

# Investigation of Dental Hygienists' Practice about Rules on Dental Disputes Prevention

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**Background:** This study analyzed the practice of dental medical dispute prevention rules of dental hygienists to present an improvement plan for improving perceived importance and practice and provide data for the development of effective medical dispute prevention programs.

**Methods:** A self-administered questionnaire survey was conducted targeting dental hygienists who were providing assistance at dental hospitals and dental clinics in Seoul and Gyeonggi-do regions from March 22 to April 28, 2022. The questionnaire collected from 273 dental hygienists consisted of eight questions on general characteristics, 30 questions on medical dispute experience, and 14 questions on medical dispute prevention.

**Results:** Complaints showed a high experience rate in 'Consultation & reservation', medical disputes in 'Patient handling (unkind related)', and 'Prosthesis installation and cement removal'. In both the importance and practice of medical dispute prevention rules, 'Preservation of medical records and other medical-related data' was high, and 'Management of patients on standby for a long time' was low in terms of practice. 'Lack of time' and 'Lack of manpower' were cited as reasons for not resolving dental treatment disputes. The importance of dental dispute prevention rules was found to be significant according to age and position, and it was also found to affect the level of practice.

**Conclusion:** Seventy-six-point six percent of the respondents said that education on the prevention of medical disputes was necessary, although they lacked recognition of prevention rules compared to their perceptions and experiences. This study suggested specifying prevention rules in dental hygiene subjects and expanding education, improvement of dental treatment system, revise the law on the range of work to improve the recognition and practice of prevention rules.

**Key Words:** Accident prevention, Dental hygienist, Disputes, Education

## Introduction

### 1. Background

Oral health, as a health field, has risen in interest as the quality of life has improved, and the number of dental medical institutions and demand for dental services has also increased<sup>1)</sup>. Along with the rapid upsurge in medical demand, the risk of medical accidents and medical disputes has increased for various reasons, such as the expansion of people's awareness of rights, excessive expectations for treatment results, and the difference between

the work of dental hygienists and legal work performed in the field<sup>2)</sup>. Therefore, oral health professionals must always be mindful of the possibility of medical accidents and their countermeasures<sup>3)</sup>.

A medical dispute is a dispute between a medical professional and a patient, starting with a medical accident<sup>2)</sup>. According to the information announced by the Korea Medical Dispute Mediation and Arbitration Service in 2020, the number of dental medical disputes was 177 cases in 2016, 246 cases in 2017, 277 cases in 2018, 307 cases in 2019, and 235 cases in 2020. The number of medical

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dispute applications has decreased slightly due to coronavirus disease 2019 (COVID-19), but the overall trend is increasing every year<sup>4</sup>). Unlike the past treatment goals that focused on functional recovery, currently aesthetic treatments such as orthodontics, esthetic prosthetics, and implants have risen, and dissatisfaction caused by not meeting the increased need of patients seems to have further escalated dental medical disputes<sup>5</sup>). As medical disputes are occurring in various medical fields<sup>4</sup>), it is necessary to investigate those where disputes occur frequently and their causes, and to devise specific solutions and countermeasures<sup>6</sup>). Furthermore, minor issues may cause disputes between the oral health professional and the patients, but oral health professionals must faithfully perform their assigned duties<sup>3</sup>).

Dental medical disputes are not limited only to dentists, but also to dental hygienists who assist in dental care and perform dental hygiene procedures<sup>7</sup>). Dental hygienists execute their assignments by communicating with patients related to oral disease prevention and oral hygiene programs like removal of plaque, fluoride application, temporary filling, removal of temporary attachments, and impression<sup>5</sup>). To prevent dental medical disputes that may arise during these assignments, the Dental Hygienist Association needs to strengthen dental medical dispute prevention education and strive to revise related laws<sup>8</sup>). Moreover, research on education and attitudes toward the patients should be conducted to confirm dental hygienists' experiences in dental medical disputes<sup>2</sup>).

Previous studies on dental medical disputes include analysis of types and precedents of medical disputes<sup>9</sup>), research on medical dispute experiences<sup>2,10</sup>), causes and solutions, and research on education requirements for dental medical dispute<sup>5,6,8</sup>), etc., have been conducted, but research on specific guidelines or rules for preventing medical disputes is insufficient. Therefore, specific research is needed to promote dental hygienists' medical dispute prevention activities and to develop and expand effective educational programs<sup>6</sup>).

## 2. Objectives

This study aims to confirm the dental hygienists' level of practice for the dental medical dispute prevention rules

proposed by the Korean Dental Association in 2020. In addition, the purpose of this study is to provide basic data for the development of an effective dental medical dispute prevention program by investigating dental hygienists' medical dispute experience, awareness of prevention guidelines, and reasons for non-practice of prevention rules.

## Materials and Methods

### 1. Ethics statement

This study was conducted after review and approval (IRB No. EUIRB2022-015) by the Institutional Bioethics Committee of Eulji University. The purpose of the study and the rights of the research subjects were informed, and it was explained that the collected data would be only used for research.

### 2. Study design

This study is a questionnaire using a structured online Google form, and the research tool was modified and supplemented with the questionnaire used in the guidelines for preventive activities at dental medical institutions (2020)<sup>11</sup>) and previous papers<sup>2,5,6</sup>). The questionnaire consisted of 8 questions regarding respondents' general characteristics regarding gender, age, recent educational background, work experience, position, type of work location, region, etc.

Thirty questions related to the state of medical dispute experience: 29 questions about complaints and medical disputes for each of the eight areas (diagnosis, patient education, conservative, prosthetics, preventive, orthodontics, medical-related laws, etc.), one question about dental medical dispute legal process experience.

Fourteen questions related to medical dispute prevention rules: two questions about completion of dental medical dispute prevention education and education needs, one question about awareness of dental medical dispute prevention rules, ten questions about the practice and importance of dental medical dispute prevention rules, one question about the reason for non-practice of medical dispute prevention rules.

Definitions were presented in the questionnaire to properly recognize complaints and medical disputes.

## Results

### 3. Sample size

In this study, the minimum sample size required for the analysis of variance (ANOVA) was selected using the G\*Power 3.1 program. When the effect size was 0.25, the significance level was 0.05, and the power was 95%; the minimum number of samples was calculated as 252, and a total of 273 people were surveyed considering the dropout rate.

From March 22 to April 28, 2022, 273 dental hygienists working at dental hospitals and clinics in Seoul and Gyeonggi-do were selected for convenience. From 273 questionnaires, a total of 260 copies were used as the final analysis data, excluding 13 questionnaires with insincere.

### 4. Statistical methods

The collected data of this study was analyzed using SPSS (Statistical Package for the Social Sciences) version 26 (IBM Corp., Armonk, NY, USA). Frequency analysis was performed on the typical characteristics of the study subjects, legal experience, awareness of the rules for preventing dental medical disputes, whether they have completed medical dispute-related education and education requirements, the number of problems raised by each type of treatment and medical disputes, and the reasons for not practicing the preventive rules. Descriptive statistics were conducted using a 5-point Likert scale to understand the importance and practice of preventive rules. t-test, one-way ANOVA was performed to understand the importance and practice of preventive rules according to general characteristics, awareness of preventive rules, and experience in medical disputes. The post hoc test was conducted by Scheffe. To understand the effect of general characteristics on the practice of preventive rules, regression analysis was performed by converting them into dummy variables. A regression analysis was performed to assess the correlation between the importance and the degree of practice of the medical dispute prevention rule and to understand the effect of the importance on the degree of practice. The statistical significance level ( $\alpha$ ) was based on 0.05.

### 1. General characteristics of research subjects, experience related to medical disputes

The results related to the general characteristics of the research subjects and the status of experiences related to medical disputes are as follows (Table 1).

Among 260 survey participants, female 92.7%, people aged 20 to 29 years 46.9%, people graduated from college 48.8%, people having clinical experience over 6 years 49.2%, people who are staff as their job position 63.5%, people who work at dental clinics 78.1%, and people

**Table 1.** General Characteristics of Research Subjects, Actual Experience Related to Medical Disputes

Variable	Category	Value
Sex	Male	19 (7.3)
	Female	241 (92.7)
Age (y)	20~29	122 (46.9)
	30~39	111 (42.7)
	≥40	27 (10.4)
Education	College	127 (48.8)
	University	119 (45.8)
	Graduate school	14 (5.4)
Work duration (y)	< 3	76 (29.2)
	3~6	56 (21.5)
	> 6	128 (49.2)
Job position	Staff	165 (63.5)
	Team manager	42 (16.2)
	Consulting manager	53 (20.4)
Type of work place	General hospital and dental university hospital	19 (7.3)
	Dental hospital	38 (14.6)
	Dental clinic	203 (78.1)
Service area	Seoul	115 (44.2)
	Gyeonggi	145 (55.8)
Experience on legal proceeding	Yes	32 (12.3)
	No	228 (87.7)
Experience of preventive education	Yes	34 (13.1)
	No	226 (86.9)
Recognition of prevention rules	Yes	47 (18.1)
	No	213 (81.9)
Educational needs for medical disputes prevention	Very likely	81 (31.2)
	Likely	118 (45.4)
	Normal	34 (13.1)
	Unlikely	18 (6.9)
	Very unlikely	9 (3.5)

Values are presented as number (%).

**Table 2.** Experience of Complaints and Medical Disputes in each Treatment Area (Multiple Responses)

Variable	Category	Complaints	Medical dispute
Diagnosis	History taking	72 (27.7)	9 (3.5)
	Oral examination	55 (21.2)	9 (3.5)
	Intraoral roentgenographic examination	103 (39.6)	12 (4.6)
	Extraoral roentgenographic examination	80 (30.8)	7 (2.7)
Education for patients	Instruction in precautions before and after dental treatment	81 (31.2)	8 (3.1)
	Instruction in precautions before and after operation	70 (26.9)	13 (5.0)
	Explanation on how to use orthodontic appliance	40 (15.4)	7 (2.7)
	Tooth brushing instruction	22 (8.5)	6 (2.3)
Conservative treatment	Matrix band setting	35 (13.5)	2 (0.8)
	Conservative preparation (FC change, Canal irrigation)	36 (13.8)	9 (3.5)
	Temporary filling (ZOE, Caviton)	44 (16.9)	4 (1.5)
	Filling material polishing	43 (16.5)	8 (3.1)
Prosthodontic	Cord packing	41 (15.8)	4 (1.5)
	Temporary crown production & setting	64 (24.6)	7 (2.7)
	Impression	82 (31.5)	5 (1.9)
	Prosthesis setting & cement removal	44 (16.9)	14 (5.4)
Preventive dentistry	Pit & fissure sealant	26 (10.0)	5 (1.9)
	Scaling	103 (39.6)	11 (4.2)
	Fluoride topical application	22 (8.5)	5 (1.9)
	Root planing	45 (17.3)	9 (3.5)
Orthodontics	Orthodontic bracket bonding	37 (14.2)	6 (2.3)
	Ligature wire	44 (16.9)	6 (2.3)
	Fixed orthodontic appliance (band, bracket) removal	41 (15.8)	8 (3.1)
Medical-related laws	Medical record management	28 (10.8)	9 (3.5)
	Disclosure of patient treatment content to others	21 (8.1)	9 (3.5)
	Companion and consent of an adult of minors	37 (14.2)	11 (4.2)
Etc.	Consultation & reservation	114 (43.8)	11 (4.2)
	Related to patient handling (unkindness)	105 (40.4)	14 (5.4)

Values are presented as number (%).

**Table 3.** Practice and Importance of Medical Dispute Prevention Rules

Variable	Importance (5 points)	Practice (5 points)
Show special attention to patients who are waiting long hours	4.47±0.60	4.09±0.74
Be accompanied by an adult in the treatment of a minor	4.51±0.72	4.38±0.82
Consult your dentist instead of trying to solve difficult questions yourself	4.53±0.59	4.39±0.70
Don't judge the dentist's medical treatment	4.41±0.69	4.35±0.78
Don't criticize the treatments at other dentists	4.47±0.64	4.42±0.67
Don't make personal calls that are not related to medical treatment in the clinic	4.72±0.54	4.66±0.68
The patient's treatment is confidential, so don't pass it on to others	4.70±0.53	4.52±0.71
Keep medical records and other medical data well	4.77±0.47	4.72±0.51
Don't go beyond your role in medical practice	4.57±0.63	4.10±0.94
Give the patient who has been treated precautions once again	4.70±0.49	4.49±0.65

Values are presented as mean±standard deviation.

working in Gyeonggi 55.8% accounted for the largest portion in each section.

The number of people without experience in legal

procedure was 87.7%. Eighty-six-point nine percent responded that they did not have experience of preventive education for medical disputes. Eighty-one-point nine percent

responded that they had no recognition of prevention rules for legal proceeding. The need for medical dispute prevention education was also ‘likely’ for 45.4% and ‘very

likely’ for 31.2%, with 76.6% responding that education is necessary.

**Table 4.** Reasons for Non-Practice of Medical Dispute Prevention Rules

Variable	Value
The chair time is getting longer	23 (16.2)
A lack of time	40 (28.2)
Not important	7 (4.9)
Bothersome	3 (2.1)
A lack of manpower	40 (28.2)
Lack of awareness of the rules	12 (8.5)
Dentist’s delegated medical treatment	9 (6.3)
Busy	3 (2.1)
Forgot	2 (1.4)
The patient’s poor medical treatment condition	1 (0.7)
Minors: difficult to adult revisits	1 (0.7)
Minors: adult delegated almost all rights	1 (0.7)

Values are presented as number (%).

## 2. Experience of complaints and medical disputes in each treatment area

Table 2 shows the results of examining complaints and medical dispute experiences in each treatment area. One-hundred fourteen people complained about ‘Consultation & reservation’ which is the highest percentage; but in medical disputes, ‘Prosthesis setting & cement removal’ and ‘Related to patient handling (unkindness)’ accounted for the largest portion at 5.4%.

**Table 5.** Practice and Importance of Medical Dispute Prevention Rules According to General Characteristics and Medical Dispute-Related Experience

Variable	Category	Practice		Importance	
		M±SD	p-value	M±SD	p-value
Sex	Male	4.28±0.46	0.220	4.59±0.36	0.949
	Female	4.42±0.38		4.58±0.36	
Age (y)	20~29	4.39±0.40	0.286	4.52 <sup>a</sup> ±0.37	0.018
	30~39	4.41±0.40		4.65 <sup>b</sup> ±0.33	
	≥40	4.52±0.34		4.62 <sup>ab</sup> ±0.38	
Education	College	4.42±0.35	0.473	4.60±0.35	0.390
	University	4.39±0.42		4.56±0.35	
	Graduate school	4.53±0.47		4.67±0.50	
Work duration (y)	< 3	4.37±0.41	0.556	4.53±0.35	0.123
	3~6	4.43±0.40		4.55±0.42	
	> 6	4.43±0.38		4.63±0.34	
Job position	Staff	4.38±0.39	0.080	4.54 <sup>a</sup> ±0.37	0.006
	Team manager	4.40±0.42		4.59 <sup>ab</sup> ±0.40	
	Consulting manager	4.52±0.35		4.72 <sup>b</sup> ±0.27	
Type of work place	General hospital and dental university hospital	4.36±0.29	0.118	4.50±0.32	0.196
	Dental hospital	4.53±0.42		4.67±0.35	
	Dental clinic	4.39±0.39		4.58±0.36	
Service area	Seoul	4.40±0.40	0.574	4.57±0.38	0.490
	Gyeonggi	4.42±0.39		4.60±0.34	
Recognition of prevention rules	Yes	4.43±0.37	0.699	4.57±0.37	0.700
	No	4.41±0.40		4.59±0.36	
Experience on legal proceeding	Yes	4.34±0.42	0.271	4.60±0.32	0.915
	No	4.42±0.39		4.59±0.36	

p-value by t-test or one way ANOVA with Scheffe’s multiple comparisons at α=0.05.

### 3. Medical disputes prevention rules for dental hygienists

#### 1) Practice and importance of medical dispute prevention rules

Table 3 shows the practice and importance of medical dispute prevention rules. ‘Keep medical records and other medical data well’ is rated the highest in both the importance (4.77 on a 5-point scale) and practice (4.72 on a 5-point scale). ‘Don’t judge the dentist’s medical treatment’ is rated the lowest in the importance (4.41 on a 5-point scale) and ‘Show special attention to patients who are waiting long hours’ is rated the lowest in the practice (4.09 on a 5-point scale).

#### 2) Reasons for non-practice the medical dispute prevention rules

Table 4 is the result of examining the reasons for not practice the medical dispute prevention rules. ‘A lack of time’ and ‘A lack of manpower’ are rated the highest at 28.2%.

#### 3) Practice and importance of medical dispute prevention rules according to general characteristics and medical dispute-related experience

Table 5 shows the results of practice and importance of medical dispute prevention rules according to general characteristics and medical dispute-related experience. Among the general characteristics, significant results were shown in the importance average according to age and job position.

#### 4) Effect of general characteristics on practice of medical dispute prevention rules

Table 6 shows the effect of general characteristics on practice of medical dispute prevention rules. As a result of analyzing regression analysis with dummy variables, there was no statistically significant effect.

#### 5) Correlation between practice and importance of medical dispute prevention rules

Table 7 shows the correlation between practice and

Table 6. Effect of General Characteristics on Practice of Medical Dispute Prevention Rules

Variable	Practice of prevention rules				p-value	
	B	Standard error	$\beta$	t-statistic		
(Constant)	4.205	0.135		31.229	< 0.001	
Education	Ref= college					
	University	-0.007	0.053	-0.009	-0.135	0.892
	Graduate school	0.086	0.117	0.050	0.734	0.464
Work duration (y)	Ref=< 3					
	3 ~ 6	0.013	0.073	0.013	0.173	0.863
	> 6	-0.070	0.102	-0.089	-0.683	0.495
Job position	Ref=staff					
	Team manager	0.034	0.075	0.032	0.455	0.649
	Consulting manager	0.145	0.075	0.150	1.931	0.055
Type of work place	Ref=general hospital and dental university hospital					
	Dental clinic	0.004	0.099	0.004	0.040	0.968
	Dental hospital	0.148	0.115	0.134	1.289	0.199
Service area	Ref=Seoul					
	Gyeonggi	0.024	0.051	0.031	0.469	0.640
Gender	Ref=male					
	Female	0.151	0.104	0.101	1.467	0.145
Age(y)	Ref=20 ~ 29					
	30 ~ 39	0.027	0.085	0.034	0.316	0.752
	≥ 40	0.120	0.114	0.094	1.058	0.291

$R^2=0.056$ , adjusted  $R^2=0.010$ ,  $F=1.220$ ,  $p=0.269$ ,  $DW=1.860$

p-value by multiple regression analysis.

importance of medical dispute prevention rules. The coefficient of correlation was 0.758, showing significant results with a strong positive correlation ( $p < 0.001$ ).

**6) Effect of importance of medical dispute prevention rules on practice of medical dispute prevention rules**

Table 8 shows the effect of importance of medical dispute prevention rules on practice of medical dispute prevention rules. As a result of regression analysis, statistically significant results were shown ( $p < 0.001$ ). The explanation ability was 58.6%.

**Discussion**

**1. Interpretation and comparison with previous studies**

In this study, 81.9% of the research subjects responded that they did not know about the rules for preventing medical disputes, 86.9% responded that they had ‘never received medical dispute prevention education’, and 76.6% responded that they needed medical dispute prevention education. This is thought to be because the current university curriculum is centered on the national examination, which focuses on work-related theories and practical training, and the education and research related to medical disputes are insufficient<sup>12)</sup>. Similar to this study, previous studies on

medical dispute experiences of dental hygienists<sup>5,6)</sup> showed that dental hygienists were exposed to medical disputes and suggested that education related to medical dispute prevention is necessary. Therefore, it is necessary to expand and improve education on medical disputes through dental hygiene curriculum and refresher education by associations.

As for the complaints by each treatment area, ‘Consultation & reservation’ appeared the highest, and ‘Patient response related (unkind)’ and ‘Prosthetic setting and cement removal’ appeared high in the medical dispute experience by area. This shows that substantial proportion is occupied in areas other than medical care and in areas other than the legally prescribed duties of dental hygienists. In the survey on the status of dental hygienists’ work, in the category of ‘Not a legal job, but it should be included as a legal job’, the actual work currently being performed, such as ‘Wearing and removing prostheses’ and ‘External imaging (CT)’ is based on the law. This suggests that there is a large gap between the specified tasks<sup>13)</sup>. Therefore, it is necessary to revise the law to reflect the reality of the actual work of dental hygienists. In addition, as in this study, previous studies on medical disputes<sup>2,5)</sup> also showed high levels of medical disputes in non-medical areas such as ‘Consultation & reservation’. It is thought that medical disputes can be prevented by changing the attitude of dental hygienists through the communication process and improving the reservation system when raising complaints through medical accidents. In addition, there is a need for an educational method that can improve the critical thinking ability of dental hygiene ethics so that ethical duty behavior standards can be established, and correct decision-making can be made<sup>14)</sup>.

In dental medical dispute prevention rules, the practice and importance of ‘Keep medical records and other medical data well’ were both high. The perception that medical records

**Table 7.** Correlation between Practice and Importance of Medical Dispute Prevention Rules

Variable	Practice of prevention rules	Importance of prevention rules
Practice of prevention rules	1	
Importance of prevention rules	0.758***	1

\*\*\* $p < 0.001$  by person’s correlation analysis.

**Table 8.** Effect of Importance of Medical Dispute Prevention Rules on Practice of Medical Dispute Prevention Rules

Variable	Practice of prevention rules				p-value
	B	Standard error	$\beta$	t-statistic	
(Constant)	0.348	0.233		1.492	0.137
Importance of prevention rules	0.833	0.044	0.764	18.785	<0.001
$R^2=0.586, F=120.559, p < 0.001$					

p-value by linear regression analysis.

play an important role in resolving dental medical disputes has had an impact<sup>2,8)</sup>. In the importance of prevention rules, the question of ‘Don’t judge the dentist’s medical treatment’ was the lowest with 4.41 points. It can adversely affect the patient’s trust and satisfaction in dentistry and then the possibility to progress medical disputes. Therefore, it will be necessary to improve recognition of the importance of the prevention rules. In the practice of prevention rules, the question of ‘Show special attention to patients who are waiting long hours’ was the lowest. In Kim and Han’s study<sup>10)</sup>, the highest complaint was ‘Long waiting times for medical treatment’. Considering that ‘Lack of time’ and ‘Lack of manpower’ appeared highly as reasons for not following the precautionary measures in this study, management of long-waiting patients is insufficient, and it is thought that the time and workforce for managing waiting patients are affected. Considering that patient satisfaction in the limited medical market directly or indirectly affects dental management<sup>10)</sup>, it is judged that continuous attention to patients waiting for a long time and improvement of the treatment system are necessary. Yoon’s study<sup>15)</sup> also indicated that the number of dental hygienists needed per dentist was in a significantly insufficient state. It is judged that this is due to the expansion of health insurance premiums<sup>16)</sup>, the increase in the number of patients due to subscription to private medical insurance<sup>16)</sup>, and career interruption after childbirth<sup>15)</sup>. Therefore, there is a need to improve the requirement of medical manpower and a stable employment culture so that prevention rules can be observed<sup>15)</sup>.

It was found that the importance of dental dispute prevention rules affected the practice. In particular, the importance of prevention rules was higher for ‘30 to 39 years old’ than for ‘20 to 29 years old’, and counseling chiefs appeared higher than medical staff. However, it was not significant in the importance and practice of preventive rules according to career and legal dispute experience. In contrast, a study by Yang et al.<sup>6)</sup> showed that the number of complaints was higher in disputes related to treatment staff based on work experience, and the number of complaints was higher in the treatment work. Additional research will be needed in the future, and since medical disputes can occur at anytime, dental hygienists’ will have to change their basic consciousness and treat-

ment attitude.

In summary, the awareness of medical dispute prevention education and prevention rules is insufficient compared to the awareness and experience of dental hygienists’ exposure to medical disputes. Therefore, to improve awareness and practice of dental hygienists’ preventive rules, it is necessary to expand medical dispute prevention education, improve the dental treatment system, and amend the law on the scope of work performed.

## 2. Limitations

The limitation of this study is that the scope of the survey is narrow, and it is difficult to generalize the research results due to the lack of representation because the focus is limited to Seoul and Gyeonggi-do. Additionally, research on dental medical dispute prevention rules was insufficient, and since medical disputes were caused by various factors and interactions, it was difficult to analyze them in detail with only a self-administered questionnaire survey.

## 3. Suggestions

Therefore, in future studies, it seems necessary to expand the target group and apply various methods other than questionnaires. By supplementing these points, we hope that more systematic research will be conducted to prevent dental medical disputes, and that the results of this study will be used as basic data to increase the practice of preventive rules.

## Notes

### Conflict of interest

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

### Ethical approval

This study was approved by the institutional review board of Eulji University (IRB No. EUIRB2022-015).

### Author contributions

Conceptualization: Hee-jung Lim. Data acquisition: all the authors. Formal analysis: all the authors. Funding: Hee-jung Lim, Hae-in Yoon, and Im-hee Jung. Supervision:

Hee-jung Lim and Im-hee Jung. Writing-original draft: all the authors. Writing-review & editing: Hee-jung Lim.

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#### Data availability

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

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