Evaluation of certain risk factors for Early Childhood Caries in Samsun, Turkey

ABSTRACT

Aim Early childhood caries (ECC) is a relatively new term used to describe any stage of caries lesion in any primary tooth surface in a child under 6 years of age. The purpose of this study was to identify certain factors that influence the development of ECC among children in Samsun, Turkey.

Methods Data were collected for 226 children (108 girls, 118 boys) aged 3-6 years. Questionnaires were administered to the mothers of participating children to obtain information on infant feeding habits and the mother's level of education and oral health knowledge. Clinical diagnoses of ECC were based on intraoral examinations conducted using a flashlight, disposable mirror and wooden tongue depressor.

Results ECC was diagnosed in 46.9% of children. The mean dmft was 2.87. Significant associations were found between ECC prevalence and bottle feeding while sleeping and between ECC and the mother's level of education (p<0.05). The caries rate increased with the addition of sugar-containing substances to bottles; however, the increase was not statistically significant (p>0.05). There were no correlations observed between ECC and the mother's oral health knowledge or attitude (p>0.05).

Conclusion Within the limitation of this study, among the various factors investigated, infant feeding habits and the mother's level of education were found to have significant effects on the development of ECC.

Keywords: Child; Deciduous Teeth; Early childhood caries; Preschool; Risk factors.

Introduction

Dental caries is the most widespread oral disease among young children [Tinanoff, 1998]. Now referred to as early childhood caries (ECC), this relatively new term has been defined as the presence of any caries in the primary dentition of a child under 6 years of age [American Academy of Pediatric Dentistry, 2007]. ECC subsumes other descriptive terms of dental caries in young children, i.e., ‘baby-bottle tooth decay’, ‘nursing caries’ and ‘bottle mouth’ [Kaste et al., 1999]. The replacement of these older terms with the broader term ECC has helped to focus attention on risk factors other than prolonged breast-feeding and bottle-feeding [Schroth et al., 2005].

ECC initially presents with smooth-surface lesions affecting the primary maxillary incisors. As the disease progresses, decay begins to appear on the occlusal surfaces of the primary maxillary first molars, spreads to other primary teeth and eventually results in the destruction of the primary dentition [Berkowitz, 2003]. In its severe form, manifestations include pain, infection, abscesses, chewing difficulty, malnutrition, gastrointestinal disorders and low self-esteem. ECC can lead to caries and malocclusion in permanent dentition and may be associated with poor speech articulation, retarded growth and social ostracism [Ripa, 1988; Kaste et al., 1992; Acs et al., 1999]. While theoretically preventable, ECC remains a significant health problem [American Academy of Pediatric Dentistry, 2007]. Studies conducted among different countries, populations and age groups have identified wide variations in ECC prevalence, from as low as 0.5% to as high as 80% [Ripa, 1988; Wendt et al., 1991; Bilgin et al., 1994; Eronat and Koparal, 1997; Dini et al., 2000; Olmez and Uzamis, 2002; Schroth et al., 2005; Werneck et al., 2008]. Recent epidemiological surveys have used the ECC terminology to report on the caries experience and associated risk factors of preschool children with caries [Bilgin et al., 1994; Eronat and Koparal, 1997; Dini et al., 2000; Hallett and O’Rourke, 2002; Olmez and Uzamis, 2002; Hallett and O’Rourke, 2003; Finlayson et al., 2007; Werneck et al., 2008; Seow et al., 2009]. ECC is now well-understood to be a multifactorial disease with numerous biological [Seow, 1998; Seow et al., 2009], psychosocial [Reisine and Douglass, 1998; Hallett and O’Rourke, 2003; Finlayson et al., 2007], and behavioral [Reisine and Douglass, 1998; Hallett and O’Rourke, 2003] risk factors that vary from population to population [Ripa, 1988] such as: limited parental education, childhood poverty, inappropriate infant feeding practices, insufficient exposure to fluoride, poor oral hygiene, episodic dental visits of parents and their children, lack of professional dental care advice, poor perinatal and prenatal health and salivary and microbiological risk factors have all been implicated in the aetiology of ECC [Werneck et al., 2008]. However, little research has been conducted on the risk factors associated with ECC in Turkish children [Olmez and Uzamis, 2002; Ersin et al., 2006; Demir et al., 2008].

The aim of this study was to investigate the relationship between ECC prevalence and infant feeding habits, mothers’ education levels and oral hygiene in a group of children aged 3-6 years in Samsun, Turkey.

Methods

Population and sampling
Subjects were randomly selected from among the 4 public and 4 private pre-schools in Samsun, Turkey. A total of 226 children aged 3-6 years (108 girls, 118 boys) were included in the study. The mothers of all children gave their informed consent.

Clinical examinations
Clinical examinations were carried out at the different
preschools by one examiner (SO) previously trained in the use of dmft indices. Teeth or surfaces were categorised as carious (d) if there was visual evidence of a carious lesion. Teeth indicated for extraction were included among those categorized as missing (m).

Oral examinations were completed in 2-3 minutes. Children were asked to sit comfortably on a chair and were examined from the 12:00 position with an open-mouth posture. Teeth were gently dried with a piece of gauze, and examinations for caries were conducted using a torch, disposable mirror and wooden tongue depressor. ECC was defined according to the AAPD definition.

Questionnaires
Questionnaires were administered to the mothers of all participating children in order to collect information on children's dietary history, mothers' education levels and oral hygiene habits. Information about dietary habits included feeding method; age at which breast feeding was terminated; frequency of drinking milk from an infant feeding bottle at bedtime, naptime or during the night; and the addition of sugar, honey or other items containing sugar to the feeding bottle. Information about oral hygiene habits of children included oral cleansing methods. Mothers were also asked how they had learned about feeding their children.

Data analysis
Data were analysed using SPSS version 12.0. Univariate analysis was used to generate descriptive statistics, bivariate analysis was used to make comparisons between children with and without ECC, and Fisher’s exact test and t-tests were used to determine significance of differences.

Results

Sample size
The age and sex distribution of the 226 children included in this study is shown in Figure 1.

Dental conditions
ECC was observed in 49.6% (112/226) of children. The mean dmft was 2.87. Significant associations were found between ECC and bottle feeding while sleeping and between ECC and a mother’s low level of education (p<0.05). Although the addition of sugar-containing items to feeding bottles was found to increase the caries rate, this increase was not statistically significant (p>0.05). No correlations were observed between ECC and the mother’s oral health knowledge or attitude.

Feeding habits
In total, 96% (216/226) of the children had been breast-fed. However, only 2 children had been exclusively breast-fed, and only 2 children had continued breast-feeding beyond the age of 12 months. No significant correlation was found between ECC and breast-feeding for more than 12 months (p>0.05).

The use of a feeding bottle was reported by 82.3% (186/226) of the children (Fig. 2). Although all children had discontinued bottle-feeding by the age of 24 months, 68% (126/226) of children continued to be given a bottle at bedtime, and of these, 56% (70/126) were diagnosed with ECC, whereas the remaining 43.3% (56/126) were found to be caries-free (Table 1). Statistical analysis indicated a significant correlation between ECC and bottle-feeding at bedtime (p<0.05).

Feeding bottles of 33% (75/226) of children were reported to contain added sugar, and 54.7% (41/75) of these children were diagnosed with ECC. However, statistical analysis did not indicate a significant correlation between ECC and the addition of items containing sugar to feeding bottles (p>0.05).

In total, 26% (59/226) of children had been bottle-fed with milk and formula only, whereas the remaining 74% (167/226) had been given fruit juices, rice flour and baby biscuits.

Education level of mothers
When the education levels of the mothers were examined, 3% (7/226) were found to be illiterate, 18% (40/226) were primary-school graduates, 35% (79/226) were high-school graduates and 44% (100/226) were
Regarding feeding, bottle was found to be a key behavioral determinant of ECC. Within the social and behavioral determinants of ECC among a population of Turkish preschool children, bedtime bottle-feeding at night is a risk factor for ECC. In line with this theory, our study also demonstrated that putting a child to bed with a bottle and allowing sipping from a bottle during the day is a strong predictor of ECC than previously thought. Recent evidence suggests that taking a bottle to bed may be a stronger predictor of ECC than previously thought.

In the present study, 49.6% preschool children were diagnosed with ECC. This rate is lower than that of a previous study conducted in Turkey, which reported the prevalence of ECC to be 69.1% [Olmez and Uzamis, 2002]. Studies among Turkish preschool children have found wide variations in dmft values, ranging from 0.68 to as high as 16.5 [Bilgin et al., 1994; Ayhan et al., 1996; Eronat and Koparal, 1997; Olmez and Uzamis, 2002]. The mean dmft of this study population was found to be 2.87. The differences in reported mean dmft values may be attributed to differences in diagnostic criteria and participant selection.

The dental environment of a young child is affected by a complexity of factors that include the mother’s and/or caregiver’s dental knowledge, attitudes, beliefs and practices, all of which affect the child’s oral condition. Feeding habits are said to be of primary importance in the aetiology of dental caries at any age, but even more so among preschool children [Johnsen, 1982].

Appropriate breastfeeding is well-recognized as the best diet for infants. However, both uptake and duration of breast-feeding varies within and between countries and depends on several factors, including traditional, cultural and social contexts [Dini et al., 2000]. In this study, 96% (216/226) of children had been breast-fed, but only 2 had been exclusively breast-fed, and only 2 had continued breast-feeding beyond the age of 12 months. In contrast, an earlier Turkish study found that only 31.6% of children were breast-fed and that 73.6% of those who were breast-fed had continued beyond 13 months [Olmez and Uzamis, 2002]. The recommended age for weaning is a topic that is still debated by paediatricians, nurses and nutritionists, and dental studies have not convincingly demonstrated that at-will breast-feeding beyond 12 months of age or breast-feeding at night are predisposing factors for ECC [Valaitis et al., 2000]. In the present study, since only 2 children had been exclusively breast-fed, a significant association between ECC and exclusive breastfeeding could not be demonstrated.

Among the determinants of ECC related to bottle-feeding that have been reported by previous studies are sweetened bottle contents, bottle-feeding beyond 12 months of age, putting a child to bed with a bottle and allowing sipping from a bottle during the day [Reisine and Douglass, 1998; Dini et al., 2000; Chan et al., 2002; Hallett and O’Rourke, 2002; Hallett and O’Rourke, 2003; Olmez and Uzamis, 2002; Seow et al., 2009]. Recent evidence suggests that taking a bottle to bed may be a stronger predictor of ECC than previously thought [Hallett and O’Rourke, 2002; Hallett and O’Rourke, 2003; Seow et al., 2009]. With bottle-feeding, because the mouth volume of milk obtained from the artificial nipple is not enough to stimulate the swallowing reflex, milk is retained around the teeth until a sufficient volume is accumulated in the mouth to stimulate the swallowing reflex [Abbey, 1979].

Table 2 shows the relationship between ECC and mothers’ education levels. Statistical analysis indicated a significant correlation between ECC and the mother’s level of education (p<0.05) (Table 2).

**Table 2 - Relationship between ECC and mothers’ education levels.**

<table>
<thead>
<tr>
<th>Level of Education</th>
<th>Caries</th>
<th>Caries-free</th>
</tr>
</thead>
<tbody>
<tr>
<td>None/primary school</td>
<td>40</td>
<td>21</td>
</tr>
<tr>
<td>Secondary school and above</td>
<td>80</td>
<td>85</td>
</tr>
</tbody>
</table>

Fisher’s Exact Test, p<0.05 (significant association between ECC and lower level of education of mothers).

**Discussion**

The typical causative triad for caries consists of cariogenic microorganisms (Mutans streptococci, Lactobacilli), fermentable carbohydrates and susceptible hosts, but a multitude of aetiological risk factors are involved in ECC development [Reisine and Douglass, 1998]. This study presents epidemiological data identifying social and behavioral determinants of ECC among a population of Turkish preschool children. Within the limitation of this study, allowing a child to sleep with a bottle was found to be a key behavioral determinant of ECC, whereas a mother’s low level of education was found to be a significant social determinant of ECC.

The majority (68.6%; 155/226) of mothers reported having learned about feeding from health-care personnel, whereas 16.8% (38/226) reported receiving instruction from their elders and 14.6% (33/226) reported learning about feeding from magazines.

### Oral cleansing methods

Responses to the questionnaires showed that 65.6% (148/226) of mothers had started oral-cleansing practices immediately following the eruption of their child’s first tooth. Cleaning was performed using a piece of cotton gauze for 13.3% (30/148) of children, using a toothbrush for 22.6% (51/148) of children, by rinsing the mouth with water for 14.8% (33/148) of children and using all the above methods for 15% (34/148) of children (Fig. 3).

### Mother’s source of information/instruction regarding feeding

The majority (68.6%; 155/226) of mothers reported having learned about feeding from health-care personnel, whereas 16.8% (38/226) reported receiving instruction from their elders and 14.6% (33/226) reported learning about feeding from magazines.
demonstrate any clear relationship between ECC and the
addition of sweetening agents to feeding bottles, although this practice has been identified by earlier studies as an ECC risk factor for susceptible children [Seow, 1998]. This result could be attributed to the size of our study population and participant selection.

The findings of our study indicate that even without the addition of sweetening agents, bottle-feeding at night should be avoided. Also, parents should be encouraged to use bottle-feeding appropriately, instructing infants to drink from a cup as they approach their first birthday, and weaning children from the bottle at 12-14 months of age.

Social class has been found to be an important factor in the development of ECC [Hallett and O’Rourke, 2003; Chan et al., 2002]. For example, the occurrence of caries among children has been shown to decrease as the mother’s level of education increases [Chan et al., 2002]. The present study also found a similar relationship between ECC and a mother’s education, which may be indicative of the importance of the role of the mother in maintaining children’s oral health in today’s society.

Poor knowledge of oral hygiene and dental care procedures among parents has also been correlated to the development of ECC [Davies et al., 2005]. However, the present study found no relationship between oral hygiene practices and ECC. Overall, 65.6% (148/226) of mothers stated that oral cleansing practices had started immediately after the eruption of the child’s first tooth.

With regard to children’s feedings, nearly 70% of mothers indicated that they had learned about feeding methods from health-care personnel. Because infants and children frequently access health care during the first 6 years of life, primary-care health providers are uniquely positioned to provide ECC assessment, intervention, education and referrals. If primary-care providers are made aware of ECC and its consequences, they can play a significant role in the prevention of ECC.

Conclusion

In conclusion, the present study found an extremely high prevalence of ECC, making it a significant health issue among Turkish preschool children. The prevention of ECC relies on multidisciplinary efforts that involve different health professionals and government sectors responsible for health investments. The findings that sleeping with a bottle and a mother’s low level of education are associated with ECC can be used as the basis for developing more effective strategies for oral health promotion and ECC prevention within Turkey. The early, rapid caries development observed in the participating children suggests that preventive programs should be initiated before or soon after tooth eruption. Strategies should be implemented that provide the population with information and encourage families to change their attitudes towards oral health.

References


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References


