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Original Article

Effectiveness of Professional Oral Health Care Interventions Delivered by Dental Hygienists: Focusing on Older Adults Attending Day Care Centers

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ABSTRACT

Objectives: This study aimed to evaluate the effectiveness of dental hygienist-led professional oral health care interventions for older adults attending day care centers and to provide evidence for defining the roles of geriatric dental hygienists. **Methods:** This pre-post intervention study included 79 older adults attending day care centers and implemented a 6-week home-visit oral health program. Oral health status was assessed using the Simplified Oral Hygiene Index (OHI-S) and the Winkel Tongue Coating Index (WTCI), while oral health-related quality of life was measured using the Geriatric Oral Health Assessment Index (GOHAI) through structured interviews. **Results:** Following the 6-week intervention, OHI-S and WTCI scores significantly decreased (p = 0.001), while GOHAI scores significantly improved (p = 0.008), indicating a positive effect of the intervention. **Conclusions:** Dental hygienist-led home-visit oral health interventions were effective in improving oral health status and oral health-related quality of life among older adults. These findings support the need for policy and institutional frameworks to facilitate the broader implementation of such interventions.

Keywords: Dental hygienists, Daycare centers, Older adults, Oral hygiene, Oral health-related quality of life

1. Introduction

The oral health status of older adults is often characterized by extensive tooth loss, leading to impaired masticatory function. This limitation restricts food choices and adversely affects both the quantity and quality of dietary intake, thereby compromising overall health and physical strength [1-3]. In addition, discomfort during chewing diminishes the pleasure of eating and negatively impacts quality of life [3,4].

Despite being a fundamental component of general health, oral health is frequently neglected in older populations [5]. Poor oral hygiene has been identified as a major risk factor for aspiration pneumonia, a leading cause of mortality in aging societies [6,7]. Previous studies have reported that appropriate oral hygiene management can

reduce the incidence of aspiration pneumonia by more than 30% [8]. Furthermore, a substantial proportion of older adults have expressed a need for oral health services, particularly for prosthetic treatment and repair and assistance with toothbrushing [9].

With the rapid aging of the population, concerns regarding the care of older adults have intensified, and community-based care has emerged as a key policy strategy [10,11]. However, the effective implementation of community-based oral health programs requires a well-trained workforce. Previous studies have shown that healthcare personnel in long-term care and welfare settings often exhibit insufficient knowledge, attitudes, and practices related to oral health care [12,13]

In response, there is a growing need to develop and train specialized professionals capable of delivering home-based oral health care [14,15]. Notably, a pilot program for specialized geriatric dental hygienists was initiated in 2023 by the Korean Dental Hygienists Association, reflecting the increasing importance of professional oral health services for older adults [8].

To facilitate the implementation of home-visit oral health programs, it is essential to establish standardized intervention protocols that integrate geriatric-specific knowledge and practical skills [16-18]. In addition, successful community care requires flexible and tailored approaches that consider regional characteristics and population structures. Systematic evaluation of existing programs is therefore necessary to generate empirical evidence and guide program refinement.

Therefore, this study aimed to evaluate the effectiveness of dental hygienist-led professional oral health care interventions among older adults attending day care centers. The findings are expected to provide evidence to support the development of geriatric oral health services and related policy frameworks.

2. Materials and Methods

2.1. Design and Setting

This study was a single-group pre-post intervention study conducted to evaluate the effectiveness of a home-visit oral health program for older adults attending day care centers. The intervention was delivered once weekly for six weeks (Table 1).

The study was conducted in accordance with the Declaration of Helsinki. Ethical approval was obtained from the Institutional Review Board of D University (IRB No. DKU 2023-10-039-005). The study was registered with the Clinical Research Information Service (CRIS; No. KCT0010277).

Table 1. Design

	Pre-test	Intervention	Post-test
Intervention group	E1	X	E2

X: Home-visit oral health care intervention program for oral health promotion (6 sessions, once weekly)

E1: Pre-intervention assessment (general characteristics, oral health-related behavioral characteristics, OHI-S = simplified oral hygiene index; WTCI = winkel tongue coating index, oral mucosal moisture, subjective oral dryness, and GOHAI = geriatric oral health assessment index)

E2: Post-intervention assessment; (OHI-S = simplified oral hygiene index; WTCI = winkel tongue coating index, oral mucosal moisture, subjective oral dryness, and GOHAI = geriatric oral health assessment index)

2.2. Participants

This study included 80 older adults attending four day care centers located in Seo-gu, Incheon, South Korea. The required sample size was calculated using G*Power 3.1 based on a paired t-test (as an approximation for within-group comparisons), with a significance level of 0.05, statistical power of 0.80, and a medium effect size (d = 0.5), yielding a minimum required sample size of 34 participants.

Considering potential dropout, 80 participants were initially recruited. During the intervention period, one participant withdrew due to health-related issues, resulting in a final sample of 79 participants included in the analysis.

2.3. Intervention

The customized oral health care program was delivered through one-on-one, on-site visit-based interventions by dental hygienists at day care centers, providing individualized care tailored to each participant. Each session lasted 50 minutes and was conducted once weekly for six weeks.

The intervention included individualized oral hygiene care (professional toothbrushing, interdental cleaning, oral mucosal care, and denture cleaning), as well as orofacial muscle massage and exercises aimed at improving oral motor function.

2.4. Measures

Participants' general characteristics, oral health-related perceptions and behaviors, clinical oral health indicators, and subjective oral health outcomes were assessed. All study instruments were reviewed by two experts in dental hygiene, and all measurements were performed by trained researchers using standardized procedures.

2.4.1. General characteristics

General characteristics were assessed using 9 items including sex, age, smoking status, economic status, employment status, educational level, living arrangement, number of systemic diseases, and experience of oral health education. Age was categorized into three groups: 65-74, 75-84, and ≥85 years. Living arrangements were classified as "living alone" or "living with others."

2.4.2. Oral examination

Oral health status was assessed according to the World Health Organization (WHO) criteria by a dentist from the Seo-gu Public Health Center in Incheon [19]. Prior to data collection, the examiner was calibrated to ensure measurement reliability. The examination included denture status and the number of functional remaining teeth. Denture status was classified as complete or partial dentures and further categorized as maxillary, mandibular, both, or none. Functional teeth included natural teeth and any teeth contributing to masticatory function.

2.4.3. Oral health-related perceptions and behaviors

Oral health-related perceptions and behaviors were assessed using seven items, including subjective health perception, perceived oral health status, dietary behaviors (three items), frequency of daily toothbrushing, and use of oral hygiene aids.

2.4.4. Clinical oral health indicators

Clinical oral health indicators included the Simplified Oral Hygiene Index (OHI-S) [20], the Winkel Tongue Coating Index (WTCI) [21], and unstimulated salivary flow rate [22].

Tongue coating was assessed using the WTCI. Participants were instructed to protrude their tongue fully, and the dorsal surface was visually examined. The tongue was divided into six regions, each scored from 0 (no coating) to 2 (heavy coating), yielding a total score of 0-12, with higher scores indicating poorer oral hygiene.

Unstimulated salivary flow rate was measured using a modified oral Schirmer's test. A standardized Whatman filter paper strip (1 cm × 17 cm) was placed on the dorsal surface of the tongue for 30 seconds. The length of the wetted area (cm) was then recorded.

2.4.5. Subjective oral health indicators

Subjective oral health indicators included oral dryness and oral health-related quality of life.

Subjective oral dryness was measured using a four-item scale developed by Fox [23]. Total scores ranged from 0 to 12, with higher scores indicating greater perceived dryness. The internal consistency in this study was Cronbach's α = 0.850.

Oral health-related quality of life was assessed using the Geriatric Oral Health Assessment Index (GOHAI) [24]. The GOHAI consists of 12 items across four domains and was rated on a 5-point Likert scale, yielding total scores from 12 to 60, with higher scores indicating better quality of life. The internal consistency in this study was Cronbach's α = 0.866.

2.5. Statistical Analysis

Data were analyzed using IBM SPSS Statistics for Windows, version 30.0 (IBM Corp., Armonk, NY, USA). General characteristics and study variables were summarized using frequencies, percentages, means, and standard deviations.

Normality of continuous variables was assessed using the Kolmogorov-Smirnov test and visual inspection (e.g., histograms and Q-Q plots). As the data did not meet the assumption of normality, the Wilcoxon signed-rank test was used to evaluate pre-post differences following the intervention. Statistical significance was set at α = 0.05.

3. Results

3.1. General characteristics of the participants

The general characteristics of the participants are presented in Table 2. A total of 79 participants were included, comprising 20 males (25.3%) and 59 females (74.7%).

Regarding age distribution, participants were categorized into three groups: 65-74 years (n = 7, 22.6%), 75-84 years (n = 10, 32.3%), and ≥85 years (n = 14, 45.2%) (Table 2).

Most participants were non-smokers (n = 28, 90.3%). In terms of economic status, the largest proportion reported a middle level (n = 48, 66.7%). Regarding living arrangements, 48 participants (66.7%) were living alone, while 31 (33.3%) were living with others.

Multiple responses indicated that hypertension and dementia were the most prevalent systemic diseases (each n = 37, 61.7%), followed by diabetes (n = 15, 25.0%), arthritis (n = 11, 18.3%), heart disease (n = 10, 16.7%), cerebral infarction (n = 9, 15.0%), and hyperlipidemia (n = 4, 6.7%). Additionally, 20 participants (33.3%) reported other conditions.

Table 2. General characteristics of the participants

Variables	Division	n (%)
Gender	Male	20 (25.3)
	Female	59 (74.7)
Age	65-74	7 (22.6)
	75-84	10 (32.3)
	≥85	14 (45.2)
Smoking status	Smoker	3 (9.7)
	Non-smoker	28 (90.3)
Economic status	High	5 (6.9)
	Moderate	48 (66.7)
	Low	19 (26.4)
Living arrangement	Living alone	48 (66.7)
	Not living alone	31 (33.3)
Systemic diseases*	Hypertension	37 (61.7)
	Diabetes mellitus	15 (25.0)
	Hyperlipidemia	4 (6.7)
	Arthritis	11(18.3)
	Cardiovascular disease	10 (16.7)
	Dementia	37 (61.7)
	Cerebral infarction	9 (15.0)
	Others	20 (33.3)

* % of Cases based on multiple response analysis

Sex-specific analysis showed that hypertension was more frequently reported among females, whereas diabetes was more common among males. Dementia prevalence was similar between sexes.

3.2. Oral health-related perceptions and behaviors

The oral health-related perceptions and behaviors of the participants are presented in Table 3. Among the participants, 41 (51.9%) reported wearing dentures.

Toothbrushing frequency on the previous day showed that 42 participants (56.8%) brushed their teeth three or more times, while 22 (29.7%) brushed twice.

With regard to oral hygiene aids used in addition to a toothbrush, interdental brushes and dental floss were each used by 2 participants, mouthwash by 3 participants, and other products (oral irrigator, tongue cleaner, electric toothbrushe, and denture care products) by 4 participants. The mean scores for subjective general health status and perceived oral health status, measured on a 5-point scale, were 2.91 and 3.12, respectively.

3.3. Evaluation of the Effectiveness of the Oral Health Care Intervention Program at Day Care Centers

The effects of the 6-week oral health care intervention conducted at day care centers on clinical oral health indicators—including OHI-S, WTCI, and unstimulated salivary flow rate—are presented in Table 4. The OHI-S decreased from 0.65 at baseline to 0.22 after the intervention ($p < 0.001$), and the WTCI decreased from 3.47 to 2.39

Table 3. Oral health-related perceptions and behaviors

Variables	Division	n (%), Mean ± SD
Denture use	Wearing	41 (51.9)
	Not wearing	38 (48.1)
Daily toothbrushing	0	3 (4.1)
	1	7 (9.5)
	2	22 (29.7)
	≥3 times	42 (56.8)
Use of oral hygiene aids*	Dental floss	2 (20.0)
	Interdental brush	2 (20.0)
	Mouthwash	3 (30.0)
	Others (oral irrigator, tongue cleaner, electric toothbrush, denture care products)	4 (36.4)
Perceived health status		2.91 ± 0.80
Perceived oral health status		3.12 ± 0.79

* % of Cases based on multiple response analysis

Table 4. Effects of the oral health intervention program on clinical oral health indicators

Variables	Before	After	p-value*
	Mean ± SD	Mean ± SD	
OHI-S	0.65 ± 0.77	0.22 ± 0.47	<0.001
WTCI	3.47 ± 3.21	2.39 ± 2.96	0.001
Unstimulated salivary flow rate	3.66 ± 1.92	2.69 ± 2.16	0.011

Mean ± SD : Mean ± Standard deviation; * by Wilcoxon signed-rank test at $\alpha = 0.05$; OHI-S = simplified oral hygiene index; WTCI = winkel tongue coating index

Table 5. Effects of the oral health intervention program on subjective oral health indicators

Variables	Before	After	p-value*
	Mean ± SD	Mean ± SD	
Subjective xerostomia	6.22 ± 1.97	6.77 ± 2.07	0.062
GOHAI	39.32 ± 8.86	43.61 ± 6.17	0.008

Mean ± SD : Mean ± Standard deviation; * by Wilcoxon signed-rank test at α = 0.05; GOHAI = geriatric oral health assessment index

(p = 0.001). Unstimulated salivary flow rate, measured using absorbent paper strips, decreased from 3.66 to 2.69, showing a statistically significant difference (p = 0.011).

The effects of the 6-week oral health care intervention conducted at day care centers on subjective oral health indicators—namely subjective oral dryness and oral health-related quality of life—are presented in Table 5. There was no statistically significant difference in subjective oral dryness between baseline and post-intervention (p = 0.062). Oral health-related quality of life, as measured by the Geriatric Oral Health Assessment Index (GOHAI), increased from 39.32 at baseline to 43.61 after the intervention (p = 0.008).

4. Discussion

In Korea, oral health care services for older adults have been provided primarily through public health centers; however, the overall scope of community-based and facility-based services remains limited [15,25]. The COVID-19 pandemic further restricted service delivery, particularly for community-dwelling older adults. Moreover, although various healthcare programs have been implemented under the community integrated care pilot project (2019-2025), oral health care services have been offered only in a limited number of regions [15].

In this context, Cheonan City represents a notable example of sustained implementation of community-based oral health care interventions since 2019 [8]. Even during the transition period between pilot phases, the program was maintained through local funding, highlighting the importance of policy commitment and institutional support for the continuity and expansion of oral health services [3,8,15,26]. These findings underscore the need for stronger policy frameworks and local government engagement to ensure sustainable service delivery.

Community care, defined as a system in which local communities take responsibility for coordinating and integrating available resources, provides a framework for delivering health services within the community setting [11]. In an aging society, strengthening preventive and proactive health management systems is essential to promote healthy aging. This requires a collaborative governance structure involving local governments, private healthcare institutions, and non-profit organizations [27].

The present study demonstrated that oral health care interventions conducted at day care centers significantly improved oral hygiene status and oral health-related quality of life among older adults. These findings are consistent with previous interventional studies reporting that integrated approaches—including needs assessment, oral examination, professional oral hygiene care, oral motor function training, and individualized education—are effective in improving oral health outcomes [28-30].

In this study, salivary flow rate showed a statistically significant decrease after the intervention. In older adults, salivary secretion is influenced by physiological variability, medication use, and autonomic nervous system regulation, which may lead to temporary fluctuations.

Despite these findings, a shortage of trained professionals and structured educational programs remains a major barrier to the implementation of such interventions in real-world settings [25,26]. Current dental hygiene curricula provide limited coverage of geriatric oral health care and do not adequately reflect the practical competencies required in community and clinical environments [25].

To improve the quality and sustainability of oral health care services for older adults, several strategies should be considered. First, specialized training programs that reflect the complex health conditions of older adults should be developed to strengthen the competencies of dental hygienists, along with certification systems for workforce development. Second, standardized clinical guidelines and tailored intervention programs based on functional status and systemic conditions should be established to enhance consistency and effectiveness.

Third, policy and institutional frameworks should be reinforced to ensure that oral health services are integrated as essential components of community-based care systems. Legal and regulatory support is needed to facilitate the implementation of facility-based and outreach oral health services. Fourth, reimbursement systems within national health insurance and long-term care insurance should be established to ensure the sustainability of service provision. Furthermore, with the rapid advancement of digital health

technologies, data-driven management systems and integrated platforms are required to support interdisciplinary collaboration and improve service efficiency [28]. Such approaches may contribute to the development of integrated care models linking oral and systemic health [30].

In conclusion, this study provides empirical evidence supporting the effectiveness of oral health care interventions delivered at day care centers and offers practical and policy implications for the expansion and institutionalization of oral health services for older adults.

Despite the meaningful findings of this study, several limitations should be acknowledged. First, this study employed a single-group pre-post design without a control group, which limits the ability to establish causal relationships between the intervention and observed outcomes. Second, the study was conducted in a limited number of day care centers within a specific region, which may restrict the generalizability of the findings to other settings or populations. Third, the relatively short intervention period (six weeks) may not be sufficient to assess the long-term sustainability of the observed improvements. In addition, some outcome measures, such as subjective oral health indicators, relied on self-reported data, which may be subject to response bias.

Future research should address these limitations by employing randomized controlled trial designs with larger and more diverse populations to enhance external validity. Longitudinal studies are also needed to evaluate the long-term effectiveness and sustainability of oral health care interventions. Furthermore, future studies should explore the integration of oral health interventions within broader community-based care models, including multidisciplinary collaboration and digital health technologies. In particular, the development and evaluation of data-driven, AI-supported oral health management systems may contribute to more efficient and personalized care for older adults.

5. Conclusions

This study demonstrated that oral health care interventions delivered by dental hygienists at day care centers were effective in improving oral health status and oral health-related quality of life among older adults. These findings suggest that community care-based oral health interventions may contribute to improving oral health and have potential implications for overall health. To facilitate broader implementation of such interventions, policy support and the establishment of appropriate legal and institutional frameworks are required.

Author Contribution

Conceptualization: JH Jang; Data collection: MH Park, MK Seong, YS Kim, SH Hwang, MY Kim; Formal analysis: JH Jang; Writing-original draft: JH Jang; Writing-review & editing: JH Jang, MH Park, SH Hwang, MY Kim, MK Seong, and YS Kim

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Conflicts of Interest

The authors declare no conflict of interest.

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