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The relationship between mothers' knowledge and practice level of cough etiquette and their children's practice level in South Korea

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Purpose: This study investigated the relationships between mothers' knowledge and practice level of cough etiquette and their children's practice level of cough etiquette as perceived by their mothers. **Methods:** This study was a descriptive correlational study. The data were collected from 160 mothers with preschoolers attending daycare centers and kindergartens in Gwangju, South Korea using self-reported questionnaires. **Results:** The correct answer rate for cough etiquette knowledge in mothers was 86.0%, mothers' average practice score was 33.65±4.14, and their children's average practice score was 28.39±4.85 out of 48. The correlation between mothers' cough etiquette knowledge and practice level was not statistically significant. However, mothers' cough etiquette practice was positively correlated with children's cough etiquette level as perceived by mothers (r=.35, $p<.001$). **Conclusion:** The development of a systematic cough etiquette education program and measurements for both mothers and children according to their developmental stages is important to effectively prevent respiratory infections.

Key words: Cough; Respiratory tract infections; Infection control; Preschool children; Mother

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INTRODUCTION

Early childhood is characterized by a higher risk of respiratory infections than adulthood because young children's respiratory defense systems are immature and their immune system continues to develop until school-age [1]. Infections of highly contagious and transmissible droplet respiratory infections are more likely to occur among preschool children, who have higher physical and group activity levels [2]. As the most common infectious diseases in this age group, influenza accounts for 49% of droplet-transmitted infections [3] and acute respiratory viral infections are responsible for 30% to 50% of all preschool-age outpatients [4,5].

As a primary preventive method for respiratory infections, the United States Centers for Disease Control and Prevention [6] recommended proper cough etiquette. Proper cough etiquette refers to covering one's nose and mouth with a tissue, handkerchief, or upper sleeve of one's clothes while coughing, sneezing, or experiencing a running nose; immediately disposing the used tissues; and washing one's hands after contact with respiratory secretions [7]. Since preschool children are a vulnerable age group to respiratory infections, which are highly likely to develop into lower respiratory diseases, it is important to practice proper cough etiquette [8]. However, 60% to 85% of adults and children do not carry out proper practices after coughing and sneezing from respiratory inflammatory reactions [9-11].

Preschool age is an effective developmental stage to teach and train children to practice a proper lifestyle [12], and mothers' health-related habits have been found to be associated with their children's health-related habits [13]. Since children's physical, mental, and social functions are incompletely developed, they experience difficulties in managing self-hygiene, which requires guidance from their mothers to form proper coping skills. Mother-child interactions and emotional bonds with mothers are important factors for promoting

healthy growth and development in children [14,15]. Mother-child interactions are two-way interactions between children and their mothers that affect children's health status and quality of life as their cognitive development progresses during the preschool years [16]. Through these interactions, children develop beliefs, values, and behavior patterns that reflect those of their mothers [16]. Since children tend to learn through imitation and observation [17,18], children formulate health behaviors by watching and imitating their mothers' behaviors. Because mothers have higher affectionate parenting attitudes than fathers [19], children tend to form a high degree of intimacy with their mothers. For this reason, mothers play an essential role in helping children to formulate new health lifestyles and behaviors. During mutual interactions with their mothers, children unconsciously follow their mothers' behavior to construct their own behavior patterns; this phenomenon is known as the chameleon effect [20]. The chameleon effect, which involves imitating and learning behavior, can be applied to the health behavioral practices of preschool children, who directly observe and follow their parents' behaviors due to their developmental stage.

Therefore, studying the knowledge and practice levels of cough etiquette in mothers with preschoolers is important since the relationship between children and their mothers could affect children's respiratory hygiene practices. However, there is a lack of studies on cough etiquette in preschoolers compared to research on hand washing and oral care, even though preschoolers are vulnerable to respiratory infections. Most studies regarding cough etiquette or respiratory hygiene were done in adolescents [21] and adults [7, 22-24]. A study on adults over 19 years old showed that only 17.3% performed proper cough etiquette [24], 78.9% of people covered themselves with their hands while coughing and sneezing, and 70% of people were not accustomed to proper cough etiquette [7]. This low practice level indicates that proper cough etiquette has not been incorporated into people's health behaviors and implies that education could have been lacking during childhood.

Thus, this study investigated the relationships between the cough etiquette knowledge and practice level of mothers with preschoolers and their children's practice level of cough etiquette as perceived by their mothers. This study will provide evidence for the development of an effective primary prevention program regarding respiratory infections for preschoolers. The specific goals were as follows: to determine mothers' level of cough etiquette knowledge; to determine the cough etiquette practice level of mothers and children; to identify relationships between mothers' cough etiquette knowledge and practice level and their children's cough etiquette practice level according to general characteristics and cough etiquette-related factors; and to explore correlations between mothers' knowledge and practice level of cough etiquette and their children's practice level of cough etiquette, as well as relationships between the two groups.

METHODS

Ethics statement: This study was approved by the Institutional Review Board of Chonnam National University (No. 1040198-171220-HR-092-03). Informed consent was obtained from the participants.

1. Study Design

This study was a descriptive correlational study that investigated the knowledge and practice level of cough etiquette of mothers with preschoolers and their children's level of cough etiquette practice as perceived by their mothers, and explored relationships between the two groups.

2. Participants

The participants were mothers of preschoolers aged between 3 and 6 years old who attended private institutions that enrolled at least 30 children. The participants were recruited at two daycare centers and three kindergartens located in Gwangju, South Korea using convenience sampling. Data were collected from 176 people, and responses from 160 people were analyzed, excluding 7 people who did not respond to the questionnaire, 2 people who provided insufficient answers, and 7 people who did not meet the target selection criteria. The specific selection criteria were 1) mothers with children aged 3 years or older to under 7 years old, 2) mothers with children without physical and mental disabilities, and 3) mothers who understood the purpose of this study and agreed to participate in the study.

G*Power version 3.1.9.2 was used to calculate the required sample size according to the formula for a correlational analysis [25]. In order to select the effect size for this study, we referred to the study of Jin and Kim [23], which had similar main variables. Using an effect size of .30, significance level of .05, and power of .95, a required sample of 134 people was calculated. Considering a dropout rate of about 20%, 176 mothers were invited to participate.

3. Data Collection

Data collection was carried out after obtaining approval from the National University Bioethics Review Board. The directors of the institutions provided consent after receiving an

explanation of the purpose, content, and procedure of the study and the confidentiality of the information. With the help of the directors, self-reported questionnaires and research agreements were distributed to households, and the data were collected from February 2018 to March 2018. The questionnaires were filled out by mothers with preschoolers who agreed to participate in the study, and the completed questionnaires were collected by mail. The written consent form included a statement that the contents of the responses would not be used for any purposes other than those of the study.

4. Measurements

The research measurements were developed by Kim et al. [22] and revised and supplemented by Jin and Kim [23]. The original developers approved usage of the measurements prior to data collection. This instrument consists of 12 questions divided into 4 categories: "parts to cover when coughing," "how to cover up," "behavior after coughing," and "how to deal with secretions." Each item was phrased in terms of both knowledge and practice level. For the items phrased to assess mothers' cough etiquette knowledge, a correct answer received 1 point, and a wrong answer or an answer of "I don't know" received 0 points. The total score was 12 points, with higher scores indicating higher knowledge levels. At the time of development, the Guttman split-half coefficient was .70 for reliability [23]. In this study, the Kuder-Richardson formula 20 was .65 for internal consistency reliability. The cough etiquette practice measurements of mothers and preschoolers contained a 4-point Likert scale, with the highest possible score being 48 points and higher scores indicating higher practice levels. At the time of Jin and Kim's development of the measurement tool [23], Cronbach's α was .61 for the reliability of cough etiquette practice level. In this study, the Cronbach's α as a measure of mothers' measurement reliability was .58 and that of children was .74. The validity of the measurement was reviewed by two nursing professors.

5. Data Analysis

The collected data were analyzed using SPSS version 23.0 (IBM Corp., Armonk, NY, USA). General characteristics, the mothers' cough etiquette knowledge level, and the mothers' and children's cough etiquette practice levels were presented using descriptive statistics such as frequency, percentage, mean, and standard deviation. Differences in major variables were analyzed using the t-test and analysis of variance, and post-hoc testing was conducted using the Scheffé test. Pearson correlation coefficients were used to evaluate the correlations between mothers' knowledge and practice level of cough etiquette and their children's practice level of cough etiquette.

RESULTS

1. General Characteristics and Cough Etiquette-Related Factors

The average age of mothers was 38.9 years, and 61.8% were in 39 years old or younger. Furthermore, 73.1% were employed, and 93.1% had a bachelor's degree or higher. More than half (59.4%) of mothers reported not having had a cold or flu in the past 6 months. The average age of children was 5.5 years, and 39.4% were 5 years old. Boys comprised 55.1% of the preschoolers, while 44.9% were girls. Most of the preschoolers (57.6%) were the first-born children in their families. In the past 6 months, 63.1% of children had a cold or flu (Table 1).

In terms of factors related to cough etiquette, 84.4% of mothers did not carry a handkerchief, 73.1% carried tissues, and 63.1% were well-informed regarding cough etiquette. More than half (57.5%) of mothers stated that they had not received cough etiquette education, while 83.8% reported that they educated their children about cough etiquette (Table 1).

2. Cough Etiquette Knowledge and Practice Level

The mean score for correct answers regarding knowledge of cough etiquette was 10.32±1.79 out of 12 points, with a correct answer rate of 86.0%. The item with the highest correct answer rate was "when you cough up sputum, dispose of it with a tissue" (96.3%). The lowest correct answer rate was found for "cover with your hand when coughing" (55.0%) (Table 2). Mothers' mean score for the practice of cough etiquette was 33.65±4.14 out of 48 points. The highest score was found for "if I need to cough up sputum, I dispose of it with a tissue and throw it into a trash can" (3.58 points), and the lowest score was found for "if I cough up sputum, I spit it out directly into a trash can" (1.76 points) (Table 3). The average score for children's cough etiquette practice level as perceived by their mothers was 28.39±4.85 out of 48 points. The highest score was found for "if I need to cough up sputum, I dispose of it with a tissue and throw into a trash can" (3.00 points), and the lowest score was found for "cover with a tissue or a handkerchief while coughing" (1.59 points) (Table 3).

Table 4 shows the statistical relationships between mothers' cough etiquette knowledge and practice level and children's practice level according to general characteristics and cough etiquette-related factors. Maternal age showed a statistically significant association with the level of knowledge ($t=2.51$, $p=.014$), but no general characteristics showed statistically significant relationships with mothers' cough etiquette prac-

Table 1. General Characteristics and Cough Etiquette-Related Factors (*N*=160)

Variables	Characteristics	Categories	n (%)	M±SD
Mother	Age* (year) (n=144)	≤39	89 (61.8)	38.9±3.6
		≥40	55 (38.2)	
	Job	Yes	117 (73.1)	
		No	43 (26.9)	
	Education level	≤High school	11 (6.9)	
		≥Bachelor	149 (93.1)	
	Had a cold/flu in the past 6 months	Yes	65 (40.6)	
		No	95 (59.4)	
Child	Age (year)	3-4	41 (25.6)	5.5±0.8
		5	63 (39.4)	
		≥6	56 (35.0)	
	Gender* (n=158)	Male	87 (55.1)	
		Female	71 (44.9)	
	Birth order* (n=151)	1st	87 (57.6)	
		2nd	47 (31.1)	
		≥3rd	17 (11.3)	
	Had a cold/flu in the past 6 months	Yes	101 (63.1)	
		No	59 (36.9)	
Cough etiquette-related factors	Carrying a handkerchief	Yes	25 (15.6)	
		No	135 (84.4)	
	Carrying tissues	Yes	117 (73.1)	
		No	43 (26.9)	
	Well-informed regarding cough etiquette (cough etiquette awareness)* (n=130)	Well known	82 (63.1)	
		Do not know	48 (36.9)	
	Experience of receiving cough etiquette education	Yes	68 (42.5)	
		No	92 (57.5)	
	Experience of educating one's child about cough etiquette	Yes	134 (83.8)	
		No	26 (16.2)	

*Non-responders were excluded from the analysis.

Table 2. Correct Answer Rate of Cough Etiquette Knowledge among Mothers (*N*=160)

Categories	Items	Number of correct answer (%)
Parts to cover when coughing	Cover only nose when coughing*	140 (87.5)
	Cover only mouth when coughing*	125 (78.1)
How to cover	It is all right not to cover when coughing as long as you do not cough on others*	143 (89.4)
	Cover with your hand when coughing*	88 (55.0)
	Cover with a tissue or handkerchief when coughing	153 (95.6)
	Cover with a sleeve when coughing, if a tissue or a handkerchief is not available	145 (90.6)
	Cover both nose and mouth when coughing	138 (86.3)
	Wear a mask as much as possible when coughing	148 (92.5)
Behavior after coughing	After coughing, there is no need to wash hands if they are clean*	149 (93.1)
	If sputum is coughed up, spit it out into a trash can*	118 (73.8)
How to deal with secretions	After coughing, wash hands with soap in running water for 20 seconds	150 (93.8)
	When you cough up sputum, dispose of it with a tissue	154 (96.3)
Total	Minimum-Maximum: 4-12	Mean score (%): 10.32±1.79 (86.0)

*Reverse question.

Table 3. Cough Etiquette Practice Levels of Mothers and Children (*N*=160)

Variables	Categories		Always n (%)	Usually n (%)	Barely n (%)	Never n (%)	M±SD
Parts to cover when coughing	Cover my nose when I cough*	Mother (n=158)	32 (20.3)	73 (46.2)	34 (21.5)	19 (12.0)	2.75±0.91
		Child (n=159)	7 (4.4)	106 (66.7)	35 (22.0)	11 (6.9)	2.68±0.67
	Cover both mouth and nose when I cough*	Mother (n=159)	38 (23.9)	72 (45.3)	42 (26.4)	7 (4.4)	2.88±0.82
		Child (n=159)	4 (2.5)	44 (27.7)	84 (52.8)	27 (17.0)	2.16±0.72
How to cover	I don't cover at all when I cough*	Mother (n=158)	103 (65.2)	43 (27.2)	12 (7.6)	0 (0.0)	3.57±0.63
		Child (n=158)	43 (27.2)	78 (49.4)	28 (17.7)	9 (5.7)	2.98±0.82
	Cover with my hand while coughing*	Mother (n=158)	41 (25.9)	87 (55.1)	18 (11.4)	12 (7.6)	2.99±0.82
		Child (n=158)	13 (8.2)	97 (61.4)	37 (23.4)	11 (7.0)	2.71±0.71
	Cover with a tissue or a handkerchief while coughing*	Mother (n=159)	8 (5.0)	54 (34.0)	69 (43.4)	28 (17.6)	2.26±0.81
		Child (n=159)	1 (0.6)	9 (5.7)	72 (45.3)	77 (48.4)	1.59±0.63
	Cover with a sleeve while coughing if a tissue or a handkerchief is not available*	Mother (n=159)	35 (22.0)	65 (40.9)	45 (28.3)	14 (8.8)	2.76±0.89
		Child (n=159)	7 (4.4)	52 (32.7)	55 (34.6)	45 (28.3)	2.13±0.88
	I usually wear a mask when I cough*	Mother (n=159)	19 (11.9)	60 (37.7)	59 (37.1)	21 (13.2)	2.48±0.87
		Child (n=159)	16 (10.1)	65 (40.9)	56 (35.2)	22 (13.8)	2.48±0.85
Behavior after coughing	I do not wash my hands as long as my hands look clean*	Mother (n=159)	40 (25.2)	60 (37.7)	51 (32.1)	8 (5.0)	2.82±0.87
		Child (n=158)	19 (12.0)	38 (24.1)	93 (58.8)	8 (5.1)	2.44±0.77
	I wash my hands with soap and running water for at least 20 seconds after coughing*	Mother (n=159)	23 (14.5)	66 (41.5)	59 (37.1)	11 (6.9)	2.63±0.81
		Child (n=159)	5 (3.1)	30 (19.0)	88 (55.3)	36 (22.6)	2.03±0.74
	I wash my hands with soap and water after coughing if contaminated with saliva*	Mother (n=158)	62 (39.2)	73 (46.2)	16 (10.1)	7 (4.5)	3.19±0.80
		Child (n=159)	14 (8.8)	75 (47.2)	50 (31.4)	20 (12.6)	2.52±0.82
How to deal with secretions	If I cough up sputum, I spit it out directly into a trash can*	Mother (n=158)	18 (11.4)	15 (9.5)	36 (22.8)	89 (56.3)	1.76±1.03
		Child (n=157)	9 (5.7)	20 (12.7)	52 (33.2)	76 (48.4)	1.76±0.88
	If I need to cough up sputum, I dispose of it with a tissue and throw into a trash can*	Mother (n=158)	101 (63.9)	50 (31.7)	6 (3.8)	1 (0.6)	3.58±0.60
		Child (n=157)	46 (29.3)	76 (48.4)	23 (14.7)	12 (7.6)	3.00±0.86
Total		Mother	Min-Max: 21-47 / M±SD: 33.65±4.14				
		Child	Min-Max: 15-42 / M±SD: 28.39±4.85				

*Non-responders were excluded from the analysis; Max, maximum; Min, minimum.

tice level. Children's cough etiquette practice level was only significantly different according to the child's birth order (F=4.77, p=.010). The post-hoc test showed that second children had higher cough etiquette practice levels than first children. Statistically significant differences in mothers' cough etiquette knowledge were found according to cough etiquette awareness (t=3.75, p<.001) and whether participants had received cough etiquette education (t=3.84, p<.001). Statistically significant differences in mothers' practice level of cough etiquette were found according to whether they carried a handkerchief (t=2.00, p=.047), cough etiquette awareness (t=2.84, p=.005), and whether they had received cough etiquette education (t=2.06, p=.041). Children's cough etiquette practice level showed statistically significant differences according to whether their mothers carried a handkerchief (t=2.86, p=.008) or tissues (t=2.15, p=.033) (Table 4).

3. Correlation between Cough Etiquette Knowledge and Practice Level

In the analysis of correlations between mothers' cough etiquette knowledge and practice level, no significant relationships were found. However, mothers' cough etiquette practice level had a significant positive correlation with children's cough etiquette practice level (r=.35, p<.001) (Table 5).

DISCUSSION

This study investigated the importance of mothers' role in establishing appropriate cough etiquette in daily life as a primary preventive intervention to protect preschool children, who are susceptible to respiratory infections. It was found that mothers' practice level of cough etiquette was correlated with that of their preschool children.

Table 4. Cough Etiquette Knowledge and Practice Level by General Characteristics and Cough Etiquette-Related Factors (*N*=160)

Variables	Characteristics	Categories	Mothers' knowledge		Mothers' practice		Children's practice	
			M±SD	t or F (*p*)	M±SD	t or F (*p*)	M±SD	t or F (*p*)
Mother	Age (year)*	≤30s	10.69±1.61	2.51	33.75±3.94	0.12	28.42±5.03	0.26
		≥40s	9.91±1.92	(.014)	33.67±4.25	(.909)	28.20±4.62	(.797)
	Job	Yes	10.36±1.85	0.47	33.62±4.43	0.13	28.16±4.94	0.97
		No	10.21±1.63	(.641)	33.72±3.30	(.896)	29.00±4.57	(.334)
	Education level	≤High school	9.36±2.06	1.85	33.18±2.68	0.39	26.27±4.58	1.51
		≥Bachelor	10.36±1.76	(.067)	33.68±4.24	(.699)	28.54±4.84	(.134)
	Had a cold/flu in the past 6 months	Yes	10.40±1.65	0.47	33.86±4.44	0.53	28.25±5.39	0.30
		No	10.26±1.89	(.637)	33.51±3.95	(.595)	28.48±4.46	(.761)
Child	Age (year)	3-4	10.32±2.03	0.14	33.49±4.09	0.28	27.23±4.80	0.58
		5	10.24±1.76	(.873)	33.46±4.37	(.760)	28.44±4.39	(.559)
		≥6	10.41±1.67		33.98±3.97		28.20±5.38	
	Gender*	Male	10.30±1.95	0.28	33.89±4.14	0.60	22.77±5.31	1.83
		Female	10.38±1.60	(.778)	33.49±4.09	(.553)	29.18±4.16	(.069)
	Birth order*	1st[a]	10.33±1.74	0.35	33.41±4.04	0.20	27.46±4.85	4.77
		2nd[b]	10.34±1.95	(.703)	33.66±4.01	(.820)	30.00±4.34	(.010)
		≥3rd[c]	9.94±1.92		32.94±4.31		29.35±4.96	a<b †
	Had a cold/flu in the past 6 months	Yes	10.34±1.82	0.16	34.00±4.11	1.40	28.53±5.06	0.50
		No	10.29±1.75	(.869)	33.05±4.17	(.163)	28.14±4.49	(.617)
Cough etiquette-related factors	Carrying a handkerchief	Yes	10.04±2.05	0.85	35.16±3.89	2.00	31.52±6.21	2.86
		No	10.37±1.74	(.339)	33.37±4.14	(.047)	27.81±4.34	(.008)
	Carrying tissues	Yes	10.26±1.85	0.63	34.03±3.79	1.91	28.88±4.70	2.15
		No	10.47±1.64	(.533)	32.63±4.88	(.058)	27.05±5.03	(.033)
	Well-informed regarding cough etiquette (cough etiquette awareness)*	Well known	10.82±1.64	3.75	34.54±4.32	2.84	28.80±5.44	1.13
		Do not know	9.79±1.80	(<.001)	32.72±3.76	(.005)	27.95±4.12	(.262)
	Experience of receiving cough etiquette education	Yes	10.93±1.36	3.84	34.42±4.11	2.06	28.88±5.11	1.11
		No	9.87±1.94	(<.001)	33.08±4.10	(.041)	28.02±4.64	(.268)
	Experience of educating one's child about cough etiquette	Yes	10.31±1.82	0.08	31.07±3.27	1.86	27.71±3.61	1.13
		No	10.35±1.65	(.932)	29.77±3.30	(.065)	26.81±4.29	(.260)

*Non-responders were excluded from the analysis; † Scheffé test, $p < .050$.

Table 5. Correlations between Cough Etiquette Knowledge and Practice Level (*N*=160)

Variables	Cough etiquette practice level of mothers	Cough etiquette practice level of children
	r (*p*)	r (*p*)
Cough etiquette knowledge level of mothers	-.01 (.939)	.03 (.674)
Cough etiquette practice level of mothers		.35 (<.001)

In this study, the correct answer rate for mothers' cough etiquette knowledge was 86.0%, and the average score for their practice level was 33.65 out of 48 points, which was higher than found in a previous study, wherein college students showed corresponding results of 61.5% and 27.28 out of 48 points, respectively [23]. Since mothers, as primary caregivers, are likely to have a high level of responsibility for children's health and hygiene, they might have paid more attention to prevention of respiratory infections through various resources. However, it is necessary to consider some of the variables that showed very low scores for both knowledge and practice in mothers. In particular, "cover my nose when I

cough" and "cover with my hand while coughing" had low scores, and fewer than 50% of mothers answered that they covered both their mouth and nose when they coughed. The United States Centers for Disease Control and Prevention [6] have emphasized the proper covering site and mechanism, but based on this study, mothers seemed unsure or confused about this correct information, which might have resulted in a low level of practice. Since respiratory infections are usually transmitted through airborne routes [3], education on proper covering and how to cover appropriately should be prioritized for mothers with preschoolers.

The average score for preschoolers' cough etiquette practice level was low. A limitation of this study is that children's practice level was measured by their mothers, which could be a source of bias, and there are insufficient studies on cough etiquette in preschoolers for comparison. Taking this into account, the children also had the lowest scores for the proper covering site and for using their hands or not covering themselves, instead of using sleeves, tissue, or a handkerchief. The low cough etiquette practice level in preschoolers could be associated with their immature physical and social development and their lack of experience, which limits proper management of their personal hygiene activities [16]. Since cough etiquette is an important intervention to prevent respiratory infections, and considering the high rate of respiratory disease transmission in preschool [4,5], more relevant studies should be conducted among preschoolers. In particular, it is necessary to develop an age-appropriate cough etiquette measurement tool to collect more accurate and less biased data. Future observational studies should be conducted instead of relying on self-reporting by mothers in order to reduce bias.

Mothers' cough etiquette knowledge showed a significant relationship with their age. Most mothers in this study were in their 30s, and younger age was associated with a higher level of knowledge on cough etiquette. One potential reason for this is that younger mothers might have recently had their first childbirth, making them more likely to take proactive steps regarding the prevention of respiratory infection transmission in light of a relative lack of parenting experience. There are few similar studies on cough etiquette in mothers with preschoolers that would provide an appropriate basis for comparison. However, a study on infection prevention by mothers of young children by Lee and Kwon [26] reported the conflicting finding that mothers' knowledge of infection prevention showed no relationship with age, except for infection prevention practices. Lee and Kwon's study [26] mainly included knowledge of hand washing; since this is one of the most widely-recognized infection control behaviors, it is likely that different results would be found for cough etiquette. In the future development of cough etiquette education programs for mothers, mothers' age should be considered.

Preschoolers' birth order showed a significant association with their perceived cough etiquette practice level. Second children presented higher practice levels of cough etiquette than first children in this study. Preschool children have a limited ability to independently answer questions regarding their cough etiquette practice level and to perform certain infection control behaviors due to their immature physical and cognitive development. There are few similar studies that reported comparable findings, but Park's study [16] regarding mothers' recognition of preschool children's health-related quality of life could be partially relevant. Park [16] found that mothers with younger children reported lower health-related quality of life because younger children are more likely to be exposed to illnesses and contract infections. For this reason, mothers might practice cough etiquette more strictly with the second child to prevent sickness or to reduce the frequency of sickness. Since this explanation takes into account the maturity of children's immune system and physical development, age may be an important factor to consider when developing educational programs and measurement tools.

Mothers who had received education on cough etiquette showed higher levels of cough etiquette knowledge and practice. Similar studies have been conducted in adults [24], college students [22,23], and adolescents [2], with comparable results. An explanation for this finding is that cognitive learning takes place as individuals acquire knowledge and formulate new concepts through education [27]. However, the rates of awareness and experience of receiving cough etiquette education were low in this study (63.1% and 42.5%, respectively), indicating inadequate education and promotion of proper cough etiquette for mothers with preschoolers in our society. This reflects the fundamental reason why proper cough etiquette is not widespread in Koreans' daily lives, as shown by Hong's study [7], in which 70% of Koreans were found not to have formed the habit of proper cough etiquette. Therefore, proper education needs to be provided earlier to improve the knowledge and practice level of cough etiquette. Future studies can measure the effectiveness of cough etiquette education in mothers with preschoolers.

When mothers carried tissues or a handkerchief, their children's cough etiquette practice level was higher than that of children whose mothers did not carry tissues or a handkerchief, and mothers who carried a handkerchief reported a high level of cough etiquette practice. Similar studies conducted by Choi and Kim [24], Jin and Kim [23], and Kim et al. [22] also found that having tissues or a handkerchief positively affected coughing etiquette, as in this study. Since preschoolers' growth and development are immature, they have a limited ability to carry and use tissues or handkerchiefs

themselves. Thus, if their mothers carry and use them to cover their children's mouth and nose when coughing and dispose of the sputum, it will be beneficial. This applies to mothers as well. Based on this study, the promotion of carrying tissues and handkerchiefs across the nation is considered to be a necessary component of education on the prevention of respiratory infections.

No significant correlation was found between mothers' cough etiquette knowledge and practice level. In other words, the level of mothers' cough etiquette knowledge did not impact their practice. A similar study in college students [23] also showed a low, non-significant correlation. An explanation for this may be that knowledge can play the role of either a facilitator or inhibitor of beliefs and behavior depending on one's motivation, according to the theory of reasoned action by Ajzen and Fishbein [28]. Therefore, providing adequate information about proper cough etiquette should be considered for knowledge of cough etiquette to serve as a facilitator of behavioral control.

A positive correlation was found between mothers' cough etiquette practice level and their children's cough etiquette practice level. This result can be explained based on Ajzen and Fishbein's theory of reasoned action [28], which states that certain behavioral changes require motivation. In this context, mothers would be the source of motivation for their children to follow the mothers' cough etiquette practices, due to the intimacy established during mother-child relationships. Regarding the further extension of motivation for behavioral control, human behavior is innately learned through modeling, observation, and imitation [17,18]. Children could have considered their mothers to be sources for modeling, observed their mothers' behavior patterns regarding cough etiquette, cognitively encoded the perceived information, and used that information to guide their behavior [29,30]. Moreover, since children cannot fully perform all aspects of proper cough etiquette due to their immature physical and social development, they receive help from their mothers. For preschool-age children, mothers play an important role as the main caregivers, through which they control their children's health-related beliefs and behaviors. According to Park's study [16], children's health status is positively affected by better mother-and-child interactions. Therefore, it will be worthwhile to conduct a comparative study on changes in children's health promoting behavior according to direct or indirect maternal interventions.

The limitations of this study are as follows. First, the reliability of the tool that was used to measure mothers' cough etiquette performance level in this study was low (Cronbach's α =.58). Even though this tool had low reliability (Cronbach's α =.61) when Jin and Kim [23] developed it for college students (mean age: 21.9 years), there was no other appropriate tool for the purposes of this study. Its reliability was also low when used with mothers in mid-adulthood (mean age: 38.9 years) in this study. Therefore, it is necessary to develop a more reliable and valid systematic tool for future research related to cough etiquette at the present time, when infectious diseases are becoming a global problem. Second, the measurements were made through a self-reported questionnaire completed by mothers, who evaluated their children's practice of cough etiquette. Therefore, the possibility of social desirability bias cannot be neglected in this study. For future research, an observational study can be suggested.

Nonetheless, this study is meaningful in that it provides insights on the knowledge and practice level of cough etiquette among mothers with preschoolers and preschoolers cough etiquette practice level. This correlational study can provide basic data and evidence of a relationship between knowledge and practice level of cough etiquette among mothers with preschoolers and confirms that mothers' cough etiquette practice level can influence their children's practice of cough etiquette.

CONCLUSION

This study was conducted to identify the correlation between the cough etiquette knowledge and practice level of mothers with preschoolers and their children's cough etiquette practice level, since cough etiquette is a primary method of preventing respiratory infections. Mothers who had received information regarding cough etiquette showed better knowledge and practice of cough etiquette. However, mothers' knowledge and practice of cough etiquette were not correlated. Age and birth order showed relationships with knowledge and practice level of cough etiquette. Mothers' practice level of cough etiquette affected that of children. The following suggestions are presented. Before developing age-appropriate tools for cough etiquette, the inhibitory factors that lead from knowledge to practice should be identified and referenced. Cough etiquette educational programs need to be customized to be age-appropriate and should provide information to mothers and children simultaneously for the purpose of information consistency. Rather than simply providing proper cough etiquette information, educational programs should provide sufficient motivation to practice cough etiquette by emphasizing the importance of cough etiquette practice and the benefits of practicing proper cough etiquette. Social culture also needs to be established, such as by promoting and encouraging proper cough etiquette practice in the public. By doing so, knowledge can be more effectively linked to practice.

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Conflict of interest

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Data availability

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