

## RESEARCH COMMUNICATION

# Factors Associated with Participation of Korean Women in Cervical Cancer Screening Examination by Age Group

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### Abstract

**Purpose:** Cervical cancer is the 6th most common cancer among Korean women, and the prevalence of cervical cancer was 21.9 (per 100,000) in 2008. This study was designed to identify factors associated with Korean women's participation by age group in cervical cancer screening. **Methods:** Based on the 2007-2009 Korea Health and Nutrition Examination Survey, we studied 6,964 women who were 30 years or older without a history of cervical cancer and completed a health questionnaire, physical examination, and nutrition examination. Information about their participation in cervical cancer screening examination was collected using a self-administered questionnaire. Multiple logistic regression was performed to identify factors associated with their participation in cervical cancer screening over the last 2 years. **Results:** Approximately 51.9% of women had been screened for cervical cancer over the previous 2 years. Women aged 65 years or older were less likely to undergo the screening than women aged 30-64 years. In the multiple logistic regression analysis, private health insurance, smoking, and body mass index were significantly associated with participation of women aged 30-44 years old in cervical cancer screening examination. Education, health insurance type, private health insurance, and smoking were significantly associated with the participation rate for women aged 45-64 years old. Participation of women aged 65 years or older was associated with private health insurance, body mass index, oral contraceptives, hormone replacement therapy, age at first birth, and number of pregnancies. **Conclusion:** Indicators of socio-demographic factors, health behavioral factors and reproductive factors seem to have varying impacts on Korean women's participation in cervical cancer screening according to age group. These results demonstrate the need for more aggressive and age-based interventions and policy programs to improve the cervical cancer screening rate.

**Keywords:** Cervical cancer - screening - pap smear - participation factors - age-dependence - Korea

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### Introduction

Cervical cancer is one of the most preventable cancers in the world and the 8th leading cause of cancer-related death in Korea (Miller et al., 1991; Whynes et al., 2007; Korea Ministry of Health & Welfare and Center, 2010). A regular Papanicolaou (Pap) test has been shown to be effective in detecting not only cancerous but also precancerous cells that can be removed (Paley, 2001; Lee et al., 2002; Abdullah and Su, 2010; Ibekwe et al., 2010). While the effectiveness of the Pap test has never been evaluated in a randomized controlled trial, observational studies have consistently shown dramatic reductions in the cervical cancer mortality rate after the implementation of population-based screening programs (Macgregor et al., 1985; Geirsson et al., 1986; Eddy, 1990; Allen, 1991; Miller et al., 1991; Houston et al., 1998; Taylor et al.,

1999; Greenlee et al., 2000; Taylor et al., 2006). Case-control studies have also demonstrated a strong inverse relationship between screening and invasive disease (Ylitalo et al., 1999).

Since its introduction in the 1940s, the Pap smear has been associated with sharp declines in cervical cancer incidence and mortality (Papanicolaou, 1948; Greenlee et al., 2000; Paley, 2001; Watkins et al., 2002). In Korea, the age adjusted incidence rate of cervical cancer dropped from 18.6 (per 100,000) in 1999 to 12.9 in 2008, and its mortality declined from 6.2 (per 100,000) in 1995 to 3.8 in 2009 (Korea Ministry of Health & Welfare and Center, 2010; National Cancer Information Center, 2010).

There are currently several types of cancer screening programs in Korea (National Cancer Information Center, 2010). First, the National Cancer Screening Program (NCSP) provides organized screening services for five

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types of cancers: stomach, liver, colorectum, breast, and cervix uteri cancers. The NCSP guidelines recommend that women aged 30 years or over undergo the Pap smear. Second, the Korea National Health Insurance (NHI) program provides the insured general population with convenient screening services for various cancers. Finally, there also are opportunistic screening services for various cancers voluntarily provided by independent medical facilities (Kwak et al., 2005). In 1999, the Korean government established a “10-year plan for cancer control”, and created the NCSP. The NCSP provided free cancer screening services for three types of cancers (stomach, breast, and cervix) to Medical Aid recipients between 1999 and 2001. Then, the target population was expanded to NHI beneficiaries within the lower 20% of the income distribution in 2002, and to those within the lower 30% income bracket in 2003. Since 2005, the NCSP has provided free-of-charge screening services for stomach, breast, cervix, liver, and colorectal cancer to Medical Aid recipients and NHI beneficiaries within the lower 50% of income earners (Kwak et al., 2005; Sung et al., 2005). Despite these government intervention efforts, the cervical cancer screening rate has remained at about 63.9% for both opportunistic and organized cancer screening programs in 2009 (Kwak et al., 2005).

Understanding various factors associated with participation in cervical cancer screening programs has been helpful in designing future programs and improving the participation rate. Studies investigating these factors have been conducted in Western countries, and many of them reported that women’s participation in screening was associated with socio-demographic factors (age, race/ethnicity, education, economic status, and marital status) (Ronco et al., 1991; Wilcox and Mosher, 1993; Wang and Lin, 1996; Borrás et al., 1999; Mandelblatt et al., 1999; Otero-Sabogal et al., 2003; Ross et al., 2006; Willoughby et al., 2006; Jang et al., 2007; Reyes-Ortiz et al., 2008; Schumacher et al., 2008; Moser et al., 2009; Lee and Jo, 2011), health behavioral factors (smoking and drinking) (Simou et al., 2010), and reproductive factors (oral contraceptives and hormone replacement therapy) (Wilcox and Mosher, 199 ; Nene et al., 2007; Simou et al., 2010). Since few studies have examined the factors associated with Asian women’s participation in cervical cancer screening programs (Wang and Lin, 1996; Taylor et al., 1999; 2004; Tu et al., 2005; Tsui and Tanjasiri, 2008; Wang et al., 2008), we investigated these factors in a representative sample population of Korean women according to age group (30-44, 45-64, and 65+).

## Materials and Methods

### Data source and subjects

The data used in this report were obtained from the cross-sectional, representative 2007-2009 Korea National Health and Nutrition Examination Survey (KNHANES) performed by the Korean Ministry of Health and Welfare (The Ministry of Health and Welfare, 2006). A stratified multistage probability design was used, with subject selection made from sampling units using household registries. A total of 10,000 households with 31,705

individuals took part in the survey consisting four parts: health interview survey, health consciousness and behavior survey, physical examination, and nutrition survey. The health interview survey was conducted by trained interviewers at each subject’s home. The health consciousness and behavior survey used standardized self-report questionnaires. Physical examination was conducted by trained health professionals in the survey area. The nutrition survey was conducted by trained interviewers at each subject’s homes (The Ministry of Health and Welfare, 2006). As the raw data are open to the public for scientific use, ethical approval was not needed for this study.

We analyzed the cross-sectional data from 9,067 women aged 30 years or older among the 13,561 women who completely answered the health behavior survey. Within this group, 2,103 women who did not provide the information about cervical cancer screening practice or answer to additional medical examination and questionnaire on screening factors, were excluded from this study. As a result, 6,964 women were included in our analysis (Figure 1).

### Independent variables and outcome variables

According to the KNCSF guidelines, persons aged at least 30 years should undergo Pap smear test every 2 years. Subjects were asked the question “when was the last time you had a cervical cancer screening examination?” The possible responses were “never”, “less than 1 year”, “1-2 years”, “more than 2 years”.

In the present study, the outcome variable is whether the individuals adhere to the KNCSF guidelines or not. We regarded individuals who never had a cervical cancer screening examination or were examined more than 2 years prior to completing the questionnaire as not adhering to the KNCSF guidelines (Figure 1).

In the present study, we considered 17 variables as possible screening participation-related factors, which were divided into (1) socio-demographic factors, (2) health status and health behavioral factors, and (3)

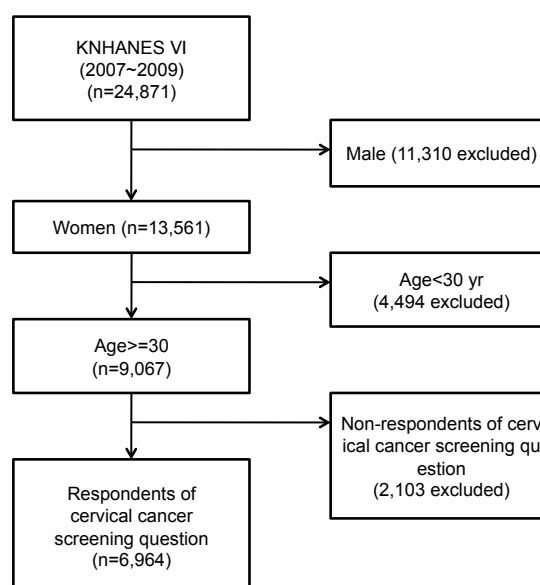


Figure 1. Selection Process of the Study Population

reproductive factors. Socio-demographic factors included age, education, marital status, household income, health insurance type, private health insurance and residence. The age of participants was classified as 30-44 (Lower incidence), 45-64 (highest incidence) and 65 years or older (lowest participation). Education was categorized into three groups (none or elementary school, middle or high school, and university or higher). Marital status was divided into two categories: married, not married. The household income quartile was sourced from KNAHANES, and household income was calculated by dividing the household monthly income by the square root of the household size. Based on this method of calculating household income, the subjects of KNHANES were ranked from lowest to highest and then grouped into four household income quartiles (1 being the lowest and 4 being the highest), each containing approximately 25% of the survey population. The health insurance type was categorized as national health insurance for the self-employed, national health insurance for employees, and the Medical Aid. Private health insurance was divided into two categories: yes and no. Residence was categorized into (1) metropolis (Seoul, Busan, Daegu, Incheon, Daejeon, Kwangju, and Woolsan) or (2) town or county.

The health status and health behavioral factors included the limitation in general activities, perceived health status, stress level, smoking, drinking, and BMI. The BMI for each participant was computed as weight (in kg) divided by the squared value of height (in meters). BMI was categorized as <18.5, 18.5<23, 23<25, and  $\geq 25$  kg/m<sup>2</sup> according to the WHO West Pacific Region (2000). We defined women with a BMI of 25 kg/m<sup>2</sup> or more as being obese.

The reproductive factors included the oral contraceptives, hormone replacement therapy, menarche, age at first birth, and number of pregnancies. The oral contraceptives and hormone replacement therapy were divided into two categories: yes and no. Menarche, age at first birth, and number of pregnancies were divided into three categories.

#### Statistical analysis

We used descriptive statistical methods to describe the characteristics of subjects, and reported the number and percentage for each variable. The crude odds ratios (ORs) with 95% confidence interval (CI) were calculated to measure the strength of the association between the variables and screening participation in this study population. All variables in the simple logistic regression analysis were tested in a multiple logistic regression model where we used the proc survey logistic procedure. The simple logistic regression and multiple logistic regression were tested by age group (30-44, 45-64 and 65 years or older). All statistical tests were performed using SAS, version 9.1 (SAS Ins., Cary, NC, USA).

## Results

#### Baseline characteristics of the study population

In the study population, 3,448 women (51.9%) had undergone a cervical cancer screening examination over the previous 2 years. Most (75.9%) were between the age

of 30-59 years. The majority (99.9%) were married, and 96.4% were enrolled in the National Health Insurance (NHI) program. Most (73.1%) were covered by a private health insurance and were non-smokers (89.4%). Oral contraceptives were used by 18.6% of the population. Hormone replacement therapy users accounted for 9.0% of the population. Compared with women who were aged 65 years old (27.8%), younger women's participation rate were better (30-44: 55.9%, 45-64: 57.7%).

#### Factors associated with cervical cancer screening participation

Table 1 shows the univariate analysis results according to age group; crude odds ratios (ORs) and 95% confidence intervals (95% CIs) were reported. The factors associated with participation of 30-44 year-old women in cervical cancer screening programs were household income, health insurance type, private health insurance, and smoking. For women aged 45-64 years old, the factors included education, household income, health insurance type, private health insurance, smoking, and menarche. Participation of the 65 years or older group were affected by health insurance type, private health insurance, smoking, BMI, oral contraceptives, hormone replacement therapy, age at first birth, and number of pregnancies.

In the multivariate logistic regression analysis the factors associated with cervical cancer screening participation of 30-44 years old group were private health insurance, smoking and BMI. The rate of 45-64 years old group was associated with education, health insurance type, private health insurance and smoking. For the 65 years or older group, factors related with the screening rate were private health insurance, BMI, oral contraceptives, hormone replacement therapy, age at first birth, and number of pregnancies. Of the socio-demographic factors considered, higher education level was found to be associated with a higher OR in 45-64 years old group. Compared with lowest education level, the adjusted OR (aOR) of highest education level was 1.81 (95% CI: 1.22-2.70). Private health insurance was found to be associated with a higher OR in all age group [2.52 (95% CI: 1.83-2.49), 1.75 (95% CI: 1.37-2.22), 1.74 (95% CI: 1.23-2.45)].

Of the health status and health behavioral factors considered, there was a clear trend to increased rates of cervical cancer screening with BMI in 65 years or older group (<18.5: aOR, 2.66; 95% CI: 1.02-6.95; 18.5<23: aOR, 3.89; 95% CI: 1.52-9.94;  $\geq 25$ : aOR, 3.79; 95% CI: 1.46-9.83).

Of the reproductive factors considered, only the 65 years or older group demonstrated any significant relation to participation in cervical cancer screening after adjusting all variables. Four of the five variables were independently associated with screening participation: these were oral contraceptives, hormone replacement therapy, the age at first birth, and also number of pregnancies. There was a clear trend to increased rate of cervical cancer screening with age at first birth (20-29: aOR, 1.71; 95% CI: 1.08-2.70; 30+: aOR, 2.47; 95% CI: 1.12-5.47).

## Discussion

In this study, the participation rate of cervical cancer

**Table 1. Factors Associated with Cervical Cancer Screening by Univariate Analysis**

Variables		30≤age<45 (n=2,457)		45≤age<65 (n=2,796)		65≤age (n=1,711)	
		OR	95% CI	OR	95% CI	OR	95% CI
Education	None/elementary school	1.00		1.00		1.00	
	Middle or high school	0.98	0.39-2.46	1.40	1.12-1.74	1.18	0.82-1.71
	University or higher	1.37	0.54-3.49	2.07	1.47-2.91	2.08	0.89-4.86
Marital status	Married	1.00		1.00		1.00	
	Not married	2.96	0.30-29.3	2.07	0.17-24.6	-	
Household income	Quartile 1	1.00		1.00		1.00	
	Quartile 2	1.35	0.82-2.23	1.17	0.90-1.51	1.20	0.87-1.65
	Quartile 3	1.55	0.98-2.48	1.17	0.88-1.56	1.10	0.72-1.69
	Quartile 4	2.46	1.54-3.92	1.74	1.32-2.28	1.59	0.97-2.60
Health insurance type	NHI (self)	1.00	1.00		1.00		
	NHI (employee)	1.29	1.06-1.56	1.27	1.05-1.55	1.38	1.04-1.81
	Medical Aid	0.47	0.20-1.10	0.79	0.50-1.25	0.66	0.42-1.05
	Private No	1.00		1.00		1.00	
	Private Yes	2.94	2.13-4.08	1.88	1.50-2.37	2.23	1.63-3.06
Residence	Metropolis	1.00		1.00		1.00	
	Town or county	1.07	0.88-1.28	0.95	0.77-1.16	0.87	0.66-1.14
Limitation in activities	Yes	1.00		1.00		1.00	
	No	1.21	0.82-1.78	1.11	0.88-1.41	1.27	0.98-1.65
Perceived health status	Good	1.00		1.00		1.00	
	Bad	0.98	0.76-1.26	0.95	0.78-1.16	0.89	0.68-1.17
Stress level	Mild	1.00		1.00		1.00	
	Severe	1.08	0.88-1.33	0.92	0.75-1.13	0.76	0.56-1.03
Smoking	Non-smoker	1.00		1.00		1.00	
	Ex-smoker	2.37	1.31-4.29	1.68	0.71-3.99	1.68	0.74-3.85
	Current smoker	2.03	1.32-3.12	2.04	1.20-3.47	2.48	1.26-4.87
Drinking	Never	1.00		1.00		1.00	
	Ever	1.39	0.99-1.97	1.21	0.92-1.58	0.93	0.71-1.21
Body mass index <18.5 (kg/m <sup>2</sup> )	1.00		1.00		1.00		
	18.5<23	1.26	0.84-1.90	1.52	0.76-3.05	2.91	1.19-7.14
	23<25	1.53	0.95-2.46	1.42	0.70-2.84	4.51	1.87-10.9
	>26	0.92	0.59-1.45	1.04	0.52-2.11	4.63	1.90-11.3
Oral contraceptives	No	1.00		1.00		1.00	
	Yes	0.96	0.74-1.24	1.07	0.84-1.37	1.88	1.37-2.59
Hormone replacement therapy	No	1.00		1.00		1.00	
	Yes	1.36	0.68-2.73	1.19	0.92-1.53	2.51	1.66-3.79
Menarche (years)	10~14	1.00		1.00		1.00	
	15~19	0.94	0.76-1.17	0.98	0.80-1.19	0.82	0.58-1.16
	20~24	0.38	0.05-2.73	0.43	0.19-0.97	0.44	0.19-1.01
Age at first birth (years)	0-19	1.00		1.00		1.00	
	20-29	1.39	0.58-3.34	1.36	0.90-2.06	1.98	1.28-3.07
	30+	1.63	0.66-3.99	1.14	0.67-1.93	2.19	0.95-5.08
Number of pregnancies	1~3	1.00		1.00		1.00	
	4~6	0.80	0.64-1.01	0.88	0.71-1.08	1.92	1.31-2.81
	≥7	1.32	0.58-2.99	1.06	0.72-1.57	1.55	1.06-2.29

screening examination in Korean women aged 30 years or more was only 51.9%, even though cervical cancer is largely treatable when detected in an early stage. The low rate may be attributed to the low participation rate of women 65 years or older (27.8%, 30-44: 55.9%, 45-64: 57.7%). The main focus of this research was to identify factors associated with participation of cervical cancer screening by age group.

The results of this study indicate that socio-demographic factors, health behavioral factors, and reproductive factors seem to have varying impacts on the participation in cervical cancer screening by age group.

Previous studies have found that education level to be a significant predictor of cervical cancer screening participation (Borras et al., 1999; Moser et al., 2009; Nene et al., 2007; Ronco et al., 1991; Wilcox and Mosher, 1993), after controlling other multilevel factors. This study also

found that high education level was significantly associated with good participation in cervical cancer screening among women aged 45-64 years old. Educational level has a huge effect on knowledge (Shin et al., 1993), and knowledge was significantly associated with participation in cervical cancer screening (Taylor et al., 2004; Tsui and Tanjasiri, 2008). Therefore, we need to develop educational interventions for women aged 45-64 years old.

In multiple regression analysis, household income was not significantly associated with screening participation, although some previous studies have reported differently (Wilcox and Mosher, 1993; Otero-Sabogal et al., 2003; Webb et al., 2004; Kwak et al., 2009; Paskett et al., 2010). Since the NCSP has expanded the scope of beneficiaries for free cervical cancer examination to include the lower 50% of households in terms of income, the socio-economic factor can be considered resolved.

Similar to previous studies (Borras et al., 1999; Kwak et al., 2006), our results also indicate that women covered by private health insurance were more likely to undergo cervical cancer screening. In addition, the cervical cancer screening rate increased with younger age. Considering previous studies (Pham and McPhee, 1992), screening cost can be an obstacle among younger women.

In line with previous studies, we found that women who are 30-64 years old and current smokers are less likely to undergo cervical cancer screening. Although women were aware of the negative health outcomes associated with smoking, those who were unwilling or unable to stop smoking may have been less likely to participate in health screening in general (Clark et al., 2000; Messina et al., 2002). However, they need to understand the risk factors for cervical cancer in women who smoke to promote them to utilize cervical cancer screening services.

Women aged 65 years or older and in the highest BMI group participated in cervical cancer screening more frequently than women in other BMI groups. This is in contrast to previous studies where obese women were less likely to participate in Pap smear screening.

Similar to previous studies (Wilcox and Mosher, 1993; Nene et al., 2007; Simou et al., 2010), we found that reproductive factors (oral contraceptives, hormone replacement therapy, age at first birth, and number of pregnancies) were related to cervical screening participation of women aged 65 years or older only. To improve screening participation, we have to make programs that reflect reproductive factors for women aged 65 years or older.

Although our analyses were conducted with a representative Korean female population, our study has several limitations. The KNHANES survey was of cross-sectional design, and part of data collected using self-administered questionnaires (Gordon et al., 1993; McPhee et al., 2002). So, there is some possibility of selection bias. Recall and misclassification bias cannot be ruled out because of the differences in memory, knowledge, understanding, and interpretation of each individual. Importantly, it is possible that self-reported cervical cancer screening might not be accurate.

In summary, we found that only 51.9% of Korean women have participated in cervical cancer screening programs over the past 2 years, which is fairly low compared to that of white and black women in other countries (Otero-Sabogal et al., 2003; Ross et al., 2006; Schumacher et al., 2008; Tsui and Tanjasiri, 2008; Simou et al., 2010). Private health insurance, smoking, and body mass index were significantly associated with the participation rate of cervical cancer screening in women aged 30-44 years old. Education, health insurance type, private health insurance and smoking were significantly associated with the participation rate of cervical cancer screening in women aged 45-64 years old. Private health insurance, body mass index, oral contraceptives, hormone replacement therapy, age at first birth, and number of pregnancies were significantly associated with participation of cervical cancer screening in women aged 65 years or older. Our findings indicate that socio-demographic factors, health behavioral factors and

reproductive factors seem to have varying impacts on the participation in cervical cancer screening by age group. These results demonstrate the need for more aggressive and age-based interventions and policy programs to improve the cervical cancer screening rate.

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