



Status and Opinions of Public Health Centers and Industrial Dental Offices on the Oral Health Promotion of Korean Adult Workers

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Background: This study investigated the status of oral health promotion activities for adult workers in public health centers and industrial dental offices and provided basic data for the model development of oral health promotion program for adult workers in Korea.

Methods: A questionnaire was developed separately according to the person who in charge of the oral health promotion activities in public health centers nationwide and dental hygienists working in 20 industrial dental offices. This survey was conducted through postal survey and consisted of 29 items and 35 items respectively, including 19 common items for general information, oral health promotion program status and opinion. Statistical analysis was performed using the IBM SPSS ver. 23.0.

Results: We analyzed the data of 147 public health centers (57.9%) and 9 industrial dental offices (45.0%). A workforce with a lack of practice was the biggest barrier to oral health promotion activities for adult workers. However, both groups showed high intention for the practice of adult worker's oral health promotion activities. Also, they showed willingness to work together in an organic partnership to perform their roles (94.4% and 77.8%, respectively). Regarding the scope of cooperation in the implementation of the industrial oral health promotion activity linked to the public health center, dental hygienists of industrial dental offices responded that they could coordinate necessary matters and schedule management.

Conclusion: The development of an oral health promotion program aided by the relationship between public health centers and industrial dental offices is essential for the oral health promotion of adult workers. The possibility of cooperation between the abovementioned centers was confirmed through this study. In a long-term perspective, it would be necessary to identify a method to institutionalize industrial dental hygienists for the provision of continuous oral health care in workplaces.

Key Words: Adult, Dental hygienists, Oral health, Workplace

Introduction

Korean adults aged between 19 and 65 years constitute 66.7% of the total Korean population¹⁾ and are mostly employed²⁾. Workers play an essential role in various aspects of society; however, they often lack the time and finances to fully care for their health³⁾. In 2017, the Korea Outpatient Clinical Disease Ranking Survey showed that the number of patients with gingivitis and periodontal disease surpassed 15 million, making these diseases the

second most prevalent diseases in Korea⁴⁾. Periodontal diseases are the main cause of adult tooth loss⁵⁾. Such losses can in turn lead to economic losses, which may exacerbate oral health problems in old age and personal economic burdens⁶⁾.

Public health centers in Korea were established in 1945 to contribute to the overall improvement of national health. An oral health program was first developed in 1980s and oral health programs spanning every developmental stage have been implemented to further prevent

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oral diseases and promote oral health in the 2000s⁷⁾. Typical oral health programs for adults include a continuing dental care program for specific groups such as smokers and pregnant women, or workplace dental hygiene programs. In 2013, the government began implementing integrated health promotion programs by converting individual state-run programs into health promotion programs⁸⁾. In particular, unlike children or the elderly, adults are perceived as being able to manage their own health, which means they tend to be given a lower priority in public health initiatives. Therefore, their access to particular services such as oral health services is limited⁹⁾. Industrial oral health was developed as a part of industrial health in the 1990s for improving and maintaining the oral health of those engaged in the industry. However, it has tended to focus on specific oral examinations since the need for occupational dentistry services was identified¹⁰⁾. In addition, the oral health examination rate is less than half of the general health examination rate¹¹⁾. Because oral diseases do not directly threaten workers' lives, these individuals often avoid early treatment even when aware of the disease^{12,13)}.

Currently, there is a global trend toward balancing the role of public and private health care¹⁴⁾. Many developed countries are constantly seeking to improve the workers' oral health by considering industrial health services when establishing general health policies. For instance, in the UK and US, since the early 20th century, it has become common for business sites to have dental clinics for improving workers' oral health²⁾. Therefore, this study investigated the status of oral health promotion activities in public health centers and industrial dental offices by surveying the opinions of people in charge of oral health promotion activities to provide basic data for the further development of oral health promotion models for Korean adult workers.

Materials and Methods

This study was conducted as part of the master's thesis of Lee¹⁵⁾.

1. Data collection

To investigate the status of oral health promotion activities at public health centers and industrial dental offices and survey the opinions of individuals in charge of oral health promotion therein, we contacted the oral health managers of 254 public health centers and dental hygienists at 20 industrial dental offices (excluding those in universities and correctional facilities).

We investigated the facilities' general characteristics and the details of their oral health promotion programs using the items adapted and supplemented from the study by Park et al.¹⁶⁾. The opinion survey was developed by referring to the opinions of persons in charge of oral health promotion in the study by Jung et al.¹⁷⁾. To determine the validity of the questionnaire, we conducted a preliminary survey with six people. The Cronbach's α of the total questionnaire was 0.825.

Table 1. General Status of Public Health Centers

Section	Variable	Content	Value
Total number of facilities investigated			147 (100.0)
Personnel information	License	Dental hygienist	132 (91.0)
		Nurse	5 (3.5)
		Dentist	1 (0.7)
		Other	7 (4.8)
		Number of dental hygienists in charge of oral health program in each public health center	2.5±1.5
Program target	Oral health program by developmental stage and condition (in 2016) ^a	Infant/child	27.3
		Teenager	23.7
		Adult	9.9
		Elderly	23.6
		Pregnant women	6.1
		Disabled person	8.5
		Other	1.1

Values are presented as n (%) or mean±standard deviation or percentage only.

Frequency analysis excluding non-responses for each question.

^aResults of responses as of 2016. Note that the data for oral health programs conducted in public health centers were averaged according to developmental stage so that the sum would be 100.

We mailed the questionnaires to the person in charge of oral health promotion at each facility and encouraged their participation in this study by telephone to increase the recovery rate. The survey was conducted from July 10, 2017 to August 11, 2017. We confirmed that the questionnaire could not be returned by nine industrial dental offices because of the internal regulations of their companies.

2. Statistical analysis

A frequency analysis was conducted to describe the general characteristics, oral health promotion program characteristics, and number of non-responses. It is notable that this frequency analysis accounted for the fact that multiple responses were allowed for several sections of the questionnaire. All statistical analyses were performed using IBM SPSS ver. 23.0 (IBM Corp., Armonk, NY, USA).

Results

A total of 147 of the 254 public health centers and 9 of the 20 industrial dental clinics returned completed questionnaires (response rates of 57.9% and 45.0%, respectively).

1. General status of public health centers

The majority of the public health centers (n=132, 91.0%) had licensed dental hygienists as persons in charge of oral health promotion. When examining the participants in the oral health program conducted in 2016 in the developmental stage, we found that only 9.9% were adults (Table 1).

2. General status of industrial dental offices

In industrial dental offices, the patients were primarily workers (81.8%) and employee welfare services played the major roles (100.0%). Health care managers were appointed in only 44.4% of the industrial dental offices. Additionally, 77.8% of industrial dental offices conducted

Table 2. General Status of Industrial Dental Offices

Section	Variable	Content	Value
Total number of facilities investigated			9 (100.0)
General characteristics	Common patient type ^a	Workers	7 (81.8)
		Family member of worker	1 (9.1)
		Other	1 (9.1)
	Business size (workers)	300 to less than 1,000	2 (22.2)
		More than 1,000	7 (77.8)
	Primary role of person in charge within industrial dental office	Employee welfare services	9 (100.0)
		Workers' oral examination	0 (0.0)
		Oral health program	0 (0.0)
	Average number of patients per day	Less than 20	5 (55.6)
		21 to 40	3 (33.3)
More than 41		1 (11.1)	
	Average number of dental care patients per day ^b		8.0±7.2
Person in charge	Health manager	None	5 (55.6)
		Doctor	1 (11.1)
		Nurse	3 (33.3)
Oral health care type	Preventive management	Not performed	2 (22.2)
		Scaling 1 ~ 2 times a year ^c	5 (55.6)
		Incremental oral health care ^d	2 (22.2)

Values are presented as n (%) or mean±standard deviation.

^aMultiple responses were made in one of the industrial dental offices. ^bThe number of the patients who regularly visited and received oral care at regular intervals. ^cProvides patients with scaling 1 ~ 2 times per year. ^dPrevention-focused care involving appropriate cycles of scaling depending on the patient's oral condition.

preventive oral health care of adult workers. Further, it is notable that 55.6% of the industrial dental offices conducted regular scaling and 22.2% of the industrial dental offices decided the appropriate frequency for patient’s oral health condition (Table 2).

3. Status of oral health activities for adult workers

Regarding the oral health promotion activities for adult workers, “Customized 1-to-1 oral health education” was performed by 53.2% of the public health centers and 100.0% of the industrial dental offices. “Oral health

campaigns” were performed at 79.7% of public health centers; however, approximately 75.0% of industrial dental offices did not conduct such campaigns. Approximately 78.3% of public health centers reported having connections to other departments at public health centers. However, most (87.5%) industrial dental offices were not connected to other departments (Table 3).

4. Problems with the oral health activities among adult workers

The difficulties or reasons for not carrying out oral health promotion activities for adult workers are shown in

Table 3. Status of Oral Health Activities for Adult Workers

Program	Execution status	Public health center	Industrial dental office	Total
Number of facilities investigated		147 (100.0)	8 (100.0)	155 (100.0)
Customized 1-to-1 oral health education	Currently	75 (53.2)	8 (100.0)	83 (55.7)
	In the past but not currently	10 (7.1)	0 (0.0)	10 (6.7)
	Never done	43 (30.5)	0 (0.0)	43 (28.9)
	Plan to do in the future	13 (9.2)	0 (0.0)	13 (8.7)
Group oral health education	Currently	99 (69.2)	1 (12.5)	100 (66.2)
	In the past but not currently	16 (11.2)	2 (25.0)	18 (11.9)
	Never done	18 (12.6)	5 (62.5)	23 (15.2)
	Plan to do in the future	10 (7.0)	0 (0.0)	10 (4.3)
Oral health campaign ^a	Currently	114 (79.7)	0 (0.0)	114 (75.5)
	In the past but not currently	8 (5.6)	1 (12.5)	9 (6.0)
	Never done	16 (11.2)	6 (75.0)	22 (14.6)
	Plan to do in the future	5 (3.5)	1 (12.5)	6 (4.0)
Environmental changes for oral health care ^b	Currently	56 (41.5)	2 (25.0)	58 (40.6)
	In the past but not currently	15 (11.1)	0 (0.0)	15 (10.5)
	Never done	48 (35.6)	5 (62.5)	53 (37.1)
	Plan to do in the future	16 (11.9)	1 (12.5)	17 (11.9)
Connected to other departments at public health center ^c	Currently	112 (78.3)	0 (0.0)	112 (74.2)
	In the past but not currently	7 (4.9)	0 (0.0)	7 (4.6)
	Never done	22 (15.4)	7 (87.5)	29 (19.2)
	Plan to do in the future	2 (1.4)	1 (12.5)	3 (2.0)
Oral examination for workers	Currently	53 (37.3)	3 (37.5)	56 (37.3)
	In the past but not currently	14 (9.9)	0 (0.0)	14 (9.3)
	Never done	71 (50.0)	5 (62.5)	76 (50.7)
	Plan to do in the future	4 (2.8)	0 (0.0)	4 (2.7)
Oral examination for workers exposed to acids	Currently	10 (7.4)	1 (12.5)	11 (7.7)
	In the past but not currently	3 (2.2)	0 (0.0)	3 (2.1)
	Never done	122 (90.4)	6 (75.0)	128 (89.5)
	Plan to do in the future	0 (0.0)	1 (12.5)	1 (0.7)

Values are presented as n (%).

^aPublicity activities, oral health promotion information booth operation, etc. ^bImprovement of underdeveloped facilities, regulation of sales of beverages containing sugar, placement of toothpaste in bathrooms, health culture development, etc. ^cPrograms linked to departments dealing with nutrition, smoking, exercise, and chronic disease.

Table 4. Problems with Oral Health Activities for Adult Workers

Problem	Customized 1-to-1 oral health education		Group oral health education		Oral health campaign		Environmental changes for oral health care		Connected to other departments in public health centers		Oral examination for workers		Oral examination for workers exposed to acids	
	PHC	IDO	PHC	IDO	PHC	IDO	PHC	IDO	PHC	IDO	PHC	IDO	PHC	IDO
No difficulty	29 (22.0)	4 (66.7)	38 (28.1)	1 (16.7)	56 (43.5)	0 (0.0)	27 (22.0)	1 (12.5)	65 (50.0)	1 (14.3)	29 (25.2)	3 (50.0)	8 (8.0)	1 (50.0)
Lack of necessity	2 (1.5)	0 (0.0)	1 (0.7)	1 (16.7)	2 (1.5)	2 (25.0)	3 (2.4)	4 (50.0)	3 (2.3)	5 (71.4)	9 (7.8)	2 (33.3)	21 (21.0)	1 (50.0)
Inadequate legal systems	5 (3.8)	0 (0.0)	5 (3.7)	0 (0.0)	2 (1.5)	0 (0.0)	18 (14.6)	0 (0.0)	3 (2.3)	0 (0.0)	16 (13.9)	0 (0.0)	14 (14.0)	0 (0.0)
Budget deficit	12 (9.1)	0 (0.0)	8 (5.9)	0 (0.0)	18 (13.7)	0 (0.0)	35 (28.5)	1 (12.5)	7 (5.4)	0 (0.0)	10 (8.7)	0 (0.0)	9 (9.0)	0 (0.0)
Lack of workforce	70 (53.0)	0 (0.0)	49 (36.3)	2 (33.3)	47 (35.9)	2 (25.0)	44 (35.8)	1 (12.5)	42 (33.1)	0 (0.0)	35 (30.4)	1 (16.7)	36 (36.0)	0 (0.0)
Lack of ability to hired qualified personnel	1 (0.8)	0 (0.0)	4 (3.0)	0 (0.0)	1 (0.8)	0 (0.0)	3 (2.4)	0 (0.0)	1 (0.8)	0 (0.0)	0 (0.0)	0 (0.0)	8 (8.0)	0 (0.0)
Time shortage of qualified personnel	32 (24.2)	1 (16.7)	19 (14.1)	0 (0.0)	16 (12.2)	1 (12.5)	19 (15.4)	0 (0.0)	14 (8.5)	0 (0.0)	19 (16.5)	0 (0.0)	16 (16.0)	0 (0.0)
Lack of awareness and support of employers	21 (15.9)	0 (0.0)	28 (20.7)	1 (16.7)	14 (10.7)	2 (25.0)	25 (20.3)	1 (12.5)	11 (8.5)	0 (0.0)	12 (10.4)	0 (0.0)	11 (11.0)	0 (0.0)
Lack of awareness and support of seniors	8 (6.1)	0 (0.0)	16 (11.9)	1 (16.7)	4 (3.1)	1 (12.5)	6 (4.9)	1 (12.5)	6 (4.6)	0 (0.0)	4 (3.5)	0 (0.0)	4 (4.0)	0 (0.0)
Lack of will to participate among workers	32 (24.2)	1 (16.7)	28 (20.7)	0 (0.0)	11 (8.4)	1 (12.5)	12 (9.8)	0 (0.0)	11 (8.5)	1 (14.3)	14 (12.1)	0 (0.0)	13 (13.0)	0 (0.0)
Uncooperative attitude among workers	11 (8.3)	0 (0.0)	9 (6.7)	0 (0.0)	7 (5.3)	1 (12.5)	7 (5.7)	0 (0.0)	8 (6.2)	0 (0.0)	9 (7.8)	0 (0.0)	5 (5.0)	0 (0.0)
Lack of training opportunity	10 (7.6)	0 (0.0)	8 (5.9)	1 (16.7)	4 (3.1)	0 (0.0)	5 (4.1)	0 (0.0)	5 (3.9)	0 (0.0)	3 (2.6)	0 (0.0)	5 (5.0)	0 (0.0)
Limitations of dental hygienists' scope	9 (6.8)	0 (0.0)	2 (1.5)	1 (16.7)	3 (2.3)	1 (12.5)	4 (3.3)	1 (12.5)	3 (2.3)	0 (0.0)	11 (9.6)	0 (0.0)	13 (13.0)	0 (0.0)

Values are presented as n (%).

Multiple responses are possible for each question.

PHC: public health center, ido: industrial dental offices.

Table 4. For “customized 1-to-1 oral health education”, public health centers reported a “lack of workforce” (53.0%), while industrial dental offices reported “no difficulty” (66.7%). For “group oral health education,” 36.3% of the public health centers and 33.3% of industrial dental offices reported a “lack of workforce.” Regarding “environmental changes for oral health care,” the public health centers generally responded with a “lack of workforce” (35.8%). On the other hand, 50.0% of industrial dental offices reported a “lack of necessity”. Regarding the “oral examination for workers”, 30.4% of public health centers reported a “lack of workforce” while 50.0% of industrial dental offices reported “no difficulty”.

carry out oral health promotion programs of adult workers.” Additionally, the majority of the facilities (94.5% of public health centers and 100.0% of industrial dental offices) perceived that the role of dental hygienists in oral health promotion programs for adult workers was important. In general, (94.4% of public health centers and 77.8% of industrial dental offices), the facilities presumed that they should work together organically to improve the oral health of adult workers. If a systematic oral health promotion program for adult workers were to be developed in the future, 89.0% of public health centers and 100.0% of industrial dental offices reported that they would participate (**Table 5**).

5. Needs and opinions survey on the implementation of oral health programs for adult workers

A survey on the needs and opinions of oral health promotion programs of adult workers revealed that 93.3% and 100.0% of public health centers and industrial dental offices, respectively, reported that they were “willing to

Discussion

In this study, we sought the basic data for the development of a model for oral health promotion programs by examining the opinions of personnel in charge of oral health promotion programs at public health centers and industrial dental offices.

Table 5. Needs and Opinions Survey on the Implementation of Oral Health Programs for Adult Workers

Opinion	Public health center	Industrial dental office	Total
I am willing to carry out oral health promotion programs for adult workers	126 (93.3)	9 (100.0)	154 (100.0)
I think that adult workers are the most vulnerable of the health center’s life-cycle oral health programs	120 (83.9)	6 (66.7)	152 (100.0)
I think that dental hygienists play an important role in oral health promotion programs for adult workers.	138 (94.5)	9 (100.0)	155 (100.0)
I think that oral health education should be mandatory in the oral examination for workers implemented by the National Health Insurance Corporation.	123 (84.2)	8 (88.9)	155 (100.0)
I consider dental hygienist to be able to provide regular oral health education to adults.	129 (89.6)	9 (100.0)	153 (100.0)
It is necessary to educate health managers in the workplace to ensure that oral health education can be delivered to adult workers on behalf of the dental hygienist.	109 (75.7)	4 (44.4)	153 (100.0)
A dental hygienist working at a public health center should work with dental hygienists in industrial dental offices organically to promote oral health among adult workers.	134 (94.4)	7 (77.8)	151 (100.0)
I am willing to participate if a systematic oral health promotion program is developed for adult workers.	129 (89.0)	9 (100.0)	154 (100.0)
A dental hygienist working at a public health center should be able to perform oral health education for health managers in the workplace.	134 (93.7)	-	143 (100.0)
I believe that the role of the industrial dental office is in providing oral health promotion activities for workers.	-	9 (100.0)	9 (100.0)
If a public health center asks me to cooperate to carry out the oral health promotion program at the workplace, I am willing to participate.	-	7 (77.8)	9 (100.0)

Values are presented as n (%).

Except for no response, frequency analysis was performed.

Upon analysis of the lifecycle of the health center's oral health promotion programs conducted in 2016, it was found that the oral health promotion business for adults is the lowest, at only 9.9%. According to the 6th Regional Health Plan (2015~2018), only 33.5% of offices planned to provide a workplace dental health care program; in comparison, 96.5% and 85.2% of health centers offered such programs for senior citizens/the handicapped and pregnant women/children, respectively¹⁷⁾. This seems to be due to a low average number of dental hygienists in charge of oral health promotion in public health centers, at only 2.5 per center (ranging from 1 to 9), including contract workers and individuals with fixed-term contracts. Securing and using a sufficient work force is necessary for public health centers to fulfill their roles in promoting and improving the oral health of local residents¹⁸⁾.

Industrial dental offices in Korea have currently been started in many large corporations and banks with more than 300 workers. In this study, we found that these offices provided employee welfare services for workers, distinguishing them from dental clinics (both within and outside of public health centers) as facilities specifically aimed at improving the oral health of adult workers. According to article 16 of the Occupational Safety and Health Act, a health manager must be appointed at companies with 50 or more full-time employees. In this study, we found that only 44.4% of industrial dental offices had health managers assigned to workplaces. These health professionals plan, operate, and manage services for health promotion while limiting factors that can harm workers according to the characteristics of the business operators¹⁹⁾. However, health managers have relatively poor oral health knowledge and attitudes for oral health promotion and maintenance compared to dental hygienists²⁰⁾. Therefore, in order to promote the oral health of adult workers in the workplace, dental hygienists with accurate knowledge can provide customized oral health education according to the oral health status of workers. Subsequently, this will help to promote a positive attitude in the employees perform oral health care by themselves²¹⁾.

The oral health promotion program activities performed in public health centers primarily included oral health campaigns (79.7%), forging connections to other depart-

ments at public health centers (78.3%), and group oral health education (69.2%). On the other hand, these activities were largely absent from the industrial dental offices (0.0, 0.0, and 12.5%, respectively). The workplace is the only place where a large number of adults can be organized. Thus if the workplace or industrial dental office has the infrastructure to support participation in adult oral health promotion program such as group oral health education campaigns and health center linkage programs, it will help to improve oral health promotion for all employees²²⁾.

Overall, the most prominent problem facing oral health promotion programs for Korean adult workers is that both public health centers and industrial dental offices lack the necessary workforce. In 2007, Lee¹⁸⁾ suggested that the minimum placement criteria for dental hygienists in public health centers should be increased from 1.2 to 3.7 to cope with the changing health care environment, such as the expansion of health promotion programs and increasing demand for oral health services. However, the shortage of workforce is a problem that has been sustained in the public oral health field even at present. Developed countries have established dental offices for oral health at workplaces to maintain the regular dental visits of workers²³⁾, to maintain the oral health condition through oral prophylaxis and oral health education, and to improve workers' oral health behaviors such as increasing the brushing practice rate at workplaces²⁴⁾. This is likely to be a possible model as most of the facilities in this study reported that dental hygienists are exceedingly important for the success of oral health promotion programs for adult workers. Therefore, it is necessary to consider strengthening and expanding the role of dental hygienists to revitalize oral health promotion programs for adult workers in the long term. Both facilities reported that they were willing to conduct oral health promotion programs for adult workers and expressed their willingness to participate if a systematic oral health promotion program for adult workers is developed. In particular, 100.0% of industrial dental offices responded that oral health promotion programs for adult workers should be included in their duties. These results together suggest that it may be possible to develop a systematic oral health promotion program model based on

a joint infrastructure of public health centers and industrial dental offices.

To promote the oral health of adult workers in South Korea, it is necessary to develop an oral health promotion program by forging an organic relationship between public health centers and industrial dental offices. It is also possible to train health managers for securing an adequate workforce. Nevertheless, from a long-term perspective, measures should be taken to prepare a system that enables the widespread deployment of dental hygienists.

It is difficult to generalize the results of this study as it only reflects the results of 9 surveys among 20 industrial dental offices. However, it is significant that the current status and opinions of oral health promotion project managers in public health centers and the dental hygienists working in industrial dental offices for the promotion of oral health of adult workers were confirmed. Additionally, the possibility of linking public health centers to industrial dental offices was confirmed to provide the basic data needed for the development of an oral health promotion model for adult workers.

Notes

Conflict of interest

No potential conflict of interest relevant to this article was reported.

Ethical approval

The Institutional Review Board of the Gangneung-Wonju National University (GWNU IRB-2017-11) confirmed that this study was not subject to a formal ethical review.

Author contributions

Sue-Hyang Lee, Sun-Jung Shin designed the study. Sue-Hyang Lee, Sun-Jung Shin interpreted the data. Sue-Hyang Lee, Soo-Myoung Bae, Bo-Mi Shin and Sun-Jung Shin revised the draft. Sue-Hyang Lee analyzed the data, wrote the draft, and English proof. All authors approved the final manuscript.

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