

# Predictive Power of PEN-3 Model Constructs in Breast Cancer Screening Behaviors among Teachers: A Cross-Sectional Study in Central Iran

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## ABSTRACT

**Objective:** Identifying the factors influencing screening is necessary to promote early detection of breast cancer. This study aims to determine the predictive power of PEN-3 model structures in breast cancer screening behaviors among teachers of Isfahan city in Iran.

**Materials and Methods:** This cross-sectional study was conducted on 192 female teachers in Isfahan selected by the multi-stage random sampling method. A questionnaire based on PEN-3 model was used for data collection. Statistical analysis was conducted using SPSS version 20 (multiple linear regression analysis, independent t-test, Pearson correlation coefficient), and  $p < 0.05$  was considered statistically significant.

**Results:** The mean score of behavior, perceptual, enabling and nurturer factors in early detection of breast cancer was  $36.5 \pm 30.5$ ,  $74.6 \pm 8.9$ ,  $65.5 \pm 19.9$  and  $68.1 \pm 20.7$ , respectively. The mean score of behavior in early detection of breast cancer in women with individual and familial history of breast disease was significantly higher than that of those who did not have such history. Perceptual and nurturer factors as the best predictors of screening behaviors were associated with screening behaviors.

**Conclusion:** The study results indicate that nurturer and perceptual factors were the best predictors of breast cancer screening behaviors among teachers. Therefore, attention to these constructs in developing educational interventions is highly recommended.

**Keywords:** Breast cancer screening, PEN-3 model, teacher, Iran.

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## Introduction

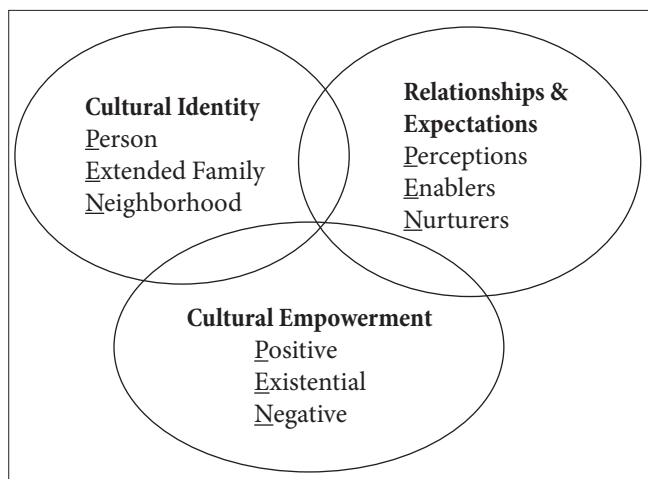
Cancer is the second major cause of death all over the world. In 2015, 9.6 million deaths were due to cancer, of which 627,000 were due to breast cancer (BC) (1). BC is at the forefront of all cancers that women suffer from, and is one of the most important public health problems in both developed and developing countries (2). The incidence of BC in Iranian women is approximately 25 per 100,000 females (3), and the mean age of those suffering is 48.3 (4). This result indicates that Iranian women are affected by BC at least 10 years earlier than women in developed countries (5). In Iran, BC has a weak diagnosis and most patients are identified at advanced stages; for this reason, it is the third leading cause of death (accounting for 16% of cancer deaths) from cancers (6). Therefore, early diagnosis of BC and its timely treatment are the most important solutions to prevent death due to this disease. Screening is the main method of early detection of BC that needs to be carried out regularly (7). Women routinely participating in screening will be diagnosed at earlier stages with significant percentage points (5 to 13%), irrespective of race or ethnicity (8). Two organized networks, National Literacy Campaign and Health Network System with extremely motivated and devoted workers (called Behvarz), provide opportunities for public education regarding breast cancer in Iranian women, particularly for surrounding areas. Due to cultural beliefs, public education through the mass media (such as TV) is limited, while Short Message System (SMS) is a simple and low-cost way to raise awareness and encourage Iranian women to seek earlier detection (9). The American Cancer Society has recommended several screening methods, including breast self-examination (BSE), clinical breast examination (CBE), mammography, ultrasonography, and magnetic resonance imaging (MRI); these methods vary from person to person depending on their risk of breast cancer (10). The most common methods include: Mammography that 40-year and older women should perform once a year; CBE that women between 20 and 40 years should perform it every 3 years and after the age 40 years, they should do it once a year by health experts; BSE that 20-year and older women should do it every month (11). Despite medical recommendations and educational inter-

vention as well as evidence of effectiveness of screening for BC in Iran, performing screening behaviors in women is low, and they do not have regular mammography utilization (12, 13). There are many barriers to women's participation in early detection of BC, such as lack of knowledge and skills, embarrassment at performing the essential examinations by the doctor or other health service staff, lack of insurance, high costs (14), low socioeconomic position, distance to the health centers, lack of self-confidence in performing breast self-examination (15), personal attitudes toward screening, perceived severity, fear, self-efficacy, lack of access, and challenging priorities at home (16). Identifying these barriers can be important in developing targeted interventions to promote BC screening behaviors. The use of theories and models in conducting research can create a comprehensive structure to predict the determinants of behavior. The PEN-3 model is one of the health education models used to report a collection of health subjects (e.g., cancer, HIV, diabetes, nutrition) with compound clinical and cultural backgrounds affecting health behaviors and health outcomes (17). This model consists of three main domains that each domain includes three factors forming the acronym PEN: 1- Cultural Identity: (*Person, Extended Family, Neighborhood*), 2- Relationships and Expectations: (*Perceptions, Enablers, and Nurturers*) and 3- Cultural Empowerment: (*Positive, Existential and Negative*) (18) (Figure 1). This study aimed to determine the predictive power of PEN-3 model structures in breast cancer screening behaviors among teachers of Central Iran.

**Material and Method**

**Study design and participants**

This cross-sectional study was conducted on 192 female teachers in Isfahan (a city in central Iran), from April to May 2018. According to the formula of correlation between quantitative variables (score of



**Figure 1.** The PEN-3 Model

behavior with perceptual, enabling and nurturer factors scores) at a significant level of 0.05 and a test power of 80% and the least correlation coefficient (0.21) obtained from Naghibi et al. (19), at least 172 people were recruited that with a probability of 10% dropping of samples, 192 were selected. For some reasons such as incomplete filling or not filling the questionnaires, 13 samples were removed, and finally 179 people were included in the study.

In this study, the multi-stage random sampling method was used. At first, one district of education department of Isfahan was randomly selected, and then out of 24 first secondary schools, 12 schools were randomly selected. Next, 16 teachers were randomly selected from each school and included in the study.

**Data collection tool**

A questionnaire based on PEN-3 model was used for data collection. The validity and reliability of the questionnaire were confirmed in the

**Table 1.** Socio demographic characteristics of the sample

| Variable                                    | Mean±Standard Deviation | Number (%) |
|---|-------------------------|------------|
| <b>Age</b>                                  | 45.5±5.2                |            |
| <b>Child Number</b>                         | 1.6±0.9                 |            |
| <b>Marital Status</b>                       |                         |            |
| Single                                      |                         | 15 (8.4)   |
| Married                                     |                         | 157 (87.7) |
| Divorced                                    |                         | 5 (2.8)    |
| Widow                                       |                         | 2 (1.1)    |
| <b>Level of Education</b>                   |                         |            |
| Associate                                   |                         | 11 (6.1)   |
| Bachelor                                    |                         | 120 (67)   |
| Higher than bachelor                        |                         | 48 (26.8)  |
| <b>Individual History of Breast Disease</b> |                         |            |
| No  |                         | 154 (86)   |
| Yes   |                         | 25 (14)    |
| <b>Familial History of Breast Disease</b>   |                         |            |
| No  |                         | 128 (71.5) |
| Yes, 1 <sup>st</sup> grade relatives        |                         | 17 (9.5)   |
| Yes, 2 <sup>nd</sup> grade relatives        |                         | 34 (19)    |

**Table 2.** Mean scores of behavior in early breast cancer detection, perceptual, enabling and nurturer factors (from 100)

| Variable           | Mean | Standard Deviation | Minimum | Maximum |
|--------------------|------|--------------------|---------|---------|
| Behavior           | 36.5 | 30.5               | 0       | 100     |
| Perceptual Factors | 74.6 | 8.9                | 48      | 98      |
| Enabling Factors   | 65.5 | 19.9               | 10      | 100     |
| Nurturer Factors   | 68.1 | 20.7               | 12      | 100     |

study conducted by Naghibi et al. (19). Content validity was approved with the advice of 10 experts, and the reliability of the questionnaire was determined using Cronbach's alpha test for each section: screening function (0.80), perceptual factors (0.81), enabling factors (0.78) and nurturers (0/77).

The questionnaire consisted of five sections. The first part consisted of 13 questions related to personal and demographic characteristics such as individual history of breast disease except for breast cancer and familial history of breast diseases, including breast cancer. The second part included 6 questions about women's behavior in early diagnosis

of breast cancer; the third part consisted of 24 questions about perceptual factors; the fourth part included 13 questions regarding enabling factors, and the fifth part encompassed 13 questions about nurturer factors. The questionnaire scoring method was the 5-point Likert scale (completely agree=5, agree=4, have no idea=3, disagree=2 and completely disagree=1) for the perceptual factors, that the spectrum scores in this section were from 24 to 120. The "Yes-No" options were used for questions of enabling and nurturer factors whose range of scores was 0-13, and the "Yes-No" and multiple-choice options were used for the questions related to behavior section, which was considered to

Table 3. The percentage of perceptual, enabling and nurturers factors based on PEN-3 model

| Factors            | Positive   | Negative  | Existential                         |
|--------------------|--|---|-------------------------------------|
| <b>Perceptions</b> | Awareness about risk factors (57.1%)   | Belief in fate and destiny (4%)   | Free health care (11.9%)            |
|                    | Belief in preventable breast cancer (67%)  | Feeling unable to perform BSE (31.5%)   |                                     |
|                    | Awareness about starting age and screening intervals (74.8%)                       | Resistance and toughness in screening (9.6%)<br>Concerned about mass detection (26.5%)  |                                     |
|                    | Belief in screening behaviors (86.9%)  | Fear of mass detection (13%)<br>Shame on screening (7.3%)<br>Not trusting the work of health personnel (15.3%)<br>Believing that screening is not necessary (11.3%) |                                     |
| <b>Enablers</b>    | Access to screening centers (70.2%)  | Danger of Mammography (16.9%)   | Time consuming of screening (51.1%) |
|                    | Health staff skills (59.9%)  | Business and lack of time (48.9%)   |                                     |
|                    | Ability to perform BSE (47.4%)   | Pain of Mammography (57.1%)   |                                     |
|                    | Cost of screening (80%)<br>Insurance (87%)   | Negligence and forgetfulness (50.3%)  |                                     |
| <b>Nurturers</b>   | Encouragement by spouse (62.7%)  | Husband`s disagreement with screening (2.6%)  |                                     |
|                    | Encouragement by family members (83.1%)  |   |                                     |
|                    | Encouragement by physicians and health workers (64.9%)                             |   |                                     |
|                    | Recommendations by religious leaders (30.2%)<br>Advising by the mass media (64.9%) |   |                                     |

Table 4. The mean score of behavior, perceptual, enabling and nurturer factors in early detection of breast cancer among women with individual history of breast disease and familial history of breast disease

| History                              | Variable           | History |                    | Lack of history |                    | p*    |
|--------------------------------------|--------------------|---------|--------------------|-----------------|--------------------|-------|
|                                      |                    | Mean    | Standard Deviation | Mean            | Standard Deviation |       |
| Individual History of Breast Disease | Behavior           | 41.8    | 28.8               | 34.3            | 30.9               | 0.04  |
|                                      | Perceptual Factors | 74.6    | 9.4                | 74.5            | 8.7                | 0.96  |
|                                      | Enabling Factors   | 67.3    | 17.7               | 64.8            | 20.7               | 0.45  |
|                                      | Nurturer Factors   | 71.9    | 17.9               | 66.6            | 21.6               | 0.09  |
| Familial History of Breast Disease   | Behavior           | 44.7    | 25.8               | 35.1            | 31.01              | 0.047 |
|                                      | Perceptual Factors | 74.7    | 7.7                | 74.5            | 9.1                | 0.95  |
|                                      | Enabling Factors   | 63.5    | 19.5               | 65.8            | 20                 | 0.59  |
|                                      | Nurturer Factors   | 69.2    | 18.3               | 67.9            | 21.1               | 0.79  |

\* Independent t-test

achieve the frequency of behavior. The questionnaires were completed by teachers, and finally the collected data were entered into SPSS version 20 for further analysis.

This study was approved via the ethics committee of Isfahan University of Medical Sciences (Approval code: IR.MUI.REC.1396.697). After explaining the goals of the study, participants completed the written consent form. The participants were informed about confidentiality of information.

**Statistical analysis**

Data analysis was conducted using descriptive and analytical statistics such as multiple linear regression analysis, independent t-test, Pearson correlation coefficient, and  $p < 0.05$  was considered statistically significant.

**Results**

The mean age of the women was 45.5 (31 to 57 years). Most of them (87.7%) were married, and the average number of their children was  $1.6 \pm 0.9$ . In terms of education, most of them (67%) had a bachelor's degree. In terms of history of breast disease, 25 (14%) had individual history of breast disease and 34 (19%) had familial history of breast disease (Table 1).

The mean score of behavior, perceptual, enabling and nurturer factors in early detection of breast cancer was 36.530.5, 74.6, 65.519.9 and 68.120.7, respectively (Table 2).

As Table 3 presents, the percentage of PEN-3 model structures (perceptual, enabling and nurturer factors) affecting screening behaviors was classified as positive, negative and existential. The most important positive perceptual factors were: belief in screening behaviors (86.9%) and awareness about starting age and screening intervals (74.8%), the most important negative perceptual factors were feeling unable to perform BSE (31.5%) and being concerned about mass detection (26.5%). In this regard, the most important positive enabling factors were insurance (87%) and cost of screening (80%). Furthermore, the

most important negative enabling factors were pain of mammography (57.1%) and negligence and forgetfulness (50.3%). Moreover, the most important positive nurturer factor was encouragement by family members (83.1%).

According to the results of the behavioral section, from all the samples, 117 (65.4%) performed BSE, of which only 25 (14%) conducted that regularly and monthly. A total of 100 (55.9%) of subjects performed CBE, of which only 41 (22.9%) performed it annually, 17 (9.5%) every two years and 19 (10.6%) every three years. In terms of performing mammography, 77 (43%) of 40-year and older teachers had history of mammography, of which only 16 (8.9%) performed it annually and 18 (10.1%) carried out twice a year.

The independent t-test indicated that the mean score of behavior in early detection of breast cancer in women with individual and familial history of breast disease was significantly higher than that of those who did not have such history ( $p=0.04$ ) and ( $p=0.047$ ), respectively. No significant correlation was found between the scores of perceptual, enabling and nurturer factors as well as individual and familial history of breast disease ( $p > 0.05$ ), (Table 4).

The Pearson correlation coefficient showed that the behavioral score in early detection of BC was significantly correlated with the scores of perceptual and nurturer factors ( $p < 0.001$ ), but it was not significantly associated with the score of the enabling factors ( $p=0.10$ ) (Table 5).

Multiple linear regression analysis showed that among different PEN-3 constructs, the scores of nurturer and perceptual factors were the best predictors for the score of behavior in early detection of BC and in the presence of these two variables, other variables were not significant predictors (Table 6).

**Discussion and Conclusion**

Breast cancer screening behaviors are low in women, and factors such as perceptual, enablers, and nurturers can predict its cause. Therefore, this study aimed to determine the predictive power of PEN-3 model structures in breast cancer screening behaviors among teachers of Isfahan city in Iran.

The results of our study were consistent with those obtained by Naghibi et al. (19, 20) showing the performance of screening in female was very low and perceptual factors were at an appropriate level; however, their results were inconsistent with our results regarding the enabling factors, which were moderate, and nurturer factors, which were low in the mentioned study.

The results of the present study showed that regular BSE was low among the participants. Consistent with our study, some studies also reported an unsatisfactory level of BSE (21-23). Higher knowledge about breast cancer, better confidence in performing BSE and regular visits to a doc-

**Table 5. Pearson correlation coefficients between behavioral score in early breast cancer detection with perceptual, enabling, and nurturer factors**

| Variable           | Score of behavior in early detection of breast cancer |        |
|--------------------|---|--------|
|                    | r   | P      |
| Perceptual Factors | 0.277   | <0.001 |
| Enabling Factors   | 0.124   | 0.10   |
| Nurturer Factors   | 0.30  | <0.001 |

**Table 6. Multiple linear regression analysis to predict behavioral scores in early diagnosis of breast cancer based on perceptual, enabling and nurturer factors**

| Variable           | Crud coefficients | Adjusted coefficients | t    | p     |
|--------------------|-------------------|-----------------------|------|-------|
| Perceptual Factors | 0.731             | 0.214                 | 2.79 | 0.006 |
| Enabling Factors   | 0.038             | 0.025                 | 0.32 | 0.748 |
| Nurturer Factors   | 0.356             | 0.243                 | 3.17 | 0.002 |

tor are listed among reasons of performing BSE (23). In our study, performing CBE was moderate, being consistent with the study conducted by Farid et al. (24). In the study conducted by Avci and Gozum and some studies conducted in Iran, performing CBE was lower than average (25-27). Performing mammography in our participants was lower than average, being in line with the study conducted by Avci and Gozum (27) and Ghahramanian et al. (25). In the study conducted by Temel et al. (28), none of the teachers had mammograms.

The results of our study revealed that behavior in early detection of BC in women with individual and familial history of breast disease was significantly higher than that in those who did not have such history; this issue has been approved by previous studies (29, 30).

Enabling factors are factors increasing the ability or impediment to the use of health services in individuals. The females included in this study had insurance, and the cost of screening was completely covered by their institutions; this was inconsistent with the study conducted by An et al. (29) in which no relationship was found between these factors and their screening behaviors. This difference in results may be due to the different population of the studies, which in our study, the target population was teachers. In contrast, perceptual and nurturer factors have been associated with screening behaviors. In our study, these factors were the best predictors of screening behaviors. Encouragement of family members is one of the nurturer factors that in the current study had the most positive effect on screening behaviors. This finding is consistent with the studies conducted by Dong and McFall (31, 32). In terms of perceptual factors, belief in screening has the most positive impact on screening behaviors, which has also been proved in the previous studies. In this regard, positive attitude toward mammography has been implicated in this behavior, and distrust of the effectiveness of mammography is an obstacle to perform it (33). Participants' knowledge of risk factors and screening methods is the other perceptual factor that was appropriate in this study and had a positive effect on screening behaviors, being consistent with the study conducted by Temel et al. (28) and Dahlui et al. (34). Other perceptual factors were fear or worry about mass detection that has a negative effect on screening behaviors, being consistent with the study of Ghahramanian et al. (27). Inconsistent with our study, the result of some studies indicated that worry about breast cancer motivated people to perform screening behaviors (35, 36). Similar to some related studies, feeling unable to perform BSE was the other perceptual factor having a negative effect on performing BSE (37).

The small number of the samples can be considered the limitation of the current study.

The results of this study indicate that nurturer and perceptual factors are the best predictors of breast cancer screening behaviors among teachers and they have a good knowledge about the BC screening behaviors, but the level of these behaviors among them is less than average, and given the fact that teachers play a significant role in educating the community, conducting research based on educational models, including the PEN-3 model for promoting breast cancer screening behaviors among teachers is essential.

**Ethics Committee Approval:** Ethics committee approval was received for this study from the Ethics Committee of Isfahan University of Medical Sciences (Approval No: IR.MUI.REC.1396.697).

**Informed Consent:** Written informed consent was obtained from teachers who participated in this study.

**Peer-review:** Externally peer-reviewed.

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