Caries Experience and Status in School-age Children Residing in Four North Italian Communities

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Purpose: The aim of this paper was to describe the caries experience in four North Italian areas. The areas selected were four North Italian medium-sized cities: San Remo located in western Liguria, Ferrara in Emilia, and Varese and Melegnano (Milan suburbs).

Materials and Methods: 1104 subjects (560 males and 544 females) were examined. Several dental outcomes were used: DMFT Index and SiCindex following WHO recommendations; and the caries experience ratio; the percentage of children with high caries disease and with rampant caries was calculated as the percentage of subjects with DMFT > 0, DMFT \ge 4 and DMFT \ge 7.

Results: Mean DMFT ranged from 1.21 \pm 1.65 in the Ferrara group to 1.83 \pm 2.49 in San Remo. Among the groups, statistically significant differences were observed for DT and DMFT (p = 0.04 and p = 0.01 respectively). The SiC index was 3.75 \pm 1.87, 3 (2-5) in all samples, with significant differences among the four areas (p = 0.04). No statistical differences were observed among the four areas regarding caries experience and the proportion of children with high and rampant caries. An elevated proportion of subjects with high caries (DMFT \geq 4) was noted in the San Remo group (22.9%). The distribution of children by gender according to DMFT levels was not statistically significant either. The F/DMFT ratio was similar in the survey areas, from 0.30 in San Remo, 0.38 in Varese and Ferrara, to 0.40 in the Milan suburbs.

Conclusion: Information drawn from this study can be helpful to describe and plan future dental prevention programmes aimed at reducing caries experience and promoting better oral health level.

Key words: caries epidemiology, DMFT index, SiC index, children, Italy

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A n important decline of caries prevalence was found in a comprehensive review of the disease carried out in 1995 in several European countries. The caries decline in permanent dentition had

reached a plateau in several industrialized European countries (Marthaler et al, 1996). However, in some countries (such as Italy) a high prevalence of dental caries is still present. In Italy, no national data on caries prevalence or incidence is available, and all the papers presented in the literature are focused on local situations; furthermore the data are not easily comparable due to different diagnostic criteria and the fact that non-calibrated examiners were used.

However, a decrease of caries disease prevalence has been shown in Italy also (Vogel et al, 1979, 1986, 1988; Strohmenger et al, 1983, 1987, 1997; Campus et al, 2000, 2001, 2003).

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Table 1	Distribution of sample by gender in the four areas					
	San Remo	Varese	Milan suburb	Ferrara		
	n (%)	n (%)	n (%)	n (%)		
Males	84 (46.9)	178 (54.3)	162 (47.9)	136 (52.5)		
Females	95 (53.1)	150 (45.7)	176 (52.1)	123 (47.5)		
p	p > 0.05	p > 0.05	p > 0.05	p > 0.05		

Since 1979 the Dental Institute of the University of Milan has been a WHO collaborating centre, carrying out activities in support of the WHO mandate for international health work and its programme priorities. Data on caries experience in 12-year-old children living in the north of Italy and more precisely in the Milan area showed a decrease of caries disease experience, expressed as caries experience and DMFT index: 90.1% and DMFT = 5.71 in 1979; 91.0% and DMFT = 4.9 in 1986; 66.13% and DMFT = 2.56 in 1997 (Vogel et al, 1979, 1986, 1988; Strohmenger et al, 1983, 1987, 1997).

Consequently, the purpose of this paper was to describe the caries experience and status of school-age children residing in four North Italian communities.

MATERIALS AND METHODS

Several epidemiological surveys were carried out during 2001–2002 in the WHO Collaborating Center of Milan for Epidemiology and Community Dentistry. We selected those referring to the areas where previous surveys had been performed (Table 1). The areas selected were four North Italian medium-sized cities: San Remo located in western Liguria, Ferrara in Emilia and Varese and Melegnano (Milan suburbs). The fluoride concentration in drinking water in the four areas is 0.05 mg/l in Milan suburbs, 0.12 mg/l in Ferrara, 0.2 mg/l in Varese and 0.33 mg/l in San Remo.

The macro socio-economic conditions of the four areas were assessed following national data (ISTAT) regarding medium income per subjects. The four areas were categorized as follows:

1. Melegnano (Milan suburb) represented a low to medium socio-economic level area, Melegnano

was a traditional industrial area, but the 1990s recession is now in socio-economic decline.

- 2. San Remo located in western Liguria is a medium socio-economic level area.
- 3. Ferrara and Varese are medium to high socio-economic level areas.

To calculate the size sample for each area, statistical data (ISTAT) on the school class population was used as a cluster. Every class was identified as a cluster and compiled into a list. The first cluster in the list was randomly chosen while the others were selected at the systematic interval of three classes. The number of subjects in each class was approximately the same. Parents or guardians were issued with an information leaflet requesting their child's participation and explaining the main goal of the study. Only children with parental consent were enrolled as participants.

Clinical Data

Clinical examinations were carried out at school under standardized conditions (Bolin et al, 1995). Several dental outcomes were used: the number of decayed, missing due to caries, or filled teeth were calculated for each child according to WHO (WHO, 1997) oral health recommendations; the Sic (Significant Caries Index) following the WHO collaborating centre in Malmö University, Sweden (Brathall et al, 2000), and recently critically modified by one of the authors of the present paper (Campus et al, 2003); and the caries experience ratio, the percentage of children with high caries disease and with rampant caries. No bitewing x-rays were taken. Furthermore, the gingival condition was assessed using the WHO recommendation and the CPI was calculated.



 $\ensuremath{\textit{Fig1}}$ Caries experience distribution in the four areas by gender.

Data Analysis

Descriptive statistics were performed. The comparison of a quantitative variable among groups was carried out using one-way ANOVA. Difference in proportion was tested using χ^2 test. The caries experience, the percentage of caries experience, high caries level and rampant caries experience were calculated as the percentage of subjects with DMFT > 0, DMFT \geq 4 and DMFT \geq 7, respectively, compared to the whole sample.

RESULTS

A total of 1104 subjects were examined (560 males and 544 females). The distribution of examined subjects by gender in the four areas is presented in Table 1. No statistically significant differences among gender were detected among the four groups. The caries experience rate was about 50% in the total sample, with minor fluctuation among gender and the various areas (Fig 1). Descriptive statistics for DMFT and subgroups are displayed in Table 2. Mean DMFT ranged from 1.21 ± 1.65 in the Ferrara group, to 1.83 ± 2.49 in San Remo. In all samples means±standard deviation, medians and percentiles $(p_{25} - p_{75})$ were respectively: $0.90 \pm 1.62, 0 (0 - 1)$ for DT; $0.01 \pm 0.22, 0 (0 - 1)$ 0) for MT; 0.54 ± 1.13 , 0 (0 – 0) for FT; and $1.46 \pm 2.00, 0 (0 - 2)$ for DMFT. Among the groups statistically significant differences were observed for DT and DMFT (p = 0.04 and p = 0.01 respec-



 $\mbox{Fig}~2$ $\mbox{The distribution of children by gender according to DMFT levels.}$

tively). The SiC index showed a value of $3.75 \pm$ 1.87, 3 (2-5) in all samples, with significant differences among the four areas (p = 0.04). The distribution of DMFT index was highly skewed; the high and rampant caries proportion was less likely to be more or less normally distributed, while the SiC index remains partially skewed. No statistical differences were observed among the four areas regarding caries experience and the proportion of children with high and rampant caries (Table 3). An elevated proportion of subjects with high caries $(DMFT \ge 4)$ was noted in the San Remo group (22.9%). The distribution of children by gender according to DMFT levels was not statistically significant either (Fig 2). The F/DMFT ratio was similar in the survey areas, from 0.30 in San Remo, 0.38 in Varese and Ferrara, to 0.40 in Milan suburbs.

The distribution of gingival condition recorded following CPI index in the four examined areas by gender (number and percentage of subjects) is presented in Table 4. Healthy gingival conditions and presence of bleeding at probing were very dissimilar among the examined areas (CPI = 0 from 58.7 in san Remo to 21.2 in Ferrara p = 0.03 and CPI = 1 from 74.1 in Ferrara, to 6.1 in Varese p=0.03), while the presence of calculus was rather analogous in all areas.

DISCUSSION

The aim of this paper was to estimate the caries experience in four different areas in north Italy. Burt

differences among mean differences was tested ANOVA one-way						
	DT Mean ± SD Median (₂₅ pc – ₇₅ pc)	MT Mean ± SD Median (₂₅ pc – ₇₅ pc)	FT Mean ± SD Median (₂₅ pc – ₇₅ pc)	DMFT Mean ± SD Median (₂₅ pc – ₇₅ pc)	SiC Index Mean ± SD Median (₂₅ pc – ₇₅ pc)	
Total sample	0.90 ± 1.62 0 (0 - 1)	0.01 ± 0.22 0 (0 - 0)	0.54 ± 1.13 0 (0 - 0)	1.46 ± 2.00 0 (0 - 2)	3.75 ± 1.87 3 (2 – 5)	
San Remo	1.20 ± 2.10 0 (0 - 2)	0.08 ± 0.52 0 (0 - 0)	0.55 ± 1.17 0 (0 – 0)	1.83 ± 2.49 1 (0 - 3)	4.54 ± 2.27 4 (3 – 6)	
Varese	0.86 ± 1.40 0 (0 - 1)	-	0.52 ± 1.08 0 (0 - 0)	1.38 ± 1.79 0 (0 - 2)	3.41 ± 1.42 3 (2 – 4)	
Milan suburb	0.91 ± 1.71 0 (0 - 1)	-	0.61 ± 1.27 0 (0 - 1)	1.52 ± 2.13 0 (0 - 2)	3.71 ± 2.09 3 (2 – 5)	
Ferrara	0.75 ± 1.33 0 (0 - 1)	-	0.46 ± 0.97 0 (0 – 0)	1.21 ± 1.65 0 (0 - 2)	3.64 ± 1.44 3 (3 – 4)	
ANOVA one-way	p = 0.04	_	p > 0.05	p = 0.01	p = 0.04	

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Caries experience, percentage of children with high level of caries (DMFT \geq 4) and with rampant Table 3 caries (DMFT \geq 7)by gender in the four examined areas, categorised following socio-economic level following **ISTAT** indications

	Milan suburb n (%)	San Remo n (%)	Varese n (%)	Ferrara n (%)	p value
Caries experience					
Males	83 (24.6)	39 (21.8)	91 (27.7)	65 (25.1)	
Females	89 (26.3)	52 (29.0)	71 (21.6)	62 (23.9)	
Total	172 (50.9)	91 (50.8)	162 (49.3)	127 (49.0)	p = 0.20
% subject DMFT ≥ 4					
Males	26 (7.7)	20 (11.2)	26 (7.9)	11 (4.2)	
Females	31 (9.2)	21 (11.7)	24 (7.3)	14 (5.5)	
Total	57 (16.9)	41 (22.9)	50 (15.2)	25 (9.7)	p = 0.06
% subject DMFT \ge 7					
Males	5 (0.5)	4 (0.4)	4 (0.4)	-	
Females	7 (0.6)	6 (0.5)	1 (0.1)	2 (0.2)	
Total	12 (1.1)	10 (0.9)	5 (0.5)	2 (0.2)	p = 0.43

(1997) describes the benefits and limitations of cross-sectional data; when these surveys are repeated periodically under general conditions (like our surveys), oral health trends over time can be estimated for the general population. The areas examined in this paper are too small and do not

allow us to generalize our results for the whole country. From the data available in literature regarding some areas, mainly in the Italian scientific journals, we can assess that the onset and development of caries disease has decreased over the last 20-year period but still remains high (Vogel et

(number and percentage of subjects)					
	San Remo n (%)	Varese n (%)	Milan suburb n (%)	Ferrara n (%)	p value
CPI = 0 healthy					
Males	43 (24.0)	119 (36.3)	82 (24.3)	5 (1.9)	
Females	62 (34.6)	115 (35.1)	100 (29.6)	50 (19.3)	
Total	105 (58.7)	234 (71.3)	182 (53.8)	55 (21.2)	p = 0.03
CPI = 1 bleeding					
Males	29 (16.2)	11 (3.4)	25 (7.4)	123 (47.5)	
Females	24 (13.4)	9 (2.7)	33 (9.8)	69 (26.6)	
Total	53 (29.6)	20 (6.1)	58 (17.2)	192 (74.1)	p = 0.03
CPI = 2 calculus					
Males	12 (6.7)	48 (14.6)	55 (16.3)	8 (3.1)	
Females	9 (5.0)	26 (7.9)	43 (12.7)	4 (1.5)	
Total	21 (11.7)	74 (22.6)	98 (29.0)	12 (4.6)	p = 0.70

rivel condition we could define the ODI index in the four eventing

al, 1979, 1986, 1988; Strohmenger et al, 1983, 1987, 1997). In the Milan suburbs the caries experience ratio dramatically decreased and changed from 97.6% to 50.9% (Vogel et al, 1979).

It is well known that many factors can influence caries activity (Brathall et al, 1996; Triun et al, 1998). However, it is almost universally agreed that an important factor is the use of fluoride toothpaste. Since the middle of the 1980s all toothpastes available in Italy have contained some fluoride concentration. Another important factor can be the fluoride concentration in drinking water. In Italy there is no national water fluoridation, so only the natural fluoride concentration is present in the water. In our study we failed to find a correlation among fluoride concentration in water and DMFT index; this is without doubt linked to high use of mineral water in Italy (Adiconsum, 2001).

The F component weights for more than one third of the DMFT index. Our results show important differences in caries disease levels among the examined areas, while non-statistical difference was observed regarding caries experience. The DT component was very different in each area, while the FT component was quite similar, showing an important need of treatment in our samples. The distribution of DMFT was highly skewed. The percentage of caries-free female children ranged from 21.6 in

Varese areas to 29.1 in San Remo: the differences reported were not statistically significant even when the areas were categorized as a result of socio-economic conditions. However, the SIC index is addressed to solve the skewed distribution of DMFT. In our study the SIC index remains partially skewed; this is probably linked to the high caries experience in our sample. The SIC index distribution remains skewed when the caries experience is higher than 30%, as previously reported (Campus et al, 2003). These observations reduce some of the expectations when applying this index as an indicator of oral health in ecological studies. Pitts et al (2002) and Campus et al (2003) defined that DMFT alone is not sufficient to provide a correct picture of the disease in highly skewed samples, while the SIC index would add important information on oral status and a wider understanding of the distribution patterns and mechanisms could be drawn. The proportion of high and rampant caries experience was not statistically different from one area to another, but this observation has to be taken into account because a small change in caries experience can modify this association, especially in the high-caries experience group. An accurate analysis of caries indices and distribution demands the concurrent estimation of figures of caries experience; inequalities and additional studies might

further evaluate these measurements. This information is crucial for describing and planning dental prevention programmes aimed at reducing caries experience and promoting better oral health level.

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