al Agili & Farsi, 2020). However, methodological differences are found between the two investigations, as the study cited did not have a representative sample, was conducted with a different age group, and OHL was measured without the use of a questionnaire (Al Agili & Farsi, 2020). A systematic review showed that individuals with low OHL use less the oral health care services. It is also noticed that the use of regular and preventive dental services is unequally distributed around the world and among different groups within countries (Reda *et al.*, 2018).

Other studies found similar results about the association between dental caries and use of oral health care services, but they evaluated dental caries using the dmft (decayed, missing, and filled primary teeth) index (Ardenghi *et al.*, 2012; Rodrigues *et al.*, 2014). In contrast, dental caries was evaluated in the present study using the epi-merged form of

Table II. Unadjusted and Adjusted Logistic Regression explaining the association of independent variables with the use of oral health care services.

Variables	Use of dental services		Unadjusted OR (95% CI)	Adjusted OR (95% CI)	p-value
	No (%)	Yes (%)			
Oral Health Literacy					
>36 scores	124 (56.6)	95 (43.4)	1.00	1.00	.042
≤36 scores	154 (67.0)	76 (33.0)	0.64 (0.44-0.95)*	0.66 (0.45-0.99)	
ECC					
No cavitated caries lesion	150 (68.2)	70 (31.8)	1.00	1.00	.003
With cavitated caries lesion	128 (55.9)	101 (44.1)	1.69 (1.15-2.49)*	1.82 (1.23-2.70)	
Socioeconomic class					
High	108 (57.1)	81 (42.9)	1.00	1.00	.090
Low	170 (65.4)	90 (34.6)	0.71 (0.48-1.04)	0.07 (0.47-1.06)	

* $p < 0.05$ in the Unadjusted analysis; Hosmer-Lemeshow Test = 0,819; OR=odds ratio; CI=confidence interval

the ICDAS, which includes three stages of severity, from not cavitated initial caries to extensive caries with dentine exposure. Moreover, one of studies cited (Rodrigues *et al.*, 2014) was conducted with a younger age group (18-36 months) than that analysed in the present investigation.

To the best of our knowledge, no studies in the literature have evaluated the impact of both presence of cavitated caries lesion and OHL in a multifactorial model predicting the use of oral health care services. This issue is investigated in the present study, which makes an important contribution to public health, stressing the importance of literacy and caries experience on the use of health services. In Brazil, children's dental care can be provided either publicly through the Brazilian Unified National Health System (SUS) or privately. However, the two gateways to oral health care services may present some obstacles to users. There may be difficulties in accessing and using SUS services due to the high demand for oral health care and few professionals, causing delays in care. In the Brazilian private oral health system, unforeseen expenses and patient evasion may occur as a result of social and economic inequities that impact the Brazilian population. Therefore, to reduce inequities in oral health and improve the level of parental OHL, measures to facilitate access and, consequently, the use of public oral health care services for children must be implemented to cover the entire population equitably (Moraes *et al.*, 2021).

Certain confusion should be addressed regarding the meaning of the terms 'seek', 'access', and 'use' in relation to health services. Healthcare seeking behaviour regards the actions/omissions of individuals with a real or possible health problem (Olenja, 2003) and includes actions taken to prevent diseases as well as to maintain good health (MacKian, 2021). Access to health services refers to the characteristics of such services and resources that either facilitate or hinder use. Use is the result of individual factors that lead to direct or indirect contact with health services, such as the scheduling of medical appointments and complementary tests (Travassos & Martins, 2004). However, difficulty in accessing the health care system can significantly interfere with its use.

According to the Medical Expenditure Panel Survey, 89.0 % of infants and one-year-old children attend medical appointments annually; however, only 1.8 % visit a dentist. Many parents may not understand the importance of taking their children to dental services early, which may be explained by lower scores of parental OHL, as demonstrated in the present study (Fig. 1a). Thus, greater integration of dental and medical care is necessary, which can be achieved with the contribution of paediatricians in counselling parents/caregivers with regard to the importance early dental appointments (Atchison *et al.*, 2018). This could lead to an increase in the use of oral health care services by children and a consequent increase in parental OHL,

since they will receive information on how to maintain their children's oral health. A previous study states that patients who obtain oral health instructions from a dentist are seven times less likely to miss regular dental appointments (Quadri *et al.*, 2018). Verbal communication is the most widely used way for dentists to instruct parents about their children's oral health (Inglehart, 2019). However, when a dentist uses technical language of which the patient or parent/caregiver has little or no familiarity, the information received may not be absorbed. It is therefore important for dentists to use accessible, simple, direct language. Information

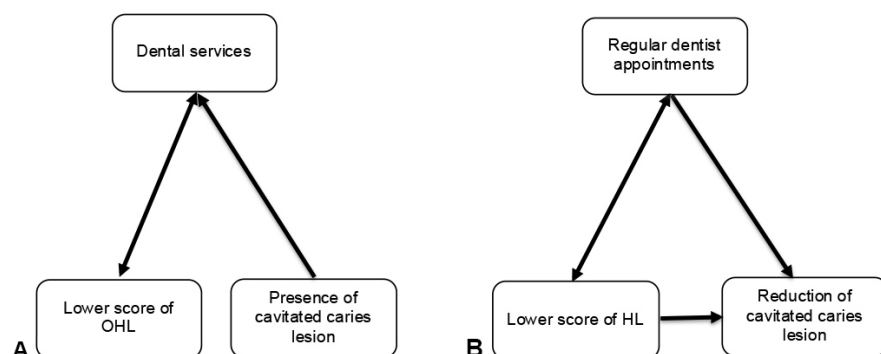


Fig. 1. A theoretical model of the relationship between parental OHL, cavitated caries" lesion and use of oral health care services by preschoolers.

Note: (A) Parents with lower scores of OHL uses less dental services, which contributes to "maintain the low OHL; as well as, children with cavitated caries lesion demands more use of oral health care services for treatment. (B) An improvement in parental OHL could favour an increase in the use dental services for prevention, resulting in an even greater improvement of OHL and in reduction of cavitated caries lesion."

can also be transmitted through visual means, such as illustrations, images, or drawings that are easy to interpret and contain the knowledge about oral health that the dentist wishes to share with the patient (Inglehart, 2019). Visual information can be used as a complement to spoken information and can motivate the patient to follow the dentist's instructions (Inglehart, 2019).

Presence of cavitated caries lesion exerts an impact on the overall health of preschool children, as it can cause pain and diminish quality of life; it also increases costs due to the need for emergency dental care and restorative treatment (Tinanoff *et al.*, 2019). In the present study, preschool children with cavitated caries lesion were more likely to use dental services (Fig. 1a), suggesting a still predominant behaviour of seeking dental services for treatment other than prevention (Rodrigues *et al.*, 2014).

An improvement in parental OHL could favour an increase in the use oral health care services by preschool children, resulting in better oral health outcomes (Fig. 1b) and altering the reason for seeking dental care, as parents would take their children to the dentist for prevention rather than treatment. However, difficult access to oral health care services remains an important barrier for patients. A previous study highlighted problems such as a lack of dentists in the public health care system, the availability of basic dental treatment, and long waiting lists for an appointment (Alshahrani & Raheel, 2016). These factors may exert an influence on parents/caregivers, who then only take their children to the dentist in urgent cases and for curative treatment, especially those who do not otherwise see the need for oral health care. Appointments for the purposes of treatment remain more frequent compared to appointments for prevention (Al Agili & Farsi, 2020). Thus, parental OHL is relevant to the oral health of children, as parental knowledge regarding oral health aspects is essential to the prevention and early treatment of many oral diseases.

This study has limitations that should be addressed. The cross-sectional design does not enable establishing causality between the use of oral health care services and either OHL or presence of cavitated caries lesion. Despite this, this study makes a relevant contribution to the literature, since it was conducted with a representative sample, which enables the data to be extrapolated to the entire population of preschool children between four and six years of age. Moreover,

a multi-skill OHL questionnaire specific to paediatric dentistry was used, which is scarce in the literature. Nevertheless, studies with longitudinal design are needed to assist in the establishment of the causal relationship among the three variables analysed in the present investigation.

CONCLUSIONS

Preschool children with cavitated caries lesion and those whose parents/caregivers had a greater capacity to understand and absorb information about oral health used oral health care services more often, thereby confirming the hypothesis of this study.

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RESUMEN: El objetivo de este estudio fue verificar el impacto de la caries de la primera infancia (CPI) y la alfabetización en salud oral de los padres (ASB) en el uso de los servicios de salud oral por parte de los niños en edad preescolar. Se realizó un estudio de base poblacional con 449 díadas de preescolares de 4 a 6 años y sus padres/cuidadores en la ciudad de Ribeirão das Neves, Brasil. Dos examinadores realizaron el diagnóstico de CPI utilizando el Sistema Internacional de Evaluación y Detección de Caries (ICDAS-Epi). Se administró la versión brasileña de Hong Kong Oral Health Literacy Assessment Task for Pediatric Dentistry para medir la ASB de los padres. Los padres/cuidadores respondieron la pregunta "¿Cuándo fue la última visita de su hijo al dentista?" para medir la utilización de los servicios de salud oral por parte de los preescolares. La regresión logística múltiple ($p < 0,05$) reveló que los niños con presencia de lesiones de caries

cavidades tenían 1,82 veces más probabilidades de utilizar los servicios de salud oral (OR=1,82; IC95%: 1,23-2,70) en comparación con aquellos con ausencia de lesiones de caries cavidades. Los niños cuyos padres/cuidadores tenían un ASB más bajo tenían un 34 % menos de probabilidades de utilizar los servicios de atención de la salud bucodental en comparación con aquellos cuyos padres tenían un ASB más alto (OR = 0,66; IC del 95%: 0,45-0,99). Los servicios dentales para niños en edad preescolar son utilizados con mayor frecuencia por niños preescolares con presencia de lesiones cariosas cavidades y cuyos padres/cuidadores tienen puntuaciones más altas de ASB.

PALABRAS CLAVE: atención dental, alfabetización en salud, caries dental.

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Corresponding author:

Jéssica Madeira Bittencourt
Department of Paediatric Dentistry
School of Dentistry
Universidade Federal de Minas Gerais
Av. Antônio Carlos 6627
Belo Horizonte
MG, 31270-901
BRAZIL

E-mail: jessbitten@yahoo.com.br