# Prevalence of Caries in 6-year-old Austrian Children

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**Purpose:** The 2001 Austrian oral health survey investigated a representative sample of 6-year-old Austrian children.

**Materials and Methods:** 516 6-year-old Austrian children were investigated with respect to $d_{1-3}$mft and $d_{1-3}$mfs and visible plaque index (VPI).

**Results:** Forty-nine per cent of the children were caries free ($d_3$ft = 0). The children had 2.1 $d_3$ft (3.5 $d_{1-3}$mft) and 3.9 $d_3$fs (6.1 $d_{1-3}$fs). 2.6 $d_3$s unrestored carious lesions ($d_3$s) predominated over 1.3 filled surfaces (fs). There was no statistical difference between girls and boys. The prevalence of caries showed a very skewed distribution: 50% of all $d_3$s were concentrated in 8% of the children with 86% of all carious lesions in 25% of the children. The prevalence of caries was inversely related to the educational level of the parents (Spearman rank test $p < 0.001$; $r = -0.219$) and family income ($p < 0.001$; $r = -0.173$): Children of parents with low educational levels (9 years of schooling) had 3.3 $d_3$ft whereas children of parents with university degrees had only 1.0 $d_3$ft.

**Conclusion:** Six-year-old Austrian children showed a very skewed distribution of the prevalence of caries and high need for dental treatment. There is a great need for pediatric dentistry in Austria.

**Key words:** caries prevalence, dmf, dental care, preschool children

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In Austria, National Health Surveys are made every 5 years. These are aimed at investigating the dental health of individuals aged 6 years, 12 years, 18 years, 35–44 years and 65–74 years. Public health policy is guided by these surveys. In 2001, the dental status of a representative sample of children at age 6–7 was investigated.

This survey aims to present current epidemiological data for this age group.

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## MATERIALS AND METHODS

### *Sample*

The study design followed the 1997 WHO recommendations for oral health surveys. Sampling was based on the two-layer Pathfinder method (WHO 1997). In the first step, a representative sample of Austrian survey localities was chosen in relation to urban/rural distribution, and in the second, the subjects were randomly selected from the chosen localities. In total, 516 children aged 6–7 years (262 girls and 254 boys) in 33 elementary schools were examined. Forty-eight per cent of the children were from rural areas, 30% from urban areas, and 22% from the suburbs.

To determine the children's socio-economic background, the parents were questioned as to their highest levels of schooling attained and their net monthly earnings (Tables 1 and 2). One per cent had completed elementary school only, 10%

**Table 1 dmft values. There was no significant difference in the prevalence of caries between girls and boys (p>0.1) or between urban and rural areas (p>0.1)**

| | All (N = 516) | Girls (N = 262) | Boys (N = 254) |
|---|---|---|---|
| $d_{1-2}t$ | 1.4 | 1.4 | 1.4 |
| $d_3t$ | 1 | 1 | 1.1 |
| mt | 0.3 | 0.4 | 0.3 |
| ft | 0.8 | 0.8 | 0.7 |
| $d_{1-3}mft$ | 3.5 | 3.6 | 3.5 |
| $d_3mft$ | 2.1 | 2.2 | 2.1 |

**Table 2 dfs values.**

| | All (N = 516) | Girls (N = 262) | Boys (N = 254) |
|---|---|---|---|
| $(d_{1+2}s)$ | 2.2 | 2.1 | 2.2 |
| $d_3s$ | 2.6 | 2.5 | 2.7 |
| fs | 1.3 | 1.4 | 1.2 |
| $(d_{1-3}fs)$ | 6,1 | 6 | 6,1 |
| $d_3fs$ | 3.9 | 3.9 | 3.9 |

intermediate school, 34% trade school, 34% high school and 9% college or university. Information on net monthly earnings was provided by 83% of the parents. Net family income was as follows: up to 1,000 €/month, 13%; 1,000–2,000 €/month, 48%; 2,001–3,000 €/month, 28%; and 3,001 €/month or more, 10%.

### *Criteria*

The $d_{1-3}$mft and $d_{1-3}$mfs were determined by the following criteria: 0 = sound; 1 = discolored enamel; 2 = initial enamel lesion; 3 = dentinal lesion; F = Filled; M = Missing. If front teeth were missing, it was assumed that they had been lost naturally and for this reason they were not counted as missing teeth in the dmft index.

WHO recently introduced the SiC index (significant caries index, Bratthall 2000) to draw attention to individuals with most caries. This index is calculated by identifying one-third of the subjects (by per cent of the sample) with the highest incidence of caries and then calculating an average $D_3MFT/d_3mft$ for this group. This value is the SiC index.

Oral hygiene was measured with the Visible Plaque Index by Ainamo (Hellwege, 1999). The buccal surfaces of the unstained lower right teeth and left upper teeth were examined with a probe and plaque was registered as present or not present (yes/no). The result was shown as the percentage of teeth with plaque.

### *Examination Procedure*

The examinations were preceded by a one-day training course for the examiners under the leadership of an examiner experienced in standardized examinations (PS). Informed consent was obtained before the examinations from the parents and the principal of the school. When the children were examined, they lay on their backs on an examining table. The mouth was illuminated with a standing halogen lamp and a dental mirror and WHO probes were used.

To test intra-examiner reliability, one child was chosen at random in each school and examined a second time. These double exams produced a kappa value for reproducibility of 0.94.

### *Statistics*

Statistically significant differences and correlation were determined with the ANOVA T-test, and Spearman rank correlation coefficients were determined.

## RESULTS

Forty-nine per cent of the children were free of caries ($d_3fs=0$). The children showed 1.0 $d_3t$ and 0.8 ft, and 0.3 teeth had been extracted due to caries. With respect to the tooth surfaces damaged by caries, 3.9 $d_3fs$ were found; the majority (2.6 $d_3s$) was

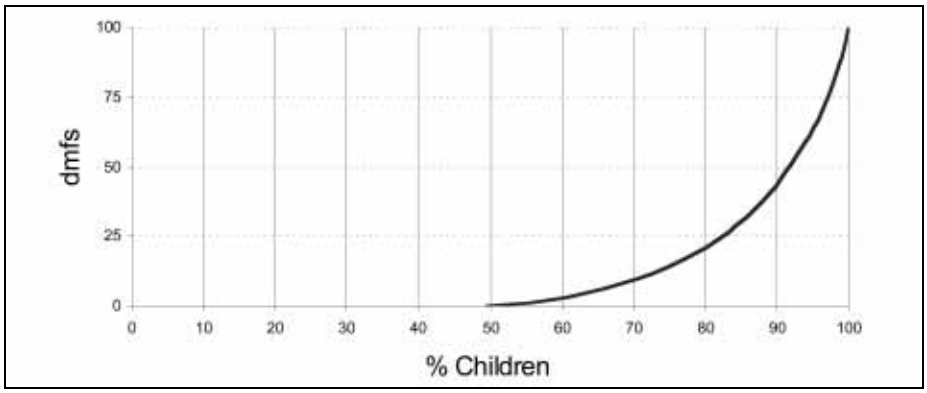


**Fig 1** Distribution of dmfs values.

untreated and only 1.3 fs had been filled. Additionally, there were 2.2 initial enamel lesions. Enamel lesions included, 3.5 $d_{1-3}$mft and 6.1 $d_{1-3}$mfs were found (Tables 1 and 2).

There was no significant difference in caries prevalence between girls and boys ($p>0.1$) or between urban and rural areas ($p>0.1$).

The dental lesions were very unevenly distributed: 50% of the lesions were concentrated in 8% of the children, and 85% of the carious lesions were concentrated in 25% of the children (Fig 1).

The significant caries index (SiC) of the third of the subjects with the greatest amount of caries was 5.6 $d_3$mft.

Children with untreated caries were most afflicted with caries, with 4.9 $d_3$mft. Children with fillings but no caries hat 4.1 $d_3$mft. The average extent of caries in all children, including those free of caries, was only 2.1 $d_3$mft.

There was a significant correlation between caries in the children and the educational level of the parents on the one hand ($d_3$mft: $p < 0.001$; $r = -0.219$) and the net family income on the other ($p < 0.001$; $r = -0.173$) as shown in Figs 2, 3.

## DISCUSSION

Very few epidemiological data are available for comparison on the extent of caries in six-year-old children. Potts et al (2001) found 1.57 $d_3$mft in Great Britain ($d_3$t=1.4; mt=0.22; ft=0.21), ranging from 0.94 in the West Midlands to 2.55 in Scotland. Overall, 40% of children had evidence of dentinal caries experience (d3mft>0), although the means ranged between 30% (West Midlands) and 55% (Scotland). The distribution of caries was highly skewed.

In Jamaica, 12 years after introduction of salt fluoridation, dmfs was 7.9 in six-year-old children (Meyer-Lueckel et al, 2002).

Karjalainen et al (2001) found that between ages three and six years, the proportion of children with caries experience, enamel and dentin lesions combined, increased from 16% to 40%.

In Hungary in 1996, 4.5 dmft were found in children aged 5–6 years, and 73% of that age group was affected by dental caries (Szoke and Petersen, 2002).

In six-year-old children, differing numbers of front teeth are missing, which previously could have been anything from healthy to highly carious before they were lost naturally or extracted. This greatly complicates, or renders impossible, the compilation of epidemiological data and comparison of caries data from different geographical areas. The distribution of caries in the children and the relationship of untreated to treated tooth surfaces are more informative than values for the prevalence of caries.

The $d_3$fs/dft ratio (Fig 2) for the different age groups reflected age-specific treatment requirements (and the need for dentists). In Austria, the need for treatment is generally slight, but in pre-school children it is still very high. Public-health measures would be required to compensate for these discrepancies (Städtler et al, 2000 and 2001).

Children, who are at the greatest risk for caries, or who have the most caries, display poor oral hy-

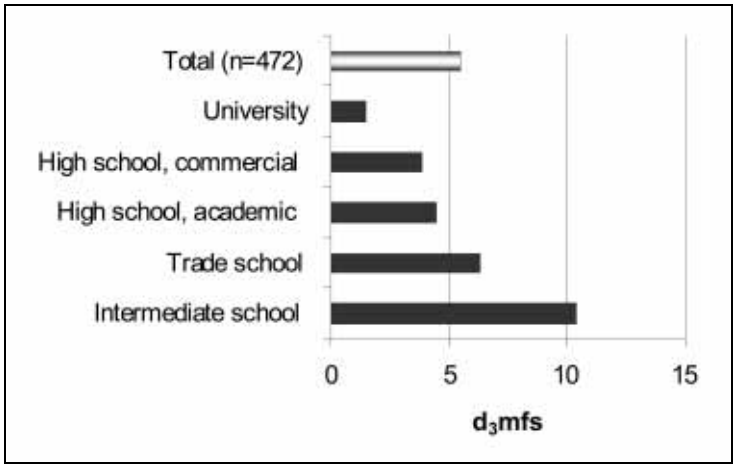


**Fig 2** $d_3$mfs and educational level.

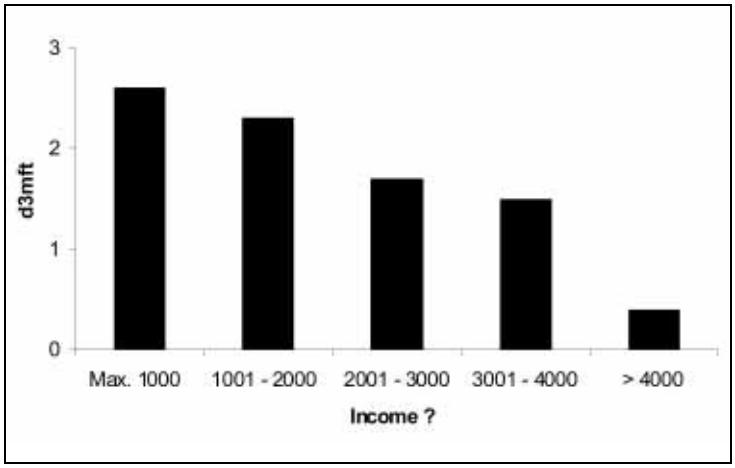


**Fig 3** $d_3$mft and net family income/month.

giene and come from the socio-economic group with a relatively low educational level and family income. Specific preventive measures for this higher-risk group should be considered in addition to the dental health education in day nurseries and schools.

Data collected in recent years for different age groups indicate that carious lesions in adults and senior citizens are distributed very uniformly, while in 5-, 12- and 18-year-olds, the prevalence of caries is distinctly polarized (Borutta and Brocker, 1996; Meyer-Lueckel et al, 2002; Städtler et al, 2000, 2001; Willershausen et al, 1997). This means that in the future, a large proportion of the population can be expected to have only small dental lesions – but may be very demanding with respect to dental care – while a small proportion of the population on relatively low incomes will have a great need for social/public dentistry.

There was a great reduction in the incidence of caries in 12-year-old children in recent years (Städtler et al, 2000), which is probably due to the dental health education in day nursery and primary schools. The relatively high prevalence of caries in 6 year olds may reflect the lack of dental health promotion in the first years of life and the insufficient dental care at pre-school age.

## CONCLUSION

Dental care for pre-school children is deficient in Austria. The incidence of caries is highly polarized and there is a significant correlation between the incidence of caries in children and the educational level and income of their parents.

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