Abstract: A survey was carried out to compare periodontal health status and oral health behavior between Japanese and Chinese dental students. Subjects consisted of 118 students at Nihon University School of Dentistry and 92 students at the school of Stomatology, Nanjing Medical University. Saliva occult blood test was performed to classify whether subjects may have periodontal disease. Further questionnaires were given to evaluate different lifestyles and oral hygiene habit. The positive rate of the saliva occult blood test in Japanese dental students was 13.6%, and that of Chinese dental students was 43.5%. Bleeding from gingiva as a subjective symptom was as follows: Japanese 7.6%, Chinese 37.0%. Japanese dental students brushed for 13.5 min each day. The rate for Chinese students was 4.6 min. Use of interdental devices was as follows: Japanese 33.1%, Chinese 7.6%.

Differences of periodontal disease rates between Japanese and Chinese dental students are thought to be differences in oral hygiene, indicating the need for improvements in hygiene measures in Nanjing City. The establishment and strengthening of oral hygiene education, including the importance of tooth brushing for prevention of periodontal disease, has been proposed. (J Oral Sci 51, 275-281, 2009)

Keywords: saliva occult blood test; periodontal disease; oral hygiene; self-administered structured questionnaires.
Introduction

Recently, China is accomplishing remarkable development through rapid modernization. However, Gini’s coefficient in China is 0.45 which is about 0.2 point higher than that of Japan (World Development Indicators Database 2005). This shows differences in wealth are still intense and that problems in society may still exist in China. In terms of public health, the average life span in China has been greatly extended from 35 years in 1949 to 71 years in 2000 (Cao, 2003). However, the number of dentists in China per population is about 1/30 of that in Japan, and people’s poor dental health may be due to few specialists (Hasegawa and Cao, 2004). For example, the rate of periodontal disease in 12 year old children is 69%. From a survey of Peking University School of Stomatology in 1986, 44% of tooth extraction (1st place) is due to periodontal disease. Periodontal disease is highly prevalent in China but periodontists are few (Cao, 2003). Several surveys also indicated that Chinese children and adults frequently have gingival bleeding and calculus, and the establishment of school-based oral health promotion together with general health promotion is urgently required (1-4). To implement an effective program for prevention of periodontal disease, it may be necessary to investigate the background of people’s lifestyles, including oral hygiene, and to analyze the relationship between those elements and the prevalence of periodontal disease.

The understanding of the School of Stomatology, Nanjing Medical University has been obtained, and a base for joint research concerning the saliva test and questionnaires has been established. As a first step, this joint research investigated rates of periodontal disease in the saliva occult blood test (Perioscreen “Sunstar”) and examined the lifestyle including the oral hygiene by self-administered structured questionnaires, and compared the results from students of the Department of Dentistry at Nihon University School of Dentistry and the school of Stomatology, Nanjing Medical University.

Subjects and Methods

Subjects

Subjects consisted of students from Nihon University School of Dentistry (Japanese dental students) and students from the School of Stomatology, Nanjing Medical University (Chinese dental students). This research was approved by the Ethics Committee of both dental schools. The objectives were explained to all participants both orally and in writing. Approval was also obtained, in the same way, from the Chinese side.

Saliva occult blood test

Saliva occult blood test was carried out using a novel test paper strip coated with anti-human hemoglobin monoclonal antibody for detection of occult blood in
saliva (Perioscreen “Sunstar”, Figs. 1 and 2). The membrane was precoated with human hemoglobin specific antibody (capture antibody) on the result area. During the test, the specimen is allowed to react with the anti-human hemoglobin monoclonal antibody-colloidal gold conjugate which was pre-dried on the lower portion of the test strip. The mixture then moves upward on the membrane chromatographically by the capillary action. For a positive specimen, the conjugate binds to the human hemoglobin forming an antigen-antibody complex. This complex binds to the anti-human hemoglobin antibody as a captured reagent on the result area and produces a red-violet colored band (positive line) when human hemoglobin concentration is equal to or greater than 2 µg/ml (Figs. 1 and 2). Absence of this colored band in the result area suggests a negative result.

Each subject was instructed to put 3 ml of water into the mouth and rinse for 10 s. The mouth rinse sample was obtained by exhalation it into a paper cup. The tail of Perioscreen was put into the sample liquid (oral rinse) for around 5 min to rise of the liquid, and then, the result was observed. With reference to the manufacturer’s manual, results were assessed as positive (++, +) or negative (±, −), by dentists at Nihon University School of Dentistry or the School of Stomatology, Nanjing Medical University, respectively.

Questionnaires

Questionnaires written in Japanese to examine the lifestyle and the oral hygiene habits were kindly provided by Prof. Koichi Ito (Department of Periodontology, Nihon University School of Dentistry). The same questionnaires were translated into Chinese and used in the School of Stomatology, Nanjing Medical University. Information was obtained about the age, sex, medical history, experience of dental treatment, subjective symptoms, oral habits, meal, eating habits consumption of alcohol and tobacco, oral hygiene habits, and other factors (Table 1). The time required to complete the questionnaires was about 5 minutes.

Statistics

The relationship between the results obtained in the questionnaires and the saliva occult blood test was examined using Chi square ($\chi^2$) test or Student $t$-test.

Results

Valid responses from the questionnaires completed by the volunteer students in Nihon University School of Dentistry were 118, and average age of responders was 22.1 year. At the School of Stomatology, Nanjing Medical University, 92 questionnaires were obtained and the average age was 22.1 years. The difference in ages between the two groups was not significant ($P > 0.05$, $t$-test).

Table 2 shows the results of saliva occult blood test (Perioscreen) and questionnaires. When comparing the results, Japanese students positive rate was only 13.6% whereas that of Chinese students was 43.5%, indicating a high positive rate for Chinese students.

Some major differences between Japanese and Chinese students were found from the results of questionnaires as shown in Table 2. Results of the survey showed 10.2% of Japanese reported having a medical history, including infectious diseases, the rate for Chinese students was 34.8%. A total of 88.1% of Japanese students reported experience of dental treatment, whereas the figure for Chinese students was 51.1%. The survey found that 18.6% of Japanese students had undergone orthodontic treatment.

Fig. 2 Diagram of positive line and negative result. (A) Before the reaction, the result line is in light blue. (B) After the reaction, red-violet colored band will appear at the result line if the sample contained 2 µg/ml or more of human hemoglobin (left, positive). If the sample contained no human hemoglobin, the band will not appear (right, negative).
whereas in Chinese students it was only 4.4%.

Concerning the gingival conditions, 37.0% of Chinese students showed gingival bleeding whereas the figure for Japanese students was 7.6%. The percentage who felt pain in the gingiva was 1.7% in Japanese students, whereas it was 12.0% in Chinese students. Furthermore, 3.3% of Chinese students had a pus discharge from their gingiva.

In Chinese students, 2.2% reported not being able to chew
hard foods. The rate of smoking, one of the risk factors for periodontal disease, was much higher (27.1%) in Japanese students and much lower in Chinese students (2.2%). Incidence of grinding or clenching teeth were higher in Japanese students (21.2%) than in Chinese students (13.0%). As for oral hygiene habits, the average time spent brushing a day for Japanese students was longer (13.5 min) than that in Chinese students (4.6 min). The interdental devices such as interdental brush or dental floss were used by 33.1% of Japanese students and 7.6% of Chinese students.

Chi square test between Perioscreen positive person and each item in the questionnaire revealed that the significant correlations existed in gingival pain, gingival swelling, and gingival bleeding ($P < 0.05$) in Chinese students. Their odds ratios were 7.2 for gingival pain, 3.8 for gingival swelling, and 2.7 for gingival bleeding, respectively. In Japanese students, there was no significant correlation because of a much lower Perioscreen positive rate.

**Discussion**

The first step in a joint research program between Japan and China was based on the difference in lifestyles in order to assess oral disease status using a combination of saliva occult blood test (Perioscreen) and a questionnaire. This research focused on periodontal disease which is known to have high rates in Japan. The study used a saliva occult blood test together with a questionnaire for subjects who were Japanese and Chinese dental students.

**Table 2 Results of questionnaires**

<table>
<thead>
<tr>
<th></th>
<th>Total No.</th>
<th>Perioscreen positive</th>
<th>General medical history</th>
<th>Allergy</th>
<th>Pain in the head and neck, face, or temporomandibular joint</th>
<th>Health conditions (good)</th>
<th>Dental treatment experience</th>
<th>Reasons for previous dental treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>(%)</td>
<td>(%)</td>
<td>(%)</td>
<td>(%)</td>
<td>(%)</td>
<td>(%)</td>
<td>(%)</td>
</tr>
<tr>
<td><strong>Japan</strong></td>
<td>118</td>
<td>36</td>
<td>12</td>
<td>6</td>
<td>5</td>
<td>99</td>
<td>104</td>
<td>97</td>
</tr>
<tr>
<td></td>
<td></td>
<td>13.1</td>
<td>5.6</td>
<td>4.2</td>
<td>85.9</td>
<td>88.1</td>
<td>22</td>
<td>4</td>
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<tr>
<td></td>
<td></td>
<td>0.04</td>
<td>0.05</td>
<td>0.44</td>
<td>0.068</td>
<td>3.09</td>
<td>0.001</td>
<td>0.40</td>
</tr>
<tr>
<td></td>
<td>1.24E+12</td>
<td>6.25E+04</td>
<td>0.003E+04</td>
<td>3.22E+04</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>China</strong></td>
<td>92</td>
<td>40</td>
<td>32</td>
<td>12</td>
<td>6</td>
<td>47</td>
<td>22</td>
<td>72</td>
</tr>
<tr>
<td></td>
<td></td>
<td>43.5</td>
<td>38.8</td>
<td>17.0</td>
<td>6.5</td>
<td>95.7</td>
<td>31.1</td>
<td>34.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.001</td>
<td>0.001</td>
<td>0.44</td>
<td>0.068</td>
<td>3.09</td>
<td>0.001</td>
<td>0.40</td>
</tr>
<tr>
<td></td>
<td>1.24E+12</td>
<td>6.25E+04</td>
<td>0.003E+04</td>
<td>3.22E+04</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* $P$ values were calculated using Chi-square test.

**Table 3 Odds ratios between Perioscreen positive Chinese students and several items in the questionnaire (Chi square test)**

<table>
<thead>
<tr>
<th>Status of the present gums</th>
<th>Status of the present mouth and teeth</th>
<th>Habits of the mouth</th>
<th>Oral care</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain in gums</td>
<td>Swollen gums</td>
<td>Bleeding gums</td>
<td>Bad breath</td>
</tr>
<tr>
<td></td>
<td>(%)</td>
<td>(%)</td>
<td>(%)</td>
</tr>
<tr>
<td>Japan</td>
<td>118</td>
<td>36</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>13.1</td>
<td>5.6</td>
<td>4.2</td>
</tr>
<tr>
<td>China</td>
<td>92</td>
<td>40</td>
<td>32</td>
</tr>
</tbody>
</table>

* $P$ values were calculated using Chi-square test.

Odds ratio: 7.29* 3.83* 2.73* 1.46 0.909 1.31 1.91 0.657 0.342 1.47 0.00 1.08 0.952

* $P < 0.05$
antibody to human hemoglobin for screening of periodontal
disease; it has both high sensitivity and high specificity
(> 90%) (7) and was jointly-developed by Nihon University
and Godo Shusei Co. Ltd. In this study, it was not possible to
carry out individual dental examinations. Accordingly,
Perioscreen positive subjects were considered to be affected
by periodontal disease such as gingivitis or periodontitis.
The test results of Perioscreen revealed that Chinese
students showed a high positive rate of 43.5% compared
with Japanese students. This high positive rate corresponds
to that found in people aged 35-40 years old in a Japanese
survey. Since the subjects in this study were dental students,
it could be concluded that periodontal disease in Chinese
people starts at an early age. In fact, it has been reported
that the periodontal disease rates in 1995 were 69% in 12-
year olds, 78.4% in 15-year olds and 85.2% in 18 year-
olds in China (Cao, 2003). Accordingly, examination of
periodontal disease status not only in the students, but also
in all age groups including infants may be required in the
near future in China.

From the results of the questionnaire, the necessity for
improving the public health including oral hygiene in
China has been suggested, since 34.8% had medical history
and several subjects had history of infectious disease.

Concerning the experience of dental treatment, half of
the Chinese students answered that they had no experience
dental treatment. However, taking into account that
China has 1/30 of the number of dentists compared to Japan,
those Chinese students who had experienced dental
treatment may represent a much higher rate compared to
that of the average person. In any event, Chinese people
do not visit dental clinics regularly. The higher rate of
periodontal disease found in young subjects in China is
considered to be linked to infrequent visits to dental clinics
and lack of brushing instructions.

Concerning the oral status, the ratio of symptoms of
gingiva such as pain, swelling, and bleeding was higher
in Chinese students. From the results of Chi square test,
it has been suggested that a person having one of the
above-mentioned three symptoms in the gingiva should visit
a periodontist, since that person has a high risk of
periodontal disease. In Stomatological Hospital of Nanjing
Medical University (Stomatological Hospital of Jiangsu
Province), although there were many patients at the Implant
Clinic, there were few patients in the Periodontal
Department, suggesting a bias towards oral hygiene
consciousness in local populations in Nanjing City.
Accordingly, it is necessary to examine the relationship
between social health and welfare systems, and the
environment of dental services in order to develop higher
levels of oral hygiene in Chinese populations.

Concerning oral care habits, the brushing time of
Japanese students was three times longer than that of
Chinese students. In the present questionnaire, there was
no item that covered the history of tooth brushing
instruction. Therefore, it is not clear how the difference
originated. Although it may be considered that the levels
of knowledge of students in Stomatological College of
Nanjing Medical University may be high, the Chinese
people have little chance to recognize the “Importance of brushing”. Furthermore, there is no system of dental
hygienists and no educational institution for dental
hygienists in China, and this may result in less chance for
people to recognize the “Importance of brushing” and to
avoid dental disease, including periodontal disease.

From the results of present survey, it is clear that the
recognition of the “Importance of oral hygiene” in the
prevention of dental caries and periodontal disease should
be a priority for Chinese students, particularly as they
bear a responsibility for the oral hygiene of China in the
future. Furthermore, greater efforts are required to improve
the levels of public health through the increased education
for oral hygiene (8,9).

To accomplish the above aims in the face of a lack of
dentists and to reduce oral disease within 10 or 20 years,
it seems important to stress that prevention is necessary,
since this may result in the most cost-effective results.

Accordingly, it is important to start a campaign so that
people recognize that tooth loss as you get older is not a
natural phenomenon, but actually a kind of sickness. The
present study should act as a motivating factor for oral
hygiene habit-making for dental students in both Japan and
China.

Acknowledgments

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