

## Dental caries prevalence and related factors in 5-year-old children in Hong Kong

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### Abstract

*One thousand five Hong Kong kindergarten children with a mean age of  $5.75 \pm 0.46$  years were sampled for caries prevalence and related factors. Samples were drawn from a total population of approximately 9,000 5-year-old children. Caries examination was conducted after the teeth were cleaned professionally using a sickle probe (Ash #54<sup>TM</sup>) and diagnostic criteria of the World Health Organization. Thirty-seven per cent of children were caries-free and the mean dmft of all children was  $3.2 \pm 3.92$ . The components of the dmft were  $dt = 2.93$ ,  $mt = 0.04$ , and  $ft = 0.23$ . The dmfs was  $5.10 \pm 7.80$  with  $ds = 4.67$ ,  $ms = 0.12$ , and  $fs = 0.31$ . The caries distribution was skewed, 18% with more than 10 dmfs and the most severely affected child having 54 decayed surfaces. Seventy-two per cent had never visited a dentist. A statistically significant positive correlation was found between the father's profession and caries prevalence. The age of the child at the first visit and the frequency of visits to the dentist were related directly to parental income. The primary mandibular first molar ranked highest among the teeth that needed treatment, mostly extraction. (Pediatr Dent 15:116-19, 1993)*

### Introduction

The first dental health survey of Hong Kong children was in 1960, one year before the introduction of water fluoridation, and included 8,535 school children, aged 6 to 11 years. The mean number of decayed, missing, or filled primary teeth (dmft) per child was 9.2 in the 6- to 8-year-old children.<sup>1</sup> More than 97% of these children were affected by dental caries. In 1968, the mean number of decayed and filled primary teeth (dft) per child was found to be 5.3 in the 5- to 6-year-old children, and more than 87% of children were affected by caries.<sup>2</sup>

Before 1961, the natural fluoride content of the drinking water in Hong Kong was less than 0.13 ppm. The drinking water in Hong Kong was fluoridated at the target level of 0.9 ppm for winter (November to April) and 0.7 ppm for summer months (May to October) in 1961. The average water level was raised to 1 ppm in 1967, but was reduced to 0.7 ppm in 1978. Because of increasing signs of dental fluorosis in children after 1967, the target level of the fluoride in drinking water was decreased further to 0.5 ppm, based on the recommendation of Wei.<sup>3</sup>

The government of Hong Kong introduced the School Dental Care Service in November 1979, to provide basic dental care to primary school children, and conducted a dental health survey in early 1980 to collect baseline data for future evaluation of this service. The dmft index was 4.1 in the 6- to 8-year-old children and more than 75% of children surveyed were affected by caries. The unmet treatment need was very high, with more than 90% of decayed teeth being untreated.<sup>4</sup> In a survey of more than 1,500 6- to 12-year-old Hong Kong children conducted in 1986,<sup>5</sup> the mean dmft of the 6- to 8-year-old children was found to be 2.9. Of these children, 76% were enrolled with the School Dental Care Service.

The dental health surveys in Hong Kong so far have included primary and secondary school children, and the dental health of younger children has not yet been investigated. The purpose of this survey was to obtain baseline data on dental caries prevalence and related factors in a sample of 5-year-old Chinese kindergarten children in Hong Kong.

### Methods and materials

Hong Kong has approximately 9,000 5-year-old children, and nearly 100% of them attend a kindergarten. A sample of 1,005 5-year-old Chinese children was selected from 14 kindergarten schools on Hong Kong island and in Kowloon peninsula. These regions contain the highest density population and the majority of the kindergartens. The schools were drawn at random with the chance of a particular school being biased in accordance with the number of 5-year-old children attending.

Of the 1,005 children sampled, 977 (520 boys and 457 girls) were examined for dental caries. Their mean age was  $5.75 \pm 0.46$  years. The study was conducted in 1986-1988. Caries examination was performed after professional teeth cleaning with a rubber cup and prophylaxis paste, using sickle probes (Ash #54<sup>TM</sup> Pennyclose, Beacon Park, Plymouth, England) that were used for a maximum of 20 examinations. The diagnostic criteria suggested by the World Health Organization<sup>6</sup> were used. Initial caries lesions were not recorded and no bite-wing radiographs were used. A primary canine or molar not present was considered missing due to caries, while a missing incisor was considered exfoliated. After the examination for caries, the types of treatment required were assessed using WHO criteria.<sup>6</sup> Data were entered immediately into a

microcomputer at chairside and transferred to the main-frame computer for further analysis using the SPSS-X® statistical program (SPSS Inc., Chicago, Ill.).

The children were examined by two of the authors, SHY and AKH. Of the 977 children, 70% were examined by SHY and 30% by AKH. Calibration of the examiners was carried out prior to the survey. Intraexaminer reproducibility was checked by re-examination of about 10% of the children. The reproducibility of SHY was calculated to be 97% and that of AKH 93%, based upon the method suggested by Shaw and Murray.<sup>7</sup>

Parents completed a questionnaire before the survey and returned it at the time of the examination. Topics related to dental caries included the following:

- Child's oral hygiene habits
- Child's visit to a dentist
- Father's profession
- Parental income.

## Results

### Dental caries

Of the 977 children examined, 37% were free of caries or restoration. The mean as well as the median dmft and dmfs values are given in Table 1. In addition, the mean, SD, and median values for dmft and dmfs for only primary canines and molars also are shown. When incisors are excluded, the proportion of caries-free children was 45%. There were no statistically significant differences in the dmft values between boys and girls, and the data are therefore pooled for analysis. The mean dmfs values varied from 1.9 to 5.6 among the 14 kindergartens. The caries prevalence was symmetrical between the right and left sides. The second molars and the incisors were the teeth most often affected by caries.

The d component constituted the largest part of the dmft values. Only 91 children (9%) had fillings, ranging from one to seven each. Twenty-six children experienced a total of 40 teeth extracted due to caries.

The caries distribution was skewed, with a large fraction of the dmft teeth found in a small fraction of the children. For example, 9% of the children had 10 or more dmft, with the highest dmft value being 19. Eighteen per cent had more than 10 dmft surfaces, and the highest value was found in one child who had 54 decayed surfaces.

The upper primary incisors of 874 children (89% of the total) had not yet exfoliated, and of all the decayed surfaces, 31.5% were found in these teeth.

### Oral hygiene habits

Thirty-six per cent of the children brushed their teeth more than once daily, while 61% brushed once a day. Seventy-seven per cent used toothpaste. Three per cent of the children never brushed their teeth. There was a statistically significant negative correlation between the toothbrushing frequency and the dmft value ( $P < 0.005$ ) as shown in Table 2.

### Child's visit to the dentist

Most of the children (72%) had never visited a dentist. Of those who had, 12% had teeth extracted and 10% had restorations. Only 1% stated that the reason for the visit was trauma, while 5% reported pain.

### Sociodemographic data

Four per cent of the fathers did not answer the question about their profession. Thirty per cent held higher positions in the society, 12% belonged to the upper middle class, and 21% to the lower middle class. Thirty-three per cent were workers, farmers, or fishermen. There was a statistically significant positive correlation ( $P < 0.001$ ) between the father's profession and the dmft of the child (Table 3). Only 19% of the fathers in the highest social group had children with more than 4 dmft, while the corresponding figure in the lowest social group was 37%.

**Table 1. Mean and median dmft and dmfs values for 5-year-old children in Hong Kong (N = 977)**

	Mean	All Teeth		Primary Canines and Molars		
		SD	Median	Mean	SD	Median
dmft	3.20	3.92	2	2.20	2.83	1
dt	2.93	3.72	2	1.96	2.67	1
mt	0.04	0.27	0	0.02	0.16	0
ft	0.23	0.88	0	0.22	0.86	0
dmfs	5.10	7.80	2	3.55	5.58	1
ds	4.67	7.39	2	3.20	5.32	1
ms	0.12	0.82	0	0.05	0.47	0
fs	0.31	1.28	0	0.30	1.26	0

**Table 2. Percentage distribution of caries prevalence in relation to toothbrushing frequency (N = 950)**

dmft	Toothbrushing Frequency		
	Twice Daily	Once Daily	Never
0	46	33	24
1-4	30	37	40
5-9	16	20	20
> 10	8	10	16
Total %	100	100	100
Total Number	342	583	25

**Table 3. Percentage distribution of caries prevalence in relation to the profession of the fathers (N = 972)**

dmft	Profession of Fathers				Blank (Did not complete)
	I	Ila	Ilb	III	
0	46	40	39	28	29
1-4	35	38	31	35	42
5-9	13	16	18	26	21
≥ 10	6	6	12	11	8
Total %	100	100	100	100	100
Total number	293	112	206	323	38

Fathers' profession was coded into 4 various categories:

- Class I Professional technical, administrative, and managerial workers.
- Class Ila Clerical workers and armed forces.
- Class Ilb Sales and service workers.
- Class III Farmers, fishermen, and factory workers.

### Parental income

The monthly parental income was less than \$4,000 HK per month (~\$516.13 US) for 17% of the families, while 34% had a monthly income of more than \$8,999 HK (~\$1,161 US). Nineteen per cent did not answer the question.

The child's visit to the dentist was related directly to the parental income; 48% in the group with the highest income had visited a dentist, compared to only 10% in the lowest group ( $P < 0.001$ ). There was also a statistically significant correlation between parental income and the child's caries status (Table 4).

### Treatment needs

The treatment need is given in Table 5. If the treatment of the primary incisors was disregarded due to the age of the children, then the types of treatment most needed were one-surface restorations in the primary second molars and two-surface restorations in the primary mandibular first molars.

The primary mandibular first molars ranked highest in the teeth that needed extraction, followed by the primary mandibular second molars.

**Table 4. Percentage distribution of caries prevalence in relation to parental income (N = 792)**

dmft	Parental Income		
	23	36	46
0	23	36	46
1-4	35	34	34
5-9	27	21	15
≥ 10	15	9	5
Total %	100	100	100
Total number	164	300	328

## Discussion

The dmft and dmf-values (3.2 and 5.1) in this population of 5-year-old Chinese children are rather high, considering that the children have had optimally fluoridated drinking water since birth. Even though the children were selected randomly, the number of children from kindergartens with low mean dmft exceeded the number from kindergartens with a high value, which implies that the dmft-values should be regarded as minimum values for

5-year-old Chinese children in Hong Kong.

In Melbourne, Australia, where the drinking water has been fluoridated since 1977, a study conducted in 1985<sup>8</sup> showed 47% of 5- to 6-year-old children to be caries free with a mean dmft of 2.3, compared to 37% and 3.2 respectively in the Hong Kong children in this study. In both studies, an association between sociodemographic variables and caries prevalence was found. The exposure to fluorides should be about the same in the two groups of children. Differences in other parameters, such as dietary habits, that were not examined in either study, may be responsible for the difference in caries prevalence between the two populations.

In a sample of 6-year-old Chinese children in Beijing (nonfluoridated), Wright et al.<sup>9</sup> found only 5% to be caries free and the mean dmft and dmfs were 6.3 and 12.0, respectively. These children experience considerably higher caries prevalence than the Chinese children residing in Hong Kong. In Thailand, 9 to 39% of 5- to 6-year-old children have been reported to be caries free with mean dmft values ranging from 2.8 to 8.2.<sup>10</sup> In Malaysia, the corresponding figures in 3- to 6-year-old children have been reported to be 21% and 5.41.

Compared to these data, Hong Kong kindergarten children have a lower caries prevalence, probably due to early exposure to fluorides. Ninety-seven per cent of the Hong Kong children stated they brushed their teeth daily, and 77% used a toothpaste (almost all toothpastes in Hong Kong contain fluoride).

The dental attendance pattern of the children was disappointing, since only about 25% had visited a dentist by age 5 years. This included those children who had visited a government dental clinic that provided free dental care to children of government civil servants. Parents' dental awareness, reflected in the child's visit to a dentist, was correlated to their financial status and educational level (as partly reflected by the father's profession). In this study, free dental care was offered to these children, but even so, only 44% of the parents sought treatment.

The relationship between the caries prevalence of the children and the educational level of the parents has been

**Table 5. Treatment need of 5-year-old Chinese children in Hong Kong (N = 977)**

<i>Types of Treatment</i>		<i>Primary</i>	<i>Primary</i>	<i>Primary</i>
		<i>Second Molars</i> %	<i>First Molars</i> %	<i>Canines</i> %
One surface restoration	Upper jaw	16	2	4
	Lower jaw	14	5	5
Compound restoration (Two and three surfaces)	Upper jaw	6	7	4
	Lower jaw	5	15	0
Complex treatment (Pulp therapy)	Upper jaw	2	0	0
	Lower jaw	3	1	0
Extraction	Upper jaw	1	1	0
	Lower jaw	2	3	0
No treatment	Upper jaw	75	90	95
	Lower jaw	76	76	95

shown in several earlier studies of the oral health of pre-school children.<sup>12-15</sup>

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