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Original Article

Dental-care Utilization Patterns and Factors Associated with Regular Dental Check-ups in Elderly

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Abstract

The purpose of this study was to investigate dental care utilization patterns in the elderly and to evaluate factors associated with regular dental check-ups in this age group. A total of 211 elderly people (50 men, 161 women) aged between 60 and 98 years were investigated. A cross-sectional survey by questionnaire was carried out on visitors to the Mihama Ikiiki Plaza (an institution for the elderly) in the city of Chiba, Japan between July and September, 2008. Items on the questionnaire included self-reported oral status, use of dentures, use of regular medication, oral problems, cleaning of teeth/dentures and dental care utilization patterns. The results showed that 135 (64.0%) of the responders had visited a dentist in the past year, 185 (87.7%) had visited the same dentist and 85 (40.3%) had had regular dental check-ups. A stepwise multiple logistic regression analysis adjusting for age and sex revealed that the factors associated with regular dental check-ups were significantly higher ADLs (odds ratio (OR) = 0.439 in the partially insured and 0.192 in the fully insured in comparison with healthy subjects, p = 0.0012), visiting the same dentist (OR = 11.978 in comparison with not visiting the same dentist, p = 0.0183) and cleaning teeth/dentures three or more times per day (OR = 1.962 in comparison with cleaning them two or fewer times per day, p = 0.0368). In this study, a higher ADL, visiting the same dentist and cleaning teeth/dentures three or more times per day were associated with having regular dental check-ups in the elderly. The best predictive factor for regular dental check-ups was a high ADL in the elderly.

Key words:　Dental visits—Same dentist—Regular dental check-ups—Elderly— Health behaviors

Introduction

The percentage of elderly aged 65 years or over in Japan has tripled in less than four decades, rising from 7% in 1970 to 21% in 2007[6]. This has meant a concomitant rise in

the importance of dental care for this age group. In earlier studies, we investigated oral health and health behavior in the elderly in Japan, including in terms of regular dental visits[14–16]. As oral health not only affects oral conditions[12,19] but also overall systemic health and vulnerability to disease[1,2,5], it is important that oral health is maintained in this age group through regular dental check-ups.

The Japanese government launched the "Healthy Japan 21" campaign in 2000 with 2012 as the target year. One of the goals of this campaign is prevention of tooth loss and maintenance of oral health by ensuring that 30% or more of those aged 60 years or over receive regular dental check-ups by 2010. The Japanese Dental Association also recommends that people visit the same (regular) dentist to maintain oral health.

This study had two aims: 1) to investigate dental-care utilization patterns in the elderly in terms of associated factors such as sex, age, activities of daily living (ADLs), living situation, regular medication, oral status, use of dentures, oral problems and cleaning of teeth/dentures; and 2) to determine which factors were associated with number of regular dental check-ups.

Materials and Methods

1. Participants and characteristics

A total of 211 elderly people (50 men, 161 women) aged between 60 to 98 years (mean age ± SD: 72.6 ± 7.9 years) were examined (Table 1). Of these, 46 were almost fully insured under a federal government rehabilitation program (almost fully insured), 68 were partially insured participants in a community-based rehabilitation program to improve ADLs (partially insured) and 97 were healthy elderly (healthy). In terms of living situation, 43 lived alone and 168 lived with others such as spouses, children and grandchildren. One-hundred forty-four took regular medication. Informed consent was obtained from all participants prior to commencement of the study.

Table 1   Participants and characteristics

Sex		
	Men	50 (23.7)
	Women	161 (76.3)
Age (in years)		
	60–69	89 (42.2)
	70–79	82 (38.8)
	80–98	40 (19.0)
ADLs*		
	Healthy	97 (46.0)
	Partially insured	68 (32.2)
	Fully insured	46 (21.8)
Living situation		
	Alone	43 (20.4)
	With others	168 (79.6)
Medication		
	Yes	144 (68.3)
	No	67 (31.7)
		Frequency (%)

*ADLs
Healthy: Healthy elderly, Partially insured: Partially insured participants in community-based rehabilitation program to improve ADLs, Fully insured: Almost fully insured participants in federal-government rehabilitation program

2. Study design

A cross-sectional survey by questionnaire was administered at the Mihama Ikiiki Plaza in the city of Chiba, Japan. The Mihama Ikiiki Plaza is an institution for elderly persons aged 60 years and over and comprises a day service center and welfare center. Visitors to the facility are able to participate in recreational activities and receive physical therapy. We conducted the questionnaire between July and September, 2008. It included items related to oral status, use of dentures, use of regular medication, oral problems (symptoms of dental or gingival problems, poorly-fitting dentures, halitosis and clicking of the temporomandibular joint), cleaning of teeth/dentures and dental-care utilization patterns. Dental-care utilization patterns consisted of number of dental visits in the past year, visiting the same dentist and regular dental check-ups (Table 2). The number of elderly who had visited a dentist in the past year included patients who were receiving treatment. The questionnaire was distributed by the staff of the institution and the responders guaranteed anonymity. Persons

Table 2   Items on questionnaire

Who do you live with?
Are you on any medication?
Do you have present teeth?
Do you have dentures?
What oral problems do you have now?
How many times do you brush your teeth per day?
How many times do you clean your dentures per day?
When did you go to the dentist last?
Do you have a regular dentist?
Do you have dental check-ups regularly?

Table 3   Oral condition and behaviors

Self-reported oral status	
Edentulous	15 (7.1)
Dentate	196 (92.9)
Dentures wearer	
Yes	118 (55.9)
No	93 (44.1)
Oral problems	
Yes	152 (72.0)
No	59 (28.0)
Cleaning teeth/dentures	
1–2 times per day	125 (59.2)
3 or more times per day	86 (40.8)
Dental-care utilization patterns	
Dental visits in past year	
Yes	135 (64.0)
No	76 (36.0)
Same dentist	
Yes	185 (87.7)
No	26 (12.3)
Regular dental check-ups	
Yes	85 (40.3)
No	126 (59.7)

Frequency (%)

less than 60 years of age or with mild dementia were excluded from the study.

3. Statistical analysis

Differences in proportions were evaluated using an χ^2 test (two-tailed). When any cell in the contingency tables showed a value of less than 5, the Fisher exact test was carried out. Stepwise multiple logistic regression was used to determine which factors were significantly associated with regular dental check-ups, as defined by odds ratios (ORs) with 95% confidence intervals. Statistical significance was set at $p<0.05$. The statistics were analyzed with the SAS version 9.1 for Windows (SAS Institute, Cary, NC, USA).

Results

Table 3 shows self-reported oral condition, frequency of cleaning of teeth/dentures and dental-care utilization pattern. Self-reported oral status revealed that 15 participants (7.1%) were edentulous and 196 (92.9%) were dentate. Furthermore, 118 (55.9%) were denture wearers, 152 (72.0%) had oral problems and 86 (40.8%) cleaned their teeth/dentures three or more times per day.

In terms of dental visits, we investigated 3 patterns of behavior: dental visits made in the past year, visits to the same dentist and regularity of visits. The results showed that 135 (64.0%) had visited a dentist in the past year, 185 (87.7%) visited the same dentist,

and 85 (40.3%) had regular dental check-ups.

Table 4 shows dental-care utilization patterns in terms of various characteristics, including oral condition and behavior. Significant differences were observed in age ($p=0.0065$), ADLs ($p=0.0497$), self-reported oral status ($p=0.0447$) and cleaning of teeth/dentures ($p=0.0199$) in relation to having made a dental visit in the past year. Significant differences were also observed in age ($p<0.0001$), ADLs ($p<0.0001$), self-reported oral status ($p=0.0243$) and cleaning of teeth/dentures in relation to visiting the same dentist ($p=0.0170$). Lower age correlated with a higher ADL, and those who cleaned their teeth/dentures three or more times per day had significantly more regular dental check-ups (age: $p=0.0009$, ADLs: $p<0.0001$, cleaning of teeth/dentures: $p=0.0031$).

We performed a stepwise multiple logistic regression analysis to determine which factors were associated with regular dental check-ups after forcing age and sex in the model (Table 5). The dependent variable was the presence or absence of regular dental check-ups, and

Table 4   Dental-care utilization patterns in relation to characteristics, oral conditions and behaviors

	N	Making dental visit in past year		Visiting same dentist		Having regular dental check-ups	
		N (%)	p value	N (%)	p value	N (%)	p value
Sex			0.9974		0.1620		0.1715
Men	50	32 (64.0)		41 (82.0)		16 (32.0)	
Women	161	103 (64.0)		144 (89.4)		69 (42.9)	
Age (in years)			0.0065		p<0.0001		0.0009
60–69	89	60 (67.4)		84 (94.4)		44 (49.4)	
70–79	82	58 (70.7)		75 (91.5)		35 (42.7)	
80–98	40	17 (42.5)		26 (65.0)		6 (15.0)	
ADLs			0.0497		p<0.0001		p<0.0001
Healthy	97	70 (72.2)		92 (94.9)		55 (56.7)	
Partially insured	68	41 (60.3)		61 (89.7)		23 (33.8)	
Fully insured	46	24 (52.2)		32 (69.6)		7 (15.2)	
Living situation			0.8554		0.4996		0.4184
Alone	43	27 (62.8)		39 (90.7)		15 (34.9)	
With others	168	108 (64.3)		146 (86.9)		70 (41.7)	
Medication			0.5112		0.9083		0.5446
Yes	144	90 (62.5)		126 (87.5)		56 (38.9)	
No	67	45 (67.2)		59 (88.1)		29 (43.3)	
Self-reported oral status			0.0447		0.0243		0.2645
Edentulous	15	6 (40.0)		10 (66.7)		4 (26.7)	
Dentate	196	129 (65.8)		175 (89.3)		81 (41.3)	
Dentures wearer			0.6643		0.5380		0.1176
Yes	118	77 (65.3)		102 (86.4)		42 (35.6)	
No	93	58 (62.4)		83 (89.3)		43 (46.2)	
Oral problems			0.8109		0.2027		0.7000
Yes	152	98 (64.5)		136 (89.5)		60 (39.5)	
No	59	37 (62.7)		49 (83.1)		25 (42.4)	
Cleaning teeth/dentures			0.0199		0.0170		0.0031
1–2 times per day	125	72 (57.6)		104 (83.2)		40 (32.0)	
3 or more times per day	86	63 (73.3)		81 (94.2)		45 (52.3)	

the 10 independent variables were as follows: sex, age, ADLs, living situation, use of regular medication, self-reported oral status, use of dentures, oral problems, cleaning of teeth/dentures and visiting the same dentist. Based on *a priori* entry and exit criteria, stepwise-model building resulted in a final logistic regression model that included five variables: age, sex, ADLs, visiting the same dentist and cleaning of teeth/dentures. No apparent differences were observed in age or sex. Those with higher ADLs (OR = 0.439 in the partially insured, and OR = 0.192 in the fully insured in comparison with the healthy, p = 0.0012), who visited the same dentist (OR = 11.978 in comparison with those not visiting the same dentist, p = 0.0183) and cleaned their teeth/dentures three or more times per day (OR = 1.962 in comparison with cleaning them twice per day or less, p = 0.0368) had significantly more regular dental check-ups.

Discussion

The National Health Survey (1999) in Japan[7] reported that 46.9% of people aged 65–74 years, 34.8% of those aged 75–84 years and 22.8% of those aged 85 years and over had made dental visits in the past year. In this study, although no decrease was observed in the percentage of participants aged 60–69

Table 5   Multiple logistic regression analysis (stepwise method) for having regular check-ups

	Adjusted odds ratio	95% confidence interval	p value
Age	0.992	0.941–1.047	0.7789
Sex			0.9403
Men	1.000 (reference)		
Women	1.030	0.479–2.213	
ADLs			0.0012
Healthy	1.000 (reference)		
Partially insured	0.439	0.266–0.722	
Fully insured	0.192	0.071–0.522	
Visiting same dentist			0.0183
No	1.000 (reference)		
Yes	11.978	1.524–94.162	
Cleaning teeth/dentures			0.0368
2 times per day or less	1.000 (reference)		
3 or more times per day	1.962	1.042–3.694	

The dependent variable was the presence or absence of regular dental check-ups.
The 10 independent variables were sex, age, ADLs, living situation, use of regular medication, self-reported oral status, use of dentures, oral problems, cleaning teeth/dentures and same dentist.
This model included compulsory age and sex to adjust for confounding factors.

and 70–79 years visiting the dentist in the past year, a significant decrease was observed in those aged 80 years and over. Other studies[9,10] covering dental visits in the past year have revealed that the percentage rapidly decreased in those aged over 80 years.

We have pointed out that it is important to understand the national dental care system in each country when considering the number of dental visits made[15]. Österberg et al.[11] reported that people aged 65 and over showed the largest increase in the utilization of dental care, which they defined as any contact with a dental clinic resulting in a bill during a calendar year before and after the introduction of the National Dental Health Insurance System in Sweden. This increased from 26% in 1974 to 39% in 1984. Also, Wall and Brown[18] in the United States found that people aged 2 years or over with private dental insurance visited a dentist more often in the past 12 months than did those without based on the 1999 National Health Interview Survey. Thus, a country's national dental care system influences the number of dental visits made.

In other studies which looked at dental visits, 44% of those aged 65 and over who were interviewed reported having visited a

dentist during the preceding year and major predictors for a dental visit were the number of present teeth and household income in Finland[17]. Also, Holtzman et al.[3] reported dentate status, perceived need and recent experience with symptoms were the best predictors of dental utilization. Moreover, Österberg et al.[10] concluded that functional ability and general health factors had lower significance for the time elapsed since the last visit to a dentist than socioeconomic, social support, or life-style factors in the elderly. The results of this study indicated that age, ADLs, dentate status and cleaning of teeth/dentures were associated with dental visits in the past year.

Ensuring that older adults receive routine oral health care is critical, as basic oral health services are essential components of primary health care, and receiving routine preventive care is associated with good oral health[20]. In 2004, 38.7% of people aged 60–69 years and 29.5% of those aged 70 years and over in Japan reported that they had regular dental check-ups[8]. In this study, 49.4% of those aged 60–69 years reported having regular dental check-ups, as did 42.7% of those aged 70–79 and 15.0% of those aged 80–98, and this percentage decreased with age, especially

for those aged 80 years and over. Another Japanese study also revealed that the percentage of people who regularly utilized dental care rapidly decreased in those aged 80 years and over[9].

We investigated the relationship between making dental visits in the past year and visiting a regular dentist[15]. The percentage of participants having regular dental check-ups was the lowest among the three dental utilization patterns investigated in this and our previous studies. This was because visiting a dentist in the past year and having a regular dentist are related to dental treatment and prevention, but having regular dental check-ups is only related to preventive health behavior. We carried out a multiple logistic regression analysis of regular dental check-ups only because this made interpretation of the results easier and such check-ups were one of the target values of the Healthy Japan 21 campaign.

Lundgren *et al.*[4] found that dental state, loneliness, number of drugs, ADL impairment depending on mental status and school education were associated with regular check-ups based on the results of a stepwise logistic regression analysis. Ohi *et al.*[9] reported that regular utilization was associated with a higher number of remaining teeth, younger age, the presence of systemic disease, the absence of depressive symptoms and higher educational attainment. Moreover, Sohn and Ismail[13] discovered that dental insurance, perceived oral health status and dental anxiety were associated with regular dental visits. They also reported that dental anxiety was a factor influencing behavior in regular dental visits, especially in adults with private dental insurance. Thus, although many factors have been associated with regular dental check-ups in earlier studies, in this study we found that ADL was the most relevant. This may be explained by the Japanese medical insurance system, economic factors and depression due to decreasing ADLs. To ensure access to dental care in the impaired elderly is very important in maintaining good oral health care.

We were unable to clearly identify the causality between regular dental check-ups and associated factors in this study as it was based on a cross-sectional survey. However, higher ADLs, visiting the same dentist and frequency of cleaning of teeth/dentures were associated with having regular dental check-ups in the elderly. The best predictive factor for regular dental check-ups was ADLs in the elderly.

References

1) Abe S, Ishihara K, Adachi M, Sasaki H, Tanaka K, Okuda K (2006) Professional oral care reduces influenza infection in elderly. Arch Gerontol Geriatr 43:157–164.
2) Fukai K, Takiguchi T, Ando Y, Aoyama H, Miyakawa Y, Ito G, Inoue M, Sasaki H (2009) Associations between functional tooth number and physical complaints of community-residing adults in a 15-year cohort study. Geriatr Gerontol Int 9:366–371.
3) Holtzman JM, Berkey AB, Mann J (1990) Predicting utilization of dental services by the aged. J Public Health Dent 50:164–171.
4) Lundgren M, Österberg T, Lundgren M, Emilson C, Steen B (1995) Oral complaints and utilization of dental services in relation to general health factors in a 88-year-old Swedish population. Gerodontology 12:81–88.
5) Mack F, Schwahn C, Feine JS, Mundt T, Bernhardt O, John U, Kocher PT, Biffar R (2005) The impact of tooth loss on general health related to quality of life among elderly Pomeranians: Results from the study of health in Pomerania (SHIP-O). Int J Prosthodont 18: 414–419.
6) Ministry of Health, Labor and Welfare (2009) Annual Health, Labor and Welfare Report 2007–2008, http://www.mhlw.go.jp/english/wp/wp-hw2/index.html, accessed on November 10, 2009.
7) Ministry of Health, Labor and Welfare (2000) Survey on trend of health and welfare 1999, http://www1.mhlw.go.jp/toukei/h11hftyosa_8/kekka7.html, accessed on November 10, 2009. (in Japanese)
8) Ministry of Health, Labor and Welfare (2006) The national health and nutrition survey in Japan 2004, http://www.mhlw.go.jp/bunya/kenkou/eiyou06/pdf/01-04.pdf, accessed on November 10, 2009. (in Japanese)
9) Ohi T, Sai M, Kikuchi M, Hattori Y, Tsuboi A, Hozawa A, Ohmori-Matsuda K, Tsuji I,

Watanabe M (2009) Determinants of the utilization of dental services in a community-dwelling elderly Japanese population. Tohoku J Exp Med 218:241–249.

10) Österberg T, Lundgren M, Emilson C, Sundh V, Birkhed D, Steen B (1998) Utilization of dental services in relation to socioeconomic and health factors. Acta Odontol Scand 56: 41–47.

11) Österberg T, Sundh W, Gustafsson G, Gröndahl HG (1995) Utilization of dental care after the introduction of the Swedish dental health insurance. Acta Odontol Scand 53:349–357.

12) Richards W, Ameen J (2002) The impact of attendance patterns on oral health in a general dental practice. Br Dent J 193:697–701.

13) Sohn W, Ismail A (2005) Regular dental visits and dental anxiety in an adult dentate population. J Am Dent Assoc 136:58–66.

14) Sugihara N (1992) Evaluation for variable factors in oral health of institutionalized and non-institutionalized elderly. Shikwa Gukuho 92:231–250. (in Japanese)

15) Sugihara N, Maki Y, Matsukubo T, Takaesu Y (2005) Relation of dental visits by Japanese elderly to dental characteristics and oral condition. Dentistry in Japan 41:86–88.

16) Sugihara N, Maki Y, Takaesu Y (2003) Oral health behavior related with oral health status in the elderly. Geriatr Gerontol Int 3:149.

17) Suominen-Taipale AL, Nordblad A, Alanen P, Alha P, Koskinen S (2001) Self-reported dental health, treatment need and attendance among older adults in two areas of Finland. Community Dent Health 18:20–26.

18) Wall TP, Brown LJ (2003) Recent trends in dental visits and private dental insurance, 1989 and 1999. J Am Dent Assoc 134:621–627.

19) Warren JJ, Cowen HJ, Watkins CM, Hand JS (2000) Dental caries prevalence and dental care utilization among very old. J Am Dent Assoc 131:1571–1579.

20) Yellowitz JA (2008) Improving oral health for the elderly, Lamster IB, Northridge ME eds., p.55, Springer, New York.

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