

Dental health and treatment needs in people with leprosy in China

FENG YUNZHI*, GUO YUE*, TIAN LILI**,
WEI ZHONGHE***, ZHANG LIANHUA****,
YANG YING***** & ZHANG GUOCHENG*****

**Dept. of Stomatology, the Second Xiangya Hospital, Central South University, Changsha, Hunan, P. R. China*

***Tianjin Baodi Hospital, Tianjin, P. R. China*

****Center for Disease Control and Prevention in Hunan Province, Changsha, Hunan, P. R. China*

*****Center for Disease Control and Prevention in Jiangsu Province, Nanjing, Jiangsu, P. R. China*

******Hanzhong Sanatorium, Hanzhong, Shanxi, P. R. China*

******Department for Leprosy Control, Institute of Dermatology, Chinese Academy of Medical Sciences, P. R. China*

Accepted for publication 21 October 2014

Summary

Objectives: To evaluate the dental health status and treatment needs of people affected by leprosy in China, and provide a basis for the development of national or regional dental health programmes to cover the treatment needs of this population.

Design: A cross-sectional study with 613 former leprosy patients was carried out in six leprosy villages, in three provinces in China (Nanjing, Taixing and Jiangyan in Jiangsu Province, Hanzhong and Shangluo in Shanxi Province and Yongzhou in Hunan Province). A questionnaire about demographic and clinical data was used. The World Health Organization's (WHO) basic methods were used to determine the tooth-based treatment needs. Periodontal status was determined by using the Community Periodontal Index of Treatment Needs (CPITN). In addition, prosthetic normative needs were assessed.

Results: Among the 613 people affected by leprosy, there were 472 people (77%) who had never visited a dentist and 172 people (28.1%) had never brushed their teeth; 302 (49.3%) brushed their teeth once a day. However, there were 267 people (43.6%) who thought their dental health was at an average level and 108 (17.6%) thought they had good dental health. 55.6% of the subjects required dental fillings, 32.7% required pulp care and restoration, and 71.1% required extraction. On CPITN, 23.2% of the

Correspondence to: Zhang Guocheng, Department of Leprosy Control, Institute of Dermatology, Chinese Academy of Medical Sciences, 12 Jiangwangmiao Road, Nanjing 210042, PR China (e-mail: zhanggc@ncstdlc.org), and Feng Yunzhi, Dept. of Stomatology, the Second Xiangya Hospital of Central South University, Renmin Middle Road, Changsha 410011, PR China (e-mail: fyz660303@163.com)

subjects scored 2, 28.6% scored three and 48.0% scored four, showing that these people required systematic periodontal treatment. In addition, 84.5% of the subjects needed normative prosthetic treatment.

Conclusions: Most of the subjects with leprosy in this study lacked self-care knowledge on dental health, and especially self-awareness of dental conditions. Normative treatment needs of people affected by leprosy were very high. This result calls for improved oral health education and oral health care in people with leprosy. Oral health education might preferably be integrated into already existing leprosy rehabilitation programs.

Introduction

Leprosy is a leading cause of permanent physical disability, which leaves a strong social and psychological impact on the people affected and the societies in which they live.¹⁻³ Although significant progress has been made in controlling the disease and reducing the disease burden, much remains to be done in order to sustain the gains and further reduce the impact of the disease, especially to improve the quality of life of people affected by leprosy.^{4,5}

People affected by leprosy have significantly worse total quality of life scores as well as lower physical and psychological domain scores compared with the general population.^{6,7} Oral health is one determinant factor for quality of life. The close interrelationship between oral and general health has been demonstrated.^{8,9} Therefore, it is very important to study the dental condition of people with leprosy, in order to improve their quality of life. However, studies concerning dental health care of the population are scarce in China. There are only a few reports in the 1990s providing information about the dental condition of people with leprosy. Because a substantial proportion of subjects showed a bad dental condition, previous investigators suggested that the prevention and treatment of dental diseases should be included in the leprosy treatment programme.^{10,11} On the other hand there are no reports about the treatment needs for dental care. However, over the past 20 years, has the dental condition of leprosy-affected people improved and are their treatment requirements met? Are there differences in dental treatment needs related to factors such as leprosy classification, age or hand disability? To answer these questions, we investigated the dental health status of 613 people with leprosy in China. A better understanding of these conditions would assist in laying a foundation for effective strategies for leprosy rehabilitation, and in improving the quality of life of people affected by leprosy.

Material & methods

This research began as a cross-sectional study. The authors conducted a cluster sampling survey in six leprosy villages in three provinces of China (Nanjing, Taixing and Jiangyan in Jiangsu Province, Hanzhong and Shangluo in Shanxi Province and Yongzhou in Hunan Province) from September 2010 to December 2010. They chose 613 residents (480 males and 133 females, ratio 3.6:1) as study subjects, from a total population of 1329 people who were all released from treatment after having had leprosy in the past.

The investigation was conducted according to the standards established in *Oral Health Surveys. Basic Methods* (4th edition) issued by the WHO.¹² The dental health of the

participants was determined through a questionnaire and on-the-spot medical examinations administered by local leprologists/dermatologists who worked in the leprosy villages. The questionnaire elicited basic information about the subjects, their leprosy classification and status, hand disabilities, their self-care ability and their productive activities. It was based on the standardised questionnaires issued by the WHO Collaborating Centre for Community Oral Health Programs and Research,¹³ translated from English into Chinese, three sections focusing on oral hygiene intentions, attitudes and behaviours. The clinical dental examinations were conducted by dentists from the Second Xiangya Hospital of Central South University. All questionnaires and oral examinations were conducted by two medical professionals. The dentists participating in the survey were trained to make consistent clinical judgments and calibration trials were performed initially to ensure an inter-examiner consistency of at least 85% in recording. For calibration, 20 subjects were evaluated and excluded from the main study. Inter-examiner agreement was measured by Cohen's kappa statistic.

The WHO basic method was used to determine the tooth status and the tooth-based treatment needs, and the Community Periodontal Index for Treatment Need (CPITN) was used to record each patient's score. The CPITN scores were as follows: 0 = healthy; 1 = bleeding observed after probing, directly or with a mouth mirror; 2 = calculus detected during probing, but all of the black band on the probe was visible; 3 = shallow pocking of 4–5mm; and 4 = deep pockets of 6mm or more. The index teeth examined in each of the six sextants were 17, 16; 11; 26, 27; 36, 37; 31; and 46, 47. A sextant was examined only when there were at least two teeth not indicated for extraction; otherwise, that sextant was excluded. The sextant value equaled the highest score of the remaining teeth on condition that no index tooth was found to be present in a sextant qualifying examination. The dentists could use a dental mirror, containers, an explorer and the periodontal probe recommended by WHO during the clinical examinations.

Table 1. Distribution of demographic and leprosy data of subjects according to gender

Variables	Males (%)	Females (%)	Total (%)
Age			
25-34 years old	5 (1.0)	0 (0.0)	5 (0.8)
35-44 years	10 (2.1)	7 (5.3)	17 (2.8)
45-54 years	38 (7.9)	15 (11.3)	53 (8.6)
55-64 years	130 (27.1)	42 (31.6)	172 (28.1)
65-74 years	205 (42.7)	46 (34.6)	251 (40.9)
≥ 75 years	92 (19.2)	23 (17.3)	115 (18.8)
Total	480 (100.0)	133 (100.0)	613 (100.0)
Leprosy classification			
Tuberculoid (TT)	63 (13.2)	8 (6.0)	71 (11.6)
Borderline-tuberculoid (BT)	117 (24.4)	30 (22.6)	147 (24.0)
Mid-borderline (BB)	12 (2.5)	2 (1.5)	14 (2.3)
Borderline-lepromatous (BL)	54 (11.3)	9 (6.8)	63 (10.3)
Lepromatous (LL)	233 (48.6)	84 (63.2)	317 (51.8)
Total	479 (100.0)	133 (100.0)	612 (100.0)
Hand disability			
no	152 (31.7)	39 (29.3)	191 (31.2)
yes	328 (68.3)	94 (70.7)	422 (68.8)
Total	480 (100.0)	133 (100.0)	613 (100.0)

This study had the approval of the Ethics Committee of the Second Xiangya Hospital of Central South University. The participants were informed both verbally and in writing about the purposes of the investigation, and written consent was obtained. Statistical analysis was performed using SPSS version 17.0 for Windows.

Results

DEMOGRAPHIC AND LEPROSY DATA

Table 1 shows the demographic and leprosy data for all subjects according to gender.

Among the 613 subjects with a history of leprosy, 480 (78.3%) were male and 133 (21.7%) were female, aged 25–93 years with an average age of 65.93 ± 10.31 years. The classification of leprosy was as follows: lepromatous leprosy (LL) 51.8% (317 persons); borderline tuberculoid (BT) 24.0%; tuberculoid (TT) 11.6%; borderline lepromatous (BL) 10.3%; mid-borderline (BB) 2.3% and one subject was not clearly classified. Among the people affected by leprosy, 68.8% (422 people) had hand disability, while 31.2% (191 people) showed no hand disability.

ORAL STATUS

Table 2 shows the oral hygiene intentions, attitudes and behaviors of all participants according to gender. The percentage of subjects who had never seen a dentist was 77.0%. On self-assessment of oral health status, 38.8% thought they had poor oral health, 43.6% thought their oral health was average and only 17.6% thought they had good oral health. Of the 613 subjects, 172 (28.1%) had never brushed their teeth and 302 (49.3%) brushed their teeth once per day.

Table 2. Oral hygiene intentions, attitudes, and behaviours

Variables	Males (%)	Females (%)	Total (%)
Had seen the dentist			
No visits	364 (75.8)	108 (81.2)	472 (77.0)
Oral checking without treatment	99 (20.6)	22 (16.5)	121 (19.7)
Treated	12 (2.5)	2 (1.5)	14 (2.3)
Treated regularly	5 (1.0)	1 (0.8)	6 (1.0)
Total	480 (100.0)	133 (100.0)	613 (100.0)
Self assessment of oral health condition			
Very good/Good	84 (17.5)	24 (18.0)	108 (17.6)
Average	216 (45.0)	51 (38.3)	267 (43.6)
Poor/Very poor	180 (37.5)	58 (43.6)	238 (38.8)
Total	480 (100.0)	133 (100.0)	613 (100.0)
Brushed teeth			
Never	141 (29.4)	31 (23.3)	172 (28.1)
< Once a day	45 (9.4)	11 (8.3)	56 (9.1)
Once a day	237 (49.4)	65 (48.9)	302 (49.3)
≥ Twice a day	57 (11.9)	26 (19.5)	83 (13.5)
Total	480 (100.0)	133 (100.0)	613 (100.0)

Table 3. Distribution of dental treatment demands in subjects according to leprosy classification

Leprosy classification	TT (%)	BT (%)	BB (%)	BL (%)	LL (%)	Total (%)	P value
Filling ^a							
No	27 (38.0)	56 (38.1)	3 (21.4)	25 (39.7)	161 (50.8)	272 (44.4)	0.015
Yes	44 (62.0)	91 (61.9)	11 (78.6)	38 (60.3)	156 (49.2)	340 (55.6)	
Total	71 (100.0)	147 (100.0)	14 (100.0)	63 (100.0)	317 (100.0)	612 (100.0)	
Pulp care and restoration							
No	42 (59.2)	99 (67.3)	10 (71.4)	46 (73.0)	215 (67.8)	412 (67.3)	0.521
Yes	29 (40.8)	48 (32.7)	4 (28.6)	17 (27.0)	102 (32.2)	200 (32.7)	
Total	71 (100.0)	147 (100.0)	14 (100.0)	63 (100.0)	317 (100.0)	612 (100.0)	
Extraction							
No	17 (23.9)	47 (32.0)	6 (42.9)	24 (38.1)	83 (26.2)	177 (28.9)	0.160
Yes	54 (76.1)	100 (68.0)	8 (57.1)	39 (61.9)	234 (73.8)	435 (71.1)	
Total	71 (100.0)	147 (100.0)	14 (100.0)	63 (100.0)	317 (100.0)	612 (100.0)	
Prosthetic							
No	9 (12.7)	24 (16.3)	3 (21.4)	16 (25.4)	43 (13.6)	95 (15.5)	0.283
Yes	62 (87.3)	123 (83.7)	11 (78.6)	47 (74.6)	274 (86.4)	517 (84.5)	
Total	71 (100.0)	147 (100.0)	14 (100.0)	63 (100.0)	317 (100.0)	612 (100.0)	

^a $P < 0.05$.

TOOTH-RELATED TREATMENT NEEDS

The study showed that 55.6% of subjects required fillings, 32.7% required pulp care and restoration, 71.1% required extraction and 84.5% required prostheses. Table 3 lists dental treatment requirements according to leprosy classification. The proportion of LL subjects who required fillings was 49.2%, which was statistically significantly lower than the other three categories ($P < 0.05$).

There were statistically significant differences in requirements for pulp care and restoration, extraction and prostheses in different age groups ($P < 0.05$) (Table 4).

Table 4. Distribution of dental treatment demands in subjects according to age group

Age	25–34 (%)	35–44 (%)	45–54 (%)	55–64 (%)	65–74 (%)	≥75 (%)	Total (%)	P value
Filling								
No	4 (80.0)	11 (64.7)	26 (49.1)	66 (38.4)	108 (43.0)	57 (49.6)	272 (44.4)	0.080
Yes	1 (20.0)	6 (35.3)	27 (50.9)	106 (61.6)	143 (57.0)	58 (50.4)	341 (55.6)	
Total	5 (100.0)	17 (100.0)	53 (100.0)	172 (100.0)	251 (100.0)	115 (100.0)	613 (100.0)	
Pulp care and restoration ^a								
No	5 (100.0)	14 (82.4)	44 (83.0)	110 (64.0)	158 (62.9)	82 (71.3)	413 (67.4)	0.015
Yes	0 (0.0)	3 (17.6)	9 (17.0)	62 (36.0)	93 (37.1)	33 (28.7)	200 (32.6)	
Total	5 (100.0)	17 (100.0)	53 (100.0)	172 (100.0)	251 (100.0)	115 (100.0)	613 (100.0)	
Extraction ^a								
No	2 (40.0)	7 (41.2)	26 (49.1)	53 (30.8)	64 (25.5)	25 (21.7)	177 (28.9)	0.005
Yes	3 (60.0)	10 (58.8)	27 (50.9)	119 (69.2)	187 (74.5)	90 (78.3)	436 (71.1)	
Total	5 (100.0)	17 (100.0)	53 (100.0)	172 (100.0)	251 (100.0)	115 (100.0)	613 (100.0)	
Prosthetic ^a								
No	3 (60.0)	8 (47.1)	22 (41.5)	31 (18.0)	24 (9.6)	7 (6.1)	95 (15.5)	0.000
Yes	2 (40.0)	9 (52.9)	31 (58.5)	141 (82.0)	227 (90.4)	108 (93.9)	518 (84.5)	
Total	5 (100.0)	17 (100.0)	53 (100.0)	172 (100.0)	251 (100.0)	115 (100.0)	613 (100.0)	

^a $P < 0.05$.

Table 5. Distribution of brushed teeth and dental treatment demands in subjects according to hand disability status

Variables	Without hand disability	With hand disability	Total (%)	P value
Brushed teeth				
Never	59 (30.9)	113 (26.8)	172 (28.1)	0.192
< Once a day	13 (6.8)	43 (10.2)	56 (9.1)	
Once a day	99 (51.8)	203 (48.1)	302 (49.3)	
≥ Twice a day	20 (10.5)	63 (14.9)	83 (13.5)	
Total	191 (100.0)	422 (100.0)	613 (100.0)	
Filling				
No	87 (45.5)	185 (43.8)	272 (44.4)	0.693
Yes	104 (54.5)	237 (56.2)	341 (55.6)	
Total	191 (100.0)	422 (100.0)	613 (100.0)	
Pulp care and restoration				
No	139 (72.8)	274 (64.9)	413 (67.4)	0.055
Yes	52 (27.2)	148 (35.1)	200 (32.6)	
Total	191 (100.0)	422 (100.0)	613 (100.0)	
Extraction				
No	57 (29.8)	120 (28.4)	177 (28.9)	0.722
Yes	134 (70.2)	302 (71.6)	436 (71.1)	
Total	191 (100.0)	422 (100.0)	613 (100.0)	
Prosthetic				
No	34 (17.8)	55 (13.0)	89 (14.5)	0.121
Yes	157 (82.2)	367 (87.0)	524 (85.5)	
Total	191 (100.0)	422 (100.0)	613 (100.0)	

^a $P < 0.05$.

Participants aged 55–64 years or 65–74 years required more pulp care and restoration (36.0% and 37.1%, respectively); only 28.7% of subjects aged 75 years or above required pulp care and restoration, but 78.3% required extraction. A relatively high proportion of subjects aged 55 years or above required prostheses, up to 93.9% in those aged 75 years or above. There were no statistically significant differences in requirements for fillings, pulp care and restoration, extraction and prostheses between people with different hand disability status ($P > 0.05$) (Table 5).

PERIODONTAL STATUS AND TREATMENT NEEDS

Figures 1, 2 and 3 show CPITN scores according to leprosy classification, age group and hand disability status. The frequency of scores of 4 showed no statistically significant difference between leprosy categories ($P > 0.05$). When the participants were divided into groups based on their age, CPITN scores of 4 were statistically more common in those aged 55–64 years, 65–74 years and 75 years or above, accounting for 49.1%, 51.7% and 56.0% of subjects in those groups, respectively. Among the people affected by leprosy with no hand disability, 28.7% of them had a CPITN score of 2, 23.4% of them had a CPITN score of 3, and 47.9% had a CPITN score of 4. However, those people affected by leprosy with hand disability were more likely to have scores of 3 and 4. A statistically significant difference was observed among CPITN scores between the people affected by leprosy with and without hand disability ($P < 0.05$).

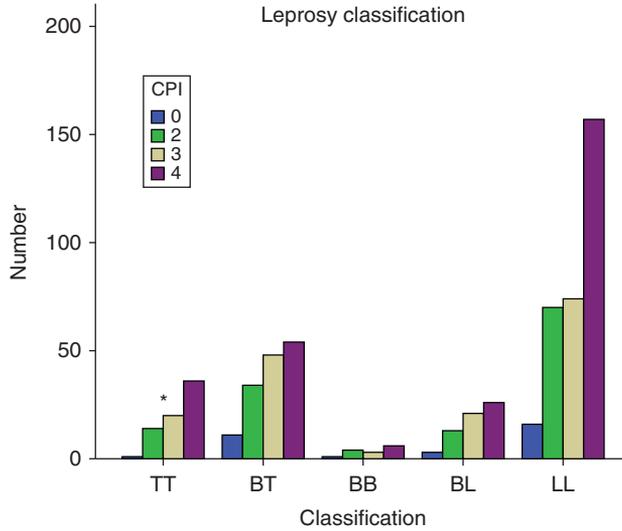


Figure 1. Distribution of CPITN scores in subjects according to leprosy classification

Discussion

The 613 subjects observed in this investigation ranged from 25 to 93 years old, with a mean age of 65.93 ± 10.31 years. The majority of the people were over 64 years old. More than half of the subjects (51.8%) had had lepromatous leprosy.

In the present study, 28.1% of the subjects never brushed their teeth and 49.3% brushed their teeth only once per day, both of which contribute to poor dental health. Furthermore, most brushed their teeth incorrectly or used mouth-washing instead of tooth-brushing.

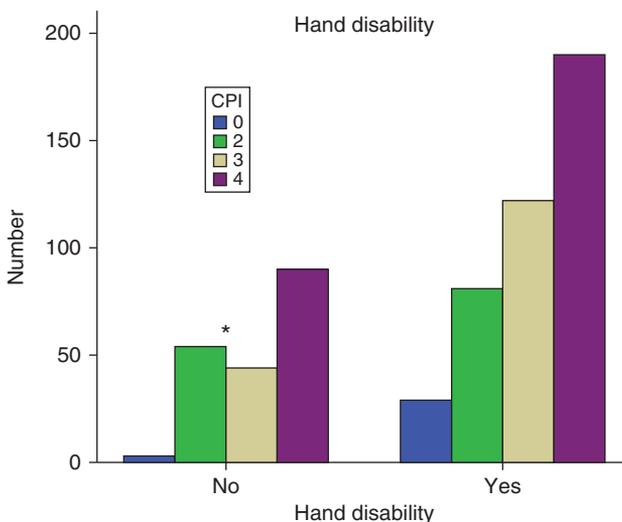


Figure 2. Distribution of CPITN scores in subjects according to age group

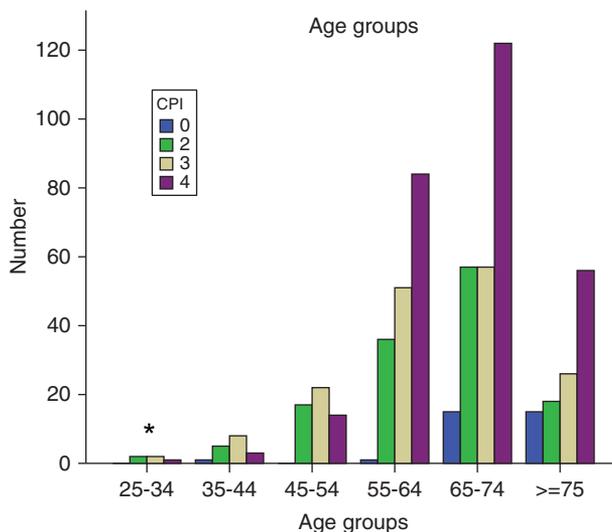


Figure 3. Distribution of CPITN scores in subjects according to hand disability status

However, this study showed that in people affected by leprosy there was no relationship between the presence of hand disability and the number of times a person brushed his teeth each day. Of the 613 subjects, 77.0% had never visited a dentist, indicating that most people with leprosy lacked self-care knowledge on dental health. This is noteworthy as there is growing evidence supporting the importance of good oral health on QOL, especially oral infection could be an exacerbating factor in leprosy reaction and dental treatment may improve the care for people affected by leprosy and help prevent disability caused by leprosy.¹⁴

There are few studies focusing on dental conditions and treatment needs of people with leprosy. The present data showed that overall dental health was very poor and the need for dental treatment high and urgent in Chinese people with leprosy: 99.8% of our subjects needed periodontal treatment; 55.6% needed fillings for dental caries; 32.7% required pulp care and restoration; and 71.1% required extraction. Only 4.4% of the participants had formal dentures, while 84.5% needed prostheses.

Periodontitis is one of the most common oral diseases. Using CPITN to assess periodontal disease, the study showed that only 0.2% of subjects had healthy periodontal tissues (score 0), 23.2% had calculus (score 2), pocket depth was 4–5 mm in 28.6% (score 3) and 48.0% had pocket depth 6mm or more (score 4). This indicated that the periodontal health of people with leprosy in China is poor, and that most participants had a moderate or high degree of periodontal pocketing, requiring systematic periodontal treatment. This result is similar to the data obtained in the Spanish survey reported by Nunez-Mart *et al.* who investigated the dental and periodontal status of the anterior maxilla in 76 subjects with leprosy.¹⁵ They found that a large proportion had missing maxillary incisors and canines and the average periodontal attachment loss was 4.18 ± 1.3 , all greater than controls. They also reported that there were no significant differences in the oral indices between subjects with the different forms of leprosy. Although the present study also found there were no significant differences in requirements for pulp care and restoration, extraction and prostheses and CPITN, the need of

LL subjects for fillings was higher than that in the other three leprosy categories. This difference may reflect the sample size and the fact that a majority of participants in this study were LL cases.

The present study showed that the dental condition and treatment needs of people affected by leprosy had a relationship to age: there was tendency for the percentage of healthy individuals to fall with age, as found in Denmark,¹⁶ and for the need for extraction or prostheses to significantly increase with age, with the highest demand in subjects aged 75 years and above. However, because the number of teeth decreased with age, the need for fillings, and pulp care and restoration was less in this group.

In this survey, we found that the people affected by leprosy with hand disability had a relatively high proportion of score 3 or 4 of CPITN scores, illustrating that their periodontal status were worse than those people with no hand disability. One might expect the people affected by leprosy with hand disability, being unable to undertake effective dental self-care, would have bad dental hygiene, which leads to a bad periodontal status. However, when comparing the dental condition and treatment need in leprosy-affected people with or without hand disability, we found that there were no significant differences.

There were several limitations to this study: in particular we were unable to compare the general population (preferably in same region) or other physically disabled people in China with people affected by leprosy, and we had observations at only one time point. However basic dental health cross-sectional surveys can provide a sound basis for estimation of the present oral health status of a population and its future needs for oral health care. They can produce reliable baseline data for development of national or regional oral health programmes and for planning for appropriate numbers and types of personnel for oral care.¹² Furthermore, our findings could be compared with observations on general or disabled populations in other published studies.^{17,18} A study of oral health service needs of the general public in China using stratified sampling method recruited 1558 people from six Counties with different economic levels and found that 35-37% of general public did not need dental treatment.¹⁷ Guangwen *et al.*¹⁸ reported that among 531 disabled people in China, 17.3% did not need any oral health care, but that 79.9% of people needed regular oral care. The present data showed a higher percentage of people with leprosy needing dental treatment than both general and disabled Chinese people, as noted in the literature, thus indicating that people with leprosy might lack facilities for prevention and treatment of dental disease. This was different to the result reported by Souza *et al.*¹⁹ who reported that oral and dental conditions in people affected by leprosy are similar to the normal Brazilian population. This difference may be due to the different sample, in Souza's investigation they focused on the newly diagnosed leprosy patients, whereas our subjects had had leprosy long ago.

Leprosy is a social disease that continues to deprive afflicted individuals of the opportunity of education, work, and so on. Chen and colleagues reported that the illiteracy rate of people with leprosy in China was 56.9%.²⁰ Although the Chinese government has provided much financial support to eliminate leprosy, the people affected by leprosy in China still mainly live in leprosy villages with no economic resources, relying mainly on the government subsidies, and have a poor quality of life, suffering a lot from social stigma, discrimination and low self-esteem. The stigma attached to leprosy is stronger than that attached to other stigmatised diseases. Even the health workers lack knowledge about the cause of leprosy, furthering unreasonable negative attitudes.⁷ Both society and government have, to some extent, been ignoring the oral health of people with leprosy, with failure to provide education and services. There are almost no oral health services in leprosy villages

and low priority is given to oral health services in the public resources allocation. Moreover, traditional treatment of oral disease is extremely costly. Therefore, in leprosy villages, oral services are not easily accessible and affordable by the community. These may be the reasons underlying the bad condition and high treatment needs of people with leprosy. Alternatively in this socio-cultural context, it might be attributed to a low level of importance of oral diseases as perceived by subjects for whom the prevailing levels of stigma, poverty, social crisis and weak health systems are much more severe problems.

In conclusion, a substantial proportion of people with leprosy lacked knowledge of self-care and especially self-awareness in relation to dental conditions. Normative treatment needs of people affected by leprosy were very high. It is urgent to improve oral health education and oral health care for these people. Considering that many people with leprosy live in leprosy villages, which have gradually changed from the resettlement of people affected by leprosy to rehabilitation centres, oral health education and services could conveniently be integrated into already existing leprosy rehabilitation programmes.

Acknowledgements

This study was supported by a grant from the HSR project (Project No. 02-2010-09-15-01).

References

- ¹ Declercq E. Leprosy figures: no time for self-complacency. *Lepr Rev*, 2012; **83**: 3–5.
- ² Rodrigues LC, Lockwood DNJ. Leprosy now: epidemiology, progress, challenges, and research gaps. *Lancet Infect Dis*, 2011; **11**: 464–470.
- ³ Suzuki K, Akama T, Kawashima A *et al*. Current status of leprosy: Epidemiology, basic science and clinical perspectives. *J Dermatol*, 2012; **39**: 121–129.
- ⁴ WHO. *Enhanced Global Strategy for Further Reducing the Disease Burden due to Leprosy (Plan Period: 2011-2015)*. WHO Regional Office for South-East Asia, New Delhi, 2009.
- ⁵ Durrheim DN, Speare R. Global leprosy elimination: time to change more than the elimination target date. *J Epidemiol Community Health*, 2003; **57**: 316–317.
- ⁶ Tsutsumia A, Izutsub T, Islamc AM *et al*. The quality of life, mental health, and perceived stigma of leprosy patients in Bangladesh. *Soc Sci & Med*, 2007; **64**: 2443–2453.
- ⁷ An J-G, Ma J-H, Xiao S-X *et al*. Quality of life in patients with lepromatous leprosy in China. *J Eur Acad Dermatol Venereol*, 2010; **24**: 827–832.
- ⁸ Petersen PE. The world oral health report 2003: continuous improvement of oral health in the 21st century—the approach of the WHO Global Oral Health Programme. *Community Dent Oral Epidemiol*, 2003; **31**(suppl): 3–24.
- ⁹ Biazevic M G H, Rissotto R R, Edgard MC *et al*. Relationship between oral health and its impact on quality of life among adolescents. *Braz Oral Res*, 2008; **22**: 36–42.
- ¹⁰ Yifu Tu, Weiping Qiu, Junluan Chen. Oral and maxillofacial damages for people affected by leprosy. *China J Lepr Skin Dis*, 1990; **6**: 1–7.
- ¹¹ Weiping Qiu. Oral diseases should be included in leprosy control programs. *China J Lepr Skin Dis*, 1995; **11**: 90–91.
- ¹² WHO: Oral Health surveys. Basic methods [M] 4th: Edition, Geneva, 1997.
- ¹³ WHO Collaborating Centre for Community Oral Health Programmes and Research. *Basic questionnaire for interviewing children*. University of Copenhagen, Copenhagen, 1995.
- ¹⁴ Motta ACF, Furini R B, Simao JCL *et al*. Could leprosy reaction episodes be exacerbated by oral infections? *Rev Soc Bras Med Trop*, 2011; **44**: 633–635.
- ¹⁵ Nunez-Mart JM, Bagan JV, Scully C *et al*. Leprosy: dental and periodontal status of the anterior maxilla in 76 patients. *Oral Dis*, 2004; **10**: 19–21.
- ¹⁶ Petersen PE, Kjoller M, Christensen LB *et al*. Changing dentate status of adults, use of dental services, and achievement of national dental health goals in Denmark by the year 2000. *J Public Health Dent*, 2004; **64**: 127–135.

- ¹⁷ Li G. Study of the situation and development of oral health services in China. *Journal of US-China Medical Science*, 2004; **1**: 36–41.
- ¹⁸ Li GW, Zhang Y, Wang J *et al*. Dental epidemic diseases and oral health knowledge in people with disabilities: a survey in a Southwest City of China. *Chin Med Sci*, 2011; **26**: 135–136.
- ¹⁹ Souza VA, Emmerich A, Coutinho EM *et al*. Dental and oral condition in leprosy patients from Serra. *Brazil. Lepr Rev*, 2009; **80**: 156–163.
- ²⁰ Chen S, Liu D, Liu B *et al*. Role of leprosy villages and leprosaria in Shandong Province. *People's Republic of China: past, present and future. Lepr Rev*, 2003; **74**: 222–228.