RESEARCH ARTICLE

Factors Associated with Mammography Adherence among Married Chinese Women in Yanbian, China

Moonhee Gang[1], Jong Im Kim[1], Kyong Ok Oh[1], Chun Yu Li[2], Youngshin Song[1]*

Abstract

Background: Despite the efficacy of regular mammograms, the incidence and mortality rate of breast cancer have been increasing in China. Insufficient studies on the factors affecting mammography adherence in Chinese married women have been conducted. The purpose of the present study was to explore the factors associated with adherence to guidelines for regular mammography among Chinese married women. Materials and Methods: The participants were recruited conveniently and included Chinese and Korean Chinese women who were married, living at Yanbian City in China. Demographic information, status regarding eight risk factors of breast cancer, health responsibility, and perceived benefits/barriers of mammography were obtained. Descriptive analyses, t-test, and multivariate analysis were performed. Hierarchical logistic regression was conducted to explore the factors associated with regular mammography adherence in Chinese and Korean Chinese subgroups. Results: About 24% of the sample population was adherent in going for regular mammography. The adherent group was significantly more educated, had more children, and had a lower proportion experiencing early menarche and a greater menopausal proportion than the non-adherent group. The final model using logistic regression analysis showed that being Chinese [OR=2.199 (1.224-3.951)], having no or one child [OR=4.879 (1.835-12.976)], early menarche [OR=3.515 (1.057-11.694)], being menopausal [OR=3.120 (0.965-10.088)], aged 40-49 [OR=2.374 (1.099-5.124)], having low education [OR=0.400 (0.211-0.765)], and perceiving greater benefits in doing mammography [OR=1.080 (1.014-1.151)] were significantly associated with mammography adherence, after controlling for covariates. Conclusions: Sociocultural sensitive intervention for minorities should be emphasized when improving the adherence of regular mammography. Intervention tailored for women with lower education should be delivered and the benefits of mammography should be propagated to women in rural areas of China.

Keywords: Breast cancer - mammography - adherence - Chinese - perceived benefits - women

Asian Pac J Cancer Prev, **14 (12)**, 7207-7213

Introduction

In China, breast cancer is the most common type of cancer afflicting women (Chen et al., 2012). In comparison to Western countries, breast cancer incidence and mortality rates have been rising due to the lack of awareness and access to health care amenities for cancer screening services (Yu and Wu, 2005; Jemal et al., 2011; Ma et al., 2012). Despite of the incidence rate among Western countries have been increasing in 1980s and 1990s due to routinely use of mammography (Jemal et al., 2011) but the death rate have been decreasing over the past 25 years due to improved early treatment. In contrast, the lower survival rate of breast cancer has been found in Asian countries including China (Kim et al., 2011).

For early detection of breast cancer, regular screening via mammography is a highly recommended health practice and is found to be a cost-effective approach all over the world (Yu and Wu, 2005; Woo et al., 2007; Wong et al., 2012). While the evidence gathered on the potential negative effects of mammography has been on the rise (Elmore et al., 1998; Rosenberg et al., 2006), mammogram is still the most common approach of screening (Nelson et al., 2009). Despite much clinical evidence in the importance of the mammogram, the adherence level towards regular mammographic screening varies even within a single country. Data from the United States showed that the mammography screening rates (36-67%) among the ethnic minorities have been observed to be the lowest in Asians (Lee-Lin et al., 2007). Similarly, in a parent study of this current paper on Chinese women in China, the rates of regular mammographic screening varied between regions from 4.8-28.8% (Kim et al., 2011). Previous studies explained sociocultural and individual beliefs and perceptions to be associated with mammography adherence (Carney et al., 2002; Chua et al., 2005; Wang et al., 2009; Lee et al., 2010). For example, as reported in the study by Wang et al. (2009) Chinese women were less interested in going for a mammography because the traditional method of cancer prevention promotes maintaining a balanced diet, using herbs, and exercising as the best approach (Wang et al.,

*[1]Chungnam National University College of Nursing, Daejeon, Korea, [2]Yanbian University College of Nursing, Yanbian China *For correspondence: yssong87@cnu.ac.kr*

2009). Likewise, diversity in individual and sociocultural environment such as cultural affiliation (Yu and Wu, 2005), lack of health services (Yu and Wu, 2005; Gomez et al., 2007; Gao et al., 2012), low perceived awareness (Yu and Wu, 2005; Gomez et al., 2007; Lee-Lin et al., 2007), or low educational level (Lee-Lin et al., 2007), fatalistic attitude (Charkazi et al., 2013), and low perceived risk of breast cancer (Kim et al., 2011) were found to affect the attendance on screenings. Using the Health Belief Model (HBM), screening practices are one of the health promotion behaviors (Lee-Lin et al., 2008; Kim et al., 2011; Charkazi et al., 2013). According to the HBM, people who believe that a course of action will produce positive outcomes or perceive barriers in engaging in the course action are more likely to participate in health behavior practices (Charkazi et al., 2013). Studies on perceived benefits and barriers on breast cancer prevention behaviors according to age or marital status have been explored in prior research (Chua et al., 2005; Lee-Lin et al., 2007; 2008; Kim et al., 2011) but few studies were focused on married women only regarding mammography adherence. Health promotion behaviors including cancer prevention behaviors of married women could be often affected by culturally prescribed gender roles (Song et al., 2012).

Health care disparities among the different ethnicities have been dealt with in a growing body of research (Guthrie, 2005). The literature highlighted that health related interventions such as general preventive services should be tailored towards the different ethnicity, gender, and social class. In China, the government adopted a variety of health-related policies to reconcile the majority and minorities. However, despite governmental support, the minorities are still facing a lower education level and have poorer access to health related information due to language barriers and cultural differentiations (Yu and Wu, 2005; Jiang et al., 2006; MAO et al., 2007; Gao et al., 2012). On the other hand, the population of Korean Chinese has decreased in size and their education level has risen. However, according to data from previous study, health promotion lifestyle including cancer screening practice and perceived health status were lower in Korean Chinese than the other ethnicities (Ahn et al., 1998), in spite of a higher education level.

The purpose of this study, therefore, is to identify the factors associated with mammography adherence of married Chinese women.

Materials and Methods

Design and sample

A cross-sectional study was conducted to examine factors that affect the adherence of mammography. Participants (n=450) were recruited from two subgroups of Chinese based on similarities in population and economic status : Chinese and Korean Chinese women who were married and living in Yanbian of China. The initial number of participants was 450, but a final sample of 406 (Chinese: 206, Korean Chinese: 200) were used for analyses as data with ineligible responses were excluded. Eligibility criteria included *i*) Aged 20 and over; *ii*) Being married; *iii*) Having no history of breast cancer; and *iv*) Being able to understand and read Chinese.

The required sample size determined by G*Power 3.13 was 139 to obtain an effect size of 0.15, at an alpha level of 0.05, with a power of 0.90, where 15 predictors will be incorporated within the multiple regression analysis. Thus, the sample size of 406 in the current study exceeded the requirement according to the power analysis.

Informed consents were obtained for all participants before enrollment into the study, which was approved by Chungnam National University Hospital Institutional Review Board, (IRB; 08-21) regarding all research procedures, such as the contents and methods.

Procedure and ethical considerations

Prior to the study, we decided what instruments should be used and obtained relevant licenses for the use of each scale. Each tool was then translated to Chinese and back translated by two bilinguals who are proficient in Chinese and English. Through a translation and back translation process, these experts reviewed the cultural differences as well as the linguistic appropriateness. Data of this study were from a parent study that conducted the survey simultaneously in five cities and data from four of the cities had been reported in an outcome paper, except for Yanbian region due to the composition of its population (Kim et al., 2011). Data collection was conducted through individual interviews by two trained researchers. Details of the data collection protocol can be found in the main paper (Kim et al., 2011). The research aims and procedures, including voluntary participation, withdrawal, as well as anonymous data collection, and collection for the sole intention of research were explained.

Data collection and tools

Mammography adherence: in this study, adherence to regular mammography refers to being compliant to the guidelines established by the American Cancer Society (Smith et al., 2010). Mammography adherence was measured by participants' self-report on the question "Have you ever routinely had a mammography?" where participants responded on a dichotomous "yes" or "no" scale.

Breast cancer risk factors: risk factors for breast cancer were measured using eight-item, including *i*) Age (≤40 years); *ii*) Years of education (≤12 years); *iii*) Number of children (≤1); *iv*) Never breast fed; *v*) Early menarche (≤12 years); *vi*) Body Mass Index (BMI≥25); *vii*) Being menopause; and *viii*) Taking oral contraceptives currently based on the various prediction models of breast cancer (Cook et al., 2009; Anothaisintawee et al., 2012; Armstrong et al., 2013). Each risk factor was responded to on a dichotomous "no" or "yes" scale and coded into "0" and "1," respectively.

Health responsibility behaviors: health responsibility was measured using Health Promoting Lifestyle Profile (HPLP II) (Walker et al., 1987). Of HPLP II, the current study extracted the subdomain of health responsibility behavior that consisted of nine items with a four-point Likert scale response format from 1 (never) to 4 (routinely). The subdomain included questions such as

"How frequently would you report any unusual signs or symptoms to a physician or other health professional?" and "How frequently would you attend educational programs on personal health care?" Higher scores indicate higher practice of health responsibility behaviors. In this study, the reliability for the health responsibility subscale was 0.78.

Perceived health status: perceived health status was measured using two items: the current general perceived health status and comparative health status with same ages. The first item was framed as "What do you think about your current general health status?" Responses were given on a 5-point Likert type scale from 1 (very bad) to 5 (very good). The second item was "What do you think about your current health status when comparing with others of similar ages?" and consisted of a 3-point Likert type scale (1=worse off than them, 2=similar to them, 3=better than them). Scores for each of these two items were summed to create a perceived health status scale ranging from 2-8. Higher scores indicated a more positive perception of health status. The Cronbach's alpha coefficient for the scale was 0.63.

Perceived benefits and barriers of mammography: perceived benefits was measured using the brief perceived benefits in practice of health promotion scale (Moon, 1990). The validity and reliability of this scale was well established in previous study for the measurement of health promotion behaviors in healthy Chinese adults (Kim et al., 2011). Perceived benefits to screening included early detection of cancer, having a better chance of being cured, and setting the mind at ease. The scale consisted of 11 items with a 4-point Likert type scale from 1 (strongly disagree) to 4 (strongly agrees), with a total score ranging from 11-44. Items about perceived benefits to screening included "How much benefit do you can help you detect the existence of breast cancer?" and "How much benefit do you perceive a mammography can increase your chances of getting cured of breast cancer?" Higher scores indicated more perceived benefits. In this study, the Cronbach's alpha coefficient was 0.93.

The variable of barriers of mammography was assessed using the brief perceived barriers in practice of health promotion scale (Moon, 1990). Perceived barriers to screening included discomfort of the procedure, pain, cost, and time. The validity and reliability of this scale was well established in a previous study for the measurement of health promotion behaviors in healthy Chinese adults (Kim et al., 2011). The scale consisted of 11 items with a 4-point Likert type scale from 1 (strongly disagree) to 4 (strongly agree), with a total score ranging from 11-44. Items included "How many barriers do you perceive in terms of not having the time to do a mammography?" and "How many barriers do you perceive about the burden of the mammography screening cost?" The reliability of the perceived barriers scale was 0.86 (Cronbach's alpha).

Data analysis

Descriptive statistics in terms of frequency, means, and standard deviation (SD) were used to summarize the sample's demographics as well as the variables of interest. Chi-squared tests were performed to compare the relationship between risk factors and mammography adherence. A multiple hierarchical logistic regression was used to examine the factors related to utilization of mammography. The first step included demographic variables and the eight risk factors. Health responsibility and perceived health status were entered in step 2. Finally, step 3 included perceived benefits to screening and perceived barriers to the use of mammography. Statistical analyses were conducted using SPSS version 20 statistical software program (SPSS Inc, Chicago, IL, USA). A two-side p value of 0.05 was applied as the threshold of significance.

Results

Demographics and health status

Table 1 presents the demographics and basic health status of participants. With regard to race, 50.7% were Chinese. The mean age was 50.0 years (SD=11.1 years) and about 90% of participants had completed middle school or higher. About half of participants were being employed (55.6%) and about 80% did not report any underlying chronic disease such as diabetes or hypertension. Around 24% of participants answered the self-reported adherence of mammography within 2 years for screening of breast cancer.

The status of risk of breast cancer revealed that 67% had one or no child, 11.0% had not breast fed before, 3.6% experienced menarche at the age of 12 or earlier, 44.5% had a BMI greater or equals to 25, 28.3% had begun experiencing menopause, and 4.5% used contraceptives currently. The mean score of perceived health status was 5.4 with scores ranging from 2.0 to 8.0 and health responsibility was 20.9 with scores ranging from 9 to 36. The mean scores of perceived benefits and barriers were 35.1 (SD=4.8) and 24.7 (SD=4.5) with scores ranging from 11-44 respectively.

Comparisons of risk factors by mammography adherence

Table 2 showed the results of the comparisons of

Table 1. Demographics and Health Status of Participants (n=406)

Characteristics		Frequency	%
Race	Korean Chinese	200	49.3
	Chinese	206	50.7
Age (years)	≤39	67	16.5
(Mean [SD]	40–49	175	43.1
=50.0[11.1])	50–59	58	14.3
	60–69	106	26.1
Years of education	≤12 years	276	70.6
Having job	Yes	224	55.6
Presence of underlying disease	Yes	91	22.4
Mammography adherence	Yes	96	23.6
Number of children	0	8	2
	1	264	65
	≥2	134	33
Breast feeding history	Yes	332	89
Age of menarche	≤12 years	15	3.6
*BMI	≥25	179	44.5
Began menopause	Yes	115	28.3
Contraceptives use	Yes	18	4.5

*BMI=Body Mass Index

mammography adherence between the high and low risk groups of each risk factor. There were significant differences in years of education (p<0.001), number of child (p<0.001), early menarche (p=0.011), and being menopause (p=0.019). When comparing to non-adherent group, mammography adherent group were more educated, had one or no child, early menarche, and not being menopause than in the non-adherent counterpart. However, there were no significant differences in the high and low risk groups in factors such as age, history of breast feeding, and BMI between the adherent and non-adherent groups.

Multiple logistic regression analysis of mammography adherence

Table 3 presents the results of multiple hierarchical logistic regression that examined the odds ratio (OR) and 95% confidence interval (CI) for each potential predictor of mammography adherence.

Demographics and risk factors of breast cancer were entered in Step 1. Chinese [OR=2.208; 95%CI (1.247-3.909)] and three risk factors such as having no or one child [OR=4.548; 95%CI (1.749-11.829)], 40-49 aged [OR=2.446; 95%CI (1.151-5.198)], being menopause [OR=3.106; 95%CI (0.972-9.921)], and low education [OR=0.356; 95%CI (0.190-0.665)] were significantly associated with mammography adherence.

Next, health responsibility and perceived health status were then entered in Step 2. Variables of Chinese [OR=2.136; 95%CI (1.202-3.793)], having no or one child (OR=4.637; 95%CI (1.779-12.085)], 40-49 aged [OR=2.412; 95%CI (1.128-5.159)], being menopause [OR=3.225; 95%CI (1.073-11.751)], and low education [OR=0.352; 95%CI (0.188-0.661)] were still significantly associated with mammography adherence in Step 2. Additionally, early menarche [OR=3.551; 95%CI (1.073-11.694)] as a predictor yielded significance.

Lastly, when perceived benefits and barriers to mammography were entered in Step 3, Chinese [OR=2.199; 95%CI (1.224-3.951)], having no or one child [OR=4.879; 95%CI (1.835-12.976)], early menarche [OR=3.515; 95%CI (1.057-11.694)], low education [OR=0.400; 95%CI (0.211-0.765)], and perceived benefits of mammography [OR=1.080; 95%CI (1.014-1.151)] were significantly associated with mammography adherence. That is, Chinese women were about 2 times more likely to go for regular mammography than Korean Chinese. Those who had higher risk of breast cancer such as having no or one child and early menarche were more likely to have routinely done their mammography than those of lower risk. Additionally, the education level was negatively associated with mammography adherence. Respondents

Table 2. Comparisons of Risk Factors between Mammography Adherence and Non-adherent Group

Risk factors		Mammography		X^2/p
		Adherent group	Non-adherent group	
Older in age (≥40)	Yes	80 (83.3)	259 (83.5)	0.002/1.000
	No	16 (16.7)	51 (16.5)	
Low educated (≤12 years)	Yes	47 (50.0)	229 (77.1)	25.266/0.000
	No	47 (50.0)	68 (22.9)	
No or one children	Yes	83 (86.5)	189 (61.2)	21.246/0.000
	No	13 (13.5)	120 (38.8)	
Breast feeding history	Yes	76 (85.4)	256 (90.1)	1.561/0.243
	No	13 (14.6)	28 (9.9)	
Early menarche (≤12 years)	Yes	8 (8.3)	7 (2.3)	7.478/0.011
	No	88 (91.7)	300 (97.7)	
High BMI (≥25)	Yes	39 (40.6)	140 (45.8)	0.778/0.411
	No	57 (59.4)	166 (54.2)	
Began menopause	Yes	18 (18.8)	97 (31.3)	5.678/0.019
	No	78 (81.2)	213 (68.7)	
Contraceptives Use	Yes	5 (5.3)	13 (4.2)	0.197/0.583
	No	89 (94.7)	294 5.8)	

Table 3. Multiple Hierarchical Logistic Regression of Mammography Adherence

Variable	Step 1		Step 2		Step 3	
	OR	95%CI	OR	95%CI	OR	95%CI
Constant	0.041		0.015		0.001	
Race (Chinese=1)	2.208*	1.247-3.909	2.136*	1.202-3.793	2.199*	1.224-3.951
Having job (yes=1)	1.698	0.883-3.267	1.624	0.838-3.146	1.644	0.842-3.212
Having disease (yes=1)	0.971	0.714-1.319	0.978	0.718-1.334	0.935	0.685-1.276
Risk factor (yes=1)						
No of Child (≤1)	4.548*	1.749-11.829	4.637*	1.779-12.085	4.879*	1.835-12.976
Never breast fed	1.366	0.612-3.050	1.431	0.639-3.207	1.436	0.639-3.226
Early menarche (≤12 years)	3.221*	0.988-10.504	3.551*	1.073-11.751	3.515*	1.057-11.694
Being menopause	3.106*	0.972-9.921	3.225*	1.073-11.751	3.120*	0.965-10.088
Contraceptives use	2.476	0.742-8.266	2.428	0.718-8.209	2.455	0.716-8.414
BMI (≥25)	0.982	0.562-1.717	0.98	0.558-1.722	1.032	0.581-1.832
Age ≤39	1		1			
40-49	2.446*	1.151-5.198	2.412*	1.128-5.159	2.374*	1.099-5.124
50-59	1.074	0.350-3.298	1.024	0.330-3.182	0.903	0.280-2.913
60-69	0.803	0.198-3.260	0.769	0.188-3.148	0.918	0.222-3.795
Low educated (≤12 years)	0.356*	0.190-0.665	0.352*	0.188-0.661	0.400*	0.211-0.765
Health responsibility			1.033	0.973-1.096	1.022	0.961-1.087
Perceived health			1.032	0.784-1.359	1.067	0.803-1.418
Perceived benefit					1.080*	1.014-1.151
Perceived barrier					0.997	0.935-1.064

*p<.05; **Step 1: Demographics (race, having job), underline disease and risk factors of breast cancer; Step 2: Demographics (race, having job), underline disease and risk factors of breast cancer+Health responsibility and perceived health; Step 3: Demographics (race, having job), underline disease and risk factors of breast cancer+Risk factors of breast cancer+Perceived benefit and barriers

who reported high perceived benefits of mammography were more likely to regularly go for mammography than those who perceived low benefits of mammography, after controlling for covariates.

Discussion

While the effectiveness of breast examination by self against clinical experts have been inconclusive, the efficacy of a mammography screening is a well-established and important screening tool in the community (Elmore et al., 2011). The findings of this study revealed important information that only about 23% of the women who participated had undergone mammography regularly, which was lower than that of western countries, and even with other Asian countries (Kim et al., 2009; Huang et al., 2010). Indeed, over 30% of menopausal women in Hong Kong, Malaysia, Taiwan, and Thailand and over 60% of Korean women were adherent to regular mammography screening (Huang et al., 2010; Suh et al., 2013). Rates of mammography adherence in China, on the other hand, significantly differed between regions (Kim et al., 2011). Recently, Kim. et al (2011) surveyed the practice of breast cancer prevention in four cities in China and found that the frequency of mammography was higher in urban cities, such as Beijing, than rural regions (Kim et al., 2011). Low rate of regular mammography adherence might have been influenced by the accessibility of health care facilities that offer the preventive service as well as individual perceptions. Likewise, screening behaviors can be affected by geography, socioeconomic status, and cultural differences (Anothaisintawee et al., 2012). According to an intersectional perspective, ethnic majorities tend to follow the early cancer detection guidelines more closely and have a much easier access to resources than the minorities (Guthrie, 2005; Yu and Wu, 2005; Gomez et al., 2007). Consistent with the prior study, the majority (Chinese) in our study was 2 times more adherent towards going for regular mammography when compared to the Korean Chinese. Although the literature indicated that high education level and economic status positively influenced health behaviors (Champion and Springston, 1999; Lubetkin et al., 2008), Korean Chinese were less likely to go for regular mammography than the Chinese even when they are highly educated. Gender roles disparity may offer one possible explanation of low adherence in Korean Chinese. Married Korean Chinese women emphasized the role of as the primary nurturer and adopted a self-sacrificing mentality more than those in other Asian countries (Song et al., 2012). As compared to Chinese women, their Korean counterpart was given a role that might burden them more in caring for the family, which involved multiple responsibilities pushing them to prioritize supporting the family than their own health (Ahn et al., 1998; Song et al., 2012). Studies regarding gender role strain of Korean women can be observed not only in preventive health behaviors but also in chronic disease managements (Ahn et al., 1998; Yoo and Kim, 2010; Park and Kim, 2012). Korean Chinese could not be encouraged to go for mammogram in spite of existing nation-wide cancer screening program in China (Chan et al., 2007). Thus, health service policies and programs should be delivered in a way that considers the gender roles disparity and emphasizes the importance of cancer preventive screening practices in Korean Chineses.

Breast cancer risk factors have been well studied by scholars using various predictive models such as Gail model, Claus model, and Colditz model (Anothaisintawee et al., 2012), which were commonly included reproductive characteristics (eg, number of children and age of menarche), demographics (eg, age and education level) and clinical characteristics (eg, Body Mass Index) in those models. Those breast cancer risk factors would be associated with mammography adherence (Cook et al., 2009; Kim et al., 2011). Consistent with the previous reports, regular mammography adherence was influenced by high risk factors such as low number of children, early menarche, being menopause, and low education level in present study. That is, those who had no or one child and early menarche were more likely to go for regular mammography while low level of education was negatively related to regular mammography adherence. Particularly, low level of education had negatively impacted the adherence of regular mammography due to the lack of the capability in understanding health information and communicating with the Chinese doctors (Chan et al., 2007; Du et al., 2011; Jing, 2011). According to a study on Chinese women regarding breast cancer preventive behaviors, feeling that a mammogram was not necessary was the main reason of non-adherence to screening due to the absence of apparent symptoms and good perceived health (Kim et al., 2011). Commonly, benefits and necessity perceptions on preventive practices including cancer screening can be informed through the educational system. In order to improve the motivation level of the less educated women in going for mammogram, planning needs to be tailored and individualized according to the education level to be more effective.

Among the 8 breast cancer risk factors, not having breast fed (never), menopause, use of contraceptives, high BMI (≥25) and older in age (50 years and over) did not turn out to be significant predictors of regular mammography adherence in this study. Which were inconsistent with the results of the study by Cook et al. (2009) but similar to a study by Kim et al. (2011) Indeed, the effectiveness of the mammography screening was inconclusive (Woo et al., 2007; Nelson et al., 2009; Wong et al., 2012). Nonetheless, studies commonly suggested that strategies should be developed to tailor and focus on high risk group not only to reduce breast cancer mortality by mammographic screening (Nelson et al., 2009) but also to reduce its cost and budgetary burden (Woo et al., 2007). Similarly, older in age and high BMI were strong predictors of breast cancer screening practice (Anothaisintawee et al., 2012). Surprisingly, the present study revealed that a high BMI did not yield significance as key predictors of mammography adherence. Consistently with previous research findings (Chan et al., 2007; Kim et al., 2011), respondents who have low risk of breast cancer are also less likely to go for screenings. The respondents of this study may seem to lack of knowledge regarding whether they are of high or low risk as well as what are

the risk factors of breast cancer. It might be noteworthy that the results could be influenced by the small number of high risk women, in terms of breast feeding (11%) and contraceptives use (4.5%), and the sample's lack of awareness of the risk factors of breast cancer. Therefore, improving the knowledge of breast cancer risk factors should be included as one of the educational components.

Besides participants' knowledge of cancer risk, barriers such as fear of embarrassment or pain have been associated with the attendance of screening (Carney et al., 2002; Wang et al., 2009; Kim et al., 2011). Perceived benefits and barriers have an important role towards the change in behaviors and is a key predictor of cancer prevention practices (Wang et al., 2009). However, perceived barrier did not associate significantly with regular mammography adherence in current study. Similar to other study (Kim et al., 2011), multivariate analysis showed that only perceived benefits on health promotion behavior significantly influenced regular mammography adherence. One possible reason for non-significance of perceived barriers might be limited measure because the tool of perceived barrier was more focused on individual burden without systematic perspective such as having insurance, having personal health care provider, the frequency of health care utilization and difficulty of communication with health care professionals etc. Although further investigations on reasons for the results should be explored, the benefits of mammography should be emphasized more than the barriers so as to positively influence regular mammography screening practices in Chinese women.

To summarize, individual focused health resources should be provided for promoting the perception of health using tailored program that takes into consideration a cultural perspective. In particular, the willingness to be adherent towards cancer screening practices might be affected by the perceived awareness of breast cancer in healthy women and the risk factors of breast cancer (Chua et al., 2005; Chan et al., 2007). Many researchers have highlighted to use of self-management education strategies to encourage the health promotion practices (Wang et al., 2009; Kim et al., 2011; Lai et al., 2011; Lee-Lin et al., 2012). In the current study, Chinese respondents who had high risk of the breast cancer (in terms of having small number of children, early menarche, and low education level) and perceived greater benefit were associated with regular mammography adherence when comparing against their Korean Chinese counterpart.

The limitations of this study should be pointed out. Firstly, the participants were sampled conveniently and were not likely representative of the Yanbian City. On the other hand, regular mammography adherence was measured by a self-administered questionnaire, which might harbor room for inaccuracy as participants. Future study, questions on whether participants went for mammography should incorporate a request for proof, for a more reliable result. Third, only 8 risk factors of breast cancer were used in this study. Although, there are few unique risk prediction models of breast cancer for Asian population, other risk factors such as healthy lifestyle and family history should be included in future studies. Lastly, we did not survey the participants' knowledge regarding breast cancer and its preventive practices. Regular mammography adherence might potentially be affected by knowledge, which may influence the healthy attitude and behavior (Wang et al., 2009).

Despite the limitations, this current study has important clinical implications regarding factors associated with mammography adherence for both of married women and health professionals in China. To the best of our knowledge, this is the first attempt to explore the key predictors of mammography adherence in a sample of Chinese and Korean Chinese. Through this study, detailed breast cancer risk factors should be educated to Chinese married women and perceived benefits should be more emphasized than barriers for improving awareness of cancer prevention. Further research with diverse population in China should be warranted to cross-validate the current results.

Acknowledgements

This study was performed within the framework of a larger survey study, which was funded by Korea Breast Cancer Foundation in 2008.

References

Ahn HO, Kim KS, Ryu SY, et al (1998). The association of perception of health status with lifestyle of Yanbian Koreans and Yanbian Chinese. *Korean J Prev Med*, **31**, 828-43.

Anothaisintawee T, Teerawattananon Y, Wiratkapun C, Kasamesup V, Thakkinstian A (2012). Risk prediction models of breast cancer: a systematic review of model performances. *Breast Cancer Res Treat*, **133**, 1-10.

Armstrong K, Handorf EA, Chen J, Bristol Demeter MN (2013). Breast cancer risk prediction and mammography biopsy decisions: a model-based study. *Am J Prev Med*, **44**, 15-22.

Carney PA, Harwood BG, Weiss JE, Eliassen MS, Goodrich ME (2002). Factors associated with interval adherence to mammography screening in a population-based sample of New Hampshire women. *Cancer*, **95**, 219-27.

Champion VL, Springston J (1999). Mammography adherence and beliefs in a sample of low-income African American women. *Int J Behav Med*, **6**, 228-40.

Chan SS, Chow DM, Loh EK, et al (2007). Using a community-based outreach program to improve breast health awareness among women in Hong Kong. *Public Health Nurs*, **24**, 265-73.

Charkazi A, Samimi A, Razzaghi K, et al (2013). Adherence to recommended breast cancer screening in iranian turkmen women: the role of knowledge and beliefs. *ISRN Prev Med*, **2013**, 8.

Chen WQ, Zheng RS, Zhang SW, et al (2012). Report of incidence and mortality in china cancer registries, 2008. *Chin J Cancer Res*, **24**, 171-80.

Chua MST, Mok TSK, Kwan WH, Yeo W, Zee B (2005). Knowledge, perceptions, and attitudes of Hong Kong Chinese women on screening mammography and early breast cancer management. *Breast J*, **11**, 52-6.

Cook NR, Rosner BA, Hankinson SE, Colditz GA (2009). Mammographic screening and risk factors for breast cancer. *Am J Epidemiol*, **170**, 1422-32.

Du J, Zhou C, Zeng L, et al (2011). Analysis on the general survery result to gynecological diseases in Tujia-Miao autonomous prefecture from 2006 to 2010 in Xianxi. *Chinese*

J Public Health, **25**, 40-1.
Elmore JG, Barton MB, Moceri VM, et al (1998). Ten-year risk of false positive screening mammograms and clinical breast examinations. *N Engl J Med*, **338**, 1089-96.
Elmore JG, Armstrong K, Lehman CD, Fletcher SW (2011). Screening for breast cancer. J Am Med Assoc, **293**, 1245-56.
Gao F, Machin D, Chow KY, et al (2012). Assessing risk of breast cancer in an ethnically South-East Asia population (results of a multiple ethnic groups study). *BMC Cancer*, **12**, 529.
Gomez SL, Tan S, Keegan TH, Clarke CA (2007). Disparities in mammographic screening for Asian women in California: a cross-sectional analysis to identify meaningful groups for targeted intervention. *BMC Cancer*, **7**, 201.
Guthrie B (2005). Bridging health care disparities: addressing unmet needs of women of color. *J Obstet Gynecol Neonatal Nurs*, **34**, 385.
Huang KE, Xu L, I NN, Jaisamrarn U (2010). The Asian Menopause Survey: knowledge, perceptions, hormone treatment and sexual function. *Maturitas*, **65**, 276-83.
Jemal A, Bray F, Center MM, et al (2011). Global cancer statistics. *CA Cancer J Clin*, **61**, 69-90.
Jing LIU (2011). Survey of 1616 cases of gynecological diseases in different nationalities married women. *Bull Dis Control and Prev*, **26**, 67-8.
Kim O, Kyong O, Li CY, et al (2011). Breast cancer screening practice and health-promoting behavior among Chinese women. *Asian Nur Res*, **5**, 157-63.
Kim BH, Koh SB, Hur HK, Park JK, Park SM (2009). Women's cancer screening according to body mass index in a cohort of rural Korean women. *J Korean Acad Nurs*, **39**, 641-50.
Lai S, Wang M, Chu L, Hsieh C (2011). Factors associated with mammography acceptance among younger women in Taoyuan country. *J Nur and Healthcare Res*, **7**, 224-32.
Lee-Lin F, Menon U, Pett M, et al (2007). Breast cancer beliefs and mammography screening practices among Chinese American immigrants. *J Obstet Gynecol Neonatal Nurs*, **36**, 212-21.
Lee-Lin F, Menon U, Nail L, Lutz KF (2012). Findings from focus groups indicating what Chinese American immigrant women think about breast cancer and breast cancer screening. *J Obstet Gynecol Neonatal Nurs*, **41**, 627-37.
Lee-Lin F, Menon U, Pett M, et al (2008). Measuring breast cancer and mammography screening beliefs among Chinese American immigrants. *Wes J Nur Res*, **30**, 852-68.
Lubetkin EI, Santana A, Tso A, Jia H (2008). Predictors of cancer screening among low-income primary care patients. *J Health Care for the Poor and Underserved*, **19**, 135-48.
Ma GX, Yin L, Gao W, et al (2012). Workplace-based breast cancer screening intervention in china. *Cancer Epidemiol Biomarkers Prev*, **21**, 358-67.
Mao L, Liu G, Ren X, et al (2007). Study on the health conditions and the quality of life of Miao, Gelao and Han miniority in Guizhou Province. Paper presented at the Modern Preventive Medicine.
Moon JS (1990). A study of instrument development development for health belief of Korean adults. Doctoral dissertation, Seoul, South Korea: Yonsei University.
Nelson HD, Tyne K, Naik A, et al (2009). Screening for breast cancer: an update for the US preventive services task force. *Ann Intern Med*, **151**, 727-37.
Park H, Kim MT (2012). Impact of social role strain, depression, social support and age on diabetes self-efficacy in Korean women with type 2 diabetes. *J Cardiovasc Nurs*, **27**, 76-83.
Rosenberg RD, Yankaskas BC, Abraham LA, et al (2006). Performance benchmarks for screening mammography. *Radiology*, **241**, 55-66.
Smith RA, Cokkinides V, Brooks D, Saslow D, Brawley OW (2010). Cancer screening in the United States, 2010: a review of current American cancer society guidelines and issues in cancer screening. *CA Cancer J Clin*, **60**, 99-119.
Song Y, Song HJ, Han HR, et al (2012). Unmet needs for social support and effects on diabetes self-care activities in Korean Americans with type 2 diabetes. *Diabetes Educ*, **38**, 77-85.
Suh M, Choi KS, Lee YY, Jun JK (2013). Trends in cancer screening rates among Korean men and women: results from the Korean national cancer screening survey, 2004-2012. *Cancer Res Treat*, **45**, 86-94.
Walker SN, Sechrist KR, Pender NJ (1987). The health-promoting lifestyle profile: development and psychometric characteristics. *Nurs Res*, **36**, 76-81.
Wang JH, Mandelblatt JS, Liang W, et al (2009). Knowledge, cultural, and attitudinal barriers to mammography screening among nonadherent immigrant Chinese women: ever versus never screened status. *Cancer*, **115**, 4828-38.
Wong IO, Tsang JW, Cowling BJ, Leung GM (2012). Optimizing resource allocation for breast cancer prevention and care among Hong Kong Chinese women. *Cancer*, **118**, 4394-403.
Woo PP, Kim JJ, Leung GM (2007). What is the most cost-effective population-based cancer screening program for Chinese women? *J Clin Oncol*, **25**, 617-24.
Yoo GJ, Kim BW (2010). Remembering sacrifices: attitude and beliefs among second-generation Korean Americans regarding family support. *J Cross Cult Gerontol*, **25**, 165-81.
Yu MY, Wu TY (2005). Factors influencing mammography screening of Chinese American women. *J Obstet Gynecol Neonatal Nurs*, **34**, 386-94.
Zhao J, Wan C, Xu C (2006). Analysis on quality of life and its influence factors in Dai and Hani minorities. *Chin J Public Health*, **22**, 272-3.