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1．研究テーマ

中華人民共和国における口臭および歯周疾患予防プログラム構築のための疫学調査

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3．研 究 組 織

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4．研究報告書

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－日中医学協会助成事業－

中華人民共和国における口臭および歯周疾患予防プログラム構築のための疫学調査

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Abstract:

The purpose of this study was to estimate the distribution of halitosis in a general Chinese population and assess the relationship between halitosis and oral health status, social status and other behaviours. The number of subjects was 2,000 (1,000 males and 1,000 females), aged from 15 to 64 years living in Beijing. Questionnaire survey and oral examination was conducted. To assess the malodor level, volatile sulphur compounds (VSC) concentration in mouth air was evaluated by the Halimeter®. The caries status, periodontal status and oral hygiene was examined using DMFT index, pocket depth (PD), modified sulcus bleeding index (mSBI), plaque index (PI), calculus index (CI), and tongue coating score (TCS). The following results were obtained. The prevalence of halitosis (75 ppb VSC and above) was 35.4% for the total population. On the other hand, the rate of persons who concerned about their own oral malodor was 27%. They often tried to use brushing, mouthrinse or chewing gum to reduce malodor level, but only 7% said they visited medical or dental clinic to receive halitosis treatment. Almost half of the subjects did not know that halitosis was caused by oral disease and poor oral hygiene. There were no significant differences between the mean values of VSC for urban and rural areas or among age groups. The VSC measurement time was related with VSC values. In the late morning, VSC values were found to be significantly higher than other period. In all age groups, significant correlation was found between VSC and TCS. Significant correlation was observed between VSC and PI in all age groups except 25-34-year-old group. For periodontal status, there were significant relationships between mSBI and VSC, CI and VSC, PD and VSC. However caries status was not related with VSC in any age groups. Logistic regression analysis revealed that TCS, gender, CI and mSBI were significantly related with VSC. TSC showed the highest odds ratio among them, followed by mSBI, gender and CI. From the results of this study, it was revealed that the prevalence of halitosis was high, and that poor oral hygiene and poor periodontal status might be the cause of halitosis. It was concluded that preventive programs for periodontal disease and halitosis are definitely necessary. Combined with clinical preventive and treatment program, community-based preventive program should be planned and implemented in China.

Key Words: Halitosis, VSC, Periodontal disease, Tongue coating, Chinese population

Introduction:

Few studies have been reported the prevalence of halitosis in the general population with classical epidemiological methods. The prevalence rate of halitosis has been previously determined from 2.4% to 58.8% with utilising a sulphide monitor (Halimeter®, Interscan CA), organoleptic measurement or the subjects' self-judgement for assessing oral malodor [1-3].

However without the standardisation, data will lack accuracy and reliability in the examination process, the diagnosis of halitosis and ultimately the value of the data itself. The availability of the Halimeter® has led to an unprecedented increase in oral malodor research because of its convenience, portability and reproducibility.

The purpose of this study was to estimate the distribution of halitosis in a general Chinese population and assess the relationship between halitosis and oral status, social status and other behaviours with employing the standardised procedure for measurement of halitosis.

Methods:

The subjects in this study were 1,000 males and 1,000 females, aged from 15 to 64 years living at 4 districts/counties of Beijing, China. These subjects were sampled by a stratified, cluster method by same proportion, from urban and rural areas, and from five age groups; 15-24, 25-34, 35-44, 45-54 and 55-64. Before the study, all the subjects were informed the purpose of the survey and participated voluntary. Data analysis was conducted anonymously.

First, subjects were asked to fill in a questionnaire which included 7 main items: socio- economic status (income, education etc), oral habits (brushing etc), knowledge for oral health, dental visit pattern, life habits (smoking etc), medical history and self-judgement of halitosis.

Prior to the oral examination, subjects were instructed to refrain from eating, drinking, smoking, brushing and mouth rinsing for 2 hours. To assess malodor level, volatile sulphur compounds (VSC) concentration in mouth air were evaluated as well as organoleptic measurements (OM). VSC was measured by the Halimeter®. Every morning before the survey, the Halimeter® was calibrated with standard 250 in parts per billion (ppb) H_2S produced by the Permeater® (PD-1B, Gastec, Japan). For OM subjects were instructed to exhale briefly through the mouth, at a distance of approximately 10 cm from the nose of the examiner. A privacy screen with a hole was placed between the subjects and the examiner. Data were recorded on a scale of 0 to 5[4].

Oral examination was conducted with dental mirror and CPI explorer under the artificial light. The caries status, periodontal status and oral hygiene was examined using DMFT index, pocket depth (PD), modified sulcus bleeding index (mSBI), plaque index (PI), calculus index (CI), and tongue coating score (TCS). PD and mSBI were assessed at 6 teeth (#16, #21, #24, #36, #41 and #44). For CI the highest score of at the 6 sites was record. TCS was evaluated in 4 grades by inspection of the distribution of tongue coating area.

Statistical analysis by SPSS 10.0E was carried out for independent-samples t test and one way ANOVA (Student-Newman-Keuls) for the mean value of VSC. Pearson correlation and logistic regression were used to assess the association between VSC and other factors.

Results:

VSC was found to be related with OM in all age groups. As 75 ppb of VSC was reported socially acceptable level of halitosis[1], the prevalence of halitosis that was scores above this level was 35.4% for the total population. There were no significant differences between the mean values of VSC for urban and rural

areas or among age groups.

The VSC measurement time was related with VSC values. In the 15-24, 25-34 and 55-64-year-old groups, the VSC values were found to be significantly higher in the 10:01-12:00 period, but no differences among 8:00-10:00, 13:00-15:00 and 15:01-17:00 were noted. In 35-44 and 45-54-year-old group, there were no statistically significant differences.

Table 1 shows the relationship between VSC values and oral health status by age groups. In all age groups, significant correlation was found between VSC and TCS. Significant correlation was observed between VSC and PI in all age groups, except the 25-34-year-old group. For periodontal status, there were significant relationships between mSBI and VSC, CI and VSC, PD and VSC. However DMFT was not related with VSC in any age groups.

According to the questionnaire, the subjects who brushed teeth in the evening showed lower VSC scores (78.54±71.14) than those who did not (86.44±81.11). The difference was significant. However, other items such as social conditions, oral habits, knowledge of oral health, frequency of dental visit, life habits, or medical history had no relationship with VSC values.

Twenty-seven percent of the subjects reported that they concerned about their own oral malodor, but this figure was lower than the prevalence of Halimeter® assessment. Only 14.6% of them thought that halitosis was a problem that affected their daily life. The subjects who concerned their own malodor often tried to use brushing, mouthrinse or chewing gum to reduce malodor level, but only 7% said they visited medical or dental clinic to receive halitosis treatment. Almost half of the subjects did not know that halitosis was caused by oral disease and poor oral hygiene. They believed that some systemic diseases produced halitosis. Among the subjects whose VSC values were 75 ppb and above, 67.5% reported they had no systemic disease. There was no statistical difference of VSC values between those with and without systemic disease.

On the basis of the results of ANOVA, logistic regression analysis was conducted (Table 2). TCS, gender, CI and mSBI were significantly related with VSC. TSC showed the highest odds ratio (OR) value among them, followed by mSBI, gender and CI.

Discussion:

In this study, the prevalence of halitosis was higher than the previous epidemiological reports[1-3]. The reason might be due to the poor oral hygiene and poor periodontal status of the present samples. The mean PI was 2.65, and 94.5% of the subjects had gingivitis. Age factor did not contribute to the occurrence of halitosis. However the correlation between gender and VSC was observed in the logistic regression analysis. VSC of females was higher than that of males. Tonzetich et. al.[5] previously reported VSC in mouth air was found to be elevated during mid-cycle and around menstruation, therefore females might show high prevalence of halitosis.

VSC scores varied by the measurement time, the mean value was highest at 10:01 – 12:00, followed by 8:00 – 10:00, 15:01 – 17:00 and 13:00 –15:00. The VSC values decrease obviously after oral activity,

especially after meals. This may be because that oral activities can stimulate amount of saliva and then reduce the level of bacteria on tongue and in saliva which is the source of the VSC.

In this study, the correlation between VSC and TCS was significant in all age groups. TCS showed the highest odds ratio value in the all factors. The tongue coating is comprised of epithelial cells from the oral mucosa, microorganisms, and leukocytes from periodontal pockets. The dorsal surface of the tongue therefore is the favourite site for the growth of the anaerobic bacteria responsible for halitosis. It should be necessary to remove tongue coating to reduce VSC level and improve halitosis.

Periodontal disease is regarded as another important contributing factor of halitosis. This study also supports this association. The more severe periodontal disease the person had, the higher value of VSC was recorded. Periodontal pathogenic bacteria, such as B. fosythus, P. gingivalis and P. intermedia influenced the production of VSC. In this study, VSC was associated with bleeding index. Blood decomposition products themselves can also produce sulphur-containing peptides and amino acids, which are the source for VSC. It was also reported VSC itself might also damage the periodontal tissues[6]. These are the reasons of the relationship between VSC and periodontal disease.

No correlation was found between VSC and dental caries or dental plaque. In this study, we found no relationship between VSC and smoking habits. This result was different from previous papers[1]. Usually smoking has a negative effect on periodontal disease and saliva flow, which may result in halitosis. The male smoking rate in China is the highest in the world. Further research on smoking and halitosis is necessary in the Chinese population. Other factors on social or economic status, oral habits, knowledge of oral health, frequency of dental visit, or other life habits had no relationship with VSC. Further no difference was found in VSC between the subjects who have good oral behaviours or not in this study population.

This study was the oral epidemiological survey on Chinese population in urban and rural area. From the results of this study, it was revealed that the prevalence of halitosis was high, and that poor oral hygiene and poor periodontal status were related with halitosis. It was concluded that preventive programs for periodontal disease and halitosis are definitely necessary. Combined with preventive and treatment program in the clinical settings, community-based preventive program should be planned and implemented in China.

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Table 1 : Pearson correlations between VSC and oral health status by age group

	VSC				
Age Number	15-24 (year) n=400	25-34 (years) n=400	35-44 (years) n=400	45-54 (years) n=400	55-64 (years) n=400
TCS	0.216 **	0.241 **	0.236 **	0.147 **	0.202 **
PI	0.210 **	0.081	0.107 *	0.122 *	0.115 *
mSBI	0.106 *	0.302 **	0.220 **	0.207 **	0.020
CI	0.203 **	0.206 **	0.156 **	0.200 **	0.035
PD	0.118 *	0.251 *	0.162 **	0.149 **	0.018
DMFT	0.037	0.035	-0.014	-0.071	0.045
OM	0.510 **	0.234 **	0.438 **	0.476 **	0.483 **

*: $p<0.05$ **: $p<0.01$

Table 2 : The results of logistic regression

	B	S.E.	OR
PD	-0.062	0.09	0.94
mSBI **	0.318	0.096	1.375
CI *	0.163	0.074	1.177
PI	0.102	0.085	1.107
Brushing in the evening	-0.148	0.104	0.862
Gender **	0.298	0.104	1.347
Time	-0.035	0.044	0.966
TCS **	0.6	0.068	1.823

*: $p<0.05$ **: $p<0.01$

注：本研究は、2003 年 9 月 27 日「第 52 回日本口腔衛生学会・総会」にてポスター発表、「口腔衛生会誌」（2003 年 8 月 第 53 巻 第 4 号 461 頁）に掲載。

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