




## Oral Health of Hospitalized Brazilian Children: A Cross-Sectional Study

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### Abstract

**Objective:** To evaluate the oral health conditions of hospitalized children, as well as describe the knowledge and practices of oral health care adopted by their parents/guardians. **Material and Methods:** The sample was composed of 46 children who had been hospitalized for at least five days, who had erupted teeth in the oral cavity and were accompanied by their parents/guardians. Information was collected in relation to: the oral health status of children (DMFT/DEF), the socioeconomic profile and access to information on health and oral hygiene of the parents/guardians and data regarding the hospitalization of the children. The data were analyzed using the Fisher, Pearson's and Mann Whitney's Chi-squared tests, with a confidence level of 95%. **Results:** 47.8% of the hospitalized children had experienced caries, and the most relevant component for the determination of the experience of caries was the presence of decayed teeth (0.50 to 1.94). A total of 97.8% of parents/guardians said they had not received information on oral health and hygiene, 100.0% had not received guidance on the sugar contained in medicines or the salivary decrease caused by the medications. 34.8% of the children did not perform oral hygiene during hospitalization. According to medical records, 58.7% took liquid medication orally. **Conclusion:** The hospitalized children had precarious oral health conditions, with the occurrence of carious lesions of the teeth. The presence of risk factors for dental caries in hospitalized children was observed (poor oral hygiene, low schooling and income of parents/guardians, limited knowledge of parents/guardians regarding health care and oral hygiene, consumption of medicines with cariogenic potential).

**Keywords:** Patients; Child, Hospitalized; Health Education; Oral Health.

## Introduction

During hospitalization, a child is subjected to a number of factors that differ from their normal routine and can negatively affect their oral health. In addition to systemic vulnerability related to the development of oral pathologies, determinants of dental caries and periodontal disease exist in the hospital routine and become more significant with longer periods of hospitalization [1]. These factors refer to the drastic change in meal times and eating habits, the introduction of cariogenic medications into the daily routine, the stress caused by hospitalization, an unwillingness to perform oral hygiene caused by illness and staying in a different environment than usual [2].

Children who continuously take medications containing sucrose in a liquid or chewable tablet form are at risk of developing dental caries if oral hygiene is not performed following the administering of the drug [3].

Hospitalized individuals, who are more concerned with their current illness, the reason why they are hospitalized, do not generally take care of their oral health [1]. However, maintaining oral health is known to be very important for the systemic health condition of hospitalized patients, due to the relationship between oral and systemic infections [2,4]. Hospitalization should encourage health, not the neglecting of oral health or the health of any other area of the body [5].

In monitoring the oral health care of hospitalized children, the parents/guardians have a fundamental role and should be guided and made aware of their responsibility regarding the oral health of their hospitalized children [2,6]. When carious lesions affect children, parents are considered responsible for the worsening of these injuries [7].

Oral health instructions, however simple, provide positive results and are essential during the hospitalization of children [8]. The indispensable addition of the dental surgeon to the medical team strengthens the maintenance of the integrity of the patient, who requires special care not only to treat the problem that led to hospitalization, but also to take care of other organs and systems that may suffer deterioration that is harmful for their recovery and prognosis, including oral health care [1].

The constant evolution of concepts relating to the promotion of health and the epidemiological understanding of multi-factorial health issues and the proposal of treatment base on the risk of caries have caused dental practice to return to the concept of health promotion, highlighting the need for action against predisposing or causative agents of diseases and not only in surgical-restorative treatment [9]. The promotion of oral health in the hospital environment, providing knowledge, motivating hospitalized patients and those accompanying them to establish good habits, aims at an integral and more humanized care of hospitalized patients [10].

Pediatric Dentistry, which is increasingly aware of its responsibilities, has demonstrated a concern for the treatment of hospitalized children and recommends that special attention is paid to the oral condition of these children [11]. The participation of the dentist in the hospital team that treats child patients, accompanying them before, during and after treatment, is of extreme importance, and the training of dental professionals and the establishing of dental surgeries in

hospital departments further encourages the integration of such health professionals within this team [12].

Considering the importance of paying special attention to the oral conditions of hospitalized children and the involvement of parents/guardians in the administering of medication and care related to its use among their children, as well as in the health care and oral hygiene of their hospitalized children, it is important to assess the oral health of hospitalized children, as well as identify the knowledge and oral health care practices adopted by parents/guardians during the hospitalization of their children in the pediatric clinic of a Brazilian University Hospital.

## Material and Methods

### Study Design

This is a descriptive-analytical and cross-sectional study, with the participation of children hospitalized in the pediatric ward of the Hospital Universitário Clemente de Faria (HUCF), Montes Claros, Brazil, between January and June 2016.

### Participants and Data Collection

The criteria for inclusion in the study were: children admitted to the hospital for at least five days, with erupted dental elements in the oral cavity and who permitted oral examination.

In order to identify the risk factors associated with dental caries in children, a questionnaire was applied among the parents/guardians of the hospitalized children, addressing their knowledge of dental caries, school attendance, family income, oral hygiene methods performed during hospitalization, length of hospitalization of the child, types of medication administered during hospitalization and access of children to dental treatment.

Data related to hospitalization were obtained from the children's medical records. The package inserts of all the liquid prescription drugs prescribed in the medical records of the hospitalized children were evaluated through the website of the National Sanitary Surveillance Agency [13] in order to verify the presence of sugars in their composition.

To ensure the suitability of the questionnaire, a pilot study was carried out with ten parents/guardians of the hospitalized children, who were randomly chosen and not part of the main sample. Through this pilot study, the existence of bias in the questionnaire applied to the parents/guardians of the hospitalized children was identified, with questions that were difficult to understand and included technical content, resulting in problems with obtaining answers consistent with the objectives of the studies. It was also verified that some data should be obtained from the respective medical records of the children, notably in relation to length of hospitalization, medical history, reason for hospitalization, and type of medication administered.

To assess the experience of dental caries, the oral examination of hospitalized children was performed by a single previously calibrated researcher (Kappa = 0.98) and followed the World Health Organization (WHO) diagnostic criteria [14], calculating the mean of the DEF index

(number of deciduous decayed, extracted and filled teeth) and the DMFT (number of permanent decayed, missing and filled teeth). The procedure complied with biosafety standards and was performed with the aid of sterile dental mirrors, artificial light, wooden spatulas and sterile gauze, in the children's own beds. The mother actively participated in the examination of the child, receiving information about their dental conditions. The child received a hygiene kit containing a toothbrush and toothpaste.

### Data Analysis

Absolute and percentage distributions were obtained during data analysis, and statistical analysis was performed using the Statistical Package for the Social Sciences (IBM Corp., Armonk, NY, USA) software package, version 20.0. The Fisher's test, Pearson's Chi-squared test ( $\chi^2$ ) and the Mann Whitney test were used for analytical statistical analysis, considering a level of statistical significance of 5% ( $p < 0.05$ ).

### Ethical Aspects

This study was approved by the Research Ethics Committee of the Universidade Estadual de Montes Claros (CEPEX 041/2015) and conducted within the precepts of Resolution 466/2012 of the Brazilian National Health Council. The parents/guardians were informed about the objectives of the research, and agreed to the participation of their children in the study by signing a Free and Informed Consent Form. Children over seven years of age also signed a Free and Informed Consent Form.

### Results

A total of 46 children accompanied by their parents participated in this study. The majority (65.2%) were male and aged between 11 months and 12 years of age (Table 1). When the oral hygiene habits during hospitalization of 46 children were analyzed, it was found that 34.8% did not perform oral hygiene when in hospital (Table 1). According to the parents/guardians, less than half of the hospitalized children had previously received dental care (45.7%). According to medical records, 58.7% of the hospitalized children used oral liquid medication (Table 1), and up to five different types of oral liquid medications per day were prescribed. The length of hospitalization of the children studied varied between 5 and 58 days.

Mothers (80.4%) were the most common group of relatives, 95.7% had less than ten years of schooling, and 73.9% declared they had a family income of up to a Brazilian minimum wage (Table 2). Regarding access to information during the hospitalization of their children, 97.8% of parents/guardians said they had not received information on oral health and hygiene, 100.0% did not receive advice about the sugar contained in the medications or the salivary reduction caused by the same. It was verified that 36.9% of parents/guardians did not consider dental caries to be a disease or did not know how to respond, 97.8% thought the presence of the dentist in the hospital was important, and 91.3% would have liked more information on oral health (Table 2).

**Table 1. Characterization of children according to gender, oral hygiene, access to dental treatment, experience of caries and use of medications.**

Variables	N	%
Gender		
Female	16	34.8
Male	30	65.2
Is Oral Hygiene Performed During Hospitalization?		
Yes	30	65.2
No	16	34.8
Has Child Previously Been to the Dentist?		
Yes	21	45.7
No	25	54.3
Has Child Experienced Caries?		
Yes	22	47.8
No	24	52.2
Did Child Take Liquid Medication When Hospitalized?		
Yes	27	58.7
No	19	41.3

**Table 2. Socioeconomic profile and access to information on oral health and hygiene of parents.**

Variables	N	%
Degree of Kinship of Individual Accompanying Child During Hospitalization		
Mother	37	80.4
Father	04	9.7
Others	05	9.9
Gender of Parent/Guardian		
Female	42	91.3
Male	04	8.7
Level of Education of Parent/Guardian		
Illiterate	02	4.3
<10 Years of Schooling	44	95.7
Family Income		
Up to Minimum Wage	34	73.9
From Two to Five Times Minimum Wage	11	23.9
Not Provided	01	2.2
Was Parent/Guardian Advised about Sugar Contained in Medications and the Reduction of Saliva Caused by the Same During the Hospitalization of Their Child?		
Yes	0	0.0
No	46	100.0
Was Parent/Guardian Advised about Health and Oral Hygiene During the Hospitalization of Their Child?		
Yes	0	0.0
No	45	97.8
Could Not Say	01	2.2
Does Parent/Guardian Consider Tooth Caries to be a Disease?		
Yes	29	63.0
No	14	30.4
Could Not Say	03	6.5
Does Parent/Guardian Think the Presence of a Dentist in the Hospital is Important?		
Yes	45	97.8
No	01	2.2
Would Parent/Guardian Like to Have More Information about Oral Health?		
Yes	42	91.3
No	04	8.7

Among children who performed oral hygiene, 86.7% used toothbrushes and toothpaste, only 10.0% used dental floss and the children themselves most frequently brushed their teeth (60.0%). Regarding the frequency of oral hygiene during hospitalization, 30.0% reported carrying out oral hygiene only once a day (Table 3).

**Table 3. Characterization of oral hygiene habits of children who brush their teeth during hospitalization.**

Variables	N	%
Do Children Brush Their Teeth alone During Hospitalization?		
Yes	18	60.0
No	12	40.0
How Many Times do They Brush Per Day?		
Once	09	30.0
Twice	13	43.3
Three or more	08	26.7
How Do They Perform Oral Hygiene During Hospitalization?		
Brush and Toothpaste	26	86.7
Brush and Toothpaste and Floss	03	10.0
Gauze, Diaper or Cotton with Water	01	3.3

It was found that 23.9 % of the children who liquid medication taken orally did not perform oral hygiene during hospitalization (Table 4).

**Table 4. Distribution of children in terms of the use of oral liquid medication and the performance of oral hygiene during hospitalization.**

Oral Hygiene During Hospitalization	Did Child Take Oral Liquid Medication During Hospitalization?					
	Yes		No		Total	
	N	%	N	%	N	%
Yes	9	19.6	21	45.6	30	65.2
No	11	23.9	5	10.9	16	34.8
Total	20	43.5	26	56.5	46	100.0

From the oral exam, 60,9 % of the children had deciduous dentition, 34.8% mixed and 4.3% permanent (Table 5). For the analysis of the experience of dental caries of the children in this study, the DEF and DMFT indexes were used for the deciduous and permanent teeth. The average DMFT of the hospitalized children was 1.00 ( $\pm 1.31$ ) and 0.50 ( $\pm 0.71$ ) for mixed and permanent dentition, respectively. The mean DEF found was 1.32 ( $\pm 2.51$ ) and 2.81 ( $\pm 3.65$ ) in the deciduous and mixed dentition, respectively. The presence of decayed teeth (mean change from 0.50 to 1.94) was the most relevant component for determining experience of dental caries (Table 5). In the present study, 47.8% of the children had an experience of caries based on the DMFT and DEF (DMFT + DEF > 0) indexes while 52.2% had no experience of caries (DMFT + DEF = 0).

There was a significant association between the dental caries experience of hospitalized children in the HUFC and the variables child's age ( $p < 0.001$ ), mean family income of the hospitalized child ( $p = 0.04$ ) and the fact that the child had been to the dentist ( $p = 0.003$ ) (Table 6). However, no statistically significant association was found between the dental caries experience of children



hospitalized in the HUFC and the other variables ( $p>0.05$ ) (Table 6), including the use of oral liquid medication during hospitalization ( $p>0.05$ ) (Table 7).

**Table 5. Descriptive analysis of dental exam of children hospitalized.**

Variables	Dentition		
	Deciduous Mean (SD)	Mixed Mean (SD)	Permanent Mean (SD)
Permanent Teeth	-	10.13 (4.16)	28.00 (0.01)
Healthy Permanent	-	9.13 (3.82)	27.50 (0.70)
Decayed Permanent	-	0.94 (1.28)	0.50 (0.70)
Filled Permanent	-	0.06 (0.25)	0.00 (0.00)
Missing Permanent	-	0.00 (0.00)	0.00 (0.00)
DMFT	-	1.00 (1.31)	0.50 (0.71)
Deciduous Teeth	16.61 (4.10)	13.44 (3.40)	-
Healthy Deciduous	15.29 (4.19)	10.63 (4.54)	-
Decayed Deciduous	1.11 (1.91)	1.94 (2.04)	-
Filled Deciduous	0.04 (0.19)	0.50 (1.75)	-
Extracted Deciduous	0.19 (0.68)	0.38 (0.80)	-
DEF	1.32 (2.51)	2.81 (3.65)	-
Total	28 (60.8%)	16 (34.8%)	02 (4.3%)

**Table 6. Association between the experience of dental caries and some independent variables.**

Variables	Experience of Dental Caries		p-value
	Yes N (%)	No N (%)	
Mean Family Income of Parent/Guardian			
≤1 Minimum Wage	14 (41.2)	20 (58.8)	
From 2 to 5 Minimum Wages	09 (81.8)	02 (18.2)	0.040*
Did Not Say	01 (100.0)	00 (0.0)	
Gender of Child			
Female	07 (43.8)	09 (56.2)	0.404*
Male	17 (56.7)	13 (43.3)	
Age			
<23 Months	09 (100.0)	00 (0.0)	
Between 23 and 84 Months	13 (50.0)	13 (50.0)	<0.001
>84 Months	02 (18.2)	09 (81.8)	
During Hospitalization was Parent/Guardian Given Information about Health and Oral Hygiene of Their Child?			
Yes	01 (100.0)	00 (0.0)	0.522
No	23 (51.1)	22 (48.9)	
During Hospitalization did Child Perform Oral Hygiene?			
Yes	13 (43.3)	17 (56.7)	0.100*
No	11 (68.8)	05 (31.2)	
How Many Times did the Child Brush Their Teeth During Hospitalization?			
Once	03 (33.3)	06 (66.7)	0.225*
Twice	05 (38.5)	08 (61.5)	
Three Times or More	05 (62.5)	03 (37.5)	
Did Not Brush Teeth	11 (68.8)	05 (31.2)	
Who Brushed the Child's Teeth During Hospitalization?			
Child Alone	05 (27.8)	13 (72.2)	0.346

Child with Help From Parent/Guardian	02 (50.0)	02 (50.0)	
Mother/Parent/Guardian	06 (75.0)	02 (25.0)	
Did not Brush Teeth	11 (68.8)	05 (31.2)	
Does Parent/Guardian Consider Dental Caries a Disease?			
Yes	14 (48.3)	15 (51.7)	0.751
No	10 (57.1)	07 (42.9)	
Has Child Previously been to the Dentist?			
Yes	06 (28.6)	15 (71.4)	0.003*
No	18 (72.0)	07 (28.0)	
Does Parent/Guardian Considers the Presence of the Dentist in the Hospital Important?			
Yes	24 (53.3)	21 (46.7)	0.478
No	00 (0.0)	01 (100.0)	
Did Child Take Liquid Medication During Hospitalization?			
Yes	15 (55.6)	12 (44.4)	0.584*
No	09 (47.4)	10 (52.6)	
Total	24 (52.2)	22 (47.8)	
Did Medication Contain Sucrose or Saccharin?			
Sucrose	09 (60.0)	06 (40.0)	0.753*
Saccharin	06 (50.0)	06 (50.0)	
Not Reported in the Package Insert	09 (47.4)	10 (52.6)	

Fisher Test; \*Pearson Chi-squared Test.

**Table 7. Association between the use of oral liquid medication during hospitalization and mean DMFT and DEF.**

	Took Liquid Medication		p-value*
	Yes Mean (SD)	No Mean (SD)	
DMFT	0.83 (1.33)	1.17 (1.16)	0.389
Decayed	0.83 (1.33)	1.00 (1.09)	0.474
Missing	0.00 (0.00)	0.00 (0.00)	1.000
Filled	0.00 (0.00)	0.17 (0.41)	0.157
DEF	1.52 (2.33)	2.32 (3.77)	0.682
Decayed	1.32 (1.99)	1.53 (2.01)	0.729
Extracted	0.17 (0.48)	0.37 (0.95)	0.685
Filled	0.04 (0.20)	0.42 (1.61)	0.386

\*Mann-Whitney Test.

## Discussion

It was found that, in general, mothers most frequently accompanied the hospitalized children. Considering the important role of mothers in the family nucleus and in actions of health promotion [15], and the fact that dental caries are a highly prevalent yet preventable childhood illness, it is fundamental that the mother and/or caregiver of the hospitalized child is included in promotion, prevention and education in oral health, making them multipliers of information [7].

Previous studies have shown that the majority of the parents/guardians of hospitalized children were female - 84.4% [16] and 91.8% [15], and that mothers were the most frequent relation (87.9%) [15]. The important role of mothers within the family nucleus and education [9] can therefore be seen. However, in order for these practices to actually lead to oral health, and to be



safe and become routine in children's lives, such individuals need sufficient knowledge and periodic reinforcement of the same in order to maintain established habits.

The predominance of low levels of schooling and income of the parents/guardians can be explained by the fact that the Hospital Universitario Clemente de Faria is an institution that provides care exclusively through the Brazilian Unified Health System (SUS). The socioeconomic profile of the population who seek hospital care through SUS comprises individuals with low income and educational levels and, consequently, a greater need for dental care [17].

As for the low number of hospitalized children who had previously received dental care, a similar result was found in another study [18], demonstrating the reduced access of children to dental care.

It was found that some of the hospitalized children did not perform any type of oral hygiene during hospitalization. Oral hygiene practices play an important role in the prevention of oral diseases, and a wide variety of methods are available for the mechanical removal of bacterial plaque [9]. Studies report that toothbrushes are the most universal, effective and important resource for dental hygiene, but dental floss is also considered a highly effective device to supplement brushing in interdental areas [19,20]. This is a cause for concern, as most parents/guardians do not encourage, nor are they encouraged to, the brushing and flossing of the teeth of their children. The problem is not limited only to a lack of hygiene after eating, but also after the administering of medications containing sugar to their children. The cariogenic and erosive potential of sugar-containing medications associated with ineffective oral hygiene increases the risk of dental carious lesions [2,21-24].

Hospitalization should promote health, and not neglect oral health, nor that of any other area of the body [5]. The adoption of healthy habits in childhood contributes to the full growth and development of the child and to the prevention of diseases, reflecting the quality of life of the family. The evaluation and control of the risk factors related to the development of caries are of fundamental importance to the identification of individuals who are more predisposed to the disease and subsequently achieving a significant reduction in future indices of dental caries [25,26].

Oral health education is essential to establishing healthy oral practices. However, in order for these practices to actually result in oral health, and to be safe and become routine in the lives of children, parents/guardians require sufficient knowledge and periodic reinforcement of the same in order to maintain established habits [27].

In this study, a high consumption of oral medications with a cariogenic potential was observed during hospitalization, with a lack of oral hygiene, and long periods of hospitalization for the children studied. A study has shown [28] that a large proportion of parents/guardians did not perform the oral hygiene of children after the ingestion of liquid medications, demonstrating the low levels of education of such individuals regarding the association between the use of liquid pediatric medicines containing sugar, inefficient oral hygiene and dental caries, especially when considering that many of these medications are taken at night.

The cariogenic and erosive potential of sugar-containing medications associated with ineffective oral hygiene increases the risk of dental carious lesions [2,21-24]. Therefore, suitable oral hygiene practices should be performed after each dose of medication, as this is the first step in reducing the risk of dental caries in children requiring long-term liquid therapy [29].

Regarding the carious indexes of the hospitalized children, in the present study, the mean DMFT was lower and the mean DEF was significantly higher than in other studies [1,30], revealing a greater experience of caries in the deciduous teeth.

According to literature, a higher index of caries in the deciduous dentition is usually due to negligence in oral hygiene practices in younger children. Additionally for some parents the deciduous dentition is not considered as important as the permanent teeth [31].

The fact that the number of decayed teeth was greater than the number of filled teeth shows that the children in the study did not have access to dental treatment, identifying a difficulty in accessing health services. The purpose of hospital dentistry is to act on changes in the oral health of hospitalized patients through a multidisciplinary team, ensuring a comprehensive approach to the individual [32].

In this way, it is necessary to encourage the formation of multidisciplinary teams in the hospital environment in order to emphasize the adoption of health promotion measures, including in oral health, in an attempt to help improve the systemic situation during hospitalization, including all the subjects involved, namely the children, caregivers and health professionals [15]. The present study has limitations, as it uses a sample of convenience.

Based on the results found, the implementation of a Health Education project in the hospital is suggested, composed of a multidisciplinary team, with the introduction, at a hospital level, of habits of hygiene and preventive care for the oral health of hospitalized children.

## Conclusion

The hospitalized children had a precarious oral health condition, with the incidence of dental carious lesions. The presence of risk factors for dental caries among the hospitalized children (poor oral hygiene, low schooling and income of the parent/guardian, precarious knowledge of the same regarding health care and oral hygiene, and consumption of drugs with cariogenic potential) was observed. Therefore, it is important to implement multidisciplinary and multiprofessional strategies, including a dental surgeon, aimed at promoting oral health, reducing risk factors for dental caries and providing comprehensive care for hospitalized children.

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