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ORIGINAL ARTICLE

Effect of community-based education to Korean mothers in relation to the prevention of cervical cancer in their daughters: A non-randomized trial

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Abstract

Aim: This study was conducted in order to examine the effects of community-based education on cervical cancer prevention in relation to South Korean mothers' knowledge about the Papanicolau (Pap) test and human papillomavirus, self-confidence in communication with their daughters, and health-related beliefs about their daughters.

Methods: A quasi-experimental pre–post design was used. For the experimental group, face-to-face education was administered to 35 participants for 60 min. For the control group, 35 participants were taught by using standardized materials for 20 min.

Results: The experimental group showed a significant increase in Pap test knowledge, cervical cancer knowledge, and self-confidence in communication with their daughters, compared to the control group. In the post-test, the mothers in the experimental group also perceived cervical cancer as more threatening, their daughter as more susceptible to cervical cancer, Pap tests as being recommended for their daughters, and they showed a significant increase in their self-efficacy of recommending the Pap test to their daughter.

Conclusion: Community-based education for mothers is effective in increasing their human papillomavirus knowledge, Pap test knowledge, improving their confidence in communication with their daughters, and in some of the health-related beliefs regarding their daughters.

Key words: education, health communication, human papillomavirus, uterine cervical neoplasm.

INTRODUCTION

Approximately 500,000 women worldwide are newly diagnosed with cervical cancer every year and almost half of these cases are fatal. The burden of disease is greater in developing countries, where screening and immunization for cervical cancer are not readily available (Thaxton & Waxman, 2015). It has been well established that human papillomavirus (HPV) is the major pathogen of HPV-associated diseases, including cervical cancer, anal caner, vulval cancer, oropharyngeal cancer, and genital warts; thus, HPV immunization is of vital importance in the prevention of cervical cancer (Forman *et al.*, 2012).

Primary prevention of cervical cancer focuses on education to reduce high-risk sexual behaviors and to increase the awareness of HPV, combined with early detection by using cancer screening tests. The HPV vaccination could protect children from several types of cancers, including cervical cancer, and mothers especially can play a critical role in decision-making with regards to HPV vaccination (Kepka, Coronado, Rodriguez, & Thompson, 2011; Kim, 2011; Kim & Kim, 2015).

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The prevalence of cervical cancer in South Korean women has shown a decreasing tendency, with a seventh ranking, explaining 3.4% of all female cancers in 2014, but cervical cancer was ranked as third among those aged 15–34 years (5.3 per 100,000 persons), after thyroid cancer and breast cancer (National Cancer Information Center, 2016a). On June 2016, the Korean Government introduced the national vaccination program against HPV that is only for young girls (aged 12 years) (Sohn, 2016), indicating that the impact of the HPV vaccination on young womens' cervical cancer would be confirmed later. From a recent survey, the current rate of HPV vaccination still appeared to be as low as 7.2% of all Korean adolescent girls (Kim, 2014).

Papanicolau (Pap) testing is important for screening cervical cancer in Korea. Although recent studies have focused on HPV awareness and HPV vaccination for the prevention of cervical cancer (Makwe & Anorlu, 2011; Wamai *et al.*, 2013), the significance of Pap testing as a secondary prevention tool cannot be emphasized enough. The Pap testing rate of unmarried Korean women, if sexually active, was reported to be as low as 7.1–12.5% (Kim, 2014; Kim & Ko, 2013). Therefore, it is valuable to promote and expand the importance of Pap testing (Kim).

Recently, the importance of communication between mothers and daughters regarding HPV and cervical cancer prevention has been highlighted in light of mothers' hesitation and lack of confidence in sharing or discussing sexual topics (Francis *et al.*, 2011; Gross, Laz, Rahman, & Berenson, 2015; Iliyasu, Aliyu, Abubakar, & Galadanci, 2012; Kim & Kim, 2015; Lee *et al.*, 2015). Mothers' lack of information about sexual health is associated with a negative perception and a lack of discussion about sexual behavior with their daughters (Abril *et al.*, 2015). It is well known that mothers' lack of knowledge regarding HPV or cervical cancer, as well as their low perceived risk of disease, are the main reasons that are contributing to a refusal to vaccinate against HPV (Dempsey, Abraham, Dalton, & Ruffin, 2009). Prior studies that have emphasized mothers' education regarding HPV and cervical cancer prevention in adolescent daughters have focused on enhancing their awareness and promoting HPV vaccine acceptance (Foley *et al.*, 2015; Francis *et al.*; Kim, 2011). Communication between mothers and their daughters has been shown to alter the daughter's sex-related behaviors and knowledge (Akers, Holland, & Bost, 2011). Although the role of mothers is important in the prevention of cervical cancer and promotion of HPV vaccination, research on the effects of education of mothers regarding cervical cancer prevention on their daughters is rare in South Korea.

The Health Belief Model (HBM) (Becker, 1974) is one of the most frequently used research frameworks for understanding health behaviors (Painter, Borba, Hynes, Mays, & Glanz, 2008), including vaccine uptake (Brewer & Fazekas, 2007; Brewer *et al.*, 2007; Valley, 2002). The HBM's constructs that have been applied previously to HPV vaccine research include self-efficacy and perceived threats, susceptibility, severity, benefits, and barriers (Brewer & Fazekas). In a former study, mothers' perception, based on the HBM, was identified as an influencing factor on their recommendation of a Pap test to their daughters (Kim, 2014). Given that applying HBM variables to mothers' perceptions toward their daughters' cervical cancer prevention have been shown to be positive, the positive impacts or changes in mothers' perceptions, including susceptibility, severity, benefits, barriers, and self efficacy related to cervical cancer prevention in their daughters, will be examined after mothers' education.

Taken together, in the current research, the maternal education was designed to expand the knowledge of cervical cancer in the community setting, to increase mothers' confidence in the communication with their daughters, and to raise the awareness of daughters' cervical cancer prevention. The immediate effects of mothers' community-based education will be examined in relation to the above factors, compared to a control group that received the traditional education.

METHODS

Design and participants

This study used a non-randomized control group pretest–post-test design. Using convenience sampling, eligible participants were recommended to be selected for this study by the community leaders of two different cities from different administrative regions (D and G cities), which served as the setting for this study. This provided no interaction among the participant mothers across the group, thus not allowing for treatment dissemination. The experimental group was chosen from D city, in which the two community leaders introduced 40 possible mothers to the research team, whereas the control group was chosen from G city (located 3 h from D city), in which the three community leaders recommended 38 possible mothers to the research team. Mothers with adolescent daughters and a willingness to participate in this study were included.

Among the variables that were used in this study, the main variable was communication with daughters, although the relevant study to guide a sample size was not identified. The number of participants in each group was estimated to be 34, with a statistical power of 0.80, a significance of 0.05, and a large effect size of 0.8, using the G power 3.12 program (Cohen, 1988), based on a previous study (Kim & Park, 2009), in which the main variable was knowledge of HPV related to cervical cancer. Assuming a 10% withdrawal rate of participants, a total of 75 participants was necessary in this study. Among the possible participants, five mothers in the experimental group and three mothers in the control group refused to be participants at the time of confirmation due to family or business affairs. Thus, 70 mothers participated in this study and none dropped out.

Mother education program

Prior to the mothers' education, the validity of the educational program content was confirmed by experts, including two female gynecologic oncology nurses, two male gynecologic oncologist doctors, and two professors of women's health nursing and child health nursing. The evaluations were made by using a 5-point Likert scale (1 = "not at all" to 5 = "very much agree") in four dimensions, including fitness of the mothers, effectiveness in accomplishing the research goal, feasibility in providing education, and scientific evidence of the content. For all four dimensions, the six experts evaluated the content as satisfactory (the content validity index ranged from 0.86 to 0.90).

The program content was designed to promote awareness in mothers regarding the importance of early cervical cancer prevention in their daughters, with the expectation of enhanced knowledge levels related to Pap testing and cervical cancer, increased confidence in communicating cervical cancer prevention between mothers and daughters, and a greater motivation to recommend Pap testing for their daughters. The education was delivered at an individual level, allowing the mothers to express themselves easier. The specific educational topics for the experimental group are illustrated in Table 1.

For the experimental group, the assistant taught the content individually, either at home or at a coffee shop, usually between 14.00 and 17.00 hours for 60 min. The lessons were conducted in two sessions by using a laptop computer and the mothers' questions were answered by the assistant. The laptops were used to effectively deliver visual and audio information to the mothers, to arouse their interest, and to strengthen their understanding. On completion, the powerpoint (PPT) file was given to the mothers in the experimental group.

Table 1 Individualized education program for mothers on early cervical cancer in their adolescent daughters

Session	Method	Contents	Time (min)
Both groups			
1	Face-to-face	Introduce the program and get permission to participate Pretest	10
Experimental group			
2	Face-to-face with a laptop	Cervical cancer prevalence in South Korea and its global trend Discussion about the communication of sexual issues, including cervical cancer prevention, with daughters Methods and current statistics on the primary prevention of early cervical cancer by Pap screening and HPV vaccination	20
3	Face-to-face with a laptop	Importance of mothers' role in the early prevention of cervical cancer in their daughters Answer and support individual questions	40
4	Face-to-face	Post-test and evaluation	10
Control group			
2	Face-to-face with a handout	Cervical cancer prevalence in South Korea and its global trend Methods and current statistics on the primary prevention of early cervical cancer by Pap screening and HPV vaccination	20
3	Face-to-face	Post-test and evaluation	10

HPV, human papillomavirus; Pap, Papanicolau.

For the control group, the mothers were individually informed of early cervical cancer prevention by using the standardized materials that are published by National Cancer Information Center (2014) for 20 min by a research assistant and the mothers also received handouts of the same materials.

At the post-test, the mothers in the experimental group should show that they are more knowledgeable and confident in communication, with better perception-related susceptibility, severity, benefits, and efficacy, but a lower barrier perception in their daughters' cervical cancer prevention, compared to those in the control group.

Data collection and ethical considerations

The research protocol was approved by the ethical review boards at the Seoul National University College of Nursing. It was clarified that participation in the research was entirely voluntary, that no response was required, and that the personal data would be used for only the research objectives. After a respondent consented to participate in the study, the written consent form was gathered by the assistants. The data for this study were collected from July 20 to October 30, 2013 at the mothers' home or a coffee shop, both before and after education using the structured questionnaire. Among the participants, five mothers from the experimental group and three mothers from the control group did not attend and were excluded after consultation. There was no dropout or withdrawal between the pre- and post-tests.

Two pairs of four assistants each were involved in this study and each pair was assigned to the experimental or control group, based on their living location. Their roles were assigned as follows: one assistant was assigned to collecting the data in the pre- and post-test, while the other assistant was assigned to teaching the mothers. Specifically, one assistant who was assigned to the experimental group demonstrated how to use the structured PPT materials and answered any question from the mothers over a total of 5 h. In contrast, the assistant who was assigned to the control group was trained to instruct the mothers by using a handout on early cervical cancer prevention, with a total class time of 2 h.

The assistants all were doctoral students who were majoring in women's health nursing and child health nursing from different universities in D and G cities, respectively, and had no contact with each other. At the beginning, the assistants who collected the data explained the purpose of the study, educational content, and rights of the participants to withdraw from the study. The assistants received consent forms from all the mothers who became participants. Both before and after education, pre- and post-tests were administered to the mothers in both groups by using a self-administered questionnaire. The tests consisted of four sessions, taking 80 min in the experimental group, and three sessions, taking 40 min, in the control group. After the post-test, the mothers received ~$US10 (10,000 Korean Won) for their participation. For the data collection, one or two cases per day were allowed by arrangement of the time and place for meeting in both groups. In addition, the assistants in this study neither met nor contacted across groups in order for blinding of the research participants.

Measurements

The validity of the structured questionnaire was confirmed by three experts on cervical cancer research. Prior to the study, research tools related to confidence in communication and the HBM variables that were developed for this study were reviewed by three experts on health education and health behavior. The pilot test was conducted by five nurses with adolescent daughters.

The measurement variables in the pre- and post-tests included knowledge of the Pap test, knowledge of HPV-related cervical cancer, self-confidence in communication about cervical cancer with daughters, and variables of the HBM for daughters' cervical cancer.

Knowledge of the Papanicolau test

The assessment was carried out by using eight items that had been developed by the research team. The assessment focused on the association between the Pap test and cervical cancer, relationship between HPV vaccination and the Pap test, and the age of the participants with regards to the Pap test. The Cronbach's alpha of the tool was 0.85 in this study.

Knowledge of human papillomavirus-related cervical cancer

The assessment was carried out by using eight items that had been developed for Korean women from a previous study (Kim, 2011). This included signs and symptoms, management, infection mode, prevention of HPV, and the relationship between genital warts and cervical cancer. The Cronbach's α was 0.80 in the previous study on the Korean women and 0.85 in this study.

Regarding both knowledge of the Pap test and HPV, the mothers answered either "yes," "no," or "do not know." A score of 1 was assigned for a correct answer and 0 was assigned for an incorrect or "do not know"

answer. Higher scores indicated that the participants were knowledgeable about the Pap test or HPV-related cervical cancer.

Confidence in communication about cervical cancer with daughters

The assessment was carried out by using 11 items that had been developed by the research team. The items were related to contraception, sexually transmitted infections, romantic relationships, cervical cancer, Pap testing, gynecological examination, smoking, abstinence, regular condom use, and the HPV vaccine. The mothers' responses were graded on a 6-point Likert scale (1 = "not at all" to 6 = "very much") and higher scores indicated that the mothers had higher confidence in communicating with their daughters. The Cronbach's α was 0.93 for this study.

Health Belief Model variables of daughters' cervical cancer

Five variables were determined to be comprehensive constucts of the HBM and thus were hypothesized to reflect mothers' beliefs or perceptions towards their daughters' cervical cancer prevention. The perceptions were measured by using five items: (i) the perceived susceptibility of daughters to cervical cancer was assessed as "How susceptible are your daughters to getting cervical cancer?"; (ii) the perceived severity of daughters' cervical cancer was assessed as "How serious is it if your daughter gets cervical cancer?"; (iii) the perceived benefits of Pap testing for daughters was assessed as "How do you assess the beneficial effects of Pap testing for your daughter if it is needed to prevent cervical cancer?"; (iv) the perceived barriers to Pap testing in daughters was assessed as "How difficult is Pap testing if your daughter needs it to prevent cervical cancer?"; and (v) the perceived self-efficacy in recommending Pap testing to daughters was assessed as "How likely are you to recommend Pap testing to your daughter?" Regarding these questions, the mothers responded "not at all" to "very much" on a 4-point Likert scale for susceptibility, severity, benefits of Pap testing, and barriers to Pap testing (Kim, 2016) and on a six-point Likert scale for self-efficacy (Prasopkittikun & Vipuro, 2008). Higher scores for an item indicated that the mother had a greater or stronger health belief.

Sociodemographic characteristics

The gathered data included information on the participants' age, education, number of daughters, monthly household income, religion, job status, disease and family history of cervical cancer, previous experience of Pap testing, mammography and breast self-examination history, previous experience of HPV testing, daughter's HPV vaccination history, and age of the daughter's vaccination in the pretest.

Data analysis

All the variables were analyzed by using frequencies, means, proportions, standard deviations, and percentages. In the pretest, a homogeneity assessment of the general characteristics and measurement variables between the experimental and control groups was carried out by using the *t*-test, χ^2-test, and Mann–Whitney U test. In the post-test, the mean differences in the measured variables between the pre- and post-tests in both groups were analyzed by using the paired *t*-test and Wilcoxon signed-rank test. The internal consistency of the measurement tools was examined with the Cronbach' alpha. IBM SPSS Statistics for Windows v. 21.0 statistical software (IBM Corporation, Armonk, NY, USA) was used for all the statistical analyses (significance level of $P < 0.05$).

Post-hoc power analysis

The main variable of this study was self-confidence in communication related to cervical cancer prevention in daughters. The scores of the participants were 53.37 + 8.14 in the experimental group and 46.85 + 9.65 in the control group in the post-test. Thus, the effect size was calculated as 0.73, with a significance of 0.05, and the power of this study was 85.4%.

RESULTS

The general characteristics between groups were shown to be homogeneous (Table 2). However, in the pretest, there were significant differences between the groups in their knowledge of HPV-related cervical cancer ($t = -2.36$, $P = 0.018$), self-confidence in communicating cervical cancer prevention with their daughters ($t = -2.50$, $P = 0.012$), and the perceived barriers to Pap testing in their daughters ($z = -2.29$, $P = 0.022$) (Table 3).

On completion of the education program, the mothers in the experimental group showed a significant increase in their knowledge of Pap testing ($z = -4.88$, $P < 0.001$) and HPV-related cervical cancer ($t = -12.78$, $P < 0.001$) and self-confidence in communicating cervical cancer prevention with their daughters ($t = -7.68$, $P < 0.001$).

Table 2 Homogeneity test for general characteristics between groups (n = 70)

Characteristic	Experimental (n = 35)	Control (n = 35)	t- or or χ^2-value	P-value
	N (%) or mean ± SD			
Age (years)	44.03 ± 3.17	44.51 ± 3.79	0.34	0.563
Education			3.46	0.178
High school	10 (28.6)	17 (48.6)		
College	22 (62.9)	17 (48.6)		
Graduate	3 (8.6)	1 (2.9)		
Number of daughters	1.40 ± 0.50	1.34 ± 0.54	0.21	0.646
Monthly income (10,000 Won)	418.57 ± 127.17	411.43 ± 147.75	0.05	0.829
Religion			0.25	0.802
No	11 (31.4)	13 (37.1)		
Yes	24 (68.6)	22 (62.9)		
Job status			2.03	0.730
Housewife	22 (62.9)	24 (68.6)		
Full-time job	7 (20.0)	4 (11.5)		
Part time job	3 (8.6)	3 (8.6)		
Other	3 (8.6)	4 (11.4)		
Diagnostic history of cervical cancer			0.27	0.797
No	25 (71.4)	23 (65.7)		
Yes	10 (28.6)	12 (34.3)		
Family history of cervical cancer			0.22	1.000
No	32 (91.4)	3 (8.6)		
Yes	33 (94.3)	2 (5.7)		
Had performed a Pap test already			3.27	0.195
No	8 (22.9)	14 (40.0)		
Irregular	13 (37.1)	13 (37.1)		
Regular	14 (40.0)	8 (22.9)		
Mammography or ultrasonography			1.15	0.477
No	3 (8.6)	6 (17.1)		
Yes	32 (91.4)	29 (82.9)		
Breast self-examination			0.07	0.968
No	14 (40.0)	13 (37.1)		
Irregular	17 (48.6)	18 (51.4)		
Regular	4 (11.4)	4 (11.4)		
Had received a HPV test already			0.00	1.000
No	31 (88.6)	31 (88.6)		
Yes	4 (11.4)	4 (11.4)		
Daughter's vaccination against HPV			0.16	1.000
No	33 (91.4)	31 (88.6)		
Yes	3 (8.6)	4 (11.4)		
Age at daughter's HPV vaccination (n = 7)	17.00 ± 1.73 (n = 4)	16.25 ± 2.87 (n = 3)	0.16	0.708

HPV, human papillomavirus; Pap, Papanicolau; SD, standard deviation.

Regarding the HBM variables, the mothers in the experimental group perceived cervical cancer as more threatening to their daughters (z = –3.59, P < 0.001), perceived their daughters as more susceptible to cervical cancer (z = –2.50, P = 0.012), and displayed greater self-efficacy in recommending Pap testing to their daughters (z = –2.33, P = 0.02). In contrast, the mothers in the control group showed a significant increase in their perception of susceptibility of their daughters to cervical cancer (z = –2.42, P = 0.015), as well as the barriers to Pap testing of their daughters (z = –2.78, P = 0.005) in the post-test (Table 4).

DISCUSSION

This study examined the effects of South Korean mothers' education on knowledge, confidence in

Table 3 Homogeneity test in the measurement variables between groups in the pretest (n = 70)

Variable (score, minimum–maximum)	Experimental (n = 35) Mean ± SD	Control (n = 35) Mean ± SD	t- or Z-value	P-value
Knowledge of Pap test† (0–8)	4.11 ± 2.32	4.49 ± 2.19	–0.70	0.482
Knowledge of cervical cancer‡ (0–8)	2.03 ± 1.84	3.03 ± 1.89	–2.36	0.018
Self-confidence of communication with daughter‡ (1–6)	40.71 ± 12.12	47.45 ± 10.30	–2.50	0.012
Health beliefs (“never agree” to “very much agree”)				
Perceived threat of daughter’s cervical cancer† (1–10)	3.46 ± 1.84	3.54 ± 2.03	0.03	0.854
Perceived susceptibility of daughter’s cervical cancer† (1–4)	1.57 ± 0.66	1.57 ± 0.78	–0.29	0.772
Perceived severity of daughter’s cervical cancer† (1–4)	2.91 ± 0.92	3.09 ± 1.04	–1.03	0.303
Perceived benefit of daughter’s Pap test† (1–4)	3.43 ± 0.56	3.26 ± 0.89	–0.41	0.682
Perceived barrier to daughter’s Pap test† (1–4)	3.31 ± 0.68	2.89 ± 0.80	–2.29	0.022
Self-efficacy of recommending Pap test to daughter† (1–6)	4.00 ± 1.24	4.20 ± 1.30	–0.85	0.397

† Wilcoxon signed-rank test; ‡ paired t-test. Pap, Papanicolau; SD, standard deviation.

communication, and perceptional changes regarding their daughters’ cervical cancer, focusing on an individual approach to encourage the mothers. The results of the experimental group in the post-test showed increased knowledge, confidence in communication, and improved perceptions of health beliefs concerning cervical cancer in their daughters, confirming the effects of the education that was provided to the mothers in this study. Therefore, strategies that are focused on the prevention of cervical cancer in adolescent daughters could be implemented successfully via education of the mothers. The creative and progressive approaches to education in this study aimed to enhance mothers’ confidence regarding communication with their daughters, as well as their self-efficacy in recommending Pap testing to their daughters.

Table 4 Mean differences in the measurement variables between groups in the post-test (n = 70)

Variable	Group	Mean ± SD Pretest	Mean ± SD Post-test	Mean difference ± SD	t- or Z-value	P-value
Knowledge of Pap test†	Experimental	4.11 ± 2.32	6.80 ± 1.30	–2.69 ± 2.22	–4.88	<0.0001
	Control	4.49 ± 2.19	4.70 ± 1.90	–0.27 ± 1.56	1.24	0.2140
Knowledge of cervical cancer‡	Experimental	2.03 ± 1.84	6.09 ± 1.04	–4.06 ± 1.88	–12.78	<0.0001
	Control	3.03 ± 1.89	2.79 ± 2.01	0.29 ± 1.40	1.22	0.2310
Self-confidence of communication with daughter‡	Experimental	40.71 ± 12.12	53.37 ± 8.14	–12.66 ± 9.75	–7.68	<0.0001
	Control	47.45 ± 10.30	46.85 ± 9.65	1.03 ± 5.49	1.09	0.2820
Health beliefs						
Perceived threat of daughter’s cervical cancer†	Experimental	3.46 ± 1.84	4.74 ± 2.15	–1.29 ± 1.55	–3.59	<0.0001
	Control	3.54 ± 2.03	3.94 ± 2.17	–0.38 ± 1.28	–1.67	0.0950
Perceived susceptibility of daughter to cervical cancer†	Experimental	1.57 ± 0.66	1.86 ± 0.49	–0.29 ± 0.62	–2.50	0.0120
	Control	1.57 ± 0.78	1.97 ± 0.94	–0.41 ± 0.93	–2.42	0.0150
Perceived severity of daughter’s cervical cancer†	Experimental	2.91 ± 0.92	3.06 ± 0.80	–0.14 ± 1.24	–0.74	0.4610
	Control	3.09 ± 1.04	3.26 ± 0.96	–0.21 ± 1.12	–0.87	0.3840
Perceived benefit of daughter’s Pap test†	Experimental	3.43 ± 0.56	3.57 ± 0.66	–0.14 ± 0.85	–1.34	0.1800
	Control	3.26 ± 0.89	3.26 ± 0.57	0.00 ± 0.82	–0.03	0.9780
Perceived barrier to daughter’s Pap test†	Experimental	3.31 ± 0.68	3.17 ± 0.79	0.14 ± 0.61	–1.39	0.1660
	Control	2.89 ± 0.80	3.35 ± 0.81	–0.47 ± 0.90	–2.78	0.0050
Self-efficacy of recommending Pap test to daughter†	Experimental	4.00 ± 1.24	4.63 ± 0.91	–0.63 ± 1.48	–2.33	0.0200
	Control	4.20 ± 1.30	3.94 ± 1.07	0.27 ± 0.86	–1.74	0.0820

† Wilcoxon signed-rank test; ‡ paired t-test. Pap, Papanicolau; SD, standard deviation.

Specifically, the level of confidence in communication with daughters related to cervical cancer, knowledge level of Pap testing, and self-efficacy in recommending Pap testing to daughters were enhanced when associated with the educator's competency and a private environment. Although individualized education requires more time than education in a group setting, face-to-face learning seems to be pertinent for this kind of sensitive and private topic. As individualized education is more effective than group education for sensitive topics, such as breast feeding, it is believed that applying individualized education about sex-related subjects results in greater knowledge and self-confidence (Park & Moon, 2016).

Although the study's participants were parents, the relevant targets were their daughters. The overall goal is to increase the rate of HPV vaccination in daughters through educational programs. Both parents and daughters can be important decision-makers in determining health behavior. Effective communication between parents and children is critical for the transmission of knowledge to children (Akers *et al.*, 2011). In this study, the education program focused not only on increasing knowledge but also mother–daughter communication.

Prior research on health-related education has identified knowledge as a predictor of behavior. There have been efforts to increase knowledge through education to promote positive behavior. A lack of knowledge of the HPV vaccine has been reported to influence the perception of cervical cancer risk factors, as well as to inhibit the motivation to maintain health behaviors (Chiang *et al.*, 2016). A lack of knowledge is an important predictor of behavior, but knowledge itself is not sufficient to describe behavior. An interest in the mediating factors, such as risk awareness and disease recognition, has grown, as explainable by the HBM.

Among the HBM variables, mothers in the experimental group perceived a greater risk or increased likelihood of their daughters getting cervical cancer, as well as enhanced self-efficacy in recommending Pap testing after undergoing education. In particular, two HBM variables, susceptibility and self-efficacy, are known to be powerful predictors of health behaviors (Schulz *et al.*, 2016). Thus, the education that was provided to the experimental group altered the perceptions of the mothers and motivated preventive actions.

On the contrary, the mothers in the control group who received conventional education showed an increased perception of susceptibility to cervical cancer in their daughters, as well as stronger barriers to Pap testing. It could be suggested that the education highlighted the sensitive nature of cervical cancer, resulting in an increased perception of difficulty with respect to daughters' Pap testing. Although traditional health education is designed to deliver knowledge directly to its participants, this study's community-based, multifaceted education focused on knowledge transfer, communication techniques, and health beliefs as links between knowledge and behavior. Previous research has demonstrated the effectiveness of educational programs that consider perceived susceptibility, perceived severity, perceived benefits, perceived disability, and self-efficacy during the design phase. Furthermore, a multifaceted educational approach has been confirmed to be effective in increasing knowledge and health beliefs (Shaw, 2016).

This study has the limitation of examining only the immediate effect of education, as it did not focus on the continuation of education or perceptional changes. In the methodology, confidence or self-efficacy was measured by the self-report method, which can be biased. In order to reduce these weaknesses, a replication study that includes follow-up education and ongoing monitoring of communication between mothers and daughters by using a diary or interview will be needed. In future studies, a mixed methodology also will be helpful in recognizing mothers' feelings towards Pap testing for their daughters after education and comprehensive evaluation of the education that is provided to mothers will be needed.

Regardless of the positive changes in the perceived susceptibility and self-efficacy due to education, the perceived severity, benefits, and barrier perceptions of the Pap test were not significantly different after education in the experimental group. For this reason, even after education, the mothers did not think of cervical cancer in their adolescent daughters as a serious issue, resulting in a lack of recognition of the beneficial effects of Pap testing for their daughters. It is possible that these concepts were not conveyed sufficiently to the mothers. Furthermore, it is noteworthy that the assessment of each perception was made by using a single item, which might have interfered with the accurate measurement of the HBM constructs. This study applied simplified HBM scales, which was intentionally designed because of the short period for the education and data collection. Also, there was not an equal assessment among the scales, in which self efficacy had six Likert scales and the remaining variables had four Likert scales. In relation to this limitation, it was not possible to evaluate the reliabilities as whole HBM constructs. According to the results of the meta-analysis of the predictive power

of the HBM construct on the preventive behavior, the issue was raised that the HBM could not provide consistent roles because of various definitions across the different situations (Carpenter, 2010). In this context, the mothers' health beliefs did not directly relate to the mothers themselves, which might be different with other health preventive studies toward the self. Nevertheless, this study revealed that some of the HBM variables were successful in guiding mothers' perceptions toward their daughters' cervical cancer prevention. Therefore, the concept of the HBM constructs will be better operationalized in future research in order to confirm the impact of each HBM variable. The authors' methodology for measuring communication between mothers and daughters did not include the frequency or quality of the conversation. Due to the sensitive research topic, the single session was face-to-face. In a future study, the exploration of the development of mothers' communication skills and support by psychological intervention are necessary. Also, the development of small-group education or a continuous program of consulting with mothers about the issues that arise, can be used so as to follow up the perceptual changes using the HBM.

In primary cervical cancer prevention, the authors emphasize that the target population should be extended to adolescent girls and married women. This study shows that nurses should consider the influence and role of parents (particularly mothers) in shaping the perceptions of children and teenagers regarding health issues and behaviors. In this study, the authors not only emphasized the importance of the maternal education that was aimed at the prevention of cervical cancer related to daughters' sexual health, but also proposed the related educational method. As a strategy to achieve the above-mentioned goal, nurses should enhance their competencies in communicative, cognitive, and emotional aspects in order to support the mothers who are raising daughters in the community.

CONCLUSION

The community-based education of mothers can be effective in increasing HPV knowledge, Pap test knowledge, and confidence in communication and health beliefs. Therefore, it is suggested that expanding the strategy for preventing cervical cancer of adolescent daughters could be successfully achieved by education of the mothers. The creative and progressive approach of the education program in this study was effective in enhancing the mothers' confidence related to communication with their daughters and their efficacy to recommend the Pap test to their daughters.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

H. W. K. and S. P. designed the study, analyzed the data and interpreted the findings, and drafted and submitted the manuscript; Y. K. supervised the study, conducted the survey, interpreted the findings, and provided guidance.

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