

1 **A review of the dental caries status of ethnic minority children in**  
2 **China**

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4

5 **Abstract**

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7 *China has 55 ethnic minority groups comprised of 113 million persons, or 7.0% of*  
8 *total population. Dental caries is a major health problem for children in China, and*  
9 *national oral health surveys currently report dental caries based on geographical*  
10 *location rather than by ethnic group. This study reviews the literature on dental caries*  
11 *in ethnic minority children in China. Publications were retrieved in Chinese and*  
12 *English from five electronic databases; thirty-eight studies from 1983 to 2012 met*  
13 *inclusion criteria and described 25 ethnic minority groups. Primary dentition median*  
14 *caries prevalence and experience were higher (51% and dmft=3.0, respectively) than*  
15 *permanent dentition caries prevalence and experience (39% and DMFT=0.8). Median*  
16 *caries prevalence was highest (80%) for permanent dentition among aggregated ethnic*  
17 *minorities with population greater than 1 million. More work and research is needed to*  
18 *expand dental caries prevention and treatment measures for ethnic minority child*  
19 *populations in China.*

20

## 21 **Introduction**

22           China is a large East Asian country with an area of 9.6 million square kilometers.  
23           The total population of mainland China is approximately 1.4 billion and is the largest  
24           in the world. Its populace comprises 56 ethnic groups [1]. Han is the main ethnic group,  
25           composed of approximately 93% of the population. The populations of other ethnic  
26           minority groups vary from a few thousand to more than 16 million. These ethnic groups  
27           have diverse languages, religions and cultures (Table 1) and are widely scattered across  
28           the country (Figure 1). Some live in the more developed eastern or central regions such  
29           as Manchu, but the majority live in the less developed mountainous inland or border  
30           districts in the western region [2]. The average per capita gross domestic product (GDP)  
31           in ethnic minority districts in 2010 was about US\$3500 [3], which was about 73% of  
32           the national GDP (US\$4800) [4]. To reduce the adverse effects of this large population  
33           on the developing country, the central government implemented the one child policy in  
34           the 1970s to slow down the population growth. However, this one-child policy does not  
35           apply to ethnic minority groups. As a result, the population growth rate of the ethnic  
36           minorities in China has increased over the past two decades and reached 6.9% in 2010  
37           [1]. The ethnic minority population was approximately 113 million in 2010, which is  
38           greater than the population of any country in the European Union [1].

39

40           Race/ethnicity has been identified as a factor for oral health status. Many studies  
41           conducted overseas suggest that people from specific ethnic minorities often have poor  
42           oral health status and increased risk of dental decay [5, 6]. While socio-economic status  
43           is one of the most important factors in dental inequalities, underlying cultural beliefs  
44           and practices can influence oral health status through diet, dental care-seeking behavior,  
45           or the use of home remedies [7], which are fundamental in framing appropriate oral  
46           health policies and the development of effective oral health services and oral health  
47           promotion activities [8].

48

49           General health care for children is always among the first priorities of national

50 health policies, and oral health is an integral part of general health [9]. Poor dentition  
51 significantly affects children's nutrition, and consequently their growth, development  
52 and general health. Dental caries is a major health problem for children and has become  
53 a huge burden in China. Dental caries causes pain and infection and advanced caries  
54 will progress into the tooth pulp and eventually form a dental abscess [10]. In the  
55 Philippines, the main reason for absence from school was dental caries [11] and an  
56 estimated 51,000,000 school hours were missed among children in the US in 2000 [12].  
57 In China, three national oral health surveys were performed in 1983, 1995 and 2005  
58 [13, 14]. Their findings indicate that although the prevalence of dental caries and caries  
59 experience among children in China has declined during the past two decades, dental  
60 caries is still a significant health problem affecting many children [14]. The three  
61 national oral health surveys document the oral health of children geographically  
62 according to province, but ethnicity is not a routinely collected category.

63

64 Determining the oral health of children is important for planning and  
65 implementing services oriented toward meeting the needs of the population [15]. The  
66 oral health of children can also be used to predict adult oral health and oral health needs  
67 [16]. It is important to understand the dental caries status in a multicultural society with  
68 different social development to ensure effective delivery of interventions and optimal  
69 allocation of resources. A literature search found no reviews of this imperative issue in  
70 China. This paper reports a literature review of the studies on dental caries in ethnic  
71 minority children in China.

72

## 73 **Materials and Methods**

### 74 *Search strategy*

75 To identify epidemiological studies on the ethnic minorities in China, a broad  
76 search of publications was conducted to include as many relevant publications as  
77 possible. The search was performed using a Chinese database (China Academic  
78 Journals Full-text Database) and two English electronic databases (PubMed, ISI Web

79 of Science) between January 1980 and December 2012. Another two databases of  
80 Chinese theses (China Master's Theses Full-text Database, China Doctor Dissertations  
81 Full-text Database) from 1984-2012 were also included in the search (Figure 2). The  
82 key words used for searching were (Chinese and English as appropriate) as follows:  
83 (dental caries OR caries OR decay) AND (ethnic minority OR ethnic groups) AND  
84 (China or Chinese) AND (child OR children OR adolescent OR student). If the  
85 publications contained the search thesaurus, they were selected to generate a list of  
86 potentially eligible studies to be included in this review.

87

### 88 ***Study selection***

89 A manual search was carried out on the list of potentially eligible studies. The  
90 selected publications were screened by title and abstract. Duplicated reports or studies  
91 using the same data were excluded. Publications were included if they fulfilled the  
92 following inclusion criteria: a) examining one or more ethnic minority groups; b)  
93 assessing the primary teeth of children aged 3 to 6 years, or assessing the permanent  
94 teeth of children aged 11 to 14 years, and c) reporting caries prevalence or caries  
95 experience. *Caries prevalence in % reports the proportion of the population who is*  
96 *suffering from (untreated) dental decay; whereas caries experience in number of teeth*  
97 *reports the proportion of the population who suffered (treated) or is suffering from*  
98 *dental decayed. The caries experience of primary and permanent teeth are expressed*  
99 *in dmft and DMFT scores, respectively.* The dmft and DMFT measure the sum of the  
100 number of decayed teeth (dt or DT), missing teeth due to decay (mt or MT) and filled  
101 teeth (ft or FT) in a child. Publications that reported the combined caries prevalence or  
102 combined mean caries experience DMFT and dmft scores or combined caries  
103 prevalence of primary and permanent dentition were excluded.

104

### 105 ***Synthesis of data***

106 The full papers of the selected publications were obtained. The bibliographies  
107 of the publications deemed eligible were searched manually and additional relevant  
108 publications were included in the review. The results of these studies were grouped into

109 two groups according to the age of the survey children: 3 to 6 years old for primary  
110 dentition and 11 to 14 years old for permanent dentition. A summary was made for each  
111 publication, according to a) ethnic group, b) investigators and year of publication, c)  
112 survey site, d) children's age range, e) sample size, f) sampling method, and g) dental  
113 caries prevalence and experience.

114

## 115 **Results**

116 The initial search identified 175 reports in the five databases (Figure 2).  
117 Duplicate reports in different databases were not counted. Most of the selected  
118 publications were found in the China Journals Full-text Database (N=120) and PubMed  
119 (N=43). These 175 publications were screened manually by abstract and title.  
120 Seventeen studies were found to be duplications of another study and thus were  
121 excluded. Seventy-nine reports were found to be unrelated to reporting of dental caries  
122 status among children of ethnic minority groups in China and they were also excluded.  
123 Consequently, 79 publications were identified, and their full papers were obtained. A  
124 further 24 publications were identified from the bibliographies and were included in the  
125 review. However, 65 publications were excluded. The majority of the studies (52/65)  
126 were excluded because the age of the sample was not mentioned or the caries  
127 assessment was on mixed dentition, or not specific to primary or permanent dentition.  
128 Thirteen studies reported the caries status of at least two ethnic groups or the status of  
129 Han and other ethnic groups. Finally, 38 publications were included in this literature  
130 review.

131

132 All 38 publications were cross-sectional studies published between 1983 and  
133 2012. Two studies were published in the 1980s, 15 in the 1990s and 21 from 2000  
134 onward. These studies evaluated the dental caries status of children from 25 ethnic  
135 minorities. More than half (14/25) of the studies referred to ethnic groups with  
136 populations of more than 1 million. There were 20 ethnic groups among the 3- to 6-  
137 year-old children included in studies of primary dentition (Table 2). The median caries

138 prevalence and caries experience in dmft for these children were 51% and 3.0,  
139 respectively. There were 23 ethnic groups among the 11- to 14-year-old children  
140 included in studies of permanent dentition. The median caries prevalence and caries  
141 experience in DMFT for 11- to 14-year-old children were 39% and 0.8. The findings  
142 according to ethnic group are summarized in Table 3 for primary dentition and in Table  
143 4 for permanent dentition.

144

#### 145 ***Primary dentition***

146 The Korean children living in Jilin province in central China had the highest  
147 caries prevalence (94%) in their primary teeth (Table 3), whereas Mongolian children  
148 living in Qinghai province in northwestern China had the lowest prevalence (11%). The  
149 highest caries experience in primary teeth was found in Bonan children living in  
150 northwestern China (dmft = 7.5) and Bulang children living in southwestern China had  
151 the lowest caries experience (dmft = 0.1). Only one study reported decayed teeth (dt),  
152 missing teeth due to caries (mt) and filled teeth (ft) [17]. Six studies mentioned that  
153 most of the decayed teeth were left untreated [17-22].

154

155 Three studies reported the dental caries experience according to gender [18, 23,  
156 24]. None of them found significant gender difference [18, 23, 24]. Five surveys  
157 compared the dental caries status of ethnic minority children with that of Han children.  
158 Zhuang children living in western China had higher dmft scores than Han children (3.4  
159 vs 2.7) [17]. Their frequent bottle feeding habit with sugary products was attributed as  
160 one of the main reasons for the high caries prevalence. Higher caries prevalence was  
161 also found in Uygur children in northwestern China than in Han children (67% vs 54%)  
162 [26]. Three studies reported that Hui (33% vs 95%), Tibetan (46% vs 81%), Uygur (39%  
163 vs 90%) and Yi children (36% vs 95%) had a lower prevalence of dental caries than that  
164 of Han children [24, 27, 46]

165

#### 166 ***Permanent dentition***

167 The highest caries prevalence in permanent teeth (84%) was found among 11-

168 to 14-year-old Tibetan children in Tibet province in northwestern China, whereas the  
169 lowest prevalence (7%) was found in Tujia children in Hubei province in central China  
170 (Table 4). The highest caries experience in mean DMFT was 2.3 among the Naxi  
171 children living in Yunnan province in southwestern China [28]. Bulang children in  
172 Yunnan province had the lowest caries experience, and their mean DMFT was 0.1 [29].  
173 Two studies reported that girls had higher caries prevalence than boys in Dongxiang  
174 (26% vs 18%) and Kirgiz children (73% vs 65%) [25,48]. One study found the caries  
175 prevalence and caries experience to be higher in Tibetan children than in Han children  
176 (44% vs 24%) [32]. Another study found that the caries prevalence of Dongxiang (41%),  
177 Bonan (44%) and Yugu children (46%) living in northwestern China was higher than  
178 that of Han children (19%) living in the same province [33].

179

## 180 **Discussion**

181 The national oral health surveys in China report dental caries according to  
182 geographic location. As the Han population dominates in majority of the provinces [4],  
183 reporting the caries status by province does not reflect the dental caries status of ethnic  
184 minorities in China. Dental caries is a multifactor disease and the possible roles of  
185 socio-economic and cultural factors have been highlighted [34]. The ethnic minority  
186 population in China is more than 110 million, thus it is essential to study dental caries  
187 according to ethnic group. This is the first article to review the literature on dental caries  
188 in ethnic minority children in China. The sources used in this review were thought to  
189 be exhaustive. They are regarded to be major databases that include the most prominent  
190 biomedical studies. The source used also contains supplemental information which  
191 published in non-medical journals. Databases in Chinese were also used in this review  
192 that include not only journal articles in Chinese but also most if not all of the master's  
193 and doctoral theses published by all dental schools and universities in China. The great  
194 majority of the studies on the caries status of children in China were assumed to be  
195 published in either Chinese or English.

196

197 This review shows that studies on the oral health of ethnic minority children in  
198 China are generally disorganized and sporadic. The total number of publications is  
199 small and covers less than half of the ethnic minority groups. There was no dental caries  
200 information on children from 30 ethnic minorities: Achang, Buyei, Daur, Deang,  
201 Derung, Dong, Erwenki, Gaoshan, Gelao, Hazak, Hezhen, Jing, Lhoba, Manchu,  
202 Monan, Monba, Mulao, Nu, Oroqen, Pumi, Qiang, Russ, Salar, She, Shui, Tajik, Tatar,  
203 Va, Wuzibieke and Xibe.

204

205 The caries status of children is a major indicator of oral health [35]. The World  
206 Health Organization (WHO) selected 5- and 12-year-old children as the indicator age  
207 groups for assessing the caries status of primary and permanent dentition in children  
208 [35]. This should help to standardize the data collected and allows comparison of the  
209 dental caries status of primary and permanent dentition between studies. However, more  
210 than half of the publications identified did not follow the recommendation. Many  
211 studies reported the combined caries status of primary and permanent dentition and  
212 hence could not be included in the review. This study included surveys reporting the  
213 dental caries status of children aged 3 to 6 for primary teeth, with the aim of including  
214 more publications in the literature search. Children younger than 3 were not included  
215 as their teeth might not have erupted. Children older than 6 were not included because  
216 their primary teeth might have exfoliated and were not available for assessment. An  
217 extended age range of 11 to 14 years old was adopted for searching the caries status of  
218 permanent dentition. Children younger than 11 would probably be in the mixed  
219 dentition stage and by 14 the second molar should have erupted for assessment. Some  
220 surveys collectively reported the caries status of children of more than one ethnic group,  
221 perhaps due to small sample sizes. The results of these studies were not included in the  
222 review.

223

224 The majority of the studies (34/38) basically used the dental caries diagnosis  
225 criteria recommended by WHO. However, many studies (23/38) did not provide details  
226 of the sampling methods and none reported the sample size estimation, which is

227 essential for making inferences about the studied population. In addition, most  
228 publications (34/38) did not mention the training and calibration of the examiners, the  
229 number of examiners and the agreement between their dental caries assessments.  
230 Therefore, the validity and reliability of examiners in diagnosing the dental caries could  
231 be problematic. Only two studies duplicated the examinations and reported the inter-  
232 examiner agreement [17, 32]. It is essential to develop a standardized survey method to  
233 ensure the repeatability, comparability and validity of the results obtained by different  
234 studies. The training and calibration of examiners is important to achieve good validity  
235 and reproducibility.

236

237         Few studies were performed on children of ethnic minorities with populations  
238 of less than 1 million. However, the prevalence and experience of caries in primary  
239 teeth was higher in these ethnic groups. For example, the caries prevalence of  
240 Dongxiang children was 79% [20] and Naxi was 71% [28]. The caries status of primary  
241 and permanent dentition varied substantially between ethnic groups in the same region  
242 [19, 20]. One study reported that children of an ethnic group living in isolated areas had  
243 little decay [36]. The study found 75% of the 5-year-olds Lahu children and 85% of the  
244 12-year-olds had no caries experience.

245

246         No consistent conclusions could be drawn from studies comparing the dental  
247 caries status of the ethnic minority groups and Han children. Only one study conducted  
248 a multifactorial analysis and found that the caries experience of children was associated  
249 with bottle feeding in babyhood and ethnicity [17]. Future studies should examine the  
250 relationship between dental caries status and potential risk factors such as language  
251 barriers, religion, oral health beliefs etc. Most studies found no significant difference  
252 between the dental caries status of boys and girls in primary dentition. This finding is  
253 similar to those of the second and third national surveys [13, 14]. A higher prevalence  
254 of caries in the permanent dentition of children was found in girls. This finding also  
255 concurs with that of the national surveys and most local surveys on Han children.  
256 Moreover, it is known that green tea, white tea, black tea, pu-er tea, oolong tea etc. are

257 largely consumed by adults in China. Many different types of tea contain substantial  
258 amount of fluoride but its consumption by children is unknown. Further studies should  
259 be carried out to investigate the drinking of tea by children and its effect on dental caries.

260

261 In general, studies conducted after 2000 reported a higher caries experience in  
262 ethnic minority children than the figure reported by the national oral health survey. This  
263 is consistent with the increased consumption of sugar and inadequate exposure to  
264 professional fluoride application [37]. Basic dental hygiene education such as twice  
265 daily tooth brushing and use of fluoride toothpaste, toothbrushes and floss are very  
266 important in ethnic minority children. The children should have access to these items,  
267 and should be educated in schools or at home. This prevention is one of the most  
268 important steps especially in low resource areas that cannot support municipal  
269 fluoridation and qualified dentists. The caries experiences in the primary dentition of  
270 ethnic minority children reported in the 1990s were all lower than those of the second  
271 national oral health survey in 1995. Nevertheless, some studies published after 2000  
272 reported a higher caries experience in ethnic minority children than in Han children [19,  
273 20, 22-24]. Two studies conducted in the 1990s reported the caries experience of  
274 permanent teeth in Yao, Lisu and Lahu children was higher than that reported in the  
275 second national survey [29, 38]. Several studies [20, 25, 30, 31, 33] reported the caries  
276 experience of permanent teeth in Bonan, Dongxiang, Krigiz, Korean, Li, Naxi and  
277 Yugur children was higher than that reported in the third nation oral health survey in  
278 2005 [14]. The oral health promotion program and school-based dental sealant  
279 placement program target large cities or affluent areas in China [39]. There are no  
280 organized caries prevention programs for children living in rural areas in China [40].  
281 The ethnic minority children have limited access to dental care services and resources  
282 because most of them, particularly those with low populations, live in isolated rural  
283 areas.

284

285 Only one study [17] reported the percentage of untreated decayed teeth (dt),  
286 although many studies commented that most decayed teeth were left untreated [20, 25,

287 28, 30, 31, 33, 41]. The dentist to population ratio has been reported to be around  
288 1:100,000 [42]. The great shortage of dentists in China, especially in rural areas, is  
289 likely to be one of the main reasons for the lack of treatment. Treating the massive  
290 amount of caries in children in these areas is challenging. The cost of conventional  
291 dental treatment and the shortage of dental health care workers make it difficult to  
292 manage caries in children [42]. Treatment that slows down or ceases caries progression  
293 is a pragmatic way of minimizing children's discomfort and problems due to caries.  
294 The provincial governments should perform epidemiological surveys to identify  
295 communities with higher caries prevalence and allocate resources to prevent and control  
296 dental caries among children. Reporting the oral health of people in mainland China  
297 according to their ethnic minority group in future national oral health surveys would  
298 also be helpful. This information would help to identify and address the unique oral  
299 health needs of culturally diverse children. The government and professional societies  
300 should also attract dentists to work in areas where ethnic minorities live. Dental training  
301 should be provided so that simple dental treatments such as topical fluoride applications  
302 and atraumatic restorative treatment can be performed to control caries among children.  
303 In the long term, oral health promotion strategies including water fluoridation should  
304 be considered to promote the quality of oral health among these children.

305

## 306 **Conclusions**

307 There are 55 ethnic minorities with a total population of more than 110 million  
308 living in predominantly rural areas of China. Dental caries is the one of the major health  
309 problems for children and has become a huge burden in China. The past three national  
310 surveys reported dental diseases based on geographical location but not ethnic group.  
311 Ethnicity is likely to be an important factor in dental caries. Various ethnic groups have  
312 different cultures and life styles, which can be important confounding factors affecting  
313 the distribution of dental caries among children. An epidemiological survey based on  
314 ethnic groups is crucial for planning, implementing and monitoring community  
315 programs to improve the oral health of children in China. Although oral health surveys

316 have been conducted on 25 of the minority groups, the survey methods of these studies  
317 were not standardized, thus comparison between studies is difficult. More studies with  
318 appropriate design should be carried out to identify high risk groups for early  
319 intervention.

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321 **References**

- 322 1. National Bureau of Statistics of China. The 2010 statistical report on the  
323 national population 2013 [In Chinese].  
324 [http://www.stats.gov.cn/tjfx/jdfx/t20110428\\_402722253.htm](http://www.stats.gov.cn/tjfx/jdfx/t20110428_402722253.htm). Date last accessed 8 July  
325 2013.
- 326 2. Gustafsson BA, Sai D. Temporary and persistent poverty among ethnic  
327 minorities and the majority in rural China. *Review of Income and Wealth* 2009;  
328 55(s1):588-606.
- 329 3. LE CH, Sheng LY. China's ethnic statistical yearbook [In Chinese]. Peking,  
330 China: China Statistics Press; 2011.
- 331 4. Sheng LY. China statistical yearbook [In Chinese]. Peking, China: China  
332 Statistics Press; 2011.
- 333 5. Gray M, Morris AJ, Davies J. The oral health of South Asian five-year-old  
334 children in deprived areas of Dudley compared with White children of equal deprivation  
335 and fluoridation status. *Community Dent Health* 2000; 17(4):243-5.
- 336 6. Pine CM, Adair PM, Nicoll AD, Burnside G, Petersen PE, et al,. International  
337 comparisons of health inequalities in childhood dental caries. *Community Dent Health*  
338 2004; 21(1 Suppl):121-30.
- 339 7. Riedy CA, Weinstein P, Milgrom P, Bruss M. An ethnographic study for  
340 understanding children's oral health in a multicultural community. *Int Dent J* 2001;  
341 51(4):305-12.
- 342 8. Marino R, Morgan M, Hopcraft M. Transcultural dental training: addressing the  
343 oral health care needs of people from culturally diverse backgrounds. *Community Dent*  
344 *Oral Epidemiol* 2012;40(Suppl 2):134-40.
- 345 9. World Health Organization. The liverpool declaration: promoting oral health in  
346 the 21st century 2013. [http://www.who.int/oral\\_health/events/liverpool\\_declaration/en/](http://www.who.int/oral_health/events/liverpool_declaration/en/).  
347 Date last accessed 8 July, 2013.
- 348 10. Chu CH. Treatment of early childhood caries: a review and case report. *Gen*  
349 *Dent* 2000; 48(2):142-8.

- 350 11. Department of Education, Health and Nutrition Center. National oral health  
351 survey among the public school population in the Philippines, 2006. Manila,  
352 Philippines; 2008.
- 353 12. Beaglehole R, Benzian H, Mackay J. The oral health atlas. UK: FDI World  
354 Dental Federation; 2009.
- 355 13. Wang HY, Petersen PE, Bian JY, Zhang BX. The second national survey of oral  
356 health status of children and adults in China. *Int Dent J* 2002; 52(4):283-90.
- 357 14. Qi XQ. Report of the third national survey of oral health. Peking, China:  
358 People's Medical Publishing House; 2008.
- 359 15. Chu CH, Chau AM, Lo EC, Lam A. Planning and implementation of community  
360 oral health programs for caries management in children. *Gen Dent* 2012; 60(3):210-7.
- 361 16. Pearce MS, Steele JG, Mason J, Walls AW, Parker L. Do circumstances in early  
362 life contribute to tooth retention in middle age? *J Dent Res* 2004; 83(7):562-6.
- 363 17. Zeng X, Luo Y, Du M, Bedi R. Dental caries experience of preschool children  
364 from different ethnic groups in Guangxi Province in China. *Oral Health Prev Dent* 2005;  
365 3(1):25-31.
- 366 18. Chen J. Oral health survey among 388 Han and Zang children in Qinghai [In  
367 Chinese]. *Qinghai Medical Journal* 2006; 36(6):70-1.
- 368 19. Chen Y, Li ZQ, Nie HB, Zhou HJ, Liu WJ. Investigation of dental caries of 5-  
369 year-old children and their parents' oral hygienic knowledge and behavior in Dongxiang,  
370 Baoan and Yugu nationalities [In Chinese]. *Journal of Lanzhou University (Medical  
371 Sciences)* 2009; 35(2):27-30.
- 372 20. Dong H. Epidemiological investigation of the caries of the Dongxiang, Yugu,  
373 Baoan minority people [In Chinese]. *Oral Medicine, Lanzhou University*; 2007.
- 374 21. Li DH. Dental caries status among preschool children in Liangshan, Sichuan  
375 Province [In Chinese]. *West China Journal of Stomatology* 1998; 13(1):70-1.
- 376 22. Ma LY, Lei T, Li XL, Zhou HJ, Li ZQ. Dental caries among Tibetan children in  
377 Gannan reign [In Chinese]. *Chinese Journal of Conservative Dentistry* 2009; 19(7):428.
- 378 23. Fang XH. Investigation of dental caries status of Korean preschool children [In  
379 Chinese]. *Journal of Clinical Stomatology* 2001; 17(1):78.

- 380 24. Huang C, Wen Y, Ye Y, Ren XQ. Epidemiological characteristics and prevention  
381 and control effects of caries in preschool children [In Chinese]. Journal of Kunming  
382 Medical Universtiy 2012; 33(7):114-7.
- 383 25. Xuehereti Y. Reporting of dental caries status among Kirgiz school children in  
384 Kezilesu region, Xinjiang Provinace [In Chinese]. Journal of Modern Stomatology  
385 2004; 18(5):470-1.
- 386 26. Nurbiye M. Epidemiological investigation on deciduous caries of 3-to-5-year-  
387 old Uygur and Chinese children in Urumqi [In Chinese]. Stomatology 2011; 31(8):488-  
388 96.
- 389 27. Ayiguli T, Asiya Y. A survey of the dental caries status among 450 Uygur and  
390 Han ethnic preschool children [In Chinese]. Chinese Journal of Child Health Care 2004;  
391 12(5):457.
- 392 28. Liu J, Zhang CH, Liu XR, Li YH, Yu B, et al,. The logistic regression analysis  
393 of dental caries status and related factors among Naxi minority children [In Chinese].  
394 Journal of Kunming Medical University 2009; 30(9):19-22.
- 395 29. Zhang QK, Yuan CY, Li CW. Oral health survey on three ethnic minorities  
396 children in Monghai County, Yunnan Province [In Chinese]. Shanghai Journal of  
397 Stomatology 1994; 3(1):46-7.
- 398 30. Liu ZM. Research of oral health status and its related factors of Korean children  
399 in Yanji City [In Chinese]. University of Yanbian; 2008.
- 400 31. Wu HX, He ST. Caries survey of 1680 Li ethnic minority primary school  
401 students in Sanya [In Chinese]. Journal of Hainan Medical University 2010; 16(3):351-  
402 6.
- 403 32. Lo EC, Jin LJ, Zee KY, Leung WK, Corbet EF. Oral health status and treatment  
404 need of 11-13-year-old urban children in Tibet, China. Community Dent Health 2000;  
405 17(3):161-4.
- 406 33. Zhou HJ, Nie HB, Ma LY, Fu SW, Liu MT. Study of dental caries and correlated  
407 factors of 12-year-old children in Dongxiang, Baoan and Yugu races [In Chinese]. West  
408 China Journal of Stomatology 2009; 27(5):569-81.
- 409 34. Chu CH, Fung DS, Lo EC. Dental caries status of preschool children in Hong

- 410 Kong. *Br Dent J* 1999; 187(11):616-20,605.
- 411 35. World Health Organization. *Oral health surveys basic methods*. 4th ed. Geneva:  
412 World Health Organization; 1997.
- 413 36. Chu CH, Chau AM, Wong ZS, Hui BS, Lo EC. Oral health status and behaviours  
414 of children in Myanmar - a pilot study in four villages in rural areas. *Oral Health Prev*  
415 *Dent* 2012; 10(4): 365-71.
- 416 37. Petersen PE, Kwan S, Zhu L, Zhang BX, Bian JY. Effective use of fluorides in  
417 the people's republic of china--a model for who mega country initiatives. *Community*  
418 *Dental Health* 2008; 25(4 Suppl 1):257-67.
- 419 38. Zhang QK, Li CW. Oral health status of Jinuo, Lahu, Yao ethnic minority school  
420 children in Xishuangbanna Prefecture [In Chinese]. *Chinese Journal of Conservative*  
421 *Dentistry* 1996; 6(4):245-6.
- 422 39. Lin HC, Schwarz E. Oral health and dental care in modern-day China.  
423 *Community Dent Oral Epidemiol* 2001; 29(5):319-28.
- 424 40. Rong WS, Bian JY, Wang WJ, Wang JD. Effectiveness of an oral health  
425 education and caries prevention program in kindergartens in China. *Community Dent*  
426 *Oral Epidemiol* 2003; 31(6):412-6.
- 427 41. Su RN, Wang RJ, Hong Y. Dental caries status among Wushengqi Mongolian  
428 ethnic minority middle school students in Yikezhaomeng, Inner Mongolia Autonomous  
429 District [In Chinese]. *Journal of Stomatology* 1996; 9(3):163.
- 430 42. Chu CH, Lo ECM. Dental caries prevention and treatment for preschool  
431 children in China. *Chin J Dent Res* 2007; 10(Suppl):54-60.
- 432 43. Lu M, Hua S, Tao J. Dental caries status of 12 ethnic minority groups aged 3-6  
433 in 16 regions in Yunnan Province [In Chinese]. *Maternal and Child Health Care of*  
434 *China* 2009; 24:100-1.
- 435 44. Zhu ZZ. Survey of dental caries among 0- to 12-year-old Miao ethnic minority  
436 children [In Chinese]. *School Medicine* 1988; 9(3):46.
- 437 45. Luo C. Epidemiology survey of dental caries of mongol children in high altitude  
438 regions[In Chinese]. *Journal of High Altitude Medicine* 2007; 17(4):50-1.
- 439 46. Wen SX, Zhou YL. Survey of 2- to 6-year-old children in high altitude region

- 440 [In Chinese]. Chinese Journal of Conservative Dentistry 1999; 9(4):307.
- 441 47. Liu DG. Epidemiology survey of dental caries status among 1962 Tujia ethnic  
442 minority school students in Changyang [In Chinese]. Hubei Journal of Preventive  
443 Medicine 1996; 7(2):53.
- 444 48. Li ZY, Lian JY. Survey of dental caries status of Dongxiang primary and  
445 secondary school children [In Chinese]. Journal of Dental Prevention and Treatment  
446 1998; 6(1):22.
- 447 49. Xu JH. Survey of dental caries status of adolescent in Jingji District, Wuzhong  
448 City [In Chinese]. Journal of Ningxia Medical College 1992; 14(2):77-9.
- 449 50. Zhang YW, Chen XL. Dental caries status of 3081 Li ethnic minority people in  
450 Wuzhishan District, Hainan Province [In Chinese]. Journal of Clinical Stomatology  
451 1992; 8(3):184-6.
- 452 51. Wang X, Chen G. Dental caries status of Lisu and Han adolescent in Nujiang  
453 Liuku region, Yunnan Province [In Chinese]. Journal of Modern Stomatology 1993;  
454 7(2):99-100.
- 455 52. Luo MA, Yang GM. Dental caries of Naxi and Han adolescent in Ninlang region,  
456 Yunnan Province [In Chinese]. West China Journal of Stomatology 1983; 1(2):47-9.
- 457 53. Xue GC. Dental caries status of Tibetan and Han adolescent in Shannan region,  
458 Tibet [In Chinese]. Journal of Dental Prevention and Treatment 1995; 3(3):51-2.
- 459 54. Gao XQ, Huang KQ, Xi HJ. Investigation of dental caries status of permanent  
460 dentition amongst Tibetan students in Naqu, Tibet [In Chinese]. Chinese Journal of  
461 School Health 2007; 28(12):1097-8.
- 462 55. Liao ZM, Lu GH, Yan Y. Dental caries status of Tu and Han children in high  
463 altitude region, Qinghai Province [In Chinese]. Qinghai Medical Journal 1994; 142:48-  
464 50.
- 465 56. Li JG, Cao H, Zhong CX. Dental caries status of 4020 Tujia ethnic minority  
466 school children in Hefeng County [In Chinese]. West China Journal of Stomatology  
467 1994; 12(3):226-30.
- 468 57. Lin JH, Wang JH, Tian KC, Shu P, Xiang YC. Logistic regression analysis of  
469 multifactors on inducing dental caries among school children in Chongqing, China [In

- 470 Chinese]. *Modern Medicine Health* 2003; 19(12):1519-1520.
- 471 58. Fen XL, Liu Y. Dental caries status of Uygur adolescent in Kashi region,  
472 Xinjiang Province [In Chinese]. *Journal of Clinical Stomatology* 1996; 12(3):185-6.
- 473 59. Di L, Liu JB, A D, Hao YQ. Dental caries status of Uygur and Han children  
474 aged 7- to 12 in Urumqi City [In Chinese]. *Chinese Journal of School Doctor* 1997;  
475 11(5):379-80.
- 476 60. Fu KH, Zhao XF, Hong B. Oral health status of Yi ethnic minority school children  
477 in Hekou village, Xundian County [In Chinese]. *Soft Science of Health* 1999; 13(3):26-  
478 7.
- 479 61. Huang SZ. Dental caries status of 1981 Zhuang ethnic minority school children  
480 [In Chinese]. *Chinese Journal of School Doctor* 2002; 16(3):262-3.