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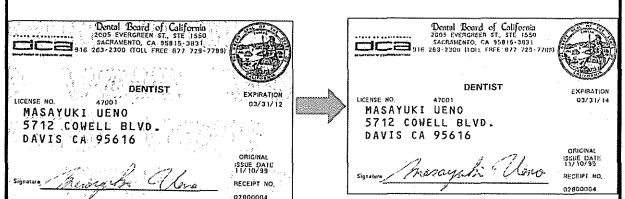

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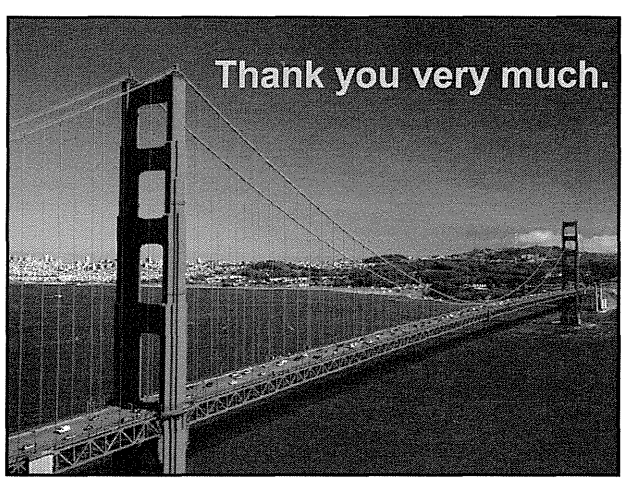

Ⅲ.　研究成果の刊行に関する一覧表

Ⅳ.　研究成果の刊行物・別刷

Ⅲ　研究成果の刊行に関する一覧表

発表者名	論文タイトル	発表雑誌名	巻号	ページ	出版年
Masayuki Ueno, Satoko Ohara, Manami Inoue, Shoichiro Tsugane, Yoko Kawaguchi.	Association between education level and dentition status in Japanese adults: Japan public health center-based oral health study	Community Dent Oral Epidemiol	40	481-487	2012
Masayuki Ueno, Yuichi Izumi, Yoko Kawaguchi, et al	Prediagnostic plasma antibody levels to periodontopathic bacteria and risk of coronary heart disease	Int Heart J	53	209-214	2012
日髙勝美、福泉隆喜、西原達次	歯科保健条例及び歯科口腔保健法の施行に伴う検討－都道府県歯科医師会に対するアンケート調査結果－	日本歯科医療管理学会雑誌	47(1)	70-78	2012
福泉隆喜、山口摂崇、日髙勝美、西原達次	在宅高齢者の咀嚼能力と身体機能の関連	日本歯科医療管理学会雑誌	47(4)	244-251	2013
森尾郁子、鶴田潤、竹原祥子、川口陽子	韓国の歯学教育事情－教育白書からみた歯科大学の状況－	日本歯科医学教育学会誌	28(2)	99-111	2012
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川口陽子	世界の予防歯科ウォッチング File 2 タイ 「Mild Seven」の画像警告表示	歯科衛生士	37 Feb	37	2013
川口陽子	世界の予防歯科ウォッチング File 3 韓国 歯科製品に印刷された「2080」のメッセージ	歯科衛生士	37 Mar	38	2013

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COMMUNITY DENTISTRY AND ORAL EPIDEMIOLOGY

Association between education level and dentition status in Japanese adults: Japan public health center-based oral health study

Masayuki Ueno[1], Satoko Ohara[2], Manami Inoue[3], Shoichiro Tsugane[3] and Yoko Kawaguchi[1]

[1]Department of Oral Health Promotion, Graduate School of Medical and Dental Sciences, Tokyo Medical and Dental University, Tokyo, Japan, [2]Department of Comprehensive Oral Health Care, Faculty of Dentistry, Tokyo Medical and Dental University, Tokyo, Japan, [3]Epidemiology and Prevention Division, Research Center for Cancer Prevention and Screening, National Cancer Center, Tokyo, Japan

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Abstract – *Objectives:* The aim of this study was to examine whether there is an educational gradient in dentition status among Japanese adults who are under the universal public health insurance system. *Methods:* Subjects were 1201 community residents aged 55–75 years as of May 2005 who completed a self-administered questionnaire and had a standard clinical oral examination. Analysis focused on the association of three education levels (junior high school, senior high school, and any college or higher education) with dentition status. *Results:* The proportion of subjects with 20 or more teeth ($P < 0.001$), number of teeth present ($P = 0.037$), number of filled teeth ($P = 0.016$), and two types of functional tooth units (FTUs): FTUs with natural teeth (n-FTUs) ($P < 0.001$) and FTUs with natural teeth and artificial teeth on implant-supported and fixed prostheses (nif-FTUs) ($P < 0.001$) were significantly associated with education level after adjusting for confounders. The significant trend of these values in dental indexes indicated a poorer dentition status with a lower education level. *Conclusions:* The results suggest that the level of education has an independent impact on dentition status in a group of Japanese adults, even after taking into account oral health-related factors. Therefore, providing appropriate oral health information from an early age within a compulsory school education program appears necessary to enhance health literacy and lessen the inequalities in dental health by educational level.

Key words: education level; functional tooth units; oral health status; universal public health insurance

Masayuki Ueno, Department of Oral Health Promotion, Graduate School of Medical and Dental Sciences, Tokyo Medical and Dental University, 1-5-45 Yushima, Bunkyo-ku, Tokyo 113-8549, Japan
Tel.: +81 3 5803 5477
Fax: +81 3 5803 0194
e-mail: ueno.ohp@tmd.ac.jp

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There are several indicators employed in the evaluation of socioeconomic status (SES). Generally, SES is measured by income, occupational status, or education level as the proxy, and these have been used singularly or in combination (1, 2). Education level is often used in research to distinguish people with a high status in society from those with a low status. Among SES measures, education level is fairly stable for most adults throughout their life, while income and occupational status are greatly influenced by economic fluctuations (3).

The relationship between SES and general health has been widely investigated, and the close link between SES and health is well established. An unfavorable health status is often found among people with a lower SES (4, 5). The association of a lower education level with a higher risk of general health problems has been often investigated among people in Europe and the United States (4, 6), but few

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studies have been conducted in the Japanese population (7–9). An earlier Japanese study reported that the relationship between education level and health behaviors was weaker in Japan than in other developed countries (7). There is, however, evidence that lower education levels are associated with worse general health conditions in Japan (8, 9).

Socioeconomic disparities in oral health have also been repeatedly demonstrated in many countries (10). People in lower SES groups are reported to have markedly poorer oral health than those in higher SES counterparts (11). There is also substantial evidence of a strong association between education level and oral health from many countries (12–14). One previous study reported that subjects with a low education level had a larger number of missing teeth compared with those with a high education level (15). Further, elderly Danes with a low education level had a tendency to have more decayed tooth (DT) surfaces compared with those with a high education level. On the other hand, individuals with a high education level had significantly more filled teeth (FT) than those with a low education level (16). A low education level in older people also has an independent negative impact on oral health-related quality of life (17).

To date, no study has assessed whether education level contributes to the inequalities of oral health in Japanese people. Thus, it is not possible to verify whether the relationship between education level and oral health status, identified in Europe and the United States, also exists in Japan. Japan is known to have a less marked socioeconomic differential compared with other developed countries. In addition, Japan has had a universal health insurance system, including dentistry, since 1961 (18). Thus, every Japanese person can receive most dental treatments, including restorations, prostheses, and oral surgery for the same price at any dental clinic by paying 30% of the cost.

Therefore, the aim of this study was to examine whether there is an educational gradient in dentition status among Japanese adults who are under the universal public health insurance system.

Methods

Subjects

The Japan Public Health Center-Based (JPHC) Study Cohort I was initiated in 1990 for the purpose of prospectively following the morbidity and mortality of various diseases, such as cancer and cardiovascular diseases, in a large population-based Japanese sample of administrative districts supervised by five public health centers (19).

In 2005, a dental survey was conducted for the first time in a cohort from the Yokote health center jurisdiction, Akita Prefecture. Thus, subjects in this study were a subsample in the Yokote health center jurisdiction, who had participated both in the JPHC Study Cohort I in 1990 and the dental survey in 2005.

Invitation letters were mailed to 15 782 residents (aged 55–75 years as of May 2005) who had joined the JPHC Study Cohort I, informing them about the purposes and procedures of the study and seeking their participation in the research. A total of 1518 subjects completed a self-administered dental questionnaire and presented for a clinical oral examination between July 2005 and January 2006. Information on demographics (date of birth and gender) and education was obtained from a self-completed questionnaire administered in 1990 as a part of the JPHC Study Cohort I. The final number of subjects used for the analysis was 1201 after excluding those with missing data for either the outcome or any explanatory variable. Ethical approval of this study was granted by the Ethics Committee of the National Cancer Center in Tokyo and Tokyo Medical and Dental University Ethical Committee, Japan.

Education levels

The response options of the question inquiring about the highest education level achieved by subjects were junior high school, senior high school, junior college or vocational school, and university or higher. The education level was then collapsed into three groups: low (junior high school), middle (senior high school), and high (any college or higher education) education levels.

Health behaviors

A self-completed dental questionnaire, administered at the time of the presentation for the oral examinations in 2005, consisted of health-behavior-related questions such as intake of sweet snacks or drinks (rarely, sometimes and everyday), dental check-up in the previous year (yes or no) and smoking status (nonsmoker, past smoker, and current smoker).

Dentition status

Clinical oral examinations of dentition status (excluding third molars) were conducted in 2005

according to the World Health Organization guidelines (20). The standardized clinical oral examinations were performed by one of 43 participating dentists trained in the survey methods. A handbook describing the clinical criteria was distributed to all participating dentists prior to the examination. The examination included the number of teeth present, DT, and FT, following which the prevalence of edentulousness and proportion of subjects with 20 or more teeth were calculated.

The total number of Functional Tooth Units (total-FTUs) was defined as the number of pairs of opposing natural teeth (i.e., sound, restored, and carious teeth) and artificial teeth on implant-supported, fixed (bridge pontics), and/or removable prostheses in posterior teeth occlusion. Carious teeth with extensive coronal destruction and missing teeth were regarded as nonfunctional. Two opposing premolars were defined as one FTU, and two opposing molars were defined as two FTUs. Therefore, a person with a complete dentition had 12 FTUs. The FTUs were further divided by tooth composition into n-FTUs (FTUs of natural teeth) and nif-FTUs (FTUs of natural teeth and artificial teeth on implant-supported and fixed prostheses).

Oral hygiene of teeth or dentures was visually evaluated by examining all teeth present or on the dentures and was scored as: (i) good = plaque covering less than one-third of tooth surfaces; (ii) fair = plaque covering more than one-third but less than two-thirds of tooth surfaces; and (iii) poor = plaque covering more than two-thirds of tooth surfaces. The worst score was recorded as representative for the subject.

Statistical analysis

The two-sample *t*-test was used for testing the difference of mean age between two groups, and chi-square test for the relationship of categorical values such as gender or education level. The linear trend of education level with demographics, health behaviors, and oral hygiene was analyzed by a linear regression model for continuous data and by the Mantel–Haenzel's chi-square test for categorical data. The linear trend of education level with each clinical dental outcome was assessed using a logistic regression for binary data and generalized linear regression of the negative binominal model with logit built-in link function for count data. The analysis was performed both unadjusted and adjusted for age, gender, intake of sweet snacks and drinks, dental check-up, smoking, and oral hygiene of teeth or dentures. All analyses were conducted using SPSS (SPSS Japan Inc., Tokyo, Japan) 18J software.

Results

The nonresponse analyses to compare participants and nonparticipants on socio-demographics assessed at baseline in 1990 indicated that the number of nonparticipants of the study (excluding those with missing data) was 10 236 (mean age: 66.2 ± 7.96, 5005 men, 5231 women) (Table 1). Nonparticipants had a similar mean age to participants (65.5 ± 5.77 years), although the difference was significant ($P = 0.003$). Male to female ratio of nonparticipants (48.9–51.1%) was similar to that of participants (46.4–53.6%) ($P = 0.102$). However, nonparticipants had a higher proportion of low education level (low: 49.8%, middle: 37.5%, and high: 12.7%) compared with participants in this study (low: 33.5%, middle: 50.6%, and high: 15.9%).

Mean ages (±SD) of men in the low, middle, and high education levels were 66.8 ± 5.8, 65.2 ± 5.5, and 64.8 ± 6.0, respectively, and those of women were 67.5 ± 5.5, 64.2 ± 5.6, and 63.8 ± 5.5, respectively. Age was inversely related with education level in both men (P for trend < 0.01) and women (P for trend < 0.001), with older ages in the lower education levels.

The proportions of men in the low, middle, and high education levels were 30.7% ($N = 171$), 51.3% ($N = 286$), and 18.0% ($N = 100$), respectively, and those of women were 35.9% ($N = 231$), 50.0% ($N = 322$), and 14.1% (N = 91), respectively. There was a significant distributional difference in gender by education level (P for trend = 0.023).

Intake of sweet drinks in men was significantly associated with education level (Table 2). More

Table 1. Socio-demographics of participants and nonparticipants

	Participants (n = 1201)	Nonparticipants (n = 10 236)	P value
Age			
Mean (SD)	65.5 (5.77)	66.2 (7.96)	0.003
Gender, n (%)			
Male	557 (46.4)	5005 (48.9)	0.102
Female	644 (53.6)	5231 (51.1)	
Education level, n (%)			
Low	402 (33.5)	5098 (49.8)	<0.001
Middle	608 (50.6)	3838 (37.5)	
High	191 (15.9)	1300 (12.7)	

Table 2. Health behaviors and oral hygiene among the study subjects by gender (n = 1201)

	Male education level				Female education level			
	Low	Middle	High	P for trend	Low	Middle	High	P for trend
Sweet snacks, n (%)								
Rarely	26 (11.2)	54 (18.9)	21 (21.0)	0.204	19 (8.2)	18 (5.6)	3 (3.3)	0.961
Sometimes	108 (63.2)	184 (64.3)	60 (60.0)		119 (51.5)	161 (50.0)	59 (64.8)	
Everyday	37 (21.6)	48 (16.8)	19 (19.0)		93 (40.3)	143 (44.4)	29 (31.9)	
Sweet drinks, n (%)								
Rarely	36 (21.1)	97 (33.9)	43 (43.0)	0.001	109 (47.2)	145 (45.0)	52 (57.1)	0.490
Sometimes	83 (48.5)	130 (45.5)	45 (45.0)		78 (33.8)	118 (36.6)	21 (23.1)	
Everyday	52 (30.4)	59 (20.6)	12 (12.0)		44 (19.0)	59 (18.3)	18 (19.8)	
Dental check-up, n (%)								
Yes	74 (43.3)	135 (47.2)	51 (51.0)	0.216	102 (44.2)	143 (44.4)	44 (48.4)	0.597
No	97 (56.7)	151 (52.8)	49 (49.0)		129 (55.8)	179 (55.6)	47 (51.6)	
Smoking, n (%)								
Nonsmoker	69 (40.4)	108 (37.8)	24 (24.0)	0.213	227 (98.3)	313 (97.2)	87 (95.6)	0.350
Past smoker	57 (33.3)	112 (39.2)	52 (52.0)		3 (1.3)	2 (0.6)	4 (4.4)	
Current smoker	45 (26.3)	66 (23.1)	24 (24.0)		1 (0.4)	7 (2 .2)	0 (0.0)	
Oral hygiene, n (%)								
Good	17 (9.9)	35 (12.2)	16 (16.0)	0.379	26 (11.3)	60 (18.6)	14 (15.4)	0.064
Fair	112 (65.5)	177 (61.9)	61 (61.0)		157 (68.0)	44 (13.7)	16 (17.6)	
Poor	42 (24.6)	74 (25.9)	23 (23.0)		48 (20.8)	74 (25.9)	23 (23.0)	

subjects who drank sweet drinks everyday were observed in the lower education levels (P for trend = 0.001). Intake of sweet snacks, dental check-up in the previous year, smoking status and oral hygiene of teeth or dentures were not significantly related with education level.

In the bivariate analysis, without adjustment by demographic and oral health-related variables, there were significant linear trends in dentition status by education level (Table 3). Prevalence of edentulousness declined with the rise of education level (P for trend < 0.001), whereas the proportion of subjects with 20 or more teeth increased as the education level went up (P for trend < 0.001).

No significant trends were observed in the number of DT and total-FTUs by education level (Table 4). Numbers of teeth present and FT showed an ascending trend by education level (P for trend < 0.001). Further, significantly more n-FTUs and nif-FTUs were found in subjects with a higher education level (P for trend < 0.001).

After adjustment for demographic and oral health-related variables, the significant association between edentulousness and education level disappeared. The proportion of subjects with 20 or more teeth (P for trend < 0.001), numbers of teeth present (P for trend = 0.037), FT (P for trend = 0.016), n-FTUs (P for trend < 0.001), and nif-FTUs (P for trend < 0.001) remained significantly related with education level. The values of these variables had a significantly increasing trend with the rise in education level.

Table 3. Prevalence of edentulousness and proportion of subjects with 20 or more teeth by education level

	Education level			
	Low	Middle	High	P for trend
Edentulousness				
% (No. of cases/subjects)	8.5 (34/402)	5.1 (31/608)	2.1 (4/191)	
OR (95% CI)	1.00	0.58 (0.35–0.96)	0.23 (0.08–0.66)	<0.001
Adjusted OR[a] (95% CI)	1.00	1.03 (0.58–1.83)	0.42 (0.14–1.27)	0.085
20 or more teeth				
% (No. of cases/subjects)	45.8 (184/402)	62.5 (380/608)	74.9 (143/191)	
OR (95% CI)	1.00	1.98 (1.53–2.55)	3.53 (2.41–5.17)	<0.001
Adjusted OR[a] (95% CI)	1.00	1.53 (1.16–2.01)	2.72 (1.81–4.07)	<0.001

[a]Adjusted for age, gender, intake of sweet snacks, intake of sweet drinks, dental check-up, smoking, oral hygiene of teeth or dentures.

Table 4. Mean numbers of teeth present, decayed teeth (DT), filled teeth (FT), and functional tooth units (FTUs) by education level

	Education level Low	Middle	High	*P* for trend
Number of teeth present				
Mean (SD)	16.33 (8.76)	19.21 (8.52)	21.71 (7.00)	<0.001
Adjusted Mean (SD)[a]	16.97 (17.80)	18.46 (19.09)	20.72 (21.35)	0.037
Number of DT				
Mean (SD)	1.01 (1.96)	1.20 (2.38)	1.28 (2.54)	0.184
Adjusted Mean (SD)[a]	0.82 (1.26)	0.93 (1.38)	0.95 (1.38)	0.248
Number of FT				
Mean (SD)	8.94 (6.16)	10.21 (6.22)	11.84 (6.03)	<0.001
Adjusted Mean (SD)[a]	9.03 (9.72)	9.76 (10.33)	11.46 (12.07)	0.016
Number of n-FTUs				
Mean (SD)	3.65 (4.01)	5.11 (4.42)	6.28 (4.32)	<0.001
Adjusted Mean (SD)[a]	3.76 (4.33)	4.68 (5.20)	5.78 (6.29)	<0.001
Number of nif-FTUs				
Mean (SD)	4.42 (4.58)	5.87 (4.75)	7.37 (4.64)	<0.001
Adjusted Mean (SD)[a]	4.58 (5.15)	5.40 (5.94)	6.79 (7.31)	<0.001
Number of total-FTUs				
Mean (SD)	10.09 (2.67)	10.14 (2.68)	10.49 (2.18)	0.084
Adjusted Mean (SD)[a]	10.05 (10.75)	10.14 (10.70)	10.53 (11.13)	0.623

[a]Adjusted for age, gender, intake of sweet snacks, intake of sweet drinks, dental check-up, smoking, oral hygiene of teeth or dentures.

Discussion

This cross-sectional study explored the association between education level and dentition status in a sample of Japanese adults. Even in Japan, where a universal public health insurance system is instituted, there existed a gradient in oral health by education level, and the gradient still persisted while controlling for other relevant demographic and health behavioral variables commonly used in many studies (11, 21, 22).

Health behaviors and oral hygiene used in this study have been demonstrated to be associated with dentition status (23–26). Dietary habit such as consumption of sweet snacks or sweet drinks is still one of risk factors of dental caries despite of the widely use of fluoride (23). Dental visit pattern is contributory to periodontal disease (24). Smoking has a positive association with missing teeth and periodontal disease (25, 26). Oral hygiene condition, especially plaque accumulation, is closely related with the development of dental diseases (27).

These possible confounding variables used to control for variability were not related with education level except for intake of sweet drinks in men. These findings were align with the report by Paulander et al. (15) who found no association of education level with dietary habit, dental care habits, and oral hygiene. Similarly, in respect to smoking status, Anzai et al. (7) also reported no differences by education level in Japanese men aged 50–59 years and 70 years or older as well as women aged 60–69 years and 70 years or older. Male subjects with a higher education level were less likely to take sweet drinks in this study.

The former studies reported that the percentage of edentulous subjects in low education level groups were significantly higher than that in higher education level groups (10, 15, 28). The unadjusted bivariate analysis in this study showed a similar trend, although this trend was attenuated and was not marginally significant ($P = 0.085$) after adjusting for confounders. Therefore, confounding factors influence the relationship between edentulousness and the education level to some degree.

Keeping at least 20 or more natural teeth until the age of 80 is the goal of the national oral health campaign in Japan (29). People with 20 or more teeth are reported to be able to eat most types of Japanese foods (30). Similar goals of having 20 and more functional natural teeth exist in the World Health Organization (31) and Federation Dentaire Internationale (32). There was a significant increasing trend in the proportion of subjects with 20 or more teeth as education level increased. Previous research has also indicated that there were fewer persons with 20 or more teeth in less educated groups (10). A further study showed a linear relationship between the prevalence of having fewer

than 24 teeth and SES, with prevalence decreasing at higher levels of perceived social status (11).

The present study showed that persons with a higher education level had significantly more FT compared with those with a low education level. Similar results were found in the National Health and Nutrition Examination Survey 1999–2004 (28). This trend might be explained by people's attitude and behavior toward oral health care utilization (10).

On the other hand, there was no significant association between education level and number of DT, confirming previous reports. For example, in a Danish study of the elderly, those with a lower education level tended to have more decayed surfaces compared with their counterparts, but the difference was not significant (16). A possible reason for not detecting a significant difference in this study is that the mean number of DT was very small, that is, close to 1, making statistical significance difficult to detect.

No difference by education level was found regarding total-FTUs, which were more than 10 at all education levels. This high number could be explained by missing teeth being replaced with the artificial teeth of dentures, resulting in the recovery of FTUs when calculated as total-FTUs, as has also been reported in previous studies (30, 33). In fact, any Japanese person can afford to have dentures made regardless of their SES, because it is relatively inexpensive under the Japanese universal public health insurance system. On the other hand, a significant oral health gradient was found in n-FTUs and nif-FTUs, indicating that less educated people were more likely to lose posterior occlusal relations with natural, implanted, and fixed prosthetic teeth. A previous study reported that recovery of total-FTUs by removable prosthodontic treatments might not yield a significantly improved masticatory function. Therefore, maintenance of occluding pairs with as many n-FTUs or nif-FTUs as possible is important in reducing the likelihood of chewing difficulty (30).

This study had certain limitations. The subjects used in this study may not have been representative of the general adult population in Japan, because their participation was voluntary. Intra- or interexaminer reliability was not obtained because of a large number of participating dentists. In addition, we only used the education level as a proxy for SES. It would be preferable to use multiple indicators, because each indicator covers a different aspect of SES. The nonresponse analyses indicate that there is a possibility that participants may have a little different socio-demographic characteristic from nonparticipants. Future research will be needed to confirm the current findings using a representative sample with multiple SES indicators.

This is the first study demonstrating that the level of education has an independent impact on dentition status, as a consequence of different treatment options by education level, in a group of Japanese adults. People with a lower education level tended to lose more teeth and wear removable prostheses, whereas those with a higher education level had more teeth and tended to receive treatments such as fillings, fixed prostheses, and implants.

The findings indicate that oral disease prevention strategies solely focusing on personal health behaviors may have a limited effect. Therefore, it is necessary to focus on the socioeconomic determinants of oral health that form the living and working environments in which oral health behaviors are created. Nine years of elementary and junior high school education are compulsory in Japan. The present study suggests that providing appropriate information from an early age through oral health education in compulsory school health programs is necessary to enhance health literacy and lessen the inequalities of dental health by educational level.

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Clinical Studies

Prediagnostic Plasma Antibody Levels to Periodontopathic Bacteria and Risk of Coronary Heart Disease

Masayuki UENO,[1] PhD, Yuichi IZUMI,[2] PhD, Yoko KAWAGUCHI,[1] PhD, Ai IKEDA,[3] PhD, Hiroyasu Iso,[3] PhD, Manami INOUE,[4] PhD, Shoichiro TSUGANE,[4] PhD, for the JPHC Study Group

SUMMARY

Many epidemiological studies have indicated that periodontitis is an important risk factor for coronary heart disease (CHD). We examined whether plasma antibody levels to 3 major periodontal pathogens, Aggregatibacter actinomycetemcomitans, Porphyromonas gingivalis, and Prevotella intermedia predicted the risk of CHD events.

A nested case-control research design (case: n = 191, control: n = 382), by matching gender, age, study area, date of blood collection, and time since last meal at blood collection, was employed in a large cohort of Japanese community residents.

Antibody levels of periodontopathic bacteria were associated with risk of CHD after adjusting for BMI, smoking status, alcohol intake, history of hypertension, history of diabetes mellitus, exercise during leisure time, and perceived mental stress. The association was different by age subgroup. For subjects aged 40-55 years, the medium (31.7-184.9 U/mL) or high tertile plasma antibody level (> 184.9 U/mL) of A. actinomycetemcomitans showed higher risk of CHD (medium: OR = 3.72; 95% CI = 1.20-11.56, high: OR = 4.64; 95% CI = 1.52-14.18) than the low tertile level (< 31.7 U/mL). The ORs of CHD incidence became higher with an increase in IgG level of A. actinomycetemcomitans (P for trend = 0.007). For subjects aged 56-69 years, the high tertile level (> 414.1 U/mL) of P. intermedia was associated with higher risk of CHD (OR = 2.65; 95% CI = 1.18-5.94) in a dose-response fashion (P for trend = 0.007).

The possible role of periodontopathic bacteria as a risk factor for CHD incidence was suggested by the results of this study by the elevated antibody level to these bacteria with the increased risk of CHD. (Int Heart J 2012; 53: 209-214)

Key words: Plasma antibody, Periodontopathic bacteria, Coronary heart disease

Periodontal diseases such as gingivitis and periodontitis are infectious disorders of the periodontal tissues caused by dental plaque accumulation. Gingivitis is a disease with reversible inflammation of the gingival tissues, whereas periodontitis is a chronic inflammation involving not only gingival tissues but also the periodontal membrane and alveolar bone.[1] Specific gram-negative anaerobic bacterial species, including Aggregatibacter actinomycetemcomitans (A. actinomycetemcomitans), Porphyromonas gingivalis (P. gingivalis), Prevotella intermedia (P. intermedia), Treponema denticola (T. denticola), Tannerella forsythia (T. forsythia) and Fusobacterium nucleatum (F. nucleatum) have been consistently associated with periodontal diseases.[2,3]

Periodontal diseases are highly prevalent dental diseases, along with dental caries.[4] A Japanese national survey of dental diseases conducted in 2005 reported that more than 80% of Japanese aged 45 years or older had some periodontal disease symptoms (ie, gingival bleeding or calculus deposition) and 42.2% of those aged 45 to 55 years had periodontal pockets.[5]

Coronary heart disease (CHD) is primarily caused by a condition called atherosclerosis, which is the narrowing of the coronary arteries that supply blood and oxygen to the heart due to fatty buildup of plaque. According to the 2010 Japanese vital statistics, heart diseases ranked as the second leading cause of mortality in Japan after cancer, accounting for 15.8% of all deaths, approximately half of which were CHD.[6]

CHD has a number of risk factors, including smoking, alcohol, and obesity.[7-10] Furthermore, many epidemiological studies have indicated that periodontitis is involved in the initiation and progression of CHD. They showed a positive association between various measures of periodontal diseases and CHD risk, even after adjustment for a variety of potential confounders of these associations.[11] However, the status of periodontal disease in most of the studies was based on clinical periodontal examinations or self-reporting. Therefore, the interpretation of such results should be made cautiously because standardized measures for periodontal disease were lacking.

The systemic immunological response to periodontitis can be measured as elevated serum antibody levels against cer-

From the Departments of [1] Oral Health Promotion and [2] Periodontology, Graduate School of Medical and Dental Sciences, Tokyo Medical and Dental University, Tokyo, [3] Public Health, Department of Social and Environmental Medicine, Graduate School of Medicine, Osaka University, Osaka, and [4] Epidemiology and Prevention Division, Research Center for Cancer Prevention and Screening, National Cancer Center, Tokyo, Japan.

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Address for correspondence: Masayuki Ueno, PhD, Department of Oral Health Promotion, Graduate School of Medical and Dental Sciences, Tokyo Medical and Dental University, 1-5-45 Yushima, Bunkyo-ku, Tokyo 113-8549, Japan.

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tain periodontopathic bacteria. Serum antibodies to such periodontal pathogens have been used to identify microbial species that are associated with status and progression of periodontal disease, and to define disease-susceptible or disease-resistant individuals.[12]

Previous studies that employed the antibody levels of periodontal pathogens have provided evidence that infections caused by main periodontal pathogens like A. actinomycetemcomitans and P. gingivalis are associated with an increased risk of myocardial infarction and acute coronary syndrome.[13,14] Pussinen, *et al* reported that high serum antibody levels to A. actinomycetemcomitans were associated with the subclinical, prevalent, and future incidence of CHD.[15] A Japanese study demonstrated that serum antibody levels against periodontopathic bacteria were higher among periodontitis patients with CHD than those without CHD.[16]

However, very few longitudinal studies have investigated a relationship between the systemic immune response to a particular strain of periodontopathic bacteria and the incidence of CHD. In particular, a large-scale prospective cohort study to assess the association between periodontitis and the development of CHD has not yet been conducted in Japanese populations. Therefore, the objective of the current study was to prospectively examine whether plasma antibody levels to 3 major periodontal pathogens, A. actinomycetemcomitans, P. gingivalis and P. intermedia, predicted the risk of CHD events in a large cohort of Japanese community residents.

METHODS

Study cohort: Subjects in this nested case-control study were those who had participated in the Japan Public Health Center-based (JPHC) prospective studies I and II, which intended to prospectively follow the morbidity and mortality of various diseases, such as cancer and cardiovascular diseases, in a large population-based Japanese sample. The JPHC Study Cohort I was initiated in 1990 and included residents aged 40-59 years as of December 31, 1989 in 5 public health center areas. The second group (Cohort II) involved 6 public health center areas, was started in 1993 and included residents aged 40-69 years as of January 1, 1993. Details of this study are described in previous articles.[17,18]

In this study, 191 subjects voluntarily provided 10 mL of blood samples at baseline from 1990 to 1992 in Cohort I or 1993 to 1995 in Cohort II and were diagnosed with CHD during the follow-up period. For each case, two controls were selected by matching gender, age (within 3 years), study area (city or town and village), date of blood collection (within 6 months), and time since last meal at blood collection (within 5 hours). Thus, the number of controls in this study was 382.

Ethical approval of this study was granted by the Ethics Committee of the National Cancer Center in Tokyo, and Ethical Committees of Osaka University and Tokyo Medical and Dental University, Japan.

Socio-demographic and health behavioral information: A self-administered questionnaire, which inquired about height, weight, smoking and drinking habits, medical history (hypertension and diabetes mellitus), leisure time physical activity, and perceived mental stress was distributed to all participants at baseline in 1990 or 1993. BMI was calculated using the formula (weight (kg)/height $(m)^2$).

Confirmation of CHD incidence: A total of 78 hospitals were registered within the sampling area of the JPHC cohort. They were all major hospitals at which CHD disease patients could be admitted. The medical records were reviewed by physicians, blinded to the patient's lifestyle data. CHD events were included in the study if they occurred after the date of return of the baseline questionnaire and before December 31, 2007. The details of the surveillance for CHD were described in a previous paper.[7] Briefly, CHD was confirmed in the medical records according to the criteria of the Monitoring Trends and Determinants of Cardiovascular Disease (MONICA) project, which requires evidence from ECGs, cardiac enzymes, or autopsy.[19]

Plasma antibody titer measurement: The plasma and buffy layer of the baseline blood sample were divided into 4 tubes holding 1.0 mL each (3 tubes for plasma and one for the buffy layer) and stored at -80°C until analysis.

Plasma samples were analyzed for the IgG antibody against cell surface antigens for the following 3 suspected periodontal pathogens: A. actinomycetemcomitans ATCC 33384, P. gingivalis ATCC 33277 and P. intermedia ATCC 25611, using an enzyme-linked immunosorbant assay (ELISA) with sonicated whole cell extracts of each periodontal pathogen. The microtiter plates coated with sonicated extracts (100 μL) were stored for 1 day at 4°C and washed 3 times with PBS-T (0.05% Tween-20/PBS), following which they were blocked with 350 μL of 2% BSA + 5% Sucrose + 0.1% NaN3/PBS (pH = 7.0) solution. The plates were incubated for 4 hours at 37°C.

Plasma samples were diluted 420-fold with 1% BSA (Sigma, A-4503) + 0.4% hydrolyzed gelatin (Sigma, G-0262) + 0.1% NaN3 + 5mM magnesium chloride + 5mM EDTA-Na2/0.1M phosphoric acid buffer solution (pH 7.0) and 6 different concentrations of reference solution were prepared with the same diluted solution.

Subsequently, 100 μL of the diluted plasma sample and reference solution were applied to each well, stored for 1 hour at 20-30°C, and washed with 350 μL of 0.05% (w/v) Tween-20/PBS 6 times. To each well was added 100 μL of labeled antibody (IgG antibody: anti-human IgG (rabbit) conj. POD (DAKO), Antibody Aa: 7500IgG, Antibody Pg: 3000IgG, Antibody Pi: 2000IgG), stored 1 hour at 20-30°C and washed with 350 μL of 0.05% (w/v) Tween-20/PBS 8 times.

After adding 100 μL of enzyme substrate solution (DAKO, TMB+) and stopping the reaction with 100 μL of 2N sulfuric acid, the absorbance of each well was read using a Microplate Reader (SOFT MaxTM) at 450 nm with a 650 nm reference wavelength. Individual plasma antibody levels of periodontal pathogens (U/mL) were calculated from the reference curves of antibody concentrations of periodontal pathogens and absorbance density.

Statistical analysis: Baseline characteristics of the cases and controls were evaluated by the Mantel-Haenszel test with matched set strata. Crude odds ratios (ORs) and 95% confidence interval (CIs) for CHD risk were estimated by the tertile level of plasma antibody of the 3 periodontopathic bacteria using a conditional logistic regression model. Tertile cutoff points of each bacterium were based on the frequency distribution of all subjects: A. actinomycetemcomitans (< 31.7, 31.7-184.9, > 184.9), P. gingivalis (< 57.0, 57.0-134.9, > 134.9) and P. in-

termedia (< 235.9, 235.9-414.1, > 414.1). Adjusted ORs were computed by entering the following potential confounding variables: BMI (continuous), smoking status (never, past, current), alcohol intake (nondrinkers or former drinkers, less than week-

Table I. Characteristics of Cases and Matched Control Subjects

	Cases (n = 191)		Controls (n = 382)		P
	Mean / N	SD / %	Mean / N	SD / %	
Age, years	56.7	7.7	56.6	7.6	-
Gender (male), %	119	62.3	238	62.3	-
BMI, kg/cm^2	24.5	3.2	24.3	9.6	0.824
Current smoking, %	78	40.8	105	27.5	0.002
Heavy alcohol intake (≧ 450 mg/week), %	16	8.4	45	11.8	0.271
History of hypertension, %	61	31.9	58	15.2	< 0.001
History of diabetes mellitus, %	35	18.3	34	8.9	0.002
Leisure exercise time (≧ 1-2 times/week), %	42	22.0	69	18.1	0.313
High mental stress, %	39	20.4	49	12.8	0.018
Aggregatibacter actinomycetemcomitans IgG, U/mL	269.7	441.5	249.6	439.7	0.606
Porphyromonas gingivalis IgG, U/mL	148.2	164.1	136.8	144.3	0.397
Prevotella intermedia IgG, U/mL	395.9	248.8	358.1	233.6	0.075

Table II. Odd Ratios (95% CI) of CHD According to Tertiles of Antibody Levels to Periodontopathic Bacteria

	Antibody Tertiles			P for Trend
	Low	Medium	High	
Total subjects				
Aggregatibacter actinomycetemcomitans, U/mL	< 31.7	31.7-184.9	> 184.9	
Cases / Controls	56 / 135	68 / 123	67 / 124	
Crude OR (95% CI)	1.00	1.34 (0.87-2.07)	1.31 (0.85-2.03)	0.227
Adjusted OR (95% CI)	1.00	1.19 (0.71-1.99)	1.65 (0.98-2.80)	0.061
Porphyromonas gingivalis, U/mL	< 57.0	57.0-134.9	> 134.9	
Cases / Controls	62 / 129	67 / 124	62 / 129	
Crude OR (95% CI)	1.00	1.13 (0.74-1.72)	1.00 (0.65-1.53)	0.993
Adjusted OR (95% CI)	1.00	1.04 (0.63-1.71)	1.00 (0.59-1.70)	0.998
Prevotella intermedia IgG, U/mL	< 235.9	235.9-414.1	> 414.1	
Cases / Controls	54 / 137	60 / 131	77 / 114	
Crude OR (95% CI)	1.00	1.18 (0.75-1.86)	1.81 (1.15-2.86)	0.010
Adjusted OR (95% CI)	1.00	1.39 (0.81-2.39)	1.89 (1.10-3.23)	0.021
Age 40-55 years				
Aggregatibacter actinomycetemcomitans, U/mL	< 31.7	31.7-184.9	> 184.9	
Cases / Controls	16 / 61	24 / 33	32 / 50	
Crude OR (95% CI)	1.00	2.55 (1.14-5.72)	2.51 (1.16-5.43)	0.019
Adjusted OR (95% CI)	1.00	3.72 (1.20-11.56)	4.64 (1.52-14.18)	0.007
Porphyromonas gingivalis, U/mL	< 57.0	57.0-134.9	> 134.9	
Cases / Controls	28 / 51	18 / 46	26 / 47	
Crude OR (95% CI)	1.00	0.73 (0.35-1.52)	0.90 (0.46-1.76)	0.757
Adjusted OR (95% CI)	1.00	0.81 (0.27-2.42)	0.94 (0.36-2.46)	0.894
Prevotella intermedia IgG, U/mL	< 235.9	235.9-414.1	> 414.1	
Cases / Controls	26 / 54	22 / 42	24 / 48	
Crude OR (95% CI)	1.00	1.21 (0.58-2.52)	0.86 (0.42-1.79)	0.695
Adjusted OR (95% CI)	1.00	1.67 (0.62-4.46)	1.19 (0.41-3.47)	0.747
Age 56-69 years				
Aggregatibacter actinomycetemcomitans, U/mL	< 31.7	31.7-184.9	> 184.9	
Cases / Controls	40 / 74	44 / 90	35 / 74	
Crude OR (95% CI)	1.00	0.90 (0.53-1.53)	0.85 (0.48-1.48)	0.556
Adjusted OR (95% CI)	1.00	0.65 (0.33-1.26)	0.96 (0.47-1.94)	0.904
Porphyromonas gingivalis, U/mL	< 57.0	57.0-134.9	> 134.9	
Cases / Controls	34 / 78	49 / 78	36 / 82	
Crude OR (95% CI)	1.00	1.29 (0.75-2.23)	0.97 (0.55-1.71)	0.910
Adjusted OR (95% CI)	1.00	1.19 (0.60-2.37)	0.96 (0.45-2.04)	0.907
Prevotella intermedia IgG, U/mL	< 235.9	235.9-414.1	> 414.1	
Cases / Controls	28 / 83	38 / 89	53 / 66	
Crude OR (95% CI)	1.00	1.31 (0.71-2.43)	2.45 (1.29-4.65)	0.004
Adjusted OR (95% CI)	1.00	1.74 (0.76-3.94)	2.65 (1.18-5.94)	0.007

Adjusted for BMI, smoking status, alcohol intake, history of hypertension, history of diabetes mellitus, exercise during leisure time, and perceived mental stress.

ly, < 150 g/week, 150-299 g/week, 300-449 g/week, and ≧ 450 g/week), history of hypertension (yes/no), history of diabetes mellitus (yes/no), exercise during leisure time (rarely, 1-3 times/month, 1-2 times/week, 3-4 times/week, almost every day) and perceived mental stress (low, moderate, high) into the conditional logistic regression model. Since the interaction term suggested that the relationship of periodontopathic bacteria and CHD varied by age, ORs were further computed stratified by two baseline age subgroups using the mean age: 40-55 years and 56-69 years (*P* for interaction by age: A. actinomycetemcomitans = 0.022, P. gingivalis = 0.878, and P. intermedia = 0.004). All statistical analyses were performed with SAS software, version 9.2.

Results

The basic characteristics of cases and matched controls at baseline are presented in Table I. The mean age at baseline in the cases was 56.7 (± 7.7 SD) and that in controls was 56.6 (± 7.6 SD). The percentage of males was 62.3% in each group.

The cases (40.8%) smoked more than the controls (27.5%, $P = 0.002$) and also had higher percentages of history of hypertension (31.9%) and diabetes mellitus (18.3%) compared to controls (15.2%, $P < 0.001$ and 8.9%, $P = 0.002$, respectively). Further, the cases (20.4%) were more likely to perceive high mental stress than controls (12.8%, $P = 0.018$).

No differences were detected regarding BMI, alcohol intake, exercise during leisure time, and the 3 periodontopathic bacterial antibody titers in the plasma.

Table II shows ORs and 95% CIs of CHD incidence risk according to tertile antibody values of the 3 periodontopathic bacteria in the plasma. Subjects with the high tertile of P. intermedia antibody titer had a higher incidence of CHD (crude OR = 1.81; 95%CI = 1.15-2.86 and adjusted OR = 1.89; 95% CI = 1.10-3.23) than those with a low tertile, and there was a dose-dependent increase in incidence of CHD (*P* for trend = 0.010 for crude OR, *P* for trend = 0.021 for adjusted OR) with the plasma antibody of P. intermedia. There were no associations of CHD incidence with plasma antibody levels of A. actinomycetemcomitans and P. gingivalis.

The associations between the bacteria antibody titers and risk of CHD were analyzed for two baseline age subgroups: 40-55 years and 56-69 years. For subjects aged 40-55 years, a medium tertile (crude OR = 2.55, 95% CI = 1.14-5.72; adjusted OR = 3.72; 95% CI = 1.20-11.56) or a high tertile plasma antibody level (crude OR = 2.51; 95% CI = 1.16-5.43; adjusted OR = 4.64; 95% CI = 1.52-14.18) for A. actinomycetemcomitans showed a higher incidence of CHD than a low tertile plasma antibody level. The ORs of CHD incidence became higher with an increase in IgG titer level of A. actinomycetemcomitans (*P* for trend = 0.019 for crude OR, *P* for trend = 0.007 for adjusted OR). No associations with CHD incidence were observed for antibody levels of P. gingivalis and P. intermedia.

For subjects aged 56-69 years, a high tertile titer of P. intermedia (crude OR = 2.45, 95% CI = 1.29-4.65 and adjusted OR = 2.65, 95% CI = 1.18-5.94) had a higher incidence of CHD compared to a low tertile titer, and the titer of P. intermedia was associated with a dose-dependent increase in incidence of CHD (*P* for trend = 0.004 for crude OR. and *P* for trend = 0.007 for adjusted OR). Antibody levels of A. actinomycetemcomitans and P. gingivalis were not related with the incidence of CHD.

Discussion

In this population-based, longitudinal study, higher levels of periodontopathic bacteria A. actinomycetemcomitans and P. intermedia, measured as the plasma antibody titer, were significantly associated with an increased risk of CHD events. The association was different by age subgroup, ie, the relationship with A. actinomycetemcomitans was accentuated in subjects aged 40-55 years and that with P. intermedia in those aged 56-69 years.

The link between periodontal disease and CHD is complex and many publications have provided support to the hypothesis of a causal association.[3,20,21] Hypothesized mechanisms include the direct effect of a subgingival biofilm or an indirect effect through an immunologic response and activation of inflammation is involved in the pathogenesis of atherosclerotic plaque formation.[20,21] Endothelial dysfunction is the first step in the development of atherosclerosis. Periodontitis has been demonstrated to be related with endothelial dysfunction.[22] Dorn, *et al* show that periodontopathic bacteria such as P. gingivalis and P. intermedia invade coronary artery cells at a significant level.[23] Further, an elevated serum IgG level of A. actinomycetemcomitans is reported to be associated with atherosclerosis.[24]

The possible relationship of A. actinomycetemcomitans with CHD incidence has been documented in several studies. Spahr, *et al* measured subgingival pathogens in subjects aged 43 to 73 years with DNA-RNA hybridization, and found a positive association of the amount of A. actinomycetemcomitans with risk of CHD (OR = 2.70; 95% CI = 1.79-4.07).[25] Pussinen, *et al* reported significant associations between elevated levels of IgG antibodies against A. actinomycetemcomitans and cardiovascular disease events in subjects aged 25 to 64 years (OR = 1.64, CI = 1.00-2.69).[26]

A. actinomycetemcomitans is the major etiologic agent of localized aggressive periodontitis, and an increased level of serum antibody to A. actinomycetemcomitans is considered to represent a destruction of the periodontal structures; thereby posing a systemic challenge that disseminates the bacteria, leading to vascular activation.[27] Individuals who carry A. actinomycetemcomitans have a higher risk of periodontitis, particularly among a younger age population (35 years or younger), because this species possesses certain disease-relevant virulence.[27] A. actinomycetemcomitans is also reported to be an etiological agent in early-onset periodontal disease.[15,28,29] Thus, the augmented association of CHD with A. actinomycetemcomitans observed in the younger age subgroup of this study implies that people who already develop advanced periodontal disease at an early age may have a higher risk of CHD.

A previous study demonstrated that the presence of P. intermedia in periodontal pockets was associated with an increased risk of myocardial infarction (OR = 1.40 and 95% CI = 1.02-1.92) in subjects aged 35 to 69 years, after adjusting for potential confounding factors.[30] A case-control study among males aged 48 to 80 years by Nonnenmacher, *et al* documented a significantly higher frequency of subgingival P. intermedia in patients with coronary artery disease when compared to the

controls, after adjusting for smoking.[31] Further, Spahr, *et al* found a markedly higher number of P. intermedia in the subgingival biofilm of 43 to 73 year-old patients with CHD compared to age- and sex-matched controls. All these findings support our current results.[25]

However, the above studies were based on the amount of P. intermedia in the subgingiva. Few reports have used the antibody level of P. intermedia, in contrast to other periodontopathic bacteria, to examine the relationship with CHD. In a population-based study conducted for 45 to 64 year-olds in the United States, a high serum IgG antibody level to P. intermedia was associated with risk of CHD among never smokers.[32]

A relationship between P. intermedia and CHD was only detected in subjects aged 56-69 years in this study. This might be linked to the fact that P. intermedia play a major role during chronic periodontitis, with which older people are more likely to be afflicted, by regulating diverse inflammatory and immune responses to tissue destruction.[33]

Since no studies have investigated the association between bacteria antibody and CHD by stratifying for age, it is unknown why different pathogens play a role in the different age groups. Therefore, further research will be needed to clarify the molecular-biological mechanisms of the age-related relationships between CHD and P. intermedia and A. actinomycetemcomitans found in this study.

Serological evidence confirms that an infection caused by P. gingivalis is a contributor to an increased risk for CHD. Pussinen, *et al* reported in a dentate male population aged 45 to 74 years that CHD was more common among subjects who were seropositive for P. gingivalis compared to those who were seronegative.[34] However, we found no association between the plasma antibody to this species and risk of CHD. Similarly, several studies showed no significant connection between the presence of IgG antibodies to P. gingivalis and CHD, especially after adjusting for confounding variables.[15,32,35]

In spite of the similar infectious capability of P. gingivalis strains, the risk of CHD differs depending on the strain; a particular genotype of P. gingivalis with strong virulence is considered to be involved more in the mechanisms linking periodontitis and CHD.[16] The existence of different genotypes of P. gingivalis with different virulence may also contribute to the inconsistent relationship with CHD.

Our study had several strengths. We used antibodies to bacteria in examining the association between periodontal disease and CHD. Defining periodontal disease by clinical periodontal parameters, such as pocket depth or clinical attachment level, has been criticized when investigating the relationship with CHD, where long-standing exposure to the bacteria is the hypothesized risk factor, because they do not represent any systemic effect incurred by the periodontal disease. The most commonly used surrogates for systemic exposure are antibody titers, which indicate an immunological response against the periodontopathic bacterial infection and are thought to be a marker of inflammation. Antibody levels to serum periodontopathic bacteria are also closely related to the distribution of organisms in gingival plaque.[32]

Further, the control of important confounders that would strongly affect both periodontal health and cardiovascular outcomes is important in interpreting the findings. We used controls and cases, individually matched for age, sex and other related factors, and a sampling ratio of 1:2 was intended to ensure adequate statistical power. We also attempted to reduce potential confounding variables by statistically controlling for a number of CHD-related health indicators. In addition, the current prospective case-control design allows assessment of the causal role of periodontal pathogens in the development of CHD.

There are also limitations of our study that deserve consideration. Although serum antibody levels are considered stable over time, clinical periodontal status was not available, and it is not known whether the levels of antibody to periodontal organisms are the result of a prior incident or to active infection in the study population. In addition, information on remaining teeth, an important confounder for the antibody values,[31] was missing. Further, only 3 periodontopathic species were investigated in this study, and antibody responses to other kinds of bacteria and their role in CHD incidence are unknown.

The possible role of periodontopathic bacteria as a risk factor for CHD incidence was demonstrated in this prospective study, where the elevated antibody level to these bacteria appeared to increase the risk of CHD. Therefore, a close relationship between oral disease and systemic disease was confirmed. From a public health standpoint, our result on periodontal disease as a risk factor for CHD is important, because periodontal disease can be prevented or treated. Given the high prevalence of both periodontal disease and CHD globally, the prevention and treatment of periodontal disease by appropriate oral health interventions might contribute to the prevention of CHD.

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原　著

歯科保健条例および歯科口腔保健法の施行に伴う検討

―都道府県歯科医師会に対するアンケート調査結果―

日髙勝美　福泉隆喜[1)]　西原達次[2)]

概要：歯科保健条例および歯科口腔保健法の施行に伴い，都道府県歯科医師会に対するアンケート調査を行った．歯科保健条例を制定済みの道県歯科医師会と未制定の府県歯科医師会の2群に分けて回答結果の検討を行い，以下の結論を得た．

1．歯科口腔保健法に規定する施策は，条例制定済みの群の実施割合が多かったが，施策と条例の関係を詳細に把握するためには継続的な調査が必要である．

2．条例制定済みの群は都道府県行政による「在宅歯科医療に関する支援」の施策を期待する割合が多かった．

3．歯科口腔保健法の施行により，条例制定済みの群のほうが「関係団体の協力が得やすくなりそう」と思う傾向にはあったが，有意差は認められなかった．

4．議員提案による歯科保健条例の制定には，歯科医師会による周知活動が寄与していることが示唆された．

索引用語：歯科保健条例，歯科口腔保健法，議員提案，都道府県，歯科医師会

緒　言

歯科医療関係者の努力や国民の歯科保健に対する意識の向上に伴い，小児齲蝕の著しい減少[1)]など口腔の健康状態は改善が認められるが，地域歯科保健対策のさらなる充実を図るため，平成20年7月の新潟県歯科保健推進条例の制定以降，各自治体で歯科保健に関する条例（以下，「歯科保健条例」という）の制定が続いており，平成23年12月現在の都道府県レベルでの歯科保健条例の公布は23，施行は22と公表されている[2)]．一方，歯科保健に関連した法律については，平成23年の第177回国会において，参議院厚生労働委員長から提出された法律案が衆参両院とも全会一致により可決成立し，「歯科口腔保健の推進に関する法律（平成23年8月10日法律第95号，以下，「歯科口腔保健法」という）」が公布・施行された[3,4)]．

歯科保健条例や歯科口腔保健法の施行に伴い，それぞれの制定経緯などについての報告[5～14)]は見受けられるが，条例施行後の歯科保健対策の動向や歯科保健条例および歯科口腔保健法に対する歯科医療関係者の認識についての調査はあまり実施されていない．今回，都道府県歯科医師会を対象としてアンケートを実施し，歯科保健条例施行後の歯科保健施策の変化について実態把握を行うとともに，歯科保健条例および歯科口腔保健法にかかわる認識などを調査し検討を加えたので報告する．

対象および方法

都道府県歯科医師会を対象に平成23年9～11月に自記式調査票を用いて郵送によるアンケート調査を行った．調査票は都道府県歯科医師会の地域保健担当者に送付し本学で回収した．調査内容は都道府県の歯科保健条例の制定の有無とそれに付随する項目，都道府県行政に期待する施策，歯科保健条例の有用性に関する認識，歯科口腔保健法の有用性に関する認識，歯科口腔保健法の施行に伴い期待する施策，歯科口腔保健法に規定する施策[4)]の都道府県での実施状況である（表1）．回答方法は多肢選択式を基本とし，自由記載を一部併用した．複数回答のうち期待する施策および条例や法律の有用性にかかわる質問については，優先する事項を把握するため3項目を目安に選択を依頼した．なお，調査内容に個人情報は含まれていない．

九州歯科大学歯学部口腔保健学科健康管理学講座（主任：日髙勝美教授）
1) 九州歯科大学歯学部歯学科総合教育学分野社会歯科学（主任：福泉隆喜准教授）
2) 九州歯科大学歯学部歯学科感染分子生物学分野（主任：西原達次教授）
受付：平成24年1月30日
受理：平成24年2月13日

表 1 歯科保健に関するアンケート（調査事項の概要）

1．歯科保健条例について
- 1-1 歯科保健条例を制定済みの場合
  - (1) 歯科保健条例の制定年月日，名称，条例案の提出経緯
  - (2) 歯科保健条例の施行による歯科保健施策の変化の有無（有の場合は変化した内容を記載）
  - (3) 歯科保健条例の制定前に歯科医師会が行った活動（自由記載）
  - (4) 歯科保健条例の施行後に歯科医師会が開始した活動や事業（自由記載）
- 1-2 歯科保健条例未制定の場合
  - (1) 歯科保健条例の制定見込みの有無とその理由
  - (2) 歯科保健条例の制定に向け歯科医師会が行っている活動（自由記載）
- 1-3 都道府県行政に期待する施策
- 1-4 歯科保健条例の有用性に関する認識（歯科保健条例は歯科保健対策の推進に役立つと思うか思わないか）とその理由

2．歯科口腔保健法について
- 2-1 歯科口腔保健法の有用性に関する認識（歯科口腔保健法は都道府県の歯科保健対策の推進に役立つと思うか思わないか）とその理由
- 2-2 歯科口腔保健法の施行に伴い期待する施策
- 2-3 歯科口腔保健法に規定する施策の都道府県での実施状況

回答結果は歯科保健条例を制定済みと未制定の2群に分け χ^2 検定を行った．ただし，全体の回答数が10未満および無回答を含む事項は検定対象から除外した．統計分析にはSPSS 13.0 J for Windows（SPSS Japan，東京）を使用した．

結　果

1．アンケートの回収率

調査対象とした47都道府県歯科医師会のうち44道府県歯科医師会から回答があり，アンケートの回収率は93.6%であった．

2．歯科保健条例の制定状況と歯科保健施策の変化

44道府県のうち歯科保健条例が制定されているのは21道県であり，未制定は23府県であった．21道県の条例制定にかかる議案は，1県のみが知事提出の議案（以下，「知事提案」という）であり，20道県は議員提出の議案（以下，「議員提案」という）であった．歯科保健条例を制定済みの21道県における歯科保健施策の変化は，「大いにある」6，「少しある」9，「あまりない」3，「全くない」1，「無回答」2であった．歯科保健施策で変化した内容（複数回答）は，「事業が増えた」8，「予算が増えた」5，「人員が増えた」3と続いた（表2）．なお，2県の歯科医師会が自由記載のなかで，東日本大震災の影響により，歯科保健施策の変化はないまたはわずかと回答していた．

3．歯科保健条例の制定前および施行後における歯科医師会の活動や事業（自由記載）

歯科保健条例の制定前に行った活動については，歯科保健条例を制定済みの21道県のうち19歯科医師会から回答があった．道県議会や議員に対する周知活動（勉強会や協議会の開催，意見交換の実施，請願書や要望書の提出，陳情など）を行った旨の記載が17あり，また，行政機関の担当部署との勉強会，調整などを行った旨の記載が7あった．一方，歯科保健条例の施行後に新たに歯科医師会が開始した活動や事業については，14歯科医師会から回答があり，シンポジウムや大会などの開催6，研修会などの開催5，広報などの普及啓発活動4，医療連携に関する事業2となっていた（表3）．

4．歯科保健条例の制定見込みと歯科医師会の活動

歯科保健条例未制定の23府県における今後の条例制定の見込みは，「ある」20，「ない」2，「無回答」1であった．歯科保健条例の制定見込みがある理由は，「議会で検討中だから」6，「議会に諮る段階にはないが検討中だから」11，「その他」3であった．歯科保健条例の制定に向け歯科医師会が行っている活動（自由記載）については13歯科医師会から回答があり，府県議会や議員に対する周知活動（勉強会の開催，説明・協議の実施，要望書の提出，陳情など）が9，行政機関の担当部署との協議などが5であった（表4）．

5．都道府県行政に期待する施策

期待する施策については，3項目を目安に選択する複

表 2　歯科保健条例の制定状況と歯科保健施策の変化

2-1　歯科保健条例の制定状況	
条例制定済み	21
知事提案	1
議員提案	20
条例未制定	23
	(n＝44)

2-2　歯科保健施策の変化	
大いにある	6
少しある	9
あまりない	3
全くない	1
無回答	2
	(n＝21)

2-3　変化した施策の内容	
予算が増えた	5
事業が増えた	8
人員が増えた	3
変化なし	3
その他	8
無回答	1
	(複数回答，n＝21)

表 3　歯科保健条例の制定前および施行後における歯科医師会の活動や事業

3-1　条例の制定前に行った活動	
道県議会や議員に対する周知活動	17
行政機関との勉強会など	7
その他（視察，調査など）	4
	(自由記載，n＝19)

3-2　条例の施行後に開始した活動や事業	
シンポジウムや大会などの開催	6
研修会などの開催	5
広報などの普及啓発活動	4
医療連携に関する事業	2
その他	4
	(自由記載，n＝14)

表 4　歯科保健条例の制定見込みと歯科医師会の活動

4-1　条例の制定見込み	
ある	20
ない	2
無回答	1
	(n＝23)

4-2　条例の制定見込みがある理由	
議会で検討中だから	6
議会に諮る段階にはないが検討中だから	11
その他	3
	(n＝20)

4-3　条例の制定に向け行っている活動	
府県議会や議員に対する周知活動	9
行政機関との協議など	5
その他	2
	(自由記載，n＝13)

表 5　都道府県行政に期待する施策

	全体 (n＝44)	条例制定済み (n＝21)	条例未制定 (n＝23)	p 値
フッ化物等による小児の齲蝕予防	14 (31.8%)	8 (38.1%)	6 (26.1%)	0.449
成人の歯科健康診査・保健指導	34 (77.3%)	19 (90.5%)	15 (65.2%)	0.132
高齢者の口腔ケア・口腔機能の向上	24 (54.5%)	13 (61.9%)	11 (47.8%)	0.432
在宅歯科医療に関する支援	30 (68.2%)	20 (95.2%)	10 (43.5%)	0.000**
歯科専門職に対する研修	2 (4.5%)	2 (9.5%)	0 (0.0%)	—
食育の推進	5 (11.4%)	4 (19.0%)	1 (4.3%)	—
その他の施策	16 (36.4%)	0 (0.0%)	16 (69.6%)	—
（再掲）歯科保健条例の制定	14 (31.8%)	—	14 (60.9%)	—

**：$p<0.01$　　(複数回答，3項目を目安に選択)

数回答とした．歯科保健条例を制定済みの21道県の歯科医師会では，「在宅歯科医療に関する支援」20(95.2%)，「成人の歯科健康診査・保健指導」19 (90.5%)，「高齢者の口腔ケア・口腔機能の向上」13(61.9%)，「フッ化物等による小児の齲蝕予防」8(38.1%)と続いた．一方，歯科保健条例未制定の23府県の歯科医師会では，「成人の歯科健康診査・保健指導」15(65.2%)，「歯科保健条例の制定（その他の施策の再掲）」14(60.9%)，「高齢者の口腔ケア・口腔機能の向上」11(47.8%)，「在宅歯科医療に関する支援」10(43.5%)と続いた．なお，「在宅歯科医療に関する支援」については，歯科保健条例を制定済みの21道県の歯科医師会のほうが歯科保健条例未制定の23府県の歯科医師会よりも優先する施策として都道府県行政に期待する割合が有意に多かった($p<0.01$，表5)．

表 6　歯科保健条例の有用性に関する認識とその理由

6-1　条例は歯科保健対策の推進に役立つと思うか

	全体 (n＝44)	条例制定済み (n＝21)	条例未制定 (n＝23)
思う	37	17	20
少し思う	6	4	2
あまり思わない	0	0	0
思わない	0	0	0
無回答	1	0	1

6-2　条例が歯科保健対策の推進に役立つと思う理由

	全体 (n＝43)	条例制定済み (n＝21)	条例未制定 (n＝22)	p 値
歯科保健の予算が増えそう	12 (27.9%)	6 (28.6%)	6 (27.3%)	0.924
歯科保健の事業が増えそう	13 (30.2%)	6 (28.6%)	7 (31.8%)	0.817
歯科保健担当の人員が増えそう	3 (7.0%)	2 (9.5%)	1 (4.5%)	—
歯科保健の業務が行いやすくなりそう	28 (65.1%)	12 (57.1%)	16 (72.7%)	0.284
住民の歯の健康づくりに役立ちそう	25 (58.1%)	12 (57.1%)	13 (59.1%)	0.897
歯科保健について住民の関心が高まりそう	18 (41.9%)	10 (47.6%)	8 (36.4%)	0.455
関係団体の協力が得やすくなりそう	13 (30.2%)	8 (38.1%)	5 (22.7%)	0.273
その他	4 (9.3%)	2 (9.5%)	2 (9.1%)	—

(複数回答，3項目を目安に選択)

6．歯科保健条例の有用性に関する認識とその理由

歯科保健条例は歯科保健対策の推進に役立つと思うか思わないかについては，歯科保健条例を制定済みの21道県の歯科医師会では，「思う」17，「少し思う」4であり，ほかの回答はなかった．一方，歯科保健条例未制定の23府県の歯科医師会では，「思う」20，「少し思う」2，「無回答」1であった．歯科保健条例が歯科保健対策の推進に役立つと思う理由（「思う」と「少し思う」と回答した43道府県歯科医師会が対象，3項目を目安に選択する複数回答）については，歯科保健条例を制定済みの21道県の歯科医師会では，「歯科保健の業務が行いやすくなりそう」および「住民の歯の健康づくりに役立ちそう」が12（57.1%）で，「歯科保健について住民の関心が高まりそう」10（47.6%）と続いた．一方，歯科保健条例未制定の22府県の歯科医師会では，「歯科保健の業務が行いやすくなりそう」16（72.7%），「住民の歯の健康づくりに役立ちそう」13（59.1%），「歯科保健について住民の関心が高まりそう」8（36.4%）と続いた．なお，検定対象の6項目について，歯科保健条例の制定の有無による回答割合に有意差はなかった（表6）．

7．歯科口腔保健法の有用性に関する認識とその理由

歯科口腔保健法は都道府県の歯科保健対策の推進に役立つと思うか思わないかについて，歯科保健条例を制定済みの21道県の歯科医師会では，「思う」14，「少し思う」7であり，ほかの回答はなかった．一方，歯科保健条例未制定の23府県の歯科医師会では，「思う」15，「少し思う」4，「あまり思わない」1，「無回答」3であった．歯科口腔保健法が都道府県の歯科保健対策の推進に役立つと思う理由（「思う」と「少し思う」と回答した40道府県歯科医師会が対象，3項目を目安に選択する複数回答）については，歯科保健条例を制定済みの21道県の歯科医師会では，「歯科保健の業務が行いやすくなりそう」12（57.1%），「関係団体の協力が得やすくなりそう」10（47.6%），「既存の法律よりも対策が実施しやすそう」7（33.3%）と続いた．一方，歯科保健条例未制定の19府県の歯科医師会では，「歯科保健の業務が行いやすくなりそう」15（78.9%），「既存の法律よりも対策が実施しやすそう」10（52.6%），「歯科保健について住民の関心が高まりそう」7（36.8%）と続いた．なお，検定対象の3項目について，歯科保健条例の制定の有無による回答割合に有意差はなかった（表7）．

8．歯科口腔保健法の施行に伴い期待する施策

期待する施策については，3項目を目安に選択する複数回答とした．歯科保健条例を制定済みの21道県の歯科医師会では，「歯科保健事業に関する国の予算増額」および「成人に対する定期的な歯科健康診査の実施」が16（76.2%）で，「歯科保健事業に関する地方自治体の予算増額」13（61.9%），「障害者に対する定期的な歯科健康診査の実施」4（19.0%）と続いた．一方，歯科保健条例未制定の23府県の歯科医師会では，「成人に対する定期