Tendency to Breast Cancer Screening Among Rural Women in Southern Iran: A Structural Equation Modeling (SEM) Analysis of Theory of Planned Behavior

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ABSTRACT

BACKGROUND: Early detection of breast cancer is a crucial factor in surviving the disease. This study aimed to investigate the mammography screening based on the theory of planned behavior (TPB) among rural women in Fasa and Shiraz cities, Iran.

METHODS: This study is a cross-sectional study performed on 800 female clients referring to rural health centers in Fasa and Shiraz cities in southern Iran in early 2021. The authors decided to send and distribute the electronic questionnaire form through the WhatsApp application in collaboration with the health staff of rural health centers for the people covered by these centers. Data gathering tools were a questionnaire on demographic characteristics, a questionnaire based on constructs of TPB, and behavior of mammography screening. Using the structural equation model (SEM), the TPB constructs and demographic variables were entered into the model. Data analysis was executed employing SPSS software version 26 and Amos version 24 (IBM Co., Ann Arbor, MI, USA). Analyzing the data was carried out using the 1-way analysis of variance (ANOVA), logistic regression, and structural equation analysis. During data analysis, various model indicators such as the goodness of fit, including comparative fit index (CFI), goodness-of-fit index (GFI), root mean square error of approximation (RMSEA), and chi-square index/df were evaluated. The significance level in all tests was considered 0.05.

RESULTS: The knowledge, attitude, and perceived behavioral control were the predictors of intention and behavior of mammography screening among the women. Among demographic variables, age, literacy, being menopausal, cancer in family, city, and ethnicity contribute more to the variance variation in TPB constructs. In this study, 7.2% of Persians, 8% of Qashqai Turks, and 4.5% of Arabs are contemplating going to mammography screening. In total, 6.8% (54 people) of all individuals intended to go mammography screening, and 5.4% (43 people) had a history of mammography screening. Goodness-of-fit indices ($\chi^2 = 18.45$, $df = 10$, n = 800, $\chi^2/df = 1.845$, RMSEA = 0.032, GFI = 0.90, non-normed fit index (NNFI) = 0.91) of conceptual model of this study indicate the suitability of the model.

CONCLUSIONS: The results of the study indicated that the constructs of the TPB can predict mammography screening behaviors in rural women. It has also demonstrated that mammographic behavior can be improved in rural women using education based on the TPB model, emphasizing critical psychological factors of creating or changing behavior.

KEYWORDS: TPB model, breast cancer, mammography, women

Background

Breast cancer (BC) has been known as the main cause of death among women and most accepted neoplasm present in around the world among them.[1] According to the World Health Organization, BC accounts for about 30% of all cancers in women, and about 2.1 million women worldwide are diagnosed with BC each year.[2] The global incidence trend of this cancer is rising as in the Middle East. Iran is not an exception.[3] In Iran, BC ranks first among malignancies diagnosed in females, comprising 24.4% of all cancers with an ASR (age-standardized rate) of 23.1 per 100000,[3,4] and it is the fifth most common cause of death related to cancers.[3] According to the new statistics in Iran, 6160 breast malignancies are diagnosed every year, and 1063 cases cause death.[5] Iran, as a developing country, faces an increment in BC.[3-5] The highest prevalence of BC in Iranian women is between the ages of 40 to 49 years and after the age of 80 years.[4-6] Early detection of BC is a crucial factor in surviving the disease.[7] Early diagnosis of the disease increases the chances of 5-year survival of patients (75% to 90%) compared with diagnosis in the advanced stages of the disease.

However, diagnosis in the second stage of the disease reduces the probability of 5-year survival by 16% compare with early stage.[8] Recent studies have indicated that thanks to early detection, BC deaths in the United States had dropped by about 34% between 1990 and 2013. Besides, in Europe, it is reported that between 25% and 31% of deaths are due to BC

among cancer cases.[9,10] Although mammography has increased significantly in the last 30 years, it is still lower than recommended in many societies.[11] Preventive screening is the most critical effort to promote health in diseases.[12] Usually, due to the late diagnosis, the most reported tumors related to BC are among Asian and American women.[13] Current guidelines recommend screening women more than 40 years, yet many women still refuse to do it periodically.[14] The World Health Organization recommends appropriate training and timely screening to prevent BC.[15] But there are many factors that may explain lack of screening, such as fear of cancer, belief in destiny, insufficient awareness, language barriers, and cultural barriers, such as feeling ashamed of screening for mammography.[16] Also, the lack of available information resources, the transportation system's weakness in reaching screening centers, and the scarcity of specialized staff have perpetuated this issue.[17] More than 90% of women are not well-acquainted with mammography's benefits and its role in mortality reduction.[18] Accordingly, adequate guidance for women is an essential factor in alleviating these inequalities in information and awareness, and access to facilities.[19] Furthermore, mitigating the death rate caused by BC employing regular mammography is a great challenge, and at the same time, a desirable, cost-effective issue for promoting women's health.[20] Mammography is the most sensitive and specialized test for BC's early detection.[21] Randomized trials and incidence-primarily based totally mortality research of provider screening programs have established a considerable deduction in BC mortality related to an invitation to and participation in mammographic screening.[22] The Saadat et al's[23] study demonstrated that among the participants, who were 40 years old and older, only 3.7% underwent annual mammography, and only 22% of those aged more than 45 years old underwent mammography every 3 years. Puharić et al indicated that among the 57 428 women invited to mammography screening in BBC (bilateral breast cancer) during 9 years, 31 402 mammograms in total were performed. The response rate of 84% in BBC was consistently higher than the national average of approximately 60% reported in 2007, 2013, and 2014, and according to Su et al, having a physician recommending mammography was the only predictor of this behavior among Chinese-American women.[24,25] Brown Sofair and Lehlbach[26] indicated that the lack of health insurance, the unavailability of care, the fear of radiotherapy, predicting and waiting for pain, fear of test results, cultural barriers, and misconceptions regarding BC play an important part in reducing mammography among women. There are various reasons behind the low rate of BC screening behaviors in Iran: the fear of receiving harmful radiation during mammography,[27] not feeling any problem in their breast,[28,29] not feeling the need for it, not having a doctor's advice to get a mammogram,[30,31] not having the necessary opportunity to have a mammogram,[32] disregard for their health status, destiny,[31] the lack of social norms[30] due to not having mammography by friends and acquaintances, inadequate knowledge regarding the nature of the disease,[33] having distrust of the health policies and guidelines,[34] limited access to mammography equipment,[35] traffic problems to the mammography center,[31,34] and pain following the mammography.[36] Given the problems in creating, maintaining, and sustaining mammography screening behavior and its complexity, it is of paramount importance to employ the behavioral change theories and models in this field due to their capability in identifying the primary factors affecting the desired behavior. Theories also help us recognize the factors emphasized in interventions. In other words, they are advantageous in identifying the elements and parameters worth being considered as the main focus of interventions.[37] One theory helping identify the contributing factors to behavior is the theory of planned behavior (TPB), used in many studies, including teaching healthy behaviors, family planning, and BC.[38] The health belief model (HBM) to create behaviors pays attention to the individual's beliefs and shows a special disregard for social factors that play a significant role in creating behavior, and therefore is criticized.[39] In contrast, the pattern of planned behavior pays attention to social factors such as social norms and motivation to follow important people, and therefore, many studies consider it an important factor in accepting desirable behaviors such as mammography.[40] Based on previous studies, mammography is influenced by cultural values and beliefs.[41] As a result, this model can study the behavior from a cultural point of view and, in this regard, can lead to more promotion of mammography than the pattern of health belief.[42]

This theory states that attitudes toward behavior, subjective norms, and perceived behavior control are the 3 principal determinants of intent to perform the behavior.[38] The TPB's foundation includes behavior-intentional, attitude toward behavior, subjective norms, and perceived behavioral control. According to the TPB, intention is determined by 3 factors as follows: attitude toward the behavior, subjective norms, and perceived behavioral control. In this theory, the behavior or behavioral intention is subject to the factors beyond the individuals' control, such as environment and social and cultural factors.[38-43] In the study of Babazadeh et al,[44] knowledge and attitude were able to predict 41% of behavioral intention changes. And the demographic variable of age had a significant relationship with attitude.

However, various studies have demonstrated a low level of Iranian women's awareness about BC screening.[45,46] But Ahmadian et al[30] state that women who have mammograms have adequate information obtained from various sources. Considering the effect of knowledge on behavioral intention as well as the relationship between age of demographic variables on attitudes, researchers decided that the 2 structures of knowledge and demographic variables based on the following
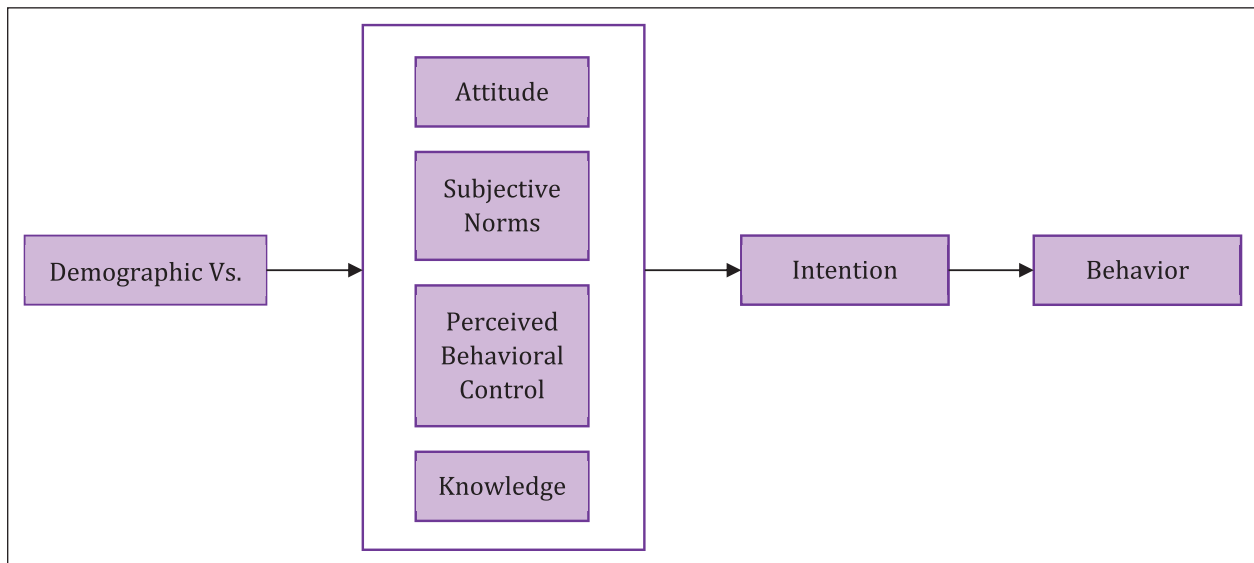
Figure 1. The conceptual framework used in this study (theory of planned behavior).

conceptual model (Figure 1) added to the traditional TPB and then following conceptual model was tested.

In a study executed by Brown and Chan of 116 women aged 18 to 39 years using programming behavior theory, perceived behavioral control was the most important predictor of screening behavior.[47] According to Bowie et al,[48] perceived attitude and behavioral control predicted the intention to repeat mammography in women. Prevention and early detection of BC will not be possible without careful planning and foresight and determining the factors affecting mammography screening behavior. Nevertheless, because of inadequate facilities, rural women have less mammography screening. Consequently, this study evaluates mammography screening based on the TPB among rural women in Fasa and Shiraz cities.

Methods

Type of study and participants

This cross-sectional study was conducted on 800 female clients referring to rural health centers in Fasa and Shiraz cities (400 women from Shiraz and 400 women from Fasa) in southern Iran in early 2021. In this study, simple random sampling method was used. Among the rural health centers of Fasa and Shiraz cities, Iran, 2 centers were randomly selected. The clients' selection was randomly based on their household file number to participate in the study. In this study, out of 850 online questionnaires, 800 people completed the questionnaire (response rate = 94/11).

Inclusion and exclusion criteria

Inclusion criteria were 35 years old and older women with no BC and no breast biopsy. Exclusion criteria were the case study's unwillingness to participate in the research and failure to answering questions.

Sample size

In early 2020, there were 52 326 women aged 35 to 69 years in rural health centers in Fasa and Shiraz cities in southern Iran. The Sample Size Calculator (Creative Research Systems) was used to determine the appropriate sample size. Using a confidence level of 95% and a confidence limit of 3%, a total of 1046 women were needed. We evaluated the effects of related factors (demographic variables and TPB model structures) on the uptake of regular mammography screening. We excluded women with missing values related to these factors, and only 800 of 1046 women (76.48%) were included in the analysis.

Data collection instruments

The code of ethics was approved by the Vice Chancellor of Research at Fasa University of Medical Sciences. The questionnaire's link was placed in Fasa and Shiraz University of Medical Sciences' health information groups and health centers and due to the possibility of Coronavirus transmission through paper questionnaires, the authors decided to send and distribute the electronic questionnaire form through the WhatsApp application in collaboration with the health staff of rural health centers for the people covered by these centers. The questionnaire was completed online. Concerning the importance of the subject, this questionnaire was used for rural women.

In this study, the data collection instrument is a questionnaire employed in the study of Khani Jeihooni et al, and its validity and reliability have been confirmed. The overall reliability of the research tool with the Cronbach alpha calculation was 0.88. Moreover, the reliability of the knowledge, attitude, subjective norms, perceived behavioral control, and behavioral intention were 0.89, 0.87, 0.82, 0.80, and 0.82, respectively.[49]

The first part of the demographic information consisted of age, the number of children, age at first pregnancy, breastfeeding history, occupation, education, marital status, insurance status, menopausal status, income, and family history of BC. The second part consists of the questions pertinent to the TPB model. This section included knowledge questions in 3 areas: "signs and symptoms, risk factors for BC, and mammography screening," consisting of 25 three-choice questions (true, false, I do not know). Each correct answer was given a score of 1; "the wrong answers" and "I do not know" options were given zero. Besides, the knowledge scores ranged from 0 to 25 (Table 1).

Fifteen questions were used to measure the attitude (the minimum score of 15 and the maximum score of 75) (Table 2).

Furthermore, to measure subjective norms, 10 questions (the minimum score of 10 and the maximum score of 50) were used (Table 3).

Perceived behavioral control was measured by 10 questions (the minimum score of 10 and the maximum score of 50). The Likert scale was used to measure the attitude, subjective norms, and perceived behavioral control variables with a range from 1 (strongly disagree) to 5 (strongly agree). Besides, behavioral intention included 1 question regarding the intention to perform mammography, measured as "yes or no." The behavior was also assessed with a question pertinent to perfume mammography, measured as "yes and no" (Table 4).

Ethical considerations

After selecting the individuals, the online questionnaire was completed by them. The informed consent form and study objectives were placed at the beginning of the online questionnaire, and participants were assured that their information would remain strictly confidential with the researchers. After accepting that "I participated in the research with my consent," people started completing the online questionnaire. The Research Council approved this study of Fasa University of Medical Sciences with the code of ethics number IR.FUMS. REC.1399.134.

Analysis

Prior to the analysis, the normality of main research variables was assessed using the Shapiro-Wilk test. Moreover, data analysis was executed employing SPSS software version 26 and Amos version 24 (IBM Co., Ann Arbor, MI, USA). The average and standard deviation values were used to describe the data. Analyzing the data was carried out using the 1-way analysis of variance (ANOVA), logistic regression, and structural equation analysis. During data analysis, various model indicators such as the goodness of fit, including comparative fit index (CFI) and goodness-of-fit index (GFI) (above 0.9), root mean square error of approximation (RMSEA, below 0.08), and chi-square index/*df* (below 3) were evaluated, all of which indicating the suitability of the model. The significance level in all tests was considered 0.05.

Results

A population of 800 samples from rural women in their mid-life course has participated in this study. According to Tables 1 to 4, the preponderance of them considered themselves as Persian ethnic group (n = 557, 69.6%); their mean age is 52.4 (SD = 9.02), 91.9% have been married, 90.4% of them are householder, 5.8% of women (n = 46) have a relative who has had BC, and 53.8% were menopausal at the end of 2020. Also, the mean age of first pregnancy was 21.8 (SD = 3.11); most samples had 3 children, and 53.8% earned less than US$120 dollars per month. Also, there was statistically a significant difference between subjects in demographic variables (see Table 5). The mean knowledge scores were 7.5 (SD = 2.46); attitude, subjective norms, and control behavior were 39.6 (SD = 4.75), 36.3 (SD = 3.51), and 26.4 (SD = 3.63), respectively. As a reliability coefficient, the McDonald omega was 0.91 for the instrument.

According to Table 6, the fixed-effect ANOVA results were obtained for TPB constructs. The effect size values demonstrate the independent variables' high coefficient of influence on explaining the TPB theoretical model. Among demographic variables, age, literacy, being menopausal, having a relative who has had BC, city, and ethnicity contribute more than other variables to the variance variation in TPB constructs.

According to the results, the subjective norms do not play an important role in middle-aged women's behavioral intention ($P = .663$). The binary logistic regression analysis for variables of behavior prediction and intention to BC screening was extracted. The results of the Cox and Snell R^2 and the Nagelkerke R^2 confirmed the model as measures of fit for logistic regression (≥ 0.30). The intention as independent variable was significantly associated with higher odds of behavior (odds ratio [OR] = 1.96, 95% confidence interval [CI] = (0.29, 3.22), $P \leq .05$). The OR indicates that as each score in the intention increases, the probability of behavior (doing BC) score presence rises by approximately 1.96 times. Also, there was no covariate in the model, and the variance inflation factor (VIF) as collinearity diagnostics of the variables in the regression analysis was 1.45. It means there was no multicollinearity and can proceed to the regression model.

The structural equation model of female samples' intention for breast cancer screening

Using the structural equation model (SEM), the TPB constructs and demographic variables were entered into the model. According to Figure 2, out of 5 extraction models, the model below is obtained with the highest fit index.

According to Figure 2, the obtained model was good based on the main goodness-of-fit indices ($\chi^2 = 18.45$, $df = 10$, n = 800,

Table 1. Questions pertinent to the theory of planned behavior model (theory of planned behavior)—knowledge questions.

KNOWLEDGE QUESTIONS (N=25)		TRUE (=1 SCORE)	I DO NOT KNOW (=0 SCORE)	FALSE (=0 SCORE)
Signs and symptoms	1. It is normal for some women to feel lumps or abnormalities in their breasts.			
	2. A lump in the breast that does not go away may be a sign of breast ca			
	3. Most lumps found in women's breasts are cancerous.			
	4. Wrinkles, pus, and sagging breasts may be a sign of breast cancer.			
	5. Nipple tenderness may be a sign of breast cancer.			
	6. Women who give birth to their first child after the age of 30 years and women who have never had children are more likely to develop breast cancer.			
	7. Women who give birth to their first child after the age of 30 years and women who have never had children are more likely to get breast cancer.			
	8. Increased size or change in the shape of the breast can be a sign of breast cancer.			
	9. Itching or inflammation of the breast can be a sign of breast cancer.			
	10. Changes in the appearance of the tip of 1 or both breasts can be a sign of breast cancer.			
	11. Feeling of change when touching the breast can be a sign of breast cancer.			
	12. General pain in any part of the breast can be a sign of breast cancer.			
	13. Breast discoloration can be a sign of breast cancer.			
	14. Scaling of the nipple can be a sign of breast cancer.			
Risk factors for breast cancer	15. Women more than 40 years should have a mammogram every year.			
	16. Only older women get breast cancer.			
	17. Women who menstruate before the age of 11 years and do not menopause until the age of 55 years are more prone to breast cancer.			
	18. If you do not have a family history of breast cancer, you are not very likely to get it.			
Mammography screening	19. Early detection of breast cancer allows you to live longer.			
	20. 59. There is no need for a mammogram until your doctor examines your breasts.			
	21. Women should have a mammogram when they turn 40 years.			
	22. Mammography allows women to live longer because it detects breast cancer before the cancer can damage other parts of the body.			
	23. Annual mammography detects the mass before it becomes malignant and helps it live longer.			
	24. Early treatment of breast cancer helps to prolong life.			
	25. If you are diagnosed with breast cancer before it spreads to other parts of your body, you will live 90% longer			

Table 2. Questions pertinent to the theory of planned behavior model (theory of planned behavior)—attitude.

ATTITUDE		STRONGLY DISAGREE—1	DISAGREE—2	I DO NOT KNOW—3	AGREE—4	STRONGLY AGREE—5
Doing mammography next year . . .	Allows me to know I have cancer.					
	It allows me to live longer.					
	Identifies cancer before I feel it.					
	The pressure of the device causes me to have problems in my chest.					
	Someone is doing something I do not know.					
	It hurts for me.					
	It is costly.					
	It takes a lot of effort on my part.					
	I have to drive a long way to get to the test site.					
	Gives me information about my breasts.					
	It scares me.					
	It is good/bad for me to know if I have breast cancer.					
	Long life is good/bad for me.					
	For me, early detection of breast cancer is good/bad.					
	For me, the pressure of the device and causing a problem in my chest is good/bad.					
	If breast cancer is diagnosed, treated early, the person can resume everyday life.					

$\chi^2/df = 1.845$, RMSEA = 0.032, GFI = 0.90, NNFI = 0.91). Furr (2011) indicated that the fit indices should have standardized loadings of 0.90 or more than that.[50] The model has the good fit indices, as well ($P \leqslant .05$). Final adjusted SEM showed the effects of demographic variables, ie, age, literacy, being menopausal, having relative with BC in family on intention and behavior by mediating factors of attitude, perceived behavioral control, and knowledge (the use of the maximum likelihood estimation with Satorra-Bentler correction). Figure 2 shows that independent variables with the mediating role of 3 main variables of knowledge, attitude, and behavioral control had high explanatory in women's intention to screen BC. The intention alone can be an important factor in creating behavior in the samples.

Discussion

This study investigated mammography screening based on the planned behavior theory among rural women in Fasa and Shiraz cities, Iran, with Persian, Turkish, and Arab ethnicities.

The results illustrated that the age, literacy, menopause, the family history of cancer, and ethnicity variables had the most significant effect on the variance alteration of the planned behavior theory and mammography screening. In a study conducted by Wang et al[51] among 776 women age 45 to 69 years, the individuals with higher education and a history of BC had regular mammography screening. According to Moodi et al,[52] among 384 women age 40 to 80 years, there was a significant relationship between the age, education, marital status, and income variables with the changing stages of mammography screening behavior. In a study by Tolma et al,[53] among 255 women age 40 to 60 years indicated that people with a family history of BC have better mammography screening. There is a substantial correlation between age, educational status, occupation, and income with mammography.[54]

In an effort by SalimiPormehr et al,[55] there was not any significant relationship between mammography and education and occupation. According to Rezabeigi-Davarani et al,[56] the educated and employed women whose husbands had

Table 3. Questions pertinent to the theory of planned behavior model (theory of planned behavior)—subjective norms.

SUBJECTIVE NORMS	STRONGLY DISAGREE—1	DISAGREE—2	I DO NOT KNOW—3	AGREE—4	STRONGLY AGREE—5
How many of the people listed do you think any person or group agrees with or disagrees with you having a mammogram?					
1. My doctor.					
2. Other members of the medical staff (health workers).					
3. My nurse.					
4. My wife.					
5. My family.					
6. My friends.					
I usually do what these people think I should do:					
7. My family.					
8. My friends.					
9. My doctor.					
10. Other members of the medical staff (health workers).					

Table 4. Questions pertinent to the theory of planned behavior model (theory of planned behavior)—perceived behavioral control.

PERCEIVED BEHAVIORAL CONTROL	STRONGLY DISAGREE—1	DISAGREE—2	I DO NOT KNOW—3	AGREE—4	STRONGLY AGREE—5
Things that make mammography easier or harder for me if . . .					
1. At the request of a doctor or nurse.					
2. Being able to make an appointment at the time.					
3. Having insurance to pay.					
4. Having money to pay.					
5. Having time to go.					
6. Waiting.					
I usually do a mammogram every year if . . .					
7. The doctor or nurse should ask me.					
8. Be able to make an appointment.					
9. I have a vehicle to go there.					
10. To have insurance to pay for the test.					
	Yes			No	
Behavioral intention					
Are you planning to have a mammogram next year?					
Behavioral					
I had a mammogram this year.					

Table 5. Demographic characteristics of samples.

VARIABLES	SUBDOMAINS	NUMBER OF SAMPLES		
		N	%	SIGNIFICANEᴬ
Literacy	Illiterate	37	4.6	0.001
	Elementary	287	35.9	
	Middle school	186	23.3	
	High school	230	28.7	
	Graduated and more	60	7.5	
Occupation	Housekeeper	723	90.4	0.000
	Employed	77	6.9	
Marital status	Never married	23	2.9	
	Married	735	91.9	
	Divorced	26	3.3	
	Widowed	16	2	
Ethnicity	Persians	557	69.6	
	Turks	88	11	0.001
	Arabs	155	19.4	
Menopause	Yes	430	53.8	0.000
	No	370	46.3	

ᵃUsing chi-square to compare samples.

Table 6. Fixed-effect ANOVA results for theory of planned behavior constructs.

FIXED FACTORS	DF	F	EFFECT SIZE	SIGNIFICANCE
1. Knowledge				
Years old	786	0.498	0.105	.007
Literacy (education)	786	0.657	0.111	.006
Being menopausal	786	1.542	0.045	.097
2. Subjective norms				
Years old	780	1.504	0.235	.007
Literacy (education)	780	1.349	0.132	.006
Menopause	780	1.739	0.041	.026
3. Perceived behavioral control				
Years old	779	0.530	0.213	.005
Literacy (education)	779	0.885	0.122	.007
Cancer in family	779	2.436	0.359	.000
Ethnicity	779	0.418	0.081	.009
4. Attitudes				
Years old	772	1.101	0.137	.001
Literacy (education)	772	0.740	0.225	.009
Cancer in family	772	1.233	0.241	.003
City	772	1.418	0.147	.078
5. Behavioral intention				
Knowledge	798	3.001	0.204	.004
Attitude	798	0.180	0.201	.002
Subjective norms	798	0.190	0.098	.663
Behavioral control	798	0.218	0.226	.005

Abbreviation: ANOVA, analysis of variance.

higher education were more likely to perform breast self-examination than their counterparts. Having access to and employing various educational resources, such as medical guidelines, magazines, and electronic resources, educated women are more likely to be acquainted with BC and diagnostic methods. Unfortunately, the population studied in this investigation had a lower percentage of educated people.

In this study, Persians, Qashqai Turks, and Arabs ethnicities are contemplating going to mammography screening. About 6.3% of Persians, 3.4% of Qashqai Turks, and 3.2% of Arabs had a mammography screening history. In total, 6.8% of all individuals intended to go mammography screening, and 5.4% had a history of mammography screening. In an investigation conducted by Ayanian et al,[57] mammography screening rates were higher among Black, Hispanic, and Asian/Pacific Islander women in health maintenance organization (HMOs). The Kapp study was among 3098 women age 30 to 39 years indicated that 29% reported having ever had a mammogram. Non-Hispanic black (NHB) women were more likely to report having a mammogram ever and receiving multiple mammograms before age 40 years among women in average risk than their white peers. Mammography employment patterns for Hispanic women varied, compared with non-Hispanic white (NHW) women.[58]

Based on the efforts made by Wilcox et al, the overall compliance with annual mammograms was 62%. Race/ethnicity was significantly accompanied by mammogram compliance. The compliance was the highest among NHB households (75%), followed by Hispanic (62%), Haitian (59%), and NHW households (51%). After controlling the educational level, marital status, employment status, health insurance status, and regular doctor visits, a borderline disparity in mammogram compliance was observed between Haitian and NHB households.[59] Miller et al[60] showed that racial/ethnic minority women identified common logistical and psychological/knowledge-related barriers regarding mammography screening. But in Purc-Stephenson and Gorey's research, there was no ethnic difference in mammography screening.[61] These differences may be related to lower patient cost-sharing and better systems to promote preventive services in managed care plans, as well as unmeasured characteristics or beliefs of minority women who enroll in these health plans relative to those in traditional Medicare.
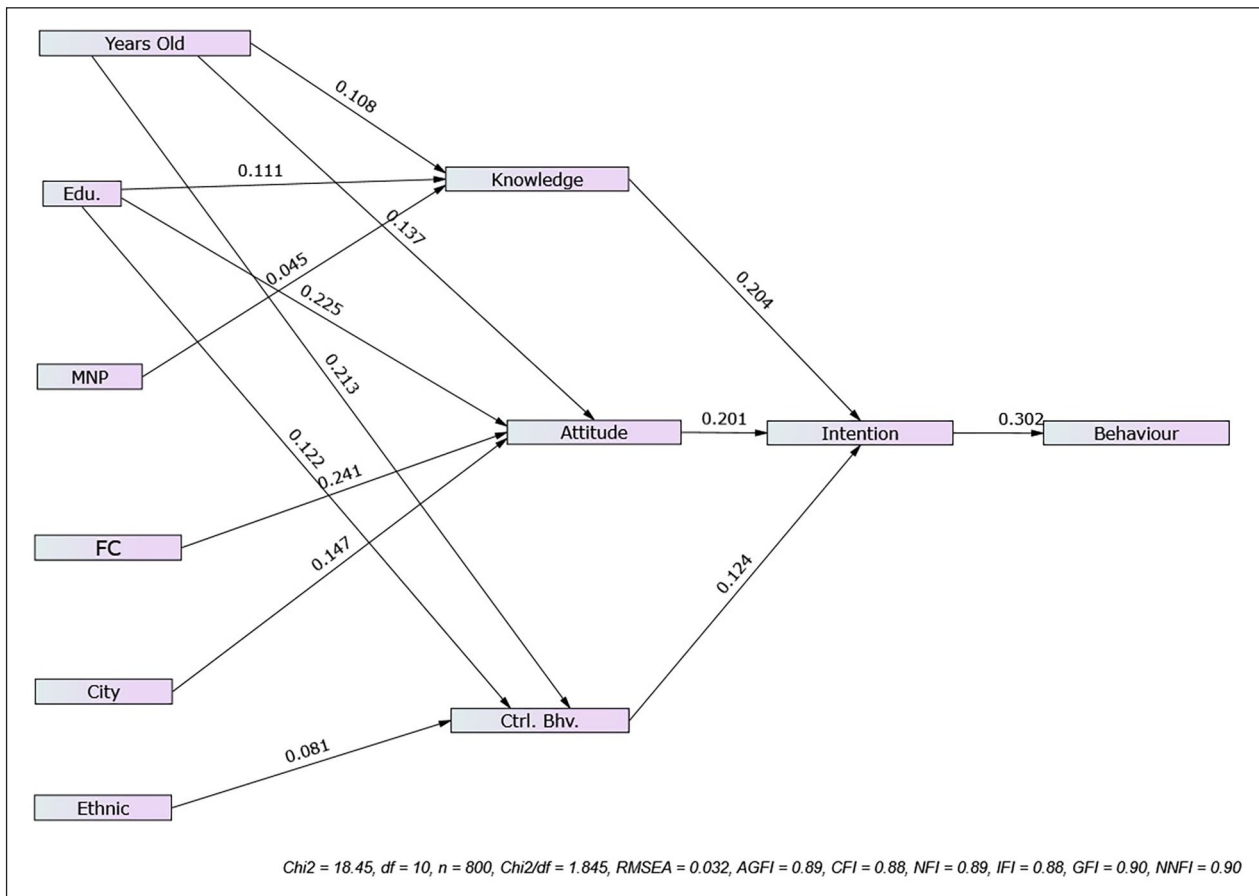
Figure 2. Final structural equation model of the study.
AGFI indicates adjusted goodness-of-fit index; CFI, comparative fit index; Ctrl. Behav., perceived behavioral control; Edu., literacy; FC, having cancer in a family member; GFI, goodness-of-fit index; IFI, incremental fit index; MNP, being menopausal; NFI, normed fit index; NNFI, non-normed fit index; RMSEA, root mean square error of approximation.

According to Moodi et al,[52] 68.5% of the case studies had no intention to perform mammography screening. Russell et al[62] indicated that 10.4% people had mammography screening, and Monfared et al[54] found that among the general population of women in Rasht, 45% underwent mammography screening. In an effort made by SalimiPormehr et al[55] performed on 300 women in Ardabil, the mammography rate was 3.7%. The mammography screening rate in the studies of Killelea et al,[63] Elobaid et al,[64] and Dourado et al[65] were 42.6%, 44.9%, and 69.4% of women undergoing mammography screening, respectively. This discrepancy of results could be attributed to different research environments and subjects or data gathering tools.

In a study on 1000 women, Monfared et al found that almost half of the women underwent mammography screening. Still, out of those individuals, most women either were diagnosed merely once by a physician to check for other physical issues or referred for health follow-up, screened for mammography. In this regard, it indicates that women may neglect health-promoting behaviors and do not pay much attention to screening and BC prevention.[54] There are several factors as the most important reasons for reducing the intention and performing mammography screening in the rural community: the

decreased access to facilities and laboratories, demanding tasks at home as a householder and taking care of family and children, handling agricultural affairs, cultural barriers, lack of access to health personnel treatment, fear of mammography, and so on. In a Secginli and Nahcivan's study on 40 years old and older women, 56% reported having never read or heard of mammography. Only 35% had a mammogram at least once in their lifetime.[66] The results demonstrated that the knowledge, attitude, and perceived behavioral control variables predicted mammography screening prediction's intent and behavioral intention.

In this study, the mean score of knowledge (7.5 ± 2.46) regarding BC and mammography screening was low. One of the chief reasons for the women's low awareness is the scarcity of training courses for them, unavailability of educational resources, and less access to doctors and health care workers. Besides, most women do not take breast examinations seriously until observing severe breast symptoms disorders, indicating women's poor awareness about clinical examinations execution and its importance. Also, it could suggest that rural women do not have accurate information regarding the expenses this disease can incur on the health care system and families in our society. Various studies have demonstrated a low level of Iranian

women's awareness about BC screening.[45,46] But Ahmadian et al[30] state that women who have mammograms have adequate information obtained from various sources. Alameer et al[67] indicated the education's role in increasing women's awareness and practice for early BC detection.

In a study done by Abamecha et al,[37] the knowledge and the TPB constructs were the predictors of the cervical cancer screening intention. Due to the traditional context in the villages under study, especially the studied ethnicities, which are less receptive to mammography screening, the perceived behavioral control is of significant importance. The perceived behavioral control reflects a person's beliefs about the availability or unavailability of resources and opportunities to engage in the behavior. People are motivated to perform well-behaved behaviors even when facing challenges to feel having control over them.[49]

According to Hatefnia and Niknami,[68] Taymoori et al,[36] Rezabeigi-Davarani et al,[56] Khazir et al,[69] and Steele and Porche,[70] the perceived behavioral control predicts intentions and accomplishments. In a study conducted by Roncancio et al on 614 Latins, the perceived behavioral control was significantly associated with cervical cancer screening intent.[71]

The attitude toward behavior means to what extent the desired behavior is favorable and valuable for the person, which depends on their judgment about the consequences of behavior.[72] In this study, attitude structure was one of the predictors of intention and mammography screening. Based on the efforts made by Fajriah et al,[73] SalimiPormehr et al,[55] and Steadman and Rutter,[41] the attitude has been one of the factors influencing women's participation in BC screening programs. But Dezham et al[74] demonstrated that the attitude was not predictive of intention and mammography screening. This discrepancy of results could be attributed to different research environments and subjects or data gathering tools.

In this study, subjective norms did not predict the intent and behavior of mammography screening. A person's subjective norms are influenced by the main people in his life, such as mother, father, wife, and doctor. One of the reasons for not predicting the subjective norm in this study is perhaps the lack of understanding of the spouse in the village, the lack of doctors and health care workers, and so on. Similarly, the spouse support issue has been observed in other countries, despite subtle cultural differences.[75] Typically, men do not have a clear idea of the cancer subject, which is less common among them, and accordingly, they pay less attention to this subject. Therefore, it is necessary to solve this problem by holding appropriate training courses and sensitizing men. Tolma et al[53] have shown family members, friends, and physicians' role in performing mammography screening among women. However, according to the valuable efforts by Dezham et al,[74] Hatefnia and Niknami,[68] Allen et al,[76] and Taymoori et al,[36] subjective norms predicted the intention and behavior of mammography screening.

Molina et al indicated that the friends' and family members' advice increases the intention to perform mammography screening among Latin American women.[77] In Armitage and Conner's study, as in our investigation, the intention was identified as the strongest and subjective norms as the weakest predictor of mammography screening behavior.[78] In general, the planned behavior theory constructs predicted the intention and the mammography screening behavior among rural women in different ethnicities under study. The findings of this study are consistent with the results of other studies.[6,79-82]

One of the limitations in this study is the population considered as a group of rural women with particular geographical, cultural, and ethnic conditions. Consequently, the findings of this study should be carefully generalized to other geographical and cultural circumstances. It seems that the shyness or unwillingness to talk about a problem could have prevented some women from attending the study, which is relatively mitigated by talking to these people.

Conclusions

This study showed that the constructs of the planned behavior theory predict mammography screening behaviors in rural women. It has also demonstrated that mammographic behavior can be improved in rural women using education based on the planned behavior theory, emphasizing critical psychological factors of creating or changing behavior. Accordingly, women have a high intention of having a mammogram for the following reasons: (1) whenever women acquire sufficient and correct knowledge and a positive attitude toward the controllability of BC; (2) social support from important people, such as spouses and health centers staff to confirm that they approve mammography; and (3) they feel that mammography is at their disposal in environmental factors (facilities and barriers). If the intention is correctly explained, a mammogram will be performed. In this regard, educational programs should be held continuously in a language that is understandable and appropriate to their cultural and ethnic conditions.

Declarations

Ethics approval and consent to participate

This study protocol was approved by the ethics committee of Fasa University of Medical Sciences (IR.FUMS. REC.1399.134). An informed consent for participation in the study was obtained from all participants. The ethics committee approved the procedure for verbal consent because the study is observational and respected the code of ethics as stated in the declarations of Helsinki.

Consent for publication

Not applicable.

Author contributions

AK, SA, FM, AA and AKHJ: Assisted in conceptualization and design of the study, oversaw data collection, conducted data analysis and drafted the manuscript.

AK, SA and AKHJ: Conceptualized and designed the study, assisted in data analysis and reviewed the manuscript.

AK, SA, FM, AA and AKHJ: Assisted in study conceptualization and reviewed the manuscript. All authors read and approved the final manuscript.

Availability of data and materials

The data sets used and/or analyzed during this study are available from the corresponding author upon reasonable request.

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REFERENCES

1. de Souza BC, dos Santos Figueiredo FW, de Alcantara Sousa LV, da Silva Maciel E, Adami F. Regional disparities in the flow of access to breast cancer hospitalizations in Brazil in 2004 and 2014. *BMC Women's Health.* 2020;20:1-9.
2. Bener A, Alsulaiman R, Doodson L, Agathangelou T. Depression, hopelessness and social support among breast cancer patients: in highly endogamous population. *Asian Pac J Cancer Prev.* 2017;18:1889-1896.
3. Sharifian A, Pourhoseingholi MA, Emadedin M, et al. Burden of breast cancer in Iranian women is increasing. *Asian Pac J Cancer Prev.* 2015;16:5049-5052.
4. Bab S, Abdifard E, Elyasianfar S, Mohammadi P, Heidari M. Time trend analysis of breast cancer in Iran and its six topographical regions: a population-based study. *J Med Life.* 2019;12:140-149.
5. Taghavi A, Fazeli Z, Vahedi M, et al. Increased trend of breast cancer mortality in Iran. *Asian Pac J Cancer Prev.* 2012;13:367-370.
6. Naz MS, Simbar M, Fakari FR, Ghasemi V. Effects of model-based interventions on breast cancer screening behavior of women: a systematic review. *Asian Pac J Cancer Prev.* 2018;19:2031-2041.
7. Taymoori P, Molina Y, Roshani D. Effects of a randomized controlled trial to increase repeat mammography screening in Iranian women. *Cancer Nurs.* 2015;38:288-296.
8. Nemoto T, Vana J, Bedwani RN, Baker HW, McGregor FH, Murphy GP. Management and survival of female breast cancer: results of a national survey by the American College of Surgeons. *Cancer.* 1980;45:2917-2924.
9. Broeders M, Moss S, Nyström L, et al. The impact of mammographic screening on breast cancer mortality in Europe: a review of observational studies. *J Med Screen.* 2012;19:14-25.
10. Paci E, Broeders M, Hofvind S, Puliti D, Duffy SW, EUROSCREEN Working Group. European breast cancer service screening outcomes: a first balance sheet of the benefits and harms. *Cancer Epidemiol Biomarkers Prev.* 2014;23:1159-1163.
11. Davis TC, Rademaker A, Bennett CL, et al. Improving mammography screening among the medically underserved. *J Gen Inter Med.* 2014;29:628-635.
12. Sharma A, Johnson BA, Sullivan PS. Evaluating interventions to promote routine preventive screenings: a comparison of analytical outcomes. *Contemp Clin Trials.* 2015;41:152-159.
13. Sun Y, Sarma EA, Moyer A, Messina CR. Promoting mammography screening among Chinese American women using a message-framing intervention. *Patient Educ Couns.* 2015;98:878-883.
14. Leeman J, Moore A, Teal R, Barrett N, Leighton A, Steckler A. Promoting community practitioners' use of evidence-based approaches to increase breast cancer screening. *Public Health Nurs.* 2013;30:323-331.
15. World Health Organization. Breast-cancer. https://www.who.int/news-room/fact-sheets/detail/breast-cancer. Accessed April 6, 2022.
16. Calderón-Garcidueñas AL, Flores-Peña Y, De León-Leal S, et al. An educational strategy for improving knowledge about breast and cervical cancer prevention among Mexican middle school students. *Prev Med Rep.* 2015;2:250-254.
17. Abuidris DO, Elsheikh A, Ali M, et al. Breast-cancer screening with trained volunteers in a rural area of Sudan: a pilot study. *Lancet Oncol.* 2013;14:363-370.
18. Baena-Cañada JM, Rosado-Varela P, Expósito-Álvarez I, González-Guerrero M, Nieto-Vera J, Benítez-Rodríguez E. Using an informed consent in mammography screening: a randomized trial. *Cancer Med.* 2015;4:1923-1932.
19. Highfield L, Hartman MA, Bartholomew LK, Balihe P, Ausborn VA. Evaluation of the effectiveness and implementation of an adapted evidence-based mammography intervention for African American women. *Biomed Res Int.* 2015;2015:240240.
20. Gardner MP, Adams A, Jeffreys M. Interventions to increase the uptake of mammography amongst low income women: a systematic review and meta-analysis. *PLoS ONE.* 2013;8:e55574.
21. Tabár L, Dean PB, Chen TH, et al. The incidence of fatal breast cancer measures the increased effectiveness of therapy in women participating in mammography screening. *Cancer.* 2019;125:515-523.
22. Duffy SW, Tabár L, Yen AM, et al. Mammography screening reduces rates of advanced and fatal breast cancers: results in 549,091 women. *Cancer.* 2020;126:2971-2979.
23. Saadat M, Ghalehtaki R, Baikpour M, Sadeghian D, Meysamie A, Kaviani A. The participation rate and contributing factors of screening mammography among (capitalize) female faculty physicians in Tehran, Iran. *Int J Cancer Manag.* 2017;10:e8016.
24. Puharić Z, Žulec M, Ceronja I, Parun AŠ. High participation rate in mammography screening: experience from Croatia. *Cent Eur J Public Health.* 2017;25:303-306.
25. Su X, Ma GX, Seals B, Tan Y, Hausman A. Breast cancer early detection among Chinese women in the Philadelphia area. *J Womens Health (Larchmt).* 2006;15:507-519.
26. Brown Sofair J, Lehlbach M. The role of anxiety in a mammography screening program. *Psychosomatics.* 2008;49:49-55.
27. Nourizadeh R, Bakhtariagdam F, Sahebi L. Knowledge, health beliefs and breast cancer screening behaviors of women referring to health centers of Tabriz, 2010. Paper presented at: The First International & 4th National Congress on health Education & Promotion; May 17, 2011; Tabriz University of Medical Sciences, Tabriz, Iran.
28. Rezaee Ghazdehi M, Amini L, Parvizi S, Hoseyni AF. Attitudinal barriers to mammography screening among women in Tehran. *J Maz Univ Med Sci.* 2013;23:69-75.
29. Abbaszadeh A, Taabi M, Kohan S, Hakdost A. The relationship of health beliefs of Kermanian women and participation in mammography. *J Qual Res Health Sci.* 2020;10:9-17.
30. Ahmadian M, Samah AA, Emby Z. Barriers to mammography among women attending gynecologic outpatient clinics in Tehran, Iran. *Sci Res Essays.* 2011;6:5803-5811.
31. Lamyian M, Hydarnia A, Ahmadi F, Faghihzadeh S, Aguilar-Vafaie ME. Barriers to and factors facilitating breast cancer screening among Iranian women: a qualitative study. *East Mediterr Health J.* 2007;13:1160-1169.
32. Taymoori P, Berry T, Roshani D. Differences in health beliefs across stage of adoption of mammography in Iranian women. *Cancer Nurs.* 2014;37:208-217.
33. Montazeri A, Vahdaninia M, Harirchi I, et al. Breast cancer in Iran: need for greater women awareness of warning signs and effective screening methods. *Asia Pac Fam Med.* 2008;7:1-7.
34. Thomas E, Escandón S, Lamyian M, Ahmadi F, Setoode SM, Golkho S. Exploring Iranian women's perceptions regarding control and prevention of breast cancer. *Qual Rep.* 2011;16:1214-1229.
35. Asadzadeh VF, Broeders MJ, Kiemeney LA, Verbeek AL. Opportunity for breast cancer screening in limited resource countries: a literature review and implications for Iran. *Asian Pac J Cancer Prev.* 2011;12:2467-2475.
36. Taymoori P, Berry T, Farhadifar F. Predicting mammography stage of adoption among Iranian women. *J Educ Health Promot.* 2012;1:13-18.
37. Abamecha F, Tena A, Kiros G. Psychographic predictors of intention to use cervical cancer screening services among women attending maternal and child health services in Southern Ethiopia: the theory of planned behavior (TPB) perspective. *BMC Public Health.* 2019;19:1-9.
38. Roncancio AM, Ward KK, Fernandez ME. Understanding cervical cancer screening intentions among Latinas using an expanded theory of planned behavior model. *Behav Med.* 2013;39:66-72.

39. Soskolne V, Marie S, Manor O. Beliefs, recommendations and intentions are important explanatory factors of mammography screening behavior among Muslim Arab women in Israel. *Health Educ Res*. 2007;22:665-676.

40. Godin G, Kok G. The theory of planned behavior: a review of its applications to health-related behaviors. *Am J Health Promot*. 1996;11:87-98.

41. Steadman L, Rutter DR. Belief importance and the theory of planned behaviour: comparing modal and ranked modal beliefs in predicting attendance at breast screening. *Br J Health Psychol*. 2004;9:447-463.

42. Godin G, Gagné C, Maziade J, Moreault L, Beaulieu D, Morel S. Breast cancer: the intention to have a mammography and a clinical breast examination-application of the theory of planned behavior. *Psychol Health*. 2001;16:423-441.

43. Ajzen I. The theory of planned behaviour: reactions and reflections. *Psychol Health*. 2011;26:1113-1127.

44. Babazadeh T, Zibaei N, Shabani L, Moradi F. Effectiveness of educational intervention based on peer education on knowledge, attitude and behavioral intention related to HIV/AIDS in the high school female students in the region 14 of Tehran. *J Educ Community Health*. 2022;2:19-27.

45. Khani H, Moslemizadeh N, Montazeri A, Godazandeh GA, Ghorbani A. Breast cancer prevention: knowledge, attitudes and practices among Iranian health workers in southern coastwise of the Caspian sea in 2006: a multi center study. *Iranian Quart J Breast Dis*. 2008;2:28-37.

46. Banaeian-Borujeni S, Kazemian A, Kheiri S. Knowledge, attitude and practice about breast cancer screening and related factors among women referred to health care centers in Boroujen in 2005. *J Shahrekord Univ Med Sci*. 2006;7:28-34.

47. Browne JL, Chan AY. Using the theory of planned behaviour and implementation intentions to predict and facilitate upward family communication about mammography. *Psychol Health*. 2012;27:655-673.

48. Bowie JV, Curbow B, Laveist TA, Fitzgerald S, Zabora J. The theory of planned behavior and intention to repeat mammography among African-American women. *J Psychosoc Oncol*. 2003;21:23-42.

49. Khani Jeihooni A, Darvishi N, Harsini PA. The effect of educational intervention based on the theory of planned behavior on mammography screening in Iranian women. *J Cancer Educ*. 2020;35:264-273.

50. DeVellis RF, Thorpe CT. *Scale Development: Theory and Applications*. SAGE Inc; 2021.

51. Wang WL, Hsu SD, Wang JH, Huang LC, Hsu WL. Survey of breast cancer mammography screening behaviors in Eastern Taiwan based on a health belief model. *Kaohsiung J Med Sci*. 2014;30:422-427.

52. Moodi M, Rezaeian M, Mostafavi F, Sharifirad GR. The study of mammography screening behavior based on stage of change model in Isfahanian women of age 40 and older: a population-based study. *J Adv Med Biomed Res*. 2013;21:24-35.

53. Tolma EL, Stoner JA, Li J, Kim Y, Engelman KK. Predictors of regular mammography use among American Indian women in Oklahoma: a cross-sectional study. *BMC Women's Health*. 2014;14:1-2.

54. Monfared A, Ghanbari A, Jansar Hosseini L, Norozi N. Status of screening by mammography and its related factors in the general population of women in Rasht. *Iran J Nurs*. 2017;30:32-41.

55. SalimiPormehr S, Kariman N, Sheykhan Z, AlaviMajd H. Investigation of breast cancer screening tests performance and affecting factors in women referred to Ardebil's health and medical centers, 2009. *J Ardabil Univ Med Sci*. 2011;10:310-318.

56. Rezabeigi-Davarani E, Khanjani N, Falahi M, Daneshi S, Iranpour A. Breast self-examination and its effective factors based on the theory of planned behavior among women in Kerman, Iran. *J Educ Community Health*. 2022;3:1-8.

57. Ayanian JZ, Landon BE, Zaslavsky AM, Newhouse JP. Racial and ethnic differences in use of mammography between Medicare Advantage and traditional Medicare. *J Natl Cancer Inst*. 2013;105:1891-1896.

58. Kapp JM, Ryerson AB, Coughlin SS, Thompson TD. Racial and ethnic differences in mammography use among US women younger than age 40. *Breast Cancer Res Treat*. 2009;113:327-337.

59. Wilcox ML, Acuna JM, Ward-Peterson M, Alzayed A, Alghamdi M, Aldaham S. Racial/ethnic disparities in annual mammogram compliance among households in little Haiti, Miami-Dade County, Florida: an observational study. *Medicine (Baltimore)*. 2016;95:e3826.

60. Miller BC, Bowers JM, Payne JB, Moyer A. Barriers to mammography screening among racial and ethnic minority women. *Soc Sci Med*. 2019;239:112494.

61. Purc-Stephenson RJ, Gorey KM. Lower adherence to screening mammography guidelines among ethnic minority women in America: a meta-analytic review. *Prev Med*. 2008;46:479-488.

62. Russell KM, Monahan P, Wagle A, Champion V. Differences in health and cultural beliefs by stage of mammography screening adoption in African American women. *Cancer*. 2007;109:386-395.

63. Killelea BK, Long JB, Chagpar AB, et al. Evolution of breast cancer screening in the Medicare population: clinical and economic implications. *J Natl Cancer Inst*. 2014;106:dju159.

64. Elobaid YE, Aw TC, Grivna M, Nagelkerke N. Breast cancer screening awareness, knowledge, and practice among Arab women in the United Arab Emirates: a cross-sectional survey. *PLoS ONE*. 2014;9:e105783.

65. Dourado F, Carreira H, Lunet N. Mammography use for breast cancer screening in Portugal: results from the 2005/2006 National Health Survey. *Eur J Public Health*. 2013;23:386-392.

66. Secginli S, Nahcivan NO. Factors associated with breast cancer screening behaviours in a sample of Turkish women: a questionnaire survey. *Int J Nurs Stud*. 2006;43:161-171.

67. Alameer A, Mahfouz MS, Alamir Y, Ali N, Darraj A. Effect of health education on female teachers' knowledge and practices regarding early breast cancer detection and screening in the Jazan area: a quasi-experimental study. *J Cancer Educ*. 2019;34:865-870.

68. Hatefnia E, Niknami S. Survey of Factors affecting to predict mammography in employed women aged 35 years and older based on the theory of planned behavior. *J Health Syst Res*. 2013;9:1062-1070.

69. Khazir Z, Morowatisharifabad MA, Vaezi A, Enjezab B, Yari F, Fallahzadeh H. Perceived behavioral control in mammography: a qualitative study of Iranian women's experiences. *Int J Cancer Manag*. 2019;12:e90225.

70. Steele SK, Porche DJ. Testing the theory of planned behavior to predict mammography intention. *Nurs Res*. 2005;54:332-338.

71. Roncancio AM, Ward KK, Sanchez IA, et al. Using the theory of planned behavior to understand cervical cancer screening among Latinas. *Health Educ Behav*. 2015;42:621-626.

72. Ajzen I. The theory of planned behavior. *Organ Behav Hum Decis Processes*. 1991;50:179-211.

73. Fajriah AS, Respati SH, Murti B. Theory of planned behavior and health belief model on factors associated with breast self examination among university students. *J Health Promotion Behav*. 2019;4:246-257.

74. Dezham S, Roozbahani N, Khorsandi M. Application of theory of planned behavior in predicting screening mammography in housewives over 40 years. *Med Daneshvar*. 2015;22:33-41.

75. Ogedegbe G, Cassells AN, Robinson CM, et al. Perceptions of barriers and facilitators of cancer early detection among low-income minority women in community health centers. *J Natl Med Assoc*. 2005;97:162-170.

76. Allen JD, Stoddard AM, Sorensen G. Do social network characteristics predict mammography screening practices? *Health Educ Behav*. 2008;35:763-776.

77. Molina Y, Ornelas IJ, Doty SL, Bishop S, Beresford SA, Coronado GD. Family/friend recommendations and mammography intentions: the roles of perceived mammography norms and support. *Health Educ Res*. 2015;30:797-809.

78. Armitage CJ, Conner M. Efficacy of the theory of planned behaviour: a meta-analytic review. *Br J Soc Psychol*. 2001;40:471-499.

79. Griva F, Anagnostopoulos F, Madoglou S. Mammography screening and the theory of planned behavior: suggestions toward an extended model of prediction. *Women Health*. 2010;49:662-681.

80. Lawal O, Murphy F, Hogg P, Nightingale J. Health behavioural theories and their application to women's participation in mammography screening. *J Med Imaging Radiat Sci*. 2017;48:122-127.

81. Agide FD, Sadeghi R, Garmaroudi G, Tigabu BM. A systematic review of health promotion interventions to increase breast cancer screening uptake: from the last 12 years. *Eur J Public Health*. 2018;28:1149-1155.

82. Ritchie D, Van den Broucke S, Van Hal G. The health belief model and theory of planned behavior applied to mammography screening: a systematic review and meta-analysis. *Public Health Nurs*. 2021;38:482-492.