

# Influence of Breastfeeding and Feeding on Children Dental Caries: a Cross-Sectional Study

## Influência da Amamentação e da Alimentação na Cárie Dentária Infantil: um Estudo Transversal

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### Abstract

The objective was to investigate the experience of dental caries and associated factors from the children's and adolescents' medical records who visited the Children's Dental Clinic of a College of southern Brazil. A cross-sectional study was carried out by analyzing 262 medical records. For data collection, information on demographic data, oral hygiene, food, breastfeeding and oral clinical data were used to investigate. A multivariate analysis was used to estimate the odds ratios (OR) and their 95% confidence intervals, by the exposure variables in a Binary Logistic Regression model ( $p$ -value < 0.05). Of the sample, 86.3% had some teeth with experience of dental caries, with only 13.7% free of caries. The average dental caries was  $5.3 \pm 3.1$  in children between 6 and 8 years and  $2.0 \pm 1.9$  between 9 and 12 years. There was a statistically significant association between age and dental caries, with the largest age group being a protective factor for dental caries (OR 0.30; 95% CI 0.17-0.53). Children who were breastfed naturally had a protective factor for caries (OR 0.29; 95% CI 0.10-0.88). The experience of dental caries in children was high, especially in primary teeth, with a higher average of decayed teeth. Breastfeeding and age were a protective factor for dental caries.

**Keywords:** Dental Caries. Breast Feeding. Candy. Oral Hygiene. Diet, Cariogenic.

### Resumo

*O objetivo foi investigar a experiência de cárie dentária e fatores associados em prontuários de crianças e adolescentes que procuraram o Ambulatório de Odontologia Infantil de uma Faculdade do Sul do Brasil. Realizou-se um estudo transversal por meio da análise de 262 prontuários. Para a coleta de dados, foram utilizadas informações sobre dados demográficos, higiene bucal, alimentação, aleitamento materno e dados clínicos bucais para investigação. Uma análise multivariada foi utilizada para estimar os odds ratios (OR) e seus intervalos de confiança de 95%, pelas variáveis de exposição em um modelo de Regressão Logística Binária ( $p$ -valor < 0,05). Da amostra, 86,3% tinham alguns dentes com histórico de cárie dentária, e apenas 13,7% livre de cárie. A média de cárie dentária foi de  $5,3 \pm 3,1$  em crianças entre 6 e 8 anos e  $2,0 \pm 1,9$  entre 9 e 12 anos. Houve associação estatisticamente significativa entre idade e cárie dentária, sendo a maior faixa etária fator de proteção para cárie dentária (OR 0,30; IC95% 0,17-0,53). Crianças amamentadas naturalmente apresentaram fator de proteção para cárie (OR 0,29; IC95% 0,10-0,88). O histórico de cárie dentária em crianças foi elevado, principalmente nos dentes deciduos, com maior média de dentes cariados. O aleitamento materno e a idade foram fatores de proteção para cárie dentária.*

**Palavras-chave:** Cárie Dentária. Aleitamento Materno. Doces. Higiene Bucal. Dieta Cariogênica.

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## 1 Introduction

Tooth decay is a public health problem that affects a large proportion of the children population. Data demonstrate that about 60 to 90% of school-age children have dental caries, which is considered a high and worrying result.<sup>1</sup> It is defined as a multifactorial disease mediated by biofilm determined by the diet, which results in the net loss of minerals from the dental hard tissues.<sup>2,3</sup>

For the disease to occur, it is necessary to have some fundamental factors such as biofilm formed in a period of time by specific microorganisms that colonize the oral cavity since childhood. There are other factors considered to be determinant, which can be negative like sugars or positive like fluorides; and modulators, which are biological and social.<sup>4</sup> Dental caries is considered a dynamic process in which

episodes of demineralization and dental remineralization are present. Mineral loss caused by metabolic activities in the dental biofilm is to some extent offset by the mineral gain promoted by saliva and increased by fluorides in the oral environment.<sup>5</sup>

Thus, currently, caries disease is considered to be of bacterial origin with behavioral development, plaque dependent. Evidence suggests that the social, cultural, economic, environmental and determinant health system aspects are intrinsic factors involved in the dental caries etiology.<sup>6</sup>

Food and drinks provide nutrients necessary for the body growth and maintenance. Healthy diet limits exposure to excessive intake of nutrients, non - nutritive compounds (i.e., sugars) associated with chronic diseases such as

dental caries.<sup>7</sup> 100% fruit juice is considered a natural drink healthy that brings benefits to health, however, the large quantity of sugar added to it is not reflecting in good results. The sugar added in the juice reflected in levels higher than the sugar present in the soft drink, leading to the presence of high glycemic index which, when associated with poor oral hygiene, may reflect a high content cariogenic.<sup>8</sup>

There is one strong relationship between breastfeeding and the development of the stomatognathic system, as the cariogenic potential of the different types of milk, it is often approached incorrectly, resulting in adverse information, which can lead families to decide for what is culturally more accepted, such as early weaning<sup>9</sup>. There is some evidence about the relationship between breastfeeding and dental caries, as a protective factor against caries in children up to 24 months.<sup>1,9,10,11</sup>

Several authors point out that dental caries disease remains a health problem in early childhood. The early presence of caries in children has many harmful consequences, because, in addition to dental pain, children may have problems with adequate nutrition and physical development.<sup>12,13</sup> Early caries in early childhood is the early onset of caries in young children with rapid progression, which can ultimately result in complete destruction of the primary dentition. An epidemiological definition of caries in early childhood is the presence of one or more caries in any primary tooth of a child under 6 years old.<sup>14</sup> Furthermore, serious decay can cause pulp infection as well as varieties of physical and psychological effects, affecting the children's development and at the same time, is one the burden on families and society.<sup>15</sup>

To try to understand the oral health and disease process in children is important to know the different characteristics of each group, their habits and the social inequalities. Thus, this study is extremely important, as it presents the registered data of patients who sought dental treatment in a Children's Clinic in the last four years and makes associations among the determining factors found in the tooth decay process in childhood.

The objective of this study was to verify the dental caries and its association in the records of children from 6 to 12 years old at the Children's Dental Clinic of a College of the southern Brazil in the years 2016 to 2019.

## 2 Material and Methods

The research was submitted to and approved by the Research Ethics Committee of Faculdade IMED, under opinion number 2.014.434, CAAE 65086317.5.0000.5319, on April 12<sup>th</sup> of 2017.

### 2.1 Study design and population

The present investigation is characterized as an observational study of a quantitative approach, whose design is cross-sectional.

The study population was a documentary-type census, carried out by analysing the medical records of patients aged 6–12 years, at the Children's Dental Clinic of the Dentistry School of IMED from 2016 to 2019. The total number of medical records in this period was 287; however, 25 medical records (8.7%) were excluded due to the lack of correct data filling. Thus, the final population included in this study was 262 records.

The study was conducted at the Dentistry Scholl, whose Dental Clinic aims to provide dental services to the entire population of a municipality. This municipality, Passo Fundo, is located in the north of Rio Grande do Sul and is considered the largest city in the northern region, with a population of 197,798 inhabitants.<sup>16</sup>

### 2.2 Procedures for data collection

For data collection, medical records were used from 2016 to June 2019 containing the oral clinical examination of patients registered and screened in the Children's Dental Clinic course assessed at the beginning of their treatment. The data were collected by a researcher in the months of May and July 2019.

The medical records of the Dentistry course at IMED were filled out by students enrolled in the internship subjects of the Children's Dental Clinic with the supervision of one or more dental surgery professors. Before filling out the patients' medical records containing the clinical examination files, they received proper training from the professors and monitors in the field of Pediatric Dentistry, based on theory and practical classes and assessments.

For the clinical oral examination, the patients seated on a dental chair and evaluated using artificial lighting (dental reflector), and a mouth mirror and a probe (according to biosafety standards) were used to perform the examination.

Thus, data collection for this research was carried out based on the analysis of medical records, extracting the following data: 1. Anamnesis examination form - demographic data (age, sex), data oral hygiene (frequency of tooth brushing, use of fluoride, flossing), data about food (intake juice, soda, candies daily), breastfeeding (breastfeeding/artificial, ingestion of artificial bottle the night); 2. Clinical examination form - containing oral clinical evaluation describing dental caries data, which were categorized in the DMFT index codes (index that measures the experience of decayed, filled, extracted and missed teeth by caries) for permanent teeth and dmft (index that measures the experience of decayed, filled teeth, with indication of

extraction by caries) for primary teeth, according to the World Health Organization.<sup>17</sup>

### 2.3 Variables in the study

The dependent variable (outcome) investigated in this study was dental caries disease, categorized as zero (0) free of cavities and one (1) to experience dental caries, for all patients who had at least one decayed tooth, restored or missed due to tooth decay.

As exposure variables, age group variables (6 to 8 years and 9 to 12 years) were analyzed; sex (female and male); natural breastfeeding (yes and no); ingestion of artificial bottle at night (yes and no); eatscandies daily (yes and no); drinks soft drink daily (yes and no); drinks juice daily (yes and no); floss (yes and no); frequency of daily tooth brushing (0 to 1 time, 2 or more times); uses fluoride (yes and no).

### 2.4 Data analysis

The data obtained were organized in an Excel spreadsheet and exported to the statistical program IBM SPSS® software (*Statistical Package for the Social Sciences*), version 20.0, Armonk, New York.

Descriptive analyzes of all the qualitative variables were performed, describing their relative and absolute frequencies. Central tendency measures were used to verify the mean, standard deviation, variance, sum and maximum of teeth with experience of dental caries. bivariate and multiple analyzes were also carried out. In the multiple analysis, odds ratios (OR) and their respective 95% confidence intervals were estimated, crude and adjusted for exposure variables in a Binary Logistic Regression model (p-value <0.05). Thus, the statistical analysis to verify the relationship between dental carie and exposure variables resulted in a statistically significant model.

## 3 Results and Discussion

The average age of children who were at the Children's Dental Clinic described in the medical records was 9 (± 1.9) years. It is observed that of the 262 participants in the research, 57.6% brushed their teeth only 0 to 1 time a day and 76.3% of these patients ate candies daily. Table 1 describes the results of the demographic, food, and oral hygiene habits of the patients.

**Table 1** - Distribution of demographic, feeding, oral hygiene habits variables in of patients of the Children's Dental Clinic, College of southern Brazil, Passo Fundo, Brazil, 2019 (n = 262)

Variables	N	%
<b>Age range</b>		
6 to 8 years	152	58
9 to 12 years	110	42
<b>Sex</b>		
Feminine	146	55.7
Male	116	44.3
<b>Natural breastfeeding</b>		
No	29	11.1
Yes	233	88.9
<b>Nighttime artificial baby bottle</b>		
No	65	24.8
Yes	197	75.2
<b>Candies/day</b>		
No	62	23.7
Yes	200	76.3
<b>Soft drink/day</b>		
No	103	39.3
Yes	159	60.7
<b>Juice/day</b>		
No	62	23.7
Yes	200	76.3
<b>Floss</b>		
No	191	72.9
Yes	71	27.1
<b>Tooth-brushing frequency/day</b>		
0 to 1 time	151	57.6
2 or more times	111	42.4
<b>Fluoride use</b>		
Does not use	193	73.7
Make use	69	26.3

Source: Research data.

Of the 262 survey participants, 226 (86.3%) had some teeth with experience of dental caries (decayed, restored or lost), with only 13.7% (36) of children being free of caries.

For this study, data on primary teeth for children aged 6 to 8 years (58%, n=152) and data on permanent teeth for children aged 9 to 12 years were analyzed (42%, n=110).

The average of the dmft verified in the children's medical records was 5.3 ±3.1 in children between 6 and 8 years old. In children aged 9 to 12 years, the average DMFT was 2.0 (± 1.9). The data of the dmft and DMFT indexes, as well as the elements that compose them (decayed, restored and lost), observing a high average of the decayed component of the dmft 4.6 (± 3.2). The results are shown in Table 2.

**Table 2** – Measures of central tendency of decayed, filled and missing teeth due to caries, classified by age group, of the children registered in the records of the Children's Dental Clinic, College of southern Brazil, Passo Fundo, Brazil, 2019 (n = 262)

	Decayed Teeth		Filled Teeth		Missing Teeth		Experience of Dental Caries	
	* D	** P	* D	** P	* D	** P	*dmft	** DMFT
Mean	4.6	1.8	0.7	0.2	-	0.5	5.3	2.0
Standard deviation	3.2	1.8	1.2	0.5	-	0.4	3.1	1.9
Maximum	15	9	6	2	-	4	15	9
Variance	10.4	3.8	1.5	0.2	-	0.1	9.9	3.7

\* D – Deciduous; \*\* P – Permanent

Source: Research data.

In order to carry out the Binary Logistic Regression, all the variables that had an association with p-value <0.20 were entered in the crude model: age group, candy / day, juice / day, maternal breast. However, after the multivariate adjustment, the variables: age group, and natural breastfeeding remained significant (p <0.05), and daily juice intake lost its association in the final adjusted model of the multivariate regression analysis (Table

3). Thus, it can be seen that older children were considered a protective factor for dental caries (OR: 0.30; 95% CI:0.17-0.53), as well as children who were breastfed naturally had a protection factor around 30% lower than those who were not breastfed (OR: 0.29; 95% CI:0.10-0.88). Thus, the statistical analysis to verify the relationship between dental caries and exposure variables resulted in a statistically significant model (Table 3).

**Table 3 - Bivariate (crude) and multivariate (adjusted) binary logistic regression model for the dental caries experience, Passo Fundo, RS, Brazil, 2019**

	<b>Crude OR (95% CI)</b>	<b>p-value *</b>	<b>Adjusted OR (95% CI)</b>	<b>p-value **</b>
<b>Age range</b>				
6 to 8 years	1	<b>0.002</b>	1	<b>0.002</b>
9 to 10 years	0.31 (0.18 – 0.52)		0.30 (0.17-0.53)	
<b>Sex</b>	1			
Male	1.56			
Feminine	(0.67-3.65)	0.299	-	-
<b>Use fluoride</b>	1			
Yes	1.03			
No	(0.41-2.57)	0.943	-	-
<b>Tooth-brushing frequency/day</b>	1			
2 or more times	1.00			
0 to 1 time	(0.44-2.27)	0.995	-	-
<b>Candies /day</b>	1			
No	1.82			
Yes	(0.77- 4.33)	0.171	2.06 (0.84-5.05)	0.111
<b>Soft Drink/day</b>	1			
No	1.14			
Yes	(0.50- 2.60)	0.742	-	-
<b>Juice/day</b>	1			
No	4.09			
Yes	(0.93-17.03)	<b>0.061</b>	3.86 (0.85-17.56)	0.080
<b>Natural breastfeeding</b>	1			
No	0.36			
Yes	(0.13-0.98)	<b>0.047</b>	0.29 (0.10-0.88)	<b>0.029</b>
<b>Nighttime artificial baby bottle</b>	1			
No	0.98			
Yes	(0.43-2.21)	0.965	-	-

\* Adjusted for the variables: age group, candies / day, juices / day, natural breastfeeding (p < 0.20). \*\* Wald test (p <0.05 - statistically significant). OR - Odds Ratio; 95% CI - 95% confidence interval

Source: Research data.

This study aimed to investigate the experience of dental caries and its relationship with demographic characteristics, food, breastfeeding and oral hygiene in patients who underwent screening at the Children's Dental Clinic of a Higher Education Institution, where it was possible to verify the high experience of caries dental and untreated decayed teeth, in addition to the association with breastfeeding and age group.

The average dmft of 5.3 verified in the children's medical records between 6 and 8 years old was high, even considering that the study was carried out with patients who had some need for dental care. However, a population-based longitudinal study with 5-year-old children in the city of Pelotas found an average of 4.05, a high result, considering that the population was healthy.<sup>11</sup> In two cities, Belo Horizonte and Córdoba, the dmft investigated in children was 3.37 and 5.56, respectively.<sup>18</sup>

In Passo Fundo, the dmft found in an epidemiological survey with schoolchildren aged 5 to 6 years in the municipality was 4.1.<sup>19</sup> Some results from other regions show lower results, as well as in Carabayllo district in Peru, whose average dmft was 3.4.<sup>20</sup> In Porto Velho the dmft was 2.77,<sup>21</sup> similar to Distrito Federal with a dmft of 2.4.<sup>22</sup> However, better rates were found in Sobral, where the dmft was considered low - 1.97.<sup>23</sup> Very low rates were observed in a study in the city of Bahia, whose dmft was 0.53,<sup>20</sup> similar to a study carried out in João Pessoa (dmft 0.28).<sup>10</sup>

However, in children aged 9 to 12 years, the average DMFT was 2.0 considered low. In the municipality of Passo Fundo, a DMFT of 3.38 had already been registered in 2011,<sup>24</sup> however, they were schoolchildren aged 12 and 15 to 19 years old. In Porto Alegre, a study evaluating patients at the age of 12 at a Dental Clinic at the College, the average was 4.39.<sup>25</sup>

According to a study conducted in two cities, Belo Horizonte and Córdoba, the DMFT found was also low, DMFT 2.20 and 2.17, respectively.<sup>18</sup> In the city of Araucária, the DMFT was 2.4,<sup>26</sup> while in São Francisco do Conde, the DMFT was 1.45.<sup>20</sup> Lower averages were recorded in Nova Araçá, RS, the DMFT found was 1.22.<sup>27</sup> In a children survey in Thailand, DMFT was 1.6 at 12 years of age.<sup>28</sup> In Distrito Federal, the recorded DMFT was very low 0.16.<sup>22</sup> Unlike these results, some studies present extremely high data for a healthy population, as in a study by, in which the DMFT was 5.77 in children aged 7 to 12 years living in Ulaanbaatar, capital of Mongolia.<sup>29</sup>

However, some surveys have compared housing locations or schools in order to verify these differences. In a study carried out in João Pessoa, the average of dental caries among adolescents aged 12 who study in public schools was higher than those who study in private schools with averages of 3.37 and 1.35, respectively.<sup>30</sup> In two municipalities in the interior of Rio Grande do Sul, the total DMFT index was 2.32, showing no differences among the municipalities.<sup>31</sup>

In this study, it was possible to verify that older children were considered a protective factor for dental caries. Similar to a study by Goldenfum *et al.*,<sup>25</sup> which states that ages between 8 and 12 years can be considered a protective factor for caries. According to SB Brazil 2010, after 5 years of age, a Brazilian child has an average of 2.43 teeth with experience of dental caries, with a predominance of the decayed component, which is responsible for more than 80% of the index. However, 12-year-old children have an average of 2.07 teeth with experience of dental caries, and in the results of SB Brasil 2010, the authors report that the proportion of individuals free of caries decreases with age, considering the cumulative character of the indices used.<sup>32</sup> However, in the present study, the opposite was observed, the greater the age, the lower the chance of dental caries.

Here it is possible to reflect, is currently the age factor decreases the number of decayed teeth or if primary teeth are being neglected by parents and / or guardians? In Brazil, there is a lack of programs to clarify the importance of children's oral health, in a way that many parents believe that dental treatment and oral health care for children in primary dentition is not relevant because it is a temporary dentition. Therefore, parents' / guardians' knowledge and perception about dental caries is extremely important, clarifying doubts and educating for disease prevention, preventing it from being a precursor of the disease in permanent dentition.<sup>33</sup>

In addition, in the present study, children who were breastfed naturally had a protective factor of 30% compared to those who were not breastfed. Corroborating with Peres *et al.*<sup>11</sup> who investigated the appropriate period for breastfeeding, concluded that preventive interventions for dental caries should be established as soon as possible, and breastfeeding is beneficial to the children's health in the first year of life. Feldens *et al.*<sup>34</sup> also state in a study carried out in the city

of Porto Alegre that natural breastfeeding was positively associated with dental caries in early childhood, that is, natural breastfeeding is a possible target for the prevention of childhood caries. Tham *et al.*<sup>1</sup> report that breastfeeding in childhood can protect against tooth decay and contrary to the findings of this study, the study described that children exposed to longer periods versus shorter breastfeeding until the age of 12 months, had a reduced risk of caries and children breastfed for more than 12 months had an increased risk of caries when compared to children breastfed for less than 12 months.<sup>1</sup> Like Soares *et al.*<sup>35</sup> who also report that breastfeeding for more than one year of life is not a risk factor for early childhood caries. Another study carried out in the city of Pelotas by Hartwig *et al.*<sup>36</sup> report that children who were breastfed for a period longer than 24 months were more likely to have tooth decay when compared to children who were not breastfed for less than 6 months. According to Branger *et al.*,<sup>37</sup> breastfeeding up to one year of age is not associated with an increased risk of caries and may offer protection compared to babies' preparations and formulas. On the other hand, babies who are breastfed beyond 12 months of age show an increased risk of caries. Lemos *et al.*<sup>9</sup> describe that there is no adequate scientific evidence that demonstrates a clear relationship about the cariogenicity of breast milk, due to the fact that caries disease is multifactorial, which makes it susceptible to the presence of confounding factors, such as the early introduction of sucrose to the infant's diet and late initiation of oral hygiene habits.

The study herein had positive results regarding natural breastfeeding, which corroborates with other studies already mentioned<sup>11,34,35</sup>. It is a fact that natural breastfeeding is a form of health promotion, as it is the main source of nutrients for children in the first years of life, in addition to the strong relationship that there is between natural breastfeeding and the stomatognathic system development. Because the correct tongue and lips posture also allows for adequate breathing with a nasal pattern, in addition to nutrition. Neural maturity, evolution and adequacy of oral functions are vital and physiological functions that depend on exercises originating from natural breastfeeding and through this will guarantee a better quality of life.<sup>9</sup>

Although this study had no association with caries and night bottles, the authors emphasize that the lack of hygiene after night feeding and the early introduction of the bottle and artificial milk are worrisome data. Therefore, they suggest the need to reinforce educational measures for the parents.<sup>10</sup>

The present study had an association in the crude analysis between the experience of dental caries and the intake of juices, however, it lost the association in the final model adjusted in the multivariate regression analysis. However, the authors report that although 100% natural fruit juice is a healthy drink, a large amount of sugar is naturally found. About 100% of fruit juices have more sugar than regular soft drink, which



causes them to have moderately high glycemic indexes and their consumption was associated with an increased chance of tooth decay in children.<sup>8</sup> Natural fruit juice (100%) provides nutrients from the fruit itself, but it has often been combined with the addition of sugary content that can work differently in relation to oral health.<sup>38</sup> In a study by Goldenfum *et al.*<sup>25</sup> sugar intake can be considered a risk factor for developing active lesions. It is important that health professionals guide and motivate their patients to replace and / or decrease cariogenic dietary habits and adopt a healthier diet.<sup>39</sup>

It also observed in in this research that, from the medical records analyzed, 57.6% of them reported brushing their teeth only 0 to 1 time a day. This finding is of great relevance, even in the present study, having no association with dental caries, as inadequate hygiene favors a susceptible environment for the disease development. Goldenfum *et al.*<sup>25</sup> report an association between the presence of caries lesions and a lower frequency of tooth brushing. Ferreira *et al.*<sup>39</sup> strongly indicate that the prevention of dental caries should start from childhood and for this, the appropriate instruction and frequency of oral hygiene must be highlighted.

As a limitation of this study, it can be attributed to the fact that the design is cross-sectional, not being able to verify cause and effect because the data are analyzed in a single moment. The findings should not be generalized to other age groups and to countries with different socioeconomic characteristics. Another important point is the mothers' memory bias when responding to the data in the medical record, as many details are not remembered due to the time spent, such as information regarding breastfeeding, among others.

The present study had a statistically significant relationship in relation to the age group and the experience of dental caries, leading us to reflect how great the challenge is in reducing the rate of this disease in children with deciduous teeth, as well as permanent. It is of fundamental importance to implement guidelines and interventions for a better children's parents' and guardians' understanding, after having analyzed the findings of this study.

#### 4 Conclusion

The experience of dental caries in children who attended the Children's Dental Clinic was high, especially in primary teeth, with a higher average in the decayed component. Natural breastfeeding was considered a protective factor for dental caries, as well as the largest age group. The patients presented inadequate oral hygiene, with a greater frequency of brushing, at the most, once a day, although without association with dental caries.

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