

The Relationship between Breast Cancer Prevention and Breast Cancer Screening Behaviours in Tehranian Women: A Structural Equation Modeling Analysis

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ABSTRACT

Introduction: Breast cancer is the most commonly occurring cancer in women. It is also one of the most important health issues in many countries. Its high prevalence in women makes it necessary to encourage breast cancer screening behaviours.

Aim: To investigate the relationship between breast cancer prevention behaviour and its screening behaviour in Tehranian women.

Materials and Methods: This was a cross-sectional study conducted on 859 women from November 2019 to December 2019 by the Iran University of Medical Sciences in Tehran, Iran. These women were selected by the multistage cluster method among five socio-economic classes living in different districts of Tehran. Structural Equation Modeling (SEM) was used to determine the relationship between breast cancer prevention behaviour and its screening behaviour. Data were analysed by Statistical Package for Social Sciences (SPSS) version 22.0 and Analysis of Moment Structures (AMOS) software. The level of significance was set at 0.05.

Results: The mean age of the participants was 42±6.94 years. Also, 137 (15.9%) of the participants were single, and 604 (70.3%)

were married, 78 (9.08%) were divorced and rest widow. Among the studied subjects, 510 (57%) had unfavourable breast cancer screening behaviour. In Pearson's correlation test, there was a direct and significant relationship between the mean score of breast cancer prevention behaviour and its subscales with breast cancer screening behaviour, except for the dimension of information-seeking ($r=0.35$, $p=0.007$). In other words, with the increased breast cancer prevention behaviour, breast cancer screening behaviour also increased. The results of SEM analysis showed that breast cancer prevention behaviour was positively correlated to breast cancer screening behaviour ($p<0.001$), and about 41% of changes in the breast cancer screening behaviour could be explained by the breast cancer prevention behaviour ($\beta=0.41$, $p=0.01$).

Conclusion: Based on the results, it seems vital to take measures to inform and educate women about breast cancer and its complications, problems, prevention, screening, and diagnostic methods. The findings of the present study can be used to increase motivation in the design of interventions in order to improve attitude, strengthen self-efficacy, reduce stress, and improve breast cancer screening behaviour.

Keywords: Early detection, Neoplasm, Unfavourable behaviours

INTRODUCTION

Breast cancer is the most common cancer in women and one of the most important health issues in developing countries [1]. It is the second cause of death in women after cardiovascular diseases [2]. Further, it accounts for 23% of all cancer cases and 14% of all deaths in women [3]. More than two million new breast cancer cases were diagnosed worldwide in 2018, accounting for 11.6% of all cancer cases in that year [4]. About 2.09 million women are diagnosed with breast cancer annually, 627,000 of whom die [2]. The prevalence of breast cancer in Iran is 22.6 per 100,000 women [5]. Despite a decrease in breast cancer mortality worldwide, its mortality rate has increased from 19% to 21.4% in Iranian women from 2015-2020 [6].

Prevention of breast cancer and its early detection are among the essential factors in controlling mortality and increasing life expectancy [7]. Concerning breast cancer, primary and secondary preventions are fundamentally important because they allow the disease to be diagnosed in the early stages and prevent its progress [8]. Indeed, prevention and screening will decrease the incidence and mortality of breast cancer [9]. Experts believe that breast cancer in women is diagnosed at advanced stages in less developed countries [10]; as a result, its treatment and costs put great pressure on the healthcare system. Secondary prevention,

which prevents breast cancer progression, is possible with regular screening. According to the recommendations of the American Cancer Society, breast self-examination, mammography, and clinical examination by an expert at different ages are three important and effective methods in the secondary prevention of breast cancer [11].

Self-breast examination, clinical breast examination, and mammography for breast cancer screening are the most effective methods to prevent breast cancer mortality and morbidity. Screening methods have been defined as activities facilitating the early screening and improvement of women's health and are said to be good for the early detection of breast cancer [12-16]. Recent studies have recommended self-examination and clinical examination of the breast as important and vital criteria for early diagnosis [12-15,17]. American Cancer Society recommends a yearly clinical breast examination for 20-30-year-old, over 40-year-old, and low-risk women, as well as mammography once every two years for over 60-year-old women [11]. The effectiveness of common screening methods such as breast self-examination, clinical examination by a physician, and mammography has been confirmed in previous studies [12,16,18].

The high prevalence of breast cancer in women makes it necessary to encourage breast cancer screening behaviours in women. A

society's health beliefs and behaviours are formed based on the social and cultural background of the people living in that society. Therefore, investigating the causes of breast cancer screening behaviours among women can provide valuable information for designing screening interventions. Therefore, this study aimed to investigate the relationship between breast cancer prevention behaviour and breast cancer screening behaviour among Tehranian women. Previous studies in women [9,19-21] have investigated self-examination, clinical breast examination and mammography, and correlated factors. The present study aimed to study the relationship between breast cancer prevention behaviour and breast cancer screening behaviour.

MATERIALS AND METHODS

This cross-sectional study was conducted on 859 women by the Iran University of Medical Sciences from November 2019 to December 2019 in Tehran, Iran. The statistical population of the present study consisted of all 18-year-old women or older living in Tehran. The present study was approved by the Ethics Committee of Tehran University of Rehabilitation Sciences and Social Health with the code of ethics: IR. IUMS.AC.IR.1396.274. The participants completed the relevant questionnaires after providing written informed consent and then received an explanation about the purpose and method of the study.

Inclusion criteria: Those Tehranian women ≥ 18 years of age, having the ability to read, write, and speak Persian, women living in Tehran for at least five years, and having no history of breast cancer were included in the study.

Exclusion criteria: The Tehranian women who showed unwillingness to participate in the study, having cognitive disorders such as Alzheimer's disease, having mental illnesses such as psychosis, and having breast cancer and those who did not answer the questionnaire correctly and completely were excluded from the study.

Sample size calculation: STATA software was used to determine the sample size. The lowest Odds Ratio (OR=0.7) value for investigating breast health behaviour was used to obtain the maximum sample size [22]. With the two-sided test, $\alpha=0.05$, test power of 80%, and design effect of 1.3 [23]. The final sample size was estimated at 900 people, 859 people participated in the present study, and the response rate was 99%.

Multistage cluster sampling was used to select the samples. For this purpose, four districts were first selected randomly from 22 districts of Tehran based on the four cardinal directions (North, South, East, and West) to ensure the highest differences.

Then, two districts in each direction were chosen, and two areas were randomly selected in each of the selected districts. All neighborhoods in each area were subsequently identified, and a neighborhood was selected by a simple random sampling method.

Study Procedure

Questionnaire: The data collection tools in this study included breast cancer prevention behaviour and breast cancer screening behaviour questionnaires. The questionnaire on breast cancer prevention behaviour was designed by Khazaei-Pool M et al., [22]. This questionnaire has 33 items and 7 subscales of "attitude" (8 items), "self-efficacy" (3 items), "motivation" (3 items), "supportive system" (5 items), "information seeking" (4 items), "self-care" (7 items), and "stress management" (3 items). The scoring system in this questionnaire was based on a 5-option Likert scale, ranging from 1 to 5. The minimum score in this questionnaire is 33, and the maximum score is 165, with a higher score indicating higher breast cancer prevention behaviour. The cut-off point for the breast cancer prevention behaviour total scale (65 or less) and its subscales was (7-20).

The construct validity and reliability of this tool have been assessed by confirmatory factor analysis, convergent and divergent validity, internal consistency, and test/retest, and its validity and reliability have been found to be appropriate. The subscales of this questionnaire generally explain 60.62 of the variance of screening literacy, and Cronbach's alpha for the subscales was calculated to be between 68 and 85. The interclass correlation coefficient of subscales has also been obtained to be between 78 and 98 [22]. The breast cancer screening behaviour was also measured using a researcher-made questionnaire based on American Cancer Society recommendations [11]. The present study calculated Cronbach's alpha for breast cancer screening behaviour at 0.87, and the interclass correlation coefficient of 0.95 was obtained.

This questionnaire had three questions, which asked the women, "Are you performing the self-examination (once every month for women aged 18 and older) one item, clinical examination (once every year for women aged 40 years and older, and twice every year for women at risk) one item and mammography (once every two years for women aged 40 and older and once every year for women at risk, one item" [11]. Each item was valued on a four-point Likert-type scale, ranging from 0=not performance, 1 incorrect and incomplete performance, 2=sometimes Correct and complete performance, and 3=Correct and complete performance of examinations and tests. The minimum score in this questionnaire is 0, and the maximum score is 9, a higher score indicates greater breast cancer screening behaviour.

The demographic data collected was regarding age (under 35-year-old, 36 to 40-year-old, between 41 and 50-year-old, over 50-year-old), marital status (single, married, divorced, widowed), educational level (illiterate, secondary, high school, diploma, associate degree, bachelor's degree, master's degree and higher) and occupation (housewife, employed, unemployed, retired).

STATISTICAL ANALYSIS

All analyses were performed using SPSS version 22.0 and AMOS statistical software. The Statistics and Data (STATA) software to determine the sample size. First, the study population's demographic characteristics were described using descriptive statistics, mean, Standard Deviation (SD) for continuous variables, and frequency (%) for categorical variables. The normality of continuous variables was assessed using the Kolmogorov-Smirnov test. The correlation between continuous variables was assessed using Pearson's correlation test and SEM. SEM is a generalised method of multiple regression that, in addition to providing the direct effects, also expresses the indirect effects and the effect of each independent variable on the dependent variables [24]. The model fit is acceptable with a cut-off value of 0.9 for the Comparative Fit Index (CFI), Goodness of Fit Index (GFI), as well as a cut-off value of <0.05 for the Root Mean Squared Error of Approximation (RMSEA) [24]. The significance level of 0.05 was considered.

RESULTS

The mean age of the participants was 42 ± 6.94 years. Regarding demographic characteristics, 137 (15.9%) of the study participants were single, and 604 (70.3%) were married, 78 (9.08%) were divorced and rest widow. Most participants had high school diplomas, and a few were illiterate. Also, 365 (42.5%) of the sample population were housewives. More details are given in [Table/Fig-1]. Among the studied subjects, 510 (57%) had unfavourable breast cancer screening behaviour. The mean score of breast cancer prevention behaviour and its subscales are presented in [Table/Fig-2]. According to the range of questions and answers in the breast cancer screening behaviour questionnaire (0 to 3), the mean score of breast cancer screening behaviour and its subscales is lower than the average level [Table/Fig-3].

Variable		Frequency	Percentage
Age	Under 35-year-old	128	14.9
	36 to 40-year-old	274	31.9
	Between 41 and 50-year-old	344	40.0
	Over 50-year-old	113	13.2
Marital status	Single	137	15.9
	Married	604	70.3
	Divorced	78	9.1
	Widowed	40	4.7
Education level	Illiterate	10	1.2
	Secondary	164	19.1
	High school diploma	266	31.0
	Associate degree	110	12.8
	Bachelor's degree	208	24.2
	Master's degree and higher	101	11.8
Occupation	Housewife	365	42.5
	Employed	408	47.5
	Unemployed	54	6.3
	Retired	32	3.7
Total		859	100

[Table/Fig-1]: Demographic characteristics of the participants in the study.

Breast cancer prevention behaviour	Minimum	Maximum	Mean	SD
Attitude	14	40	48.29	5.578
Self-efficacy	3	15	44.10	2.670
Supportive system	5	25	19.15	4.881
Information seeking	4	20	74.11	3.755
Self-care	7	35	76.21	5.486
Stress management	3	15	64.10	2.644
Motivation	3	15	36.11	3.423
The total score of breast cancer prevention behaviour	39	165	46.111	18.279

[Table/Fig-2]: Mean scores of breast cancer prevention behaviour and its subscales (N=859) [22].

Breast cancer screening behaviour	Minimum	Maximum	Mean	SD
Self-examination	0	3	0.69	0.937
Clinical examination	0	3	1.24	1.276
Mammography	0	3	1.11	1.375
The total score of breast cancer screening behaviour	0	9	3.03	3.001

[Table/Fig-3]: The mean score of breast cancer screening behaviour and its subscales [11].

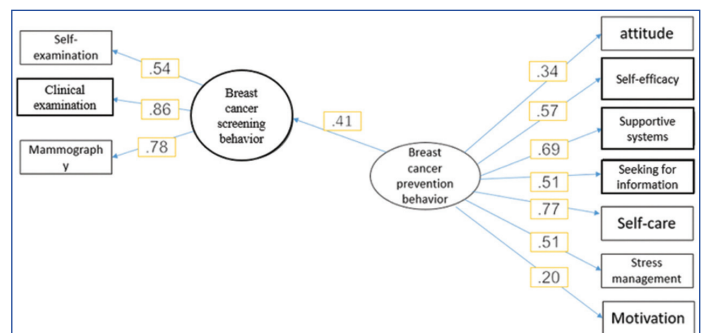
As shown in [Table/Fig-4], there was a direct and significant relationship between the mean scores of breast cancer prevention behaviour, breast cancer screening behaviour, and its subscales ($p < 0.05$). In other words, an increase in breast cancer prevention behaviour will improve breast cancer screening behaviour. In the bivariate analysis based on the Pearson correlation test, the results also showed no significant relationship between information-seeking and breast cancer screening behaviour and its subscales. No significant relationship was found between stress management, motivation, and breast self-examination and between stress management and mammography ($p > 0.05$).

Pearson's correlation test: According to [Table/Fig-1,5], about 54%, 86% and 78% of breast cancer screening behaviour was explained by self-examination, clinical examination, and mammography, respectively, and also about 34%, 57%, 69%, 51%, 77%, 51% and 20% of breast cancer prevention behaviour was explained by attitude, self-efficacy, supportive system, information seeking, self-care, stress management, motivation

Dimension of breast cancer prevention behaviour	Self-examination	Clinical examination	Mammography	The total score of breast cancer screening behaviour
	r, p-value	r, p-value	p-value	p-value
Attitude	0.232	0.236	0.224	0.275
	p=0.002*	p=0.006	p=0.002	p=0.001
Self-efficacy	0.162	0.122	0.105	0.151
	p=0.01	p=0.002	p=0.009	p=0.001
Supportive system	0.218	0.251	0.207	0.270
	p=0.003	p=0.003	p=0.002	p=0.003
Information seeking	0.57	0.57	-0.10	0.37
	p=0.63	p=0.57	p=0.24	p=0.5
Self-care	0.309	0.415	0.397	0.455
	p=0.004	p=0.001	p=0.001	p=0.002
Stress management	0.044	0.978	0.48	0.77
	p=0.55	p=0.007	p=0.06	p=0.04
Motivation	0.57	0.128	0.107	0.122
	p=0.63	p=0.002	p=0.008	p=0.005
The total score of breast cancer prevention behaviour total score	0.276	0.329	0.275	0.352
	p=0.003	p=0.002	p=0.004	p=0.007

[Table/Fig-4]: The relationship between breast cancer prevention behaviour and its subscales with breast cancer screening behaviour.

seeking, self-care, stress management, motivation respectively and finally about 41% of changes in breast cancer screening behaviour could be explained by the breast cancer prevention behaviour ($\beta = 0.41$).



[Table/Fig-5]: Structural equation model of the relationship between breast cancer prevention behaviour and breast cancer screening behaviour.

SEM was used to investigate the role of breast cancer prevention behaviour in explaining breast cancer screening behaviour [Table/Fig-5]. The model had two measurement models [Table/Fig-5,6]. The two measurement models formed a structural equation model according to the role of variables. According to [Table/Fig-5], about 41% of breast cancer screening behaviour changes could be explained by breast cancer prevention behaviour ($\beta = 0.41$). The breast cancer screening behaviour measurement model with three indicators (self-examination, clinical examination, and mammography) and the breast cancer prevention behaviour measurement model with seven indicators (attitude, self-efficacy, supportive system, information seeking, self-care, stress management, motivation) had an acceptable goodness of fit [Table/Fig-7].

DISCUSSION

Since the incidence of breast cancer is increasing, especially in developing countries and in people below 40 years of age [6], planning for interventions to prevent breast cancer is of great importance. The present study aimed to investigate the relationship between breast cancer prevention behaviour and breast cancer

Independent variable	Direction of relationship	Dependent variable	Estimate	Standard error	Critical value	β	p-value
Breast cancer prevention behaviour total score	-->	Breast cancer screening behaviour	0.30471	0.06588	4.62508	0.41250	0.001
Attitude	-->	Breast cancer screening behaviour	2.73612	0.58524	4.67525	0.34041	0.001
Self-efficacy	-->	Breast cancer screening behaviour	2.22502	0.43095	5.16304	0.57839	0.001
Supportive system	-->	Breast cancer screening behaviour	4.91364	0.93499	5.25526	0.69859	0.001
Seeking for information	-->	Breast cancer screening behaviour	3.12848	0.60597	5.16278	0.57814	0.001
Self-care	-->	Breast cancer screening behaviour	5.67716	1.07822	5.26531	0.71824	0.001
Stress management	-->	Breast cancer screening behaviour	2.19464	0.42527	5.16062	0.57603	0.001
Motivation	-->	Breast cancer screening behaviour	1.00000	-	=	0.20277	0.001
Self-examination	-->	Breast cancer screening behaviour	1.00000	-	-	0.54687	0.001
Physical examination	-->	Breast cancer screening behaviour	2.15337	0.14779	14.57022	0.86498	0.001
Mammography	-->	Breast cancer screening behaviour	2.10280	0.14138	14.87317	0.78421	0.001

[Table/Fig-6]: Regression coefficient, factor load, and significance of each coefficient in model number 1.

Indicator	The value obtained in the study	Acceptable cut-off point
Comparative Fit Index (CFI)	0.9456	Values higher than 0.9
Goodness-of-fit index (GFI)	0.91024	Values higher than 0.9
Root Mean Square Error of Approximation (RMSEA)	0.04456	Values less than 0.08

[Table/Fig-7]: Fit indexes of structural equation model and its acceptable values.

screening behaviour. To the best of authors' knowledge, the present study is the first that investigates the relationship between breast cancer prevention behaviour and breast cancer screening behaviour. SEM is a generalised method of multiple regression that, in addition to providing the direct effects, also expresses the indirect effects and the effect [24] between breast cancer prevention behaviour and breast cancer screening behaviour.

The findings showed that breast cancer prevention behaviour and its subscales, such as attitude, self-efficacy, supportive system, seeking information, self-care, stress management, and motivation, directly correlated with breast cancer screening behaviour. This study provides valuable information about factors associated with breast cancer screening behaviour. In general, the findings showed that women, who have a positive attitude towards their health, seek health information, know how to manage stress, and have greater self-efficacy, appropriate sources of support, necessary motivation for self-care, and breast cancer screening behaviour. These results are in line with the study of Khazai Pool M et al., [23]. Based on the health belief model, the more people's sensitivity to a disease, the more preventive measures and healthcare they take [25,26]. Other studies have also shown that increased sensitivity to breast cancer leads to increased mammography screening [27,28].

The present study showed that having a supportive system can lead to an increase in breast cancer screening behaviour ($\beta=69$, $p=0.001$). Supportive systems refer to factors that may facilitate maintenance, repetition, and fixing preventive behaviours. Support may come from family members, peers, healthcare workers, decision-makers, and insurance systems. Supportive sources and supportive systems include feelings and help that a person expects to receive in times of difficulty [26,29]. These supportive sources can help to encourage and support a person to perform breast cancer screening behaviours. In many studies, supportive sources and better socioeconomic status were the most important predictors of breast screening [19,30,31].

When women are aware of the importance of preventive behaviours, they will have greater motivation to perform such behaviours. This study showed that motivation is related to breast cancer screening behaviour ($\beta=0.2$, $p=0.001$). In line with the findings of the present study, the evaluation of health-related behaviours has shown that women take preventive measures when they have motivation and support [22]. In line with the findings of the present study, a study

showed that motivation is the main factor in a healthy lifestyle [32]. Similarly, searching for correct and useful information is one of the key approaches known in cancer prevention and screening behaviours [33].

The present study showed that self-efficacy could lead to an increase in breast cancer screening behaviour ($\beta=34$, $p=0.001$). Self-efficacy has a positive impact on health-promoting behaviours and is associated with increased breast cancer preventive behaviours. Women's beliefs associated with self-efficacy may be an important factor in influencing health behaviours. Studies have shown that if people improve their self-efficacy abilities to change unhealthy behaviours and improve themselves, they will be more likely to participate in breast cancer screening behaviours [20]. In line with the findings of the present study, Salehi A et al., in year 2016, showed that self-efficacy could be a useful tool for participating in activities that are related to a healthy lifestyle [32].

Breast cancer prevention is critical for women, including breast self-awareness and risk factor knowledge. The present study showed that self-care is related to breast cancer screening behaviour ($\beta=0.71$, $p\text{-value}=0.001$). In line with this finding, Tabrizi, in 2018, observed a significant relationship between self-care and mammography [19]. Gathirua-Mwangi W et al., in 2004, showed that people with higher levels of perceived health (health motivation) are more involved in self-care-related activities [33]. The most important self-care activities include paying attention to the possibility of becoming ill, following a healthy diet, and performing physical activity [34,35]. So it is necessary to design and apply interventions and pieces of training based on these activities to encourage women to take more breast cancer screening behaviour [22,23].

The result of the present study showed that attitude is correlated with breast cancer screening ($\beta=0.41$, $p\text{-value}=0.001$), in line with other studies [21,36]. Attitude reflects conditions that might encourage women to experience breast cancer preventive behaviours. It includes factors that impede or facilitate preventive behaviours, including issues related to a woman's personal concerns. It is recognised that some factors, like knowledge, beliefs, attitudes, values, and personal priorities, can motivate people to perform and modify their behaviour. It is essential to raise women's knowledge to develop attitudes and change their lifestyles through education about the risk factors for breast cancer. Many women do not have a health-related attitude toward the disease, and many of them, particularly women from developing countries, do not participate in screening programs [37].

Uncertainty regarding the risk of stress on breast cancer exists. As a result, stress management not only improves women's health but also further enhances breast cancer-preventive behaviours. Stress management includes many methods, including use of spirituality, positive thinking, and relaxation. The present study showed

that stress management is related to breast cancer screening behaviour ($\beta=0.57$, $p=0.04$) in women and hence inferred that stress management intervention shall be incorporated, to improve patients' skills in coping with stress and buffer against the negative effects of cancer [38,39].

The results of the present study showed that seeking information is related to breast cancer screening behaviour ($\beta=0.57$, $p=0.04$). The more women seek health information, the more cancer screening behaviour they have. Information-seeking refers to the acquisition of health information, such as searching the Internet or talking to providers. A lack of breast cancer prevention knowledge may lead to a lower perceived susceptibility for breast cancer and lower perceived disease severity. Eibich P and Goldzahl L showed that women eligible for breast cancer screening have better knowledge of breast cancer prevention and treatment [40]. And Griesser AC et al., showed that women with early-stage breast cancer had been identified as particularly active information seekers [41].

Limitation(s)

The self-reporting method used for data collection. One of the strengths of the present study was its appropriate sample size and the use of diverse samples from different socio-economic classes. Secondly, 41 participants did not respond correctly to the dependent variable of the study, so they were excluded from the analysis of the present study, and this could possibly affect the power of the study.

CONCLUSION(S)

The results showed a direct and significant relationship between breast cancer prevention behaviour and breast cancer screening behaviour. Different levels of attitude, self-efficacy, supportive system, self-care, stress management, and seeking information can motivate women to do preventive behaviours. The findings of the present study can be used to increase motivation in the design of interventions to improve attitude, strengthen self-efficacy, reduce stress, and improve breast cancer screening behaviour.

Authors' contributions: Study concept and design MR, RN, and SB. Search, analysis, and interpretation of data FB, ME, and SB. Drafting the manuscript FH, MR, ME, and RN. Critical revision of the manuscript MR, FB. All authors read and approved the final manuscript.

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