Dental Caries Prevalence in 12-year-old Children in Shenyang, China

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Abstract : The purpose of the survey reported herein was to evaluate the caries prevalence in 12-year-old children in the city of Shenyang, China. In total 919 children aged 12 years attending the Shenyang School No. 126 were selected. Five calibrated dentists examined their dental health status annually using dental mirrors, explorers and artificial lights between 1992 and 1996. The annual caries prevalence rates ranged from 59.1% to 70.6% and no significant differences were found among survey years. The mean DMFT was about 1.5 until 1995 and then increased to 1.8 in 1996, and a significant difference was found between the DMFT in 1992 and 1996. Among the components of the DMFT, the mean number of DT decreased and that of FT increased annually up to 1995. In 1996, conversely, the mean DT was significantly increased ($p<0.01$) compared with that in 1995 and the mean FT was decreased, although no significant difference was found. However, both the caries prevalence rates and the DMFT in these subjects examined between 1992 and 1996 were twice the Chinese national means. These results suggest that this school-based dental health program, implemented in 1992, should be improved to provide better dental health for the children.

抄録：本調査の目的は中国瀋陽市の12歳児における最近のう蝕有病状況を評価することである。瀋陽市第126学校の12歳児合計919名を調査対象者とし，う蝕の診断はＷＨＯの国際スタンダードに基づき，事前にキャリブレーションを行った５名の歯科医により，人工照明下で歯鏡，探針を用い行われた。調査期間は1992年～1996年の５年間であった。調査期間中の永久歯う蝕有病者率は59.1％（1993年）～70.6％（1996年）で統計学的に有意差は認められなかった。平均DMFTは1995年まで約1.5本と一定であったが，1996年に1.8本に増加し，1992年のそれに対し差は有意（$P<0.05$）であった。DMFTの内訳をみると，1995年まで経年的に平均DT（未処置歯数）は減少し平均FT（処置歯数）は増加した。しかし，1996年では，逆に平均DTは有意（$P<0.01$）な増加に転じ，平均FTは減少した。なお，1996年にみられたこれらの突然の変化については，今後の更なる調査が必要と思われた。しかしながら，対象者における1992年～1996年の有病者率，および，平均DMFTは，中国の全国平均の２倍であったことから，1992年以来行われてきた学校歯科保健プログラムを改善する必要性を示唆している。

Introduction

Although hundreds of epidemiological surveys on dental caries have been conducted in all parts of the People's Republic of China, almost of all the data were collected without standardization in terms of caries diagnostic criteria. Therefore, it is difficult to compare the data collected from survey to survey. In 1982-1984, the National Oral Health Survey was carried out, using an international standard, World Health Organization (WHO) criteria and methodology, by the Ministry of Public Health of China[1], and this was considered as the first set of standardized survey data ever to have been obtained in this country. According to the results of this survey, China has one of the lowest caries prevalence rates of countries in the world[2]. In China, especially in the highly populated cities that have been rapid undergoing industrial and economic development, the recent social change may give rise to high prevalence of dental caries like that seen in industrialized countries. Thus, we need basic information on dental health to plan new health programs or to re-assess the programs already being implemented. The national survey of caries data does not apply to Shenyang but only to province as a whole.

Moreover, the survey was carried out more than a decade ago. Therefore, the purpose of this survey was to clarify the recent caries prevalence in Shenyang.

Materials and Methods

The survey subjects were 12-year-old children enrolled in the 6th grade at School No. 126 in Shenyang, China. Between 1992 and 1996, a total of 919 school children (458 boys and 461 girls) were examined annually in March at the school according to the WHO oral health survey criteria[3] by 5 calibrated dentists using dental mirrors, explorers and artificial lights. The kappa values for all examiners involved, between intra-examiner and inter-examiners, exceeded 0.85. The data were processed using a PC-9821/NEC Bp personal computer, and the t-test for the mean number of decayed, missing, and filled teeth (DMFT) and *Chi-square test* for caries prevalence rate were used to analyze the statistical differences between compared groups.

Results

Table 1 shows the caries prevalence in the 12-year-old children by survey year from 1992 to 1996. The annual caries prevalence rates (percentage of children with one or more DMF tooth) ranged between 59.1% and 70.6%, and no significant differences were found among the five years. The mean DMFT was about 1.5 each year until 1995, but that in 1996 was significantly higher ($p<0.05$) than that in 1992. Among the components of DMFT, the mean number of decayed teeth (DT) decreased and that of filled teeth (FT) increased annually up to 1995. In 1996, conversely, the mean DT was significantly increased ($p<0.01$) compared with that in 1995, and the mean FT decreased, although no significant difference was found. In contrast missing teeth (MT) were seldom observed in the subjects, and only one tooth in 1994 and four teeth in 1995 were missing. Gender difference (girls>boys) was observed both in the caries prevalence rates and the mean DMFT in each survey year.

Discussion

In developing countries, the dental caries prevalence is generally low or very low[2]. However, dental problems will easily become an object of public concern if the caries prevalence becomes high in such countries, even if the mean number of carious teeth increases by only 0.1. This must be especially serious in China because of its extremely large population (estimated at 1,200 million). Shenyang, in the northeast of China,

Table 1 Dental caries status in 12-year-old children in Shenyang, China

Survey years	Gender	Number of subjects	Caries prevalence rate (%)	DMFT mean	DMFT SD	DT mean	DT SD	MT mean	MT SD	FT mean	FT SD
1992	B	127	62.2	1.14	(1.27)	0.40	(0.67)	0.00	(0.00)	0.74	(0.97)
	G	123	74.8	1.71	(1.55)	0.84	(0.97)	0.00	(0.00)	0.87	(1.09)
	T	250	68.4	1.43	(1.44)	0.62	(0.86)	0.00	(0.00)	0.80	(1.04)
1993	B	39	46.2	1.00	(1.41)	0.33	(0.69)	0.00	(0.00)	0.67	(1.12)
	G	54	68.5	1.93	(1.94)	0.59	(1.03)	0.00	(0.00)	1.33	(1.32)
	T	93	59.1	1.54	(1.80)	0.48	(0.91)	0.00	(0.00)	1.05	(1.28)
1994	B	108	58.3	1.54	(1.80)	0.39	(0.65)	0.01	(0.10)	1.14	(1.46)
	G	96	67.8	1.72	(1.71)	0.48	(0.83)	0.00	(0.00)	1.24	(1.38)
	T	204	63.7	1.62	(1.76)	0.43	(0.74)	0.01	(0.07)	1.19	(1.42)
1995	B	119	57.1	1.30	(1.60)	0.31	(0.61)	0.01	(0.09)	0.98	(1.39)
	G	127	70.9	1.76	(1.65)	0.38	(0.66)	0.02	(0.15)	1.36	(1.47)
	T	246	64.2	1.54	(1.64)	0.35	(0.64)	0.02	(0.13)	1.18	(1.44)
1996	B	65	64.6	1.52	(1.52)	0.74	(0.95)	0.00	(0.00)	0.79	(1.05)
	G	61	77.1	2.15	(1.74)	0.95	(1.00)	0.00	(0.00)	1.20	(1.44)
	T	126	70.6	1.83	(1.66)	0.84	(0.98)	0.00	(0.00)	0.98	(0.42)

B: Boys, G: Girls, T: Totle (both B and G)

is the capital city of Liaoning Province and has a 6.5 million total population, including about 850,000 children enrolled in primary and junior high schools.

According to the national dental survey[1], the caries prevalence rate among 12-year-old children was 32% and the mean DMFT was 0.67. The present survey in Shenyang showed that the annual caries prevalence rates range at among 60-70%. This result is similar to that reported by Yang[4] that 63.3% of 12-year-old children in Beijing were affected with caries. In other reports by Petersen[5] and Wang[6], the rates were 50.4% and 62.5% in Wuhan and in Guangdong, respectively. In Beijing[4], the mean DMFT showed no significant change from 1981 to 1989, although a slight increase was found (from 1.61 to 1.87). Our survey also disclosed that the annual mean DMFT was stable and low (about 1.5) between 1992 and 1995. On the other hand, in the large city of Chengdu[8] the mean DMFT in 12-year-olds increased significantly ($p<0.01$) from 0.70 in 1982 to 1.05 in 1990. However, the rate was still below that in Beijing or Shenyang.

Thus, both the caries prevalence rate and the mean DMFT in large cities are twice the national means. This indicates that the caries prevalence is much higher in urban areas than rural areas in China. There is another report[7] regarding the national survey, which summarizes the mean DMFT in 12-year-old children by province. The present caries rates for Shenyang are clearly higher than the provincial mean (Liaoning, DMFT=0.76), which is at an intermediate level in terms of all provinces (Fig. 1).

In the present survey, the mean DMFT was significantly higher in 1996 than 1992. We are not sure of the reason for the increase whether it is the start of a trend or just an anomalous exception. Similarly, the caries status in terms of DT and FT seemed to improve until 1995, but it abruptly deteriorated in 1996. Therefore further studies are needed to clarify these issues.

Since 1992, a school-based dental health program including dental health education, topical fluoride application, dental examinations and caries treatment has been in operation at the school surveyed. The children receive routine dental health education provided by dentists and school nurses 6 to 7 times a year. The dental treatments are provided only for children who have enamel caries in permanent teeth or deciduous teeth needing extraction, by dentists from a university and dental therapists from dental health centers, at the time of the dental examinations. For all children, 2% NaF solution is applied once a year in a mass treatment program. The fluoride concentration is low (consistently 0.1-0.2 ppm) in the drinking water in the city, and other fluoride usage is rare.

Although a school dental health program has been implementing at this school, we could not evaluate its effects because of the lack of baseline data. We can at least speculate that it might not be adequate accord-

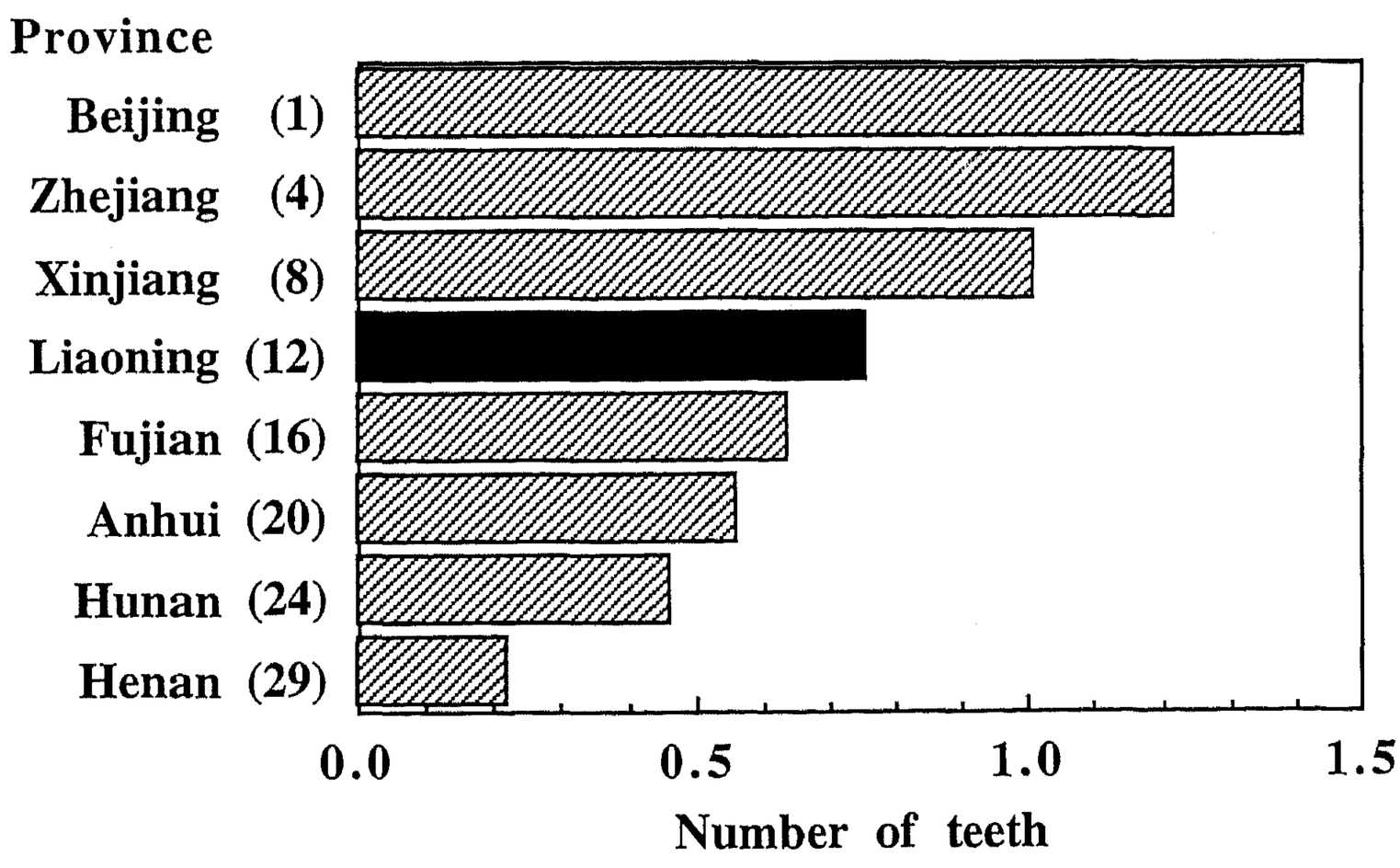

Fig. 1 Mean DMFT at age 12 years by province[7]. Data for 8 of the 29 provinces in the survey are illustrated. ( ): Numbers show the rank order according to the caries (DMFT) frequency from the highest (Beijing) to the lowest (Henan).

ing to other reports[9,10] regarding topical fluoride application only once a year. It might be more practical and effective to introduce fluoride mouth rinsing into the school dental health program[11,12]. Most of the children (54% to 72%) had one or two carious teeth, but the children with 4 or more DMFT represented 13% to 28% of the entire group during the five years examined (data not shown). Caries mainly occurred on the permanent first molars, and accounted for 72% to 78% of all caries. Thus, pit and fissure sealant should be introduced into the school preventive program. This might play an important role in reducing the caries prevalence among the children at this school. The development of a dental health program which is appropriate for this country and takes account of the actual conditions in China is still the main task facing every dental professional.

Conclusion

Dental caries data for a total of 919 12-year-old children in Shenyang from 1992 to 1996 were acquired using WHO oral health survey criteria. The annual caries prevalence rates ranged from 59.1% to 70.6%, and no significant differences were found between survey years. The mean DMFT was about 1.5 until 1995, then increased to 1.8 in 1996. Significant difference in DMFT was found only between 1992 and 1996. The results revealed that the caries prevalence in these children was stable and low until 1995. However, it is not clear why the DMFT increased in 1996 and further monitoring is needed to clarify this. The survey also indicated that the caries prevalence in the school is higher than the national mean. It is suggested that improvement of the on-going school based dental health program would reduce the prevalence of dental caries among the children at the school.

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