Original

Analysis of Factors Influencing the Dental Caries
Prevalence in 7-Year-Old Chinese
Children in Taiwan

台湾7歳児の齲蝕有病に関わる要因の分析

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概要: 台湾における齲蝕有病に関わる要因を明らかにするために、台湾中部員林市の7歳の児童112名を対象として齲蝕罹患状況の診査及び、その保護者を対象として生活習慣についての質問紙法調査を行い次の結果を得た。1) t検定を用いた解析の結果、歯磨きを低年齢から開始した児童ほど、また間食の頻度が少ない児童ほど齲蝕が有意に少なかった。また、保護者の歯科疾患に対する認識が高い児童ほど有意に齲蝕が少なかった。2) 数量化理論第I類を用いた解析の結果、6項目の重相関係数は0.55 ($p < 0.01$)であり、保護者の歯科疾患に対する認識が児童の齲蝕の多寡に関与しており、保護者の歯科疾患に対する認識が高い児童ほど有意に齲蝕が少なかった。また、歯磨きを低年齢から開始した児童ほど齲蝕が有意に少なかった。以上から、母親の歯科保健に対する意識が児童の年齢が低いときから確立されていることの重要性が示唆された。

Key words: Taiwan, Multivariate analysis, Toothbrushing habit

索引用語: 台湾, 多変量解析, 歯磨き習慣

Introduction

The incidence of dental caries is influenced by many factors in a complex manner. Promotion of scientifically sound dental health activities and identification of the various factors influencing the incidence

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ce of dental caries are required for the prevention of dental caries.

There have been many investigations concerning deciduous caries; and it is said that the prevalence of caries in deciduous dentition is influenced by the infants' developmental environment and habits of daily life¹⁻¹⁰). However, there is little research concerning the prevalence of dental caries in school children¹¹). In 1987 we surveyed families in Taiwan concerning the children's daily habits and the degree to which dental diseases were recognized by their parents. We report the correlation between the prevalence of dental caries and the factors determining the presence of the disease.

Table 1 Mean number of df and DMF teeth in Chinese children in Taiwan

Age(yr.)	N	dft	DMFT
5	201	6.90±4.93	0.06±0.41
6	121	6.94±4.40	0.36±0.90
7	112	6.04±3.24	1.63±1.56
8	97	5.20±3.20	2.27±1.73
9	96	3.37±2.62	2.88±2.00
10	105	1.55±2.04	3.39±2.17
11	94	0.57±1.24	3.67±3.00
12	18	0.11±0.32	3.61±2.52

Mean±s.d.

Materials and Methods

A survey of dental caries and a questionnaire were carried out among 1,036 children (between 3 and 12 years of age) in Yuanlin City (population: 117,911), Taiwan in 1987. Of the 1,036 children surveyed, 112 seven-year-olds were selected for further analysis. Dental conditions were assessed with sufficient illumination using dental mirrors and probes. The questionnaire consisted of 20 items concerning the parents' recognition of dental diseases and the children's daily habits. The questionnaire was written in Chinese and answered by the parents.

The t-test was used for an analysis of significant differences in the prevalence of dental caries among each category in each item of the questionnaire.

The categories of the questionnaire items were quantitated by multivariate analysis using the type I theoretical quantification¹²). Individual dental caries experience (DMFT+dft) was used as a dependent variable.

Result

Table 1 shows the mean number of df and DMF teeth, and their standard deviation by age. The mean number of df teeth was 6.94 in 6-year-old children and decreased with age. The mean number of DMF teeth increased with age reaching 3.67 in 11-year-old children.

Table 2 shows the mean number of DMF+df teeth in 7-year-old children by each category in 10 items, excluding questions concerning gingival diseases or questions which gave duplicate answers. The dental caries prevalence tended to be lower in children who had started brushing their teeth at a younger age. A particularly significant difference was found between children who had begun brushing their teeth at the age of 3 and those who had started at 6 or 7 ($p<0.01$, 0.05). With respect to eating between meals, caries prevalence was significantly higher among those eating between meals on a daily basis than among those who did not ($p<0.01$). Concerning the parents' knowledge of dental caries, children whose parents responded 'yes' to the question "Do you think dental caries is hereditary?" had significantly more caries than the children of parents responding with 'no' ($p<0.05$). No significant differences were observed for items such as order of birth, frequency of toothbrushing, timing of toothbrushing, regularity of meals, type of snacks, or the frequency of consuming sweet drinks.

Table 2 Factors which have an influence on the DMFT+dft in 7-year-old Chinese children

Item	Category	N	Mean DMFT + dft	S. D.
Order of birth	1	43	8.53	3.77
	2	35	6.06	3.51
	3 $\leq$	24	8.08	4.22
Sex	Boy	55	7.71	4.11
	Girl	53	7.81	3.62
Starting age of tooth brushing	3 yr.	7	4.57	3.82
	4 yr.	22	7.36	3.35
	5 yr.	50	7.12	4.16
	6 yr.	25	8.92	2.90
	7 yr.	5	10.40	4.28
Frequency of brushing	Once	50	7.82	4.31
	Twice	51	7.20	3.63
	3 $\leq$	5	8.80	2.86
Time for brushing	Less than 2 min.	38	7.42	3.70
	2 min. <	53	7.74	4.07
	3 min. $\leq$	20	7.90	3.86
Regularity of meals	Regular	91	7.77	3.67
	Irregular	19	7.11	4.93
Snacks between meals	Daily	30	8.10	3.67
	Sometimes	78	7.64	3.99
	Seldom	4	4.75	0.96
Kinds of snacks	Sweet snacks	80	8.05	3.74
	Others	27	6.74	3.55
Frequency of consuming sweet drinks	Twice a day	2	2.50	0.71
	Once a day	25	7.80	3.71
	Sometimes	59	8.46	3.73
	Never	17	6.82	3.49
Cause of dental caries	Hereditary	13	9.32	2.98
	Acquired	78	7.12	3.84
	Lack of understanding	21	8.71	4.12

* $p < 0.05$, ** $p < 0.01$

The information shown in Table 2 for seven-year-old children was quantified by type I quantification and items closely related to dental caries prevalence were selected. Table 3 shows the items, categories, category scores, and the type II sum of square. A multiple correlation coefficient R shows the degree of the explanatory variables upon the dependent variable. The multiple correlation coefficient of 6 items was 0.55 ($p < 0.01$). The type II sum of square indicates the degree of contribution of each item to the estimation of the dependent variable⁽³⁾. The maximum value of type II SS for 'the cause of dental caries' was 112.1 ($p < 0.05$). The 'starting age of tooth brushing' occupied the second and the 'frequency of consuming sweet drinks' the third rank. An intercategory test revealed significant differences for the

Table 3 Factors which have an influence on DMFT+dft and category score in 7-year-old Chinese children

Item	Category	Category Score	Type II SS
Starting age of tooth brushing	3 yr.	5.31	81.6
	4 yr.	5.80	
	5 yr.	6.01	
	6 yr.	6.85	
	7 yr.	12.30	
Regularity of meals	Regular	7.84	13.2
	Irregular	6.66	
Snacks between meals	Daily	8.51	23.0
	Sometimes	7.70	
	Seldom	5.55	
Frequency of consuming sweet drinks	Twice a day	3.00	79.4
	Once a day	8.80	
	Sometimes	9.36	
	Never	7.84	
Frequency of toothbrushing	Once	7.69	41.7
	Twice	6.24	
	3 times	7.84	
Cause of dental caries	Hereditary	7.44	112.1*
	Acquired	5.69	
	Lack of understanding	8.64	

Multiple correlation coefficient 0.55**

* $p < 0.05$, ** $p < 0.01$

'cause of dental caries', the 'starting age of tooth brushing' and the 'frequency of consuming sweet drinks' ($p < 0.05$).

Discussion

The present study showed the dental caries prevalence of Taiwanese children between 5 and 12 years of age; the mean number of df teeth and DMF teeth was lower than those reported by the Ministry of Health and Welfare, Japan in 1987¹⁴, except for DMFT in 8 and 9-year-old children.

Seven-year-old children were selected for further study because this age is an age when many deciduous teeth still remain and the first permanent molars are more likely to form caries.

The items of the questionnaire for which the t-test indicated significant intercategory differences were the 'starting age of toothbrushing', 'snacks between meals' and the 'cause of dental caries'. A high prevalence of dental caries was observed among children who started brushing at a later age. No significant intercategory differences were observed for other items related to toothbrushing such as 'frequency of toothbrushing' and 'time for toothbrushing'.

The prevalence of dental caries was significantly higher in children whose parents responded that caries is hereditary than in children whose parents believed that it is not. There was a higher prevalence of caries in those subjects having daily snacks than in those who did not. This fact coincides with other

reports that the frequency of eating between meals significantly influences the prevalence of dental caries^{2,3)}.

The results of a multivariate analysis using the type I theoretical quantification showed that the multiple correlation between six items was 0.55. This is statistically significant. Among the various items only 'cause for dental caries' had a significant influence on the prevalence of caries. Significant inter-categorical differences were observed for the items 'starting age of toothbrushing', 'frequency of consuming sweet drinks' and 'cause for dental caries'.

A review of prior studies revealed that most investigations¹⁻¹¹⁾ did not recognize a correlation between caries of deciduous teeth and toothbrushing habits¹⁻⁶⁾. For example there were reports stating that toothbrushing by children was not effective in preventing dental caries^{3,5,6)}. However, these studies investigated only the present situation of habitual toothbrushing. Since dental caries is an accumulative disease, the actual correlation of toothbrushing to caries was considered to be difficult to determine⁹⁾. Takahashi and Shimada⁹⁾ suggested that many children were motivated to brush daily after dental caries was diagnosed. The preventive effect of long-term daily toothbrushing by children who were caries-free was, therefore, undetected. In the present study we could not find any correlation between the 'frequency of toothbrushing' or 'time for toothbrushing' and the prevalence of caries, respectively. However, we found that early commencement of toothbrushing led to a lower prevalence of caries. Many reports state that caries prevalence is significantly lower in those who commenced toothbrushing at a lower age⁷⁻⁹⁾. Therefore, the question asking for the 'starting age of toothbrushing' is considered to represent the long-term dental health care habits rather than the present situation alone. Although the effect of toothbrushing on preventing dental caries is difficult to ascertain in a cross-sectional study, the present study revealed its efficacy beyond doubt.

The parents' ability to recognize dental diseases also influenced the dental caries prevalence in their children. Because children who started to brush their teeth at an earlier age had a lower prevalence of caries, the importance of establishing a consciousness of dental health care in mothers (fathers) was indicated.

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