

**Dental caries and periodontal status of 12-year-old school children in rural Qinghai, China**

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*Key words:* children, China, dental caries, periodontal status, survey

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*This oral health survey was conducted under the auspices of Christian Action. The study report was part of a two-month Oral Health Care Service which conducted yearly for the last three years under the financial support of the S.K. Yee Medical Foundation.*

## **Abstract**

**Objective:** *To describe the oral health status of 12-year-old children in rural Qinghai and to determine if there was a difference in oral health status between the Han and ethnic minority children.*

**Method:** *Three primary schools in Heyang and Hexi Townships, Guide County, Hainan Tibetan Autonomic State, Qinghai Province, China, were selected and all children aged 12 years were surveyed. Each child was interviewed and clinically examined in the schools, using portable equipment. World Health Organization (WHO) examination procedures and diagnostic criteria were used.*

**Results:** *196 children (118 Han and 78 ethnic minorities, i.e. Muslims and Tibetans) were surveyed. About 48% of the children never brush their teeth while another 12% of them brush only every 2-3 days. Over ninety percent (n=182) of the children had never visited a dentist. Low caries experience was observed in both Han and minority groups, i.e. DMFT scores of 0.12 and 0.23 respectively. Larger proportion of caries free 12-year-old was observed in Han group (94%) than Muslims and Tibetans (82%) group ( $P<0.01$ ). None of the children had healthy gums (highest CPI score=0) and about 85% of them had calculus.*

**Conclusions:** *Dental caries and treatment need level of Han and minority rural children in Qinghai was low but their periodontal health status was unsatisfactory. Basic dental health and preventive education for the children in this part of China is needed.*

Qinghai Province is situated in the western part of China at the Northeastern part of the Qinghai-Tibetan plateau. It has a land area of 721,200 km<sup>2</sup> and has an average altitude of 3,000 m. The total population of Qinghai Province is 4.74 million with 58% Han and 42% ethnic minorities including Tibetans, Muslims and Mongolians<sup>1</sup>. The province is also at center of the region where remoteness and ecological disadvantage had created poverty especially in the rural area<sup>2</sup>. This region, unlike the coastal provinces, did not benefit from the economic reform policies since 1978 and hence is still lacking behind in income and development.

There is no dental university nor middle level stomatological school in Qinghai. The nearest two dental institutions, servicing the corresponding region of China is at Lanzhou, the capital city of Gansu Province, approx. 215 km to the east of the capital city, Xining, of Qinghai Province. They are the Department of Stomatology, Lanzhou Medical School and Gansu Provincial School of Hygiene<sup>3</sup>. The Gansu Provincial School of Hygiene is responsible for training 40 middle level dentists per year since 1985. The middle-level dentists who underwent three years related training are independent operators who provide simple dental treatments such as scaling, filling, simple extraction and prosthesis to all age groups which is similar to dental therapists in some countries. The Lanzhou Medical School had also trained annually 30 middle level dentists since 1985 and then at 1989 it switched to provide university level dental training to 25 graduates per year<sup>3</sup>. The middle level dentists, the principal oral health care workers in that region, mainly work in dental clinics affiliated with general hospitals in the cities. There are one Stomatological Hospital and five integrated Hospitals with Department of Stomatology, all located in Xining. No artificial water fluoridation is available in Qinghai.

Little information about the oral health status of children living in rural China was available<sup>4</sup>. Two national oral health surveys have been conducted in 1983 and 1995 in 29 and 11 provinces/autonomic regions, respectively<sup>5,6</sup>. In both surveys, the rural as well as the urban populations were surveyed and so as the ethnic minorities if available. The two studies, however, fell short in matching or comparing results from minorities groups versus the local Han population. The general trend was, as shown from both studies, dental caries in Chinese urban 12-year-olds seemed to remain at the same level from 1983-1995, whereas the situation in the rural areas deteriorated<sup>4</sup>. The

oral periodontal health status seemed to be the same in this 2 time points. One of the authors (WKL) was involved in an earlier study investigating the oral health status and treatment need of 11-13-year-old urban school children in Tibet had showed that the mean DMFT score of the Tibetans (0.8) was significantly higher than their Han (0.4) classmates<sup>7</sup>. The DMFT scores of the Tibet school children were, however, comparable to data from other parts of China<sup>7-9</sup>. The periodontal status of the urban Tibetan children was comparable to their urban countrymen by the sea, however, the rural children living in the coastal province of Guangdong was found to have poorer gums than their urban counter part who had already unsatisfactory periodontal health.

The present study forms part of a report of a 3-year oral health care project conducted in the eastern region of the Qinghai Province targeting mainly children living in the economically deprived rural areas. For simplicity and practical reasons, only findings from part of the final year project was presented in this report. The objectives of the present study were to describe the oral health status of rural 12-year-old children in Qinghai and to determine if there was a difference between the oral health status of the rural Han and minority children.

## **Materials and Methods**

The survey was conducted at Hexi Townships, Guide County, Hainan Tibetan Antonomic State. Hexi Townships, including Hexi Xiang and the Heyin Zhen. The latter being the capital town situated at the center of Guide County. The towns are situated by the Yellow River (Huang He) banks at an attitude of 2,300m. 15,842 persons were reported living in these 435 km<sup>2</sup> townships in 1985<sup>10</sup>. The towns were 117 km or 4 hours by 4-wheel-drive from Xining. The Yellow River irrigated 26% of the Guide county area which accounts for 70% of the county farm land sustaining 55% of the county population. The majority of the local population of Hexi Townships live on agriculture by growing barley, beans, and cash corps. Three largest primary schools, two in Hexi Xiang and one in Heyin Zhen were selected and all school children were examined. Information concerning the children's age, ethnic background, number of years they had lived in Guide, toothbrushing habits and dental visit behaviour was collected by interviews. The interviews were conducted in Tibetan or Putonghua (Han and Muslims speak putonghua) by the manager of the volunteer dental

programme (LZT) who is proficient in both languages. Clinical examination of the 12-year-old students was carried out by WKL in the schools, who was trained and experienced in such survey using portable equipment<sup>7</sup>. The examination procedures and diagnostic criteria used followed those recommended by the World Health Organization<sup>11</sup>. The DMFT index was used to describe the dental caries experience of the children. Community Periodontal Index (CPI) scores for the six index teeth of each child were recorded but pocket depths were not measured. Thus the CPI scores only ranged from 0 (healthy) to 2 (calculus). Presence of tetracycline-stained teeth was also noted. A tooth brush was issued to all participants after the oral examination.

Duplicate examinations were conducted throughout the survey on a total of 19 children. Results from these duplicate examination showed that intra-examiner reliability on tooth status (sound, decayed, filled and missing due to caries) assessed by the Kappa statistic was excellent (Kappa = 0.95) while that for periodontal status (CPI scores 0, 1 and 2) was very good (weighted Kappa = 0.87). The collected data were analysed using SPSS/PC software. Statistical significance of the differences in prevalences between groups was assessed by Chi square test and differences in mean scores by t-test. The level of significance chosen was 0.05.

Oral health education regarding the importance of oral hygiene to prevent caries and periodontal diseases was given to the students of all classes and their teachers after examination. Then proper toothbrushing method was demonstrated and all students practiced brushing with their new tooth brush using fluoridated tooth paste at the schools.

Due to the limited resources of the current project, dental treatment was given only to school children at one of the 3 schools surveyed. The Hexi Primary School, where dental treatment was provided, selected before the voluntary dental team set-off from Xining and was located furthest away from the Heyin Zhen Town Centre. This part of the voluntary projects in Guide County lasted for 2 weeks. Portable dental equipments were used.

## Results

A total of 1,185 school children were examined and 196 of them who were 12-year-old and were recruited for the surveyed. 118 were Han (63 boys and 55 girls) and 78 were ethnic minorities (Muslims or Tibetans, 38 boys and 40 girls). All recruits lived in Guide, Qinghai since birth.

Almost half of the children reported that they never brush their teeth and slightly more than 10% of them brushed at least once daily (Table 1). The reported toothbrushing habits of the Han and the minority groups of children were similar. More than 90% of the children in both groups never visited a dentist. Only 5% of the Han group visited a dentist within a year.

As shown in Table 2, the prevalence of caries experience in the permanent dentition was very low in both groups, 94% in the Han and 82% in the minorities ( $P<0.01$ ) were caries free. The mean DMFT scores of the Han and minorities were 0.1 and 0.2 respectively. Filled teeth (FT) and teeth missing due to caries (MT) were rarely found in both groups of children and the DMFT scores were almost exclusively composed of decayed teeth (DT). There was no difference in mean DMFT scores between the Han and minorities boys and girls. From all subjects surveyed a total of 31 teeth were affected by caries, of which 22 were on lower first molars (tooth 36 or 46), 7 on upper first molars (tooth 16 or 26) and one each on a upper first premolar and a upper second premolar. No caries on anterior teeth was found. No tetracycline-stained teeth were found.

None of the children in both groups had healthy gums (Table 3). More than 80% of the children had calculus and the mean number of sextants with calculus was 2.4. There was no statistically significant difference in the distribution of the highest CPI scores between the two groups nor between the boys and girls in either group.

## Discussion

This study reported on the oral health status of children living in a remote and economically deprived part of China. Comparison was also made between Han and

ethnic minorities co-inhabiting the region. Han, Muslims, Tibetans and Mongolians are indigenous people of this part of China. Record of Han colonization of this region was as early as 60 A.D. while Tibetans, Muslims and Mongolians started settling in this part of China at around the eleventh to twelfth century<sup>1,10</sup>. Mongolians are mainly inhabitants of northwestern and southeastern parts of Qinghai. Few of them live in Guide County and hence not encountered in this study.

The dental profile of Han and ethnic minorities living in the rural was reported in the two national oral health surveys<sup>5,6</sup>. However, the reports only presented data on minorities studied from certain prescribed regions of China. The Qinghai data reported were only Han and the reports did not indicate if attempts been made to avoid subject mix-up when supposedly substantial minority populations were co-inhabiting the region. The data presented were also inappropriately summarized i.e. results from students aged 7, 9, 12, 15 and 17 years were often grouped into one analysis which made interpretation of the data very difficult.

This study shown, when compared with the more developed coastal rural region of Guangdong, and the remote urban city of Lhasa, that the 12-year-old living at this remote and yet economically deprived rural Northwestern region of China still maintained an apparently lower caries experience in their permanent dentition despite natural 0.3 -3.4 ppm fluoride in the local drinking water was comparable to the corresponding level from rural Guangdong<sup>12</sup>. Recent studies in southern and southwestern China<sup>9,13</sup> have found that the caries level of children living in rural areas was lower than that of those living in urban areas. The caries status of the Qinghai recruits compared favourably to the corresponding group from rural Sichuan, i.e. 94% vs 87% caries free rate and 0.2 vs 0.2 DMFT score respectively. The present recruits, were expected to be having similar, if not worse, socio-economic background than the Sichuan rural children. Such results were also similar to that of other rural, economically deprived populations around the world<sup>14-17</sup>.

The present sample surveyed was by no means random sample of the children in rural Qinghai because of the convenient sampling protocol and the requirement of the survey to dovetail with the voluntary dental service. However, there were no obvious reasons to believe that the sample was biased. In fact, the ratio of the Han vs

the ethnic minority in the sample, i.e. 60% Han and 40% minorities was very close to the available provincial or county vital statistics data<sup>1,10</sup>.

Similar to the earlier publication on urban Tibetan 12-year-olds, the present study reported an overall higher caries free rate in Hans children than their ethnic minority schoolmates<sup>7</sup>. The reasons why there is different are not clear but probably worth further study. The finding that nearly all of the decayed teeth found in these children were untreated reflected the extremely limited access to these children to dental care, which was evidenced by the finding that over 90% of the children had never visited a dentist. Together with the general poor periodontal conditions and lack of attention to oral hygiene had clearly demonstrated that school-based and outreach dental programmes focusing on prevention are needed if the provision of dental care services for children in Guide, Qinghai is to be improved. Since the dental treatment need of these children is mainly oral hygiene education and simple fillings and extractions, a school teacher-supervised tooth-brushing programme<sup>18</sup> and regular visit of a middle level dentist for scaling, simple filling and extractions should be able to provide the necessary care.

Although findings from the report contributed to information about the corresponding population surveyed, there are limitations in the study. This study was conducted among children living in the agricultural region of rural Qinghai Province only and the oral health condition of children in the more remote parts of Qinghai where the people live mainly on nomadic life may be different. It is obvious from the present and other related findings about disease profiles and availabilities and location of related oral health care facilities that the existing oral health workforce and delivery system in remote regions of China is not coping with the oral disease situation of the children living in such region. The Chinese government had already drawn up plans to gradual develop the western regions of China in the coming decades. At this interim period, emphasis should be put on provision of dental care services that can be effectively delivered and user friendly to the population served. That is, alternative ways of delivery dental care services such as school-based prevention programmes working with middle level dentist operating on a mobile dental unit round the year plus intense periods of voluntary dental services would hopefully improve the present situation.



## **Acknowledgements**

The S.K. Yee Medical Foundation and Christian Action financially supported this study. WKL would like to thank the 2001 Volunteer Dental Program organizer: Mr. K.Y. Tai, manager: Dr. L.Z. Tai, fellow team members: Dr. P.K. Dayal, Dr. G.Q. Cao and Miss D. Jiang for their kind assistance to enable smooth run of the survey.

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Table 1. Percentage distribution of the 12-year-old rural Qinghai children according to their oral hygiene and dental visit behaviour

	Han % (n = 118)	Minority*% (n = 78)	Total % (n = 196)
<b>Frequency of tooth brushing</b>			
Never brush	45	53	48
Less than once daily	42	35	40
Once or more daily	13	12	12
<b>Last dental visit</b>			
None	90	98	93
≥ 3 years ago	3	1	2
1-3 years ago	2	1	2
Within 1 year	5	0	3

\*Muslims and Tibetans

Table 2. Dental caries experience ( $\pm$  SD) of the 12-year-old rural children in Qinghai

	Han % (n = 118)	Minority*% (n = 78)	Total % (n = 196)
% DMFT = 0 <sup>+</sup>	94	82	89
% DMFT = 1 or 2	5	18	10
% DMFT > 3	1	0	1
<b>Mean (<math>\pm</math> SD) number of:</b>			
Decayed teeth (DT)	0.1 (0.5)	0.2 (0.5)	0.2 (0.5)
Missing teeth (MT)	0	0	0
Filled teeth (FT)	< 0.1 (0.0)	< 0.1 (0.0)	< 0.1 (0.0)
DMFT	0.1 (0.5)	0.2 (0.5)	0.2 (0.5)

<sup>+</sup>Statistically significant between the two groups,  $P < 0.01$ .

\*Muslims and Tibetans

Table 3. Periodontal health status of 12-year-old rural children in Qinghai

	Han % (n = 118)	Minority*% ( n = 78)	Total % (n = 196)
% Highest CPI = 0*	0	0	0
% Highest CPI = 1	18	12	15
% Highest CPI = 2	82	88	85
<b>Mean (<math>\pm</math> SD) number of sextants:</b>			
Healthy (CPI = 0)	0.6 (6.7)	0.4 (0.6)	0.5 (0.7)
Bleeding only (CPI = 1)	3.0 (1.9)	3.2 (1.7)	3.1 (1.8)
With calculus (CPI = 2)	2.3 (1.9)	2.4 (1.7)	2.4 (1.8)