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Relationships between various aspects of lifestyle and dental health behaviors in a rural population in Japan

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Abstract- Objectives: The aim of this study was to determine associations of lifestyle with dental health behaviors such as tooth brushing frequency, use of extra cleaning devices, and regular dental visits to a dentist. Methods: Data were collected from 1,182 dentate residents 18 years of age or older who resided in a typical farming village. The data included data on the demographic factors, dental health behavior, and various aspects of lifestyle, i.e, mental condition, alcohol consumption, smoking habit, physical activity, social activity, dietary habits, and presence of systemic diseases. Results: Multiple logistic regression analysis revealed that subjects in a younger group (18-39 years old) and subjects who had never smoked brushed their teeth more frequently. Experience of social volunteer work and presence of systemic disease were correlated with use of extra cleaning devices. Associations of female gender with frequency of tooth brushing and use of extra cleaning devices were weakly positive. The subjects who considered dietary combination carefully and those who lived alone were predisposed to visit a dentist regularly. Conclusions: The results indicate that dental health behavior is associated with lifestyle as well as demographic factors.

Key words: lifestyle; dental health behavior; rural area

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Introduction

Major chronic diseases are influenced more by lifestyle and by psychological and social conditions than by standard risk factors (1). This concept is accepted in dental science as well (2-17). Dental health behavior is associated with gender and socioeconomic status. Females are more likely than males to brush their teeth, use dental floss, and visit dentists for prevention of dental diseases (4, 6, 8, 12, 14). Daily brushing has been shown to be significantly related to education and income in a US adult population (8). Dental health behavior is associated with smoking habit, alcohol consumption, physical activity and dietary habits (4, 11, 14). Family characteristics and dental health behavior of the parents affect regular dental visits by adolescents (16). These findings suggest that dental health behavior is multidimensional.

There have been several multivariate studies on the relationship between dental health behavior and lifestyle (8, 14). However, there have been few multivariate studies in Japan. We hypothesized that mental condition, social activity and presence of systemic disease also affect dental health behavior. The aim of this study was to determine the association of lifestyle with dental health behavior such as tooth brushing frequency, use of extra cleaning devices and regular visits to a dentist.

Materials and methods

All of the 2,359 residents over 18 years of age or older of a farming village (total population of 3,055) of Japan were invited to take part in this study. Two regional health officers visited residents' homes, to explain the purpose of the study and to ask the residents to fill in questionnaires. Verbal consent for participation in the study was obtained from all residents. The officers visited their homes again to collect the questionnaires.

The first page of the questionnaire included questions on demographic factors, i.e., age, gender, occupation (none, farming, manufacturing, or service/others) and type of household (living alone, a couple, parent and child, or with other family members) and questions on anthropometric data. Body mass index (BMI) was calculated as body weight (kg) divided by height² (m²). Aspects of dental health behavior included frequency of tooth brushing (more than twice/day, twice/day, once/day, or less frequently), frequency of use of extra cleaning devices such as dental floss or an interdental brush (every day, sometimes, never), and regular visits to a dentist for the purpose of dental disease prevention (yes or no). Condition of remaining teeth (edentulous or not edentulous) was also recorded.

Lifestyle was assessed by means of questions about mental condition, alcohol consumption, smoking habit, physical activity, social activity, dietary habits and presence of systemic disease. Mental condition included present relaxation (well, moderately well,

moderately poor, or poor), duration of sleep, consumption of alcohol or taking medicine for the purpose of falling asleep (no, occasionally, or every day), sleeping (well, moderately well, moderately poor, or poor), and mental stress (never, rarely, sometimes, or often). Alcohol consumption was based on the frequency of consumption of beverages per week (everyday, 3 times or more, less than 3 times, or none). For assessment of smoking habit, residents were asked to classify themselves as non-smokers, regular smokers, occasional smokers, or ex-smokers (14). Physical activity was assessed by the frequency of active movement for work for 30 min or more (everyday, sometimes, rarely, or never) and extra physical exercise during leisure time (everyday, sometimes, rare, or never) (18). Social activity was assessed by experience of social volunteer work (often, sometimes, rarely, or never), leading a worthy life (yes or no), and number of intimate relatives and friends. Dietary habits were based on frequency of eating breakfast (every morning, 3-5 times/week, 1-2 times/week, or never), degree of likes and dislikes of foods (much, moderate, slight, or none), attention to dietary combination (always, sometimes, rarely, or never), and attention to intake of sugar and salt (always, sometimes, rarely, or never). The presence of systemic disease was recorded as positive if one or more typical systemic diseases was checked in the checklist of diseases that included cancer, hypertension, heart diseases, hyperlipidemia and diabetes mellitus.

The data from dentate subjects were analyzed. Each dental health behavior, i.e.,

frequency of tooth brushing, frequency of use of extra cleaning devices and regular visits to a dentist, was separately analyzed for association with lifestyle. First, each lifestyle factor was employed as an independent variable in a univariate unconditional logistic regression analysis in which the dependent variables were three dental health behaviors, and the odds ratio (OR) together with the 95% confidence interval (95% CI) were calculated. In stepwise multivariate logistic analysis, the factors that showed a significant correlation with dental health behavior in the univariate unconditional logistic analysis were used as the independent variables, and variables with a significant relation to each dental health behavior were selected. All data were analyzed using an SPSS statistical package (11.0 J for Windows, SPSS Japan, Tokyo, Japan).

Results

Questionnaires were sent to all 2,359 residents, and responses were received from 1,533 residents. A total of 1,181 residents were dentate. Table 1 shows the percent distributions of the target population and respondents by age and gender.

The data from the dentate residents were used for further analysis. The distribution of subjects according to oral health behaviors is shown in Table 2. About 54% of the subjects brushed their teeth twice/day or more, and 29% of them sometimes used extra tooth cleaning devices. The percentage of subjects who regularly visited a dentist

for the purpose of dental disease prevention was low (6.2%).

Table 3 shows the relationships between dental health behaviors and all of the dependent variables analyzed using univariate unconditional logistic analysis. Advanced age, male gender, and smoking habit showed significantly negative associations with tooth brushing frequency and use of extra cleaning devices. The residents who felt stress and those who considered dietary combination were apt to brush their teeth more frequently and to use extra cleaning devices. Occupation and lifestyle variables such as duration of sleep and physical exercise during leisure time were related to tooth brushing frequency but not to the use of extra cleaning devices. Experience of social volunteer work was positively associated with use of extra cleaning devices. Demographic factors showed no significant associations with regular visits to a dentist. However, physical activity and physical exercise were significantly associated with regular visits to a dentist. The subjects who gave consideration to dietary combination were more predisposed to visit dentists regularly compared to those who did not.

More detailed analysis by stepwise logistic regression analysis changed the results in some cases. Six factors were selected as significant variables for tooth brushing frequency, 5 factors were selected for use of extra cleaning devices, and 2 factors were selected for regular visits to a dentist (Table 4). Tooth brushing frequency was still clearly related with advanced age and smoking habit. Subjects in the older age group (OR=0.49 for

the 40-64-year-old group; OR=0.27 for the group of subjects 65 years old or over) and subjects who smoked or had smoked (OR=0.47 for the regular or occasional smokers; OR=0.51 for the ex-smokers) brushed their teeth less frequently. Less physical exercise in leisure time (OR=0.68) and less attention to intake of sugar (OR=0.64) were significantly associated with decrease in tooth brushing frequency. Associations of female gender with increase in tooth brushing frequency (OR=1.65) and use of extra cleaning devices were weak (OR=1.71) but significant. The subjects who had no experience of social volunteer work (OR=0.57) and those who had no systemic diseases (OR=0.61) tended not to use extra cleaning devices. The feeling of stress (OR=1.46) was associated with use of extra cleaning devices. Two factors showed associations with regular visits to a dentist, but the associations were weak. The subjects who considered dietary combination and who lived alone tended to visit a dentist regularly. Associations of physical activity and physical exercise became not significant, though they were selected by univariate analysis.

Discussion

In a national oral health survey in Japan (19), the percentage of subjects who brushed their teeth twice/day or more was 67%. In our study, about 40% of the subjects answered that they brushed their teeth twice/day or more. Differences between dental health behaviors in urban and rural areas have been reported (13). Therefore, the population in this study is

thought to be a representative of rural area populations rather than the general population of Japan.

Females were more apt than were males to brush their teeth more frequently and use extra cleaning devices. This result is supported by results of past studies (4, 6, 8, 12, 14). Among 1,012 55-year-old Finnish citizens, 30.4% of the females brushed their teeth twice/day and 27.0% used extra cleaning devices, whereas only 14.4% and 22.7% of the males did so. This trend was significant after adjusting the other factors examined using by multiple logistic analyses (14). The reason for more frequent tooth brushing by females has been reported to be aesthetic or caused by social norms (3, 14). Encouragement for tooth brushing is therefore needed more for males than for females (8).

Aging was a factor contributing to decrease in tooth brushing frequency. The odds ratios (ORs) of increase in tooth brushing frequency were 0.49 in the 40-64-year-old group and 0.27 in the group of 65 years old or over when the 18-39-year-old group was used as a control group (Table 3). These results are supported by results of a previous Japanese study (20). On the other hand, Ronins *et al.* (8) found no significant association between aging and tooth brushing frequency. However, they compared the percentages of subjects who brushed daily (once/day or more) in several age groups, whereas we focused on subjects who brushed their teeth twice/day or more. With regard to the use of extra cleaning devices, OR was 1.21 for the 40-64-year-old group. This generation generally

loses teeth because of periodontal disease (21), and people in this age group are more conscious of oral health (20). Therefore, aging might have a greater effect on use of extra cleaning devices than on tooth brushing frequency. However, the oldest group (65 years old or over) used extra cleaning devices less frequently (OR=0.56 than did the youngest group. This result is different results of studies in Canada (6) and the US (8). The percentage of subjects in the oldest group (65 years old or over) who used an interdental brush (34%) was significantly higher than that (25%) in the younger group ranging from 50-64 years of age (6). The OR of flossing was 2.47 for the older group (55 years old or over) when compared with that in the younger (30-39 years old) group (8). Thus, in Japan, more encouragement should be given, particularly to older people, to use extra cleaning devices.

Healthier smoking behavior and more physical exercise were significantly associated with increase in tooth brushing frequency. Even ex-smokers, as well as current regular or occasional smokers, brushed their teeth less frequently than subjects who have never smoked. This result is supported by the results of a past study (11). It was also found in the present study that social activity as assessed by experience of social volunteer work was correlated with dental health behavior.

Deinzer *et al.* (15) found psychological stress induces more accumulation of dental plaque among medical students. Therefore, we hypothesized that any mental stress has an

adverse effect on dental health behavior. However, frequent feeling of stress was significantly related to increase in tooth brushing frequency or use of extra cleaning devices (Tables 3 and 4). The reason of the difference between our result and the finding by Deinzer *et al.* remains unclear. One possibility is that we could not identify the type of stress exactly by the questionnaire. They focused on only academic stress and assumed that this type of stress induces neglect of oral hygiene (15). Although we asked the subjects about their mental situation based on duration of sleep and use of alcohol/medicine for falling asleep, the results were not significant.

We also hypothesized that people with systemic disease are more conscious about their health and consequently have healthier dental behavior. It was in fact found in the present study that the presence of systemic disease was correlated with use of extra cleaning devices (Table 4): 35.3% of subjects with hyperlipidemia and 44.8% of those with diabetes mellitus used extra cleaning devices, whereas only 29.6% and 29.4% of the subjects without those diseases used extra cleaning devices (data not shown).

Factors significantly related to regular visits to a dentist were not identified. Subjects living alone were more apt to visit a dentist regularly than were subjects living together with many family members. It is possible that subjects living alone visited a dentist more regularly because they were oriented to self-consciousness. A significant effect of parental characteristics on regular visits to a dentist by children has been reported

(16). It is possible that family characteristics also affect dental health behavior in adults. Careful consideration to dietary combination was related to regular visits to a dentist, indicating an association between healthier lifestyle and dental health behavior. However, unlike the results of previous studies (10, 14), neither demographic factors (age and gender) nor socioeconomic factors correlated with regular visits to a dentist. Those previous studies were conducted in urban areas, and the percentages of subjects who visited dentists regularly were over 70%, much higher than the 6.2% in our study.

Occupational status was not a factor strongly influencing tooth-brushing behavior. This result differs from results of past studies (8, 9, 12, 14). The reason for the discrepancy between the results of past studies and the present study might result from the difference in occupational classification. In those previous studies, income and education were taken into consideration for classification of subjects. However, since Japanese generally feel uncomfortable to answer to such questions, we were only able to divide subjects according to type of work. The classification used in the present study is not suitable for determination of socio-economic status.

In summary, aging and smoking behavior were factors contributing to decrease in tooth brushing frequency. Experience of social volunteer work and presence of systemic diseases were correlated to the use of extra cleaning devices. Associations of female gender with frequency of tooth brushing and use of extra cleaning devices were weakly

positive. The subjects who considered dietary combination carefully and those who lived alone were predisposed to visit a dentist regularly. These results indicate that dental health behavior is associated with lifestyle as well as demographic factors.

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