Effects of Health Status of Elderly Living Alone on Remaining Teeth

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Abstract

Objectives: This study identifies the effects of the health status of elderly living alone on remaining teeth to provide basic data that can be used in exercising proper health management. Methods/Statistical Analysis: The subjects for this study were 1,107 senior citizens living alone in Seoul, Korea. The demographical features and number of remaining teeth of research subjects were reviewed by calculating frequency and percentage. In order to examine the demographical characteristics and the remaining teeth impact factors per health status, multiple regression analysis was carried out. The explanatory power of the model was identified using the multiple Regression coefficients (R²). Findings: By gender, there were 376 (34.40%) male and 731 (66.0%) female senior citizens. For number of remaining teeth of research subjects, 716 (64.7%) had 11 to 15 teeth remaining. This group was followed by those with six to ten teeth at 293 people (26.5%), while 83 (7.5%) had less than five and 15 (1.4%) had 16 or more. Upon analyzing the impact factors of demographical features on remaining teeth, it was found that elderly women, younger age, higher education, and those with monthly incomes had more remaining teeth, and the explanatory power of variables was 84.2. For physical health status, those with good subjective physical health, no diabetes, and no osteoporosis had more remaining teeth. For mental health status, those with good subjective mental health, no depression, did not experience suicidal impulses, and less stress had more remaining teeth. For oral health status, those with good subjective oral health, no periodontal diseases, no dental carriers and no discomforts with mastication had more remaining teeth. Improvements/Applications: It is necessary to develop health care programs in order to help elders living alone to accurately perceive their health status, and to share with them the importance of remaining teeth.

Keywords: Elderly, Mental Health, Oral Health, Physical Health, Remaining Tooth

1. Introduction

Elderly living alone refers to a person of senior citizen households who does not live with spouses, relatives, non-relatives, or anyone else and cannot receive support. In terms of its discussable concept, it refers to elderly living alone who are in absolute poverty. The isolated living conditions of elder lies living alone can lead to accelerated decline of daily life activities and age-related diseases, and physical, mental and oral health can also worsen more compared to senior citizen counterpart. More than half of senior citizens who live alone have three or more compound chronic diseases, and this shows that elderly people
living alone are at higher risk for diseases compared to the elderly who do not live alone.

Due to the stark increase of elderly living alone, there has been a rise in social interest on their lives, and in particular, resolving the health issue so that they may lead satisfying lives which has become an important agenda. The negative health state of the elderly living alone acts as an obstacle for basic daily lifestyle capabilities for independent life. Furthermore, as physical aging continues, the level of such will become more serious.

This has a negative impact on the overall life of senior citizens living alone and can be a cause for lowering the quality of life. According to health is an important element for senior citizens to live a happy life, and oral health is very important for maintaining general health.

The oral health of the elderly are closely related to mental health and it acts as a determining factor for quality of life as well. Tooth loss in the elderly age can cause narrow absorption of the alveolus area, leading to caving in of the lips and cheek and thus changing the facial appearance, and thereby feeling discouraged to interact with others. Furthermore, the drop in mastication abilities can lead to difficulty in food consumption, thus resulting into deterioration of health and fitness. The number of remaining teeth is not only an index of results of extended tooth lifespan, but it also makes it possible to predict the individual oral health status.

When the elderly have few remaining teeth, it reduces not only the mastication ability, but also lowers the quality of life by having an impact on nutritional state and overall health. Therefore, taking care of the remaining teeth of senior citizens can act as a cornerstone for spending the rest of their lives happily.

Accordingly in this study, the impact of the health status of elderlies living alone on remaining teeth, which is an important scale for oral health, was analyzed to provide education on the importance of health care and remaining teeth.

2. Materials and Methods

2.1 Research Subject and Method

The subjects for this study were 1,107 senior citizens living alone in Seoul, Korea. For the method of research, two dentists and five dental hygienists visited senior welfare centers to conduct health and oral examinations for senior citizens living alone, and data on mental health status were collected through interviews.

Details for demographical features included gender, age, education and monthly income. Details for physical health status included subjective physical health status, high blood pressure, diabetes, obesity, and osteoporosis. Questions on mental health status included subjective mental health status, depression, suicidal impulses, stress, and insomnia. Questions on oral health status included subjective oral health status, periodontal diseases, dental caries, discomfort in mastication, and oral dryness. The dependent variable was the number of remaining teeth and it was categorized as ‘less than 5’, ‘6-10’, ‘11-15’, and ‘16 or more’. During oral examination for matters on oral health, mouth mirror, explorer and cotton plier were used. Questions on physical, mental and oral health status were comprised of ‘Yes’ or ‘No’ questions.

2.2 Data Analysis

The demographical features and number of remaining teeth of research subjects were reviewed by calculating frequency and percentage. In order to examine the demographical characteristics and the remaining teeth impact factors per health status, multiple regression analysis was carried out. The explanatory power of the model was identified using the multiple regression coefficient ($R^2$).

Among the independent variables used for regression analysis, gender, monthly income and physical health status, mental health status, and the detailed items of oral health state were made into dummy variables with ‘Yes’ being 1 and ‘No’ being 0. The collected data was analyzed using the SPSS Window Program 19.0 version (IBM, United States). The significance level ($\alpha$) used for statistical significance verification was 0.05.

3. Results

3.1 The General Characteristics of the Subjects

The demographical characteristics of the research subjects are as shown in Table 1. By gender, there were
376 (34.40%) male and 731 (66.0%) female senior citizens. For age group, the group between ages 65 and 74 were the most common respondents at 602 people (54.4%), while those over 80 was the smallest group with 69 people (6.2%). For education level, middle school graduates was highest at 728 people (65.8%), while 435 (39.3%) of the elderly respondents answered that they had income.

For number of remaining teeth of research subjects, 716 (64.7%) had 11 to 15 teeth remaining. This group was followed by those with six to ten teeth at 293 people (26.5%), while 83 (7.5%) had less than five and 15 (1.4%) had 16 or more.

### 3.2 Impact Factors of Demographical Characteristics on Remaining Teeth

Upon analyzing the impact factors of demographical features on remaining teeth, it was found that elderly women, younger age, higher education and those with monthly incomes had more remaining teeth and the explanatory power of variables was 84.2 as shown in Table 2.

#### Table 1. The general characteristics of the subjects

| Variables        | N    | %    |
|------------------|------|------|
| Gender           |      |      |
| Male             | 376  | 34.0 |
| Female           | 731  | 66.0 |
| Age              |      |      |
| 65-74            | 602  | 54.4 |
| 75-79            | 436  | 39.4 |
| ≥80              | 69   | 6.2  |
| Education        |      |      |
| Ineducation      | 81   | 7.3  |
| Elementary school| 298  | 26.9 |
| ≥Middle school   | 728  | 65.8 |
| Monthly income   |      |      |
| Yes              | 435  | 39.3 |
| No               | 672  | 60.7 |
| Remaining teeth  |      |      |
| <5               | 83   | 7.5  |
| 6-10             | 293  | 26.5 |
| 11-15            | 716  | 64.7 |
| >16              | 15   | 1.4  |
| Total            | 1,107| 100.0|

Upon analyzing the impact factors of demographical features on remaining teeth, it was found that elderly women, younger age, higher education and those with monthly incomes had more remaining teeth and the explanatory power of variables was 84.2 as shown in Table 2.
3.3 Impact Factors of Health Status on Remaining Teeth

Multiple regression analysis results on the impact factors of health status on remaining teeth are as shown in Table 3-5. For physical health status, those with good subjective physical health, no diabetes, and no osteoporosis had more remaining teeth, and the explanatory power of variables was 14.0 as shown in Table 3.

Table 2. Impact factors of demographical characteristics on remaining teeth

| Variables          | B    | SE   | β    | t      | P     |
|--------------------|------|------|------|--------|-------|
| Gender             | 1.233| 0.018| 0.904| 67.291 | 0.000*** |
| Age                | -0.033| 0.014| -0.031| -2.376 | 0.018*  |
| Education          | 0.136| 0.014| 0.131| 9.894  | 0.000*** |
| Monthly income     | -0.022| 0.018| -0.016| -1.216 | 0.224  |

R²=0.843, AdR²=0.842, F=1475.768

B: Unstandardized Coefficients, β : Standardized Coefficients.
Statistically significant differences by multiple regression analysis at α=0.05.
*: p<0.05, ***: P<0.001.

Table 4. Impact factors of physical health status on remaining teeth

| Variables               | B    | SE   | β    | t      | P     |
|-------------------------|------|------|------|--------|-------|
| **Physical Health Status** |      |      |      |        |       |
| Subjective Physical Health | 0.256| 0.041| 0.176| 6.142  | 0.000*** |
| Hypertension            | 0.060| 0.049| 0.035| 1.212  | 0.226  |
| Diabetes                | -0.147| 0.038| -0.110| -3.814 | 0.000*** |
| Obesity                 | -0.062| 0.043| -0.041| -1.451 | 0.147  |
| Osteoporosis            | -0.412| 0.037| -0.316| -10.993| 0.000*** |

R²=0.144, AdR²=0.140, F=37.060

B: Unstandardized Coefficients, β : Standardized Coefficients.
Statistically significant differences by multiple regression analysis at α=0.05.
***: P<0.001.
3.4 Impact Factors of Mental Health Status on Remaining Teeth

For mental health status, those with good subjective mental health, no depression, did not experience suicidal impulses, and less stress had more remaining teeth and the explanatory power of variables was 13.5 as shown in Table 4.

3.5 Impact Factors of Oral Health Status on Remaining Teeth

For oral health status, those with good subjective oral health, no periodontal diseases, no dental carriers, and no discomforts with mastication had more remaining teeth, and the explanatory power of variables was 84.0 as shown in Table 5.

### Table 4. Impact factors of mental health status on remaining teeth

| Variables         | B   | SE  | β    | t    | P   |
|-------------------|-----|-----|------|------|-----|
| **Mental Health Status** |     |     |      |      |     |
| Subjective Mental Health | 0.412 | 0.037 | 0.316 | 11.196 | 0.000*** |
| Depression        | -0.094 | 0.037 | -0.073 | -2.574 | 0.010** |
| Suicidal Impulse  | -0.197 | 0.052 | -0.108 | -3.791 | 0.000*** |
| Stress            | -0.231 | 0.039 | -0.172 | -5.978 | 0.000*** |
| Insomnia          | -0.031 | 0.041 | -0.022 | -0.754 | 0.451 |

R²=0.139, Adjusted R²=0.135, F=35.618

B: Unstandardized Coefficients, β: Standardized Coefficients. Statistically significant differences by multiple regression analysis at α=0.05.

*: p<0.01, **: P<0.001.

### Table 5. Impact factors of oral health status on remaining teeth

| Variables         | B   | SE  | β    | t    | P   |
|-------------------|-----|-----|------|------|-----|
| **Oral Health Status** |     |     |      |      |     |
| Subjective Oral Health | 0.082 | 0.016 | 0.064 | 5.225 | 0.000*** |
4. Conclusion

The issue with elderly living alone in Korea today has become a social issue. One of the main reasons for this is that the health risk elements they possessed lowered their satisfaction of life. Generally, senior citizens living alone had higher likeliness of health problems compared to the elderly who did not live alone due to lower financial abilities, restricted social activities, and lack of linking with social support. Moreover, as negative health state is closely related to oral health, it is necessary to provide support measures that take into consideration their circumstantial weaknesses.

The results of this study aimed at examining the factors that affects the remaining teeth of elderly living alone. Demographical features that affected remaining teeth included gender, age, and education level. In particular, the reason why the number of remaining teeth dropped with age was not natural due to aging. This is the accumulated result of genetic factors and unhealthy eating habits and poor oral care. Furthermore, it can be analyzed to be the result of not receiving regular preventive oral healthcare.

Those with higher education had more remaining teeth, and this was identical with the results of 5.

Physical health status that affected remaining teeth included subjective physical health, diabetes, and osteoporosis. Remaining teeth are very important as part of the digestive organs for consuming nutrients to maintain appropriate physical health for senior citizens. Particularly in the case of diabetes patients when compared to healthy people, they have more dental plaque, attachment loss, gingival bleeding, and tooth mobility, which accelerates the destruction of the alveolar bone, thus having a big impact on reducing the number of remaining teeth.

When having osteoporosis, skeletal diseases caused by the reduced bone strength accelerates the progress of periodontal diseases. Therefore, remaining teeth are closely related to physical health and it will also act as a determining factor the quality of life of elderly.

Mental health status that affected remaining teeth included subjective mental health, depression, suicidal

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**Table 5 Continued**

| Periodontal Disease | B   | SE  | β    | t    | Sig  |
|--------------------|-----|-----|------|------|------|
| Periodontal Disease | -0.077 | 0.016 | -0.060 | -4.952 | 0.000*** |
| Dental caries       | -1.213 | 0.017 | -0.889 | -72.387 | 0.000*** |
| Chewing difficulty  | -0.128 | 0.022 | -0.070 | -5.712 | 0.000*** |
| Xerostoma           | -0.008 | 0.016 | -0.006 | -0.481 | 0.631 |

R²=0.841, AdjR²=0.840, F=1164.370

B : Unstandardized Coefficients, β : Standardized Coefficients.
Statistically significant differences by multiple regression analysis at α=0.05.
***: P<0.001.
impulses, and stress. Consumption of anti-depressants due to depression can cause oral dryness by lowering salivation. The resulting proliferation of microorganisms can cause oral diseases, thus contributing to the decrease in the number of remaining teeth.

According to statistical data, the stress awareness rate of senior citizens in Korea is on the rise. The elderly said that health problems were major causes of stress because there was higher potential for incurring diseases due to reduced physical functions and because they are more likely exposed to chronic diseases and complications.

It was reported in preceding studies that stress has a negative impact on oral hygiene care.

Research by also found that among mental health, stress, depression and suicidal impulses affected subjective oral health, and the impact of stress was highest among them. They reported that stress not only had negative impact on oral hygiene management, but was also closely related to quality of life.

It is presumed that high stress normally increases frustration and depression, thus lowering interest in oral health.

Therefore, it is necessary to help patients recognize that mental health state can increase risks related to oral health, and moreover, it is necessary to establish a joint cooperation system for mental and oral health treatment to improve the oral health of the elderly. It is thus necessary to operate an education program at a dental treatment institute to improve mental health. Oral health status that affected remaining teeth included subjective oral health status, periodontal diseases, dental caries, and discomforts in mastication.

When examining preceding studies related to subjective oral health status, it was reported that when subjective oral health is poor, the rate of having no teeth was 50.8%. When elder lies living alone had experience with periodontal diseases, dental caries and discomforts with mastication, if there is severe damage to the tooth, the tooth is extracted, thus causing a reduced number of remaining teeth.

In other words, when one has experience with extracting many teeth in the past, it is presumed that there would be a high possibility of oral diseases due to poor dental care even in the present.

According to factors that impact the oral health-related quality of life for the elderly in Korea is uncomfortable mastication, oral pain, and perceived oral health. This shows that the oral health of senior citizens is closely related to quality of life. In research stated that elders had higher quality of life when they had no tooth pains, fewer oral prosthetics and tooth loss, and when they had no oral diseases. They claimed that oral health status and oral health behavior affected the overall satisfaction on life. Oral health care is essential for overall health of elders living alone, and therefore, it is necessary to come up with a plan to prevent tooth loss and to maintain oral health for the elderly.

Care-services for the elderly living alone should also be reinforced to reduce concerns on dangerous flues and provide positive support so that they may live comfortable and healthy lives. In the case of senior citizens living alone who need health management, it is necessary to procure more health professionals and resources for systematic visit-type health services and health management systems broken down into physical, mental and oral health services. By having senior citizens maintain stable psychological states and resolve social and health related problems through this, it can ultimately lead to improving their satisfaction of life.

Hence, it is necessary to develop healthcare programs in order to help elders living alone to accurately perceive their health status, and to share with them the importance of remaining teeth.

5. References

1. Health and Welfare Forum. Available from: https://www.kihasa.re.kr/html/jsp/publication/periodical/focus/list.jsp
2. Saltines SS, Storhaug K, Borge CR, Enmarker I, Willumsen T. Oral health-related quality-of-life and mental health in individuals with chronic obstructive pulmonary disease. Acta Odontologica Scandinavica. 2015 Mar; 73(1):14-20.
3. Kang BW, Kim MJ, Kim MH, Kim SJ, Kim YS, Kim JY. Public Oral Health. Seoul, Korea: Koonja; 2013. p. 98-109.
4. Jeffcoat MK, Lewis CE, Reddy MS, Wang CY, Redford M. Post-menopausal bone loss and its relationship to oral bone loss. Periodontology. 2015 Mar; 23(1):94-102.
5. Kwon MH, Choi HS. Impacting factors on oral health status of the community among the elderly the 6th Korea national
health and nutrition examination. Indian Journal of Science and Technology. 2016 May; 9(20):1-6.
6. Kim MJ. The effects of life habits of some elders on subjective symptoms of periodontal disease. Journal of Korean Society of Dental Hygiene. 2015 Jun; 15(3):425-33.
7. Won YS, Kim JH. The relationship between psychological health and self-rated oral health on convergence study. Journal of Digital Convergence. 2015 Oct; 13(7):239-48.
8. Jang KA, Kim DY. Subjective oral health perception and oral health behaviors of the elderly people in Busan and Gyeongnam province. Journal of Korean Society of Dental Hygiene. 2008 Dec; 8(4):1-9.
9. Jang JH, Park YD, Kim JH, Kim EJ. Clinical predictors related to oral health-related quality of life (OHRQoL) in Korean elderly for visiting oral health care. Indian Journal of Science and Technology. 2015 Oct; 8(25):1-6.
10. Woo SR, Seo BI, Han CH. The impact of oral health status of the elderly in the community on their satisfaction with life. The Journal of East-West Medicines. 2010 Feb; 35(2):39-71.