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Evaluation of Factors Related to the First Deciduous Tooth Eruption Time in Infants Born in Hamadan, Iran

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Abstract

Background: Pattern of tooth eruption (TE) may vary in different communities and may be affected by many factors. It also may cause nutritional problems in infants and anxiety in parents. The current study aimed at investigating the relationship between birth weight and other factors contributing to the time of the first TE.

Methods: The current study employed the multistage sampling method to select 126 infants admitted to the health centers of Hamadan, Iran. Health records of infants were listed and relevant information was collected using a questionnaire and interviewing the parents. The tooth emergence was considered as TE in the current study. Finally, the recruited infants were examined for the eruption of the first primary tooth. Descriptive, linear, and the curve regression tests were used with SPSS version 16.

Results: Despite the significant differences in weight and height between male and female infants, no significant relationship was observed between time of the first primary TE and most of the studied variables. Height, feeding with formula, family income, and mother's age had inverse effects on TE time. Infants who were fed with synthetic formula milk had earlier TE. Eruption sign and infant height had the most effects on delayed TE.

Conclusions: No significant relationship was observed between the eruption time of the first primary tooth and the studied variables. Nevertheless, there was a significant association between the infant's height and time of the first primary TE.

Keywords: Tooth Eruption, Deciduous Tooth, Infant

1. Background

Tooth eruption (TE) is a dynamic process in which tooth moves axially from its nonfunctional position in the osseous crypt into the oral cavity to functional occlusion with its antagonist (1). Appearance of any part of the cusp or crown through the gingival is the emergence and may be used as a clinical marker for eruption (2).

Normal TE occurs in a very broad age range (2). Exact mechanisms of TE are not entirely known. Many factors may play role in the eruption process. Fallowing items may influence the process of TE: demographic variables such as race, gender, ethnicity, age (2), physiological factors, (3) several hormones and mediators (4), growth of the mandible (5), certain systemic disorders such as diabetes mellitus and congenital abnormalities (6, 7), genetic factors, birth weight (BW), and nutritional status (8), socioeconomic status, breastfeeding (9) postnatal growth, obesity (1), Down syndrome, prenatal diseases, and (10) head circumference (11).

Delayed TE may cause malocclusion and crowding, which may in turn lead to poor oral health (12). Teeth with early eruption have higher risks for dental caries. In addition, sequencing of eruption may affect periodontal and temporomandibular joint disorders (1).

Primary teeth usually erupt at the age of 24 - 36 months, except delayed eruption cases (8). Premature and, especially, delayed eruptions are observed in clinical settings (2). Deciduous teeth have the main role in the proper permanent TE. Delayed primary TE can cause parental concerns and nutritional problems for the child (8).

A study showed that children with obesity had more and earlier TE than the ones without obesity (1). In another study, head circumference was a better predictor for dental development than the body size (11). Folayan et al. showed that gender, socioeconomic status, or breastfeeding had no effect on the time and pattern of tooth eruption (9). There was a negative linear correlation between time of the first deciduous TE and birth weight, suggesting that delayed TE may be related to lower body weight (BW) (8).

The tooth eruption pattern varies in different populations and to the authors' best knowledge, no study was performed on factors influencing TE time in infants in

Hamadan, Iran; hence, the current study aimed at evaluating the factors related to TE pattern in Hamadan, Iran.

2. Methods

2.1. Study Design

The current descriptive, analytical, cross sectional study was performed in health centers of Hamadan, Iran, in 2012. Study protocol was approved by ethics committee of Hamadan University of Medical Sciences. Informed consent was taken from all parents. The infants were all born in Hamadan city. A total of 126 term neonates were included in the study (gestational age: 38 to 42 weeks) using the multistep sampling method. Twenty-seven health centers of Hamadan were assigned into 4 geographic regions (South, West, East, and North) and 2 heath centers were randomly selected in each region.

2.2. Sample Size Calculation

The current study assumed that the correlation between independent and dependent variables was 0.5 and it would be approximately 0.2 in further study. Sample size was 126 with respect to $\alpha = 0.05$ and $1 - \beta = 0.9$.

2.3. Exclusion Criteria

Non-term or preterm infants with low birth-weight (birth-weight lower than 2,500 g) and inadequate or poor follow-up, poor compliance, congenital disorders, history of hospitalization, birth complications ,detectable genetic disorders of infant and mother, major congenital anomalies, and admission to the newborn intensive care unit (NICU) were excluded from the study (1, 8-10, 13).

2.4. Inclusion Criteria

Full-term and clinically healthy infants without history of birth problems, diseases or medical problems, aged 3 to 40 months were enrolled in the study.

The study population consisted of infants referred to the immunization and outpatient clinics at one of the primary healthcare centers in Hamadan over the 2-year study period. In the clinic, infants are visited 6 times in the 1st year of life; 3 times in the 2nd year; and once yearly thereafter until the age of 5. In each visit and between the intervals, the growth, development, and feeding patterns of infants are assessed (14).

2.5. Questionnaire

A questionnaire was developed based on the variables influencing TE according to the results of available studies. The first part of the questionnaire emphasized on the demographic characteristics and the 2nd part contained 18 open-ended questions about variables influencing TE such as gender, mother's age, type of childbirth, BW, infant height and head circumference, systemic disease of infant and mother, type of nutrition, time of the 1st TE, clinical symptom at eruption time, problems in pregnancy (gestational diabetes mellitus, preeclampsia, trauma, and premature birth), number of children in the family, and feeding pattern in the 1st year of life (breastfeeding, cow milk or formula feeding) educational level of father and mother, and monthly income. Data collection was also completed by interviewing the mothers and reviewing infants medical records in the healthcare centers. Vitamin A + D consumption routinely prescribed for all infant less than 2 years old was also recorded. Since vitamin AD consumption was reported for all infants, the impact of these vitamins on TE was not assessed in the current study.

In the current study, TE was recorded if the tooth emerged or the tooth or any part of the crown penetrated the gum and was visible in the oral cavity (15). The tooth emergence was considered as the time of tooth eruption in the current study.

The TE was determined by a final year dental student using a mouth mirror in a room with a good source of light (8, 9).

2.6. Statistical Analysis

The collected data were analyzed using t test, the multiple linear regression, and the curve regression analyses .A P value of < 0.05 was considered statistically significant. Analysis of data was performed with SPSS version 16 (SPSS Inc., Chicago, IL, USA).

3. Results

In the current study, 46.03% of the participants were male and 53.97%were female; 31 infants were fed by formula milk and the mean time of the first TE was 6.64 ± 3.25 months.

Table 1 compares mean $\pm$ standard deviation (SD) of TE, weight, and height of the male and female infants. Results of the logistic test are shown in Table 2.

According to Table 1, means of TE in male subjects was 7 days (0.24 month) later than female ones (P = 0.32). Means of TE was less than 2 days (0.058 month) per 1 kg weight gain, 2 days (0.071 month) per 1 cm increase in head circumstance, 7 days (0.23 month) for infants with tooth eruption sign and symptoms, 5 days (0.157 month) for the ones

Table 1. Comparison of Mean ± SD of TE, Weight, and Height Between Male and Female Infants[a,b]

Gender	Weight	Height	Time of the First TE
Female	2.66 ± 0.415	62.84 ± 4.47	6.29 ± 1.39
Male	2.99 ± 0.534	64.96 ± 5.85	6.26 ± 0.614
P value	0.001	0.023	0.915

[a] Values are expressed as mean ± SD.
[b] Independent samples t test.

with cesarean delivery, 7 days (0.208 month) for birth order, 3 days (0.073 month) for mother's education higher than diploma, 9 days (0.304 month) for father's education higher than diploma.

According to the results of the current study, height, formula feeding, family income, and mother's age had inverse effects on TE time.

Infants fed with synthetic formula milk had earlier tooth eruption. Eruption sign and infant height had the most effects on delayed TE (Table 3).

4. Discussion

Teething is a significant and important event in the infant growth (14, 16). However, tooth emergence patterns are significantly various in different populations (16).

Therefore, the current investigation was performed on infants in Hamadan, Iran. According to the results, infants with higher BW had delayed TE, although this difference was not statistically significant. A study showed that deciduous teeth erupt earlier in infants with higher BW (8). Similar to the results of the current study, 2 studies showed no significant relationship between BW, birth height, head circumference, age, and time of the first dental eruption (13, 17). A study by Sajadian et al. also demonstrated no significant correlation between TE time and birth height, head circumference, maternal age, type of childbirth, or gender of the infant (8).

Khan et al. reported that taller children exhibited delayed TE, regardless of their birth weight, while heavier and shorter children had early eruption (16).

Similar to the results of a study, the first deciduous tooth erupted earlier in male infants than the female ones in the current study (18). Generally, the mean eruption time for female infants was less than that of the male ones. Agarwal et al. (19) found that for the same age group, males had late dental eruption, in support of the earlier findings (20).

Male Saudi Arabian children showed earlier teeth eruption in both jaws (21). But other studies did not remark any significant gender differences (9, 22). Similar to other studies, the current study results did not consider the effect of gender on the time of teething. Although males had earlier TE than females, the difference was not statistically significant (14).

Results of the current study showed that infants with higher family income had earlier TE, compared with the others, but the difference was not statistically significant. However, a study also showed no statistically significant effect of socioeconomic status and breastfeeding on the time and pattern of tooth emergence (9, 23). Another study observed a significant association between the number of erupted teeth, and the socioeconomic status (13).

A study found a significant association between age and height and the number of erupted teeth in children. In addition, there was a significant difference in the number of erupted teeth between the children with high socioeconomic status, compared with the ones with low status (24).

Family high-income leads to better nutrition of mother, which can influence the time of TE. As stated by other studies, the effect of socioeconomic status, family educational level, and family income on TE should be clarified by further studies.

In the current study, the mean TE time was 6.64 ± 3.25 month that was approximately in the normal age range. Although delayed teething may be associated with several disease-related factors such as hypopituitarism, hypothyroidism, rickets, Down syndrome, and cleidocranial dysplasia; in 1% of the healthy children the first tooth erupts in the12th month of life (25, 26); this variable was excluded from the current study and only normal infants were assessed.

Haddad and Correa also concluded that primary TE was highly influenced by the height of the child (13), but the current study findings showed no statistically significant effect of height on TE, although tooth eruption was reported earlier in taller infants.

In the current study, infants fed with formula milk had earlier tooth eruption than the ones with breastfed.

In spite of the results of the current study, Holman and Yamaguchi indicated the delayed emergence of some teeth in children not breastfed (27). In another study, no significant difference was observed in the time and sequence of TE based on the feeding pattern (9). A study reported that cow or formula milk feeding in the first year of life had negative effects on the time of TE (14).

Subsequent studies should be conducted to evaluate the effect of breastfeeding on TE (9).

The dentition develops from the week 4 of gestation to about 20 years postnatally (28). Therefore, genetic deficiency in child and mother was excluded.

The current study showed no statistically significant

Table 2. Regression Analysis Between the Variables and First Time of Tooth Eruption

Variable		B	SE	95%CI		R^2	P Value
Gender	Female	-	-	-	-	0.021	0.32
	Male	-0.0247	0.245	-0.741	0.247		
Weight		0.058	0.26	-0.465	0.582	0.001	0.824
Height		-0.03	0.026	-0.083	0.023	0.028	0.258
Head circumference		0.071	0.074	-0.078	0.219	0.02	0.343
Feeding pattern	Breastfeeding	-	-	-	-	0.06	0.089
	Formula feeding	-0.472	0.271	-1.018	0.074		
Eruption sign	No	-	-	-	-	0.0002	0.102
	Yes	0.23	0.138	-0.047	0.507		
Type of delivery	MVD	-	-	-	-	0.01	0.458
	Cesarean	0.266	0.355	-0.449	0.981		
Birth order		0.208	0.37	-0.536	0.951	0.007	0.577
Family income		-0.021	0.053	-0.128	0.086	0.004	0.694
Mother's education	Diploma and lower	-	-	-	-	0.001	0.796
	Higher than diploma	0.073	0.279	-0.49	0.635		
Father's education	Diploma and lower	-	-	-	-	0.038	0.191
	Higher than diploma	0.304	0.229	-0.158	0.766		
Delivery problems	No	-	-	-	-	0.01	0.498
	Yes	0.157	0.23	-0.306	0.62		
Mother's age		-0.023	0.054	-0.132	0.085	0.004	0.666

Table 3. Descriptive Findings About Gender, Diet, and Delivery Type

Variable	Gender		Feeding Pattern		Delivery Type	
	Female	Male	Breastfeeding	Formula Feeding	NVD	Cesarean
Number	68	58	95	31	95	31
Percent	54	46	75	25	77	23

association between the first TE and the studied variables such as systemic disease of mother and infant, type of delivery, nutritional status, mother's age, parents' educational level, monthly family income, and eruption signs and symptoms. The number of siblings, pregnancy complications, age, gender, height, head circumstance, and socioeconomic status were discussed earlier, and to the authors' best knowledge no study was performed on the relationship between other variables and TE so far to compare the results.

The differences and variations noted in the study may be due to cross sectional study design, environmental factors, small sample size, and genetic factors. The generalization of the study results is, however, limited. Further studies with larger sample sizes should be conducted to evaluate the effect of other variables on TE in different geographical regions.

Eruption is a very complicated and multifactorial process. The results of the current study showed no statistically significant association between the factors related to tooth eruption and time of the first TE in Hamadan, West of Iran. Therefore, other epidemiological studies with larger sample sizes in other geographical regions and countries are needed to explore factors related to TE time and pattern.

Conclusion: No significant relationship was observed between the time of eruption of the first primary tooth and the studied variables. Nevertheless, there was a significant

association between the infant height and the time of the first primary tooth eruption.

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Footnotes

Conflict of Interest: The authors declared no conflicts of interest.

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