

Effectiveness of a 5-year Community Oral Health Program for the Elderly in Korea

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Korea has been running the community oral health program for the elderly, including topical fluoride application and scaling. The aim of this study was to compare the subjective and objective oral health status of 345 participants according to the number of participants in the program and of 37 participants before and after the 5-year program. The survey consisted of an interview questionnaire and oral examinations. Analysis of variance was used to compare the variables of the 345 participants according to the numbers of participants. Paired t-test was used to compare the oral health statuses before and after the 5-year program in 37 subjects. There was no difference in subjective oral health status according to the number of participants in the oral health program in the elderly, including subjective health status, subjective oral health status, satisfaction with oral health, concern about oral health, need of dental treatment, oral pain, tooth sensitivity, subjective periodontal health, and subjective symptoms of periodontitis. The community periodontal index (CPI) of the 1 time participants was significantly higher than that of 3 times, 4 times or 5 times participants in the upper center, lower left, lower center, and lower right areas. There was a significant improvement in CPI from 2.59 ± 1.14 to 1.41 ± 1.54 ($p < 0.001$) and positive oral behavioral change (daily tooth brushing frequency from 2.27 ± 0.73 to 2.54 ± 0.90) before and 5 years after the program. However, the program did not prevent tooth loss as the numbers of the remaining teeth significantly reduced from 23.77 ± 1.84 to 21.95 ± 2.03 over 5 years. We showed that running the community oral health program for the elderly for more than three years might have positive effects on the periodontal health of participants.

Key Words: Elderly, Korea, Oral health

Introduction

The proportion of older people continues to grow worldwide in developing countries¹⁾. According to Korean national demographic census in 2015, approximately 6,624,000 people, which accounted for 13.1% of the population, were aged 65 years and over. The aging population has outnumbered the youth in 2017, and it will exceed 40% of the total population. Korea has introduced the 2020 Oral Health Goals to improve the oral health of the elderly. This includes increasing the proportion of the elderly with 20 or more teeth by 59.0%, increasing the number of remaining teeth by 20, reducing the prevalence of subjective mastication discomfort by 48.0%, and in-

creasing the proportion of the elderly who have annual oral health checkups by 36.0%²⁾.

Korea has two community-driven oral health programs including prevention and rehabilitation for the elderly. The denture delivery program for low-income groups, which started in 2002, was stopped in 2016 because the national health insurance did not cover partial and full dentures for the elderly over 65 years of age. The fluoride application-scaling program for the elderly has been delivered in some communities, which started as a demonstration project in 2009 with national funds. After the integrated health promotion program in 2013, it has been promoted as an optional program according to the condition of each community.

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Daejeon Donggu Public Health Center has run the oral health promotion program for the elderly since 2009. About 3% of the population of the elderly in this area has participated in this project every year. The dental hygienists in charge of the program insisted that the project should be evaluated to measure improvements in oral health status of the participants in spite of the difficulty in its management. Oral examinations and a questionnaire for the participants were conducted to confirm the improvement of oral health status in the participants through the program in 2013. The aim of this study was to inspect the difference of oral health status according to the numbers of years of participation and change of oral health status through the 5-year community oral health program.

Materials and Methods

1. Study design and sampling

This cross-sectional study was based on a sample of participants in the oral health promotion program for the elderly in Donggu, Daejeon in 2013, followed by a retrospective cohort study using the data from the survey of oral health status in this area in 2009³⁾. Among 1,257 participants aged ≥ 65 years in 2013, 355 subjects gave their written consent to participate in this survey. We excluded 10 participants with multiple missing responses in the questionnaire. There were 127 persons who participated once and 217 persons who had participated more than once in the program. Thirty-seven subjects in this study participated in the 2009 Oral Health Survey. Among the subjects, 57.4% were women, and the average age was 74.46 ± 4.81 years. This study was approved by the institutional review board of Konyang University Hospital (KYUH 13-92).

2. Data collection

One dentist performed oral examination in the program. The dentist had no prior knowledge of the participants to exclude prejudice, and the oral examination was carried out according to the criteria of the World Health Organization. Community periodontal index (CPI) and the number of remaining teeth were evaluated.

The interview questionnaire comprised an assessment

of subjective health status, subjective oral health status, satisfaction with oral health, concern about oral health, need of dental treatment, oral pain, tooth sensitivity, subjective periodontal health, subjective symptoms of periodontitis, and oral health behavior. Subjective health and subjective oral health were assessed using a 6-point Likert scale. Assessment of satisfaction with oral health, concern about oral health, need for dental treatment, and subjective periodontal health was performed using 5-point Likert scales. Oral pain and tooth sensitivity were assessed using a 4-point Likert scale. Oral health behavioral was assessed using a 100-point Thurstone scale. Subjective symptoms of periodontitis consisted of swollen gums, sore gums, receding gums, loose teeth, drifting teeth, and bad breath. The positive and negative symptoms were mixed to achieve good reliability. In the statistical analysis, the higher the score, the more acceptable the item.

3. Oral health promotion program in elderly⁴⁾

The oral health promotion program for the elderly in Donggu, Daejeon, is a program in which dental hygienists search for and visit target persons directly. The dental hygienists responsible for the program contacted the managers of community centers, welfare centers, nursing homes, and silver halls, among others. They visited the places where the managers agreed to participate in the program. The program consisted of an oral examination, scaling with an ultrasonic scaler, fluoride varnish application with 5% sodium fluoride, denture cleaning, individual oral health education, and supply of toothbrush and denture cleaner. The participants could attend the program only once a year.

4. Statistical analysis

The purposes of this analysis were to compare the subjective and objective oral health statuses according to the number of individuals participating in the program and to investigate whether an improvement in oral health occurred through the program. Analysis of variance was used to compare the variables according to the number of individuals participating in it. Paired t-test was used to compare the oral health status between 2009 and 2013 in 37 participants because the data were normally distributed

Table 1. Subjective Oral Health Status according to the Numbers of Participating in Community Oral Health Program in Elderly

Subjective oral health status	Once (n=127)	Twice (n=99)	Three times (n=52)	Four times (n=38)	Five times (n=29)	p-value
Age (y)	73.68±4.70	74.44±5.35	75.22±4.56	74.49±4.57	76.14±4.69	0.099
Bad health	3.47±1.19	3.40±1.20	3.35±1.22	3.42±1.08	3.55±1.02	0.940
Bad oral health	3.65±1.25	3.57±1.23	3.65±1.21	3.66±1.26	3.66±1.08	0.988
Dissatisfaction about oral health	2.58±1.05	2.63±1.03	2.54±0.94	2.66±1.02	2.45±0.91	0.909
Concern about oral health	2.46±0.89	2.53±0.96	2.52±0.92	2.55±0.89	2.55±0.95	0.964
Need of dental treatment	3.17±1.10	3.36±1.22	3.18±1.13	3.13±1.17	3.34±0.95	0.674
Oral pain	1.32±0.62	1.45±0.64	1.34±0.52	1.34±0.53	1.38±0.56	0.548
Tooth sensitivity	1.42±0.57	1.30±0.52	1.33±0.62	1.42±0.55	1.34±0.55	0.564
Bad periodontal health	2.67±1.00	2.58±0.97	2.66±0.85	2.41±0.90	2.41±0.63	0.452
Need of periodontal treatment	1.70±0.46	1.76±0.43	1.78±0.42	1.86±0.35	1.90±0.31	0.117
Number of symptoms of periodontitis	1.05±1.20	1.36±1.46	0.90±1.19	1.03±1.27	0.92±1.12	0.214
Subjective oral health behavior	73.66±18.04	75.08±17.12	77.50±17.30	77.24±17.88	69.11±20.05	0.269
Tooth brushing frequency a day	2.44±0.94	2.42±0.77	2.35±0.86	2.45±0.89	2.41±0.87	0.977

Values are presented as mean±standard deviation.

Bad health, Bad oral health: 6 points scale (1, very healthy; 2, healthy; 3, normal; 4, a little unhealthy; 5, rather unhealthy; 6, very unhealthy).

Dissatisfaction about oral health, Concern about oral health, Need of dental treatment: 5 points scale (1, I absolutely disagree with it; 2, I disagree with it; 3, so-so; 4, I agree with it; 5, I absolutely agree with it).

Oral pain, Tooth sensitivity: 4 points scale (1, never; 2, sometimes; 3, often; 4, always).

Symptoms of periodontitis: swollen gums, sore gums, receding gums, loose teeth, drifting teeth, bad breath.

Oral health behavior: 100 points scale (the higher the score, the better the oral health care).

p-values were analyzed using ANOVA.

in spite of the small number of participants. The level of statistical significance was set at $\alpha=0.05$. All statistical analyses were performed with the IBM SPSS 20.0 (IBM Co., Armonk, NY, USA).

Results

There were no differences in subjective oral health

status including subjective health status, subjective oral health status, satisfaction with oral health, concern about oral health, need of dental treatment, oral pain, tooth sensitivity, subjective periodontal health, and subjective symptoms of periodontitis according to the number of participants in the oral health program for the elderly (Table 1). There were some difference in CPI in the upper center, lower left, lower center, and lower right area

Table 2. Objective Oral Status according to the Numbers of Participating in Community Oral Health Program in Elderly

Objective oral health status	Once (n=127)	Twice (n=99)	Three times (n=52)	Four times (n=38)	Five times (n=29)	p-value
CPI	1.60±1.44	1.36±1.53	1.20±1.46	1.26±1.52	1.22±1.50	0.416
CPI-upper right	0.57±0.21	0.61±1.28	0.63±1.21	0.21±0.86	0.62±1.32	0.555
CPI-upper center	0.56±1.21 ^a	0.25±0.87 ^{a,b}	0.26±0.96 ^{a,b}	0.08±0.49 ^b	0.08±0.50 ^b	0.015
CPI-upper left	0.71±1.29	0.51±1.18	0.50±1.13	0.56±1.24	0.67±1.34	0.803
CPI-lower left	1.02±1.34 ^a	0.71±1.29 ^{a,b}	0.45±1.07 ^{a,b}	0.16±0.64 ^b	0.50±1.03 ^{a,b}	0.004
CPI-lower center	1.11±1.22 ^a	0.86±1.25 ^{a,b}	0.45±0.90 ^b	0.63±1.02 ^b	0.50±0.95 ^b	0.004
CPI-lower right	1.01±1.30 ^a	0.64±1.30 ^{a,b}	0.12±0.54 ^b	0.59±1.33 ^{a,b}	0.54±1.06 ^{a,b}	0.002
Total remaining teeth	19.68±8.05	19.68±8.10	19.54±7.97	22.11±5.29	21.52±8.22	0.358
Upper anterior teeth	4.50±2.00	4.71±2.04	4.40±2.32	5.03±1.35	5.03±2.03	0.405
Upper posterior teeth	5.17±2.90	4.94±2.84	4.69±2.94	6.08±1.96	5.59±2.88	0.148
Lower anterior teeth	4.85±1.85	4.87±1.96	4.98±1.69	5.45±1.22	4.86±1.94	0.474
Lower posterior teeth	5.17±2.64	5.16±2.66	5.46±1.22	5.55±2.01	6.03±2.50	0.465

Values are presented as mean±standard deviation.

CPI: community periodontal index (0, healthy periodontal condition; 1, dental plaque; 2, calculus; 3, shallow periodontal pocket; 4, deep periodontal pocket).

^{a,b}The same characters are not significant by Tukey post-hoc analysis; p-values were analyzed using ANOVA.

Table 3. Change of Subjective Oral Health Status between Pre and Post 5-Year Community Oral Health Program (n=37)

Subjective oral health status	Before the program (2009 year)	After 5 years (2013 year)	p-value
Bad health	3.31±0.92	3.56±1.13	0.071
Bad oral health	3.08±0.81	3.19±1.14	0.524
Dissatisfaction about oral health	3.00±0.79	3.25±0.97	0.212
Concern about oral health	2.64±0.90	2.64±0.96	1.000
Need of dental treatment	2.50±0.88	3.14±0.99	0.004
Oral pain	1.42±0.55	1.39±0.55	0.800
Tooth sensitivity	1.58±0.60	1.47±0.56	0.291
Bad periodontal health	2.17±0.91	2.53±0.70	0.041
Number of symptoms of periodontitis	1.45±1.31	0.97±1.17	0.057
Subjective oral health behavior	65.81±17.74	71.39±17.74	0.209
Tooth brushing frequency a day	2.27±0.73	2.54±0.90	0.003

Values are presented as mean±standard deviation.

Bad health, Bad oral health: 6 points scale (1, very healthy; 2, healthy; 3, normal; 4, a little unhealthy; 5, rather unhealthy; 6, very unhealthy).

Dissatisfaction about oral health, Concern about oral health, Need of dental treatment: 5 points scale (1, I absolutely disagree with it; 2, I disagree with it; 3, so-so; 4, I agree with it; 5, I absolutely agree with it).

Oral pain, Tooth sensitivity: 4 points scale (1, never; 2, sometimes; 3, often; 4, always).

Symptoms of periodontitis: swollen gums, sore gums, receding gums, loose teeth, drifting teeth, bad breath.

Oral health behavior: 100 points scale (the higher the score, the better the oral health care).

p-values were analyzed using paired t-test.

according to the number of participants (Table 2). The CPI of the 1 time participants was significantly higher than that of 3 times, 4 times or 5 times participants in the upper center, lower left, lower center, and lower right areas. There was no difference in the number of remaining teeth.

Regarding the difference in oral health status during the 5-year program, 37 subjects after the program thought they needed more dental treatment ($p=0.004$) and they had worse periodontal health ($p=0.041$; Table 3). However, they brushed their teeth more often after the program ($p=0.003$). They said their oral health behavior improved after the program, but there was no statistical difference. CPI in all areas was statistically improved after the 5-year program although the number of remaining teeth decreased significantly (Table 4).

Discussion

The oral health of the elderly is a cumulative consequence of dental caries and periodontal disease over a lifetime¹⁾. There is a prejudice that oral disease prevention program for the elderly is less important and the oral health education for the elderly is less effective than that for other ages. However, Petersen and Yamamoto¹⁾ found that older people did not hesitate to develop new oral health habits for improved health. Prayoonwong et al.⁵⁾ insisted the new

community-based care models to enhance oral health care for the elderly are needed. The importance of oral health programs for the elderly should not be over looked because the elderly population and life expectancy is increasing. The Australian government has invested in improving the oral health of elderly people in 2010⁶⁾, and the Korean government has driven the fluoride application-scaling program for the elderly since 2009⁴⁾.

In Korean studies about the oral health of the elderly, regular dental visits had a significant impact on the oral health of the elderly⁷⁾, and the participants' satisfaction rate regarding their oral condition and the frequency of tooth brushing increased⁸⁾. Experience in oral health education had a positive impact on oral health knowledge, attitudes, and behavior, especially on periodic scaling⁹⁾. The group with more interest in oral health was likely to brush their teeth more often, and those with more frequent tooth brushing had higher oral health knowledge¹⁰⁾. Some studies showed oral health education for the elderly was also effective¹¹⁾; it improved tooth brushing and flossing ability and reduced gingival bleeding¹²⁾. The participants' oral behavior in this study changed positively because the result showed that they brushed their teeth more often compared to before the program (Table 3). Besides, the objective oral health examinations showed an improvement in periodontal health indicators. CPI decreased by one

Table 4. Change of Objective Oral Health Status between Pre and Post 5-Year Community Oral Health Program (n=37)

Objective oral health status	Before the program (2009 year)	After 5 years (2013 year)	p-value
CPI	2.59±1.14	1.41±1.54	<0.001
CPI-upper right	1.72±1.58	0.55±1.24	0.002
CPI-upper center	1.09±1.50	0.00±0.00	<0.001
CPI-upper left	1.94±1.50	0.76±1.37	0.001
CPI-lower left	1.54±1.50	0.46±1.09	<0.001
CPI-lower center	1.61±1.59	0.64±1.22	0.003
CPI-lower right	1.97±1.13	0.64±1.10	<0.001
Total remaining teeth	23.77±1.84	21.95±2.03	0.047
Upper anterior teeth	5.21±1.54	5.03±1.63	0.181
Upper posterior teeth	6.26±2.42	5.64±2.68	0.004
Lower anterior teeth	5.54±1.43	5.13±1.72	0.031
Lower posterior teeth	6.76±1.97	6.16±2.07	0.003

Values are presented as mean±standard deviation.

CPI: community periodontal index (0, healthy periodontal condition; 1, dental plaque; 2, calculus; 3, shallow periodontal pocket; 4, deep periodontal pocket).

p-values were analyzed using paired t-test.

point after the 5-year program (Table 4). Because those who participated more than 3 times showed significant improvement in CPI, we insist that the community oral health program is required for at least three years.

However, the participants in this program did not report a significant improvement in subjective oral health according to the number of years of participation (Table 1); they experienced symptoms of reduced periodontal health more, and they needed dental treatment more often after the program than before the program (Table 3). This program did not prevent tooth loss because 37 participants lost an average of 1.82 teeth over 5 years (Table 4). The negative view of their oral health might have led to their continued participation in the program. Komulainen et al.¹³⁾ reported that oral health intervention among the community-dwelling elderly reduced the incidence of oral diseases or symptoms to 0 in both the intervention and control groups at the 2-year follow-up; however, the difference between the groups was not significant. Gagliardi et al.¹⁴⁾ found that dental treatment intervention improved the quality of life regarding oral health; however, no improvement was seen in subjects with pain or discomfort. One study did not show significant relationships among objective oral examination, subjective oral health status, and requirement of dental treatment¹⁵⁾. Some previous studies have shown that the effects of oral health promotion programs for the elderly were not clear. There are many confounding variables to consider before concluding on the effectiveness of oral health program for the elderly because major oral diseases are cumulative diseases and there are the limitations on treating them through just prevention. Besides, we only offered oral health programs once a year, and there was no control over the participants' other behaviors. McGrath et al.¹⁶⁾ insisted that higher-quality research is required to provide more definite guidelines on oral health promotion practices for the elderly people.

The limitation of this study was the sampling bias because the research was designed using only the data from the community programs, without a control group. People who voluntarily participated in the program might have more interest in their oral health than general people. No reliability tests were performed on the oral examiner of

this survey; however, she had been trained to measure reliability before the study. Nonetheless, this study could be valuable because the previous literature on the effects of the oral health promotion program for the elderly is scarce in Korea. The oral health promotion program in Korea might improve the periodontal health and oral health behavior in the elderly because this study showed there were significant improvements in CPI after the program. The participants had better oral health condition with more remaining teeth compared to the 2015 National Health Nutrition Survey¹⁷⁾, although they lost their teeth 1.82 ± 3.12 over 5 years. We have shown here that running the community oral health program for the elderly for more than three years might have positive effects on the periodontal health of participants.

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