RESEARCH ARTICLE

Association of Cervical Cancer Screening with Knowledge of Risk Factors, Access to Health Related Information, Health Profiles, and Health Competence Beliefs among Community-Dwelling Women in Japan

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Abstract

Objective: The aim of this study was to evaluate the past attendance for cervical cancer screening with knowledge of risk factors, access to health-related information, health profiles and health competence beliefs among Japanese women. **Methods:** Women ages 25, 30, 35, 40, 45, 50, 55, and 60 were contacted cross-sectionally as part of a project for the Japanese Ministry of Health, Labour and Welfare in Nikaho, Akita prefecture Japan between June 2010 and March 2011, and 249 women were analyzed for the current study. The questionnaire asked about past cervical cancer screening. Knowledge of each cervical cancer risk factor was determined on a four-point scale. A barriers to information access scale was utilized to assess the degree of difficulty in accessing health-related information. Health profiles were measured using the EuroQOL EQ-5D. Perceived health competence was measured using a scale (PHCS). The association was evaluated with odds ratios with 95% confidence interval were calculated from a logistic regression analysis after adjustment for age and potential confounders. The trend across the level was also assessed. **Results:** Women who knew that sexual intercourse at young age was a risk factor were significantly more likely to have participated in cervical cancer screening sometime in their lives (p for trend =0.02). Women who had pain/discomfort and those who had anxiety/depression were significantly more likely to have participated in cervical screening within the past two years (odds ratio [OR]: 2.02, 95% confidence interval [CI]: 1.04–3.94; OR: 2.32, 95% CI: 1.05–5.16, respectively). Women with higher PHCS were significantly more likely to have attended for cervical screened at some point in their lives (p=0.04). **Conclusion:** This study observed that specific knowledge of cervical cancer risk factors, health profiles and PHCS were associated with the past attendance for cervical cancer screening among women in a community. Further researches are warranted.

Keywords: Mass screening- cervical cancer- health status- knowledge- risk factors- Japanese

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Introduction

Although the efficacy of Papanicolaou smear screening in populations has been confirmed (O'Meara, 2002; Sasieni et al., 1996), a relatively low rate of cervical cancer screening has been reported in Japan. A national survey in 2010 estimated that only 32% of women 20 years old or older had participated in a cervical cancer screening program within the previous two years (Ministry of health, labor and welfare, 2011), while in the United States, 76.4 percent of women 18 years or older had been screened for cervical cancer within three years (R. A. Smith et al., 2012). In 2010 in Japan, the incidence rate of cervical cancer peaked at ages 35-39 and 40-44 years, with 28.6 and 31.2 per 100,000 respectively (Editorial Board of Cancer Statistics in Japan, 2015). Low annual household income was associated with low cervical cancer screenings in one study (Fukuda et al., 2005), and this is the only characteristic that had been reported to be associated with cervical screening in Japan. A national survey reported cost of screening is one of the major reasons for not participating in unspecified cancer screening among Japanese women (Sauvaget et al., 2016).

Since opportunities to participate in cervical cancer screenings are frequently funded, screening may not be mediated solely by the ability to pay in Japan. Lack of knowledge and awareness of cancer, cancer control, and perceived benefit of cancer screening may be associated with socioeconomic status (von Wagner et al., 2011). Several previous studies focused on the association between the knowledge of risk factors for cervical cancer and screening compliance (Denny-Smith et al., 2006; Do

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et al., 2007; Ekechi et al., 2014; Gu et al., 2010; Hislop et al., 2004; Leung et al., 2010; Ralston et al., 2003; Twinn et al., 2002). Knowledge would be associated with socioeconomic status (Low et al., 2012). Because of that, individuals with better knowledge of risk factors would manage their own health (Welch et al., 2008), and that may lead to screening participation as well as better health profiles (Loerzel et al., 2005). However, studies assessing participation in cervical cancer screening and its association with knowledge as well as health profiles have scarcely been conducted in Japan.

The aim of this study was to measure the level of knowledge of risk factors for cervical cancer and assess its association with past attendance for cervical cancer screening among the women residing in a Japanese community. In relation to knowledge of risk factors, women's access to health-related information was also evaluated. Women's self-reported health profiles and health competence beliefs were also assessed to evaluate their association to attendance for the cervical cancer screening.

Materials and Methods

Study subjects and procedure

This cross-sectional study was conducted in Nikaho, Akita prefecture, Japan, between June 2010 and March 2011. Women who resided in two areas of Nikaho and who were 20, 25, 30, 35, 40, 45, 50, 55, or 60 years old were contacted by mail as part of a project for the Japanese Ministry of Health, Labour and Welfare. A coupon for a free cervical cancer screening examination was sent to women between 20 and 40 years age, and a coupon for free breast cancer screening was sent to women between 40 and 60 of age. An educational booklet explaining the importance of screening and basic information on breast cancer, cervical cancer, and cancer in general was also enclosed. For the purpose of the current study, a self-administered questionnaire was sent with the coupon and the booklet together with a return envelope. The aim and procedure of the study were also described, and only individuals who agreed to participate in the current study were asked to respond to the questionnaire.

The educational booklet was enclosed as a part of the governmental project, not for the purpose of the current study. Cervical cancer risk factors were explained in the booklet as follows: the incidence of cervical cancer rapidly increases among women in their 20s and 30s and peaks at late 30s; cervical cancer is caused by a viral infection; cervical cancer screening is effective; cervical cancer screening is recommended every other year; the screening rate for cervical cancer is relatively low in Japan. In addition, cancer in general is explained as follows: heredity explains about five percent of all cases of cancer; removing modifiable risk factors cannot completely prevent cancer, so that attempting to reduce the levels of modifiable cancer risk factors and being screened for cancer are both important; smoking cessation is important for preventing cancer.

In Japan, women aged 20 years or older are advised to participate in screening (Kakizoe et al., 2004). Because of that, women who were 20 years old were excluded from the current study, since they were less likely to have participated in cervical cancer screenings within the past two years. Out of 1162 women, 273 women returned the questionnaire. Twenty-three subjects who reported having been diagnosed as having cervical cancer or who had undergone a hysterectomy in the past and one subject who did not reply to the questions regarding past cervical cancer screenings were excluded from the study. Finally, a total of 249 women were analyzed in the current study.

Instruments and measures

The level of women's knowledge of cervical cancer risk factors was measured in the questionnaire. It presented a list of risk factors, and subjects were asked whether each of them was associated with the risk of cervical cancer. Their knowledge of the following risk factors was evaluated: age, oral contraceptive use, sexual intercourse at a young age, tobacco use, and viral infection (Bosch et al., 2002; Cuzick et al., 2000; Ho et al., 1998; Kruger-Kjaer et al., 1998; Louie et al., 2009; Onuki et al., 2009; Storey et al., 1998; Zondervan et al., 1996). We included age as a risk factor, since the incidence of human papillomavirus infection has been reported to vary with age in Japan (Onuki et al., 2009). In addition, we asked questions regarding several items, which have not been reported as cervical cancer risk factors: stress, diet, occupation, alcohol use, obesity, use of unsanitary swimming pools, exposure to chemicals, air pollution, and lack of physical activity. The subjects answered each question using a four-point scale ranging from 1 (do not think so) to 4 (strongly think so). We also utilized a barriers to information access scale (BIAS) to assess the degree of difficulty in accessing health-related information or respondents' satisfaction with that access (Arora et al., 2002; Togari, 2004). This consisted of three questions with a 5-scale answer. In the Japanese version of this scale, a higher score reflects a lower barrier to information access, with total possible scores ranging between 5 and 15 (Togari, 2004).

Health profiles were measured using the Japanese version of the EuroQOL EQ-5D (The Euro QOL group, 1990; Ikegami et al., 2001). It's numeric values range from 0 (death) to 1 (best state of health) (Ikegami et al., 2001). In the present subjects, approximately half of the participants (n=126) obtained the value of 1, the best state of health. Because of that, we classified subjects in two groups: a group with the best state of health and a group that did not have the best state of health or with poorer health (value was less than 1). The EQ-5D is comprised of five distinct domains or subcategories (mobility, self-care, usual activities, pain/discomfort, and anxiety/depression), and we planned to additionally analyze each domain individually. Subjects were asked to select one of the three levels for each domain: no problems, moderate problems, and severe problems. For each domain, only a few subjects responded as having a severe problem (n=0 for mobility, n=1 for self-care, n=0 for usual activity, n=6 for pain/discomfort, and n=3 for anxiety/depression), so that we combined the categories for moderate problems and severe problems together for the statistical analysis.

Efficacy beliefs concerning one's health were measured by using the Perceived Health Competence Scale (PHCS). The scale for the Japanese version was utilized (Smith et al., 1995; Togari et al., 2006). A higher score reflects higher competence beliefs concerning the respondent's own health, with scores ranging between 8 and 40 (Togari et al., 2006). Since PHCS was approximately normally distributed, it was categorized according to a tertile of the values.

Cervical cancer screening participation

The questionnaire asked subjects whether they had been screened for cancer of the uterus less than 1 year ago, 1 year ago, 2 years ago, or 3 or more years ago. The reason for use the expression cancer of the uterus was because Pap smears are conducted with the option of endometrial cancer screening in Japan. Based on the answer to the question, subjects were classified according to their screening status in two different time ranges: within the past two years and any past attendance. Two years was the recommended interval between cervical cancer examinations in Japan (Kakizoe et al., 2004).

Demographic characteristics, including age, marital status, parity (having given birth), employment status, years of education, smoking status, height, and weight were also asked in the questionnaire. The amount of regular physical activity was estimated by using a validated questionnaire and transferred to weekly metabolic equivalents (METs) (Suzuki et al., 1998). METs were logarithmically transformed for the statistical analysis. Alcohol intake was estimated using part of a validated food frequency questionnaire (Shimizu et al., 1999).

Statistical analysis

The characteristics of women who had been screened within the past two years and those who had not were compared with the Kruskal-Wallis test for numeric variables, and with the chi-square test for nominal variables. Logistic regression models were used to estimate odds ratios (ORs) between four levels of knowledge and cervical cancer screening with 95% confidence interval. ORs were estimated with adjustment for age, marital status, job, smoking status, and METs, which were selected on the basis of their bivariate association with cervical cancer screening within the past two years. The trend across the level of knowledge was also assessed by assigning values of 1, 2, 3, and 4. We set the significance level at $P < .05$. BIAS was assessed in association with cervical cancer screening participation for each one-point increment of the score using logistic regression models. EQ-5D and its domains and PHCS were also analyzed with logistic regression models. The trend analysis was conducted by assigning the numeric value of BIAS and the median value of each tertile category of PHCS.

For each measure, only the subjects who responded to the questionnaire were included in the analysis: 17 to 25 subjects did not answer questions regarding their knowledge of risk factors, 10 subjects did not answer BIAS, 12 subjects did not answer the PHCS, and 9 subjects did not answer the EQ-5D. All statistical analyses were performed using SPSS (IBM Chicago, IL). This study was approved by the ethics committee of the National Institute of Public Health, Saitama, Japan.

Results

Among 249 women, 208 reported that they had participated in cervical cancer screening at some point in their lives; of those, 180 women reported that they had participated in screening within the past two years. Table 1 summarizes the characteristics of the study subjects according to whether they had participated in screening for cervical cancer within the past two years. Women who had participated in screening were more likely to be married, employed, to have never smoked, and to have higher physical activity levels as compared with women who had not.

Table 2 summarizes the associations between past screenings for cervical cancer and knowledge of cervical cancer risk factors as well as access to health-related information. Women who knew that viral infection

Table 1. Comparison of Characteristics of Study Participants between Those who Did and who Did not Attend at Cervical Cancer Screening within Past 2 Years among Women in Nikaho City, Akita, Japan

	Not attended n= 69	Attended n = 180	p-value[2]
Age (%)			0.20
25 year-old	9%	1%	
30 year-old	10%	6%	
35 year-old	13%	4%	
40 year-old	6%	8%	
45 year-old	3%	13%	
50 year-old	7%	20%	
55 year-old	20%	16%	
60 year-old	32%	32%	
total	100%	100%	
Currently married (%)	77%	87%	0.04
Parous (%)[1]	84%	92%	0.08
Employed either full-time or part-time (%)[1]	53%	70%	0.01
Education, 15 years or longer (%)[1]	10%	16%	0.25
Smoking status (%)[1]			0.003
Never smokers	72%	88%	
Past smokers	9%	7%	
Current smokers	19%	5%	
BMI kg/m^2, median[1]			0.48
Physical activity, metabolic equivalent (h/week), median	7.5	15	0.03
Alcohol intake (g), median1	0	0.4	0.83

[1], Only individuals whose information is available are included. Parity: n = 248. Employment status: n = 246. Education: n = 245. Smoking status: n=244, BMI: n = 246. Alcohol intake: n = 234; [2], Comparison between women who attended and women who did not attended at cervical cancer screening within two years. Non-parametric test (Kruskal wallis) for analyzing age, BMI, physical activity and alcohol intake, and chi-square test for analyzing other variables.

Table 2. Knowledge of Risk Factors and Barriers to Information Access and Their Association to Attendance at Cervical Cancer Screening

		Analyzed n	% Attended screening	Multivariable odds ratio*	95%CI	p-for trend*
Attended at cervical cancer screening within past 2 years						
Viral infection						
Do not think so	1	11	64%	1.00		0.05
	2	34	71%	2.20	(0.44-10.90)	
	3	85	72%	1.81	(0.42-7.74)	
Strongly think so	4	99	79%	3.68	(0.85-16.02)	
Sexual intercourse at young age						
Do not think so	1	18	50%	1.00		0.18
	2	61	72%	2.62	(0.82-8.33)	
	3	85	84%	6.7	(2.07-21.71)	
Strongly think so	4	64	68%	2.51	(0.78-8.14)	
Tobacco						
Do not think so	1	27	74%	1.00		0.98
	2	73	71%	0.72	(0.25-2.07)	
	3	76	78%	1.07	(0.36-3.13)	
Strongly think so	4	52	71%	0.77	(0.25-2.34)	
Age						
Do not think so	1	44	64%	1.00		0.1
	2	57	77%	2.07	(0.81-5.30)	
	3	87	75%	1.87	(0.81-4.31)	
Strongly think so	4	44	77%	2.53	(0.91-7.02)	
Oral contraceptive						
Do not think so	1	37	73%	1.00		0.66
	2	73	73%	0.95	(0.37-2.44)	
	3	78	72%	1.00	(0.39-2.52)	
Strongly think so	4	36	78%	1.30	(0.42-4.02)	
Barriers-to-information-access (For each one-point increment of the score, the barriers decrease)						
		239		1.08		0.13
Any attendance at cervical cancer screening in the past						
Viral infection						
Do not think so	1	11	82%	1.00		0.37
	2	34	85%	2.14	(0.28-16.27)	
	3	85	82%	1.19	(0.20-7.24)	
Strongly think so	4	99	87%	2.34	(0.39-14.26)	
Sexual intercourse at young age						
Do not think so	1	18	72%	1.00		0.02
	2	61	79%	1.43	(0.38-5.47)	
	3	85	89%	4.86	(1.20-19.66)	
Strongly think so	4	64	88%	3.87	(0.90-16.68)	
Tobacco						
Do not think so	1	27	89%	1.00		0.61
	2	73	80%	0.38	(0.09-1.56)	
	3	76	93%	1.70	(0.34-8.42)	
Strongly think so	4	52	77%	0.36	(0.08-1.52)	
Age						
Do not think so	1	44	82%	1.00		0.16
	2	57	84%	1.03	(0.32-3.29)	
	3	87	83%	1.06	(0.37-3.05)	
Strongly think so	4	44	91%	3.25	(0.79-13.48)	
Oral contraceptive						
Do not think so	1	37	92%	1.00		0.43
	2	73	84%	0.43	(0.10-1.73)	
	3	78	81%	0.38	(0.10-1.52)	
Strongly think so	4	36	86%	0.51	(0.10-2.53)	
Barriers to information access scale (for each one-point increment of the score, the barriers decrease)						
		239		1.00	(0.89-1.13)	1.00

*adjusted for age, marital status, current employment status, smoking status and log transformed physical activity in weekly metabolic equivalents.

increases the risk of cervical cancer were more likely to have participated in screening within the past two years, with borderline significance. Knowing that sexual intercourse at a young age is a risk factor showed a non-linear association with cervical cancer screening within the past two years. The linear association was observed between the same knowledge and any past screening. Any knowledge of non-risk factor items for cervical cancer was not associated with participation in cervical cancer screenings. BIAS was not associated with cervical cancer screening for either time range.

Table 3 summarizes the association of cervical cancer screening participation with EQ-5D and PHCS. Women who were not in the best health state were 1.8 times more likely to have participated in cervical cancer screening within the past two years; however, the association was not statistically significant. In the analysis of domains or subcategories, women who had pain or discomfort and women who had anxiety or depression were significantly more likely to have participated in cervical cancer screening within the past two years. The domains of mobility, self-care, and usual activities were not analyzed since there were too few individuals who reported having moderate to severe problems (n=14, n=4, and n=13, respectively). Women who had higher PHCS were significantly more likely to have ever participated in cervical cancer screening in that past.

Discussion

In this study conducted among women residing in a community in Japan, having knowledge of a cervical

Table 3. Odds Ratio of Attendance at Cervical Cancer Screening by Level of Self-Reported Health Profiles (EQ-5D) and Perceived Health Competence among Women in Nikaho, Akita, Japan

	Analyzed n	Attended screening %	Multivariable odds ratio*	(95% CI)	p for trend
Attended at cervical cancer screening within past 2 years					
EQ-5D					
EQ-5D = 1 (in the best health state)	126	68%	1		
EQ-5D < 1 (not in the best health state)	114	79%	1.81	(0.96-3.40)	
EQ-5D: domains					
Pain/discomfort					
No problem	149	68%	1		
Moderate - severe	95	80%	2.02	(1.04-3.94)	
Anxiety/depression					
No problem	188	70%	1		
Moderate - Severe	56	82%	2.32	(1.05-5.16)	
PHCS (higher score indicates higher perceived health of competence)					
First tertile	95	72%	1		0.45
Second tertile	68	74%	1.28	(0.61-2.72)	
Third tertile	74	73%	1.31	(0.63-2.73)	
Any attendance at cervical cancer screening in the past					
EQ-5D					
EQ-5D = 1 (in the best health state)	126	81%	1		
EQ-5D < 1 (not in the best health state)	114	86%	1.24	(0.59-2.62)	
EQ-5D: domains					
Pain/discomfort					
No problem	149	81%	1		
Moderate - Severe	95	88%	1.65	(0.73-3.69)	
Anxiety/depression					
No problem	188	83%	1		
Moderate - Severe	56	86%	1.23	(0.51-2.97)	
PHCS (higher score indicates higher perceived health competence)					
First tertile	95	79%	1		0.04
Second tertile	68	85%	2.04	(0.82-5.08)	
Third tertile	74	88%	2.48	(0.99-6.26)	

*adjusted for age, marital status, current employment status, smoking status and log transformed physical activity in weekly metabolic equivalents.

cancer risk factor was clearly associated with past participation in cervical cancer screenings. In addition, women with lowered mental or physical health profiles were more likely to have participated in screening within the past two years, and women with higher perceived health competence were more likely to have participated in screening in the past at some time in their lives. The characteristics of women according to their cervical cancer screening status have rarely been researched in Japan, despite the low participation rate in cervical cancer screenings. To our knowledge, this is the first study to evaluate Japanese women's knowledge and health profiles and their past participation in cervical cancer screenings.

Only the knowledge of having sexual intercourse at a young age showed a clear association with participation in cervical cancer screening in this study. This risk factor is generally not openly discussed among women in Japan, and it was even not mentioned in the educational booklet distributed with this study. A study conducted in mainland China reported a somehow related result that women who thought that "women should have cervical screening soon after the first sexual intercourse" were more likely to have taken part in cervical screening as compared with women who did not think so (Gu et al., 2010). These results suggest the importance of educating women in Asian culture about this risk factor to raise awareness of this disease, and that, possibly, such knowledge would contribute to increased cervical cancer screening participation rate. Various studies conducted in the USA reported low screening rates in the Asian-American population as compared to non-Asian populations (Okazaki, 2002), and a study of young Asian women reported that women who were more acculturated into American society were more likely to have had a Pap smear test (Tang et al., 1999). Further research regarding the knowledge of this risk factor among Asian women may contribute to changing their attitudes toward cervical cancer screening.

Knowing various other risk factors for cervical cancer was not noticeably associated with cervical cancer screening participation in this study. This contradicts previous several studies conducted among Asian women that reported that individuals with a high level of general knowledge of cervical cancer risk factors were significantly more likely to have a Pap-smear test (Do et al., 2007; Hislop et al., 2004; Leung and Leung, 2010; Ralston et al., 2003). However, one study reported a weak or no association between total knowledge of cervical cancer risk factors and cervical cancer screening (Twinn et al., 2002). One additional study even reported that women who knew that smoking or being postmenopausal was a risk factor of cervical cancer were less likely to take part in screenings (Gu et al., 2010). Knowledge alone may not be sufficient for a favorable change of attitude. According to a protection motivation theory proposed by RW Rogers, women given knowledge of cervical cancer risk factors may need the process of evaluating their own perceived risk to adopt the recommended attitude (Rogers, 1975). Several studies reported that women who perceive that their risk was higher were more likely to have a Pap-smear (Marteau et al., 2002; Orbell et al., 1995); such results support the protection motivation theory. Current study subjects may have considered themselves to be at low risk of cervical cancer, and that could explain why no association with knowledge level was observed.

Physical as well as mental health profiles were observed to be associated with past participation in cervical cancer screenings. Since screening within the past two years but not within a lifetime showed a clear association, we interpreted that individuals with ongoing deteriorating health may have sought screening. This may not be cause by their frequent contact with the health care

system, since Japanese health care usually do not routinely encourage women to get screened. Studies among Asian women using both qualitative and quantitative approaches reported that women did not have cervical examinations when they felt healthy (Holroyd et al., 2004; Lee et al., 2002). Raising awareness of the purpose of screening examinations, which is to detect asymptomatic illness, would be important for women living in a community. In contrast, women with higher levels of perceived health competence were more likely to have participated in screening at some point in their lives. Past screening could have raised the perceived health competence of these women, although the cause-effect association should not be determined in the cross-sectional design of this study.

The current study has several limitations. The study participation rate was low. Individuals who responded to the current study were likely to be health conscious or compliant with the local government project, and the results cannot be generalized to all women living in this community. Data collection was conducted as a part of governmental project, so that the sample size was not predetermined to have sufficient statistical power for the current study. In addition, the study was conducted with a self-administered questionnaire, which is subject to social desirability bias. A free booklet explaining the cervical cancer risk factors of age and viral infection was distributed to participants, and it may have affected the study results. Moreover, because of the nature of the cross-sectional design of this study, we are not able to determine the cause-effect association for our findings. Women who have participated in cervical cancer screening may have obtained their knowledge through their past screening, rather than sought screening as a result of their knowledge. Despite these limitations, the current study provides precious information regarding Japanese women, whose cervical cancer screening status has rarely been researched.

In summary, the current study observed that Japanese women who knew that sexual intercourse at early age is a risk factor for cervical cancer were more likely to have participated in cervical cancer screening in the past. Lower levels of physical or mental health profiles were positively associated with screening within the past two years, whereas women with higher perceived health competence were more likely to have participated in screening at some time in their life. Educating Japanese women about cervical cancer risk factors and its secondary prevention with appropriate openness to discussing women's health would be beneficial. Conducting further research to evaluate the perception of the risk of cervical cancer and education to modify women's attitude toward screenings is important for Japanese women or women in populations with low screening rates.

Statement conflict of Interest

The authors declare no conflict of interest.

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