

Social differences in tooth decay occurrence in a sample of children aged 3 to 5 in North-East Italy

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Objective: To correlate the occurrence of tooth decay with a social class indicator (occupational level) and the immigrant status in a sample of pre-school children in Veneto region. **Basic research design:** Cross-sectional survey. **Clinical setting:** Twenty nursery schools in the area of Health District n.15. **Participants:** A total of 1,410 children aged 3 to 5 years old visited between September 2005–May 2006. **Outcomes:** Occurrence of dental caries into dentine threshold was made visually and confirmed with a probe when necessary by two calibrated examiners. Information on immigrant status and occupational level of parents was obtained by a questionnaire. Children were categorized as immigrant or non-immigrant on the basis of their mother's country of origin. Means and standard deviation were calculated for continuous variables; for categorical variables the results were provided as proportions. Comparisons between groups were made using Pearson chi-square test. The association between caries occurrence and the independent variables gender, age, immigrant status and family social class was evaluated by means of a logistic regression model. **Results:** Caries occurrence was higher among children from lower social class families (1.7 ± 3.2) than among children from higher social class (0.8 ± 2.1). The prevalence of dental caries in immigrant pre-school children was significantly higher than in indigenous ones (15% vs 40%; $p = 0.000$) while the severity in immigrants was almost 4 times higher (2.2 ± 3.6 vs 0.6 ± 1.8). **Conclusions:** Our data on preschoolers confirm the worldwide literature shared statement that social class as well as immigration status are determinants of oral health.

Key words: Italian pre-school children, inequalities, socioeconomic factors, tooth decay experience

Introduction

The outstanding improvements in oral health that started in the '70s across the industrialised countries did not involve children from disadvantaged communities who have been continuing to experience higher disease levels (Pine *et al.*, 2004). Few studies were carried out in Italy on this topic (Petti *et al.*, 2000; Perinetti *et al.*, 2005; Campus *et al.*, 2007). As the effects on health among disadvantaged social categories spread over all ages (Sisson, 2007), it would be useful to assess how early social differences affect oral health in preschool Italian children.

The aim of this study was to evaluate the relationship between caries occurrence and a social class indicator such as occupational level and immigrant status in a sample of 3 to 5-year-old children in the Veneto region.

Methods

A cross-sectional study was carried out from September 2005 to May 2006 among a sample of 3 to 5-year-old children in our local health unit (Veneto region; northern Italy). In this area, kindergartens represent the ideal setting, being attended by more than 90% of the studied population. As of 31/12/2005, the area had 7,397 children between the ages of 3 and 5 who were attending a total of 88 nursery schools. A convenience sample of 20 kindergartens was randomly selected, for a total of 1,820 eligible children: no power calculation was carried out as the number of schools selected represents the best performance the examina-

tion team could cope with during one school-year. All nursery schools selected agreed to participate in the study. Parents of the children were informed about the study by a letter and then invited to give their written consent to the evaluation of the oral health of their children, following the ethical principles defined by World Medical Association Declaration of Helsinki (World Medical Association, 2001).

Of the selected 1,820 subjects, 1,410 children formed our study base (77.5%), 372 (20.5%) were absent and 38 (2%) were not authorized by their parents to participate in the examination.

The children were examined in their classrooms by two dentists using a portable light, a mouth mirror and a dental probe. Diagnosis of dental caries at the tooth level (decayed, missing and filled teeth index or dmft index; WHO, 1997) was mainly made visually and confirmed with a probe when necessary. Dental caries was diagnosed when a cavitation into dentine was present. Each child with no obvious decay was then classified as $dmft = 0$ (a dichotomous variable 1/0 was defined to record this information). To bring attention to high risk individuals, the SiC index, which is the mean dmft detected in one third of population with the highest caries scores, was also calculated (Bratthall, 2000). The Care Index (Pitts and Evans, 1997) was used to describe the level of restorative care (the number of filled teeth divided by the number of obviously decayed, missing and filled teeth and multiplied by 100). A sub-sample of fifty subjects was observed independently by the two examiners as a

tool for standardizing examination procedures: agreement was assessed by means of kappa statistic ($\kappa = 0.935$ (CI 95% 0.777-0.975) for dmft score); discrepancies have been resolved by discussions between the two dentists. Children were categorized as immigrant based on the definition of Skeie *et al.* (2006) according to which a child was defined “immigrant” if his/her mother was born in a “Non Western Country” (Eastern Europe, Asia, Africa, Turkey, South and Central America); otherwise a “non-immigrant” status was assigned. Along with the consent form, the parents were asked to fill in a questionnaire about the mother and father’s occupational status. We obtained information on occupational status in 85.5% ($n=1,205$) of the questionnaires. Occupational level has been classified into four classes according to Costa’s recommendations (Costa *et al.*, 2004): high class (managers, professionals), clerks (clerical employees and technical occupations), self-employed (small employers and own account workers), working class (manual workers, skilled and unskilled, and housewives). For each child, a social class position was assigned according to the highest occupational level observed between the mother and father’s status.

The dmft score was the primary outcome in the study; it was analysed as a categorical variable (dmft = 0 vs dmft > 0). Means and standard deviation were calculated for continuous variables; for categorical variables the results were provided as proportions. Comparisons between groups were made using Pearson chi-square test. The association between caries occurrence and the independent variables gender, age, immigrant status, and family class of social position was evaluated by means of a logistic regression model. Collinearity was checked with a matrix of correlation using the Spearman rank correlation coefficient between independent variables: a significant correlation was found between occupational status and immigrant status ($r = 0.323$; $p = 0.0000$). This is not surprising when looking at the dataset: 102 out of 123 (83%) immigrants were workers (27.3% among non-immigrants). Furthermore, we fitted two separate logistic regression models (with and without immigrant status) as the observed relative risk also depends on collinearity between the variables in the model. Statistical analysis was performed with software Stata rel. 8.2 (Stata Corporation, College Station, TX, USA).

Results

Table 1 presents data of caries occurrence among the study population according to age, gender and immigrant status. The dmft score distributions being very skewed, we think that it could be more informative to show Table 1 with the overall dmft means (with standard deviation) and SiC index values.

The dmft scores showed a tendency to be higher through age classes and immigrant status, thus confirming previous studies (Ferro *et al.*, 2006). Similarly, the prevalence of children with no obvious decay was significantly lower with increasing age (62% among 5-year-olds vs 83% among 3-year-olds) as well as in the immigrant group (63% vs 76%).

Table 2 shows caries occurrence according to social class. Tabulating the odds of caries against social class indicator showed a meaningful linear trend across

categories of that explanatory variable ($\chi^2 = 22.4$; $p = 0.0000$). The risk for a dmft score > 0 was 1.9 (CI 95% 1.3-2.8) among children of parents in lower social class (Table 3, model 1) compared with children of parents in the higher social class; age was also a good predictor of caries occurrence. After adding the immigrant variable in the analysis (Table 3, model 2), the social class odds ratio decreased to 1.4 (CI 95% 0.9-2.1), while immigrant status showed a significant risk of caries occurrence (OR=3.3 - CI 95% 2.1-5.1). There was no statistically significant difference in caries occurrence between the genders. As regards Care Index (Table 4), it should be pointed out that out of 391 children with a dmft >0 (28% of the whole sample), 91% have a C.I. value =0 and only 9% have a C.I. >0. These data do not allow dividing the study population into any subgroup (immigrants/non-immigrants, high/class/working class) to consider the Care Index.

Discussion

The response rate for questionnaire on job status (85.5%) appears to be satisfactory. The reasons for not responding do not suggest a selection effect based on social class. Overall caries prevalence showed a satisfactory level comparable to those found in other European countries (Pitts *et al.*, 2007; WHO Country/Area Profile Programme 2007). The observation of children from working class families experiencing more caries than those from higher social classes was also pointed out in a recent study in another Italian area (Campus *et al.*, 2007). Moreover, most of the immigrant families come from working class and, although they represent the 22% of this social class, their children’s caries experience takes account almost completely for caries prevalence and OR value in the working class group (Table 3, model 2). These data confirm that immigrant background has a significant association with caries prevalence in children (Ferro *et al.*, 2007; Stecksen-Blicks *et al.*, 2004). The need for dental care was demonstrated by the high value of the “d” component of dmft index compared to the low “f” component, so leading to a low care index ($f/dmft \times 100\% = 14.3$). With the primary “free” dental care service either unavailable or limited in Italy due to the reduced budget assigned to public dental services, most of oral treatment needs of children in low income families are not going to be met. This relates to the “paradox of dental need”: higher prevalence and incidence of oral disease do not translate into higher dental utilization depending upon how one defines need and how one defines the utilization outcome (Gilbert, 2005). Obviously in children the perception of dental needs as well as the establishment of favorable habits to oral health are influenced by parental awareness on this topic (Pine *et al.* 2004). Moreover, in immigrant groups the utilization of care can also be influenced by differences in culture and language (Mouradian, 2001). In conclusion, our data on preschoolers confirm the worldwide literature shared statement that social class as well as immigrant status are strong determinants of oral health. Reaching this segment of the population with effective preventive oral health programmes appears the most pressing problem currently in community dentistry all over the world (Skeie *et al.*, 2006).

Table 1. Study population and caries occurrence, according to age, gender and immigrant status

	<i>n</i>	<i>n</i> (%) <i>no obvious decay</i>	<i>Dmft</i> (<i>mean ± SD</i>)	<i>SiC index</i>
Total	1410	1021 (72%)	0.7 ± 2.1	2.2
by age				
3 yrs-old	393	328 (83%)	0.4 ± 1.7	1.2
4 yrs-old	515	382 (74%) ^{°°}	0.6 ± 1.8	1.7
5 yrs-old	502	311 (62%) ^{°°}	1.2 ± 2.6	3.6
By gender				
Girls	704	515 (73%)	0.8 ± 2.2	2.1
Boys	706	506 (72%)	0.7 ± 2.1	2.4
By ethnicity				
Native	1.265	958 (76%)	0.6 ± 1.8	1.7
Immigrant	145	63 (43%) [°]	2.2 ± 3.6	6.4
By social class position				
High class	211	164 (78%)	0.9 ± 2.2	2.4
Clerks	395	315 (80%)	0.7 ± 2.0	2.1
Self-employed	200	147 (74%)	1.3 ± 2.8	3.7
Working class	399	256 (64%) ^{°°°}	1.7 ± 3.2	4.9
Unemployed, n.d.	205	137 (67%)	1.6 ± 3.1	4.7

[°] Pearson chi-square for prevalence comparison; $\chi^2 = 67.9$ $p = 0.000$

^{°°} Pearson chi-square for prevalence comparison; $\chi^2 = 52.3$ $p = 0.000$

^{°°°} Pearson chi-square for prevalence comparison; $\chi^2 = 11.8$ $p = 0.001$

Table 2. Number (%) of subjects with no obvious decay according to social class position

	<i>n</i>	<i>n</i> (%) <i>no obvious decay</i>
High class	211	164 (77%)
Clerks	395	315 (79%)
Self-employed	200	147 (73%)
Working class	399	256 (64%)
Total	1205	882 (73%)

Table 3. Odds ratios for caries occurrence adjusted for age, gender and social class with (model 2) and without (model 1) adjustment for immigrant status.

		<i>Model 1</i>		<i>Model 2</i>	
		<i>OR</i>	<i>CI 95%</i>	<i>OR</i>	<i>CI 95%</i>
Age	3 yrs-old	1		1	
	4 yrs-old	1.7	[1.2-2.6]	1.7	[1.2-2.6]
	5 yrs-old	3.2	[2.3-4.6]	3.3	[2.3-4.7]
Gender		0.9	[0.7-1.3]	0.9	[0.7-1.3]
Social class	High class	1		1	
	Clerks	0.9	[0.6-1.3]	0.8	[0.6-1.3]
	Self-employed	1.2	[0.7-1.9]	1.2	[0.7-1.8]
	Working class	1.9	[1.3-2.8]	1.4	[0.9-2.1]
Immigrant status	Non-immigrant			1	
	Immigrant			3.3	[2.1-5.1]

Table 4. Care index in the population with dmft index >0

Care index	Freq.	Percent	Cum.
0.0%	356	91.05	91.05
12.5%	1	0.26	91.30
16.7%	2	0.51	91.82
20.0%	2	0.51	92.33
22.2%	1	0.26	92.58
25.0%	1	0.26	92.84
28.6%	1	0.26	93.09
33.3%	3	0.77	93.86
40.0%	1	0.26	94.12
50.0%	4	1.02	95.14
60.0%	3	0.77	95.91
66.7%	3	0.77	96.68
71.4%	1	0.26	96.93
100.0%	12	3.07	100.00
Total	391	100.00	

References

- Bratthall D. (2000): Introducing the Significant Caries Index together with a proposal for a new oral health goal for 12-year-olds. *International Dental Journal*; **50**: 378-384.
- Campus G., Solinas G., Sanna A., Maida C., Castiglia P. (2007): Determinants of ECC in Sardinian preschool children. *Community Dental Health* **24** 253-256.
- Costa G., Spadea T., Cardano M. (2004): Inequalities in health in Italy. *Epidemiologia e Prevenzione* **28**(suppl.3), 64-74
- Ferro R., Besostri A., Meneghetti B. (2006): Dental caries experience in preschool children in Veneto region (Italy). *Community Dent Health* **23**(2), 91-94.
- Ferro R., Besostri A., Meneghetti B., Olivieri A., Benacchio L., Tabaccanti S., Mazzoleni S., Favero G., Stellini E. (2007): Oral health inequalities in preschool children in North-Eastern Italy as reflected by caries prevalence. *European Journal of Paediatric Dentistry* **8**(1), 13-18.
- Gilbert G.H. (2005): Racial and socioeconomic disparities in health from population-based research to practice-based research: the example of oral health. *Journal of Dental Education* **69** (9) 1003-1014
- Mouradian W.E. (2001): The face of a child: children's oral health and dental education. *Journal of Dental Education* **65**(9) 821-831.
- Perinetti G., Caputi S., Varvara G. (2005): Risk/prevention indicators for the prevalence of dental caries in school-children : results from the Italian OHSAR Survey. *Caries Research* **39**, 9-19.
- Petti S., Cairella G., Tarsitani G. (2000): Rampant early childhood dental decay: an example from Italy. *Journal of Public Health Dentistry* **60**, 159-166.
- Pine, C.M., Adair, P.M., Nicoll, A.D., Burnside, G., Petersen, P.E., Beighton, D., Gillett, A., Anderson, R., Anwar, S., Brailsford, S., Broukal, Z., Chestnutt, I.G., Declerck, D., Ping, F.X., Ferro, R., Freeman, R., Gugushe, T., Harris, R., Lin, B., Lo, E.C.M., Maupomé G., Moola, M.H., Naidoo, S., Ramos-Gomez, F., Samaranayake, L.P., Shahid, S., Skeie, M.S., Splieth, C., Sutton, B.K., Soo, T.C. and Whelton, H. (2004): International comparisons of health inequalities in childhood dental caries. *Community Dental Health* **21** (supplement), 121-130.
- Pitts N.B. and Evans D.J. (1997): The dental caries experience of 5-year-old children in the United Kingdom. Surveys coordinated by the British Association for the Study of Community Dentistry in 1995/96. *Community Dental Health* **14**, 47-52
- Pitts N.B., Boyles J., Nugent Z.J., Thomas N., Pine C.M. (2007): The dental caries experience of 5-year-old children in Great Britain (2005/6). Surveys co-ordinated by the British Association for the Study of Community Dentistry. *Community Dental Health* **24**(1) 59-63.
- Sisson K.L. (2007): Theoretical explanations for social inequalities in oral health. *Community Dentistry and Oral Epidemiology* **35**, 81-88.
- Skeie M.S., Riordan P.J., Klock K.S., Espelid I. (2006): Parental risk attitudes and caries-related behaviours among immigrant and western native children in Oslo. *Community Dentistry and Oral Epidemiology* **34**, 103-113.
- Stecksen-Blicks C., Sunnegårdh K., Borssen E (2004): Caries experience and background factors in 4-year-old children: time trends 1967-2002. *Caries Research* **38** 149-155.
- WHO (1997): Oral health surveys: Basic Methods, 4th edn. WHO, Geneva.
- WHO (2007) Oral health Country/Area Profile Programme (CAPP). At: www.whocollab.od.mah.se/index.html. last accessed 02.19.2008.
- World Medical Association (2001): World medical Association Declaration of Helsinki. Ethical principles for medical research involving human subjects. Bulletin of World Health Organisation.; **79**(4):373-4 Epub 2003 Jul 2.