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# *The Relationship between Weaning Method and Its Time and Severe Early Childhood Caries*

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## Abstract

***Background:*** Severe early childhood caries is the most important dental problem among children younger than three years of age.
***Objectives:*** The aim of this study was to investigate the relationship between time and manner of weaning and severe early childhood caries (S-ECC).
***Methods:*** This descriptive-analytical study was performed in Kerman, Iran, in 2020. The study population consisted of 130 mothers and their children aged 18 to 30 months with and without S-ECC who visited the health centers in Kerman. Clinical examinations of the children's teeth were carried out with a dental mirror by a trained dentist after drying the surfaces of the maxillary incisors. The presence or absence of S-ECC was marked in a relevant checklist. Then, the mothers were asked to answer questions about the way they feed their children and the weaning method used in case of weaning off their children. Finally, data was analyzed using *t*-test in SPSS version 16.
***Results*:** The mean age of the children was 24.4±4.7 months, and 52% of them were girls. Most of the mothers had used the traditional methods to wean their children. The mean age at weaning was 23.8 months. There was a significant relationship between the age at which the child was weaned and S-ECC. In other words, children with S-ECC were significantly older at weaning than those children without S-ECC ($p<0.05$).
***Conclusion:*** Children with S-ECC had a longer breastfeeding period than children without S-ECC; thus, it seems that one of the reasons for the high prevalence of such caries in children in Kerman could be the longer period of breastfeeding or bottle-feeding. Therefore, an appropriate pattern of breastfeeding is effective in preventing S-ECC.

***Keywords: dental Caries, breast feeding, weaning***

## Introduction

Early childhood caries (ECC) is reported to be the most common chronic oral disease in children, causing significant health problems in both developed and developing countries [1]. Early childhood caries is defined by the American Academy of Pediatric Dentistry (AAPD) as "the presence of one or more decayed (non-cavitated or cavitated lesions), missing (due to caries), or filled tooth surfaces in any primary tooth of a child aged 71 months or younger". The American Academy of Pediatric Dentistry also states that any sign of smooth surface caries in children younger than three years of age is indicative of severe early childhood caries (S-ECC) [2,3]. Numerous predisposing factors have been

mentioned for S-ECC, such as breastfeeding or bottle-feeding at night, frequent consumption of sugar containing snacks, tooth brushing less than once a day, poor parental knowledge of child's oral health, absence of access to oral health care centers, and low socio-economic status of the family [4-6].

Breastfeeding has been accepted as the best method to provide optimal nutrition for an infant, but in certain conditions, it has been suggested as a risk factor for ECC, which is further discussed. When assessing the association between breastfeeding and ECC, studies reveal inconsistent results. The World Health Organization (WHO) recommends that children be breastfed up to 24 months of age [7]. However, pediatric dentistry textbooks suggest that bottle-feeding should be stopped after 12 months of age, and cup feeding should be replaced [5]. When the child is breastfed at night or is put to bed holding a bottle of milk or any type of sugar-containing beverage, the teeth will get exposed to fermentable carbohydrates for a long period of time. In addition, the decreased salivary flow at night, which slows the clearance of liquids from the oral cavity, deteriorates the condition [8-10].

In general, two methods have been used for the weaning of infants, including the abrupt and gradual weaning methods. In the abrupt method, traditionally, the taste or appearance of the breast is changed, for example by rubbing pepper, pomegranate paste, or tomato paste, applying a wound bandage on the nipple or the tip of pacifier, but recently, there has been an increasing tendency towards the application of a bitter substance (named Talkhak) to the nipple or the tip of pacifier to wean off children. This drug is sold in pharmacies of Iran, and its composition is potassium chloride in distilled water (manufactured by Pars Sina Alborz Company, Iran). As for the gradual technique, feeding episodes are reduced step by step. First, day time feeding is reduced, and then night feeding is eliminated [11]. It is known that the sudden termination technique can cause trauma to the mother and infant and may negatively affect the infant's mental-social development [12]. In a study carried out in Fars Province of Iran, which assessed the pattern of complete weaning of children, in half of the children (50.1%) complete weaning had occurred at 24 months or later [13].

The results of a study performed by Wassuna et al. indicated a significant relationship between S-ECC and voluntary breastfeeding and/or bottle-feeding.

According to a study by Glazer et al., children who were breastfed for 24 months or more had higher caries scores, and they were 2.4 times more likely to experience S-ECC than children who were breastfed until 12 months of age [14]. When assessing the cariogenic potential of human milk and infant formula, human milk is stated to be less cariogenic than formula [15]. In a study by Azevedo et al., breastfeeding and/or bottle-feeding after 12 months of age was associated with S-ECC [15]. In Iran, different prevalence rates of ECC have been reported in diverse regions. Its prevalence in Tehran ranges from 17.3% to 21.1% [16], in Qazvin 9.9% to 19.5% [17], in Mashhad 19%, and in Kerman the prevalence of ECC spanned from 39.1% to 45% [16], which was higher than other cities in Iran.

To our knowledge, no study has been carried out to assess the relationship between the age at which a child is weaned and the presence of SECC. Also, considering the high prevalence of ECC in Kerman city and in Iran and its possible relationship with ECC, we decided to perform this study to determine the age at which children were weaned in Kerman. Moreover, the method of weaning was assessed due to its importance in the psychological development of children.

## Methods

This descriptive-analytical study was performed among 130 children aged 18 to 30 months with and without S-ECC who visited Kerman health centers for vaccination. Considering the 39% prevalence rate of SECC in Kerman Province, which was mentioned earlier[13], and according to the following formula, a sample size of 105 mothers (with their children) were randomly selected to participate in the study, but for more accuracy, was decided to participate more mothers and children in the study.

(Sample size $N = p * q * z2 / d$)

$N= 0.39*0.61*3.84/ (0.09)2=105$(p=39%, q=61%, d=0.09, z=1.96)

The inclusion criteria comprised children aged 18-30 months who had no history of any systemic diseases. Prior to the study, written informed consent was obtained from parents, and the study

objectives were clarified. Distorted checklists were not analyzed. The maxillary anterior teeth of the children were examined in a lap-to-lap position with the help of their mother in a room with adequate natural light (near the window). After drying the surface of maxillary incisors with sterile gauze, clinical examination was performed using a dental mirror by a trained dentist. The presence of any sign of caries on the labial surface of any of the four anterior maxillary incisors was the criterion used to diagnose S-ECC. The presence or absence of caries (decalcification to discrete cavity) was marked in a relevant checklist. If the child was weaned, the mother was asked to mark the method used to wean the child. Also, if the mother had not yet weaned the child, she was asked to indicate the reason in the checklist. After the clinical examinations, teeth cleaning tips were given to the mothers.

Descriptive statistics and independent *t*-test were used to analyze the data in SPSS version 21. A *P*-value of less than 0.05 was considered significant.

## Results

Children in this study had a mean age of 24.4 months. Forty-eight percent of the children were boys. According to clinical examinations, 83 (63%) children had S-ECC, and 62.3% of the mothers had weaned their children. The youngest weaned child was 12 months old, and the oldest weaned child was 31 months old. The average weaning age of the children was about 2 years old. The timing and method of weaning are shown in Table 1. This table shows that most mothers tried to wean their child by the traditional method. They used pepper, reddening the nipple or tip of the bottle with pomegranate paste or tomato paste, or applying a wound bandage on the nipple or tip of the bottle milk.

***Table 1: Distribution frequency of age and method of weaning among the children***

| Age range of weaning (months) | Number | Percent |
|---|---|---|
| **12-15** | 3 | 3.7 |
| **16-19** | 7 | 8.6 |
| **20-23** | 17 | 21 |
| **24-27** | 44 | 54.3 |
| **28-30** | 9 | 11.1 |
| **31-35** | 1 | 1.2 |
| **Total** | 81 | 100 |
| **Method of weaning** | **Number** | **Percent** |
| **By the traditional method** | 65 | 80.2 |
| **By using a bitter substance** | 12 | 14.8 |
| **Gradual weaning based on the infant's desire** | 4 | 5 |
| **Total** | 81 | 100 |

Overall, 49 (37.7%) mothers had not yet weaned their children. The reasons that mothers stated for not weaning their children are presented in Table 2. The majority of the mothers believed that their child was not yet old enough to be weaned. The mean age of the children of mothers who had declared the second option (I have not found a suitable way to stop breastfeeding) was significantly higher than those of the mothers choosing the third option (The child is not old enough to transition from breastfeeding/bottle-feeding to cup feeding) (P=0.01).

*Table 2: Distribution frequency of the reasons stated by the mothers for not yet weaning their children*

| Cause of not weaning | Number | Percent | Range of age (months) | Standard deviation |
|---|---|---|---|---|
| **I should wean my child whenever his/her tendency to being breastfed is reduced** | 2 | 4.1 | 21.5 | 0.7 |
| **I haven't found a suitable method to stop breastfeeding or bottle-feeding** | 7 | 14.3 | 25.6 | 3.5 |
| **The child is not old enough to change from breastfeeding/bottle-feeding to cup feeding** | 40 | 81.6 | 21.2 | 3.6 |
| **Total** | 49 | 100.0 | 21.8 | 3.8 |

The results showed that children with S-ECC were weaned at a significantly (P = 0.009) higher age than children without S-ECC (Table 3).

*Table 3: The relationship between age at getting weaned off and the prevalence of S-ECC*

| S-ECC | Number | Average of age in months (standard deviation) | P-value |
|---|---|---|---|
| **Yes** | 83 | 26.36(4.12) | 0.009 |
| **No** | 47 | 23.97(5.26) | |

t-test

## Discussion

In the present study, 130 mothers completed a checklist on when and how they weaned their children and why they delayed weaning. The results of the present study showed that the mean age at weaning was 23.8 months. In addition, among 81 weaned children, 65 (80.1%) mothers used the traditional method to wean their children, and only 12 (14.8%) mothers had used a bitter substance, and the rest of them said that their child had stopped breastfeeding and/or bottle-feeding gradually. A study by Hommami et al. among children under three years of age in Damghan, Iran showed that the mean age of weaning was 20.6 months [18]. Another study by Hommami et al. in children up to three years of age in Tehran, showed that the mean age of weaning of children was 21.01 months. In a study by Zare et al. among children younger than three years old in Fars Province of Iran, an average age of 21 months was reported as the age at which children were weaned [13]. In the present study, the mean age of weaning was about two and a half to three months higher than the three mentioned studies, which can be due to cultural differences and social beliefs among mothers in Kerman compared to the mentioned cities.

The higher mean age of breastfeeding/bottle-feeding in children of Kerman can be one of the reasons for the higher prevalence of ECC in children in Kerman than in children in other areas such as Tehran and Shiraz [13,19]. According to the present study, slightly more than half of the mothers weaned their children between the ages of 24 and 27 months (Table 1), while a study by Ruhusen et al. in Turkey found that about 91% of mothers weaned their children before 24 months and only 8.7% of mothers weaned their children at 24 months or later [20]. This difference in the statistics of the two studies could be due to social and cultural differences between the two societies. In the meantime, it could be a reason for the lower prevalence of ECC in Turkey [21].

In Hommami studies in Damghan and Tehran, 37.2% and 63.8% of mothers had used the traditional methods for weaning their children, respectively [18], while in the present study, 80% of the mothers had used the traditional methods for this purpose (Table1). This also can be related to cultural differences in different cities.

Potassium chloride is a substance used in the pharmaceutical, food, and chemical industries. This substance has a bitter taste, and for this inappropriate taste, it is used as a substance that helps to wean off children. Potassium chloride has entered the Iranian pharmaceutical market and is developed as an Iranian medicine. To our knowledge, no study has been carried out to examine the prevalence of the use of potassium chloride solution in weaning.

In our study, most mothers expressed that their children were not old enough to change from breastfeeding/bottle-feeding to cup feeding (Table 2). We could not find any study of mothers who explained the reasons for delay in weaning. Therefore, the results of this part of our study are not comparable with any other study. When bottle-feeding continues until after one year of age and/or breastfeeding continues until after two years of age, and they are not replaced with cup feeding, the risk for caries increases. This occurs because children do not suck the bottle tip and mother's breast for nutrition, but they do so for mental satisfaction. This type of sucking is named non-nutritive sucking. In non-nutritive sucking, the child usually falls asleep, holing the bottle/mother's breast in the mouth. The child does not swallow milk during sleep, and milk remains in the mouth. Then, milk is fermented by some cariogenic bacteria, and lactic acid is produced. Lactic acid can decalcify tooth enamel, hence increasing teeth caries risk. Therefore, prolonged breastfeeding and/or bottle-feeding can be a strong risk factor for ECC and S-ECC [16]. In the present study, children with S-ECC had a significantly higher age at the time of weaning than children without caries (Table 3). Jain et al. [22] and Martignon et al. [23] also showed that the age of the child at weaning is directly related to the incidence of ECC and S-ECC. A systematic review has also revealed that long-term breastfeeding can be a risk factor for S-ECC [24]. Therefore, it can be supposed that breastfeeding or bottle-feeding for a long time and occasionally more than two years increases the risk of S-ECC.

## Conclusion

According to the results of the present study, children with S-ECC had a longer breastfeeding period than children without S-ECC; thus, it seems that one of the reasons for the higher prevalence of ECC among children in Kerman could be the longer period of breastfeeding and/or bottle-feeding, but this issue needs further studies. However, teaching mothers of toddlers proper feeding patterns can be effective in the prevention of S-ECC.

The limitations of the present study were the impossibility of using two examiners and nonrandom sampling. It is suggested to conduct similar studies in other parts of Iran.

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## Conflict of interest

None declared.

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