

Prevalence of premature primary tooth loss and contributing factors in preschool children of Babol City, Iran, 2018

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Original Article

Abstract

BACKGROUND AND AIM: Early loss of deciduous teeth has negative effects on chewing function, aesthetics, self-esteem, and permanent dentition. This study aimed to evaluate the prevalence of premature primary tooth loss and the contributing factors in children aged 36-71 months in Babol City, north of Iran.

METHODS: In this cross-sectional study, 558 healthy preschool children underwent oral examination to record the type and frequency of premature tooth loss and Silness-Loe plaque index. The parents were then asked to fill out a questionnaire about the related factors. Data were evaluated by SPSS software and analyzed using one-way analysis of variance (ANOVA), independent samples t-test, and multiple linear regression analysis. The level of significance was set at $P \leq 0.05$.

RESULTS: The frequency rate of missing primary teeth was 1.56% estimated in 13.62% of children. The mean number of missing teeth showed a significant difference among different subgroups of children classified based on parent's education ($P = 0.001$), socio-economic status ($P = 0.001$), child's age ($P = 0.020$), plaque index ($P = 0.001$), frequency of consumption of cariogenic snacks ($P = 0.001$), and brushing ($P = 0.001$). According to multiple linear regression test, father's educational level, socio-economic status, plaque index, and frequency of consumption of cariogenic snacks were correlated with the number of missing teeth.

CONCLUSION: Less than one-seventh of children had at least one premature missing primary tooth. Child's age, parent's educational level, socio-economic status, frequency of consumption of cariogenic snacks, plaque index, and brushing are related to premature primary tooth loss.

KEYWORDS: Child; Tooth; Deciduous; Tooth Loss

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The complete set of primary teeth is in the mouth until age 3. The first primary teeth (lower central incisors) erupt at the age of 6-10 months and the last primary teeth (lower second molar and upper canine) fall out at the age of 11-13 years. Primary teeth loosen when an adult tooth moves up in the jaw, eventually causing the baby tooth to fall out. A child's 20 primary teeth usually start to fall out around age 6 or 7.¹ Exfoliation time of primary teeth and eruption time of saccadaneous teeth are shown in table 1.¹

The primary dentition possesses many tasks such as chewing function and guidance of permanent teeth eruption; it is also important for aesthetics and phonation.² Early loss of deciduous teeth can result in negative consequences such as chewing function problems, dental crowding, space loss, and psychological effects.^{3,4} Based on previous studies, different reasons exist for the premature loss of primary teeth. According to Law,⁵ early loss of primary incisors happens because of severe early childhood caries and trauma. Premature

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canine loss is usually because of severe crowding. This crowding accelerates the resorption of primary canine roots with ectopic eruption of permanent lateral incisors. Premature primary molars loss mostly occurs because of severe caries.⁵

Table 1. Exfoliation time of primary teeth and eruption time of succedaneous teeth*

Primary teeth	Exfoliation time (year)	
	Maxilla	Mandible
Central incisor	7-8	6-7
Lateral incisor	8-9	7-8
Canine	11-12	9-11
First molar	9-11	10-12
Second molar	9-12	11-13
Permanent teeth	Eruption time (year)	
	Maxilla	Mandible
Central incisor	7-8	6-7
Lateral incisor	8-9	7-8
Canine	11-12	9-11
First premolar	10-11	10-12
Second premolar	10-12	11-13
First molar	5.5-7	5.5-7
Second molar	12-14	12-14

*Based on https://www.aapd.org/global/assets/media/policies_guidelines_r_dental_growth.pdf, published in 2018

The results of studies showed disparate prevalence rates of premature loss of primary teeth in different countries, ranging from 8.5% in Venezuela to 51.0% in Saudi Arabia.^{6,7} Nabipour et al. found 9.9% of 3 to 6-year-old Iranian children with at least one missing tooth because of dental caries.⁸

Given the importance of preserving the health of primary dentition, investigating the factors associated with premature primary tooth loss in preschool children seems necessary. Thus, this study aimed to evaluate the prevalence of early loss of primary teeth and its related factors in preschool children.

Methods

The study protocol was confirmed by the Ethics Committee of Babol University of Medical Sciences, Babol, Iran (MUBABHOL.REC.1396.9) and informed consent was obtained from parents. This

cross-sectional study was conducted in Babol City in 2018.

Overall, 558 preschool children (at the age of 36-71 months) were randomly selected from kindergartens. The chronological age of children was estimated based on the birth date which had been recorded by the kindergarten's personnel in the child's file. The kindergartens were selected based on geographic dispersion map in different socio-economic classes. The number of stars of kindergartens (1, 2, or 3 stars) was the criterion for socio-economic classification as poor, moderate, and good status. The sample size was estimated at 95% significance level with the assumed prevalence of 15% and accuracy of 3%. Children with systemic diseases and uncooperative behaviors were excluded from the study.

Oral examination was conducted by a senior dental student with a dental mirror, flash light, and World Health Organization (WHO) probe at 10-12 am.

Premature primary tooth loss was considered when the primary tooth loss occurred at least 12 months earlier than the chronological eruption time of succedaneous teeth.⁹ Regarding the study age range, premature primary tooth loss for anterior teeth was considered when the tooth loss occurred at the age of 5 or earlier and for the other teeth at 6 or earlier. After recording the type and number of missing teeth for every child, the Silness-Loe plaque index was evaluated based on recording both soft debris and mineralized deposits on lower central incisors and first molar of each quadrant in primary dentition.¹⁰ In children with reference teeth loss, the adjacent teeth were considered to record the plaque index. Finally, parents were requested to declare the cause of early tooth loss and fill out a researcher-made questionnaire. The questionnaire consisted of three parts as follows: 1) demographic information of children and their parents, 2) oral hygiene and dietary habits of children, and 3) parent's knowledge about eruption and shedding

time of teeth and the possible complications of premature primary tooth loss. The age range suggested for tooth eruption and shedding by Kronfeld and Logan with the standard deviation of 6 months was considered the correct answer to related questions.⁹ Questionnaire's validity was confirmed by four faculty members of Babol School of Dentistry and the reliability was ensured by the Cronbach's alpha 0.72.

Data were analyzed by one-way analysis of variance (ANOVA), independent samples t-test, and multiple linear regression analysis (Enter model) to assess the statistical correlation between the number of missing teeth as dependent variable and those of independent variables with SPSS software (version 23, IBM Corporation, Armonk, NY, USA). Significance level was set at $P \leq 0.05$.

Results

In this study, 175 teeth were lost in 76 cases. 13.62% of the children were estimated to have premature primary tooth loss. The prevalence of early tooth loss was estimated

at 1.56%. Table 2 shows the descriptive data of the study.

Only one tooth was missed due to trauma, and dental caries was the major cause of early loss of primary teeth in other cases. The most common missing tooth was maxillary right lateral incisor (Tooth #52) with the frequency of 25.14%. The highest prevalence of premature tooth loss was 38.28% for upper lateral incisors followed by first molars with a prevalence of 37.70% and the lowest prevalence of early tooth loss was 2.28% for canines. Anterior mandibular teeth were not affected. The frequency of premature tooth loss based on tooth type is presented in table 3. Table 4 displays the mean and standard deviation (SD) of number of missing teeth in terms of the study variables.

No significant difference was found in the number of missing teeth between girls and boys, but an increasing trend was observed in the number of missing teeth by age. The number of missing teeth in 4-year-old children was significantly less than in two other age groups ($P = 0.020$).

Table 2. Frequency distribution of selected characteristics among Iranian preschool children

Variable	Group	Total number and percentage	Number and percentage of children with premature primary tooth loss
Gender	Boy	281 (50.36)	40 (14.23)
	Girl	277 (49.64)	36 (12.99)
Age (month)	36-47	186 (33.33)	16 (8.60)
	48-59	186 (33.33)	28 (15.05)
	60-71	186 (33.33)	32 (17.20)
Father's educational level	Non-academic	265 (47.50)	47 (17.73)
	Academic	293 (52.50)	29 (9.89)
Mother's educational level	Non-academic	281 (50.36)	50 (17.79)
	Academic	277 (49.64)	26 (9.38)
Socioeconomic status	Poor	187 (33.51)	34 (18.18)
	Moderate	186 (33.33)	37 (19.89)
	Good	185 (33.15)	5 (2.70)
Regular tooth brushing	Yes	159 (28.49)	6 (3.77)
	No	399 (71.51)	70 (17.54)
Tooth brushing frequency (time/day)	< 1	159 (28.49)	6 (3.77)
	≥ 1	399 (71.51)	70 (17.54)
Regular dental visit	Yes	62 (11.11)	6 (9.67)
	No	496 (88.88)	70 (14.11)
Regular fluoride therapy	Yes	24 (4.30)	2 (8.33)
	No	534 (95.70)	74 (13.85)
Frequency of consumption of cariogenic snacks (time/day)	0-1	383 (68.63)	40 (10.44)
	≥ 2	175 (31.35)	36 (20.57)

Table 3. Relative frequency (%) of primary teeth affected by premature tooth loss according to dental quadrants

Tooth type	Maxilla (%)		Mandible (%)		Total (%)
	Right	Left	Right	Left	
Central incisor	6.85	4.00	0	0	10.85
Lateral incisor	25.14	13.14	0	0	38.28
Canine	1.14	1.14	0	0	2.28
First molar	14.85	13.14	5.14	4.57	37.70
Second molar	1.14	1.71	5.14	2.85	10.84

The number of missing teeth in children who took cariogenic snacks 0-1 times per day was significantly lower than those who used sugared snacks more than once a day ($P = 0.001$). The number of missing teeth in children whose parents had academic education was significantly lower than those whose parents did not have academic education ($P = 0.001$). The number of missing teeth in children who did not brush or regularly brush their teeth was significantly higher than those who regularly brushed their teeth ($P = 0.001$).

The results of the study showed that the mean (\pm SD) of plaque index in children with early tooth loss was significantly higher than

those who did not have missing teeth (1.78 vs. 0.84, $P = 0.001$).

The multiple linear regression analysis showed that father's educational level, socioeconomic status, frequency of consumption of cariogenic snacks, and plaque index were significantly associated with number of missing teeth (Table 5).

The percentage of parents who knew the physiologic shedding time of the first and the last primary teeth were respectively 58.2% and 41.8% and only 47.5% of the parents knew the physiologic eruption time of the first permanent tooth. The frequency percentage of premature primary tooth loss complications as reported by the parents is presented in figure 1.

Table 4. Comparing the mean \pm standard deviation (SD) of missing teeth among Iranian preschool children according to categorical variables

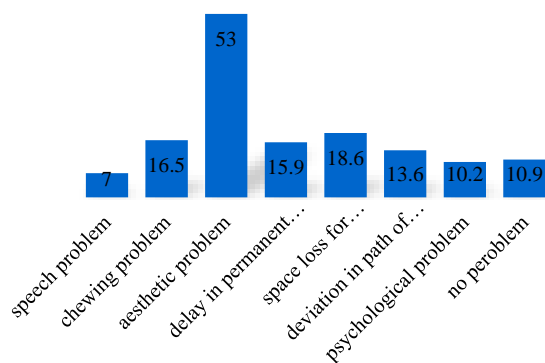
Variable	Group	Mean \pm SD	P
Gender	Boy	0.31 \pm 0.98	0.771*
	Girl	0.33 \pm 0.96	
Age (month)	36-47	0.16 \pm 0.65	0.020**
	48-59	0.40 \pm 1.07	
	60-71	0.40 \pm 1.11	
Father's educational level	Non-academic	0.43 \pm 1.16	0.009*
	Academic	0.22 \pm 0.75	
Mother's educational level	Non-academic	0.45 \pm 1.17	0.001*
	Academic	0.19 \pm 0.70	
Socioeconomic status	Poor	0.49 \pm 1.28	0.001**
	Moderate	0.42 \pm 1.01	
Regular tooth brushing	Yes	0.11 \pm 0.60	0.001*
	No	0.40 \pm 1.07	
Tooth brushing frequency (time/day)	< 1	0.11 \pm 0.60	0.001*
	\geq 1	0.40 \pm 1.07	
Regular dentistry visit	Yes	0.18 \pm 0.55	0.061*
	No	0.34 \pm 1.01	
Regular fluoride therapy	Yes	0.12 \pm 0.44	0.053*
	No	0.33 \pm 0.99	
Frequency of consumption of cariogenic snacks (time/day)	0-1	0.20 \pm 0.68	0.001*
	\geq 2	0.57 \pm 1.38	

*Independent t-test; **One way analysis of variance (ANOVA)
SD: Standard deviation

Table 5. Multiple linear regression analysis for the number of missing teeth as the dependent variable and the scale and ordinal independent variables

Variables	Unstandardized coefficients		Standardized coefficients	t	P
	B	SE	Beta		
Constant	-1.129	0.366	-	-3.080	0.002
Age	0.017	0.046	0.014	0.362	0.718
Father's educational level	0.101	0.038	0.142	2.634	0.009*
Mother's educational level	-0.046	0.037	-0.067	-1.240	0.215
Socioeconomic status	-0.111	0.047	-0.093	-2.376	0.018*
Tooth brushing frequency (time/day)	0.032	0.066	0.019	0.475	0.635
Plaque index	1.075	0.076	0.557	14.182	< 0.001*
Frequency of consumption of cariogenic snacks (time/day)	0.162	0.052	0.114	3.108	0.002*

*P ≤ 0.05; R: 0.580; R²: 0.336; Adjusted R²: 0.332; Standard error (SE) of the estimate: 0.802
SE: Standard error

**Figure 1.** Percentage of parent's knowledge about complication of premature primary tooth loss

Discussion

The frequency rate of primary teeth affected by premature tooth loss was estimated at 1.56% and 13.62% of children had at least one missing tooth. Andreeva et al. reported a lower prevalence rate for early tooth loss among 6 to 7-year-old Brazilian children than that found in the present study (4.60% vs. 13.62%). They estimated the frequency rate of 3.64% and 5.00% for prematurely extracted teeth in urban and rural children, respectively. This divergence may be due to difference in the studied age range and dental groups. Andreeva et al. examined only molars and canines, and primary incisors were not included in their study.¹¹ Unlike, Andronic reported that 48.0% of 6 to 10-year-old children in Romania had at least one early lost tooth.¹²

The present study found caries as the major cause of premature primary tooth loss, as reported by Lopez-Gomez et al.¹³ and Andreeva et al.¹¹

Similar to the study performed by Andronic,¹² we found no considerable difference in the mean number of prematurely missing teeth between the two sexes.

According to a study conducted based on the Global Burden of Disease Study (GBD), the rate of dental caries in children has increased from 1990 to 2010.¹⁴

The increasing number of untreated carious primary teeth may be due to lack of knowledge about the importance of primary dentition or high costs of dental care services, especially in families with low socio-economic status. The present findings confirmed that there was a significant relationship between socio-economic status and the number of missing teeth. In a systematic review conducted by Amiresmaili et al., an inverse relationship was concluded between socio-economic status and childhood dental caries in Iranian families.¹⁵ In families with a lower socio-economic status, inability to pay for dental services and negligence are commonly observed, and the tendency to remove the painful carious teeth is more than restoration and pulp therapy.

In our study, the most prevalent age for early tooth loss was 60-71 months followed by 48-59 months and 36-47 months. Andronic reported the highest prevalence rate of early

tooth loss around 10 years old.¹² Monte-Santo et al. found no significant difference between children aged 8 and 9 years.¹⁶

Maxillary right lateral incisor was the most common missing tooth with a frequency of 25.14%. This could be attributed to the earlier time the tooth erupts in the oral cavity which makes it more prone to early childhood caries. Lateral incisors compared to central incisors have a smaller crown and following tooth decay will destroy them faster and performing pulp therapy and reconstruction of the crown is more difficult. Jayachandar et al. reported the right lower first molar as the most common missing tooth.¹⁷ This result may be due to different study age groups and different treatment plan decisions were made based on the judgment of clinician.

Molar teeth play a significant role in chewing function. In the present study, the first molar was more affected than the second molar, which is in line with the results of Jayachandar et al.¹⁷ It might be because this tooth is less responsive to endodontic treatments and clinicians prefer to remove it. The present study focused on children under 6 years. This age range was selected to reduce the chance of errors in remembering the time and cause of tooth loss. However, the authors think that the primary molar loss may be more prevalent in a bigger age range.

The mean plaque index of children with early tooth loss was significantly higher than those who did not have missing teeth. A high plaque index leads to tooth decay and advanced tooth caries is the major cause of tooth extraction. These findings were consistent with the results of Lopez-Gomez et al.¹³

A significant relationship was shown between the frequency of consumption of cariogenic snacks per day and premature tooth loss. The high sugar content of sweet snacks leads to high acid production by oral bacteria, which is considered to be a cause of caries and might lead to tooth extraction.¹³

In the present study, the mean number of missing teeth in children with regular dental visits and regular fluoride therapy was less than that of others, but this finding was not statistically significant, which might be due to small sample size. Further researches with larger sample size and bigger age range are recommended. Also, a limitation of this study was the lack of cooperation of some kindergartens principals, parents, and children in data collection, so that the authors had to examine more children in order to achieve the mentioned sample size.

Conclusion

Based on our findings, it can be concluded that children from families with a low socio-economic status, frequent consumption of snack, and poor oral hygiene are susceptible to premature primary tooth loss because of dental caries.

Conflict of Interests

Authors have no conflict of interest.

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