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## ARE PREMATURETY AND LOW BIRTH WEIGHT ASSOCIATED WITH A DELAY IN THE CHRONOLOGY OF THE ERUPTION OF THE FIRST TOOTH?

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### ABSTRACT

**Objective:** To describe the association between the eruption chronology of the first primary teeth among preterm birth and birth weight. **Methodology:** This is a cross-sectional study, carried out at the Institute of Social Perinatology of Piauí, in the Preventive Program for Pregnant Women and Babies. The research was approved by the UFPI Research Ethics Committee with protocol number 2,445,846. After signing the consent form, the mothers answered the questionnaire with questions related to the baby's socioeconomic data. Then, a clinical examination of the oral cavity and verification of the presence of primary teeth were performed, and these were classified according to the World Dental Federation. The data was tabulated in the SPSS for Windows, version 20.0, to determine the prevalence of tooth eruption in preterm and term babies, using Poisson Regression tests, Kolmogorov-Smirnov normality test, and Mann-Whitney test. **Results:** 229 babies of both genders were examined, of which 39.7% were of preterm birth, and 60.3% were full-term babies. It was found during the study that the first primary tooth in babies under 37 weeks erupted on average at 7.96 months of age, while the average tooth eruption in full-term babies was 6.34 months, being statistically significant ( $p < 0.001$ ). **Conclusion:** Male babies with extremely low birth weight, very low birth weight, and low birth weight, had a higher prevalence of erupting their first teeth after 6 months of age. Preterm babies presented, on average, the eruption of the first primary tooth after the term babies.

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## INTRODUCTION

Tooth eruption is an integral part of the child's growth and development processes and promotes physiological stimulation of the stomatognathic system (WANG *et al.*, 2019). The mechanism responsible for the eruptive movements is not fully elucidated (CRADDOCK; YOUNGSON, 2004).

Dental development and eruption chronology of deciduous teeth are influenced by socioeconomic conditions and prenatal, metabolic and nutritional factors (SHAWEEESH, 2018; AL-BATAYNEH, 2018). A newborn is considered premature when birth occurs before 37 weeks of gestation. The prevalence of premature births in Brazil was 11.7% in 2013, showing a growth of 4.5% compared to that recorded in the period from 2000 to 2010 (Ministry of Health and UNICEF, 2013). Preterm infants can be classified as low birth weight (<2,500g), very

low birth weight (<1,500g) and extremely low birth weight (<1,000g) (EDMOND, 2006; VON *et al.*, 2007). Prematurity and low birth weight can interfere with the child's general development, including abnormalities in neuromotor development (DADALTO *et al.*, 2018). Patterns related to the eruption of deciduous teeth have been little studied. The association between chronology of these teeth eruption and prematurity and birth weight is not fully understood (FERNANDES NETO; FALCÃO, 2014; PAVIČIN *et al.*, 2016). The influence of prematurity on the process of tooth eruption has been reported, indicating a delay in the eruption of the first deciduous tooth in infants born preterm, when compared with those born at term or with the average eruption described for children with similar characteristics. The standard eruptive stage of the primary dentition, in general, begins with the eruption of the lower central incisors, with an average described in the literature of  $7.68 \pm 2.84$  months,  $8.2 \pm 0.8$  months,  $8.3 \pm 3.1$  months and  $8.5 \pm 2.6$  (DADALTO *et al.*, 2018). Therefore, the present study aims to determine the association between prematurity and birth weight and chronology of eruption of the first deciduous teeth.

## METHODOLOGY

**Ethical procedures:** This study was approved by the Research Ethics Committee of the Federal University of Piauí (opinion No. 2,445,846) and complied with the ethical standards established in the Declaration of Helsinki. Those responsible signed the Free and Informed Consent Term. The writing of the article followed the recommendations of the "Strengthening the Reporting of Observational Studies in Epidemiology" (STROBE Statement).

**Population, sample and study setting:** Cross-sectional study, with a convenience sample composed of children assisted in a maternal and child care project – Preventive Program for Pregnant Women and Babies (PPGB) (LOPES *et al.*, 2014), whose actions are developed at the Instituto de Perinatologia Social do Piauí, located in Teresina, Piauí, Brazil, from August 2017 to April 2019. This is a health outpatient clinic linked to the reference maternity hospital in the state of Piauí (Maternity Dona Evangelina) that received the Baby-Friendly Hospital Initiative seal. The services provided at the PPGB are carried out in an interdisciplinary manner.

**Eligibility Criteria:** Infants younger than 12 months who had an erupted tooth were included in this study. Syndromic babies, those with neurological disorders and those with cleft lip and palate were excluded.

**Pilot study:** To evaluate the methodology of execution of the study, a pilot study was carried out with 20 babies assisted at the PPGB. There was no need for methodological changes and these babies were not included in the final sample.

**Data collect:** Data on gender, birth condition, admission to the Neonatal Intensive Care Unit (NICU), type of delivery, birth weight, health problem and use of medication by the baby were collected from the vaccination booklet. In addition, the mother answered a questionnaire about the number of consultations during prenatal care, health problems during pregnancy and the time of eruption of the baby's first tooth. Then, an examination of the oral cavity was performed, in the knee-to-knee position (the baby's head resting on the examiners' legs), under indirect fluorescent lighting. The tooth was considered erupted when it broke the gingival margin. The child was considered premature when the birth occurred before 37 weeks of gestation (WHO, 2017). To calculate the mean chronological age and corrected age for prematurity, the postnatal age was subtracted from the number of weeks, months and days needed to complete 40 gestational weeks, which is considered the standard time for the baby's birth, and then it was mean age is taken (FERNANDES NETO; FALCÃO, 2014). Baby weight was classified as low (<2,500g), very low (<1,500g) and extremely low (<1,000g) weight (EDMOND, 2006).

**Statistical analysis:** Data processing and statistical analysis were performed using the Statistical Package for the Social Sciences program (SPSS® for Windows, version 20.0, Armonk, NY, USA: IBM Corp). The dependent variable, eruption of the first tooth, was dichotomized into less than or equal to 6 months and greater than 6 months (VIANA *et al.*, 2013). to verify its association with independent variables (gender, weight, birth condition). Descriptive analysis and Poisson regression with robust variance, Kolmogorov-Smirnov normality test and Mann-Whitney test were performed. The magnitude of the association was assessed by unadjusted and adjusted prevalence ratios (PR), confidence intervals (95% CI), and p-values. Variables with p values  $\leq 0.20$  in the bivariate analysis were included in the adjusted model. Statistical significance was determined at the 5% level ( $p < 0.05$ ).

## RESULTS

A total of 229 babies were included in this study. The sociodemographic characterization and general and oral health conditions of the study participants are described in Table 1. Most babies had normal weight (64.6%) and were born at term (60.3%) (Table 1).

**Table 1. Sociodemographic and general and oral health conditions**

Variables	n (%)
Sex	
Female	97 (42.3)
Male	132 (57.7)
Weight (grams)	
< 1500	33 (14.4)
1500 - 2499	48 (21.0)
$\geq 2500$	148 (64.6)
birth condition	
at term	138 (60.3)
preterm	91 (39.7)
Presence in the NICU	
Yes	68 (29.7)
No	161 (70.3)
type of delivery	
Normal	86 (37.5)
Caesarean	143 (62.5)
Baby health problem	
Yes	31 (13.5)
No	198 (86.5)
Number of consultations during prenatal care	
$\leq 4$	25 (89.1)
$> 4$	204 (10.9)
Maternal health problem during pregnancy	
Yes	55 (24.0)
No	174 (76.0)
first erupted tooth	
81	72 (31.5)
71	43 (18.7)
51	7 (3.1)
61	8 (3.5)
51.61	21 (9.2)
71.81	74 (32.3)
51,61,71,81	1 (0.4)
Other	3 (1.3)
Total	229 (100.0)

NICU- Neonatal Intensive Care Unit

The average age of the child was 11 months. The association of age at first tooth eruption and sociodemographic conditions and general and oral health are described in table 2. Extremely low/very low birth weight babies (PR = 1.68; 95%CI = 1.44 – 1.96) and low birth weight (PR = 1.50; 95% CI = 1.29 – 1.74) were 68% and 50% more likely, respectively, to have their first tooth erupted after six months of age than normal-weight babies. Male babies were 13% (PR = 1.13; 95%CI = 1.01 – 1.27) more likely to erupt their first tooth after six months of age (Table 2). The association between chronological and corrected ages of eruption of the first deciduous tooth and the condition at birth are shown in Table 3.

**Table 2. Association of age at first tooth eruption and socioeconomic conditions and general and oral health conditions**

Variables	Age of eruption of the first tooth (months)		unadjusted RP (CI 95%)			
	≤6 n (%)	>6 n (%)	P *	adjusted RP (CI 95%)	P*	
<b>Sex</b>						
Male	49 (37.1)	83 (62.9)	1.13 (0.99 - 1.29)	0.061	1.13 (1.01 - 1.27)	0.027
Female	48 (49.5)	49 (50.5)	1		1	
<b>Weight (grams)</b>						
< 1499	2 (6.1)	31 (93.9)	1.69 (1.51 - 1.90)	<0.001	1.68 (1.44 - 1.96)	<0.001
1500 - 2499	8 (16.7)	40 (83.3)	1.52 (1.33 - 1.74)	<0.001	1.50 (1.29 - 1.74)	<0.001
≥ 2500	87 (58.8)	61 (41.2)	1		1	
<b>birth condition</b>						
preterm	18 (19.8)	73 (80.2)	1.45 (1.29 - 1.63)	<0.001	-	-
at term	79 (57.2)	59 (42.8)	1			
<b>Presence in the NICU</b>						
Yes	13 (19.1)	55 (80.9)	1.39 (1.23 - 1.57)	<0.001	1.01 (0.87 - 1.17)	0.891
No	84 (52.2)	77 (47.8)	1		1	
<b>type of delivery</b>						
cesarean	55 (38.5)	88 (61.5)	1.11 (0.97 - 1.27)	0.124	-	-
Normal	42 (48.8)	44 (51.2)	1			
<b>Baby health problem</b>						
Yes	8 (25.8)	23 (74.2)	1.21 (1.02 - 1.43)	0.026	1.10 (0.95 - 1.28)	0.184
No	89 (44.9)	109 (55.1)	1			
<b>Maternal health problem during pregnancy</b>						
Yes	18 (32.7)	37 (67.3)	1.13 (0.98 - 1.31)	0.085	-	-
No	79 (45.4)	95 (54.8)	1			
Total	97 (42.4)	132 (57.6)				

\*Poisson regression; PR: Prevalence Ratio; CI: Confidence Interval; NICU: Neonatal intensive care unit.

**Table 3. Association between chronological and corrected ages of eruption of the first deciduous tooth and birth condition**

Birth Condition	chronological age			corrected age		
	μ (± SD)	Maximum minimum	P	μ (± SD)	Maximum minimum	P
preterm	7.96 (1.74)	4 - 12	<0.001	6.17 (1.72)	3 - 11	0.627*
at term	6.34 (1.55)	4 - 12	*	6.32 (1.53)	4 - 12	

μ: mean; SD: standard deviation; Kolmogorov-Smirnov normality test, p<0.001 (non-normal distribution); \*Mann-Whitney test

In premature babies, the first deciduous tooth erupted, on average, at 7.96 months of age, while in full-term babies at 6.34 months (p<0.001). However, after age correction, there was no difference (p=0.627) (Table 3).

## DISCUSSION

In the present study, it was observed that babies with extreme/very low weight and low weight had a higher prevalence of erupting the first teeth after six months of age when compared to babies with normal weight, corroborating studies in the literature ( SEOW,1997; FERNANDES NETO; FALCON, 2014). Mean chronological age observed in months of eruption of primary teeth was generally higher in preterm infants compared to term infants. Tooth eruption is one of the phenomena associated with the growth and development of the baby (RAMOS; GUGISCH; FRAIZ, 2006; CARREGNATO, MELLO; SILVEIRA, 2009).The chronology of tooth eruption serves as an indicator of a series of biological occurrences and can be influenced by several genetic and environmental factors (CAIXETA; CORREA, 2005; FATEMIFAR *et al.*, 2013). The mean age of eruption of the first deciduous tooth in infants with a gestational age of less than 34 weeks and 34 to 37 weeks was 8.00 and 8.29 months of age, respectively (VISCARDI; ROMBERG; ABRAMS, 1994; JAVANEH; ABTIN; MOHAMMAD, 2015), corroborating the results found in the present study. In the study carried out by Dadalto *et al.* (2018) , which sought to analyze the age of eruption of the first deciduous tooth of infants born preterm with 62 participants, described that the chronological age for the eruption of the first deciduous tooth, as reported by the mothers, at 12 months of age, varied from 5 to 12 months. In all cases, the first deciduous tooth to erupt was one of the lower central incisors. The mean number of teeth present at 12 months was 3.84±1.94. The mean age (in months) of eruption of the first deciduous tooth was 8.94±1.52.

This age, corrected for prematurity, had a mean of 7.74±1.64 months. Prematurity has been reported as one of the causes for delayed tooth eruption and the appearance of enamel defects, from color changes to more severe damage such as dental agenesis, problems of great clinical relevance that can impact dentition aesthetics and tooth function. the entire stomatognathic system (AGUIAR; CASTRO; BARBIERI, 2003; CARREGNATO, MELLO; SILVEIRA, 2009; VERMA *et al.*, 2017). Adequate birth weight is one of the most important variables for newborn survival (SEOW, 1997). Premature and low birth weight babies present lower physical development and weight in the long term, with a tendency to develop systemic problems due to the incomplete maturity of the organs (FERNANDES NETO; FALCÃO, 2014; PINHO, 2011). What is in contrast to the study by Dadalto *et al.* (2018) and Ramos, Gugisch and Fraiz (2006), where they described the relationship between eruption delay and birth weight, no significant difference was found when corrected age was considered. After adjusting for age for prematurity, there is no difference in weight in the assessment of delayed eruption. Late tooth eruption in premature babies can be attributed to a shorter gestational period, maternal nutritional status (WANG *et al.*, 2019) and malnutrition, factors that affect the growth and development of the craniofacial complex.However, in this study, when correcting for the age of tooth eruption in preterm infants, there was no difference when comparing the chronological age among full-term infants (PAVIĆIN *et al.*, 2016 ; KHALIFA) *et al.*, 2004). To this end, we calculated the corrected age by subtracting the postnatal age from the number of weeks left to complete 40 weeks at the time of the child's birth, and then the children's age was averaged, a method recommended by FERNANDES NETO ; FALCON (2014). Due to the very early birth, these newborns would no longer receive essential nutrients for growth and development because they are not in the uterus, in addition to being the group that, in general, would need a longer hospital stay (SALAMA ; DRAIDI ; AYYASH, 2012 ).

The first teeth to erupt in most babies in this study were the lower central incisors, followed by the upper central incisors. These findings agree with other studies, in which the sequence observed, in ascending order, was lower central incisors and, later, upper central incisors (FERRINI; MARBA; GAVIÃO, 2007; CARREGNATO, MELLO; SILVEIRA, 2009; PATRIANOVA; KROLL; BÉZIN, 2010). Although the results obtained in this study are in agreement with the literature (FERNANDES NETO; FALCÃO, 2014; AGUIAR; CASTRO; BARBIERI, 2003; JAVANEH; ABTIN; MOHAMMAD, 2015; VISCARDI; ROMBERG; ABRAMS, 1994) on the association between prematurity and late eruption of deciduous teeth, these results are not unanimous. Disagreement was reported, a fact that can be justified due to the different methodologies adopted (WANG *et al.*, 2019). Some authors have analyzed both gestational age and corrected age, others just the gestational age. (AKTOREN *et al.*, 2010; JAVANEH; ABTIN; MOHAMMAD, 2015; REZENDE; ZOLLER; SANTOS, 2010). Some authors suggest that when the age of eruption of teeth in premature children is corrected, the delay becomes non-existent, that is, that the delay in eruption is due to the fact of early birth and not a late dental development (KHALIFA *et al.*, 2014). These divergences regarding the time of eruption and sequence of tooth eruption can be justified due to the methodologies used and groups included, including premature and low birth weight children, in addition, such referenced studies include low birth weight and very low birth weight premature infants, and should be considering that there are preterm infants with very low birth weight, extreme low birth weight, and low birth weight, which are distinct groups. Thus, the design of this study is in line with the method of correction of gestational age (CORRÊA *et al.*, 1998; VEJDANI; HEIDARZADE, 2015).

There is no consensus regarding the association between sex and chronology of eruption of the first deciduous teeth. In this study, male babies showed a delay in the chronology of eruption, but other studies observed that boys erupt their teeth earlier when compared to girls (AKTOREN *et al.*, 2010). On the other hand, some authors did not observe this difference in relation to sex (VERMA *et al.*, 2017). Studies have shown the influence of environmental, cultural and ethnic factors as modifiers of the moment of eruption of the deciduous dentition, and there is no difference in the chronology of eruption for both sexes. It was observed that the appearance of the first deciduous tooth in male individuals. The phenomenon of deciduous tooth eruption also undergoes changes according to the heterogeneity of different populations, as individuals tend to be in different eruptive phases (PATRÍCIO *et al.*, 2021; MUST *et al.*, 2012). Tooth eruption is the developmental sign most affected by variables that have been more frequently described as active in the integral evolution of the child. Thus, among children born with low birth weight, premature, malnourished, who are not breastfed or who have not breastfed at any time in their lives, children of adolescent mothers and whose education did not exceed the fourth grade of primary school had a significant risk of delay in teething, compared to children who did not have these conditions (CASTRO *et al.*, 2019). This study shows evidence of delayed eruption of the first deciduous teeth in premature and low birth weight babies. However, it has limitations because it is a cross-sectional study, and there is a need for a longitudinal study to better understand the chronology and sequence of eruption of deciduous teeth and the associated factors. Memory bias may also be one of the limiting factors of the study. On the other hand, the results found can be used as a source of information for the dental class and provide a basis for better care and guidance for parents and family members.

## CONCLUSION

Male, extremely low birth weight, very low birth weight and low birth weight babies showed a delay in the chronology of eruption of the first deciduous teeth. Preterm babies showed delay, but after age correction, there was no difference. Developmental and nutritional variables at birth and during early life can be important predictors of time to eruption, and further investigations are necessary for an

adequate assessment of this association. These data are important to justify monitoring the eruption of the first teeth and instituting measures to guide and prevent the disease.

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