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Original Article

Japanese workers with long leisure time have deteriorated periodontal condition: A cross-sectional study

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ABSTRACT

Objectives: The relationship between length of leisure time and periodontal condition is unknown. The aim of this cross-sectional study was to clarify the association between leisure time and periodontal states.
Methods: This study was conducted on a cross-sectional sample of male (n=68) and female (n=30) Japanese healthy workers aged between 22 and 75 years. Periodontal states, including probing pocket depth, attachment level, bleeding on probing and serum antibody level for periodontal bacteria, and self-reported work conditions were assessed.
Results: Subjects with long leisure times on a weekday showed increased probing pocket depth and attachment loss compared to subjects with shorter free times. The serum antibody level of a major periodontal pathogen, *Porphyromonas gingivalis*, was higher in the long leisure group than in the short time group.
Conclusions: Subjects with long leisure time showed aggregated periodontal condition consistent with increased serum antibody against periodontal bacteria compared to subjects with short free time.

1. Introduction

Periodontal disease is a multifactorial infectious disease. Not only bacterial infection and consequent inflammatory reaction, but also environmental factors, which interact with each other, cause the destruction of periodontal tissue [1]. Smoking a risk factor that shows the association with clinical periodontal destruction [2,3]. Other possible risk factors and indicators for periodontal disease include alcohol consumption [4], diabetes mellitus [5], obesity and metabolic syndrome [6], osteoporosis [7], stress [8] and genetic [9], and epigenetic factors [10]. Therefore, lifestyle may affect the progression of periodontal disease.

However, the influence of leisure time on periodontal states is unknown. The aim of this study was to assess the relationship between leisure time and periodontal condition.

2. Materials and methods

2.1. Subjects

Ninety-eight subjects participated in the present study. They visited a check-up venue and were recruited for participation in this study from December 2014 to June 2015. Those who did not consent to participation in this study or had a history and/or presence of severe systemic disease were excluded.

2.2. Clinical periodontal test

The number of teeth in each subject was counted. Probing pocket depth and attachment level was measured at 6 sites per tooth on the upper right first molar, upper right central incisor, upper left first molar, lower right first molar, lower left central incisor, and lower left first molar with a manual probe (PCP-UNC 15, Hu-Friedy, Chicago, IL, USA). When a representative tooth was missing, we measured a neighboring tooth.

2.3. Questionnaire regarding working and leisure time

The data related to total work time in a week and length of leisure time on a weekday was corrected using a self-reporting

Abbreviations: PCR, polymerase chain reaction

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questionnaire sheet. Question items were as follows: how many days and how long the subjects work in a week and the length of leisure time on a weekday except for sleep, diet, and bathing.

2.4. Bacterial Identification

Unstimulated saliva was obtained from each subject. Bacterial DNA was extracted from 200 μL saliva using the DNeasy Blood and Tissue kit (Qiagen, Hilden, Germany) according to the manufacturer's instructions, and was stored at −30 °C until analysis. Real-time polymerase chain reaction (PCR) was used to detect the periodontopathic bacterium *Porphyromonas gingivalis*. To determine the quantitative range of real-time PCR, DNAs were prepared from 10^2–10^8 cells of cultured bacteria. Specific primers for *Porphyromonas gingivalis* were used as previously described [11]: 5′-cttgacttcagtggcggcag-3′ and 5′-agggaagacggttttcacca-3′. Real-time PCR was performed using a Thermal Cycler Dice^R Real Time System (Takara Bio Co., Shiga, Japan). The reaction mixture for the SYBR Green assay (25 μL) contained 12.5 μL of SYBR^R Premix EX Taq II (Takara Bio Co.), 1 μL of forward and reverse primers (10 mol/L), and 2 μL of extracted DNA. The thermocycling program was as follows: 40 cycles of 95 °C for 5 s, and 60 °C for 30 s with an initial cycle of 95 °C for 30 s. At each cycle, accumulation of PCR products was detected by monitoring the increase in fluorescence of the reporter dye from dsDNA-binding SYBR Green. After PCR, a dissociation curve (melting curve) was constructed in the range of 60 °C to 95 °C.

2.5. Serum antibody level against periodontal pathogens

A serum sample was collected from each subject and analyzed for IgG antibody against the major periodontal pathogens, *Porphyromonas gingivalis*, *Aggregatibacter actinomycetemcomitans*, and *Prevotella intermedia* using an enzyme-linked immunosorbent assay as previously described [12]. We calculated serum antibody levels (U/mL) from the standard curve obtained from the gradual dilutions of reference and compared the levels among subjects.

2.6. Statistical analysis

Wilcoxon test was used to compare antibody levels because the data were not normally distributed. Other numerical data were presented as the means ± standard error and Student's *t*-test was used to compare the values. Chi-square test was performed to compare gender and smoking rate. JMP 9.0.3 (SAS Institute Inc., Cary, NC, USA) was used for all statistical analyses. Values of $p < 0.05$ were considered significant.

3. Results

3.1. Characteristics

At first, we divided the subjects into two groups according to leisure time on a weekday. Participants who had 2 h or more free time on a weekday were categorized into the long leisure time group (n=50), while those with less than 2 h per a day for their free time were categorized into the short leisure time group (n=48). The data for weekly working days or time was not used in this study because most subjects worked approximately 5 days and similar hours each week.

Subject characteristics are shown in Table 1. The mean age of the two groups was not significantly different. The mean age of the short leisure time group was 45.6 ± 2.0 years, while that of the long time group was 45.9 ± 1.9 years. The rate of male subjects in the long time group was higher than that in the short time group (p=0.019). No significant difference in smoking habit was detected, although the subjects in the long leisure time group generally contained more subjects who smoked than the short leisure time group.

Table 1
Characteristics of subjects (n).

	Short leisure group	Long leisure group	*p*
n	48	50	
Mean age ± SE	45.6 ± 2.0	45.9 ± 1.9	$p = 0.909$
Male/Female	28/20	40/10	$p = 0.019$
Smoker	10 (21%)	18 (36%)	$p = 0.095$

Table 2
Comparison of periodontal condition (Mean ± SE).

	Short leisure group	Long leisure group	*p*
Residual teeth number	27.5 ± 0.5	26.5 ± 0.5	$p = 0.164$
Mean probing pocket depth [mm]	2.12 ± 0.07	2.36 ± 0.07	$p = 0.013$
Mean clinical attachment level [mm]	2.33 ± 0.10	2.72 ± 0.10	$p = 0.008$
Positive rate of bleeding on probing [%]	9.8 ± 2.8	15.9 ± 2.7	$p = 0.115$
P. gingivalis in saliva [Counts/ml]	$9.2 \times 10^5 \pm 6.2 \times 10^5$	$1.4 \times 10^6 \pm 6.1 \times 10^5$	$p = 0.609$

3.2. Clinical periodontal states

The periodontal condition of the subjects is shown in Table 2. Residual teeth number in the two groups was not significantly different. The mean probing pocket depth in the long leisure group was deeper than that in the short leisure group (p=0.013). Mean clinical attachment level was higher in the long leisure group than in the short leisure group (p=0.008). The positive rate of bleeding upon probing and counts of *Porphyromonas gingivalis* in saliva did not significantly differ between groups.

We assessed the difference in periodontal states between males and females, because the gender rate was statistically different between the long leisure group and short leisure group. Tables 3 and 4 show the periodontal condition in the short and long leisure time groups, respectively. All periodontal parameters were similar between men and women in both groups.

We also assessed the difference in the states between smokers and non-smokers to analyze the influence of smoking. The periodontal states of smokers and non-smokers were compared in Table 5 (short leisure time group) and Table 6 (long leisure time group). No significant difference was detected between smokers and non-smokers in these data. To cancel the effect of smoking, the data of only non-smokers is shown in Table 7. The mean clinical attachment level was higher in the long leisure group than in the short leisure group (p = 0.018).

Table 3
Periodontal condition in the short leisure time group (Mean ± SE).

	Female	Male	*p*
Residual teeth number	27.1 ± 0.8	27.9 ± 0.7	$p = 0.458$
Mean probing pocket depth [mm]	2.21 ± 0.11	2.05 ± 0.09	$p = 0.231$
Mean clinical attachment level [mm]	2.47 ± 0.16	2.22 ± 0.14	$p = 0.170$
Positive rate of bleeding on probing [%]	9.5 ± 4.3	10.0 ± 3.6	$p = 0.926$

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