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The poor oral health status of former heroin users treated with methadone in a Chinese city

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Background:	There have been few studies conducted on the oral health status of illegal drug users in China, affecting the development of preventive and therapeutic approaches. The aim of the present study was to investigate and analyze the oral health status of former heroin users treated with methadone in Chengdu, the capital of Sichuan Province in southwestern China.
Material/Methods:	The presence of caries (decayed tooth and root), missing teeth, residual roots, dental prosthetic restoration and periodontal health were investigated in 445 former heroin users treated with methadone (317 males and 128 females). Their ages ranged from 20 to 59 years old.
Results:	Among the study subjects, the prevalence of decayed/filled teeth was 64.72%, and the mean of decayed/filled teeth score was 2.92. The prevalence of decayed/filled roots was 21.80%, and the mean of decayed/filled roots score was 0.62. The prevalence of missing teeth was 31.46%, and the mean missing teeth score was 0.62. The prevalence of residual roots was 42.02%, with a mean score of 1.06. The rates of gingival bleeding, calculus, shallow pockets periodontal pocket, and deep periodontal pocket were 99.55%, 96.63%, 30.34%, and 2.70%, respectively.
Conclusions:	The oral health status among the studied former heroin users in Chengdu was poorer than the general population. Better dental care for the former heroin users is needed to promote their oral health.
key words:	drug addicts • methadone • oral health status

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BACKGROUND

The abuse of illicit drugs such as opiates is a worldwide problem for both the users and society. Drug abuse is linked with a number of diseases, including HIV and HBV infections and other communicable diseases, and many drug addicts die of either the drug itself or complications from use everyday. In China, the number of drug addicts is estimated to be more than 1,160,000 in 2005, and 78.3% of them are heroin users [1]. There is an urgent need for a better health care aiming at prevention and treatment of drug addiction.

Methadone maintenance treatment for the management of opioid dependence is a substitution therapy that requires daily dosing with methadone solution under close monitoring by clinic staff [2]. Methadone treatment allows for the patients to decrease or completely stop their use of illegal drugs and drug-related high-risk behaviors. By the end of 2008, there were over 500 methadone maintenance treatment clinics, and 95,000 users receiving treatment in mainland China. In Sichuan province alone, the number of illegal drug users who have received this treatment is over 5000 [3].

Published studies have shown that the oral health of drug addicts is poorer than that of the general population [4–6]. For former heroin users who have received or are receiving methadone treatment, the prevalence rates of caries and periodontal diseases are higher than that in the general population. There are a number of reasons for this, including a lack of concern about oral health by the patients due to their altered mental state, damage due to the illicit drugs or methadone, or differing oral health care needs for other reasons (eg, poverty or dietary problems). There is an urgent need for effective approaches to monitoring, preventing and treating oral health problems among these individuals.

Although the harmful effects of drug abuse on general and mental health have been well-documented, the information about the oral health status of former heroin users receiving methadone treatment in China is generally lacking. This study was designed to investigate and analyze the oral health status of former heroin users treated with methadone in Chengdu, the capital of Sichuan Province in southwestern China. We speculate that the information obtained can then be used to better prevent and treat various oral health issues among this population.

MATERIALS AND METHODS

Patients

We recruited 445 former heroin users, including 317 males and 128 females, who were receiving methadone treatment in Chengdu. The mean age of these subjects was 35.21 years, ranging from 20 to 59 years old. The oral health of all of the patients was examined in November 2009. The study protocol was approved by the Ethics Committee of the Chinese Stomatology Association. All of the subjects provided informed consent before the study.

Data collection

Oral health examinations using a portable dental chair were carried out using the optical fiber projection plane dental

reflector and Community Periodontal Index (CPI) probe according to the WHO basic oral health survey methods (version 4, 1997). The decayed/filled teeth index (DFT) was used to record decayed teeth (DT) and filled teeth (FT), and the presence of decayed root (D-Root), residual roots, missing teeth (MT), and dental prosthetic restoration were also recorded. Because of the poor periodontal health of the former heroin users, it was difficult to determine whether the missing teeth were a result of caries or periodontal disease. For this reason, the status of missing teeth was listed separately from the caries status, which was reflected by the prevalence rate of decayed and filled teeth and the mean decayed and filled teeth score. While all 32 teeth in the oral cavity were examined in this investigation for patients who had them in order to accurately reflect the teeth and dentition status, the missing teeth rate was determined excluding the third molars because of variations in tooth eruption.

The periodontal conditions were determined by the CPI. A total of 10 index teeth were examined in a sequence. The examination for all the subjects was accomplished by 1 experienced dentist. The consistency of DF and periodontal examinations were evaluated, and the kappa values were 0.87 and 0.85, respectively.

Statistical analysis

A database of the results was set up, and the data were analyzed by χ^2 test, independent t-test, or single factor analysis of variance, as appropriate, using SPSS 12.0 software.

RESULTS

Characteristics of subjects

This study included 445 subjects, 317 males and 128 females. The mean age of these subjects was 35.21, ranging from 20 to 59 years old. There were 391 subjects who were unemployed. Eleven, 290, 136 and 8 people had middle school, high school, college, and postgraduate education, respectively. The duration of illicit drug use ranged from 1 year to 32 years, and the duration of methadone treatment ranged from 1 to 15 months. The daily dosage of methadone was 8–150 ml, which was adjusted daily, and the mean maintenance dosage was 40 ml. There were 329 smokers in this study (272 males and 57 females), and 334 subjects (227 males and 107 females) brushed their teeth (once or twice) everyday. Only 10.11% of subjects (30 males and 15 females) had received dental treatment in the past year, 11 subjects had a tooth or teeth extracted, 27 subjects had a tooth filled and 7 subjects had dental prosthetic restoration performed.

The prevalence and score of DFT

The detailed prevalence and scores of DFT, grouped by sex, are shown in Table 1. As a general trend, females had higher (worse) prevalence/scores than the males, which is similar to the results of the Chinese general population [7]. The mean scores reflecting the presence of decayed teeth and decayed/filled teeth of female subjects was higher than male subjects (Table 1, $p < 0.05$). As determined by the χ^2 test, the prevalence rate of decayed teeth and decayed/filled teeth of female subjects was higher than for males (Table 1,

Table 1. The prevalence and score of decayed/filled teeth among the subjects, grouped by gender.

Subjects	n	Prevalence of DT	DT score	Prevalence of FT	FT score	Prevalence of DFT	DFT score
Male	317	60.6%	2.45	13.6%	0.25	63.4%	2.70
Female	128	75.0% ^a	4.07*	18.0%	0.31	78.9% ^{ab}	4.38*
Total	445	64.7%	2.92	14.8%	0.27	67.9%	3.18

* P<0.05, females vs. males; Chi-square value; ^a 8.318; ^b 10.044.

Table 2. The missing teeth among the subjects, separated by age(yr).

Subjects	n	Prevalence of MT	MT score
<35	197	21.8%	0.38
35–44	216	35.7% ^a	0.82*
≥45	32	62.5% ^a	1.91*
Total	445	31.5%	0.70

* P<0.05, compared with <35 group; Chi-square value; ^a 24.530.

Table 3. The decayed root and residual roots among the subjects, separated by gender.

Subjects	n	Prevalence of D-root	D-root score	Prevalence of Residual root	Residual root score
Male	317	18.3%	0.51	36.9%	0.89
Female	128	30.5% ^a	0.88*	54.7% ^{ab}	1.50*
Total	445	21.8%	0.62	42.0%	1.06

* P<0.05, females vs. males; Chi-square value; ^a 7.925; ^b 11.830.

p<0.05). The DFT scores were related to sex and the duration of drug abuse by linear regression (p<0.05) (including education, occupation, sex, age, duration of drug abuse and methadone maintenance therapy).

The prevalence of missing teeth, decayed root, and residual roots

As shown in Table 2, women and men had differing prevalences of missing teeth. We also observed (by χ^2 test and single-factor analysis of variance) that the prevalence of missing teeth increased as the age of subjects increased (Table 2, p<0.05).

The prevalence of decayed roots for all subjects was 21.80%, the mean decayed root score was 0.62, the residual root prevalence was 42.02%, and the mean residual root score was 1.06. The prevalence of decayed root and of residual roots in women was significantly higher than that in men as determined by χ^2 and independent t-tests (p<0.05) (Table 3).

The decayed root scores and the residual root scores related to sex and the duration of drug abuse by linear regression (p<0.05) (including education, occupation, sex, age, duration of drug abuse and methadone therapy).

In addition, there were a total of 38 patients who had dental prosthetic restoration. Twenty subjects had fixed dental prosthetic restoration, and 18 subjects had removable prosthesis. The total overall rate of dental prosthetic restoration was 8.54% of the patients. There are no differences in this parameter between women and men.

CPI scores

The distributions of the CPI scores of 0, 1, 2, 3, and 4 were 0%, 2.92%, 66.29%, 27.64%, and 2.70%, respectively. The CPI scores related to the sex, age and the duration of drug abuse by bivariate correlations (p<0.05) (including education, occupation, sex, age, duration of drug abuse and methadone therapy). The overall frequency of gingival bleeding in all the subjects was 99.55%, the frequency of dental calculus was 96.63%, the frequency of shallow pocket was 30.34%, and the frequency of deep periodontal pocket was 2.70%. For the prevalence of gingival bleeding, there were no differences between men and women or among various age groups (Table 4). As determined using the χ^2 test, the prevalence of calculus deposition, presence of shallow periodontal pockets, and presence of deep periodontal pockets were higher in men than women (p<0.05) (Table 4). The prevalence of calculus formation and the incidence of shallow

Table 4. The periodontal status of the subjects.

Subjects	n	Gingival bleeding	Dental calculus	Shallow pocket	Deep periodontal pocket
Gender					
Male	317	99.7%	98.7% ^a	35.3% ^{ab}	3.8% ^c
Female	128	99.2%	91.4%	18.0%	0.0%
Age (yr.)					
<35	197	99.5%	93.9%	17.3%	0.5%
35-44	216	99.5%	98.6% [*]	38.4% [*]	4.2% [*]
≥45	32	100.0%	100.0% ^d	56.3% ^{de}	6.3% ^{ef}
Total	445	99.6%	96.6%	30.3%	2.7%

* $P < 0.05$, females vs. males and groups of various age; Chi-square value; ^a 15.049; ^b 12.410; ^c 5.028; ^d 8.198; ^e 32.798; ^f 6.916.

and deep periodontal pockets increased with the age of the subjects ($p < 0.05$) (Table 4).

Additionally, the dental calculus average section count in all the subjects treated with methadone was 3.99, and the dental calculus average section count in males and females were 4.23 and 3.37, respectively. The dental calculus average section count in subjects in men was larger than in women (all $p < 0.05$). The dental calculus average section count of subjects, separated by age (<35, 35–44, >45), were 3.49, 4.37, and 4.44, respectively. The dental calculus average section count increased with increasing subject age ($p < 0.05$).

DISCUSSION

There are a number of possible reasons for the poor oral health of the former heroin users. Firstly, overall awareness of oral health care in this population is low, and few of the subjects regularly brushed their teeth the recommended two times per day [8]. It has also been reported that the intake of sugar by drug addicts is higher than by the general population [9]. Additionally, the use of many medications is associated with xerostomia [10], and it has been shown that the amount of saliva produced by drug abusers is decreased [11], creating a favorable environment for the formation of plaque and eventual dental caries. Thus, the illicit drug abuse and methadone treatment both could lead to xerostomia, which is associated with dental caries [12]. Although the effect of methadone itself on the formation of caries has not been demonstrated, it has been reported that the methadone was not sugar-free [12] and the pH of a 1% water solution of methadone is 4.5–5.5, suggesting that taking methadone could increase oral acidity, thus increasing the rate of caries. It has also been shown that the immune function of methadone patients decreases [13], with lower levels of IgG, IgM, and especially IgA, the decrease of which may result in an increased rate of caries [14] compared to the general population. It is also possible that the concentration of microelements in the oral cavity may have changed, influencing the capacity of teeth to resist acid [15]. In this study, the caries score had no relation with the duration of methadone use. The reason may be that the duration of using methadone was short, the longest only 15 months, but the oral status did relate to the duration of drug abuse.

Caries prevalence and mean caries score increase with increasing age [16,17]; however, we did not observe any significant differences between groups based on age. By linear regression, the caries scores only related to sex and the duration of drug abuse. Nevertheless, there was a tendency toward an increase in the prevalence and score of missing teeth as subject age increased.

The detection rates of gingival bleeding, calculus, and shallow pockets and deep periodontal pockets in the former heroin users treated with methadone in Chengdu were higher than in the general adult population in the same area [7]. The CPI index was used in this periodontal examination. Because only the worst condition was recorded in every zone, some periodontal conditions may have been overestimated, especially the probing bleeding, which may have been overestimated by as much as 50%. However, other reports have indicated that gingival bleeding was observed in most illegal drug users [18,19]. Thus, while there may have been some overestimation in this investigation, the periodontal condition of the subjects was poorer than the general population.

The age was very strongly associated with periodontal disease. Earlier studies have shown that periodontal health continues declining with the duration of illegal drug use. In this study, the periodontal health declined with the duration of illegal drug use and age. In addition to local factors (the presence of bacterial plaques and dental calculi), systemic factors also influence periodontal health. Because heroin contains a number of noxious substances, it is likely that the drug can injure oral tissues following systemic administration. Heroin has been demonstrated to induce disorders of the endocrine system, which could change the reaction of the periodontium to the drug stimulus, possibly increasing its destruction. Drug abuse can also damage the humoral and cellular immunity, further exacerbating the periodontal disease.

The dental calculus average section count is often used to evaluate the overall status of oral hygiene. In this investigation, the dental calculus average section count of men was higher than that of women, which explains the poorer periodontal status of the men.

In this investigation, we discovered that the oral status of former heroin users in Chengdu was poorer than the general population in the same area. There was a significant increase in various markers of dental and periodontal diseases in these subjects. The majority of carious teeth were untreated and the majority of missing teeth were not repaired. The frequency of missing teeth likely accounted for the lower values compared to other reports [20,21]. A large number of carious retained roots were observed, demonstrating a high level of unmet dental treatment need. The West China Dental Hospital, located in Chengdu, is the most famous dental hospital in China and has many dental clinics that offer dental treatment to all, including methadone users. Obviously, most subjects of this study don't visit the dentist regularly. This is likely because the former heroin users have a little expendable income and cannot pay the fee for dental treatment. Furthermore, their chaotic life-style makes them unlikely to practice good oral hygiene, and the illicit drug use may have masked the pain caused by the caries or residual root. Since almost all of the subjects were from disadvantaged groups, it is hoped that this investigation will provide the necessary data to serve as an impetus for increasing programs that can help them improve their oral health [22]. Dentists should understand the dental emergency of methadone users [23]. To provide better dental services for the methadone users, dentists teach them the importance of oral health, teach them brushing and oral self-care, check their oral status regularly and without charge and, and encourage them to take care of their teeth and see a dentist when needed. Additionally, we suggest the government should establish a dental clinic in the methadone treatment clinic to provide basic dental care (eg, filling teeth, root canal treatment, cleaning teeth, extracting teeth) without charge or for a very low fee.

CONCLUSIONS

We conclude that the oral health status among the studied former heroin users in Chengdu is poorer compared to the general population. Dentists should provide this population with basic dental care for free or charge only a small fee, as well as teaching them self-care.

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