Tooth loss and Longevity in Korean elderly people aged 85 and older

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Abstract

It was aim of this cross-sectional study to investigate the relationship between tooth loss and longevity in elderly person aged 85 and older. Among 218 aged 85 years and older residents on nine longevity villages in Jejudo, responders in direct interview were 146 subjects. In addition to the number of remnant teeth, life style, dietary habit, current diseases and medication, daily living activities and screening for dementia and depression were gathered from all participants. The anthropometrics, systolic and diastolic blood pressure, and blood glucose level were also measured. The mean age of study participants was 89 years (SD 3.2) and 85% women. The frequencies of 5 and more remnants of teeth would not different between group aged 85 to 87 years and group aged 90 years and older. And, the dentate group had less suffering from current illness, fewer cases of suspected dementia, more never smokers, fewer skip of meal per week, and higher body mass index than the edentulous group. The results suggested that the remnants of self teeth might be a factor of longevity and of quality of life in elderly people. Therefore, care services for dental health would be necessary to promote health status in elderly people.

Key Words : Aged, 80 and over; Tooth loss; Dental care for Aged; Quality of Life

Introduction

The proportion of elderly people in the population has increased throughout the course of the 20th century, particularly in the western industrialized countries (1,2). Korean society has engaged in the 'aging society' since 2003, and will be the 'aged society' in 2019. This fact means that Korea is the leading country in aging process in the world (3).

Prolongation of life expectancy, prevention and/or delayed occurrence of chronic diseases and an improvement of their prognosis are receiving increasing attention in public health research (4). Especially, several strategies for increasing quality of life and keeping healthy longevity should be needed (5). But gains in longevity result in more medically compromising conditions or systematic disease with oral manifestation (6).

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The possible effect of oral health on general health status in elderly people has attracted growing interest. For example, an association between poor oral health status, such as edentulousness, and cardiovascular diseases and even mortality has been reported in several studies (7-13). Especially, oral health has a significance impact on the quality of life of elderly adults (14-19). The loss of tooth in elderly people could decrease some dietary intakes so that dental health would be a potential factor for longevity (9-11,20-22). However, the authors can not find a study for the suggestion in the elderly people aged 85 and older, who are called as a 'long-lived' person in Korea.

Thus, the authors hypothesized that the loss of tooth in Korean aged 85 years and older is also an important determinant of longevity. A cross-sectional study was designed for evaluating relationship between remnants of tooth and health status in Korean long-lived people.

[Materials and Methods]

The 218 eligible population was defined as the 85-year-old and older residents on nine longevity villages in Jejudo in 2002 (23). Because Jejudo is called as the longevity island because the proportion of people aged 85 years and older is the highest in Korea (24). The 72 eligible peoples were excluded because they had died at the contact time (n=8); or the actual age of them at interview was less than 85-year-old (n=24); or they could not contact with interviewer (n=40). So the final subject included 146 participants.

All participants were directly interviewed to assess the lifestyle, dietary habits, suffering diseases, and current medications as well as the number of remnant tooth by using the structured questionnaire. In addition, it was used some screening tools like as the K-ADL (Activities of Daily Living) for daily activity status (25), the MMSE-K (The Korean version of the Mini Mental State Examination) for dementia (26), and the GDSSF-K (Geriatric Depression Scale Short Form Korea Version) for depression (27). For the responders of interview, the anthropometrics, systolic and diastolic blood pressure, and blood glucose level were measured.

Two primary independent variables for tooth loss were defined for the analysis. The first variable for tooth loss, the number of remnant tooth was determined by numbers of remaining tooth and categorized as 0, 1-4, 5 and more using the median split. The second variable for tooth loss, status of tooth loss, was regrouped into two classes - dentate group (DG) and edentulous group (EDG).

Age at interview was categorized as 85-87, 88-89, and 90≤ based on median value. Education level was grouped into 0, 1-6, 7≤ by period of primary school. Smoking and Drinking habit were classified as never, past, and current, respectively. Skip of meals per week was arranged into none, 1-3, 4≤ because 3 times of meal per day are recommended in general. The scales of items in MMSE-K, SGDS, ADL were summarized respectively, and arranged the abnormal by 17 and less in MMSE-K, and 10 and more in SGDS.

Body mass index (BMI) was calculated with dividing weight (kg) by the square of height (m2), and then grouped into <18.5, 18.5-24.9, 25.0≤. Waist hip ratio (WHR) was taken by the proportion of waist circumference and hip circumference, and then categorized as <85.0, 85-89.9, 90-94.9, and 95.0≤ by sex. The criteria of hypertension in the JNC VII report was applied to systolic and diastolic blood pressure (28). Glucose intolerance was defined when a level of blood glucose was 126 mg/l and more in fasting status, or 200 mg/l and more in postprandial condition (29).

Statistical analyses with the chi-square test and Fisher's exact test were carried out by SPSS, version 12.0 (30). Data were considered significant when p value did not exceed 0.1.

Results

The study group (n=146) was 87% women. As Figure 1 shows the age distribution by sex, the mean age was 89 ± 3.2 (SD) years while the minimum and maximum age was 85 and 102 years, respectively. There was a statistical significance between age and number of remnants of tooth and age (p=0.09) (Table 1). Some 87.5% of subjects were not educated; 42.8% living alone; 85.4% having no job; 66.0% supported by their children. These factors were not different among 3 age groups.

The distribution of summary means of scales in MMSE-K, SGDS, and ADL were not different between EDG and DG (Table 4). However, there were more suspected cases for dementia in MMSE-K (<=17) in EDG than in DG (p=0.069).

In the anthropometry, DG had higher body mass index (BMI) than EDG (p=0.035). However, height, weight, waist circumference, hip circumference, and waist-hip ratio (WHR) were not different (Table 5). And systolic and diastolic blood pressure, glucose intolerance, hearing disturbance, and walking disturbance were not also different.

Table 1. Demographic characteristics of subjects *

Remnants of tooth	None		1~4		5+		Total		p-value
Age Group									
85-87	36	(40.0)	4	(25.0)	18	(45.0)	58	(39.7)	0.090
88-89	27	(30.0)	2	(12.5)	12	(30.0)	41	(28.1)	
90-	27	(30.0)	10	(62.5)	10	(25.0)	47	(32.2)	
sex									
Man	12	(13.3)	1	(6.3)	6	(15.0)	19	(13.0)	0.672
Woman	78	(86.7)	15	(93.8)	34	(85.0)	127	(87.0)	
Year of Education									
0	75	(84.3)	16	(100)	35	(89.7)	126	(87.5)	0.470
1-6	12	(13.5)	0	(0)	3	(7.7)	15	(10.4)	
7+	2	(2.2)	0	(0)	1	(2.6)	3	(2.1)	
Family types									
Single	38	(42.2)	5	(31.3)	19	(48.7)	62	(42.8)	0.265
Spouse	12	(13.3)	1	(6.3)	5	(12.8)	18	(12.4)	
Childrens	37	(41.1)	7	(43.8)	12	(30.8)	56	(38.6)	
Others	3	(3.3)	3	(18.8)	3	(7.7)	9	(6.2)	
Daily Job									
None	75	(85.2)	15	(93.8)	33	(82.5)	123	(85.4)	0.558
Having	13	(14.8)	1	(6.3)	7	(17.5)	21	(14.6)	
Living expenses by									
Self	10	(11.5)	1	(6.3)	3	(7.9)	14	(9.9)	0.688
Children	60	(69.0)	9	(56.3)	24	(63.2)	93	(66.0)	
Government	11	(12.6)	3	(18.8)	7	(18.4)	21	(14.9)	
Others	6	(6.9)	3	(18.8)	4	(10.5)	13	(9.2)	

* number(percent)

Table 2. Distribution of life-styles in subjects *

Remnants of tooth	EDG		DG		Tal		p-value
Smoking habit							
Current smoker	7	(7.9)	1	(1.8)	8	(5.6)	0.060
Past smoker	15	(16.9)	4	(7.3)	19	(13.2)	
never	67	(75.3)	50	(90.9)	117	(81.3)	
Drinking habit							
Current drinker	2	(2.3)	4	(7.3)	6	(4.2)	0.273
Past drinker	10	(11.4)	4	(7.3)	14	(9.8)	
Never	76	(86.4)	47	(85.5)	123	(86.0)	
Sleeping pattern							
Regular	40	(46.0)	28	(51.9)	68	(48.2)	0.497
Irregular	47	(54.0)	26	(48.1)	73	(51.8)	
Daily sleep time (hour)							
-6	32	(49.2)	14	(36.8)	46	(44.7)	0.425
7-8	29	(44.6)	22	(57.9)	51	(49.5)	
9+	4	(6.2)	2	(5.3)	6	(5.8)	
Taking pattern of meal							
Regular	79	(88.8)	47	(85.5)	126	(87.5)	0.560
Irregular	10	(11.2)	8	(14.5)	18	(12.5)	
Skip of meals per weak							
None	47	(54.0)	17	(30.9)	64	(45.1)	0.026
1-3	18	(20.7)	17	(30.9)	35	(24.6)	
4+	22	(25.3)	21	(38.2)	43	(30.3)	
Current appetite							
Good	52	(59.1)	33	(60.0)	85	(59.4)	0.444
Ordinary	22	(25.0)	17	(30.9)	39	(27.3)	
Bad	14	(15.9)	5	(9.1)	19	(13.3)	

* number(percent) ; EDG: Edentulous group; DG: Dentate group

Table 3. Current disease status and medication in subjects *

Remnants of tooth	EDG		DG		Total		p-value
Current disease status							
No	25	(28.7)	24	(43.6)	49	(34.5)	0.069
Yes	62	(71.3)	31	(56.4)	93	(65.5)	
Suffering diseases							
Hypertension	30	(33.3)	17	(30.4)	47	(32.2)	0.708
Osteoarthritis	11	(12.2)	10	(17.9)	21	(14.4)	0.345
Respiratory	4	(4.4)	3	(5.4)	7	(4.8)	0.802
Cardiovascular	4	(4.4)	2	(3.6)	6	(4.1)	0.796
Diabetes mellitus	3	(3.3)	1	(1.8)	4	(2.7)	0.578
Medication for							
Hypertension	28	(31.1)	18	(32.1)	46	(31.5)	0.896
Osteoarthritis	8	(8.9)	6	(10.7)	14	(9.6)	0.716
Respiratory	4	(4.4)	3	(5.4)	7	(4.8)	0.802
Cardiovascular	3	(3.3)	1	(1.8)	4	(2.7)	0.578
Diabetes mellitus	4	(4.4)	0	(0.0)	4	(2.7)	0.110

* number(percent); EDG: Edentulous group; DG: Dentate group

Table 4. Scales of screening tools for psychiatrics and daily activities

Remnants of tooth		EDG		DG		Total		p-value
MMSE-K								
		21.4	(5.8)	20.9	(5.8)	21.2	(5.8)	0.598
MMSE-K								
	18+	67	(82.7)	36	(69.2)	103	(77.4)	0.069
	-17	14	(17.3)	16	(30.8)	30	(22.6)	
SGDS								
		8.1	(5.5)	8.5	(5.5)	8.3	(5.5)	0.701
SGDS								
	-9	47	(56.6)	28	(53.8)	75	(55.6)	0.752
	10+	36	(43.4)	24	(46.2)	60	(44.4)	
ADL								
		8.4	(2.5)	9.0	(3.3)	8.6	(2.9)	0.228

* number(percent) or mean(standard deviation); EDG: Edentulous group; DG: Dentate group

Table 6. Sub-analysis for relation between age and remnant of tooth in Table 1

Remnants of tooth		0		5+		Total		p-value
Age								
	85-87	36	(57.1)	18	(64.3)	54	(59.3)	0.645
	90-	27	(42.9)	10	(35.7)	37	(40.7)	
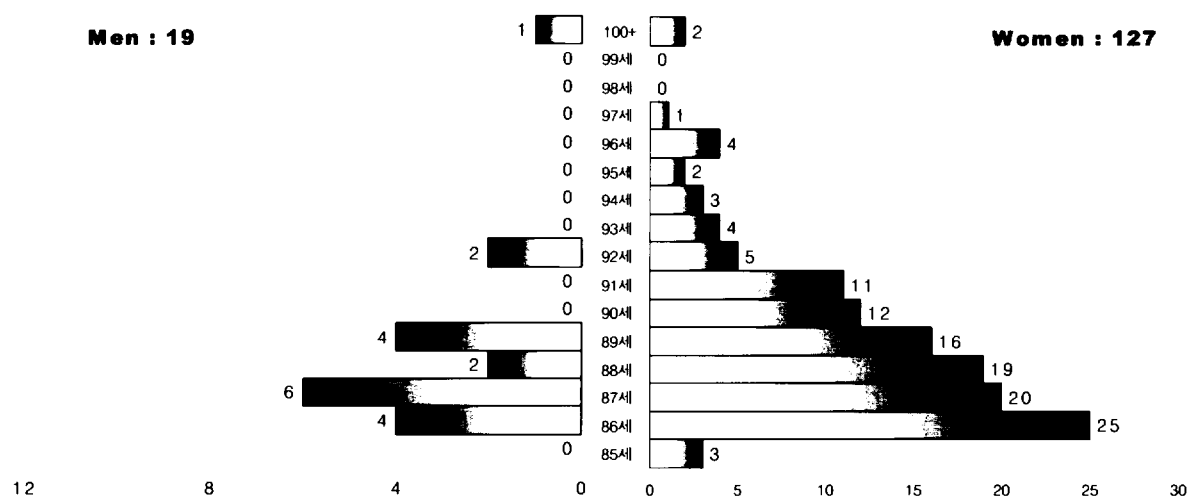
Figure 1. Distribution of age and sex in the study participants

Table 7. Anthropometric characteristics of subjects *

Remnants of tooth	EDG	DG	Total	p-value
Height (cm)	146.4 (10.0)	145.2 (7.7)	145.9 (9.2)	0.477
Weight (Kg)	47.8 (8.6)	47.5 (8.4)	47.7 (8.5)	0.864
Waist circumference(cm)	83.3 (7.8)	83.5 (08.7)	83.4 (8.1)	0.922
Hip circumference(cm)	92.3 (7.1)	93.1 (8.0)	92.6 (7.4)	0.526
BMI(Kg/m2)				
<18.5	6 (7.8)	7 (15.6)	13 (10.7)	0.035
18.5-24.9	60 (77.9)	25 (55.6)	85 (69.7)	
25.0-	11 (14.3)	13 (28.9)	24 (19.7)	
WHR_men(%)				
<85.0	3 (27.3)	1 (16.7)	4 (23.5)	0.962
85.0-89.9	2 (18.2)	1 (16.7)	3 (17.6)	
90.0-94.9	3 (27.3)	2 (33.3)	5 (29.4)	
95.0-	3 (27.3)	2 (33.3)	5 (29.4)	
WHR_women(%)				
<85.0	14 (20.6)	10 (26.3)	24 (22.6)	0.962
85.0-89.9	13 (19.1)	8 (21.1)	21 (19.8)	
90.0-94.9	30 (44.1)	13 (34.2)	43 (40.6)	
95.0-	11 (16.2)	7 (18.4)	18 (17.0)	
Blood pressure level				
Systolic	148.8 (21.4)	152.5 (23.7)	150.2 (22.3)	0.786
Diastolic	83.2 (9.7)	86.7 (10.3)	84.5 (10.1)	
Hypertension				
Nomal	21 (25.0)	9 (17.6)	30 (22.2)	0.715
Grade1	36 (42.9)	23 (45.1)	59 (43.7)	
Grade2	15 (17.9)	9 (17.6)	24 (17.8)	
Grade3	12 (14.3)	10 (19.6)	22 (16.3)	
Blood glucose level	158.7 (44.3)	156.5 (42.9)	157.8 (43.6)	0.787
Glucose intolerance				
Nomal	59 (79.7)	41 (82.0)	100 (80.6)	0.754
Abnormal	15 (20.3)	9 (18.0)	24 (19.4)	
Hearing disturbance				
No	52 (57.8)	33 (58.9)	85 (58.2)	0.891
Yes	38 (42.2)	23 (41.1)	61 (41.8)	
Walking disturbance				
No	59 (65.6)	36 (65.5)	95 (65.5)	0.990
Yes	31 (34.4)	19 (34.5)	50 (34.5)	

* number(percent) or mean(standard deviation) ; EDG: Edentulous group; DG: Dentate group; BMI : body mass index, WHR : waist-hip ratio

Discussion

It is interested that there was a statistical significance between age and number of remnants of teeth. The authors suspected that the relation might be due to the relatively higher proportion of 1 to 4 remnants of teeth in the group aged 90 years and older in Table 1 (62.5%). For this reason, group aged 88 to 89 years and group of 1-4 remnants of tooth were excluded and sub-analysis for the relationship between age and remnant of teeth was done.

Table 6 showed that the frequencies of 5 and more remnants of tooth would not different between group aged 85 to 87 years and group aged 90 years and older. This fact might indicate that tooth loss would be a one of determinant of longevity. The reason is that if the remnants of self tooth were not related to longevity, group aged 90 years and older should have fewer remnants of self tooth than group aged 85 to 87 years. Because the 3-year incidence rates of tooth loss was 53% for Blacks and 29% for Whites, respectively (31,32). In addition, the data of this study was obtained using not the follow-up study but the cross-sectional study. Some follow-up studies will be necessary to elucidate the relationship between tooth retention and longevity.

The association between oral health status and mortality might reflect an association between poor dental status, and general functional limitation, which are significant predictors of mortality (33). An additional potential mechanism explaining this association might relate to oral infections (34). Thus, the effect of remnant of teeth for longevity seems to be indirect mainly (21,33,35,36).

In addition to the factor of longevity, remnant of self tooth would be an important factor of quality of life in

elderly people (10,14,15,37). This opinion is based on that DG had less suffering from current illness and less cases of suspected dementia than EDG. These results are also supported by the results that DG had more never smokers and less skip of meals, and higher BMI than EDG in this study and related studies (38-40).

Previous studies has reported that increased risk for tooth loss was associated with deteriorated general health (33,41,42), age-related hearing loss (43), insufficiency of calcium and vitamin D (20), smoking (44), and low socioeconomic status (45-47). The result that there were more current and past smokers in EDG than DG in this study is consistent with the previous study (43,44,48,49). However, subjects were residents of rural districts so that a relation between tooth loss and socioeconomic status could not be identified in this study.

For screening of dementia by MMSE-K, there were more suspected cases for dementia in EDG than DG. In other words, tooth loss in elderly people was related to the poor mental health status (50-53). Although cognitive function appears to be a marker of capacity for survival (54), longitudinal studies should be needed to evaluate mechanisms of the relationship between dementia and tooth loss.

It is a strength of our study that the subjects are community-dwelling persons aged 85 years and older, which are defined as a 'long-lived person' in Korea. So results of this study would be applied for the study of longevity. However, there are a few subjects aged 85 years and older in the selected districts. The statistical power would be low so that the 10% of type I statistical error should be chosen. The data was collected by the direct interview was another strength of our study. Because data collected by direct interview would have lower chance to information bias in the elderly people than by self-administered method. In addition, the

data was gathered by only two interviewers so that a chance of interviewer-induced information bias could be minimized.

There is a limitation of our study that we have no information about the bias that could arise from non-contacts. The authors guess that they might be not residents in the address registered in the administrative office. Therefore, it does not seem likely that a bias from non-contacts would not affect the inference in this population-based study.

In summary, the remnant of tooth would be a major predictor for longevity and quality of life in the 'long-lived' people. According to Burt's suggestion (55), tooth loss is a risk indicator of longevity in this cross-sectional study. Although associations in cross-sectional studies do not automatically imply causation, the suggestion of this study provides hints to a successful way to prevent impaired quality of life and elongate the healthy longevity in the 'long-lived' people. Therefore, care services for dental health would be necessary to promote health status in the 'long-lived' people (6,18,56,57).

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