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RESEARCH ARTICLE

Pre-Treatment Infection Control Practices and Associated Factors among Korean Dental Hygienists in Response to COVID-19

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Background: Dental hygienists are crucial in managing infection control within dental clinical settings. This study focused on examining the pre-treatment infection control practices ($PT\text{-}PRF_{IC}$) of Korean dental hygienists in the context of coronavirus disease (COVID-19) and identifying factors influencing their implementation levels.

Methods: An online, self-administered survey was conducted with 263 dental hygienists working in dental hospitals or clinics. The survey explored various aspects such as the experience with infection control education (Edu_{IC}), $PT\text{-}PRF_{IC}$, and the types of surface disinfectants used. Additionally, data from previous studies on the knowledge level of COVID-19 (KNW_{CO}), infection control awareness level (AWR_{IC}), infection control performance level (PRF_{IC}), and infection control organizational factor (OFW_{IC}) were utilized. Statistical analyses included t-tests, one-way ANOVA, chi-square tests, Pearson correlation, and multiple linear regression.

Results: The study identified variations in $PT\text{-}PRF_{IC}$ based on the number of dental hygienists within an organization. Differences in Edu_{IC} were observed concerning age, number of years worked, and monthly pay. The OFW_{IC} had the most substantial impact on $PT\text{-}PRF_{IC}$, followed by PRF_{IC}, and AWR_{IC}.

Conclusion: To improve compliance with $PT\text{-}PRF_{IC}$, it is essential to consider a combination of factors including OFW_{IC}, PRF_{IC}, and AWR_{IC}. Strengthening organizational factors and awareness can enhance infection control practices and prevent COVID-19 transmission during dental care.

Key Words: COVID-19, Dental hygienists, Education, Infection control

Introduction

1. Background

Coronavirus disease (COVID-19) is still active around the world. The virus spreads primarily through the respiratory tract and causes symptoms ranging from mild respiratory symptoms to severe pneumonia and death. For about 3 years, countries have been responding to the pandemic with vaccine development, treatment research, and infection prevention measures. Nevertheless, new cases continue to emerge, and variants keep appearing[1]. Therefore, ongoing active response and research on transmission mechanisms, prevention methods, and treatment approaches remain essential.

The World Health Organization provides a variety of guidelines, including those on clinical care, home care, and vaccines, for healthcare workers at the center of the COVID-19 pandemic response. The standard policy manual of the Centers for Disease Control and Prevention and Korea's Ministry of Health and Welfare for dental infection control presents data on infection prevention in dental clinics[2,3]. The Korea Disease Control and Prevention Agency has presented guidelines for the prevention and management of infection before dental treatment to

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prevent the spread of COVID-19 in dental institutions[4]. The questions covered various methods of pre-dental infection control, for example: "Do you check the patient for risk factors such as COVID-19 symptoms or contact when scheduling an appointment?" "Do you use hand sanitizer, wear a mask, check for fever, and manage record access?" "Do you minimize waiting patients to maintain an appropriate distance of at least 1m in the waiting room?" and "Do you select and don the appropriate personal protective equipment according to the type of procedure before the procedure begins?"[4]

The individuals who perform infection prevention and management protocols in the dental environment are mainly dental hygienists, and their expertise and ability greatly affect the quality of care[5]. In addition to direct contact with patients, dental hygienists in charge of disinfection and sterilization of dental equipment require a high level of expertise.

Several previous studies have investigated the risk of COVID-19 transmission in dental settings. Dental healthcare workers are considered high-risk due to their exposure to aerosols and droplets, but no cases of transmission in dental settings have been reported[6]. Similarly, the virus did not spread among 24 patients who visited a Korean dental clinic within 13 days prior to their COVID-19 diagnosis[7]. Likewise, a study conducted in New York with 2,810 patients treated over a period of 6 months reported no transmission to dental healthcare workers or patients when infection control measures and personal protective equipment were in place[8]. However, the potential risk of asymptomatic patients remains a concern in dental settings. For instance, in Korea, three asymptomatic patients tested positive for COVID-19 after dental treatment, leading to the quarantine of 46 staff members[9]. Nonetheless, there were no confirmed cases, suggesting strict infection prevention protocols in dental settings are crucial. These protocols should be detailed from the moment patients enter the dental clinic, as demonstrated in this study.

As mentioned, most previous studies have focused on infection control performance during treatment[10-14]. However, there is insufficient research on dental hygienists' infection prevention performance and infection control education in the preparation stage, before dental treatment. Therefore, we conducted a study to determine whether dental hygienists were performing infection control in accordance with recommended protocols from the time patients arrive to prevent COVID-19 infection and cross-infection.

2. Objectives

This study aimed to investigate the pre-treatment infection control practices (PT-PRF_{IC}) of Korean dental hygienists in response to COVID-19 and to identify the factors influencing their level of implementation.

Materials and Methods

1. Subject of research

This study was conducted according to the STROBE statement[15]. It was approved by the Ethics Committee of Cheongju University. The questionnaire used in this study was a self-administered online survey conducted on January 21, 2021, specifically targeting dental hygienists employed in hospitals or clinical settings. The required number of participants was calculated to be 138 using G*power 3.1.9.7, with an effect size of 0.15, a significance level of 0.05, and a power of 95%. Considering a dropout rate of 10%, the final number was calculated to be 152. A total of 300 responses were collected, but 37 participants were excluded from the analysis. These exclusions were made due to participants working in other occupations or providing insincere answers. The dataset used in this study, consisting of 263 participants, was identical to the dataset used by Park and Min[16].

2. Research tools

Of the survey responses incorporated in this study, the demographic characteristics of the participants; their levels of knowledge regarding COVID-19 (KNW_{CO}), infection control awareness (AWR_{IC}), and infection control performance (PRF_{IC}), and organizational factors for infection control (OFW_{IC}) mirrored those used in Park and Min's study[16]. In addition, PT-PRF_{IC}, the participation experience in infection control education (Edu_{IC}), the educated route, and the types of surface disinfectant used in response to COVID-19 were investigated. The type of surface

disinfectant and the educated route were investigated using multiple responses. The PT-PRF_{IC} were addressed in seven questions and included guidance for visitors, minimization of entrances and exits, and maintenance of distance in the waiting room. Bartlett's sphericity test and Kaiser-Meyer-Olkin measure were used to examine the validity of the survey; as the PT-PRF_{IC} was analyzed as 0.791, it was judged that the measured variable was appropriate for factor analysis[17]. The Cronbach's alpha value of the seven questions on PT-PRF_{IC} was 0.815, indicating reliability of the questionnaire[18]. KNW_{CO}, PRF_{IC}, and PT-PRF_{IC} were assessed using a 5-point Likert scale; respondents assigned 1 point for "not at all," 2 points for "no," 3 points for "normally," 4 points for "yes," and 5 points for "very much so." Higher scores indicated a higher level of knowledge and practice.

3. Statistical analyses

The data obtained in this study were analyzed using IBM SPSS Statistics 27 (IBM Corp., Armonk, NY, USA), and statistical significance was established at α=0.05. Frequency and descriptive statistical analyses were conducted to examine the various types of surface disinfectants, PT-PRF_{IC}, and Edu_{IC}. Differences in PT-PRF_{IC} based on the participants' general characteristics were verified through t-tests, one-way ANOVA, and subsequent Scheffe post-hoc tests. Differences in Edu_{IC} according to the general participant characteristics were tested using the chi-square test. Pearson's correlation coefficient was used to examine the relationships among KNW_{CO}, AWR_{IC}, PRF_{IC}, OFW_{IC}, and PT-PRF_{IC}[16]. Multiple linear regression analysis was used to identify the factors affecting PT-PRF_{IC}.

Table 1. General Participant Characteristics (n=263)[16]

Characteristic	Category	Number (%)	Mean±SD
Age (y)	＜27	36 (13.7)	31.44±5.09
	27～31	116 (44.1)	
	32～36	64 (24.3)	
	≥37	47 (17.9)	
Education level	Associate degree	151 (57.4)	-
	Bachelor's degree or higher	112 (42.6)	
Number of years worked	＜3	68 (25.9)	5.96±4.27
	3～6	107 (40.7)	
	≥7	88 (33.5)	
Form of work institution	Dental clinic	145 (55.1)	-
	Dental hospital level or higher	118 (44.9)	
Number of dental hygienists in organization	＜4	93 (35.4)	-
	4～8	135 (51.3)	
	≥9	35 (13.3)	
Number of unit chairs	＜6	116 (44.1)	-
	≥6	147 (55.9)	
Residential area	Metropolitan area	190 (72.2)	-
	Non-metropolitan area	73 (27.8)	
Monthly pay (1,000 won)	＜220	69 (26.2)	-
	220～260	102 (38.8)	
	260～300	59 (22.4)	
	＞300	33 (12.5)	
Task type (multiple responses)	Dental care work	179 (68.1)	-
	Administration	94 (35.7)	
	Consulting	55 (20.9)	
	Disinfect or sterilize	99 (37.6)	
	All the above tasks	47 (17.9)	

SD: standard deviation.

Results

1. General participant characteristics

The average age of the participants was 31.44±5.09 years, with the majority aged 27 to 31 years accounting for 44.1%[16]. Dental clinics accounted for 55.1% of employers, and dental hospitals accounted for 44.9%[16]. Monthly pay distribution was as follows: 38.8% earned between 2.2 million and 2.6 million won, 26.2% earned less than 2.2 million won, 22.4% earned between 2.6 million and 3 million won, and 12.5% earned over 3 million won (Table 1)[16]. The general characteristics of the participants were the same as those described by Park and Min[16].

Table 2. Questions on Pre-Treatment Infection Control Practices

Question number	Question	Mean±SD
Q1	Do you check patients for fever or respiratory symptoms?	4.39±0.82
Q2	Do you monitor your overseas travel history?	4.17±1.08
Q3	Do you enter the dental practice wearing a mask?	4.63±0.64
Q4	Do you enter the dental practice after using hand sanitizer?	4.28±0.88
Q5	Do you measure the patient's temperature with a non-contact thermometer before they enter the dental practice?	4.36±0.95
Q6	Do you minimizing entrances and exits to control the flow of individuals through the practice?	4.02±1.13
Q7	Do you practice physical distancing of at least 1 m in patient waiting rooms?	3.62±1.28
Total		4.21±0.68

SD: standard deviation.

Table 3. Differences in PT-PRF$_{IC}$ According to General Characteristics of Participants

General characteristic	Category	PT-PRF$_{IC}$	F (p-value)*
Age (y)	＜27	4.02±0.84	1.416
	27～31	4.12±0.64	(0.107)
	32～36	4.38±0.62	
	≥37	4.34±0.67	
Education level	Associate degree	4.19±0.71	0.617
	Bachelor's degree or higher	4.24±0.63	(0.910)
Number of years worked	＜3	4.22±0.69	1.073
	3～6	4.18±0.69	(0.377)
	≥7	4.26±0.66	
Form of work institution	Dental clinic	4.17±0.70	1.095
	Dental hospital level or higher	4.27±0.64	(0.353)
Number of dental hygienists in organization	＜4	4.11±0.81	2.098
	4～8	4.28±0.60	(0.004)
	≥9	4.23±0.55	
Number of unit chairs	＜6	4.20±0.77	1.315
	≥6	4.22±0.59	(0.162)
Residential area	Metropolitan area	4.20±0.66	1.134
	Non-metropolitan area	4.23±0.73	(0.312)
Monthly pay (1,000 won)	＜220	4.27±0.75	0.791
	220～260	4.18±0.70	(0.736)
	260～300	4.13±0.67	
	＞300	4.32±0.45	
Total average score		4.21±0.68	

Values are presented as mean±standard deviation.
PT-PRF$_{IC}$: pre-treatment infection control practices.
*Statistical significance between categories was analyzed using t-tests or one-way ANOVA.

Table 4. Differences in Questions Regarding PT-PRF_{IC} According to General Characteristics of Participants

General characteristic	Category	Q3		Q4		Q5		Q6		Q7	
		Mean±SD	F (p-value)*	Mean±SD	F (p-value)*	Mean±SD	F (p-value)*	Mean±SD	F (p-value)*	Mean±SD	F (p-value) *
Age (y)	＜27	4.72±0.57	2.152	4.25±1.00[a]	2.784	4.14±1.27[a]	3.102	3.64±1.42[a]	3.536	3.08±1.38[a]	5.518
	27～31	4.53±0.73	(0.094)	4.14±0.89[a]	(0.041)	4.23±0.96[a]	(0.027)	3.91±1.17[ab]	(0.015)	3.47±1.37[ab]	(0.001)
	32～36	4.75±0.54		4.36±0.86[a]		4.59±0.68[a]		4.28±0.85[ab]		3.95±1.02[b]	
	≥37	4.68±0.56		4.55±0.69[a]		4.51±0.88[a]		4.23±1.01[b]		3.96±1.06[b]	
Form of work institution	Dental clinic	4.74±0.49	8.635	4.28±0.94	0.013	4.38±1.02	0.171	3.90±1.23	3.672	3.40±1.36	9.928
	Dental hospital level or higher	4.51±0.77	(0.004)	4.29±0.80	(0.910)	4.33±0.86	(0.679)	4.17±0.97	(0.056)	3.89±1.12	(0.002)
Monthly pay (1,000 won)	＜220	4.78±0.45	3.663	4.38±0.88	1.122	4.35±1.08	1.582	4.10±1.26	0.998	3.68±1.28	0.130
	220～260	4.59±0.72	(0.013)	4.20±0.95	(0.341)	4.39±0.91	(0.194)	4.02±1.02	(0.394)	3.61±1.25	(0.942)
	260～300	4.46±0.73		4.22±0.83		4.17±0.97		3.83±1.22		3.63±1.34	
	＞300	4.79±0.42		4.45±0.71		4.61±0.66		4.21±0.93		3.52±1.28	

PT-PRF_{IC}: pre-treatment infection control practices.
*Statistical significance between categories was analyzed using t-tests or one-way ANOVA.
Q3: Do you enter the dental practice wearing a mask?
Q4: Do you enter the dental practice after using hand sanitizer?
Q5: Do you measure the patient's temperature with a non-contact thermometer before entering the dental practice?
Q6: Do you minimize entrances and exits to control the flow of patients through the practice?
Q7: Do you practice physical distancing of at least 1 m in patient waiting rooms?
[a,b]Different letter indicates are significant difference at a=0.05 by Scheffé test.

2. PT-PRF$_{IC}$

The total average score of PT-PRF$_{IC}$ was 4.21±0.68 points, and "Do you enter the dental practice wearing a mask?" had the highest score of 4.63±0.64 points. "Do you practice physical distancing of at least 1 m in patient waiting rooms?" was the lowest, with 3.62±1.28 points (Table 2). After examining the differences in PT-PRF$_{IC}$ according to the general characteristics of the participants, only the number of dental hygienists on duty (p=0.004) showed a significant association (Table 3). Significant differences were confirmed in Q3, Q4, Q5, Q6, and Q7 (Table 4).

3. Edu$_{IC}$

Those who had received Edu$_{IC}$ in the past year accounted for 68.1%, whereas those who had not received Edu$_{IC}$ accounted for 31.9%. Methods of education included hospital self-education (70.9%), education through the Korean Dental Hygiene Association (31.8%), and univer-

Table 5. Edu$_{IC}$ of Participants

Characteristic	Category	Number (%)
Recent infection prevention education	Yes	179 (68.1)
	No	84 (31.9)
Method of infection prevention education[a]	University curriculum	43 (22.9)
	Education through the Korean Dental Hygiene Association	57 (31.8)
	Hospital self-education	127 (70.9)

Edu$_{IC}$: infection control education.
[a]Received more than one response.

Table 6. Presence or Absence of Edu$_{IC}$ according to General Characteristics

Characteristic	Category	Education status		χ^2 (p-value)[a]
		Educated	Uneducated	
Age (y)	＜27	29 (80.6)	7 (19.4)	9.155 (0.027)
	27～31	68 (58.6)	48 (41.4)	
	32～36	48 (75.0)	16 (25.0)	
	≥37	34 (72.3)	13 (27.7)	
Education level	Associate degree	98 (64.9)	53 (35.1)	1.629 (0.202)
	Bachelor's degree or higher	81 (72.3)	31 (27.7)	
Number of years worked	＜3	55 (80.9)	13 (19.1)	7.333 (0.026)
	3～6	66 (61.7)	41 (38.3)	
	≥7	58 (65.9)	30 (34.1)	
Form of work institution	Dental clinic	93 (64.1)	52 (35.9)	2.288 (0.130)
	Dental hospital level or higher	86 (72.9)	32 (27.1)	
Number of dental hygienists in organization	＜4	60 (64.5)	33 (35.5)	2.859 (0.239)
	4～8	91 (67.4)	44 (32.6)	
	≥9	28 (80.0)	7 (20.0)	
Number of unit chairs	＜6	77 (66.4)	39 (33.6)	0.270 (0.603)
	≥6	102 (69.4)	45 (30.6)	
Residential area	Metropolitan area	127 (66.8)	63 (33.2)	0.468 (0.494)
	Non-metropolitan area	52 (71.2)	21 (28.8)	
Monthly pay (1,000 won)	＜220	54 (78.3)	15 (21.7)	8.226 (0.042)
	220～260	72 (70.6)	30 (29.4)	
	260～300	34 (57.6)	25 (42.4)	
	＞300	19 (57.6)	14 (42.4)	

Values are presented as n (%).
Edu$_{IC}$: infection control education.
[a]Statistical differences were confirmed through chi-square tests.

sity curriculum (22.9%) (Table 5). Through cross-analysis, Edu_{IC} status in the past year showed significant associations with age (p=0.027), number of years worked (p=0.026), and monthly pay (p=0.042) (Table 6).

4. Types of surface disinfectants

Responses showed that 62.5% were using alcohol, 23.3% were using hypochlorous acid, and 7.4% were using other surface disinfectants, while 6.8% were not aware of the type of surface disinfectant being used (Table 7).

5. Correlation analyses

Significant correlations were confirmed between KNW_{CO}, AWR_{IC}, PRF_{IC}, OFW_{IC}, and $PT\text{-}PRF_{IC}$. The highest correlation was between PRF_{IC} and OFW_{IC} ($r=0.753$, $p<0.001$) (Table 8). Previous studies have confirmed the correlations among KNW_{CO}, AWR_{IC}, PRF_{IC}, and OFW_{IC}, excluding $PT\text{-}PRF_{IC}$ have been confirmed[16].

6. Multiple regression analyses of $PT\text{-}PRF_{IC}$

Upon assessing multicollinearity to validate the assumptions regarding independent variables in multiple regression analysis, the tolerance values ranged from 0.286 to 0.926, all exceeding 0.1, and the variance inflation factor was observed to be between 1.079 and 3.491. All values remained below the reference threshold of 10, indicating the absence of multicollinearity. Furthermore, the Durbin-Watson value, obtained to assess the independence of residuals, was 1.984, closely approximating 2. This suggests the absence of autocorrelation, indicating the regression model was aptly constructed to elucidate the dependent variable. Following the analysis, the regression model for $PT\text{-}PRF_{IC}$ demonstrated significance ($F=87.600$, $p<0.001$), with the model explaining 62.3% of the variance. The $PT\text{-}PRF_{IC}$ was found to be significantly affected in the order of OFW_{IC} ($\beta=0.317$, $p<0.001$), PRF_{IC} ($\beta=0.311$, $p<0.001$), and AWR_{IC} ($\beta=0.222$, $p<0.001$) (Table 9).

Table 7. Types of Surface Disinfectants in Use[a]

Disinfectant	Number (%)
Alcohol	212 (62.5)
Hypochlorous acid (HOCl)	79 (23.3)
Other	25 (7.4)
Unawareness	23 (6.8)
Total	339 (100)

[a]Received more than one response.

Discussion

1. Interpretation and comparison to previous studies

Dental hygienists may be infected through exposure to blood, saliva, etc. in the oral cavity of the patient and may transmit the infection to others[19,20]. Therefore, the role of dental hygienists in response to infectious diseases such as COVID-19 is important. To prevent cross-infection through dental hygienists, infection control activities before dental treatment and infection prevention education are important. This is not only essential for legal and ethical compliance, but also for maintaining social safety. This study investigated whether Korean dental hygienists were complying with $PT\text{-}PRF_{IC}$ and receiving infection control training.

The survey on $PT\text{-}PRF_{IC}$ showed that maintaining a distance of at least 1 meter in the waiting room had the lowest compliance (3.62±1.28). It is believed that the indoor spaces may not have ben wide enough to accommodate the recommended distance or there was a lack of education or guidance[21,22]. According to previous studies on distancing in dental offices, people can significantly reduce the risk of COVID-19 transmission if they keep 2 m of space between individuals[23,24]. Although aerosols can travel more than 6 m when coughing or sneezing, measures to keep a distance of at least 1 m in the clinic are a way to reduce the incidence of infection, as large water droplets are released only up to about 1 m. The highest score was for wearing a mask when entering the dental practice (4.63±0.64). This can be attributed to the legal obligation to wear a mask and the emphasis on their importance through various media channels[25]. Similarly, Melo et al.[26] emphasized that wearing a mask while in the dentist's office is essential and that, if a patient is not wearing a mask, a mask should be provided, and the patient should be advised of the infection prevention measures in place. After dental treatment, the patient should again wear a mask and minimize movement[26].

Moreover, Peng et al.[27] noted that coughing or talking without a mask in a dental office can lead to infection due to contamination with microorganisms and aerosols. Also, Meng et al.[28] recommended providing medical masks to patients and their companions visiting dental offices to prevent cross-infection.

In medical offices, the importance of surface disinfection is emphasized to chemically eliminate contaminants that can be transported in the air, such as droplets or aerosols. Various disinfection methods are used, including spraying solutions and wiping surfaces. This study investigated which chemicals are commonly used in clinical dental practice. Kampf et al.[29] found that using a surface disinfectant containing 67% to 71% ethyl alcohol, 0.5% hydrogen peroxide, or 0.1% sodium hypochlorite (NaOCl) can effectively inactivate the COVID-19 virus in less than 1 minute. This finding aligns with the results of this study, which showed that alcohol (62.5%) was the most frequently used surface disinfectant. Notably, a significant number of respondents (6.8%) indicated that they did not know which disinfectant to use, highlighting a low awareness of effective chemical substances recommended for surface disinfection.

We found significant differences in the PT-PRF_{IC} according to general characteristics, especially in relation to the number of dental hygienists in the organization (p=0.004). This is consistent with previous research showing that staffing shortages are a factor affecting pretreatment hand hygiene compliance[30-32]. In this study, 68.1% of the participants reported receiving infection control training in the past year, and 70.9% of them reported receiving training from their dental organization. Differences in Edu_{IC} were confirmed depending on age (χ^2=9.155, p=0.027), number of years worked (χ^2=7.333, p=0.026), and monthly pay (χ^2=8.226, p=0.042). This is very similar to the results of Moon's study, which showed that infection control training was higher among clinical dental hygienists aged 26 to 30 years with 2 to 5 years of work experience[33]. According to another study by Moon et al.[34], infection control performance was higher when the participants had received infection control training and when dental offices provided infection control guidelines. This is consistent with the results of this study There is a need to strengthen the infection control system in dentistry, and the information revealed in this study can be used to prepare for infectious diseases[34].

Table 8. Correlations among the KNW_{CO}, AWR_{IC}, PRF_{IC}, OFW_{IC}, and PT-PRF_{IC} for the Prevention of COVID-19 Infection

Variable	KNW_{CO}	AWR_{IC}	PRF_{IC}	OFW_{IC}	PT-PRF_{IC}
KNW_{CO}	1				
AWR_{IC}	0.550 (<0.001)	1			
PRF_{IC}	0.568 (<0.001)	0.738 (<0.001)	1		
OFW_{IC}	0.540 (<0.001)	0.569 (<0.001)	0.753 (<0.001)	1	
PT-PRF_{IC}	0.510 (<0.001)	0.660 (<0.001)	0.743 (<0.001)	0.707 (<0.001)	1

KNW_{CO}: COVID-19 knowledge level, AWR_{IC}: infection control awareness level, PRF_{IC}: infection control performance level, OFW_{IC}: infection control organizational factor, PT-PRF_{IC}: pre-treatment infection control practices.

Table 9. Factors Influencing the PT-PRF_{IC}

Variable	B	SE	β	t	p	Tolerance	VIF
KNW_{CO}	0.042	0.068	0.030	0.611	0.542	0.612	1.635
AWR_{IC}	0.119	0.031	0.222	3.837	<0.001	0.429	2.333
PRF_{IC}	0.140	0.032	0.311	4.382	<0.001	0.286	3.491
OFW_{IC}	0.140	0.026	0.317	5.350	<0.001	0.409	2.442
Edu_{IC}	0.533	0.401	0.052	1.331	0.184	0.926	1.079
R^2=0.630, Adj R^2=0.623, F=87.600, p<0.001							

KNW_{CO}: COVID-19 knowledge level, AWR_{IC}: infection control awareness level, PRF_{IC}: infection control performance level, OFW_{IC}: infection control organizational factor, PT-PRF_{IC}: pre-treatment infection control practices, VIF: variance inflation factors.

This study confirmed that PT-PRF$_{IC}$ as significantly correlated with AWR$_{IC}$, PRF$_{IC}$, and OFW$_{IC}$. In addition, it was confirmed that OFW$_{IC}$ (β=0.317, $p<0.001$), PRF$_{IC}$ (β=0.311, $p<0.001$), and AWR$_{IC}$ (β=0.222, $p<0.001$) had significant impacts on PT-PRF$_{IC}$ (in that order). Aldahlawi and Afifi[35] reported that, in addition to standard infection control precautions in dentistry, additional precautions are needed to control the spread of highly contagious viruses, and dentists must have sufficient knowledge of infectious disease transmission routes and recommended infection control measures. A review article on dentists' infection control knowledge, attitude, and performance, confirmed that dentists' level of infection control knowledge was high, but their attitude and performance were low[36]. A recent study emphasized the need for education and monitoring because, although there are infection control guidelines for hand hygiene, use of personal protective equipment, high-temperature sterilization, and surface disinfection, compliance is low[37]. Previous findings that efforts to improve areas such as dental infection control awareness, attitude, and dental work environment are necessary for infection prevention measures are consistent with the results of this study showing that PT-PRF$_{IC}$ is significantly correlated with AWR$_{IC}$, PRF$_{IC}$, and OFW$_{IC}$[34]. Therefore, to increase compliance with infection control practices for the COVID-19 response, the appropriate environment and organizational facilities for infection control are required, and it is necessary to continuously provide infection control education[35]. Infection control education should encompass not only protocols during treatment but also preventive measures before treatment, starting from the moment patients enter the dental office. This education should extend beyond the scope of dental hygienists' responsibilities to include patient guidance for infection prevention. Furthermore, the training should provide detailed information on disinfectants, their composition, and the effective duration of surface disinfection, rather than merely addressing the presence or absence of surface disinfection practices. Given that such training is most often conducted within dental offices, it is crucial to ensure that it is delivered by individuals with sufficient expertise. Moreover, to enhance compliance, it is essential to foster a culture that encourages all staff members to cooperate and fulfill their obligations rather than simply follow guidelines. Establishing this culture requires a concerted effort from the entire dental office, not just individual initiatives.

2. Limitations

This study was conducted among 263 dental hygienists in South Korea through a convenience sample survey rather than a random sample survey; as such, it may be less representative. As we investigated only the pre-treatment infection control measures of dental hygienists in the early stages of the spread of COVID-19, it is difficult to compare the findings with more recent studies. In addition, it is difficult to determine what changes occurred before the start of the COVID-19 pandemic.

3. Conclusion

In this study, as a result of examining the factors affecting compliance with PT-PRF$_{IC}$, correlations were confirmed among KNW$_{CO}$, AWR$_{IC}$, PRF$_{IC}$, and OFW$_{IC}$ ($p<0.001$). PRF$_{IC}$ (β=0.311, $p<0.001$), and AWR$_{IC}$ (β=0.222, $p<0.001$). PT-PRF$_{IC}$ were found to be significantly affected in order of OFW$_{IC}$ (β=0.317, $p<0.001$), PRF$_{IC}$ (β=0.311, $p<0.001$), and AWR$_{IC}$ (β=0.222, $p<0.001$). In order to strengthen infection control practices, it is essential not only to follow the guidelines, but also to foster a culture that encourages all employees to work together to fulfill their respective obligations. To establish this culture, not only individual efforts but also the entire dental team and administrative efforts are needed.

Notes

Conflict of interest

Ji-Hyun Min has been journal manager of the *Journal of Dental Hygiene Science* since January 2023. Ji-Hyun Min was not involved in the review process of this editorial. Otherwise, no potential conflict of interest relevant to this article was reported. Hye-Rin Park declares that she has no conflicts of interest.

Ethical approval

This study was approved by the institutional review board of Cheongju University (IRB No. 1041107-202312-

HR-049-01). Written informed consent was obtained from all participants.

Author contributions

Conceptualization: Hye-Rin Park and Ji-Hyun Min. Data acquisition: Hye-Rin Park. Formal analysis: Hye-Rin Park. Writing-original draft: Hye-Rin Park. Writing-review & editing: Ji-Hyun Min.

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Data availability

Raw data is provided at the request of the corresponding author for reasonable reason.

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