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Timing of the first deciduous tooth eruption (incisors) and its related factors in infants: a longitudinal study using Cox's proportional hazards model

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Abstract

***Background & Aims*:** The present study was performed to investigate the timing of the first deciduous tooth eruption in infants and its relationship with environmental and nutritional factors such as weight, height, and head circumstance at birth, type of childbirth, duration of breastfeeding, and initiation time of semi-solid food.

Materials & Methods: This study is a prospective study conducted on newborn infants during 2008-2009 years. For these infants, variables such as parental education level, parental ages, type of childbirth, infant's breastfeeding duration, initiation time of semi-solid food, weight, height, and head circumstance at birth, and then the researchers entered the data into the statistical software STATA 12 and analyzed the data by COX regression model.

Results: The mean age of the infants receiving semi-solid food was 0.033 ± 5.99 months, and the mean height of the infants at birth was 0.078 ± 50.26 cm. The mean weight of the newborns at birth was 0.016 ± 3.37 kg. Finally, the mean head circumference of the newborns at birth was 0.062 ± 35.02 cm. By increasing the maternal childbearing age, the eruption time of the first primary tooth increases in the newborns. Furthermore, increasing the age of receiving semi-solid food in infants causes an increase in the eruption time of primary tooth in newborns.

Conclusion: The study uncovered that higher maternal childbearing age, increased duration of breastfeeding, increased age of infants in initiation time of receiving semi-solid food were significantly associated with delayed eruption of the first primary tooth in infants. However, infant's high birth weight had a significant relationship with the earlier eruption of the first primary tooth.

***Keywords*:** deciduous tooth eruption, Breastfeeding, Cox proportional hazards model, child growth

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Introduction

The first stage of tooth development begins in the fetus (growing baby) at about 6 weeks of pregnancy (1). Deciduous teeth eruption usually occurs between 6 to 30 months depending on the type of teeth (1). Before tooth eruption, formation and mineralization of the crown are largely completed but the roots are fully formed for a further 18 months following the eruption (1). Mononuclear cells become osteoclasts by migrating to the dental follicle which breaks up the underlying alveolar bone to grow teeth (2). Tooth eruption in children is affected by several factors, including the duration of pregnancy, gender, race, disease (such as the cleft lip or palate), body height and weight at birth, hormonal changes, nutrition, and general growth (3-5). In the same age groups, permanent teeth eruption occurs later in children with height and weight below standard level than those within the standard range (6). Also, mothers' low gestational age and infants' low birth weight influence infants delayed deciduous tooth eruption but daily weight gain, age, diet, and vitamin supplements affect this process (7). The emergence of primary teeth in the oral cavity is a very important and exciting event in the child's development (8). On the other hand, they are vital in childhood as guidance to the development of permanent teeth, jaw growth, chewing, and food preparation for digestion (9). Tooth eruption is an 8-day process that includes 4 days before tooth eruption, the day of eruption and the 3 subsequent days (10). Babies at this stage suffer from general irritability, sleep disturbances, diarrhea, fussiness, loss of appetite, crying, and fever (10&11).

Breast milk provides the ideal nutrition for infants and is supercharged with antibodies which improve the baby's immunity. Also, it may play a role in natural mouth development and antibodies in breast milk may help to impede bacterial growth of teeth (12). The timing of primary teeth eruption is important for children's health planning and the diagnosis of some growth disorders (13). For this reason, we want to study the timing of the first tooth eruption in children and its relationship with environmental and nutritional factors such as weight and height and head circumstances at birth, childbirth type, the duration of breastfeeding, and initiation time of semi-solid food.

Method

This prospective study was conducted on 876 newborn babies born in West Azarbaijan province affiliated to Urmia University of Medical Sciences during 2008-2009. The sample was selected randomly by two-stage cluster sampling and was studied until the time of growth of the first tooth of these infants. Variables, such as maternal and dental education level, mothers' age at birth, breast milk duration, babies' weight, height, and head circumference at birth were recorded to determine their effect on the eruption of the first teeth in newborns. Also, infants who received a poor follow-up and were not available were excluded from the study.

Data were collected using a pre-designed checklist for this purpose. Data were entered into the statistical software STATA 12 and were analyzed by the COX regression model.

Result

A total of 876 infants, including 467(54%) boys and 398(45/5%) girls, were included in this prospective study. None of the infants had a history of birth problems, diseases or medical problems.

The mean age of mothers was 26.82 ± 0.2717 years and the mean age of fathers was 30.71 ± 0.224. The mean age of the infants when receiving semi-solid food was 5.99 ± 0.033 months and the mean height of the newborns at birth was 50.26 cm ± 0.078. The mean weight of newborns at birth was 3.37 ± 0.013 kg. Also, the mean of the head circumference of newborns at birth was 35.02 ± 0.062 cm (Table 1). Some data are not shown in the table According to the results of the independent T-test, the mean of the mentioned variables (weight, height, and head circumference) between boys and girls was not equal (Table 1).

Table 1. The mean of weight, height, and head circumference of newborns at birth between boys and girls

	gender	N	Mean	Std. Deviation	P-Value
weight	boy	476	3.4317	.47496	0.000
	girl	398	3.2963	.46587	
height	boy	476	50.4832	2.18914	0.002
	girl	398	49.9925	2.43530	
head circumstance	boy	476	35.1870	1.97477	0.003
	girl	398	34.8146	1.63499	

The mean of infants' first primary tooth eruption time for the variables of gender, childbirth type, duration of breastfeeding, and parental education level in the study are reported in Table 2.

Table 2. Descriptive statistics indicators of the mean of infants' first primary tooth eruption time for the variables of gender, childbirth type, duration of breastfeeding and parental education.

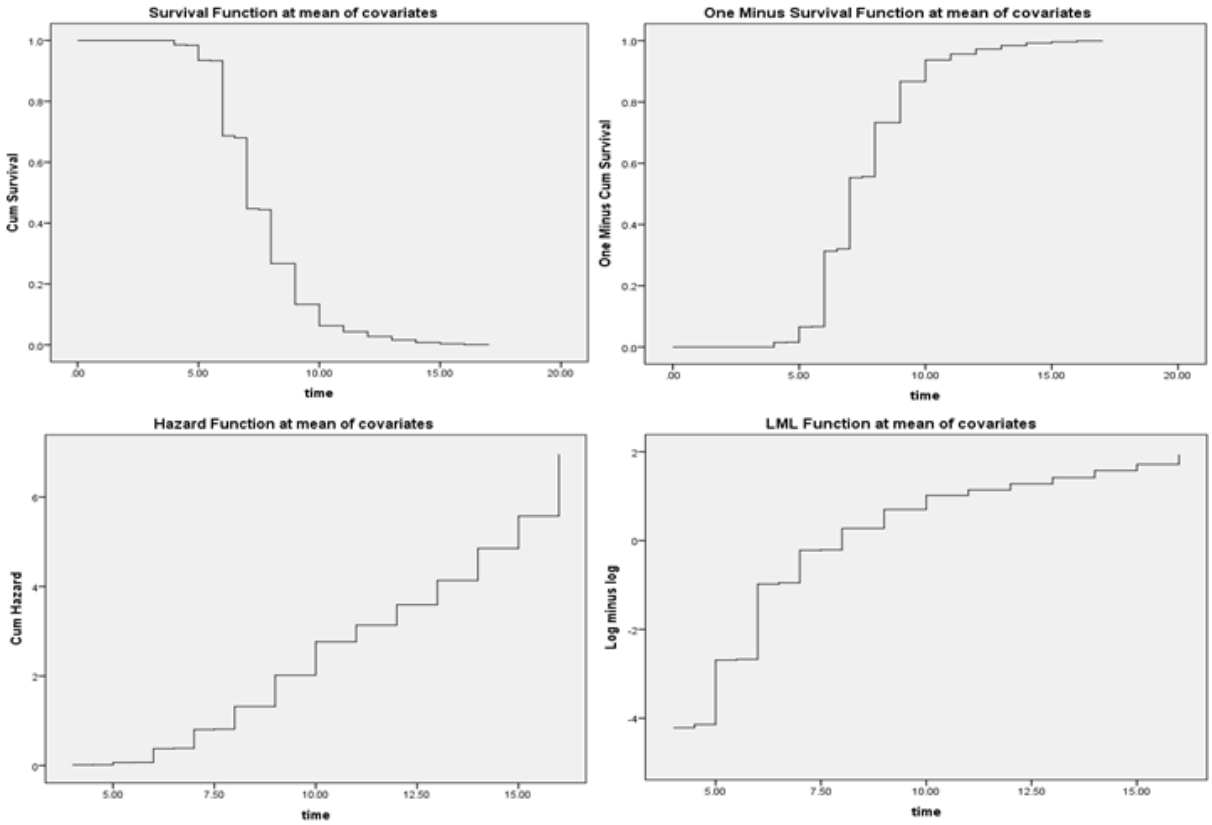
Variables		Mean		Median	
		Estimate	Std. Error	Estimate	Std. Error
gender	Boy	7.587	.087	7	.051
	girl	7.724	.104	7	.103
childbirth type	vaginal	7.634	.080	7	.040
	Caesarean	7.700	7.451	8	.111
duration of breastfeeding	less than 24 months	7.391	.112	7	.065
	more than 24 months	7.754	.082	7	.076
mother's education level	illiterate	8.010	.128	8	.103
	elementary	7.712	.118	7	.067
	guidance	7.013	.141	7	.065
	High school	7.359	.136	7	.100
	university	7.604	.326	7	.312
father's education level	illiterate	7.822	.226	8	.177
	elementary	7.680	.100	7	.100
	guidance	7.728	.162	7	.076
	High school	7.479	.133	7	.075
	university	7.555	.262	7	.280

Table 3. The COX regression model assuming PH to be established for the time of infant's first tooth eruption

	B	SE	Wald	df	Sig.	Exp(B)	95.0% CI for Exp(B)	
							Lower	Upper
mother age *	-.016	.006	7.245	1	.007	.985	.973	.996
infant's birth weight*	.177	.071	6.281	1	.012	1.194	1.039	1.372
age of receiving semi-solid food *	-.098	.034	8.246	1	.004	.907	.848	.969
duration of breastfeeding by infant *	-.150	.075	3.962	1	.047	.861	.742	.998

** Significant at the level of 0.001*

According to the results of the COX model, there are inverse associations between eruption time of first primary tooth and maternal age, infant's age of receiving semi-solid food, the duration of breastfeeding (these variables cause a delay in tooth eruption). While there is a direct association between infant's weight at birth and the time of first primary tooth eruption (the first primary tooth erupts earlier in infants with higher birth weight). (Table 3)



Graph 1. The survival function curve, the risk of delayed primary first teeth eruption against the variables of the mother's age, infant's weight at birth, age of receiving semi-solid food and breastfeeding duration.

Discussion

In this prospective study, we found that higher maternal childbearing age and infant's increased age of receiving semi-solid food was significantly associated with delayed first teeth eruption, while high birth weight was significantly associated with earlier eruption of primary teeth.

Comparing of our study with the study of Folyan Mo et al. in Nigeria, they concluded that there was no significant correlation between the first primary teeth eruption in babies, the duration of their breastfeeding (P: 0.48), and model of their breastfeeding (P: 0.61) (14). In a case-control study, it was found that mothers suffering from illness during pregnancy, prematurity, and lack of breastfeeding significantly caused developmental defects of enamel, while the mother's body mass index, maternal and infant's low birth weight had no significant effect on the development of enamel (15).

In a cross-sectional study, it was concluded that the very low birth weight of infants and the nutritional status of children (BMI) significantly affected the development of dental enamel development disorders, while the duration of breastfeeding, the mother's age, the time of birth, the amount of family income, the number of children in the family, mother's education, and place of residence did not have a significant impact on enamel development.

Galan-Gozalez AF et al. concluded that breastfeeding in comparison to the feeding by milk bottle provides a better development of the dental arch on the jaw bones and creates less dental pairing problems (17). Sahin F et al. found that a height of baby less than 50th percentile and infants fed by cow's milk or formula in the first year was an independent factor that causes a delay in tooth eruption up to 6 months (18). In a retrospective study, it was found that the time of first primary tooth eruption was significantly different between genders. Also, low birth weight was significantly associated with the delayed eruption of the first primary tooth in the infant, while maternal morbidity in the first trimester, caffeine consumption and mother's smoking during pregnancy did not have a significant effect on delayed first teeth eruption.

Also, the majority of deciduous teeth that emerge for the first time into the infants' oral cavity were mandibular central incisors, mandibular lateral incisors, maxillary central incisors, maxillary lateral incisors, and mandibular lateral incisors, respectively.

In a cross-sectional study, it was found that the age, height, and socioeconomic level of infants during the time of referral to the clinic were significantly correlated with the number primary teeth, so that infants with higher age, height, and socioeconomic level had a larger number of erupted primary teeth (19). In another cross-sectional study, it was found that the child's height and age had the greatest impact on the eruption time of the infant's primary teeth (20). Prokocimer T et al. concluded that the preterm birth and low birth weight of infants could lead to hypomineralization of the primary and permanent teeth of children (21).

Conclusion

According to the results of this study, there is a negative association between higher maternal childbearing age, increased duration of breastfeeding, and increased age of infants in initiation time of receiving semi-solid food with delayed primary tooth eruption in infants. But there is a positive relationship between early primary tooth eruption and higher birth weight.

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