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CARIES AND TOOTH LOSS IN THE FIRST PERMANENT MOLAR AND THE EMOTIONAL IMPACT ON CHILDREN: A CROSS-SECTIONAL STUDY

CÁRIE E PERDA DENTÁRIA NO PRIMEIRO MOLAR PERMANENTE E O IMPACTO EMOCIONAL DAS CRIANÇAS: UM ESTUDO TRANSVERSAL

CARIES Y PÉRDIDA DENTAL EN EL PRIMER MOLAR PERMANENTE Y SU IMPACTO EMOCIONAL EN LOS NIÑOS: UN ESTUDIO TRANSVERSAL.

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ABSTRACT: Dental caries and tooth loss are significant oral conditions that impact quality of life when they affect the first permanent molars. This study aimed to evaluate the presence of caries and tooth loss in first permanent molars and their emotional association in children. This is a cross-sectional and analytical study, conducted with 59 children aged 6 to 12 years from a public school. Data collection included clinical examination, questionnaire, and use of the Faces Pain Scale – Revised. Data were analyzed using descriptive statistics, Mann-Whitney U test, and Spearman correlation, adopting a significance level of 5%. Children with caries presented higher scores for discomfort when eating and shame related to smiling; dental pain showed a borderline association. Tooth loss was associated with discomfort when eating and a tendency towards greater difficulty sleeping. The experience of caries was associated with dental pain, and higher DMFT/dmft scores showed a positive correlation with quality of life. These findings suggest that the experience of caries can cumulatively impact children's functional and psychosocial well-being. It is concluded that caries was related to functional and psychosocial impairments, while tooth loss should be interpreted with caution due to its low frequency.

Keywords: Dental caries. Tooth loss. Emotions. Children. Molar.

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RESUMO: A cárie dentária e a perda dentária são condições bucais relevantes e impactam a qualidade de vida quando acometem os primeiros molares permanentes. Este estudo teve como objetivo avaliar a presença de cárie e perda dentária em primeiros molares permanentes e sua associação emocional em crianças. Trata-se de um estudo transversal e analítico, realizado com 59 crianças de 6 a 12 anos, de uma escola pública. A coleta de dados incluiu exame clínico, questionário e utilização da escala Faces Pain Scale – Revised. Os dados foram analisados por estatística descritiva, teste de Mann-Whitney U e correlação de Spearman, adotando-se nível de significância 5%. Crianças com cárie apresentaram maiores escores de desconforto ao comer e vergonha relacionada ao sorriso; dor dentária apresentou associação limítrofe. A perda dentária esteve associada ao desconforto ao comer e tendência para maior dificuldade para dormir. A experiência de cárie esteve associada à dor dentária, e maiores valores CPOD/ceo-d apresentaram correlação positiva na qualidade de vida. Esses achados sugerem que a experiência de cárie pode ter impacto cumulativo no bem-estar funcional e psicossocial infantil. Conclui-se que a cárie esteve relacionada a prejuízos funcionais e psicossociais, enquanto a perda dentária deve ser interpretada com cautela devido à baixa frequência.

Palavras-chave: Cárie dentária. Perda dentária. Emoções. Crianças. Molar.

RESUMEN: La caries dental y la pérdida de dientes son afecciones bucales importantes que impactan la calidad de vida cuando afectan a los primeros molares permanentes. Este estudio tuvo como objetivo evaluar la presencia de caries y pérdida de dientes en los primeros molares permanentes y su asociación emocional en niños. Este es un estudio transversal y analítico, realizado con 59 niños de 6 a 12 años de una escuela pública. La recolección de datos incluyó examen clínico, cuestionario y el uso de la Escala de Dolor Facial Revisada. Los datos se analizaron mediante estadística descriptiva, la prueba U de Mann-Whitney y la correlación de Spearman, adoptando un nivel de significancia del 5%. Los niños con caries presentaron puntuaciones más altas de incomodidad al comer y vergüenza relacionada con sonreír; el dolor dental mostró una asociación límite. La pérdida de dientes se asoció con incomodidad al comer y una tendencia a mayor dificultad para dormir. La experiencia de caries se asoció con dolor dental, y puntuaciones más altas de CPOD/dmd mostraron una correlación positiva con la calidad de vida. Estos hallazgos sugieren que la experiencia de caries puede impactar acumulativamente el bienestar funcional y psicosocial de los niños. Se concluye que la caries estaba relacionada con deficiencias funcionales y psicosociales, mientras que la pérdida de dientes debe interpretarse con precaución debido a su baja frecuencia.

Palabras clave: Caries. Pérdida de dientes. Emociones. Niños. Mola.

INTRODUCTION

Dental caries is a chronic, non-communicable and multifactorial disease characterized by the progressive demineralization of dental tissues. This process results from the metabolism of fermentable carbohydrates by cariogenic microorganisms in the oral biofilm, leading to acid production and mineral loss in enamel and dentin. High sugar intake, inadequate oral hygiene, limited fluoride exposure, host susceptibility and time of exposure contribute to disease development and progression (Moynihan, 2016; Pitts et al., 2021; Stoica et al., 2023).

When left untreated, dental caries may lead to pain, infection, impairment of the dentin-pulp complex and, in advanced cases, tooth loss. These consequences may affect chewing, sleep, school activities, social interaction and oral health-related quality of life. In children, dental pain and untreated caries have been consistently associated with functional limitations and psychosocial burden (Gilchrist et al., 2015; Mota-Veloso et al., 2016; Quadros et al., 2021).

First permanent molars are clinically important because they erupt early, generally around six years of age, and remain exposed to the oral environment for a long period during mixed dentition. Their occlusal morphology, with pits and fissures that favor biofilm retention, and the difficulty children may have in cleaning posterior teeth increase susceptibility to carious lesions. Moreover, parents and caregivers may not recognize these teeth as permanent, which may delay preventive care (Llena et al., 2020; Sanchez-Perez et al., 2019; Stoica et al., 2023).

Tooth loss involving first permanent molars may have relevant clinical consequences, including changes in occlusion, migration or tilting of adjacent teeth, reduced masticatory efficiency and functional imbalance. Although premature loss is less frequent in childhood than caries experience, it represents a clinically relevant event that may reflect the cumulative burden of untreated disease (Almahdi et al., 2022; Saber et al., 2018).

Oral problems in childhood may also affect emotional well-being. Children can experience toothache, discomfort when eating, sleep disturbance, shame about their smile and dissatisfaction with appearance. These conditions may interfere with self-esteem, social relationships and participation in daily activities. Therefore, evaluating children's perceptions of oral health is important to understand the broader impact of dental caries and tooth loss (Gilchrist et al., 2015; Guimaraes et al., 2021; Souza; Mendes; Kappler, 2021).

Based on this context, the present study aimed to evaluate the presence of caries and tooth loss in first permanent molars and their association with emotional and functional perceptions in children from a rural public school in the Alto Sertao region of Paraiba, Brazil.

METHODS

This cross-sectional analytical study was conducted with children aged 6 to 12 years enrolled in a public school located in a rural area of the Alto Sertao region of Paraiba, Brazil. The sample consisted of 59 children selected by non-probabilistic convenience sampling, according to eligibility and availability during the data collection period.

Children regularly enrolled at the school, within the established age range, present during data collection and whose parents or guardians authorized participation by signing the informed consent form were included. Children also signed an assent form. Children with systemic diseases or conditions that could impair clinical examination, severe respiratory or cardiac conditions, cognitive impairment that could limit understanding of the instruments, or ongoing orthodontic treatment were excluded.

The independent variables were the presence of dental caries in first permanent molars, tooth loss in first permanent molars and caries experience. First permanent molars were defined as teeth 16, 26, 36 and 46. Caries experience was assessed using the DMFT/dmft indices. The dependent variables were self-reported emotional and functional perceptions related to oral health, including toothache, discomfort when eating, sleep difficulty and smile-related shame.

Children answered a structured questionnaire during data collection. The instrument included information on age, feelings related to oral health, discomfort when eating because of teeth, toothache, difficulty sleeping due to teeth, tooth brushing frequency, use of dental floss, eating habits, peers' comments about their teeth, number of friends, history of dental visits and tooth loss.

The Faces Pain Scale - Revised (FPS-R) was used as a visual response scale to facilitate children's understanding of the response options. The scale includes illustrated faces numbered from 0 to 10, with higher scores indicating worse perception or greater impact. Children selected the face that best represented their perception in each situation, and the corresponding score was recorded.

Clinical oral examination was performed in the school environment to identify the presence of dental caries and tooth loss, with emphasis on first permanent molars. The oral conditions analyzed included caries in first permanent molars, tooth loss in first permanent molars and overall caries experience, defined as DMFT and/or dmft values greater than zero.

Data were organized in a spreadsheet and analyzed using IBM SPSS Statistics for Windows, version 22.0 (IBM Corp., Armonk, NY, USA). Descriptive analysis of emotional scores was performed using medians and interquartile ranges (Q1-Q3). The Mann-Whitney U test was used to compare emotional scores between groups with and without caries, tooth loss or caries experience. Functional composite scores were calculated as the mean of toothache, discomfort when eating and sleep difficulty. Psychosocial composite scores were calculated as the mean of smile-related shame and general oral health perception. Spearman correlation was

used to evaluate the relationship between DMFT/dmft indices and functional or psychosocial scores. A significance level of 5% was adopted.

The study was approved by the Ethics Committee of Centro Universitario Santa Maria, under approval number 7,994,810. Parents or guardians signed the informed consent form, and all participating children signed the assent form.

RESULTS

The sample consisted of 59 children, with a mean age of 8.5 years (standard deviation = 1.34). Most participants were male (61.0%). The sample characteristics are presented in Table 1.

Table 1 - Sample characterization

Variable	n (%) or mean +/- SD
Age	8.5 +/- 1.34
Female	23 (39.0%)
Male	36 (61.0%)

Fonte: Autores (2026)

Caries in first permanent molars was observed in 36 children (61.0%). Children with caries in first permanent molars had higher scores for discomfort when eating and smile-related shame than children without caries in these teeth. Toothache showed a borderline association with caries in first permanent molars (Table 2).

Table 2 - Emotional and functional scores according to caries in first permanent molars

Outcome	Without caries Median (Q1-Q3)	With caries Median (Q1-Q3)	p*
Toothache	2 (0-8)	8 (1.5-10)	0.059
Discomfort when eating	0 (0-6)	6 (1.5-8)	0.049
Smile-related shame	0 (0-2)	2 (0-6)	0.004

*Two-tailed Mann-Whitney U test.

Fonte: Autores (2026)

Tooth loss in first permanent molars was identified in 4 children (6.8%). Children with tooth loss in first permanent molars had higher scores for discomfort when eating, and sleep difficulty showed a borderline association. Regarding overall caries experience, children with DMFT and/or dmft values greater than zero had higher toothache scores. The functional composite score also showed a borderline association with caries experience (Table 3).

Table 3 - Emotional and functional scores according to tooth loss in first permanent molars and caries experience

Oral condition	Outcome	No condition Median (Q_1-Q_3)	With condition Median (Q_1-Q_3)	p*
Tooth loss in first permanent molars	Discomfort when eating	2 (0-8)	8 (7.5-8.5)	0.038
Tooth loss in first permanent molars	Sleep difficulty	0 (0-2)	8 (6-8.5)	0.058
Caries experience	Toothache	0 (0-4)	8 (0-10)	0.036
Caries experience	Functional composite score	1.33 (0-4.33)	4.33 (1.83-6.67)	0.061

*Two-tailed Mann-Whitney U test.

Fonte: Autores (2026)

A positive and statistically significant correlation was observed between DMFT/dmft indices and functional and psychosocial scores. These findings indicate that higher caries experience was associated with greater functional and psychosocial impact, suggesting a cumulative effect of dental caries (Table 4).

Table 4 - Correlation between caries indices and functional/psychosocial impact

Index	Outcome	Spearman rho	p*
DMFT	Functional score	0.340	0.008
DMFT	Psychosocial score	0.435	0.001
Dmft	Functional score	0.605	<0.001
Dmft	Psychosocial score	0.289	0.027

*Spearman correlation.

Fonte: Autores (2026)

DISCUSSION

The findings of this study showed that caries in first permanent molars was related to worse self-reported functional and psychosocial perceptions in children, particularly discomfort when eating and smile-related shame. Toothache showed a borderline association with caries in these teeth. These results suggest that dental caries may affect not only clinical oral conditions, but also children's daily experiences, self-perception and social interactions (Gilchrist et al., 2015; Guimaraes et al., 2021; Mota-Veloso et al., 2016).

Previous studies have reported that untreated caries and its clinical consequences may impair eating, speaking, sleeping, school activities and social participation. Children may also experience dissatisfaction with appearance, embarrassment and lower self-confidence when oral problems are visible or painful. The association between caries in first permanent molars and smile-related shame observed in this study is consistent with evidence that oral health conditions can influence psychosocial well-being during childhood (Al-Omari et al., 2014; Gilchrist et al., 2015; Guimaraes et al., 2021).

First permanent molars deserve particular attention because they erupt early and remain exposed to cariogenic challenges during mixed dentition. Their morphology, characterized by pits and fissures, favors biofilm retention and makes hygiene more difficult for children. In addition, caregivers may fail to recognize these teeth as permanent, which can delay preventive actions. These factors may explain the high frequency of caries in first permanent molars observed in this sample (Llena et al., 2020; Sanchez-Perez et al., 2019; Stoica et al., 2023).

Caries experience proved to be an important indicator of cumulative disease burden. Children with DMFT/dmft values greater than zero presented higher toothache scores, and the functional composite score showed a borderline association. More importantly, the positive correlations between DMFT/dmft indices and functional or psychosocial scores suggest a gradient in which greater caries experience is accompanied by worse perceived impact. This finding is compatible with the understanding of dental caries as a progressive and cumulative non-communicable disease whose consequences may intensify when preventive and therapeutic interventions are delayed (Pitts et al., 2021; Quadros et al., 2021; Tinanoff et al., 2019).

Regarding tooth loss in first permanent molars, children with missing first molars presented higher scores for discomfort when eating, and sleep difficulty showed a borderline association. However, these findings should be interpreted with caution because tooth loss was infrequent in the sample. Even so, premature loss of first permanent molars is clinically relevant, as it may compromise masticatory function, occlusion, dental arch stability and overall well-being (Almahdi et al., 2022; Saber et al., 2018).

The clinical and public health implications of these findings are relevant. Monitoring the eruption of first permanent molars, early detection of initial caries lesions, use of fluoridated toothpaste, dietary guidance, sealants and minimally invasive interventions may contribute to preventing disease progression and tooth loss. Pediatric dental care should also consider children's self-reported pain, eating discomfort, sleep difficulty and embarrassment related to the smile, allowing a more comprehensive approach to oral health (Albuquerque et al., 2023; Large et al., 2023).

In the public health context, school-based actions are especially important in rural and socially vulnerable populations. Oral health education, supervised hygiene activities, early screening and referral to dental care can help reduce the burden of untreated caries and its functional and psychosocial consequences. Intersectoral strategies involving schools, families and primary health care services may improve prevention and access to timely treatment (Arrais; Roncalli; Rosendo, 2021).

This study has limitations. The cross-sectional design does not allow causal inference between caries, tooth loss and emotional or functional outcomes. The convenience sample from a single rural school limits generalizability. In addition, the emotional and functional perceptions were self-reported by children and may be influenced by individual interpretation of the scale. The low frequency of tooth loss also limited the statistical analysis of this condition. Therefore, the results should be interpreted as associations and not as evidence of causality.

Despite these limitations, the study has strengths. It integrated clinical oral examination with self-reported functional and emotional perceptions, focused on first permanent molars, and used statistical methods appropriate for non-parametric data. This approach contributes to understanding dental caries not only as a biological condition, but also as a health problem with functional and psychosocial implications for children.

FINAL CONSIDERATIONS

Caries in first permanent molars was related to functional and psychosocial impairment in children, especially discomfort when eating and smile-related shame. Overall caries experience was also associated with toothache and showed positive correlations with functional and psychosocial scores, suggesting a possible cumulative impact of the disease on children's quality of life.

Tooth loss in first permanent molars was infrequent, but it was associated with greater discomfort when eating and showed a borderline relationship with sleep difficulty. This finding should be interpreted cautiously due to the small number of children with tooth loss.

Integrated strategies involving early diagnosis, preventive measures, monitoring of first permanent molar eruption, oral health education and timely dental care are essential to reduce risk factors, prevent disease progression and minimize functional and psychosocial impacts in children.

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