

Original

Association Between Dental Health Behavior and Incidence
of Dental Caries in Women Nurses in JapanNobue Saito¹, Toshimi Sairenchi¹, Takashi Muto¹, Shizue Sayama²,
Junko Morikawa², Hiromi Taneichi³, and Masako Nishigori¹¹ *Department of Public Health, Dokkyo Medical University School of Medicine,*² *Department of Nursing, Dokkyo Medical University Hospital,*³ *Dokkyo Medical University School of Nursing*

SUMMARY

Background : The relationship between dental health behavior and incidence of dental caries among women nurses remains unclear.

Methods : A cross-sectional questionnaire-based survey was conducted on 693 women nurses who worked at Dokkyo Medical University Hospital. The survey questionnaire consisted of demographic characteristics, dental health behavior, visits to dentists during working hours in the previous year, and further details about dental problems. The odds ratio (OR) with 95% confidence interval (CI) for experience with dental problems due to dental caries in the previous year was calculated using single logistic regression models.

Results : Among 693 subjects, 178 (25.7%) had experienced dental problems due to dental caries in the previous year. Compared with subjects who never brushed their teeth after snacking between meals, the OR of experience with dental problems due to dental caries was significantly lower among subjects who always brushed their teeth after snacking between meals (OR : 0.55, 95% CI : 0.32–0.94). Compared with subjects who never had dental checkups, the OR of experience with dental problems due to dental caries was significantly lower among subjects who had dental checkups once a year (OR : 0.46, 95% CI : 0.26–0.81) and less than once a year (OR : 0.57, 95% CI : 0.39–0.83).

Conclusions : Women nurses who always brushed their teeth after snacking between meals had less experience with dental problems due to dental caries than those who did not. Women nurses who had dental checkups were at lower risk of dental problems due to dental caries than those who did not.

Key Words : dental caries, nurse, dental health behavior, women, dental checkup

INTRODUCTION

In Japan, medical care expenditure for dental care constituted 7.1% of the national healthcare expenditure in 2010, and the estimated amount for dental care is increasing yearly¹⁾. Medical care expenditure for dental care thus occupies an important place in national healthcare in Japan. Moreover, dental disease causes a loss of productivity²⁾. Therefore, it is important to

Received October 15, 2013 ; accepted November 21, 2013

Reprint requests to : Nobue Saito

Department of Public Health, Dokkyo Medical
University School of Medicine, Mibu, Tochigi
321-0293, Japan

detect dental caries in the early stage before symptoms become obvious. Also, dental caries must be prevented before serious symptoms develop.

Factors such as the behavior of snacking between meals³⁾, having a family dentist³⁾, the use of fluoride toothpaste³⁾, fluoride mouthwash⁴⁾, and plaque control record (PCR)⁵⁾ are related to dental caries among Japanese adults. However, the subjects of the above mentioned studies were mainly men^{3,4)}. The relationship between dental health behavior and dental caries among women nurses in a hospital remains unclear. If there were general awareness of optimal dental health behavior for preventing dental caries, good dental health behavior in everyday life would be easier to practice and women nurses might take an interest in their oral health.

Thus, the purpose of this study was to examine the relationship between dental health behavior and dental caries in women nurses in Japan.

METHODS

Study Design and Population

The study had a cross-sectional design. An anonymous, self-administered questionnaire-based survey was conducted among nurses working at Dokkyo Medical University Hospital, Japan, during August 2012. Full-time nurses (N=913) who worked at the hospital were recruited. A total of 884 nurses responded, with a response rate of 96.8%. From these 884 respondents, we excluded 191 (109 who had worked less than one year, 54 males, and 28 who submitted incomplete data). Thus, 693 subjects were enrolled in the present study. The protocol of this study was approved by the ethics committee of Dokkyo Medical University (No. 24020).

Survey Procedure

The survey questionnaire consisted of three parts. Part one included the following demographic characteristics : sex, age (years), years of experience as a nurse, number of night shifts per month in the last year ('two-shift system' or 'three-shift system'), and marital status ('married' or 'single'). Part two included questions regarding the following dental health behavior we thought might affect dental caries : frequency of tooth brushing ('once per day', 'twice per day', or

'three or more times per day') ; tooth brushing after snacking between meals ('never', 'sometimes', or 'always') ; use of dental floss or interdental brushes ('never', 'twice or less per week', 'three times per week', or 'every day') ; and having dental checkups ('never', 'less than once a year', 'once a year', or 'every six months'). Part three included questions regarding dental problems in the previous year : any experience with dental problems in the previous year ('yes', 'no', or 'unsure') ; and further details about dental problems ('dental caries', 'periodontal disease', 'detachment of prosthesis', 'temporomandibular disorder', 'pericoronitis', or 'other').

Statistical analysis

The p values for experience with dental problems due to dental caries were calculated using the chi-squared test for frequency of tooth brushing, tooth brushing after snacking between meals, use of dental floss or interdental brushes, and having dental checkups.

The odds ratio (OR) with 95% confidence interval (95% CI) for experience with dental problems due to dental caries in the previous year was calculated using single logistic regression models. The independent variables were dental health behavior : frequency of tooth brushing ('twice per day' or 'three or more times per day'), tooth brushing after snacking between meals ('never', 'sometimes', or 'always'), use of dental floss or interdental brushes ('never', 'twice or less per week', 'three times per week', or 'every day'), and having dental checkups ('never', 'less than once a year', 'once a year', or 'every six months'). All statistical analyses were conducted using SAS, version 9.3 (SAS Institute, Inc., Cary, NC, USA).

RESULTS

Baseline characteristics of 693 women nurses are shown in Table 1. One hundred and seventy-eight subjects (25.7%) had experienced dental problems due to dental caries in the previous year.

The proportions of responses based on experience with dental problems due to dental caries in the previous year are shown in Table 2. Statistically significant differences were found with presence of dental checkups. No significant differences were found for frequen-

Table 1 Baseline characteristics of 693 women nurses

	Total (N = 693)	
Sex (No., %)		
women	693	100.0
Age (mean \pm SD)	33.5	\pm 8.5
Years of experience as a nurse (mean \pm SD)	11.6	\pm 8.2
Number of night shifts per month (mean \pm SD)		
Two-shift system (night shift)	4.8	\pm 2.0
Three-shift system (evening shift and night shift)	6.9	\pm 3.6
Marital status (No., %)		
Married	282	40.7
Single	411	59.3

SD indicates standard deviation.

Table 2 Proportions of responses based on experience with dental problems due to dental caries in the previous year among 693 women nurses.

	Total (N = 693)		No experience with dental problems due to dental caries in the previous year (N = 515)		Some experience with dental problems due to dental caries in the previous year (N = 178)		P value *
Frequency of tooth brushing (No., %)							
Once per day	0	0	0	0.0	0	0.0	
Twice per day	78	11.3	57	11.1	21	11.8	0.79
Three or more times per day	615	88.7	458	88.9	157	88.2	
Brushing teeth after snacking between meals (No., %)							
Never	188	27.1	131	25.4	57	32.0	
Sometimes	376	54.3	280	54.4	96	53.9	0.09
Always	129	18.6	104	20.2	25	14.1	
Use of dental floss or interdental brushes (No., %)							
Never	331	47.8	247	48.0	84	47.2	
Twice or less per week	252	36.4	186	36.1	66	37.1	
Three times per week	71	10.2	51	9.9	20	11.2	0.84
Every day	39	5.6	31	6.0	8	4.5	
Having dental checkups (No., %)							
Never	250	36.1	168	32.6	82	46.1	
Less than once a year	286	41.3	224	43.5	62	34.8	
Once a year	99	14.3	81	15.7	18	10.1	<0.01
Every six months	58	8.3	42	8.2	16	9.0	

* Data were analyzed using chi-squared tests for frequency of tooth brushing, brushing teeth after snacking between meals, use of dental floss or interdental brushes, and having dental checkups.

cy of tooth brushing, tooth brushing after snacking between meals, and use of dental floss or interdental brushes.

Table 3 lists further details about dental problems in the previous year (multiple answers). The most fre-

quently reported dental problem was dental caries (173 participants) followed by detachment of prosthesis and pericoronitis.

The OR with 95% CI for dental visits in the previous year is shown in Table 4. Compared with subjects

Table 3 Prevalence of dental problems in the previous year (multiple answers) (N = 293)

	n (%)
Dental caries	178 (60.8)
Detachment of prosthesis	71 (24.2)
Pericoronitis	62 (21.2)
Periodontal disease	52 (17.8)
Temporomandibular disorder	29 (9.9)
Other	40 (13.7)

Table 4 Odds ratio with 95% confidence interval for experience with dental problems due to dental caries in the previous year among 693 women nurses.

	Odds Ratio*	95% CI*
Frequency of brushing teeth		
Twice per day	1.00	
Three or more times per day	0.93	0.55-1.58
Brushing teeth after snacking between meals		
Never	1.00	
Sometimes	0.79	0.54-1.16
Always	0.55	0.32-0.94
Use of dental floss or interdental brushes		
Never	1.00	
Twice or less per week	1.04	0.72-1.52
Three times per week	1.15	0.69-2.05
Every day	0.76	0.34-1.72
Having dental checkups		
Never	1.00	
Less than once a year	0.57	0.39-0.83
Once a year	0.46	0.26-0.81
Every six months	0.78	0.41-1.47

* This analysis was conducted by single logistic regression models.

The independent variables were frequency of tooth brushing, brushing teeth after snacking between meals, use of dental floss or interdental brushes, and having dental checkups.

who never brushed their teeth after snacking between meals, the OR of experience with dental problems due to dental caries in the previous year was significantly lower among subjects who always brushed their teeth after snacking between meals. Compared with subjects who never had dental checkups, the OR of experience with dental problems due to dental caries in the previous year was significantly lower among subjects who had dental checkups once a year and less than once a year. However, compared with subjects who never had dental checkups, the OR of experience with dental problems due to dental caries in the previous year was not significantly lower among subjects who had dental

checkups every six months.

DISCUSSION

To the best of our knowledge, this is the first study to show an association between dental health behavior and dental caries among women nurses in Japan. Women nurses who always brushed their teeth after snacking between meals had less experience with dental problems due to dental caries than those who did not. Women nurses who had dental checkups were at lower risk of dental problems due to dental caries than those who did not.

The association between snacking between meals

and dental caries among children has been reported previously in the United States⁶⁾ and in Japan^{7,8)}. A questionnaire survey⁷⁾ of 1,621 3-year-old children reported a correlation between decayed deciduous teeth indicated for filling, missing deciduous teeth because of dental caries, and filled deciduous teeth (dmf) and frequency of sweets and sugary drinks per day. The association between snacking between meals and dental caries among adults has been reported previously in Japan³⁾. A questionnaire survey³⁾ of 3,109 workers reported that those who snacked between meals had significantly more dental caries. In contrast, a questionnaire survey⁸⁾ of 26 children aged 2–3 years old reported that there was no association between frequency of solid sweets per day and dental caries.

Previous studies^{9,10)} have shown no association between the frequency of tooth brushing and dental caries. The present study that showed an association was not consistent with previous findings. The reason for no association could be that the preventive effect of daily tooth brushing is masked by highly caries-susceptible subjects who have recently joined the brushing group because of the occurrence of dental caries⁹⁾. As workshops on oral care are regularly held for nurses at Dokkyo Medical Hospital, most nurses were aware of the importance of oral care¹¹⁾ and might be familiar with appropriate methods of tooth cleaning.

The association between dental checkups and dental caries has been reported previously¹²⁾. A previous study showed that the oral health status of adults who received regular oral health care including checkups was better than that of subjects of two separate national or municipal basis surveys of dental diseases¹²⁾. However, it is unknown whether those subjects received dental checkups or not¹²⁾. In the present study, those who had dental checkups every six months did not show fewer dental problems due to dental caries. The possible reason could be that some subjects might have been advised to have dental checkups because of high caries risk. However, as we did not evaluate the oral health condition of nurses who had dental checkups every six months, future research would be required.

The possible reason that tooth brushing after snacking between meals is effective for the prevention of dental caries is unclear. However, the possible mecha-

nism of the reason that snacking between meals is related to dental caries has been reported previously^{13,14)}. A significant relationship was found between the number of streptococcus mutans and not brushing after snacking¹³⁾. A previous study reported that plaque control is likely to play a significant role in controlling streptococcus mutans¹⁴⁾. Moreover, the oral health status of adults who received regular oral health care including checkups was better than the oral health condition of subjects of two separate national or municipal surveys of dental diseases¹²⁾. In addition, as the brushing per day increased, the lower the PCR became¹⁵⁾.

The strength of the present study was the high response rate (96.8%). However, our study had several limitations. First, because the frequency of snacking between meals was not recorded, subjects who never snack between meals might have been included in the subjects who never brushed their teeth after snacking between meals. However, a previous study¹⁶⁾ reported that 71.9% of nurses always or sometimes had snacks between meals. Second, the dental problem was self-reported and we did not conduct oral examination. Third, as the present study was a single-center study, the results might not be generalizable.

In conclusion, women nurses who always brushed their teeth after snacking between meals had less experience with dental problems due to dental caries than those who did not, and women nurses who had dental checkups were at lower risk of dental problems due to dental caries than those who did not. Brushing after snacking between meals might prevent dental caries among people familiar with appropriate methods of tooth cleaning.

Acknowledgments This research was supported by Dokkyo Medical University Young Investigator Award (No.2012-03-05).

REFERENCES

- 1) Ministry of Health, Labour and Welfare of Japan : Estimates of National Medical Care Expenditure 2010 [http://www.mhlw.go.jp/toukei/saikin/hw/k-iryohi/10/dl/kekka.pdf] (accessed September 17 2013).
- 2) Ichihashi T, Muto T, Shibuya K : Influence of dental disease on workers in terms of hours lost from work or daily life activities. *J Dent Hlth* **52** : 141-149, 2002.

- 3) Morita T, Ogawa Y : Lifestyle and dental health behavior influenced by dental caries in adult. The Journal of Dental Hygienist **30** : 77-79, 2006.
- 4) Gunjishima Y : The effects of fluorides for caries prevention in adults. J Dent Hlth **47** : 281-291, 1997.
- 5) Iijima Y, Yasui T, Nakao S : Evaluation of oral environmental factors in adults. Meikai Univ Dent J **26** : 144-149, 1997.
- 6) Weiss RL, Trithart AH : Between-meal eating habits and dental caries experience in preschool children. Am J Public Health Nations Health **50** : 1097-1104, 1960.
- 7) Sakuma S, Takiguchi T, Yagi M, et al : A study of multiple factors influencing on the prevalence of dental caries of deciduous teeth in 3-year-old children and the effectiveness of dental health education. J Dent Hlth **37** : 261-272, 1987.
- 8) Motohashi M, Ozawa K, Sagara T : A study on between-meal eating habit from the viewpoint of dental health - comparison with primary school children and the relationship between the habit and dental caries. Minzoku Eisei **62** : 359-369, 1996.
- 9) Takahashi N, Shimada Y : Relationship between tooth brushing and the prevalence of dental caries in 1 to 3 years old infants. J Dent Hlth **33** : 49-60, 1983.
- 10) Perinetti G, Caputi S, Varvara G : Risk/prevention indicators for the prevalence of dental caries in school-children : Results from the Italian OHSAR Survey. Caries Res **39** : 9-19, 2005.
- 11) Tsuchida S, Ishikawa T, Doi Y, et al : Opening of Dokkyo Medical Hospital division of oral care and results of two years of oral care. Journal of Tochigi Dental Association **62** : 57-61, 2010.
- 12) Miura Y, Shinada K, Shimoyama K, et al : A study of oral status of adults who received regular checkups and professional care. J Stomatol. Soc **69** : 285-289, 2002.
- 13) Okazaki Y, Miyagi A, Hori M, et al : The number of mutans streptococci and its relationship to the daily habits of children. The Japanese journal of pedodontics **40** : 693-700, 2002.
- 14) Law V, Seow WK : A longitudinal controlled study of factors associated with mutans streptococci infection and caries lesion initiation in children 21 to 72 months old. Pediatr Dent **28** : 58-65, 2006.
- 15) Tamai K, Ueno M, Okabe A, et al : Studies about the state of the periodontal patients in the initial visit 2. The condition of the accumulation of plaque. The Japanese Society of Periodontology **27** : 890-901, 1985.
- 16) Yamaguchi M, Shimizu K, Nakazawa Y, et al : The relationship between occupations and lifestyle-related disease. Official Journal of the Japanese Society of Human Dry Dock **18** : 191-194, 2003.