Original Report:
Research Findings

Analyzing Factors of Breast Cancer Screening Adherence among Korean American Women Using Andersen's Behavioral Model of Healthcare Services Utilization

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Objectives: Regular uptake of mammography screening reduces the risk of advanced stage diagnosis of breast cancer (BC). However, BC screening rates remain suboptimal among Korean American (KA) women. Using the Andersen's Behavioral Model of Healthcare Services Utilization, this study examined factors associated with mammography screening among KA women aged 50 to 80 years in the state of Georgia, USA.

Methods: We used purposive sampling to recruit study participants in the Atlanta metropolitan area from May 2015 to February 2016. A total of 303 KA women completed a cross-sectional, self-report survey about their sociodemographics, health care access information, knowledge, self-efficacy, decisional balance, and mammography history.

Results: Descriptive analyses confirmed low rates of mammography screening in the participants. Multiple logistic regression analyses showed that having a mammogram within the past year was associated with greater BC knowledge, higher scores of decisional balance and fewer annual health check-ups among KA women without any cancer history.

Conclusions: The findings offer implications for health policy aimed at increasing BC screening by leveraging enabling factors among medically underserved KA women at both structural and cultural levels. *Ethn Dis*.2019;29(Suppl 2):427-434; doi:10.18865/ed.29.S2.427

Keywords: Breast Cancer; Mammography; Korean American Women; Andersen's Behavioral Model of Healthcare Services Utilization

Introduction

Routine breast cancer (BC) screening saves women's lives through early detection of BC.[1] Health institutes firmly recommend regular BC screening for women at average risk.[1,2] While their recommendations vary slightly and change over time, the American Cancer Society (ACS) recommended yearly mammography screening for average-risk women aged ≥ 40 years and, in October 2015, divided the screening age intervals: annual mammogram for women aged 45 to 54 years and either annual or biennial mammogram for women aged ≥55 years.[2]

However, BC screening rates, ranging from 63% to 68%, remain at a suboptimal level for the US population,[3] and it falls short of the national goal (81.1%) set by *Healthy People 2020*.[4] Additionally, for some underrepresented ethnic groups, BC screening rates remain lower than the national average and target.[5] Specifically, only 22%–39% of Korean American (KA) women had a mammogram in the past year and 34%–57% had one within two years.[6] Research has shown that KA women experience increased incidence and persistent mortality of BC, which is becoming the most commonly diagnosed cancer and the second leading cause of death in this population, with an annual diagnosis rate of 53.5 per 100,000.[3]

Such underutilization of BC screening poses an increased risk of diagnosis of advanced BC,[7] resulting in poor prognosis after treatment and low survival rates.[8] It is critical to understand BC screening behavior and factors associated with BC screening uptake for KA women. Our study employed the Andersen's Behavioral Model of Healthcare Services Utilization (hereafter, Andersen's Model) as a theoretical framework to examine BC screening behavior among KA women. The Andersen's Model posits that health care services utilization is influenced by full functions of the

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following three domains: individuals' predisposition characters related to services use (eg, age and marital status); factors that enable or impede use (eg, health insurance, doctor recommendation, and self-efficacy); and their perceived need for care (eg, health status and cancer history).[9]

The existing literature also shows that cultural and psychological factors can facilitate access to care. Prior studies showed that KA women with low English proficiency were less likely than those with high English proficiency to use health care services, and have difficulties in communicating with health providers.[10,11] Several studies also showed that decisional balance (pros vs cons) associated with attitudes and beliefs regarding screening contributed to the use of BC cancer screening among KA women.[12,13] For example, KAs who believe that a person's diagnosis of cancer means death tended to determine that screening is unnecessary when symptoms are absent.[14]

Thus, this study aimed to examine: 1) rates of mammography screening among a sample of KA women; and 2) factors associated with having a mammogram within the past year among KA women. The findings provided useful information for interventions and policy to facilitate BC screening among KA women.

This study aimed to examine: 1) rates of mammography screening among a sample of Korean American (KA) women; and 2) factors associated with having a mammogram within the past year among KA women.

Methods

Study Participants and Procedures

We conducted a cross-sectional study in the Atlanta metropolitan area from May 2015 to February 2016. The inclusion criteria for this study were: self-identified KA woman aged 50 to 80 years, and resident in the state of Georgia (GA). We also included KA women diagnosed with any type of cancer in this study because, to our knowledge, this study was the first attempt to target KA women residing in GA and explore their BC screening practice. However, in order to understand the potential impacts of previous cancer experiences on BC screening behavior, we also conducted further analyses comparing the sample including a cancer history for self and the sample excluding a cancer history for self.[15]

To guide our study, we formed a community-university advisory board. This board consisted of four English-Korean bilingual KAs: a community coordinator and interpreter at a local medical center; a church pastor; and two faculty from the departments of English Literacy Education and Applied Language at a local university. The major roles of this advisory board were to: review survey questionnaires and translation of measures in English into Korean; assist in recruitment; and offer consultations for interpreting the study findings.

We performed purposive sampling to recruit study participants from the KA community. For recruitment, we developed a list of KA community organizations and their contact information, including senior centers, churches/temples, and associations. We contacted each organization via phone and email for data collection. According to the organization's permission and preferred time and place, we administered the self-report survey questionnaires immediately after explaining the nature and purpose of the study and obtaining informed consent documents from those who were interested in the study. A total of 322 KA women participated in this survey, and 303 of the participants (94.1%) completed the survey. On average, the survey took approximately 40 minutes to complete.

Measures

Outcome Variable

The main outcome variable for this study was having a mammogram within the past year. Based on the recommendation by the ACS at the time of data collection, we considered those having a mammogram within the past year as adhering to

the annual mammography screening guideline (hereafter, "adherence to mammography" and otherwise "non-adherence to mammography").

Enabling Variables

We assessed the BC screening knowledge by a total composite score of the following two scales: a five-item BC knowledge scale adopted from the ACS's BC screening guideline[16] and a five-item BC screening familiarity scale adopted from Han et al.[17] The ACS's BC knowledge scale items included "Women at age of 40 are recommended to have a mammography annually," with response options of 'true' and 'false.' Also, the BC screening familiarity scale items measured participants' familiarity (scale from 0 for 'not familiar' to 4 for 'very much familiar') with the most commonly used terms related to mammography, including "hyperplasia," "lump," "lymph," "metastasis," and "nipple." Thus, we measured a total score of BC knowledge by a standardized score using the Principal Component Analysis method with the 10 items because two different types of items were used with different ranges of values.

We also measured the self-efficacy for BC screening by the three items of perceived self-efficacy for mammography adopted from Luszczynska and Schwarzer.[18] An item sample includes, "I am able to perform mammography regularly even if I will have to overcome my different habit of non-examination." A seven-point Likert scale ranging from 0 for 'strongly disagree' to 7 for 'strongly agree' was used to measure abilities of the participants to overcome potential obstacles anticipated in mammography screening. We used the standardized score of the mean of the three items as a composite score of perceived self-efficacy for mammography, with higher scores of self-efficacy indicating higher abilities to perform mammography screening. The Cronbach's alpha for the three items was .9572.

Additionally, we assessed the decisional balance in BC screening, which indicates a person's attitudes and beliefs about mammography. The 18-item decisional balance scale consisted of seven positive statements and 11 negative statements about mammography. A positive statement example includes "Having regular mammography screening gives me peace of mind about cancer." We averaged and standardized an 18-item decisional balance scale with binary values (0 = 'no' and 1 = 'yes') used by Costanza and colleagues to measure decisional balance scores.[19] Higher scores of decisional balance indicate more positive attitudes and beliefs regarding uptake of mammography. The Cronbach's alpha for the 18 items was .7707.

We also included education, income, annual medical check-up, health insurance, physician's recommendation for mammography, and English proficiency as additional enabling factors in the model.

Predisposing and Needs Variables

The predisposing variables were age and marital status. The need variables included a cancer history for self and family and self-rated health status. We translated all measures in English to Korean using back-translation to assure comparability and equivalence in the meaning of measures,[20] and the advisory board reviewed them.

Statistical Analyses

We implemented descriptive analyses to summarize the predisposing, enabling, and need variables. We also conducted Pearson Chi-squared test for categorical variables and t-test for continuous variables to examine their associations with adherence to mammography. Finally, we performed multiple logistic regression analyses to analyze the associations of the predisposing, enabling, and need variables with adherence to mammography with heterogeneity robust standard errors. The first logistic regression analysis included participants who reported any cancer history for self, while the second analysis excluded the participants who reported a cancer history for self to compare the variables in the model. We used Stata version 4.2 for all analyses, and all tests in the study were two-sided with a 5% statistical significance level.

Results

Characteristics of Participants

Tables 1 and 2 show the sociodemographic characteristics of the participants (N=303). The participants' mean age was 59.1 (SD=7.55). The majority were married or partnered (78.3%) and insured (72.7%). More than half of the participants had bachelor's degrees or higher (50.3%), annual medical check-ups (55.0%), physician's recommendation for BC

Table 1. Summary of sociodemographic characteristics, panel A variable, N=303

(Panel A) Variable	n[a] (%)	Mammography Adherence[b], n=84	
		n[a] (%)	P[c]
Predisposing factor			
Age, years; mean = 59.01, SD = 7.55			
50 – 64	222 (73.3)	64 (28.8)	.4764
65 – 80	81 (26.7)	20 (24.7)	
Marital status			
Never married or other	65 (21.7)	20 (30.8)	.5742
Married or partnered	235 (78.3)	64 (27.2)	
Need factor			
Self cancer history			
No	263 (86.8)	65 (24.7)	.0027
Yes	40 (13.2)	19 (47.5)	
Family cancer history			
No	142 (47.0)	34 (23.9)	.1573
Yes	160 (53.0)	50 (31.3)	
Self-rated health status			
Very bad / bad	28 (9.4)	7 (25.0)	
Moderate	183 (61.2)	49 (26.8)	.6395
Very good / good	88 (29.4)	28 (31.8)	
Enabling factor (categorical)			
Education			
<Bachelor's degree	146 (49.7)	38 (26.0)	.5614
≥Bachelor's degree	148 (50.3)	43 (29.1)	
Income			
< $20,000	50 (18.2)	12 (24.0)	
$20,000 - $39,999	68 (24.7)	25 (36.8)	
$40,000 - $59,999	73 (26.6)	15 (20.6)	.3141
$60,000 - $79,999	44 (16.0)	13 (29.6)	
$80,000 - $99,999	21 (7.6)	7 (33.3)	
≥$100,000	19 (6.9)	7 (36.8)	
Annual health check-up			
No	134 (45.0)	61 (45.5)	<.0001
Yes	164 (55.0)	23 (14.0)	
Health insurance			
No	81 (27.3)	12 (14.8)	.0025
Yes	216 (72.7)	70 (32.4)	
Doctor recommendation			
No	100 (36.5)	18 (18.0)	.0027
Yes	174 (63.5)	61 (35.1)	
English proficiency level			
Very poor / poor	157 (51.8)	32 (20.4)	
Moderate	118 (38.9)	38 (32.2)	.0021
Very good / good	28 (9.2)	14 (50.0)	

a. The total number of observations for each variable may vary and be different from the total sample size due to missing values. However, the total numbers are consistent considering the number of observations with missing values.
b. Mammography adherence based on annual screening mammography.
c. P for Pearson Chi-squared test.

screening (63.5%), a cancer history for self (13.2%), a cancer history for family (53.0%), and poor or very poor English proficiency (51.8%). About 43% of the participants had an annual household income <$40,000 and 29% rated their health status as good or very good.

Differences between Adherence and Non-Adherence to Mammography

As shown in Tables 1 and 2, Pearson Chi-squared test found significant differences between participants' adherence to mammography and non-adherence to mammography for categorical variables, including a cancer history for self (P=.0027), annual medical check-ups (P<.0001), health insurance (P=.0025), physician's recommendations (P=.0027), and English proficiency (P=.0021). Furthermore, t-test for continuous variables revealed significant differences between participants' adherence to mammography and non-adherence to mammography for BC screening knowledge (P=.0004), self-efficacy for BC screening (P<.0001), and decisional balance in BC screening (P<.0001), respectively.

Mammography Screening History

Table 3 shows mammography screening history of the participants. The majority (n = 222; 73.3%) reported ever having mammography, whereas about a fifth of the participants reported never having a mammography. Twenty participants (6.6%) did not report their mammography screening history. Among those who reported that they ever had mammography,

Table 2. Summary of sociodemographic characteristics, panel B variable, N=303

(Panel B) Variable	n[a]	Mean (SD)	Mammography adherence[b], n=84		P[c]
			Mean (SD)		
			No	Yes	
Enabling factor (continuous)					
BC knowledge score[d]	273	.00 (1.00)	-.14 (.95)	.36 (1.05)	.0004
BC self-efficacy score[d]	286	.00 (1.00)	-.22 (.98)	.57 (.82)	<.0001
BC decisional balance score[d]	293	.00 (1.00)	-.21 (.99)	.54 (.81)	<.0001

a. The total number of observations for each variable may vary and be different from the total sample size due to missing values. However, the total numbers are consistent considering the number of observations with missing values.
b. Mammography adherence based on annual screening mammography.
c. P for t-test with unequal variances.
d. Standardized scores.

more than a third (n=84, 37.8%) were up-to-date with annual mammography, while about 28% reported having mammography between 1 to 3 years.

Factors Associated with Adherence to Mammography

Table 4 presents the result of a multiple logistic regression analysis of factors associated with participants having had a mammogram within the past year, including those with a cancer history for self. In the model, adherence to mammography screening was significantly associated with a need factor of a cancer history of self (OR=3.27, P<.05, 95% CI [1.29, 8.33]) and several enabling variables, including annual medical check-ups (OR=.17, P< .01, 95% CI [.06, .49]), self-efficacy (OR=2.06, P<.01, 95% CI [1.24, 3.41]), and decisional balance (OR=3.08, P<.001, 95% CI [1.86, 5.10]), respectively, compared with non-adherence to mammography. Table 4 also shows the results of a multiple logistic regression analysis of factors associated with having mammography screening within the past year among the participants, excluding those with a cancer history for self.

Discussion

We found low rates of adherence to the annual mammography screening among KA women. Nearly 40% of the participants had had a mammogram within the past year, and even if the screening period was extended up to two years, about half of the participants had had a mammogram. This rate is consistent with the literature, whereas more than 50% of non-Latina White, African American, and Hispanic/Latina women in the United States reported having mammography screening within the past year and more than 70% of non-Latina Whites and aggregated Asian Americans reported having mammography screening within the past two years.[21,22]

We also found significant differences in several factors of adherence and non-adherence to mammography screening among KA women. These differences offer primary health care professionals an essential understanding of their KA patients seeking BC screening in the community and development of strategies targeting those not seeking BC screening. For example, it is critical for primary health care providers to not only recommend mammography screening but also focus on promoting competency levels to complete screening and improving negative attitudes and beliefs about

Table 3. Mammography screening history

Have you ever had a mammography?	n (%)	N
Mammography ever	222 (73.27)	
Mammography never	61 (20.13)	303
Missing	20 (6.6)	
When did you have a mammography?	n (%)	N
Mammography within 1 year	84 (37.84)	
Mammography between 1 year and 2 years	33 (14.86)	
Mammography between 2 years and 3 years	29 (13.06)	
Mammography between 3 years and 5 years	24 (10.81)	222
Mammography 6 years or longer ago	43 (19.37)	
Missing	9 (4.05)	

Table 4. Logistic regression analysis[a]: Annual mammography adherence[b]

	Sample including a cancer history for self		Sample excluding cancer history for self	
	OR	**95% CI**	**OR**	**95% CI**
Predisposing factor				
Age	.95	(.89 – 1.01)	.95	(.89 – 1.02)
Marital status (married or partnered) (Ref: never married or other)	.44	(.17 – 1.12)	.43	(.15 – 1.18)
Need factor				
Self cancer history	3.27[d]	(1.29 – 8.33)	-	-
Family cancer history	1.61	(.72 – 3.60)	1.50	(.63 – 3.56)
Self-rated health status (Ref: very bad / bad)				
Moderate	1.56	(.38 – 6.48)	1.50	(.29 – 7.61)
Very good / good	1.76	(.39 – 7.96)	1.62	(.30 – 8.68)
Enabling factor				
Education (bachelor's degree) (Ref: <bachelor's degree)	.65	(.23 – 1.89)	.42	(.13 – 1.34)
Income (Ref: < $20,000)				
$20,000 - $39,999	2.12	(.57 – 7.80)	1.45	(.36 – 5.85)
$40,000 - $59,999	.35	(.07 – 1.67)	.34	(.06 – 1.81)
$60,000 - $79,999	.54	(.15 – 1.95)	.34	(.07 – 1.51)
$80,000 - $99,999	1.21	(.21 – 6.81)	1.13	(.19 – 6.71)
≥$100,000	.54	(.10 – 2.94)	.65	(.12 – 3.60)
Annual health check-up (Ref=no)	.17[e]	(.06 – 0.49)	.19[e]	(.06 – 0.56)
Health insurance (Ref=no)	.83	(.29 – 2.41)	.71	(.22 – 2.31)
Doctor recommendation	.92	(.35 – 2.41)	1.07	(.38 – 2.96)
English level (Ref: very poor/poor)				
Moderate	.93	(.32 – 2.69)	1.30	(.39 – 4.29)
Very good / good	1.17	(.26 – 5.14)	2.21	(.45 – 10.76)
BC knowledge score[c]	1.24	(.77 – 1.97)	1.12	(.70 – 1.78)
BC self-efficacy score[c]	2.06[e]	(1.24 – 3.41)	1.83[d]	(1.04 – 3.20)
BC decisional balance score[c]	3.08[f]	(1.86 – 5.10)	3.43[f]	(1.91 – 6.17)
Number of observations	185		215	
Wald x^2 test	40.74[e]		50.02[f]	
Pseudo R^2	.3371		.3690	

a. Heterogeneity robust standard errors are used
b. Mammography adherence based on annual screening mammography
c. Standardized scores
d. P<.05.
e. P<.01
f. P<.001.

screening among KA women not adhering to mammography.

Moreover, we found that several variables were associated with adherence to mammography screening among KA women. Prior research also supports the association of having BC screening with greater perceived self-efficacy and attitudes and beliefs regarding cancer screening, respectively.[13,23] These findings suggest the needs for collective efforts at structural and cultural levels for promoting BC screening among KA women. At the structural level, it is imperative for health care providers and policy makers to continue their collaborative efforts to improve KA women's self-efficacy. These efforts include lowering structural barriers to accessing BC screening services, including suboptimal health insurance coverage, poor English proficiency, and lack of transportation services that KA women often encounter in the community. At the cultural level, it is critical for health professionals to develop culturally appropriate interventions for increasing BC screening especially among non-U.S.-born KA women because culturally interwoven negative attitudes and beliefs regarding BC screening among KA women

impede their utilization of BC screening services. Suggested intervention models include training health professionals in culturally competent communication skills with KA patients to maintain regular screening.

Finally, we found a reverse association between having annual medical check-ups and adherence to mammography screening, which is inconsistent with the literature.[24] One explanation can be that the participants might confuse the event of annual medical check-ups with the event of annual mammography screening. Another explanation can be related to KA's specific beliefs mentioned earlier that no symptom of any cancer means no perceived need for screening or having regular medical check-ups prevents development of cancer. However, further research is warranted to clarify this association.

We found low rates of adherence to the annual mammography screening among KA women.

Limitations

Due to the nature of non-probability sampling, we can neither generalize the findings into overall KA women nor explain their causal-effect relationships. Future studies should build on probability sampling and a randomized controlled experimental design to more clearly explain the factors found in this study. Additionally, this study employed a self-report survey so the findings might be affected by recall bias of participants with poor memory or inability to accurately describe their past mammography screening, although we attempted to mitigate this bias by including detailed descriptions of BC screening. Lastly, while the Andersen's Model guided this study, different behavioral change theories might help better explain factors contributing to screening behavior in KA women.

Conclusion

Using the Andersen's Model, this study identified underutilization of mammography among KA women and several enabling factors associated with having mammography screening within the past year. Although these factors can play important roles in facilitating BC screening among KA women, it is notable for BC screening interventions and policy to ensure predisposing and need factors to fully function together when designing and implementing them. These collaborative efforts can contribute to reducing disparities in BC and its screening among KA women and enhancing their health outcomes.

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Conflict of Interest

No conflicts of interest to report.

Author Contributions

Research concept and design: Jin, H Lee, J Lee; Acquisition of data: Jin; Data analysis and interpretation: Jin, H Lee, J Lee; Manuscript draft: Jin, J Lee; Statistical expertise: J Lee; Acquisition of funding: Jin, H Lee; Administrative: H Lee, J Lee; Supervision: Jin, H Lee

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