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Caries prevalence and sex in preschoolers aged 18 to 36 months: a cross-sectional design

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Aim: Dental caries is a multifactorial disease where aspects such as socioeconomic status, caregivers' health education, and dietary and hygiene patterns are recognized factors associated with this condition. However, the literature remains inconclusive regarding sex differences, especially in children. Therefore, this study aimed to assess the relationship between dental caries prevalence and sex in preschoolers. **Methods:** A cross-sectional study was conducted with a representative sample of 432 children aged 18 to 36 months, enrolled in Early Childhood Education Centers (CMEIs) in São José dos Pinhais, PR, Brazil. Data on demographic and socioeconomic conditions, dietary practices, hygiene habits, and bottle-feeding were collected through a questionnaire directed to parents. Children were assessed for dental caries (DMFT and modified DMFT index) by a calibrated researcher (Kappa≥0.80). Bivariate analysis was performed to verify the association between dental caries and other covariates, with a significance level of 0.05. **Results:** There was no difference in per capita household income between boys and girls. The dmft value in girls was 0.12 (SD=0.59; median 0; interquartile range 0), and in boys, it was 0.34 (SD=1.37; median 0; interquartile range 0), with no statistically significant difference (p=0.197, Mann-Whitney test). The prevalence of caries was also not statistically different between boys and girls (p=0.087, Chi-square test). **Conclusion:** It can be concluded that in this age group, there was no association between sex and dental caries.

Keywords: Dental caries. Child. Child, preschool.

Introduction

Dental caries is a multifactorial disease with socioeconomic and behavioral dimensions. If not treated early, it can compromise oral health and the quality of life of individuals in later stages of life[1]. The ongoing challenge of accessing healthcare services, which persists today, exacerbates the prevalence of tooth decay as the most common non-communicable disease among children globally. In the Americas region, its prevalence ranges from approximately 39% to 65% among children aged 5 to 6 years, presenting a significant public health concern[2]. It is a chronic condition primarily attributed to dietary factors, particularly the consumption of sugars. Sugars serve as a substrate for the proliferation of cariogenic oral bacteria, which produce acids leading to the demineralization of dental tissues[3]. Currently, dental caries' causes are categorized into five main domains, acknowledging various factors like biology, genetics, social and physical environments, healthcare access, and timing[4]. Several studies propose that clinical conditions in the perinatal and early childhood stages could predict later development of dental caries. These conditions include low birth weight, overweight, obesity, and sugar intake frequency. These factors are closely linked to maternal education levels, as previously shown[5].

Early Childhood Caries (ECC) refers to caries found in primaryteeth in children under 6 years of age[6]. The prevalence of this caries type among Brazilian children aged up to 60 months was 49.2%, with an average dmft of 2.2, as reported in the latest SB-Brasil-2020 oral health survey. Upper incisors are the most commonly affected teeth, followed by the first molars, canines, and second molars[7]. The initial clinical sign presents as a white spot lesion, which tends to progress to cavitations at a later stage[8]. Increased ECC risk appears to be associated with the child's age, frequency of tooth brushing, number of dental visits, parental lack of knowledge about their children's oral health, and parental education level[9]. Furthermore, the emergence of new carious lesions seems to be linked to previous caries experiences[10].

Studies conducted in Brazil found the prevalence of childhood caries in 2003 ranged from 12% to 46%. According to the epidemiological survey at that time, 26.85% of the disease prevalence affected children aged 18 to 36 months, and this percentage increased with age, regardless of the child's sex[7]. Recent studies in specific regions of Brazil still align with these findings. For instance, a study in Canoas-RS reported a caries prevalence of 25% among preschoolers[11], and another study in Diamantina-MG found a prevalence of 46.6%[12].

The consequences of the ECC extend beyond damage to dental structures, potentially affecting the quality of life of affected children. More frequently reported issues include pain-related problems and psychological issues[12], feeding difficulties[13], and a higher incidence of verbal bullying[14]. Additionally, there appears to be an association between the early loss of primary teeth and malocclusion[15], loss of space in the dental arch, crowding[16], and speech disorders[17].

Frequently in prevalence studies of carious lesions, there is a tendency to explore the association between dental caries and sex[18,19]. There appear to be certain sex-related oral health disadvantages for women, attributed to genetic, hormonal, cultural, and dietary influences. While some studies show an association[20] between dental caries and sex, often linking this factor to the behavior of male children[21,22], other research has not found a statistically significant association between these two variables[1,23]. Recently, a systematic review with meta-analysis investigating predictors for dental caries concluded that a child's sex did not influence a higher prevalence of caries over 24 months[24]. However, to date, no study has been identified that specifically investigates the relationship between caries and sex in the age group of 18 to 36 months. Considering the existing discrepancies among published works that have addressed this issue, this study aimed to assess the relationship between dental caries and sex in preschoolers aged 18 to 36 months in São José dos Pinhais, PR. The null hypothesis is that there is no difference in the prevalence of dental caries based on the child's sex.

Methodology

Ethics approval and consent to participate:

The research received approval from the Research Ethics Committee of the Health Sciences Sector of the Federal University of Paraná (CEP/SD-UFPR), with document registration number 2,033,588 dated 26/04/2017.

This study also obtained approval from the Secretary of Education of the Municipality of São José dos Pinhais. The participating children in the research are those whose parents signed the Informed Consent Form (ICF), and the children who agreed to be examined on the day of data collection.

Selection of participants and sampling design

This is an observational cross-sectional study that was part of a larger project[25] to evaluate dietary practices, dental caries, and food insecurity. The study included a total of 432 children, aged 18 to 36 months, enrolled in Municipal Early Childhood Education Centers in the city of São José dos Pinhais-PR, a municipality located in the metropolitan region of Curitiba.

According to the Brazilian Institute of Geography and Statistics (IBGE), São José dos Pinhais has a population of approximately 302,759 habitants. In 2016, there were 1,401 children aged up to 36 months, enrolled in 43 Municipal Early Childhood Education Centers (CEMEIs).

Participation in the study required signed Informed Consent Forms from parents, and children willingly agreed to undergo examinations on the day of data collection.

Initially, 526 informed consent forms (ICFs) were distributed. However, some children were excluded (94). Figure 1 illustrates the complete participant selection flowchart.

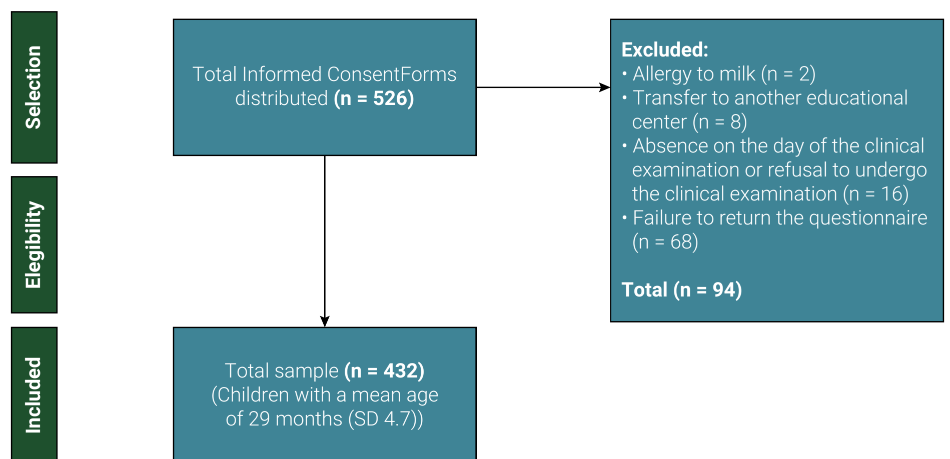

Figure 1. Flowchart of participant selection

Sample Size Calculation:

To conduct this study, a sample size calculation was performed to ensure enough individuals in the investigated group. The calculation employed the estimation formula for a proportion with a finite population. The sample size calculation considered a prevalence of dental caries of 50%, a confidence level (1-α) of 95%, and a desired precision of 5%. Considering that São José dos Pinhais had 2,667 infants aged 18 to 36 months enrolled in the early childhood education network in 2016.

The calculated value was multiplied by 1.2 for the cluster effect (design effect), resulting in a minimum sample of 404 children. An additional 30% was added to account for estimated losses, leading to a total sample of 526 children.

To ensure that the collected samples represented the reality of the studied population in the municipality, 20 Municipal Early Childhood Education Centers were randomly selected from the 43 existing in São José dos Pinhais. The proportion of children aged 18 to 36 months was maintained. To ensure equal opportunities for all children to participate in the research, a random draw was conducted for the children as well. In cases where the selected student was absent, another student was randomly chosen as a replacement.

Inclusion Criteria:

Children aged 18 months to 35 months and 29 days, regardless of sex, enrolled in a Municipal Early Childhood Education Center, and possessing a filled and signed Informed Consent Form from their guardians.

Exclusion Criteria:

Children who were absent during data collection or those who refused to undergo the examination. Additionally, children with systemic diseases such as syndromes,

cerebral palsy, among others that could interfere with nutritional patterns and dietary practices due to their special needs, were excluded.

Dental Examination

The assessment of dental caries at Early Childhood Education Centers (CMEIs) adhered to criteria outlined by the World Health Organization, employing the dmft index (decayed, missing, filled primary teeth) and the modified dmft index (which includes active or inactive white spots). Data collection was conducted by a single researcher who underwent prior calibration (Intra-examiner Kappa 0.87).

To ensure accuracy, the researcher received theoretical training and analyzed images simulating clinical scenarios relevant to the study. Next, calibration occurred at the university's pediatric dentistry clinic, where the researcher examined 15 eligible children not included in the final sample. After seven days, these children were re-examined to evaluate consistency. An experienced epidemiological researcher supervised these procedures as the "gold standard".

Examinations were conducted in natural light using a mouth mirror and sterile WHO probe. Sterile gauze was utilized for cleaning and drying dental surfaces, and children were positioned supine for ease of examination. Personal protective equipment and sterile instruments were employed to prevent cross-contamination throughout the examinations.

Socioeconomics and Demographic Characteristics:

Information on socioeconomic and demographic characteristics was obtained through a questionnaire administered to parents or guardians, with a preference for maternal responses. The questions covered the child's sex, birth weight, gestational weeks, mother's literacy level, mother's marital status, number of children, number of people living in the same household, and family income in Brazilian Reais.

Data analysis

The data were analyzed using SPSS software (IBM Corp. Released 2017. IBM SPSS Statistics for Windows, Version 28.0. Armonk, NY: IBM Corp.). The data analysis included describing the relative and absolute frequencies of the variables.

The continuous data were subjected to Kolmogorov-Smirnov test and presented non-normal distribution. Then the relationships between dental caries and the child's sex, as well as between sex and family income per capita, were examined using the Mann-Whitney Test. Associations between dichotomized variables were analyzed using the Chi-square test. The adopted significance level was 5%.

Qualitative variables received only a descriptive analysis.

Results

Initially, 526 informed consent forms (ICFs) were distributed. Some children were excluded from these, either due to milk allergies, transferring to another educational center, absence on the day of the clinical examination, refusal to undergo the clinical

examination, or failure to return the questionnaire. This resulted in a sample of 432 children, with an average age of 29 months (SD 4.7). The majority of the sample consisted of male children, accounting for 57.2% (n=247). There were no statistically significant differences in socioeconomic and demographic variables between the sexes (Table 1).

Table 1. Socioeconomic and demographic variables and child's sex. São José dos Pinhais - PR, Brazil, 2017. (n=432)

Variables	**Sex**		**p-value***
	Female n(%)	**Male n(%)**	
Child's Age			
< 24 months	42 (51.2)	40 (48.8)	0.088
≥ 24 months	146 (40.9)	211 (59.1)	
Guardian's Education			
< 8 years	149 (43.7)	192 (56.3)	0.412
≥ 8 years	35 (38.9)	55 (61.1)	
Guardian's Occupation			
Works at home or informally	88 (41.3)	125 (58.7)	0.414
Outside the home (formal work)	99 (45.2)	120 (54.8)	
Guardian's Marital Status			
With stable relationship	131 (42.6)	176 (57.3)	0.713
Without stable relationship	54 (44.6)	67 (55.4)	

*Chi-squared test
Values less than 432 refer to the absence of data for the variable.

The relationship between *per capita* income of the guardians and the sex of the children is depicted in Table 2. The average income for parents of female children was R$ 575,23, and for parents of male children, it was R$ 573,52. There was no statistically significant difference between the variables (p=0.895).

Table 2. Per capta income of children's guardians and child's sex. São José dos Pinhais- PR, Brazil, 2017. (n=432)

	Sex				**P value**
	Female		**Male**		
	Median	**Interquartile range**	**Median**	**Interquartile range**	
Per capita income	500,00	525,00	500,00	450,00	0.895

* Mann-Whitney Test.

The prevalence of caries based on the modified dmft criteria (decayed, restored, and actively white-spotted teeth) it was 15.7% in girls and 22.3% in boys without statistical significance (0.087). The ceo-d total was 0,25 (SD=1,1; median=0, interquartile range=0). The experience of caries based on the modified dmft criteria (decayed, restored, and actively white-spotted teeth) in relation to the sex of the child is presented in Table 3. There was no statistically significant difference in relation to the child's sex and the total score of the modified dmft (p=0.197). When sex was separately evaluated for each criterion of the modified dmft, no statistical difference was found between the variables as well.

Table 3. Dental caries experience in relation to children's sex. São José dos Pinhais-PR, Brazil. 2017. (n=432)

	Sex						p-value
	Female			Male			
	Mean (SD)	Median	Interquartile range	Mean (SD)	Median	Interquartile range	
ceo-d total	0.12 (0.59)	0	0	0.34 (1.37)	0	0	0.197
Caries (c)	0.11 (0.58)	0	0	0.32 (1.31)	0	0	0.115
Restored (o)	0.01 (0.10)	0	0	0.02 (0.26)	0	0	0.891
Ative White Stop	0.25 (0.72)	0	0	0.28 (0.70)	0	0	0.435

** Teste Mann-Whitney. Min-Max= Minium and Maximum.

Discussion

Dental caries in early childhood (ECC) is a condition initially characterized by a white spot on the enamel, and if left untreated, it rapidly progresses to the cavitation of the affected tooth[8]. Despite the known etiology of dental caries, its prevalence in early childhood remains high[10,11]. Dental caries is recognized as a multifactorial disease, and one of the predictors for a higher prevalence of ECC may be the child's sex[21]. In this study, we evaluated the relationship between dental caries experience and sex in preschoolers, and we did not observe a statistically significant difference between these two variables.

Another factor that appears to influence the prevalence of dental caries in children is the parents' occupation. Parents without remuneration, self-employed individuals, or those working shifts and overtime tend to have children with a higher likelihood of dental caries. Moreover, it seems that the mother's occupation has a more significant impact on caries prevalence[26]. The fact that in our research, over 50% of parents had formal employment may partly explain the relatively low prevalence of caries (average dmft 0.25). Another related factor could be the marital status of the parents. In our study, 71,06% of parents were in a stable relationship. Some studies have found a roughly 27% higher caries progression in children whose parents were not in a stable union[27].

Socioeconomic conditions have been considered a predictor of dental caries, a fact previously reported in studies[22]. In our study, we did not find statistically significant differences when comparing *per capita* income with the sex of the child (p=0.895). A recent systematic review showed that children from low socioeconomic families had a 52% higher chance of having caries[28]. In our study, the average income per family member was R$ 572,72, representing a family of moderate socioeconomic status at the time of data collection (2017). This tends to act as a protective factor against dental caries[28], partially explaining the low average DMFT (0.25) compared to previous studies (average DMFT 1.1)[1].

Previous studies have identified a statistically significant association between dental caries and gender[21,22]. However, our study findings, as demonstrated in Table III, do not indicate a statistically significant difference between dental caries and the sex of the child. Our results align with other studies that also found no association between these two variables in children[1,24]. While some authors suggest that in adolescents, a behavioral factor related to oral hygiene, where females exhibit better oral hygiene habits, may exist[29], this behavioral factor does not seem to have influenced our results. The discrepancies in these results are somewhat attributed to the different regions where the studies were conducted, as well as differences in the age groups studied. These factors lead to variations in behavior patterns and knowledge about the health of their populations[30].

When evaluating the modified dmft index, most of the final index was composed of decayed elements, which, although not showing a statistically significant difference between the sexs of the children, yielded results similar to those found by other authors[31]. Thus, the results demonstrate that a significant portion of teeth affected by dental caries remained unrestored. According to Assunção et al.[31], this underscores the need for early intervention and increased attention to oral health at younger ages. Other authors had previously concluded that there is a need for greater awareness among parents regarding the maintenance of healthy primary dentition and the potential consequences if it is neglected[32].

In 2020, according to the Ministry of Health, 43.4% of children aged up to 60 months in Brazil exhibited dental caries experience in at least one primary tooth, with an average DMFT of 2.2.[7] In contrast, in the present study, the average DMFT was 0.12 for girls and 0.34 for boys, demonstrating a considerable improvement in oral health conditions at least in the studied region after 14 years[8]. However, preventive measures should always be adopted to reduce or even eradicate Early Childhood Caries (ECC). Preventive measures such as the use of fluorides are highly effective in preventing dental caries, including toothpaste, water fluoridation, and professional topical fluoride application[33]. Additionally, the professional application of fluoride varnishes and supervised use of mouth rinses have shown positive results in reducing caries[34]. Some authors suggest that caries prevention in early childhood should begin during the prenatal period with guidance for future parents and extend beyond the perinatal period[35].

This study presents positive aspects as it is, so far, the only one to address the prevalence of dental caries in the age group of 18 to 36 months in the studied region. Additionally, it features a representative sample of 432 children, with the sample size

determined based on a pre-established calculation. Due to the randomization processes employed, the results can be extrapolated to the general population. However, it has some limitations related to the study design, where the data only represent the moment, they were collected. Other variables, such as the number of children in the family, birth order, the mother's age, and the primary caregiver of the child, could have been collected, as they might have some relationship with the prevalence of dental caries and the association with the child's sex.

In conclusion, based on this cross-sectional analysis, it can be inferred that there was no statistically significant difference in the prevalence of dental caries based on gender among children aged 18 to 36 months. Additionally, no significant distinctions were observed between a child's gender, dental caries, and socioeconomic status.

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Data availability

Datasets related to this article will be available upon request to the corresponding author.

Conflict of Interest Disclosure

The authors declare no conflict of interest.

Contribution statement authored by CRediT

Karina Cardoso: Conception; data acquisition, analysis and interpretation; original writing; final approval. **Maria Dalla Costa:** Conception; data acquisition, analysis and interpretation; original writing; final approval. **Vanessa da Rocha Chapanski:** Conception; data acquisition, analysis and interpretation; original writing. **Fabian Calixto Fraiz:** Conception; Data analysis and interpretation; critical review; final approval. All authors actively participated in this study, reviewed and approved the final version of the document.

References

1. Gradella, CMF, Oliveira, LB, Ardengh, TMI, Bönecker, M. [Caries Epidemiology in children aged 5-59 months-old in the city of Macapá, State of Amapá, Brazil]. RGO. 2007;55(4):329-34. Portuguese.

2. Ending childhood dental caries: WHO implementation manual. Geneva: World Health Organization; License: CC BY-NC-SA 3.0 IGO. 2019.

3. Sheiham A, James WP. Diet and Dental Caries: The Pivotal Role of Free Sugars Reemphasized. J Dent Res. 2015 Oct;94(10):1341-7. doi: 10.1177/0022034515590377.

4. Fisher-Owens SA, Gansky SA, Platt LJ, Weintraub JA, Soobader MJ, Bramlett MD, Newacheck PW. Influences on children's oral health: a conceptual model. Pediatrics. 2007 Sep;120(3):e510-20. doi: 10.1542/peds.2006-3084.

5. Ribeiro CCC, Silva MCBD, Nunes AMM, Thomaz EBAF, Carmo CDS, Ribeiro MRC, et al. Overweight, obese, underweight, and frequency of sugar consumption as risk indicators for early childhood caries in Brazilian preschool children. Int J Paediatr Dent. 2017 Nov;27(6):532-9. doi: 10.1111/ipd.12292.

6. American Academy of Pediatric Dentistry. Policy on Early Childhood Caries (ECC): classifications, consequences, and preventive strategies. Pediatr Dent. 2017 Sep;39(6):59-61.

7. Brazilian Ministry of Health. [SB BRAZIL 2020: national oral health surveys: main results]. Brasília: Brazilian Ministry of Health; 2020. Português.

8. Seow WK. Early Childhood Caries. Pediatr Clin North Am. 2018 Oct;65(5):941-4. doi: 10.1016/j.pcl.2018.05.004.

9. Guan M, Nada OA, Wu JJ, Sun JL, Li N, Chen LM, et al. Dental caries and associated factors in 3-5-year-old children in Guizhou Province, China: an epidemiological survey (2015-2016). Front Public Health. 2021 Sep;9:747371. doi: 10.3389/fpubh.2021.747371.

10. Corrêa-Faria P, Paixão-Gonçalves S, Paiva SM, Pordeus IA. Incidence of dental caries in primary dentition and risk factors: a longitudinal study. Braz Oral Res. 2016 May;30(1):S1806-83242016000100254. doi: 10.1590/1807-3107BOR-2016.vol30.0059.

11. Kramer PF, Priesnitz MC, Celeste RK, Pereira MJ, Benelli KG, Feldens CA. Spatial distribution of dental caries among preschool children in Canoas, Southern Brazil. Acta Odontol Latinoam. 2019 Apr 1;32(1):3-9.

12. Vollú AL, da Costa MDEPR, Maia LC, Fonseca-Gonçalves A. Evaluation of oral health-related quality of life to assess dental treatment in preschool children with early childhood caries: a preliminary study. J Clin Pediatr Dent. 2018;42(1):37-44. doi: 10.17796/1053-4628-42.1.7. Epub 2017 Sep 22.

13. Mishu MP, Tsakos G, Heilmann A, Watt RG. The role of oral health-related quality of life in the association between dental caries and height, weight and BMI among children in Bangladesh. Community Dent Oral Epidemiol. 2022 Dec;50(6):529-38. doi: 10.1111/cdoe.12707.

14. Barasuol JC, Soares JP, Castro RG, Giacomin A, Gonçalves BM, Klein D, et al. Untreated dental caries is associated with reports of verbal bullying in children 8-10 years old. Caries Res. 2017;51(5):482-8. doi: 10.1159/000479043.

15. Fadel MAV, Santos BZ, Antoniazzi RP, Koerich L, Bosco VL, Locks A. Prevalence of malocclusion in public school students in the mixed dentition phase and its association with early loss of deciduous teeth. Dental Press J Orthod. 2022 Sep;27(4):e2220120. doi: 10.1590/2177-6709.27.4.e2220120.oar.

16. Rönnerman A. The effect of early loss of primary molars on tooth eruption and space conditions. A longitudinal study. Acta Odontol Scand. 1977;35(5):229-39. doi: 10.3109/00016357709019797.

17. Nadelman P, Bedran N, Magno MB, Masterson D, de Castro ACR, Maia LC. Premature loss of primary anterior teeth and its consequences to primary dental arch and speech pattern: a systematic review and meta-analysis. Int J Paediatr Dent. 2020 Nov;30(6):687-712. doi: 10.1111/ipd.12644.

18. Kramer AAC, Pivodic A, Hakeberg M, Östberg AL. Multilevel Analysis of Dental Caries in Swedish Children and Adolescents in Relation to Socioeconomic Status. Caries Res. 2019;53(1):96-106. doi: 10.1159/000489570. Epub 2018 Jul 12.

19. Li J, Fan W, Zhou Y, Wu L, Liu W, Huang S. The status and associated factors of early childhood caries among 3- to 5-year-old children in Guangdong, Southern China: a provincial cross-sectional survey. BMC Oral Health. 2020 Sep;20(1):265. doi: 10.1186/s12903-020-01253-w.

20. Martinez-Mier EA, Zandona AF. The impact of gender on caries prevalence and risk assessment. Dent Clin North Am. 2013 Apr;57(2):301-15. doi: 10.1016/j.cden.2013.01.001.

21. Kamran R, Farooq W, Faisal MR, Jahangir F. Clinical consequences of untreated dental caries assessed using PUFA index and its covariates in children residing in orphanages of Pakistan. BMC Oral Health. 2017 Jul;17(1):108. doi: 10.1186/s12903-017-0399-9.

22. Khani-Varzegani F, Erfanparast L, Asghari-Jafarabadi M, Shokravi M, Azabdaftari F, Parto M, et al. Early occurrence of childhood dental caries among low literate families. BMC Res Notes. 2017 Aug;10(1):366. doi: 10.1186/s13104-017-2698-2.

23. Moura AM, André M, Lopez MT, Dias RB. Prevalence of caries in Brazilian children with cleft lip and/or palate, aged 6 to 36 months. Braz Oral Res. 2013 Jul-Aug;27(4):336-41. doi: 10.1590/s1806-83242013005000009.

24. Lam PPY, Chua H, Ekambaram M, Lo ECM, Yiu CKY. Risk predictors of early childhood caries increment-a systematic review and meta-analysis. J Evid Based Dent Pract. 2022 Sep;22(3):101732. doi: 10.1016/j.jebdp.2022.101732.

25. Costa MD, Chapanski VDR, Crema AFA, Menoncin BLV, Höfelmann DA, Fraiz FC. Untreated early childhood caries: the role of parental eating behavior. Braz Oral Res. 2022 Jan;36:e010. doi: 10.1590/1807-3107bor-2022.vol36.0010.

26. Lim SS, Kim B, Yoon JH, Song JS, Park EC, Jang SI. Relationship between parents' occupational characteristics and untreated dental caries in offspring: a population-based study of data from the Korean National Health and Nutrition Examination Survey, 2008-2015. Scand J Work Environ Health. 2018 May 1;44(3):303-11. doi: 10.5271/sjweh.3714.

27. Piva F, Pereira JT, Luz PB, Hashizume LN, Hugo FN, Araujo FB. A longitudinal study of early childhood caries and associated factors in brazilian children. Braz Dent J. 2017 Mar-Apr;28(2):241-248. doi: 10.1590/0103-6440201701237.

28. Yousaf M, Aslam T, Saeed S, Sarfraz A, Sarfraz Z, Cherrez-Ojeda I. Individual, family, and socioeconomic contributors to dental caries in children from low- and middle-income countries. Int J Environ Res Public Health. 2022 Jun;19(12):7114. doi: 10.3390/ijerph19127114.

29. Kudirkaite I, Lopatiene K, Zubiene J, Saldunaite K. Age and gender influence on oral hygiene among adolescents with fixed orthodontic appliances. Stomatologija. 2016;18(2):61-5.

30. Bonanatoa K, Scarpellia AC, Goursanda D, Motab JPT, Paiva ASM, Pourdeusa IA. [Sense of coherence and dental caries experience in preschool children from Belo Horizonte city]. Rev Odonto Cienc. 2008;23(3):251-5,.Portuguese.

31. Assunção LRS, Villela KD, Rocha DP, Menezes SL, Pinheiro RDPS, Nascimento LS, et al. [Caries epidemiology of children in the primary infancy in the City of Belém, PA]. Rev Assoc Paul Cir Dent. 2015;69(1):74-9. Portuguese.

32. Setty JV, Srinivasan I. Awareness and attitude of patients' parents toward pulp therapy of the primary teeth: a clinical survey. J Indian Soc Pedod Prev Dent. 2011 Jul-Sep;29(3):198-201. doi: 10.4103/0970-4388.85810.

33. Anil S, Anand PS. Early Childhood Caries: Prevalence, Risk Factors, and Prevention. Front Pediatr. 2017 Jul;5:157. doi: 10.3389/fped.2017.00157.

34. Marinho VC, Worthington HV, Walsh T, Clarkson JE. Fluoride varnishes for preventing dental caries in children and adolescents. Cochrane Database Syst Rev. 2013 Jul;2013(7):CD002279. doi: 10.1002/14651858.CD002279.pub2.

35. Jørgensen MR, Castiblanco G, Twetman S, Keller MK. Prevention of caries with probiotic bacteria during early childhood. Promising but inconsistent findings. Am J Dent. 2016 Jun;29(3):127-31.