Comparison of data on Early Childhood Caries (ECC) with previous data for Baby Bottle Tooth Decay (BBTD) in an Italian kindergarten population

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ABSTRACT. Aim This was to assess the prevalence of Early Childhood Caries (ECC) among preschool children attending nursery schools and to compare the results with those of a previous survey where the investigators used the term and diagnosis for Baby Bottle Tooth Decay (BBTD) syndrome. Methods: A cross-sectional survey of 1,006 children aged 1-6 years was carried out. WHO recommendations for oral health surveys were used for caries diagnosis (non cavitated lesions were excluded). In addition, a comparison was made for prevalence of ECC between immigrant and native born children. Data were compared for ECC in the present survey with BBTD data in a previous study (1994) in the same area with a sample of 401 children aged 4 years. All examinations were by one examiner (Cohen’s Kappa=0.96). Results: Of the 1,006 children originally selected 52 children aged more than 71 months were excluded according to published ECC definition and diagnostic criteria. The overall sample was 29 children aged <36 months; 271 aged 3 years; 364 aged 4 years and 290 aged 5 years. ECC was diagnosed in 19.7% of the overall sample. The prevalence of ECC (and S-ECC) were respectively by age: <36 months S-ECC=17.2%; at 3 years: 13.28% (6.64%); at 4 years: 18.95% (9.34%); at 5 years: 26.9% (12.75%). In the native born children (916) the ECC was 18.34%, while in immigrants (38) it was 52.63% (p>0.001). In 1994 the prevalence of BBTD syndrome was 11.9% and in the present study 6.5%. Conclusion: The ECC prevalence, as ECC and severe (S-ECC) ,increased with age. In immigrant children ECC was 3 times (S-ECC 6 times) more frequent than in native born. Using the BBTD diagnosis the prevalence had dropped from 11.9% in 1994 to 6.5% in the present survey. KEYWORDS: Early Childhood Caries, Prevalence, BBTD syndrome.

Introduction

Over the past 30 years a dramatic decline of dental caries has occurred in children and adolescents in western countries [Marthaler et al., 1996; Bratthall et al., 1996; Petersson and Bratthall, 1996; Vanobbergen, 2001]. In the primary dentition, however, this trend has stopped and in some areas appears to have slightly increased [Rugg-Gunn, 2001; Birkeland and Haugejorden, 2002].

Early Childhood Caries (ECC) is the name used to describe the occurrence of caries in primary dentition prior to the eruption of permanent teeth. This terminology was proposed as an ‘umbrella term’ for caries in primary teeth in 1994 [Horowitz, 1998] and substitutes and integrates many previous definitions such as Baby Bottle Tooth Decay (BBTD) syndrome, bottle caries, rampant caries of the primary dentition, black teeth of the very young, nursing caries, nursing bottle caries, nursing bottle mouth, nursing bottle weaning, nursing bottle syndrome, prolonged nursing habit, labial caries of deciduous incisor teeth in small children, bottle mouth caries [Ottolenghi et al., 1998], tooth cleaning neglect [Moss, 1996; Ramos-Gomez et al., 1999], and severe dental caries in preschool children [Strohmenger and Ferro, 2003]. This confusion still, however, continues to exist in international literature and is discussed more fully by De Grauwe et al. [2004].

Ismail and Sohn [1999] carried out a systematic review of case definitions and clinical diagnostic criteria on ECC and also on what has been described as Severe Early Childhood Caries (S-ECC) in children aged 1 to 5 years. The acronym S-ECC, as used in

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their paper, was suggested to cover the terms nursing caries, baby bottle tooth decay, rampant caries, labial caries, maxillary anterior caries, and all other terms used to refer to severe dental caries in preschool children. The research of Ismail and Sohn considered articles published in peer-reviewed journals and indexed in Medline (overall 126). The analysis showed that 81 were cross-sectional, 7 case-controlled, 2 clinical trials and 4 were cohort studies. The authors excluded 32 out of 126 studies. These reports varied widely in the name used to identify S-ECC, case definitions, and diagnostic criteria. For instance ‘cavitation’ was the most common criterion used to define dental caries. Almost 1/3 of the 27 studies used the presence of one carious cavity on a maxillary incisor to classify a child with S-ECC. Some other reports defined S-ECC by the presence of caries on two or more teeth (23 studies) or 3 or more (9 studies) maxillary incisors. Ismail and Sohn [1999] found that there was a wide variation both in the case definitions and diagnostic criteria used for ECC or S-ECC. For this reason they underlined the need for an international accepted definition.

The diagnostic criteria of ECC as adopted by the American Academy of Pediatric Dentistry [Drury et al., 1999] were as follows:
- ECC is the presence of one or more decayed (non-cavitated or cavitated lesions), missing (due to caries) or filled tooth surfaces in any primary tooth in a child of 71 months of age or younger;
- in children younger than 3 years of age, any sign of smooth-surface caries is indicative of Severe Early Childhood Caries (S-ECC);
- from 3 to 5 years of age, one or more cavitated, missing (due to caries), or filled smooth surfaces in primary maxillary anterior teeth, or a decayed, missing or filled score of ≥4 (age 3), ≥5 (age 4) or ≥6 (age 5) surfaces constitutes S-ECC.

The most popular term of BBTD is, therefore, included as a severe form of ECC [Quartey and Williamson, 1999; Ismail and Sohn, 1999]. The term was coined by the Healthy Mothers. Healthy Babies Coalition to acknowledge what was considered the main predisposing factor and a name easily understood by lay people [Febres et al., 1997; Quartey and Williamson, 1999]. Today we know, however, that children who never use a bottle may still develop the condition [Matee et al., 1994]. Therefore, the connotation with use of a bottle should be dropped. The term ECC will be used hereinafter in this paper to cover all meanings of the condition.

While the aetiology is well known, an estimate of the prevalence of ECC in different countries is difficult principally because of the varying terminologies and diagnostic definitions as described above. Until epidemiological indices for ECC become standardized, the prevalence and severity data for these forms of caries will be crude at best [Al-Shalan et al., 1997]. There are very few recent Italian data on this topic. The aims of the present study, therefore, were both to assess the prevalence of ECC in a paediatric population sample aged <3 to 5 years old, in the Veneto region and to compare the current prevalence of the condition defined under the previous criteria of BBTD on a sub-population of 4 year old children with data of a similar investigation carried out in the same area in 1994. Finally, the data was used for a comparison of the prevalence of ECC between immigrant children and those who were native born Italian.

**Materials and methods**

**Study population.** This comprised 1,006 preschool children of both genders (519 males, 487 females) attending both private and public nursery schools in the area of Ulss n. 15 “Alta Padovana”, in Veneto region (Italy). The epidemiological survey was carried out within an oral health promoting activity in this district entitled “From mother to child”, articulated in different educative moments involving pregnant women during ante-natal courses, new mothers attending with their children for 12 month vaccinations and also children in nursery schools.

**Dental examinations.** Children were visited and an oral examination was conducted, at school, by one clinical dental examiner (RF) using plain mouth mirrors and dental probes. A sub-sample of children was examined a second time at a later date to assess the intraexaminer’s reproducibility. Only primary teeth were included in the caries scoring using WHO [1997] recommendations for oral health survey. Therefore, lesions were recorded as present when a carious cavity was apparent on visual inspection. At the time of the examinations 52 children aged more than 71 months were excluded according to ECC definition and diagnostic criteria [Drury et al., 1999]. Although the sample of 29 children aged <36 months could not be considered as representative of all children of that age in the locality, it was a convenience sample and their data were included. This population thus comprised 29 children aged <36 months, 271 aged 3 years, 364 aged 4 years and 290 aged 5 years and was examined between October 2002 and May 2003.

In 1994 in the same geographic area a survey was carried out to evaluate the prevalence of caries among a paediatric population of 1,626 children aged 4 to 12
years old. A sub-sample of 4 year old children was examined using the BBTD criteria, where at least 2 maxillary incisors were affected by cavitation. With the aim of comparing the results of this previous survey, 401 4 year old children [Ferro, 1995] living in the same area were examined utilizing the same diagnostic criteria as in '94 for a 4 year old sub-sample in the present study.

Finally, the data of the present study were stratified on the basis of whether each child was a native born Italian or were born in another country. The latter were defined as ‘immigrant’ children. We considered as ‘immigrants’ children belonging to families from Africa, East Europe, South America and Asia who had come to Italy in the previous 10 years. The status of immigrant or native born was determined by questioning of the mother of each child. A comparison of ECC prevalence was then made between immigrant and native born children.

**Statistical analysis.** Comparisons were made between groups using Chi square analysis.

**Results**

The reproducibility of the examiner was found to be good. Analysis of the repeated examinations gave a Cohen’s Kappa score of 0.96.

In total 19.7% of the overall sample presented with ECC, while 80.3% of children were caries free. The prevalence of ECC by age is reported in Figure 1. In children under 3 years of age all the cases of ECC presented as the severe form S-ECC, from 3 to 5 years approximately 50% were S-ECC. The comparison of caries using BBTD criteria between 1994 and 2003 showed that the percentage of children affected by BBTD syndrome dropped from 11.9% to 6.5%.

In Table 1 the differences between immigrant and Italian native born are reported. Both ECC and S-ECC were significantly higher in the immigrant group than in the native born children (p>0.001%).

**Discussion**

ECC has been known to exist for many centuries and probably since prehistoric times [O’Sullivan et al., 1993; Kowash et al., 2000]. It can, particularly in the severe form, be an extremely debilitating condition manifesting as severe pain, infection abscesses, chewing difficulty, malnutrition and gastrointestinal disorders. It is a risk factor for future caries in permanent teeth and it can lead to malocclusion, poor speech articulation, low self-esteem and social ostracism [Ramos-Gomez et al., 1999, 2002]. Studies have shown that ECC can have a profoundly negative impact on the quality of life and general growth and development of affected children [Milnes, 2003].

The dental treatment of ECC, in its severe form, generally requires sedation or general anaesthesia, especially for uncooperative children [Milnes, 2003; Mazzucchelli et al., 2003], but hospitalization is very expensive and such a treatment also results in substantial costs beyond those for dental treatment [Attari and Roberts, 2004]. As ECC is a preventable condition, the most effective approach to control must be based on prevention. The ideal conduct would be to provide expectant mothers with counselling and guidelines, as one of the greatest difficulties is the fact that few parents take their children to the dentist before the age of three years [Horowitz, 1998]. Starting at a much younger age, before the primary teeth erupt, can be effective [Kowash et al., 2000].

While serious disturbances in the balance between bacteria, substrate and host are the factors traditionally considered to result in ECC [De Grauwe et al., 2004], family, economic and social conditions also have a substantial impact on the development of the disease.

**Table 1** - Differences in prevalence of Early Childhood Caries (ECC) between immigrant and native born children in an Italian population living in the Veneto Region.
Income level and socioeconomic status are probably the major determinants of which children will suffer from ECC [Gibson and Williams, 1999]. The interrelationship of these social and environmental factors suggests that an approach emphasizing health promotion, rather than disease prevention at the individual level, is the model likely to have the greatest positive effect on children’s oral health.

The choice of case definition and diagnostic criteria to be used in carrying out the present study was confronted by a topic much debated in international dental paediatric literature. In 1994 the ‘umbrella term’ of ECC was proposed by CDC of Atlanta and substituted the previous and different terminology quoted in introduction. The most known and popular name of Baby Bottle Tooth Decay has been set within ECC as its severe form [Ismail and Sohn, 1999]. In the Italian literature, this is the only investigation recently carried out on this topic which adopted the new specification (caries in primary teeth) as emerged in the workshop of 30 and more Paediatric Dentistry opinion leaders in 1999 [Drury et al., 1999].

Besides this study in the Veneto Region, another epidemiological survey was carried out in the area of Rome on a kindergarten population [Petti et al., 2000]. For their study the investigators used the term RECDD (Rampant Early Childhood Dental Decay) and adopted the diagnostic criteria of at least two carious cavities on maxillary incisors involved. The results showed similar values on the prevalence of BBTDS of 6.5% (Veneto) versus 7.4% (Rome).

In our study the ECC prevalence, in its two forms of ECC and S-ECC, increased with age. From 3 to 5 years old, the number of children affected doubled from 13.3% at 3 years to 26.9% at 5 years and from 6.64% at 3 years to 12.75% at 5 years. The disease in this severe form shows an annual constant increment (3%).

ECC is more frequent among immigrant Italian children in Veneto, with a prevalence of ECC around 3 times more than native born and S-ECC is 6 times more frequent with a highly statistically significant difference (p<0.001). Such disparities in the prevalence of ECC between various population groups have been shown before [Curzon and Preston, 2004].

Comparing previous local data on BBTD prevalence (1994) with the present study, there has been an apparent reduction of 42.3%. It can be hypothesised that Veneto has traditionally been active in community based programs on prevention and oral health promotion, as exemplified in the name of the project ‘From mother to child’. Moreover, as König [1993] suggested, the mass media’s modern facial image proposing white teeth and dazzling smiles on television and periodicals could be beneficial in promoting preventive dental messages. Nevertheless, it appears that the prevalence of ECC/BBTD has decreased, which is beneficial. There is concern, however, about the high levels of the condition in immigrant groups, which pose a problem in trying to implement a preventive program because of cultural and language difficulties.

Conclusion

Early Childhood Caries remains a significant problem in preschool children in Veneto region, Italy. The prevalence of ECC was significantly higher in immigrant compared with native born Italian children.

References


