

Oral health inequalities in preschool children in North-Eastern Italy as reflected by caries prevalence

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ABSTRACT. ***Aim** To investigate dental caries experience among preschool children aged 3-5 years living in 2 Health Districts in North-Eastern Italy and to compare caries experience between indigenous and immigrant children. **Study design** Cross-sectional observational survey. **Methods and statistics** In this study 4,198, 3-5-year-old children, drawn from a total population of 9,829 were asked to participate. The examinations were performed at school between October 2004 and June 2005 and only lesions that penetrate the dentine were recorded (according to the BASCD criteria, 1997), by 2 calibrated examiners using artificial light, mouth mirrors and dental probes. The participants were categorised into 2 subgroups according to the country of origin of their mothers: indigenous mothers, almost all born in Italy, plus a very small number of mothers born in other highly developed western countries - "western origin" - (Nordic countries, Western Europe, North America, New Zealand and Australia), and immigrant mothers from Eastern Europe, Asia, Africa, Turkey, South and Central America, "non-western origin". Comparisons between groups were made using Pearson chi-squared test. Caries risk estimation was established by logistic regression analysis to assess the influence of gender, age and ethnicity on caries experience. Risk was summarised as odds ratio plus 95% CI. **Results** A total of 3,401 pre-school children were examined. The overall prevalence of dentinal caries was: 15.4% in 3-year-olds, 24.2% in 4-year-olds and 31.1% in 5-year-olds. At the same ages, children of immigrant mothers ("non-western origin") showed a significantly higher prevalence of caries compared with their counterparts of "western origin". As expected, older children had more caries. "Non-western origin" had a negative effect on caries experience. **Conclusions** Inequalities associated with mothers with an immigrant background were observed in the distribution of caries experience among the children. These children represent the first generation settling in and growing up in Italy, and their dental status-related data are comparable to those observed at the same ages in first generation "non-western" children living in other industrialised countries.*

KEYWORDS: Dental caries, Dental epidemiology, Italy, Preschool children, Prevalence.

Introduction

Despite the dramatic decline of dental caries in children and adolescents of western countries [Petersson and Bratthall, 1996; Marthaler et al., 1996], it is still a major oral health problem affecting 60-90% of schoolchildren (Petersen, 2003). Until fifteen years ago, only sporadic and uncertain epidemiological data existed on the Italian situation. During the 1995 ORCA

Symposium (Prevalence of Dental Caries in Europe 1990-1995), Italy was defined as "the only large populous Western continental country for which a decline in caries remains to be demonstrated" [Marthaler et al., 1996]. This gap was filled through national pathfinder surveys [Falcolini et al., 1998; Castiglia et al., 2006] promoted by scientific societies and regional or local health administrations as reported in the last decade of international literature [Ferro et al., 2006; Campus et al., 2004; Petti et al., 2000; Angelillo et al., 1999]. The outcomes of these studies indicate a low prevalence of dental caries in Italian preschool children with dental health scores comparable with those recorded in other western

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developed countries. The most recent data come from a 2004 national pathfinder on a sample of 5384 4-year-old subjects [Castiglia et al., 2006]: the mean dmft was 0.82 (SD±2.31) and caries free percentage was 78.1%; in the same years (2002/2003) a local survey in the area of Health District no.15 in Veneto region in the same aged preschool children population (n=364) confirmed these outcomes: mean dmft 0.83 (SD±2.24) and caries free percentage 81.1% [Ferro et al., 2004]. Oral health improvements across the world have not involved children from disadvantaged communities, and those from minority ethnic groups continue to experience higher disease levels [Watt and Sheiham, 1999; Murray, Thomson et al., 2003]. The “social polarisation” of caries is well documented in literature world wide with skewed distributions within populations [Graves et al., 1985; Vargas et al., 1998; USDHHS, 2000; Pitts et al., 2003; Pine et al., 2004; Marthaler, 2004]. Ethnic diversity, in “western” countries, is considered a strong determinant in oral health status, although lately in some countries like the UK, the relationship between higher caries experience and belonging to an ethnic minority is considered to be a confounding factor and more attention is paid to poverty, educational attainment and acculturation [Watt and Sheiham, 1999; Sundby and Petersen, 2003]. These considerations could be useful for those industrialised countries where immigration is a well established social phenomenon, dating since decades or centuries, and the contrary for Italy, given that immigration is fairly recent. It is since the beginning of 90’s that people moving from East Europe, Africa and Asia started settling in our country and now they represent (analysis updated to 01.01.2005 by the National Institute of Statistics - ISTAT) in Veneto region (North-East of Italy) 6.1% of the resident population (287,732/4,699,950). As a large proportion of immigrant children have only recently arrived in Italy, it is very likely that they have poorer oral health status and higher prevalence of caries than their local Italian counterparts. The aims of the present study were to describe the caries occurrence in preschool children in Local Health Districts 15 and 7 of the Veneto region in North-Eastern Italy and to compare the collected data for subgroups (immigrant or indigenous) by age and gender.

Materials and methods

In Italy kindergartens provide either a 3-year or a 4-year preschool programme and, even if the attendance is not compulsory, the large and widespread offer of these services in the areas of Health Districts no.7 (42

kindergartens over a population of about 100,000 inhabitants) and no. 15 (88 kindergartens over a population of nearly 280,000 inhabitants) in Veneto region (North-Eastern Italy) evidences that, in our social environment, the parents belonging to all classes are accustomed to send their children to kindergartens, so representing the appropriate setting to investigate preschool children population. Fiftyseven kindergartens were randomly chosen from each teaching district (41 in H.D. no. 15, and 16 in H.D. no. 7). A letter was sent to the Directors of the selected schools in June 2004 and all agreed to participate in the study. Within a population of 9,829 children aged 3-5 years, 4198 (42.7%) were selected to participate in our descriptive cross-sectional survey. The teachers were responsible for the distribution and collection of the positive consent forms requested from each child’s parents. We included all those present in each kindergarten on the examination days, but we were not able to return to examine those who were absent. The clinical examinations were carried out from October 2004 to June 2005 by two examiners (A.B., R.F.) using a portable light, a mouth mirror and a dental probe. Diagnosis of dental caries at the tooth level (dmft index) was, according to the criteria recommended by the British Association for the Study of Community Dentistry (BASCD) [Pitts et al., 1997], mainly made visually and confirmed with a probe, when necessary. Dental caries was diagnosed at the caries into dentine (d₃) threshold. No x-rays were taken. In order to document any discrepancy in caries diagnosis between examiners, diagnostic criteria were discussed prior the survey and duplicate examinations were carried out on about 10% of the whole sample. The kappa statistic was used to assess the inter-examiner reproducibility. According to the cultural background of their mothers, recorded in the consent form, participants was divided into 2 subgroups. The immigrant group (IG) was defined as children with mothers of “non-western” origins whereas the “western” indigenous group (WG) had mothers with western background. “Non-western” origins meant participants from Eastern Europe, Asia, Africa, Turkey, South and Central America. Nordic Countries, Western Europe, North America, New Zealand and Australia were the areas referred to as “western origin” [Skeie et al., 2005].

Means and standard deviation were calculated for dmft scores relating to age, gender and ethnicity. A child was defined caries free when his/her dmft score was zero. Comparisons between groups were made using Pearson chi-squared test. Caries risk estimation was established by logistic regression analysis to

assess the influence of sex, age and ethnicity (independent variables) on caries experience (dependent variable). Risk was summarised as odds ratio plus 95% CI.

Results

From the 4,198 children aged 3-5 years enrolled for this survey 3,401 (1637 girls and 1764 boys) were examined in the period October 2004 to June 2005. The response rate was 81% (208 parents did not give their consent and 589 children were absent). The IG of 277 children constituted 8.1% of the study sample

(over-represented according to the data of 6.1% in the whole population). In the WG nearly all the mothers were Italians, excepting 12 born in other western countries. The subjects were grouped as shown in tables 1 and 2. The inter-examiner assessment in caries diagnosis among the investigators as measured by Kappa statistics over a sub-sample of 322 children (separately examined by the 2 dentists in the same sessions) was good (0.85) as also was the intra-examiner reliability (0.82). Caries occurrence in the study population accounting for age, gender and ethnicity is shown in table 3. The overall mean dmft (SD) score was 1.02 (2.47). As regards the pattern of dental caries, the upper teeth had a higher caries experience (dmft = 0.57) than the lower teeth (dmft =

Age	girls	boys	Total
3 yrs-old	452 47.5%	499 52.5%	951
4 yrs-old	576 48.4%	614 51.6%	1,190
5 yrs-old	609 48.3%	651 51.7%	1,260
Total	1,637 48.1%	1,764 51.9%	3,401

TABLE 1 - Study population by age and gender.

Gender	Western group	Immigrant group	Total
Girls	1,523 93.0%	114 7.0%	1,637
Boys	1,601 90.8%	163 9.2%	1,764
Total	3,124 91.9%	277 8.1%	3,401

TABLE 2 - Study population by gender and immigrant status.

	N	caries free n	(%)	d score	m score	f score	dmft	dmft caries positive	SiC Index
Total	3401	2575	(75%)	0.9 ± 2.4	0.0 ± 0.1	0.1 ± 0.5	1.0 ± 2.5	4.2 ± 3.4	1133 3.1 ± 3.5
By age									
3 yrs-old	951	805	(85%)	0.6 ± 0.8	0	0.0 ± 0.2	0.6 ± 1.8	3.9 ± 3.2	237 2.4 ± 3.1
4 yrs-old	1190	904	(76%) ^{°°}	1.0 ± 2.4	0.0 ± 0.1	0.1 ± 0.4	1.1 ± 2.5	4.3 ± 3.5	395 3.1 ± 3.5
5 yrs-old	1260	866	(69%) ^{°°}	1.2 ± 2.6	0.0 ± 0.1	0.1 ± 0.6	1.3 ± 2.7	4.2 ± 3.5	501 3.0 ± 3.5
By gender									
girls	1637	1242	(76%)	0.9 ± 2.3	0.0 ± 0.1	0.1 ± 0.5	1.0 ± 2.4	4.1 ± 3.4	548 2.9 ± 3.4
boys	1764	1333	(76%)	1.0 ± 2.4	0.0 ± 0.1	0.1 ± 0.4	1.1 ± 2.5	4.3 ± 3.5	585 3.2 ± 3.5
By ethnicity									
Western group	3124	2437	(78%)	0.8 ± 2.0	0.0 ± 0.1	0.1 ± 0.5	0.8 ± 2.2	3.8 ± 3.1	974 2.7 ± 3.2
Immigrant group	277	138	(50%) [°]	3.0 ± 4.2	0.0 ± 0.2	0.1 ± 0.4	3.1 ± 4.2	6.2 ± 3.4	159 5.4 ± 4.3

[°] Pearson chi-square for prevalence comparison; $\chi^2 = 109.9$ $p = 0.000$

^{°°} Pearson chi-square for prevalence comparison; $\chi^2 = 74.7$ $p = 0.000$

TABLE 3 - Caries occurrence accounting for age, gender and mothers' background.

0.45). The lower posterior teeth had the highest caries experience (dmft = 0.43) whereas the lower anterior teeth had the lowest (dmft = 0.01). Decayed teeth (dt=0.94 ±2.37), accounted for 92% of dmft score, while 8% were filled (ft=0.08±0.46). Age and ethnicity are good predictors of oral health status: 4-year-old and 5-year-old children vs 3-year-old showed an increased risk of caries occurrence (OR 1.7, IC 95% 1.35-2.11, and OR 2.5, IC 95% 2.01-3.10, respectively) as well as non-western subgroup (OR 3.6, IC 95% 2.76-4.60). Figure 1 gives the distribution of dmft scores according to immigrant status. The IG (8,1%) accounts for nearly a quarter (24.8%) of all the caries lesions. No statistically significant difference was found for gender.

Discussion

Of the total 9,829 three, four and five year-olds living in two Health Districts in the Veneto region 3,401 were examined. As 98.8% of this population (9,715) attended kindergartens, the surveyed sample can be esteemed representative of the preschool children oral health status in the selected areas of the Veneto region. Dental caries was diagnosed only at the

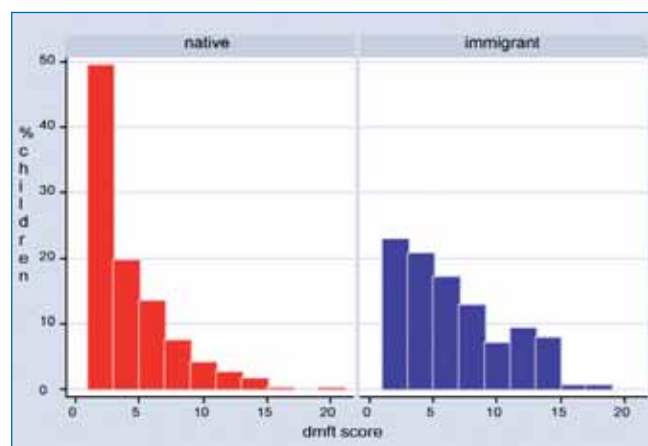


FIG. 1 - dmft score distribution according to immigrant status,.

Age	dmft (SD)	prevalence
3 yrs-old	3.9 ± 3.2	15%
4 yrs-old	4.3 ± 3.5	24%
5 yrs-old	4.2 ± 3.5	31%

TABLE 4 - Caries positive children: trend of severity and prevalence.

cavitation level mainly through visual inspection with the aim to ensure a higher level of agreement between examiners so underestimating the number of carious teeth in the population. As expected the “d” component dominates the dmft score. Different and known barriers affect dental treatment of childhood caries; such as parents’ skill to deal with children [Pine et al., 2004] and so on. Therefore it is a common outcome to find a low (10%) care index (ft/dmft x 100 per cent). Another expected finding is age as good predictor of disease. From ages 3 to 5 in the caries positive subgroup, the mean dmft value does not vary in a notable way, whilst the prevalence doubles. It is worth noting that in this young community new subjects with the same severity score occur (table 4). In caries-positive immigrant children both the severity and the prevalence increase with age (table 5). Age being a good predictor, early childhood caries is the main risk factor for caries in permanent dentition [Berkowitz, 2003; Peretz et al, 2003; Schroth and Moffatt, 2005; Mattila et al., 2005; Scottish Intercollegiate Guidelines Network, 2005]. The mean dmft index and the prevalence in 5 year-old children are similar to those reported for peers in western countries [WHO Oral Health Country/Area Profile Programme; Pitts et al., 2003]. According to Bratthall et al. [1996], we believe that the widespread use of fluoride toothpastes and the acquired knowledge of oral hygiene importance in oral health maintenance produced by mass-media take account of the generalised dental health improving occurred within Europe. Acquired lifestyle habits induced by improved socio-economic contexts have been acting as a minimum common denominator that have been working beyond the different prevention and care provision systems and beyond national boundaries. Nowadays, being the value of dmft index similar in all the affluent European countries apart from dental care delivery systems, it can be regarded as a social indicator more than a severity dental index [Holst and

Western group			Immigrant group	
Age	dmft	prevalence	dmft	prevalence
3 yrs-old	3.9	14.3 %	4.3	31.1%
4 yrs-old	3.9	21.8%	6.2	47.7%
5 yrs-old	3.7	28.1%	6.7	63.8%

TABLE 5 - Caries positive children: trend of severity and prevalence in western and immigrant group.

Schuller, 2000]. As expected, health dental scores in immigrant preschoolers are worse than native born ones: the severity is 4 times and the prevalence is almost 2 times higher. Usually oral health in immigrant schoolchildren living in developed countries is poor [Dhawan and Bedi, 2001]; as long as immigrants are not fully integrated into the community, their oral health status will tend to be worse than that of indigenous ones.

Conclusions

Inequalities associated with mothers with an immigrant background were observed in the distribution of caries experience among the children. These children represent the first generation settling in and growing up in Italy, and their dental status-related data are comparable to those observed at the same ages in first generation "non-western" children living in other industrialised countries. As our public dental services, no uniformly organised and providing only 5% of dental care at national level (Widström and Eaton, 2004), are not able to satisfy the increasing oral needs of this segment of the population. Primary preventive dentistry programmes should be organised targeting parents, kindergartens' operators and paediatricians with the aim to facilitate the full integration into the community.

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