

Short Communication

Caries prevalence and location and dental treatment needs in preschoolers in Athens – GENESIS Project

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Objectives: The purpose of this study was to evaluate the dental caries prevalence, its intraoral distribution and the dental treatment coverage and needs of preschool children in the City of Athens. **Methods:** Six hundred and eighty four preschool children (27.17 – 77.33 months old) were clinically examined for carious, extracted and restored primary tooth surfaces (dmfs) and primary teeth (dmft). **Results:** Mean dmfs was 5.36 (0-62). Mean dmft was 3.18 (0-20). The dmfs index was broken down to its components: mean ds was 4.81 (0-54), mean ms was 0.15 (0-16) and mean fs was 0.40 (0-42). Occlusal surfaces accounted for 36.69% of all dmfs, proximal surfaces for 42.40% and buccal and lingual surfaces for 20.91%. **Conclusions:** Children in the City of Athens day care centres have an average of more than five decayed, missing or restored surfaces in their primary dentition. The disease displayed a polarized distribution in the sample. For the most part, the respective treatment needs have not been addressed.

Key words: caries location; caries prevalence; dmfs; GENESIS project; preschoolers

Introduction

The World Dental Federation, the World Health Organization and the International Association for Dental Research have joined forces and are setting new goals for the year 2020, necessitating, among others, the evaluation of the current situation of oral health regionally (Hobdell *et al.*, 2003). The World Health Organization does not have preschooler data for Athens or any other part of Greece (WHO, 2005).

The purpose of this investigation was to evaluate dental caries prevalence, its intra-oral distribution and restorative coverage in preschool children in the city of Athens.

Method

This investigation forms part of the GENESIS (Growth, Exercise & Nutrition Epidemiologic Study in preschoolers) project. This project involves a comprehensive multi-disciplinary evaluation of preschool children. The investigation was approved by the City of Athens Municipal Nursery Board and appropriate informed consent was obtained from the parents.

Our sample consisted of all 2 – 6 year-old children in 47 day care centres proportionately distributed geographically and numerically across various areas within the limits of the city of Athens. The sampling of the day care centres was random, multistage and stratified by the total population of children, based on data provided by the National Statistics Service of Greece (Census 1999). The study population should be considered representative of

the total population of preschoolers in the city of Athens, since parental distribution by age and educational level was equivalent to that reported by the National Statistics Service of Greece for the overall population of the city of Athens. We examined 684 children – 346 boys (50.58%) and 338 girls (49.42%). Their ages ranged between 27.17 and 77.33 months with a mean age was 56.37 months (SD 10.91) and a median of 57.75 months.

All children were examined clinically with disposable tongue depressors (single-use) under an adjustable focus light. The same experienced pediatric dentist (GM) examined all children. All children in one day care centre (n=24), were re-examined two months after initial examination, to assess intra-examiner reliability. Decayed, extracted and restored primary tooth surfaces were recorded. The dmfs and dmft indices were thus calculated. Carious lesions were recorded according to criteria established by the World Health Organization (“... unmistakable cavity, undermined enamel, or a detectably softened floor or wall ...”) (WHO, 1997). Superficial enamel decalcification lesions were not recorded as caries. No radiographs or other diagnostic aids were employed. The non-parametric Mann-Whitney-U-test was used to evaluate the gender differences for caries findings.

Results

The caries scores recorded for the 24 children examined twice were identical. Differences in dmfs scores with respect to gender were not statistically significant (dmfs $p=0.100$, ds $p=0.058$, ms $p=0.737$, fs $p=0.832$, mfs $p=0.748$).

All 684 children were successfully examined, i.e. there were no failures to examine a child due to refusal or other reasons. Of the 684 children examined, 411 (60.09%) had had caries experience (dmfs > 0), while 278 (40.64%) were free of obvious decay (dmfs = 0). Mean dmfs was 5.36 (mean dmft 3.18) and mean ds was 4.81 (mean dt 3.04). Caries index findings are presented in detail in table 1.

The 684 children in the sample presented with 3663 carious, extracted or restored surfaces (2172 teeth) in their primary dentitions. The findings were analyzed according to surface location and type of tooth. Caries was most frequently located in the proximal surfaces, followed closely by the occlusal location, these two locations combined accounting for approximately 80% of the total caries experience. These findings and total numbers of surfaces per dmfs component and per location are presented in table 2. Caries distribution per tooth type is presented in table 3.

Data were further analyzed to determine the distribution of caries in the sample. Approximately one third of the children accounted for almost 90% of the carious surfaces (table 4). Percentile analysis revealed that half the children in the sample had a dmfs and a ds of over two, while 25% of the children had a dmfs of over seven and a ds of over six.

Of the 411 children with caries experience (dmfs > 0), 49 (11.92%) had also had dental treatment experience (mfs > 0), while 406 (98.78%) had active carious lesions (ds > 0). Only five (1.22%) of the 411 children with caries experience were free of obvious decay (dmfs > 0 and ds = 0).

Data from patients under six years (n=654) were analyzed with respect to early childhood caries type as per Wyne (1999). Of the 389 children with caries experience in this age group, 362 (93.06%) conformed with ECC type I (mild to moderate) criteria, 22 (5.66%) with ECC type II (moderate to severe), and 5 (1.29%) with ECC type III (severe). ECC and caries index distribution per age group is presented in table 5.

Discussion

Caries scores similar to ours were reported by Carvalho *et al.* (2004) and Vanobbergen *et al.* (2004) in Belgium. Sundby and Petersen (2003) found a mean dmfs score of 3.28 for 3-5 year-olds in Denmark. The lower caries index reported by Sundby and Petersen (2003) may be in part explained by the younger age of the children included in that study. It should be noted that the methodology used in the present study might have, to a certain extent, underestimated caries prevalence, as explorers or radio-

Table 1. Mean dmfs and components

	Mean	SD	Min	Max	Median	25 th Percentile	75 th Percentile
dmfs	5.36	8.71	0	62	2	0	7
ds	4.81	7.56	0	54	2	0	6
ms	0.15	1.19	0	16	0	0	0
fs	0.40	2.48	0	42	0	0	0
mfs	0.54	3.25	0	58	0	0	0
dmft	3.18	3.77	0	20	2	0	5.75
dt	3.04	3.63	0	19	2	0	5

Table 2. Mean dmfs and its components according to surface type (occlusal, proximal, buccal/lingual)

	Mean	SD	n	%	Median	25 th Percentile	75 th Percentile
dmfs	5.36	8.71	3663	100	2	0	7
dmfs _{occl}	1.96	2.51	1344	36.69	1	0	3
dmfs _{prox}	2.27	4.03	1553	42.40	0	0	3
dmfs _{bl}	1.12	3.21	766	20.91	0	0	0.75
ds	4.81	7.56	3288	89.76	2	0	6
ds _{occl}	1.81	2.36	1239	33.82	1	0	3
ds _{prox}	2.06	3.62	1406	38.38	0	0	3
ds _{bl}	0.94	2.67	643	17.55	0	0	0
mfs	0.54	3.25	375	10.24	0	0	0
mfs _{occl}	0.15	0.82	105	2.87	0	0	0
mfs _{prox}	0.21	1.34	147	4.01	0	0	0
mfs _{bl}	0.18	1.34	123	3.36	0	0	0

Table 3. Caries experience: distribution according to type of tooth

	<i>Primary Incisors</i>		<i>Primary Canines</i>		<i>Primary Molars</i>		<i>Total</i>	
	<i>n</i>	<i>%</i>	<i>n</i>	<i>%</i>	<i>n</i>	<i>%</i>	<i>n</i>	<i>%</i>
Surfaces	483	13.19	80	2.18	3100	84.63	3663	100
Teeth	298	13.72	67	3.08	1807	83.20	2172	100

Table 4. dmfs distribution within the sample

<i>dmfs</i> →		≥ 30	≥ 20	≥ 10	≥ 5
Children	n	23	47	130	225
	%	3.35	6.85	18.95	32.89
Surfaces	n	896	1446	2567	3207
	%	24.43	39.42	69.98	87.55

Table 5. Caries indices and ECC type per age group

		<i>2 – 3 years</i>	<i>4 – 5 years</i>	≥ 6 years
dmfs	mean	3.06	5.79	10.03
	SD	7.75	8.66	11.36
	median	0	2	5
	25 th percentile	0	0	0
	75 th percentile	3	8	14
ds	mean	2.81	5.17	9.13
	SD	6.85	7.36	11.12
	median	0	2	4
	25 th percentile	0	0	0
	75 th percentile	3	7	14
dmft	mean	1.94	3.44	5.13
	SD	3.26	3.79	4.34
	median	0	2	5
	25 th percentile	0	0	0
	75 th percentile	3	6	8
dt	mean	1.90	3.31	5.60
	SD	3.16	3.67	3.95
	median	0	2	4
	25 th percentile	0	0	0
	75 th percentile	3	6	8
ECC type I	n	60	302	
	%	89.55	93.79	
ECC type II	n	5	17	
	%	7.46	5.28	
ECC type III	n	2	3	
	%	2.99	0.93	

graphs were not employed (Assaf *et al.*, 2004).

In our sample, three quarters of caries lesions were located proximally and occlusally, these two locations being approximately equal in frequency. Practically identical findings were reported by Carvalho *et al.* (2004). Nainar and Crall (1997) found occlusal lesions to be the most frequent (44.19%), proximal (26,76%) and buccal/lingual (29.05%) lesions being approximately equal in frequency.

We observed a polarization of caries in how it affects the population. This type of disproportionate accumulation of the disease in a relatively small part of the population has been reported in several studies accompanying the overall caries prevalence reduction in the post-fluoride-introduction era (Nishi *et al.*, 2002).

Approximately 40% of the children in the sample were free of obvious decay compared with 47.5% reported by Carvalho *et al.* in 2004 and 23% reported by Nainar and Crall in 1997. Only 49 (11.92%) of the 411 children with caries experience had dental treatment experience. Moreover, only five (1.22%) of these 411 children presented with complete treatment (no untreated caries lesions). These five children represent 10.2% of the 49 children who at some point sought treatment. However, that is not to say that they were necessarily incompletely treated: new lesions may have appeared in the period between treatment completion and examination by us. These findings demonstrate a severe discrepancy between treatment needs and seeking and/or provision of treatment. Considering that caries in the primary dentition is probably one of the most accurate predictors for caries in the permanent dentition (Haugejorden and Birkeland, 2002; Li and Wang, 2002), the implementation of educational programmes, targeting the children with caries in their primary teeth, their parents and day care centre staff and possibly pediatricians, regarding prevention and guidelines in seeking treatment might help in improving the picture. These programmes, however, should be carefully planned and executed, since there are mixed reports as to the success of such ventures (St. Leger, 1999; Vanobbergen *et al.*, 2004).

In conclusion, our findings on caries prevalence and intra-oral distribution in the primary dentition of the preschoolers in the city of Athens are, in general, comparable to those from other European countries. That said, they are far from satisfactory, even more so with respect to a disease vs. treatment comparison.

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References

- Assaf, A.V.; Meneghim, M.C.; Zanin, L.; Mialhe, F.L.; Pereira, A.C. and Ambrosano, G.M.B. (2004): Assessment of different methods for diagnosing dental caries in epidemiological surveys. *Community Dentistry and Oral Epidemiology* **32**, 418-425.
- Carvalho, J.C.; D'Hoore, W. and Van Nieuwenhuysen, J.P. (2004): Caries decline in the primary dentition of Belgian children over 15 years. *Community Dentistry and Oral Epidemiology* **32**, 277-282.
- Haugejorden, O. and Birkeland, J.M. (2002): Evidence for reversal of the caries decline among Norwegian children. *International Journal of Paediatric Dentistry* **12**, 306-315.
- Hobdell, M.; Petersen, P.E.; Clarkson, J. and Johnson, N. (2003): Global goals for oral health 2020. *International Dental Journal* **53**, 285-288.
- Li, Y. and Wang, W. (2002): Predicting caries in permanent teeth from caries in primary teeth: an eight-year cohort study. *Journal of Dental Research* **81**, 561-566.
- Nainar, S.M. and Crall, J.J. (1997): Caries experience in inner-city preschoolers at the time of their initial dental visit. *Journal of Dentistry for Children* **64**, 421-424.
- Nishi, M.; Stjernsward, J.; Carlsson, P. and Bratthall D. (2002): Caries experience of some countries and areas expressed by the Significant Caries Index. *Community Dentistry and Oral Epidemiology* **30**, 296-301.
- St. Leger, L.H. (1999): The opportunities and effectiveness of the health promoting primary school in improving child health – a review of the claims and evidence. *Health Education Research* **14**, 51-69.
- Sundby, A. and Petersen, P.E. (2003): Oral health status in relation to ethnicity of children in the municipality of Copenhagen, Denmark. *International Journal of Paediatric Dentistry* **13**, 150-157.
- Vanobbergen, J.; Declerck, D.; Mwalili, S. and Martens, L. (2004): The effectiveness of a 6-year oral health education programme for primary schoolchildren. *Community Dentistry and Oral Epidemiology* **32**, 173-182.
- WHO (1997): *Oral Health Surveys – Basic Methods*. 4th edn. pp39-44. Geneva: WHO.
- WHO (2005): Greece; oral disease prevalence; dental caries. <http://www.whocollab.od.mah.se/euro/greece/data/greececar.html>; last viewed on May 18, 2005.
- Wyne, A.H. (1999): Early childhood caries: nomenclature and case definition. *Community Dentistry and Oral Epidemiology* **27**, 313-315.