

## Original

# Association between smoking, exercise habits and dental checkups among community residents in Japan

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## SUMMARY

**Background** : Poor lifestyle is a risk factor for oral diseases, and dental checkups are very useful for preventing oral disease. But association between lifestyle and dental checkups is unclear. The aim of this study was to examine the association between lifestyle and participation in dental checkups.

**Methods** : A cross-sectional questionnaire-based survey was conducted in a city of Japan, from where we were asked to evaluate the health promotion program conducted in the city. Three thousand subjects aged 20 years or over were randomly selected from about 35,000 inhabitants. Completed questionnaires were obtained from 1,670 persons (741 men and 929 women). The odds ratio (OR) with 95% confidence interval for having dental checkups was calculated using age-adjusted logistic regression models.

**Results** : Of 1,670 subjects, 57.4% of men and 53.7% of women had dental checkups. The current smoker and ex-smoker rate were 30.2% and 29.2% for men and 9.6% and 10.7% for women, respectively. The proportion of subjects who did not perform 30 minutes of moderate-intensity exercise twice or more a week was 60.6% in men and 70.2% in women. Compared with non-smokers, the OR of having dental checkups was significantly lower among current smokers : 0.59 for men and 0.53 for women. There were no significant differences among ex-smokers compared with non-smokers. The OR of having dental checkups was significantly lower for women who never performed exercise : 0.55.

**Conclusions** : We conclude that people who have poor lifestyle, especially smokers and women who never perform exercise, should be advised to have dental checkups.

**Key Words** : dental checkup, lifestyle, oral health, risk factor, smoker

## INTRODUCTION

Tooth loss and other oral conditions impact on quality of life, being associated with lower morale and lower levels of life satisfaction<sup>1)</sup>. The main reasons for losing teeth are dental caries and periodontal disease. In Ja-

pan, over 90% of people aged over 20 years old have a history of dental caries<sup>2)</sup>. Moreover, over 70% of people aged over 20 years old show signs of periodontal diseases<sup>2)</sup>. Dental caries and periodontal disease develop gradually, without obvious symptoms such as pain in their early stage<sup>3)</sup>. Dental checkups are an effective method for discovering various oral health problems in their early stage.

Dental checkups are recommended for healthy individuals on a scientific basis<sup>4)</sup>. Recently, checkup frequency was advised based on individual risk factors such as an individual's oral health status<sup>5,6)</sup>. In Japan, the Ministry of Health, Labour and Welfare has been

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promoting the “National Health Promotion Movement in the 21st Century (Health Japan 21)” as the third health promotion measure for citizens since 2000. “Health Japan 21” aims to reduce the number of deaths, prolong healthy years of life, and improve people’s quality of life. As part of the oral health objective, it is recommended that people have dental checkups, and the expected percentage of preventive dental checkups among adult population was 30%<sup>7)</sup>. In order to achieve this rate, many local governments have carried out “periodontal screening” for adults at the ages of 40, 50, 60, and 70 years. In 2009, the percentage of adults who had dental checkups within the previous year was 33.1% for men and 37.8% for women<sup>8)</sup>. However, more than half of the population had not had dental checkups.

Lifestyle factors such as smoking<sup>9)</sup>, alcohol consumption<sup>10)</sup> and lower levels of education<sup>11)</sup> are related to tooth loss and oral health. In Japan, the probability of tooth loss showed statistically significant relationships with smoking, alcohol drinking, and frequency of snacks between meals among adult men<sup>12)</sup>. Poor lifestyle was a risk factor for oral diseases, and people who have poor lifestyles should have dental checkups. Previous studies have found that factors interrupting dental checkups included being male<sup>13,14)</sup>, having lower income levels<sup>13,14)</sup>, nonwhites<sup>13)</sup>, low-levels of education, and bad self-perceived oral health<sup>15)</sup>. Previous studies<sup>16,17)</sup> found an association between lifestyle and participation in medical checkups. However, the association between lifestyle and dental checkups has been unclear.

The aim of this study was to examine the associations between lifestyle and dental checkups.

## METHODS

### *Study design and population*

The study design was a cross-sectional study. An anonymous cross-sectional questionnaire-based survey was conducted from January to February 2011 in a city in Tochigi prefecture, Japan, from where we were asked to evaluate the health promotion program conducted in the city. The city has a population of about 35,000. Regarding industrial structure, 7.9% of workers were engaged in primary industries, 34.4% of workers were engaged in secondary industries, and

57.7% of workers were engaged in tertiary industries. The present study was conducted by using some information from the questionnaire. Three thousand subjects aged 20 years old or over were randomly selected from about 35,000 inhabitants by official population registers. The number of respondents was 1,866, yielding a response rate of 62.2%. We excluded 196 persons from the analysis because of incomplete data. Thus, 1,670 persons (741 men and 929 women) were enrolled in the present study. Ethical approval was given by the ethics committee of Dokkyo Medical University (No. 23009).

### *Survey procedure*

The anonymous questionnaire comprised 29 items focused on personal information, e.g., age, sex, body weight, height, information on meals, smoking status, alcohol intake, dental status, stress, sleeping, rest, and physical activity. The questionnaires were mailed to the inhabitants, or health committees distributed the questionnaires.

Subjects were classified by age using the following question: “How old are you?” The possible responses were: (a) twenties; (b) thirties; (c) forties, (d) fifties; (e) sixties; (f) seventies; (g) eighties or over. Many local governments have carried out “periodontal screening” for adults at the ages of 40, 50, 60, and 70 years. We speculated that many people might attend screenings after age 40 years. We divided people into age groups of 39 years or under and 40 years or over. We also speculated that the oral condition might change after age 70 years. We thus divided people into age groups of 69 years or under and 70 years or over. Therefore, in this study, the age variable was divided into three categories: 20–39 years; 40–69 years;  $\geq 70$  years. Standard body weight (SBW) was calculated as height squared ( $m^2$ ) times 22. Proper weight was defined as  $SBW \pm 10.0\%$ . Lean people were defined as those with body weight less than  $SBW - 10.0\%$ . Obese people were defined as those with body weight more than  $SBW + 10.0\%$ . Alcohol intake was divided into two categories: non-drinkers or  $< 69$  g/day of ethanol;  $\geq 69$  g/day of ethanol (1 go contains 23 g of ethanol)<sup>18)</sup>. Moderate exercise was defined as moderate-intensity exercise (e.g., walk in a quick pace) for at least 30 minutes a day. Subjects were classified with regard

**Table 1** Proportions of responses according to sex classification in terms of lifestyle among 741 men and 929 women.

Variable	Categories	Total (N = 1670) (No.)	Men (N = 741) (No., %)	Women (N = 929) (No., %)	P value *
Having Dental Checkup					
	Yes	924	425 (57.4)	499 (53.7)	0.137
	No	746	316 (42.6)	430 (46.3)	
Age (years)					
	20-39	413	174 (23.5)	239 (25.7)	
	40-69	903	393 (53.0)	510 (54.9)	0.112
	≥70	354	174 (23.5)	180 (19.4)	
Sleep Duration (hours) †					
	6-8	825	386 (53.6)	439 (49.1)	0.072
	≤6, ≥8	789	334 (46.4)	455 (50.9)	
Smoking Status †					
	Non-smoker	1031	299 (40.6)	732 (79.7)	
	Ex-smoker	313	215 (29.2)	98 (10.7)	<0.001
	Current smoker	310	222 (30.2)	88 (9.6)	
Have Breakfast †					
	Every day	1378	596 (82.8)	782 (87.1)	0.016
	Not every day	240	124 (17.2)	116 (12.9)	
Alcohol Intake †					
	Non-drinkers or <69 g/day of ethanol	1623	695 (42.8)	928 (57.2)	<0.001
	≥69 g/day of ethanol	47	46 (97.9)	1 (2.1)	
Perform Moderate Exercise †					
	Twice or more a week	544	281 (39.4)	263 (29.8)	<0.001
	Never	1052	433 (60.6)	619 (70.2)	
Have snacks †					
	Less than twice a week	929	483 (66.8)	446 (49.2)	<0.001
	Three times or more a week	701	240 (33.2)	461 (50.8)	
Body Weight					
	SBW < ±10.0%	867	408 (55.1)	459 (49.4)	
	SBW ≤ -10.0%	305	88 (11.9)	217 (23.4)	<0.001
	SBW ≥ +10.0%	498	245 (33.1)	253 (27.2)	

SBW indicates standard body weight.

\*This analysis was performed by Chi-squared test.

† Data were missing from 16-74 people.

to performing moderate exercise using the following question: "Do you perform moderate exercise?" The possible responses were: (a) I perform every day; (b) I perform twice or more a week; (c) I do not perform. In this study, "Never perform moderate exercise" was defined as answer (c), and "Perform moderate exercise twice or more a week" was defined as answer (a) and (b). Subjects were classified with regard to having dental checkups using the following question: "Have you had dental checkups?" The possible responses were: (a) I had within one year; (b) I had within two years; (c) I did not have dental

checkups, but I want to have; (d) I did not have dental checkups, and I do not want to have. In this study, "Having dental checkups" was defined as answer (a).

#### Statistical analysis

The Chi-squared test was applied to determine the difference between men and women in terms of having dental checkups, age, sleep duration, smoking status, having breakfast, alcohol intake, performing moderate exercise, having snacks between meals, and body weight. The odds ratio (OR) with 95% confidence interval (95% CI) for having dental checkups was calcu-

**Table 2** Odds Ratios and 95% CIs of Dental Checkups in Terms of Lifestyle among Men.

Variable	Categories	OR <sup>*</sup>	95% CI <sup>*</sup>	OR <sup>†</sup>	95% CI <sup>†</sup>
Sleep Duration (hours) <sup>‡</sup>					
	6-8	1.00		1.00	
	≤6, ≥8	0.93	0.69-1.24	0.94	0.70-1.26
Smoking Status <sup>‡</sup>					
	Non-smoker	1.00		1.00	
	Ex-smoker	0.76	0.53-1.08	0.71	0.49-1.02
	Current smoker	0.57	0.40-0.81	0.59	0.41-0.84
Have Breakfast <sup>‡</sup>					
	Every day	1.00		1.00	
	Not every day	0.64	0.43-0.96	0.72	0.47-1.10
Alcohol Intake <sup>‡</sup>					
	Non-drinkers or <69 g/day of ethanol	1.00		1.00	
	≥69 g/day of ethanol	0.52	0.52-1.73	0.92	0.50-1.69
Perform Moderate Exercise <sup>‡</sup>					
	Twice or more a week	1.00		1.00	
	Never	0.77	0.60-1.04	0.81	0.60-1.11
Have snacks <sup>‡</sup>					
	Less than twice a week	1.00		1.00	
	Three times or more a week	1.17	0.86-1.60	1.20	0.88-1.64
Body Weight					
	SBW < ±10.0%	1.00		1.00	
	SBW ≤ -10.0%	1.72	1.08-2.73	1.80	1.13-2.88
	SBW ≥ +10.0%	1.30	0.94-1.79	1.27	0.92-1.76

OR indicates odds ratio ; CI, confidence interval.

\*This analysis was performed by logistic regression models.

† This analysis was performed by logistic regression models adjusted by age.

‡ Data were missing from 16-74 people.

lated using age-adjusted logistic regression models. All statistical analyses were conducted using SAS, version 9.3 (SAS Institute, Inc., Cary, USA).

## RESULTS

The proportions of persons according to sex classification in terms of lifestyle are shown in Table 1. Statistically significant differences were found between men and women for smoking status, having breakfast, alcohol intake, performing moderate exercise, having snacks between meals, and body weight.

Among 1,670 persons (741 men and 929 women), 924 persons (425 men and 499 women) had dental checkups.

The ORs of men who had dental checkups in terms of lifestyle are shown in Table 2. Compared with non-smokers, the age-adjusted OR of having dental checkups was significantly lower among current smokers. Compared with persons of proper weight, the age-ad-

justed OR of having dental checkups was significantly higher for lean persons.

The ORs of women who had dental checkups in terms of lifestyle are shown in Table 3. Compared with non-smokers, the age-adjusted OR of having dental checkups was significantly lower among current smokers. Compared with persons who performed moderate exercise twice or more a week, the age-adjusted OR of having dental checkups was significantly lower for persons who did not perform moderate exercise.

## DISCUSSION

To the best of our knowledge, the results of our study are the first to show associations between lifestyle and dental checkups. Current smokers, and women who never perform moderate exercise do not tend to have dental checkups, and lean men tend to have dental checkups.

A previous study showed that the proportion of peo-

**Table 3** Odds Ratios and 95% CIs of Dental Checkups in Terms of Lifestyle among Women.

Variable	Categories	OR*	95% CI*	OR†	95% CI†
Sleep Duration (hours)‡	6-8	1.00		1.00	
	≤6, ≥8	0.85	0.65-1.10	0.85	0.65-1.10
Smoking Status‡	Non-smoker	1.00		1.00	
	Ex-smoker	1.14	0.75-1.74	1.16	0.76-1.78
	Current smoker	0.52	0.32-0.84	0.53	0.33-0.85
Have Breakfast‡	Every day	1.00		1.00	
	Not every day	0.69	0.46-1.03	0.70	0.47-1.05
Alcohol Intake‡	Non-drinkers or <69 g/day of ethanol	1.00		1.00	
	≥69 g/day of ethanol	—	—	—	—
Perform Moderate Exercise‡	Twice or more a week	1.00		1.00	
	Never	0.56	0.42-0.74	0.55	0.40-0.74
Have snacks‡	Less than twice a week	1.00		1.00	
	Three times or more a week	0.82	0.63-1.07	0.83	0.64-1.08
Body Weight	SBW < ±10.0%	1.00		1.00	
	SBW ≤ -10.0%	0.94	0.68-1.31	0.96	0.69-1.33
	SBW ≥ +10.0%	0.94	0.69-1.28	0.93	0.68-1.26

OR indicates odds ratio ; CI, confidence interval.

\*This analysis was performed by logistic regression models.

† This analysis was performed by logistic regression models adjusted by age.

‡ Data were missing from 16-74 people.

ple who had general health checkups was higher among non-smokers than current smokers<sup>19)</sup>, which was consistent with the present study. With regard to physical activity, no previous studies directly reported the association between physical activity and the dental checkups, but some previous studies<sup>20,21)</sup> have shown an association between physical activity and healthy behavior. Considering the healthy behavior may include the dental checkups, these results of previous studies<sup>20,21)</sup> could support our study.

A previous study showed that the oral health status of adults who received regular oral health care including checkups was better than the oral health condition of those who were subjects of two separate national or municipal basis surveys of dental diseases<sup>22)</sup>. Research investigating the association between dental checkup and general health status is extremely scarce. On the other hand, the association between medical checkup and general health status has previously been report-

ed<sup>23,24)</sup>. The study was conducted in a town of Fukushima Prefecture, and the study population was residents aged over 65 years old<sup>23)</sup>. Compared with residents who did not participate in general health examination, residents who participated in general health examination had a high survival rate<sup>23)</sup>. An interview survey was conducted in a village of Shiga Prefecture, and the study population was residents aged over 66 years old<sup>24)</sup>. There were more hypertensive people (> 160/95 mmHg) in those who did not participate in examination ( $p < 0.01$ ). It will be clear from these examples that dental or medical checkups are associated with better oral health status or general health status.

The strength of the present study is in the use of a large population-based survey compared with previous studies<sup>14,20,21)</sup>. However, our study had several limitations. First, self-reported information may be considered less valid than direct observation. However, a previous study<sup>25)</sup> found self-reporting to be reliable

means of gathering data. Second, this survey did not investigate why people had dental checkups. Some people might have dental checkups due to some trouble, e.g., pain. Third, as this study did not have a high response rate, sampling bias might have occurred. Fourth, although six-monthly dental checkups have been customary in many countries<sup>15)</sup>, this study focused on dental checkups within one year. Fifth, the subjects of this study were residents of a single city. Multiregional and large scale studies are warranted.

### CONCLUSION

Current smokers and women who never perform exercise do not tend to have dental checkups. People who have poor lifestyle, especially smokers and women who never perform exercise, should be advised to have dental checkups.

#### *Competing interests*

None.

#### *Funding*

None.

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