



## Chronology of the First Deciduous Tooth Eruption in Brazilian Children with Microcephaly Associated with Zika Virus: A Longitudinal Study

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### Abstract

**Objective:** To analyze the chronology of first deciduous tooth eruption in children with microcephaly associated with presumed or confirmed Zika virus. **Material and Methods:** A longitudinal study was developed with 74 children of both sexes. Data on prematurity, gestational age (in weeks), anthropometric characteristics at birth [length (cm), weight (g) and cephalic perimeter (cm)] and dental eruption (chronological age and corrected age for prematurity in months) were collected and presented through descriptive statistics. Data was analyzed using the Statistical Package for Social Sciences. **Results:** The majority of children were female (54.1%) and 14.9% were born premature. The mean gestational age was 38.2 ( $\pm$  1.9) weeks, while length, weight and cephalic perimeter at birth were 45.6 ( $\pm$  3.1) cm, 2750 ( $\pm$  526.6) and 30 ( $\pm$  2.3) cm, respectively. The eruption of the first tooth occurred on average at 12.3 ( $\pm$  3.0) months of chronological age and at 11.1 ( $\pm$  2.3) months of corrected age. The first erupted teeth were the lower deciduous central incisors (82.4%). The mean age for dental eruption in males was 12.5 months ( $\pm$  3.0) and in females 12.0 months ( $\pm$  3.1) among full-term children. For premature infants, the mean corrected age of dental eruption was 11.5 months ( $\pm$  3.4) for boys and 11 months ( $\pm$  1.7) for girls. **Conclusion:** In this group of children with microcephaly, the first tooth to erupt was the lower central incisor around the first year of life. Girls had lower average eruption time when compared to boys in both chronological age and age corrected for prematurity.

**Keywords:** Tooth Eruption; Tooth, Deciduous; Microcephaly; Zika Virus Infection.

## Introduction

The Zika virus (ZIKV) is an arbovirus of the family Flaviviridae, genus Flavivirus [1], whose main form of transmission is by pricking from an infected mosquito of the genus Aedes [2]. Arboviruses have teratogenic potential and are a growing threat to public health [3]. In Brazil, ZIKV was declared a Public Health Emergency after researchers reported an unexpected increase in the diagnosis of fetal and pediatric microcephaly [4-7].

Although congenital microcephaly has been a hallmark of intrauterine infection by the Zika virus [8], this condition is considered a sign of extensive encephalopathic changes [9]. The absence of microcephaly at birth does not exclude congenital infection by Zika virus [8].

The majority of cases under monitoring of changes in growth and development related to Zika virus infection and other infectious etiologies are concentrated in the northeastern region of the country, with Paraíba being the third State of the Federation with the highest number of cases of children with microcephaly [10]. For being a recent condition, the orofacial changes that may occur in these children [11], including the pattern of tooth eruption, which is related to the general growth and metabolic function of the individual, are still unknown [12].

The time of formation, calcification and eruption of deciduous teeth is subject to individual differences [13] and is genetically influenced [14,15], and can be affected by several other factors such as sex, ethnicity, birth weight and length, nutritional status, socioeconomic status [16] and congenital anomalies [17].

Considering the absence of similar studies on the deciduous eruption in infants with microcephaly, the present study aimed to describe the chronology of the first deciduous tooth eruption in Brazilian children with microcephaly associated with Zika virus.

## Material and Methods

### Study Design and Location

This epidemiological study of dynamic cohort was conducted in the city of Campina Grande, located in the Agreste region of Paraíba State, 112km from the capital city of João Pessoa, Brazil. The municipality has estimated population of 410,332 inhabitants, infant mortality rate of 12.7 cases per 1,000 live births and Human Development Index (HDI) of 0.72.

### Data Collection

Data collection occurred between September 22, 2016 and October 15, 2017. The sample consisted of 74 children of both sexes, with microcephaly resulting from congenital infection by presumed or confirmed ZIKV.

Examinations were conducted in a reserved place with natural light by a researcher. The technique used was the knee-knee position (infant in dorsal decubitus, with head and part of the trunk on the examiner's lap and the rest of the body on the parent / guardian's lap) in order to allow

a systematic inspection by quadrant. At the end of the examination, parents / guardians received guidance on the adoption of dietary habits and oral hygiene.

Infants were examined at monthly intervals until the eruption of the first deciduous tooth. A tooth was considered to have erupted when any part of its crown was visible in the oral cavity [18-20]. Nomenclature adopted by the International Dental Federation and the American Dental Association was used for tooth identification [20,21].

Information collected included gestational age (in weeks), child's age at the time of first tooth eruption (in children born before 37 weeks of gestation [22], age was corrected for prematurity: subtracted from the number of weeks that were missing to complete 40 weeks at birth [20]), head circumference (in cm), gender, length (in cm) and weight (g) at birth.

### Statistical Analysis

For the analysis of data, the SPSS (Statistical Package for the Social Sciences for Windows - version 18.0) was used. Descriptive statistics (absolute distributions, percentages, mean and standard deviation) was also used.

### Ethical Aspects

This research was approved by the Research Ethics Committee of the State University of Paraíba under number 66941917.7.0000.5187. Prior to examinations, parents / legal guardians of research subjects were clarified about the objectives of the study and agreed to their participation by signing the Free and Informed Consent Form.

### Results

The majority of children were female (54.1%) and 14.9% were born premature. Data on mean and standard deviation of weight, length and cephalic perimeter at birth, gestational age and chronology of the first deciduous tooth eruption are shown in Table 1 and are presented separately for male and female as well as for the sample total.

**Table 1. Distribution of children according to anthropometric characteristics, gestational age and chronology of tooth eruption according to sex.**

Variables	Male		Female		Total	
	Mean	SD	Mean	SD	Mean	SD
Birth weight (g)	2781	475.9	2724	570.9	2750	526.6
Length at birth (cm)	46.4	2.3	44.9	3.5	45.6	3.1
Head circumference at birth (cm)	30.2	2.2	29.8	2.5	30.0	2.3
Gestational age (weeks)	38.4	2.0	38.1	1.9	38.2	1.9
Eruption (chronological age - months)	12.5	3.0	12.0	3.1	12.3	3.0
Eruption (corrected age - months)	11.5	3.4	11.0	1.7	11.1	2.3

SD = Standard Deviation.

The mean gestational age was 38.2 weeks, and length, weight and cephalic perimeter at birth were 45.6 cm, 2750 g and 30 cm, respectively (Table 1). The eruption of the first tooth occurred on average at 12.3 ( $\pm$  3.0) months of chronological age and at 11.1 ( $\pm$  2.3) months of corrected age. The

average age for first tooth eruption in males was 12.5 months ( $\pm 3.0$ ) and in females 12.0 months ( $\pm 3.1$ ) for full-term infants. For premature infants, mean corrected eruption age was 11.5 ( $\pm 3.4$ ) months for males and 11 ( $\pm 1.7$ ) months for females.

In the entire sample, the first teeth to erupt were the lower central incisors in 82.4% of cases, the mandibular ones (71/81) and in 14.9%, maxillary teeth (51/61). The simultaneous eruption of the upper and lower central incisors was verified in only 2.7% of children. When analyzing dental eruption according to sex, it was verified that in girls, lower central incisors (85%) first erupted, followed by the upper central incisors (15%), whereas in boys, the first teeth to erupt were inferior central incisors (79.4%), upper central incisors (14.7%) and only 5.9% of children showed simultaneous eruption of upper and lower central incisors.

## Discussion

Knowing to recognize situations of normality involving the oral cavity of children in their first years of life and, at the same time, to identify possible abnormalities is the role of health professionals [11,23]. This study aimed to describe the chronology of the first deciduous tooth eruption of children with ZIKV-associated microcephaly, and found that the lower central incisors were the first erupted teeth and that this event occurred at around 12 months of age.

Despite the existence of deciduous teeth eruption chronology tables that are used as standard in scientific research and clinical practice, continuous studies on chronology and eruption sequence are justified due to hereditary, environmental and systemic factors that may show differences in the eruptive process [24]. This wide diversity of factors that influence dental eruption justifies this research in a specific population of children with ZIKV-associated microcephaly, since there are differences at the time of dental eruption among populations, and it is essential that each population establishes its own eruption timeline [21].

A previous study developed on the phenotypic spectrum of the Zika virus congenital syndrome found that children aged 6-10 months did not have deciduous teeth erupted in the oral cavity [7], confirming the findings of this research. In healthy infants, growth parameters and feeding patterns may be determinants of tooth eruption [19]. The delayed eruption of deciduous teeth, especially the first teeth, causes nutritional problems for infants [14]. However, chewing and swallowing are processes that can also be affected by structural, physiological or neurological disturbance, which can cause dysphagia [25]. Dysphagia appears to be a common feature of ZIKV-associated microcephaly [11] due to the disorganization of voluntary swallowing activity, including oral phase dysfunction with changes in food intake and lip closure, loss of food in the mouth, improper positioning of the food bolus and bolus ejection [26].

Some children use probe and their diet presents a great variation of consistency, texture and type of food, being also influenced by the degree of neurological impairment. However, for microcephalic children with less neurological impairment, the delay in the eruption of the deciduous dentition is another factor that may contribute to malnutrition.

In addition, deciduous teeth play an important role in establishing adequate occlusion of permanent teeth [14,27] and participate in the development of facial muscles and speech [27]. In the present investigation, the first teeth to erupt were the lower central incisors, predominantly mandibular. This pattern is consistent with literature [20,21]. However, it was found that girls had shorter average eruption time, a result that was different from other findings [18,21] in which boys showed shorter eruption time.

It is important to avoid contact of the child with sugary drinks and foods, as well as the early adoption of healthy oral hygiene habits in children [11,28,29]. Erupting teeth are difficult to clean and cleaning can be avoided due to sensitive gums and behavioral factors in children [27]. In this sense, oral hygiene becomes mandatory from the moment the teeth erupt and later eruption can be even positive considering that the mother can develop a greater ability to care for the erupted teeth. Parents and / or caregivers of children with ZIKV-associated microcephaly have an intense routine of therapies that often occur in different locations, requiring displacement and stressing the subjects involved. Thus, persistence and routine necessary to perform oral hygiene can be compromised. On the other hand, frequent contact with health professionals may be a factor that would favor oral health care. Children with neurological impairment often do not respond to stimuli and controls, a feature that hinders biofilm control [28].

Society has been preparing to qualify the assistance of individuals with special needs [30]. In the case of children with neurological disorders, there is also a need for early preventive interventions to guide parents and caregivers on the adoption of healthy eating habits and satisfactory biofilm control [11,31], considering that most children with special needs are dependent on their caregivers to carry out their daily life activities [30].

In this study, children with microcephaly associated with maternal infection by ZIKV during gestation presented a delay in tooth eruption. Preterm and low-weight children showed a slight delay in the onset of dental eruption when compared to full-term infants [32], which was not observed in the present study.

Children with ZIKV-associated microcephaly, due to neurological impairments [33], routinely use continuous-use medications [11]. The use of continuous medication is not the only causal factor for the presence of dental caries [30]; however, considering that pediatric drugs have tooth demineralization potential, these individuals will present an increased risk of erosive lesions [34,35] and caries, since pediatric medicinal products have high concentration of sugars, high titratable acidity, pH below critical value and high viscosity [36].

## Conclusion

In this group of children with microcephaly, the first teeth to erupt were the lower central incisors around the first year of life. Girls had earlier eruption when compared to boys, both in chronological age and in the age corrected for prematurity.

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