Risk factors for severe early childhood caries in 2-3-year-old children in Rasht

Original Article

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Abstract

Introduction: Severe early childhood caries is the presence of smooth-surface caries in children younger than three years of age. This rampant form of dental caries exerts a negative impact on the quality of life of both the child and the family .The purpose of this study was to investigate the risk factors for severe early childhood caries (S-ECC) among 2-3 year-old children in Rasht.

Materials and Methods: A retrospective, case control study was carried out on 267, 2-3 year-old-children, who were divided into two groups. The study group (cases) included 89 children who were diagnosed with S-ECC. The cases were compared with the control group including 178 children who were caries free. The mothers of children in two groups were asked to fill in a checklist containing the demographic data, dietary, sleep and oral hygiene habits of the children. Data were statistically analyzed using χ^2 test and multiple logistic regression analysis.

Results: Statistical Significant variables associated with S-ECC were breast or bottle feeding to assist with falling asleep at night (P = 0.001), number of nights the child sleep through the night (P< 0.0001), on demand feeding (P < 0.0001), late start of brushing (P = 0.007), frequency of giving sugary snacks (P = 0.016) and the use of a bottle to drink sweetened liquids (P <0.0001). There was no significant relationship between S-ECC and the method, duration of feeding and educational level of parents.

Conclusion: Breast or bottle feeding to assist with falling asleep at night, number of nights the child sleep through the night, on demand feeding , late start of tooth brushing, frequency of giving sugary snacks and the use of a bottle to drink sweetened liquids were identified as risk factors for the development of dental caries in young children.

Key words: •Child •Dental Caries •Risk Factors

Introduction

Early Childhood Caries (ECC) is a serious public health problem in both developing and industrialized countries. It continues to affect babies and preschool children worldwide.[1]

The American Academy of Pediatric Dentistry(AAPD) defines early childhood caries as the presence of one or more decayed, missing(as a result of caries),or filled tooth surfaces in any primary tooth in a child 71 months of age or younger. The AAPD also specifies that in children younger than 3 years of age, any sign of smooth-surface caries is indicative of severe early childhood caries.[2]

Several antecedent terms have been used to describe S-ECC, many attributing causation to inappropriate infant-feeding methods. [3] One of the most recognized terms is Baby Bottle Tooth Decay (BBTD).[3] The term conjures up images of severe decay affecting the primary maxillary incisors as a result of inappropriate bottle-feeding. In reality, like other chronic diseases, ECC and S-ECC are multi factorial. These new terms were adopted in the late 1990s to refocus attention on the broader factors that influence oral health.[4]

ECC has been associated with demographic characteristics, oral hygiene practices, parental attitudes, educational status of mother, socio-economic status, temperament of the child, mouth breathing habit, pacifiers dipped in honey, children with chronic illness or special health care needs and other feeding habits, maternal nutrition, psychosocial issues, frequent use of medications and parenting practice.[5]

Patterns of sugar consumption are established early in life, and sugar consumption increases during the first 2 years.[6] Sugar consumption rate in the Middle-Eastern countries is higher than in other developing countries[7], and failure to implement proper oral health programs may well lead to higher rates of dental caries than elsewhere.

Although frequent consumption of sugary snacks has been associated with ECC[8], some reports dispute the existence of such a relationship.[4, 9, 10]

Azevedo et al. found that night-time breast feeding or breast-feeding in children older than 12 months, the use of a bottle at night as a substitute for the pacifier and the use of bottle on demand during the day was correlated with the etiology of S-ECC.[11]

Untreated ECC can lead to consequences such as abscesses, pain, malocclusions and lasting psychosocial impediments. Since the level of cooperative behavior of babies is less than ideal, the current standard of care for treatment of severe forms of ECC often necessitates general anesthesia, with its potential complications and costs.[1,5] It has been noted that S-ECC children attain significantly less height and weight when compared to children without S-ECC.[11]

Since this group of children are at preschool age, they are not as accessible for examination as older children, and therefore, few studies in the literature are available. S-ECC should be a concern as it increases the risk for caries throughout childhood [12, 13] and can have an impact on overall health and well-being.[14-17]

Identifying specific risk factors in children is useful to help inform targeted prevention and risk minimization activities in the community. This is critical in order to reduce the incidence and severity of caries in future generations.The purpose of this study was to investigate the risk factors for severe early childhood caries among 2-3 year-old-children in the city of Rash, Iran.

Materials and Methods

A retrospective, case control study was carried out on 267, 2-3 year-old-children. The study population was selected from public health centers, where children of most families, regardless of their socioeconomic level, are vaccinated. Six Public health centers were randomly selected, representing all districts in Rasht. Samples were divided into two groups. The study group (cases) included 89 children who were diagnosed with S-ECC. By definition, S-ECC exists when a child under 3 years of age has caries involving smooth surfaces. [2] The Control included 178 children who were caries free (dmf = 0).

A pilot survey was conducted among 40 children, in order to determine the number of samples, to train and familiarize the examiner

with the survey. Estimation of sample size was determined by unequal sample size formula by power of 80%. After the parents had signed the informed consent, the mothers were asked to fill in a checklist containing demographic data, feeding, sleeping and oral hygiene habits of the children.

Clinical examination was performed using mouth mirror for indirect vision of lingual areas of the teeth and explorer after drying the teeth with gauze. The children were examined in rooms with good natural light (near the window) with assistance of their mothers', by means of the "knee-to-knee" position.

Our samples were 2-3 year old Children and we evaluated the presence of smooth-surface caries especially on the buccal and lingual surfaces of maxillary incisors.

Feeding habits covered feeding with milk method, total duration of feeding, and nighttime feeding practices. The question about the feeding method had three responses: breastfeeding only, bottle-feeding only, or both. The total duration of feeding was recorded in months. Mothers were asked to answer one question about feeding at bedtime for the purpose of helping the child fall asleep.[6] Information about sleeping habits was elicited in two questions: Night waking episodes and Days of week slept through the night.[18]

The data were analyzed using the statistical package for social sciences(SPSS) version 16.

Also, χ^2 test and multiple logistic regression analysis were used for further and in detail analysis. The odds ratios(OR) and their 95% confidence intervals were calculated, accordingly. The significance level was $P<0.05$.

Results

In S-ECC group, 52.8% of children were boys and 47.2% were girls. In caries free group (control), 50.6% of children were boys and 49.4% were girls. There was no significant relationship between S-ECC and the sex of the child (P=0.729).

Mean age of children was 2.57±0.35 in S-ECC group and 2.46±0.33 in caries free group.

It was noted that 74.8% of children were breastfed, 6.4% were bottle fed and 18.8% both. There was no difference in the method (P=0.148) and duration of feeding (P=0.111) between those with and without S-ECC. (Table 1)

Mothers in the S-ECC group were significantly more likely to have fed the child on demand in response to crying or waking (P<0.0001) as well as breast or bottle feeding to assist with falling asleep at night (P=0.001) (Table 1).

About sleeping habits, it was found that children in S-ECC group had a greater number of night waking episodes. Children in the other group slept through the night more days per week than children in S-ECC group. (Table 1) Daytime sugar intake was higher for children in the S-ECC group. All of the children, who didn't eat sugary snacks, were caries free. (P=0.016)

It was observed that 92% of the parents, who started to brush teeth of their children after eruption of the first tooth, had caries-free children. Statistical analysis showed a significant association of the age tooth brushing started and the presence of S-ECC. (P=0.007)(Table 2)

While it appeared that fathers who had completed high school were more likely to have a child with S-ECC than those who had not completed high school, the association was not significant.(P=0.059) There was no significant relationship between S-ECC and educational level of mothers.(P=1.000) (Table 3)

A logistic regression analysis showed that S-ECC was more likely to occur among the children who had been fed at night (OR: 2.52), on demand feeding (OR: 3.95), cow milk-bottle feeding (OR: 4.39) and the tooth brushing started after 12 months (OR: 6.52). (Table 4)

Table 1. Feeding habits and sleep patterns in 2-3 year-old children in Rasht

variables	Children with S-ECC, %	Caries-free children, %	Pvalue*
Feeding method			
Breast fed	72(81.8%)	127(71.3%)	P=0.148
Bottlefed	3(3.4%)	14(7.9%)	
Both	13(14.8%)	37(20.8%)	
Duration of feeding			
≤ 12 months	2(2.3%)	17(9.7%)	P=0.111
18 months	13(14.9%)	27(15.3)	
≥ 24 months	72(82.8%)	132(75%)	
Sleep during feeding at night			
Yes	73(37.4%)	122(62.6%)	P=0.001
No	11(16.4%)	56(83.6%)	
On demand feeding			
Yes	59(69.4%)	67(36.6%)	P<0.0001
No	26(30.6%)	111(62.4%)	
Bottle contents			
Formula	6(24%)	19(76%)	P<0.0001
Cow milk	16(57.1%)	12(42.9%)	
Sweetend liquids	12(48%)	13(52%)	
Mixed	6(13.3%)	39(86.7%)	
Days of week slept through the night			
1-3 days	13(86.7%)	2(13.3%)	P<0.0001
≥ 4 days	70(28.5%)	176(71.5%)	

*chi-square

Table 2. Tooth brushing habits in 2-3 year-old children in Rasht

variables	Children with S-ECC, %	Caries-free children, %	P value*
Tooth brushing			
Yes	66(30.4%)	151(69.6%)	P=0.035
No	23(46%)	27(54%)	
The age tooth brushing started			
When the first tooth erupted	2(8%)	23(92%)	P=0.007
≥12 months	67(34.9)	125(65.1%)	

*chi-square

Table 3. Educational level of parents in 2-3-year-old children in Rasht

Educational Level	Children with S-ECC, %	Caries-free children, %	Pvalue*
Father			
Elementary to High school	23(26.1%)	60(33.7%)	P=0.059
Completed high school	35(39.8%)	81(45.5%)	
University	30(34.1%)	37(20.8%)	
Mother			
Elementary to High school	25(28.4%)	53(29.9%)	P=1.000
Completed high school	41(46.6%)	81(45.8%)	
University	22(25%)	43(24.3%)	

*chi -square

Table 4. Factors related to S-ECC as explained by a logistic regression model

Parameters in the model	OR	95% CI	Pvalue *
Sleep during feeding at night	2.52	1.01-6.27	0.046
On demand feeding	3.95	1.94-8.04	0.0001
Cow milk-feeding	4.39	1.48-13.01	0.008
Formula	0.47	0.09-2.41	0.367
Sweetend liquids	2.30	0.77-6.85	0.133
Mixed	0.32	0.1-1.04	0.059
Tooth brushing started at ≥12 months	6.52	1.3-32.7	0.023

*chi -square

Discussion

This study compared children with and without S-ECC in regard to behavioral and parenting variables. Breast or bottle feeding to assist with falling asleep at night (P=0.001), number of nights the child sleep through the week (P<0.0001), on demand feeding (P<0.0001), late start of brushing (P=0.03), frequency of giving sugary snacks (P=0.01) and use of a bottle to drink sweetened liquids (P<0.0001) showed a prominent impact on S-ECC in these samples. Whereas, sex of the child (P=0.729), method of feeding (P=0.148), duration of feeding (P=0.111) and the educational level of parents were not related to S-ECC. This study showed that 92.1% of the children had been solely or partly breastfed. This figure is similar to corresponding figures reported for Jordan and India[7, 19], but somewhat higher than those reported for the Far East.[20]

Reports suggesting that breastfeeding is a risk factor for ECC are based on the fact that breast milk, compared with cow's milk, has lower mineral and protein contents and a higher concentration of lactose.[6] However in this study, neither breastfeeding nor its duration was related to S-ECC. This finding is similar to that of Mohebbi et al.[6], but different from Shantinath et al.[18] and Azevedo et al.[11] Shantinath et al. showed that the average age of weaning was 6 months earlier for caries-free group than for the caries group.[18] In Azevedo's study, breast feeding in children older than 12 months was strongly associated with S-ECC.[11] In this study,

there was a significant relationship between nighttime feeding habits and S-ECC. Azevedo et al.[11] indicated that breast feeding during night time was associated with S-ECC that is consistent with our study's result. In addition, there was a significant relationship between the feeding behavior and S-ECC. Those who fell asleep with the nipple in the mouth had a statistically significant greater rate of caries than those who did not retain it during sleep.

Similar results were found by Azevedo et al.[11] and Mohebbi et al.[6] Feeding during the night may lead to prolonged exposure to fermentable carbohydrates and create dentally harmful environments in the oral cavity.[6] Salivary flow is decreased during sleep.

Swallowing function is reduced during sleep. Using the above facts, one can analyze the process involved in the initiation of dental caries.

In S-ECC group, there were more sleep problems than the other group. Children in S-ECC group were reported by their mothers to sleep through the night without awaking less than children without caries. They use feeding to help their child fall asleep. Similar results were found by Shantinath et al.[18] and Williamson et al.[21] Carey states that temperament may play a role in etiology, outcome or management of variety of illnesses, reactions to pain, and dental management. Nervous children very often are calmed by the sipping from the bottle.[22]

Our findings have implications for understanding of the risk factors of S-ECC and its prevention. The findings lend support to a broader model of caries etiology that includes behavioral factors.

There was a significant relationship between child's daytime sugar intake and S-ECC. Children consuming soft drinks, sweets and juice were more likely to have S-ECC. These snacks are convenient and readily available in communities. It is well recognized that the more frequent the consumption of these and other cariogenic foods and beverages are, the higher the risk of decay is. Snack foods, such as chips, cookies, candy, and drinks like pop and juice, have all been linked with caries.[4] Increased frequency of sugar consumption increases the risk of enamel demineralization and decreases time for remineralization by saliva, and then demineralization becomes a predominating process.[23] In addition, the introduction of sugary foods and drinks at an early age is known to lead to the establishment of a habit that persists into maturity.[8]

The results from this study showed the relation between the age tooth brushing started and the presence of SECC. This finding support the results of Bissar et al.[24] Aminabadi et al.[25] , Slabsinskiene et al.[23] , Davis et al[26] and Li et al.[27] Bissar et al. indicated that start of tooth brushing after the first birthday was a risk factor of S-ECC.[24] But, in Ayhan H, the age when tooth brushing began, did not show a significant effect on the incidence or the nursing caries.[28] The etiology of caries in early childhood is multifactorial. Our findings suggest that timely parent training in sleep management, before the establishment of bedtime routines or the onset of sleep problems might be an avenue to consider in preventing early childhood caries. In addition, oral health promotion programs should be extended to all health care facilities where children from all socio-economic levels are visiting from infancy on.

Conclusion

In conclusion, as S-ECC was associated with feeding at night and on demand feeding, these practices should be curtailed for children, whereas prolonged breastfeeding appears to have no such negative dental consequences. Late start of tooth brushing and frequency of giving sugary snacks showed a prominent impact on S-ECC.

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