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Breast Cancer Screening Practices Among First-Generation Immigrant Muslim Women

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Abstract

Background: The purpose of this study was to identify beliefs about breast cancer, screening practices, and factors associated with mammography use among first-generation immigrant Muslim women in Chicago, IL.
Methods: A convenience sample of 207 first-generation immigrant Muslim women (Middle Eastern 51%; South Asian 49%) completed a culturally adapted questionnaire developed from established instruments. The questionnaire was administered in Urdu, Hindi, Arabic, or English, based on participant preference. Internal-consistency reliability was demonstrated for all scales (alpha coefficients ranged from 0.64 to 0.91). Associations between enabling, predisposing, and need variables and the primary outcome of mammography use were explored by fitting logistic regression models.
Results: Although 70% of the women reported having had a mammogram at least once, only 52% had had one within the past 2 years. Four factors were significant predictors of ever having had a mammogram: years in the United States, self-efficacy, perceived importance of mammography, and intent to be screened. Five factors were significant predictors of adherence (having had a mammogram in the past 2 years): years in the United States, having a primary care provider, perceived importance of mammography, barriers, and intent to be screened.
Conclusions: This article sheds light on current screening practices and identifies theory-based constructs that facilitate and hinder Muslim women's participation in mammography screening. Our findings provide insights for reaching out particularly to new immigrants, developing patient education programs grounded in culturally appropriate approaches to address perceived barriers and building women's self-efficacy, as well as systems-level considerations for ensuring access to primary care providers.

Introduction

Breast cancer is a leading cause of death and disability globally and is the most commonly diagnosed cancer in women, regardless of race or ethnicity, in the United States.[1] Early detection of breast cancer is a key to reducing morbidity and mortality. Substantial increases in mammography use in the 1990s resulted in up to 30% reduction in mortality attributed to breast cancer.[2–8] Despite these advances, segments of our population have not benefited from cancer prevention and control efforts, and disparities in breast cancer screening and health outcomes persist for minority groups.[1,9–15] Low mammography use has been associated with a variety of factors, including not having a medical home, not having health insurance, being a recent immigrant, and having low levels of knowledge and awareness about breast cancer.[16–18]

Migration to Western countries and increased length of stay are associated with increased risk of breast cancer,[19] which in turn is attributed to a number of factors and is compounded by barriers to timely screening.[20] Ethnic-minority women residing in Western countries are more likely to be diagnosed with advanced-stage disease and hence have higher mortality rates.[21] This often results from lower utilization of timely breast cancer screening services.[22–26] Personalizing or tailoring education about mammography to

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patients' culture and beliefs has the potential to increase breast cancer prevention awareness and screening utilization.[27–33]

The purpose of this study was to identify beliefs about breast cancer, screening practices, and factors associated with mammography use among first-generation immigrant Muslim women (born outside the United States) in Chicago, IL. In the United States, immigrant Muslim women represent a fast-growing and understudied population whose healthcare behaviors and utilization of health services, including cancer screening, are influenced by religious and cultural beliefs.[34–38] There is a paucity of rigorous theory-based, descriptive, and intervention research on this population, and few studies have evaluated breast cancer incidence, stage, treatment, and mortality rates for Muslim women. Preliminary evidence suggests that Muslim women underutilize mammography.[34,39–40] More importantly, lack of cultural accommodation hinders Muslim women's utilization of mammography services. When breast cancer screening programs are not structured in a manner consistent with their beliefs and customs, Muslim women choose not to participate.[34,39–40]

The number of Muslims in the United States is estimated to be 2–6 million (47% women) and growing.[41–43] African American Muslims indigenous to the United States comprise the largest number of American Muslims. Apart from these, immigrant Muslims are extremely varied ethnically, coming from virtually every country where Muslims live. The largest group of Muslim immigrants in the United States is from South Asian (SA) countries (33%), followed by the Middle Eastern (ME) countries (25%).[44] Hence, these two immigrant groups were the focus of our research.

The limited literature on ME women indicates that breast cancer is a leading cause of cancer-related mortality in this group in their home countries, as well as when they immigrate to Western countries.[45–51] Within the United States, breast cancer is the most frequently diagnosed cancer among SA women in California.[52] In the United Kingdom, the risk of breast cancer among SA women differs according to their specific ethnic subgroup; Muslim women from India and Pakistan are almost twice as likely to develop breast cancer as their counterparts.[53] In Australia, immigrants from Pakistan, a country with a predominantly (95%) Muslim population,[54] present with the highest age-standardized breast cancer mortality rate.[55]

Multiple factors, such as language barriers; lack of medical insurance; geographical barriers; and limited knowledge, education, and access to healthcare services, contribute to barriers faced by immigrant women in accessing and utilizing healthcare.[56] In order to identify factors that influence Muslim women's decision making to engage in breast cancer screening, our study had the following three primary objectives:

1. Develop a culturally relevant survey to assess screening practices and to identify factors associated with mammography use by Muslim women.
2. Confirm psychometric properties of survey subscales in differing languages.
3. Explore the associations between mammography use and predisposing, enabling, and need variables.

Three theoretical models—the Andersen Behavioral Model of Health Services Utilization,[57,58] the Health Belief Model,[59–61] and the Transtheoretical Model[62–64]—were used to guide the development of the study.

Materials and Methods

Study design and setting

A cross-sectional study design was used to survey 215 first-generation immigrant Muslim women. The study was conducted in Chicago, IL, home to a large number of immigrant Muslims. According to estimates by the Council of Islamic Organizations of Greater Chicago, approximately 400,000 Muslims live in the Chicago area. Recruitment sites were several Chicago-based community agencies and faith-based institutions. Data collectors were bilingual or trilingual females and were trained research interviewers. Survey development and translation took place in 2008 and 2009; survey administration and data collection, in 2009 and 2010. The Institutional Review Board of the University of Illinois at Chicago approved this study.

Measures and survey development

A written survey was developed to collect information on two sets of core measures:

1. Breast cancer screening practices, with mammography the primary dependent variable. Participants were asked about their past mammography use and future intent to screen in order to assess stage of readiness. Mammography use was categorized as (a) never having had a mammogram (never-screened group), (b) having had at least one mammogram but none in the past 2 years (overdue group), and (c) having had a mammogram in the past 2 years (adherent group). For our study, the National Cancer Institute recommendations for breast cancer screening were used to define adherence: mammogram screening every 1–2 years, beginning at age 40.[64]
2. Predictors of mammography screening, organized into predisposing, enabling, and need categories (see Table 1).

Three instruments—the Champion Breast Health Survey,[65] Ferrans Cultural Beliefs Scale,[66] and Suinn-Lew Asian Self-Identity Acculturation Scale (SL-ASIA)[67]—were adapted, combined into one survey, and translated into the study languages (Urdu, Hindi, and Arabic). Focus groups were conducted to confirm that the survey items were understandable and culturally relevant to the target population (described later).

Champion Breast Health Survey. The widely used subscales for breast cancer screening beliefs (perceived susceptibility, perceived benefits, perceived barriers, and perceived self-efficacy), with established reliability and validity,[68] were included in our study. All subscales have good internal consistency reliability (Cronbach's alphas greater than 0.70) and construct validity (demonstrated by confirmatory factor analysis; all subscales were unidimensional).

Ferrans Cultural Beliefs Scale. This scale, which measures cultural beliefs about breast cancer, has previously been tested with African American, Hispanic, and Caucasian women. The instrument focuses on beliefs in three content

Table 1. Predictors of Mammography Use

Predisposing	*Enabling*	*Need*
• Perceived risk (susceptibility)[a] for developing breast cancer • Perceived benefits[a]— positive outcomes associated with screening for breast cancer • Perceived barriers[a]—obstacles associated with breast cancer screening • Self-efficacy[a]—self-confidence in one's ability to get a mammogram • Knowledge[a]—cognitive information about breast cancer risk, screening recommendations, causes, treatment, and cure • Emotional factors—fear and shame associated with breast cancer and mammography screening • Cultural factors[b]—cultural beliefs regarding breast cancer • Global rating of importance of mammography—self-perceived overall importance of the need for getting a mammogram	• Education • Income • Insurance—third-party payer of healthcare costs • Acculturation[c]—modification of the culture of a group or individual as a result of contact with a different culture	• Self-perceived health status • Physician recommendation—patients' perception of recommendation by their respective providers to screen

[a]Source: Champion Breast Health Survey[65] modified/refined via focus groups.
[b]Source: Ferrans Cultural Beliefs Scale.[66]
[c]Source: Suinn-Lew Asian Self-Identity Acculturation Scale (SL-ASIA).[67]

areas: those that make women feel less vulnerable to breast cancer, those that discourage participation in breast cancer screening, and those about the lack of efficacy of breast cancer treatment. Higher scores on the Ferrans scale indicated that more cultural myths inhibiting screening were believed. The scale has demonstrated reliability (alpha = 0.73) and validity in the populations tested.[69]

Suinn-Lew Asian Self-Identity Acculturation Scale. The SL-ASIA[67] was originally modeled after the Acculturation Rating Scale for Mexican Americans[70] and has been developed for and extensively tested with East Asian groups. The measurement approach recognizes the multidimensionality of the acculturation process and takes into account the issue of bicultural development. The instrument assesses cognitive, behavioral, and attitudinal areas, and its 21 multiple-choice questions yield five factors and a single acculturation score that range from 1:00 (low acculturation) to 5:00 (high acculturation). The scale demonstrated internal consistency reliability (Cronbach's alpha: 0.88–0.91 in two studies) and concurrent validity.[67] The questions in the scale are generic; to make the scale more relevant to our study population, we changed country/region names to represent those of our study population.

Global rating of importance of mammography screening. A 10-point Likert-type scale measuring global rating of the importance of regularly getting mammograms (ranging from ''not at all important'' to ''very important'') developed for this study was also included in the survey.

Cultural adaptation and refinement of survey via focus groups. To account for regional and ethnic differences in beliefs and to add culturally relevant content, two focus groups were conducted (one each for SA and ME women), with 10–12 participants in each group. To be eligible to participate in the focus groups, participants had to be female, Muslim (defined as those who self-identify with the Islamic faith), aged 40 years or older, first-generation immigrants (18 years or older on arrival in the United States) from the Middle East or South Asia and able to read, write, and speak English and one of the study languages (Urdu, Hindi, Arabic). Two of the study authors (Memoona Hasnain and Usha Menon, who are fluent in Urdu and Hindi), moderated the focus groups. An Arabic-language translator participated in the Middle Eastern focus group. We used a semistructured format to refine survey items and to identify new items. The process was used to confirm that the survey items were understandable and culturally relevant to the target population. Based on participant input, the Champion scales were adapted; some of the items were reworded, some items were removed, and others were added. See Appendix 1 for the modified Champion scales. No changes were made to the Ferrans Cultural Beliefs Scale and SL-ASIA; both were determined to be understandable and culturally appropriate by the focus groups in their original form.

Translation of survey. To address language barriers, the culturally adapted survey and other study documents (informational flyer and consent brochure) were translated into Urdu, Hindi, and Arabic. The committee-translation method[71] was utilized, as it is a more rigorous process than using a single translator. A translation team consisting of three translators and a language expert (adjudicator) was established for each language to guide the translation. This systematic development of study survey and other documents

increased the likelihood of developing a culturally appropriate and psychometrically sound survey.

Sample and data collection

Sample size. A sample size of 230 participants (115 per ethnic group) was planned on the basis of recommendations by Nunnally[72] for measurement reliability. To account for incomplete data, we planned to oversample by 9% for a total 250 participants.

First-generation immigrant Muslim women (same eligibility criteria as for those who participated in the focus groups) were eligible for the study. Given the exploratory nature of this study, self-reported mammography-screening practices were not verified via medical records.

Recruitment and data-collection procedures. Participants were selected from a purposive sample of Muslim women residing in Chicago, IL. Participant recruitment and data-collection procedures were standardized and kept similar for both SA and ME women. Study flyers, in English and translated languages, inviting participation were circulated electronically and posted in community agencies and mosques. Trained research assistants approached women at community sites and used snowball sampling to accrue the proposed sample size. After obtaining full written informed consent, the in-person survey was administered to eligible participants at data-collection sites. Participants received a small monetary incentive to participate in the study.

Statistical analyses

In addition to psychometric assessment (reliability and validity) of the various scales used in each of the three language groups, descriptive statistics, bivariate correlations, contingency-table analyses, analyses of variance (ANOVAs), and hierarchically nested logistic regression models were conducted. Owing to the significant differences in screening behavior based on ethnicity, we stratified by ethnicity for all bivariate analyses. For each outcome—(1) ever having had a mammogram versus not and (2) adhering to mammogram guidelines (mammogram within the past 2 years) versus not—modeling began with all sociodemographic characteristics. Model 2 contained only cultural and health-related predictors. Model 3 included all sociodemographic and cultural and health-related predictors significant in Models 1 and 2 at alpha = 0.10. We then tested for statistical interactions as was necessary. The sample size was insufficient to fit separate logistic models for ME and SA women. Therefore, we tested for ethnicity in the models. Finally, only one participant completed the survey in Hindi, precluding psychometric analysis for data collected in that language; hence, data from the Hindi survey were not included in the analysis. Data analysis was performed using SPSS v. 21 (IBM, New York).

Psychometric analyses

Each of the established scales, translated into Urdu and Arabic from English, was examined for reliability (internal consistency) and validity (correlations) within and across each language group. More than one-third of the participants completed the survey in English (38.2%, $n = 79$), one-third in Arabic (35.3%, $n = 73$), and about one-fourth in Urdu (26.1%, $n = 54$). Every subscale was internally consistent, with alpha coefficients ranging from 0.72 to 0.92, and constructs expected to be related were significantly appropriately correlated (e.g., benefits and self-efficacy $r = 0.53$, $p < 0.001$, barriers and cultural beliefs $r = 0.39$, $p < 0.001$). There were no significant differences based on the language of the survey, so we analyzed the combined data.

Results

Sample characteristics

The 207 participants had emigrated from 13 South Asian and Middle Eastern nations: The largest proportions were from Pakistan (30%, $n = 65$), Palestine (21%, $n = 45$), and India (17%, $n = 37$). Although 37% ($n = 80$) spoke primarily English, 35% ($n = 75$) spoke primarily Arabic, and 27% ($n = 59$) spoke primarily Urdu. The majority of participants were married (85%, $n = 183$), with a mean age of 52 years (standard deviation [SD] = 10.0). Almost one-third of the participants (31%, $n = 66$) were college graduates, and one-third (30%, $n = 65$) had a high school diploma. More than one-third (42%, $n = 90$) reported incomes less than $20,000, and one-third (34%, $n = 70$) reported having health insurance. In terms of mammography-screening practice (Table 2), 32% ($n = 66$) had never had a mammogram (never-screened group); 17% ($n = 37$) had had a mammogram but more than 2 years prior to the survey (overdue group); and 52% ($n = 112$) had had a mammogram within the past 2 years (adherent group). Only 20% ($n = 44$) reported a family history of breast cancer.

Bivariate analyses

There were significant differences in mammography-screening practice based on sociodemographic characteristics. For both the ME and SA groups, women in the never-screened group had been in the United States for significantly fewer years than those in both the overdue group and the adherent group ($F_{(2,105)} = 3.3$, $p < 0.05$, $F_{(2,102)} = 3.1$, $p < 0.05$). Fifty-seven (72.2%) ME and 36 (52.1%) SA women in the adherent group reported having a primary care provider, in contrast to only 15 (19%) ME and 20 (20.9%) SA in the never-screened group ($\chi 2_{(df=1)} = 11.5$, $p < 0.01$, $\chi 2_{(df=1)} = 11.0$, $p < 0.01$). In addition, adherent participants rated the importance of being screened significantly higher than did the overdue and never-screened groups ($F_{(2,105)} = 6.0$, $p < 0.001$, $F_{(2,102)} = 5.5$, $p < 0.001$).

In the bivariate analyses, there also were significant differences in screening behavior based on ethnicity. First, only 26 (23.6%) ME women had never been screened, as compared to 40 (38.1%) SA women. Similarly, 69 (62.7%) ME women were adherent to guidelines, as compared to only 43 (41.0%) of SA women ($\chi 2_{(df=1)} = 10.2$, $p < 0.01$). Second, only for SA women was greater acculturation significantly associated with being screened ($F_{(2,102)} = 3.1$, $p < 0.05$). There were significant differences in mammography-screening practices as a function of beliefs for SA women (benefits, self-efficacy, and cultural beliefs; see Table 3). However, significantly lower barriers were reported by adherent participants in both the ME and SA groups.

Table 2. Health-Related Characteristics of Study Participants by Ethnicity

	Never screened (never had mammogram) n = *26* *mean (SD)*	*Overdue (mammogram > 2 years ago)* n = *16* *mean (SD)*	*Adherent (mammogram within past 2 years)* n = *59* *mean (SD)*	*Test statistic*
Middle Eastern				
Age	50.2 (10.1)	51.0 (7.9)	52.7 (10.0)	ns
Years in United States	15.6 (10.5)	23.4 (10.7)	21.9 (10.9)	$F_{(2,100)} = 3.3$[a]
Acculturation score	1.7 (.56)	1.5 (.43)	1.8 (.45)	ns
Self-perceived general health	2.6 (1.2)	2.3 (1.4)	2.7 (1.1)	ns
Global rating of importance of getting a mammogram	7.6 (2.9)	9.5 (1.4)	9.2 (1.8)	$F_{(2,107)} = 6.0$[b]
	Count (%)	*Count (%)*	*Count (%)*	
Have a primary care provider	15 (19)	7 (8.9)	57 (72.2)	$\chi^2 = 11.5$[b]
Family history of breast cancer	3 (17.6)	3 (17.6)	11 (64.7)	ns
	Never screened n = *40* *mean (SD)*	*Overdue* n = *22* *mean (SD)*	*Adherent* n = *43* *mean (SD)*	*Test statistic*
South Asian				
Age	53.1 (11.3)	54.8 (8.8)	51.2 (9.3)	ns
Years in United States	12.7 (8.7)	17.2 (8.2)	18.0 (8.5)	$F_{(2,92)} = 3.6$[a]
Acculturation score	1.6 (.47)	1.7 (0.44)	1.8 (.40)	$F_{(2,102)} = 3.0$[a]
Self-perceived general health	3.0 (1.1)	3.1 (1.1)	3.0 (1.0)	ns
Global rating of importance of getting a mammogram	5.9 (3.8)	7.5 (3.5)	8.4 (3.0)	$F_{(2,102)} = 5.5$[b]
	Count (%)	*Count (%)*	*Count (%)*	
Have a primary care provider	20 (29)	13 (18.8)	36 (52.2)	$\chi^2 = 11.0$[b]
Family history of breast cancer	11 (40.7)	7 (25.9)	9 (33.3)	ns

[a] $p < 0.05$.
[b] $p < 0.01$.
ns, not significant; SD, standard deviation.

Multivariate analyses

To identify the predictors of ever having had a mammogram, women who had never been screened were compared with those who had had at least one mammogram (both those who were overdue and those who were adherent). As presented in Table 4, in Model 3, controlling for insurance and income, there were four significant predictors of ever having had a mammogram: (1) years in the United States (adjusted OR [AOR] = 1.1), (2) perceived importance of being screened (AOR = 1.3), (3) self-efficacy (AOR = 2.4), and (4) intent to be screened (AOR = 2.2). Although the effect of time since immigration was negligible, a positive difference of 1 point in perceived importance of mammograms was associated with 1.3 times the odds of being screened. Those who reported greater self-efficacy by 1 point had 2.4 times the odds of having had a mammogram, and those who indicated intent to be screened had more than twice the odds of having been screened in the past. Finally, there was no effect of ethnicity. The model explained slightly more than a third of the variance (Nagelkerke $R^2 = 0.36$).

To identify the predictors of adherence, women who were adherent were compared with those who had not had a mammogram in the past 2 years (both those who had never been screened and those who were overdue). As presented in Table 5, in Model 3, controlling for insurance and income, there were five significant predictors of being adherent: (1) years in the United States (AOR = 1.1), (2) having a primary care provider (AOR = 1.3), (3) barriers (AOR = –0.52), (4) the perceived importance of screening (AOR = 1.2), and (5) intent to be screened (AOR = 2.2). Although the effect of time since immigration was, again, negligible, those who had a primary care provider had 1.3 times the odds of being adherent. A positive difference of 1 point in barriers was associated with half the odds of being adherent. Perceived importance was associated with 1.2 times the odds of being adherent, and those who indicated intent to be screened had more than twice the odds of being adherent. There was no effect of ethnicity. The model explained slightly less than a third of the variance (Nagelkerke $R^2 = 0.28$).

Discussion

The provision of culturally appropriate, patient-centered cancer-screening education has not yet been fully explored for immigrant Muslim women in the United States, an especially vulnerable population, given their increasing numbers and unique cultural beliefs. This study sought to explore breast cancer screening practices and factors associated with mammography screening among a study sample

Table 3. Self-Ratings on Beliefs Related to Breast Cancer Screening Behavior

	Never screened n = *62* *mean (SD)*	*Overdue* n = *36* *mean (SD)*	*Adherent* n = *109* *mean (SD)*	F-*test statistic*
Middle Eastern				
Champion subscales				
Benefits	4.3 (.56)	4.2 (.70)	4.1 (.83)	ns
Barriers	2.6 (.44)	2.3 (.49)	2.2 (.60)	$F_{(2,102)} = 3.4$[a]
Self-efficacy	3.7 (.95)	4.2 (.38)	4.1 (.68)	ns
Susceptibility	3.0 (.91)	2.8 (1.1)	3.0 (.95)	ns
Fear/shame	3.3 (.84)	2.8 (1.2)	3.4 (.88)	ns
Ferrans cultural beliefs	4.2 (3.5)	5.3 (4.0)	4.0 (2.9)	ns
	n = *62* *mean (SD)*	n = *36* *mean (SD)*	n = *109* *mean (SD)*	
South Asian				
Champion subscales				
Benefits	3.7 (.92)	4.1 (.75)	4.1 (.67)	$F_{(2,102)} = 3.5$[a]
Barriers	2.8 (.61)	3.0 (.78)	2.6 (.58)	$F_{(2,102)} = 3.4$[a]
Self-efficacy	3.9 (.65)	4.3 (.51)	4.3 (.56)	$F_{(2,102)} = 6.5$[b]
Susceptibility	2.5 (.92)	2.8 (.78)	2.9 (.90)	ns
Fear/shame	3.5 (.92)	3.7 (1.3)	3.2 (1.0)	ns
Ferrans cultural beliefs	7.2 (3.8)	6.5 (4.4)	5.0 (3.2)	$F_{(2,102)} = 3.6$[a]

[a] $p < 0.05$.
[b] $p < 0.01$.

Table 4. Predictors of Ever Having Had a Mammogram

Variable	*Model 1* *AOR (CI)*	*Model 2* *AOR (CI)*	*Model 3* *AOR (CI)*
Demographics			
Partner	1.2 (0.43–3.4)		
Income			
< $20,000	Referent		
$20,000–$75,000	1.5 (0.67–3.4)		0.36 (0.06–2.17)
> $75,000	1.4 (0.43–4.8)		0.48 (0.09–2.71)
Insurance	0.88 (0.38–2.0)		1.18 (.37–3.78)
Education			
High school or less	Referent		
Bachelor degree or more	2.0 (0.25–10.9)		
Years in the United States	1.1 (1.0–1.1)[a]		1.1 (1.0–1.1)[a]
Primary healthcare provider	0.43 (0.20–0.93)		
Ethnicity	0.31 (0.08–1.2)		1.1 (0.50–2.5)
Language			
English	Referent		
Urdu	2.4 (0.66–8.8)		
Arabic	2.7 (0.57–12.9)		
Family history of breast cancer		0.87 (0.38–1.9)	
Mammogram importance		1.2 (1.08–1.33)[b]	1.3 (1.1–1.4)[c]
Self–health assessment		0.93 (0.68–1.3)	
Benefits		0.84 (0.35–1.3)	
Barriers		0.67 (0.35–1.3)	
Self-efficacy		2.7 (1.5–4.9)[b]	2.4 (1.4–4.4)[b]
Susceptibility		1.1 (0.78–1.9)	
Fear		1.0 (0.73–1.5)	
Cultural beliefs		1.0 (0.90–1.1)	
Acculturation		1.3 (0.56–2.9)	
Intent to be screened		2.7 (1.4–5.4)[b]	2.2 (1.0–5.0)[b]

[a] $p < 0.05$.
[b] $p < 0.01$.
[c] $p < 0.001$.
Pseudo $R^2 = 36\%$.
AOR, adjusted odds ratio; CI, confidence interval.

Table 5. Predictors of Adherence to Screening Guidelines (Mammogram Within the Past 2 Years)

Variable	*Model 1 Adjusted OR (CI)*	*Model 2 Unadjusted OR (CI)*	*Model 3 Adjusted OR (CI)*
Demographics			
Partner	1.3 (0.48–3.2)		
Income			
< $20,000	Referent		
$20,000–$75000	1.0 (0.48–2.2)		0.36 (0.06–2.17)
> $75,000	0.80 (0.27–2.4)		0.48 (0.09–2.71)
Insurance	1.96 (0.91–4.2)		1.18 (0.37–3.78)
Education			
High school or less	Referent		
Bachelor degree or more	0.55 (0.12–2.5)		
Years in the United States	1.0 (1.0–1.12)[a]		1.08 (1.03–1.14)[c]
Primary care provider	1.3 (1.0–1.6)[b]		1.3 (1.1–1.7)[b]
Ethnicity	0.37 (0.12–2.5)		
Language			
English	Referent		
Urdu	2.4 (0.66–8.8)		
Arabic	2.7 (0.57–12.9)		
Family history of breast cancer		1.4 (0.64–3.0)	
Mammogram importance		1.1 (1.0–1.3)[a]	1.2 (1.0–1.3)[a]
Self–health assessment		0.83 (0.62–1.1)	
Benefits		0.77 (0.47–1.3)	
Barriers		−0.40 (0.22–0.75)[b]	−0.52 (0.31–0.89)[a]
Self-efficacy		1.6 (0.92–2.38)	
Susceptibility		1.3 (0.89–1.8)	
Fear		1.3 (0.93–1.9)	
Cultural beliefs		1.0 (0.90–1.1)	
Acculturation		1.9 (0.87–4.2)	
Intent to be screened		3.3 (1.7–6.4)[b]	2.2 (1.1–4.20)[b]

[a] $p < 0.05$.
[b] $p < 0.01$.
[c] $p < 0.001$.
Pseudo $R^2 = 28\%$

that represented two of the largest groups of immigrant Muslims in the United States: those from South Asia and the Middle East. In our sample, only 52% of women reported screening in the past 2 years, which is substantially lower than the national figure of 67% (all women, not limited to Muslims) for the data-collection period of 2009–2010.[73] A greater proportion of ME women had had a mammogram within the past 2 years compared with their SA counterparts, although ethnicity was not a significant predictor of adherence. Previous evidence from prevalence studies of Arab American women in the Detroit region indicates mammography-screening rates close to 70%.[74–75] Lower mammography rates, however, have been found when specifically looking at Muslim women over age 40 in southern California,[76] where 46% had not had a mammogram in the past 2 years.

In the multivariate analysis, the predictors of ever having had a mammogram were years in the United States, self-efficacy, perceived importance of mammography, and intent to be screened. Adherence to screening guidelines (screening in the past 2 years) was predicted by three of those same variables (years in the United States, perceived importance of mammography, intent to be screened), along with two additional predictors (having a primary care provider and barriers to screening). Thus, our findings are similar to those in previous studies reporting that physician recommendation, acculturation and length of stay in the United States, and barriers to mammography were significantly associated with screening behavior.[16,25,37,77–84]

Self-efficacy is a key variable in the Health Belief Model (HBM). Interestingly, self-efficacy was significant in distinguishing between women who had never had a mammogram and those who had had at least one but was not a predictor for adherence to screening guidelines. Thus, for this sample, the findings indicate that ever having obtained a mammogram made women confident in their ability to get one, but this confidence was insufficient to produce adherent screening behavior that would take these women from the stage of ''action'' to that of ''maintenance'' in the Transtheoretical Model.

Barriers, another key variable of the HBM, was a significant predictor of adherence. This variable distinguished between those who were successful in timely screening and those who did not, providing insights for future work focused on reducing and eliminating barriers to mammography.

Implications

Immigrant Muslim women in the United States represent a unique and fast-growing population whose healthcare behaviors, including breast cancer screening practices, are significantly influenced by past beliefs and experiences.[34–38] Considering that mammograms are not part of the routine screening process in public hospitals in their home countries

and are usually recommended only as part of the diagnostic workup after a lump has been detected, raising awareness of the importance of routine and regular screening is vitally important. When designing breast cancer screening programs for immigrant Muslim women, our findings indicate that increasing both self-efficacy and intention to be screened is essential, as well as ensuring the provision of a primary healthcare provider. Our findings also highlight the need for reaching out to recently migrated Muslim women and conveying the importance of regular screening, emphasizing the message that it is not enough to get screened once or sporadically. This will require providing culturally sensitive and specific information, as well as supportive services, such as health care system navigation, to assist women in overcoming barriers and finding a medical home.

Study limitations

In any study of health behavior, there is always the possibility that self-reported health behavior may be over- or underreported. In research settings, participants commonly overreport health screening use; validity of self-report for mammography ranges from 49% to 94%.[85–86] This factor should be taken into consideration when drawing conclusions from self-reported breast cancer screening. For our study, this means that actual participation in mammography for this group of Muslim women may have been lower than our figures indicate. Further, the external validity of our study is limited because of the moderate sample size, as well as the fact that we used a convenience sample. For an exploratory study, however, we believe that it was appropriate to test the translated survey with a small sample, which has provided information about moving forward with additional descriptive and interventional studies with larger, more representative samples of immigrant Muslim women.

Conclusions

Breast cancer screening rates for underserved and minority women must be increased in the United States, as early and regular mammography screening is critical to reducing breast cancer–related morbidity and mortality. This study provides the important and currently unavailable information about theory-based factors associated with Muslim women's participation in mammography screening. The findings of this study are intended to encourage future research to develop and test culturally appropriate, patient-centered strategies for promoting timely and regular breast cancer screening and therapeutic services for immigrant Muslim women, as well as for other minority immigrant women in the United States.

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(*Appendix follows* →)

Appendix 1. Culturally Adapted Champion Scales, Based on Focus-Group Input

Susceptibility	1. You are likely to get breast cancer in the next few years. 2. You are likely to get breast cancer. 3. You will get breast cancer sometime during your life.
Benefits	1. If you have regular mammograms, you won't worry as much about dying from breast cancer. 2. If you have breast cancer found through regular mammograms, your chances of being cured are good. 3. Having regular mammograms will help you find breast cancer early when it starts.[a] 4. Having regular mammograms will set your mind at ease.
Self-efficacy	1. You can ask your doctor for a mammogram even if the doctor does not mention it.[a] 2. You can get to the clinic to have a mammogram.[a] 3. You can make time in your life to have a mammogram.[a] 4. You can talk to people at the mammogram center if you have a problem. 5. You can go for a mammogram even if you are worried. 6. You can go for a mammogram even if you don't know what to expect during the test.[a] 7. You can get a mammogram even if you can't afford it.[a] 8. You can make an appointment for a mammogram. 9. You can get a mammogram if you really want to. 10. You can find a place to get a mammogram
Barriers	1. The treatment for breast cancer is worse than breast cancer itself. 2. You are too old to have a mammogram. 3. You are afraid to get a mammogram because it may find a problem in your breast.[a] 4. Having a mammogram is too difficult.[a] 5. Having a mammogram would cause too much pain. 6. Having a mammogram would be too embarrassing. 7. Worry about being exposed to harmful radiation keeps you from having a mammogram.[a] 8. You have difficulty remembering to make an appointment for a mammogram. 9. You are worried about having a mammogram because you don't understand how the test is done.[a] 10. It is difficult for you to get transportation to go for a mammogram.[a] 11. It is difficult for you to get child care to go for a mammogram.[a] 12. You don't have time to get a mammogram. 13. You don't have a convenient place to get a mammogram. 14. Compared with your other health problems, having a mammogram is not important. 15. You don't want to get a mammogram because if you have breast cancer it is better not to know about it. 16. You wouldn't get a mammogram because it costs too much. 17. You are afraid to have a mammogram because it may show a problem. 18. You don't want to get a mammogram because people you know don't think it is necessary. 19. You don't think a mammogram is necessary if you have a breast exam by a doctor. 20. You don't think a mammogram is necessary because a doctor didn't recommend one. 21. You don't need a mammogram because your chances of getting breast cancer are low. 22. You wouldn't want to go for a mammogram if it was done by a male provider.[b] 23. You wouldn't want to go for a mammogram unless the clinic has private space for mammography patients.[b]
Emotional (fear and shame)	1. When you think about breast cancer, you get scared. 2. When you think about breast cancer, you get worried. 3. When you think about breast cancer, you get depressed. 4. Thinking about breast cancer is shameful.[b]

[a]Item reworded per input from focus group participants.

[b]New items:

Susceptibility: reworded items (0), new items (0), deleted items (2). Your chances of getting breast cancer are higher than most women your age. Your chances of getting breast cancer are lower than most women your age.

Benefits: reworded items (1), new items (0), deleted Items (0).

Self-efficacy: reworded items (5), new items (0), deleted items (0).

Barriers: reworded items (6), new items (2), deleted items (1). Getting a mammogram could cause breast cancer because the breasts are squeezed.

Emotional (fear and shame): reworded items (0), new items (1), deleted items (4): When you think about breast cancer, you feel nervous. When you think about breast cancer, you get upset. When you think about breast cancer, you get edgy. When you think about breast cancer, your heart beats faster.