Breast Cancer Risk Evaluation by Utilizing Gail Model and Association between Breast Cancer Risk Perception with Early Diagnosis Applications among Midwives and Nurses Working in Primary Health Services

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Objective: The present study was performed to detect cancer risk of the midwifes and nurses playing central role in raising awareness in the society using Gail's model.

Materials and Methods: Sample of the present cross-sectional study consists of 750 volunteer midwifes and nurses in 2016.Breast cancer risk was calculated using the Gail Risk Assessment Tool. Perceived and calculated risk levels were compared. Descriptive statistics and Chi-Square analysis, t-test, Multivariate Linear Regression Analysis, the Logistic Regression Analysis were conducted.

Results: A mean of 5 years risk (0.8% ± 0.52) and a mean of lifetime risk (11.03% ± 4.46) were computed. It was found that risk of development of breast cancer over the next 5-years period was high for 7.1% of the midwifes and nurses. The difference between the breast cancer risk perception level of women and the breast cancer risk level according to the Gail Model was significant (p<0.01). It was determined that the midwives and nurses, who thought that they had high risks for individual breast cancer, had mammography with a higher frequency (p<0.00) and went to clinics for breast examination on a regular basis (p<0.01).

Conclusion: Considering the fact that participants were healthcare professionals, the use of clinical breast examination and mammography practices as a preventive behavior by nurses and midwives was lower than expected. [*P R Health Sci J 2018;37:98-104*]

Key words: Breast cancer, Risk assessment, Gail model, Early diagnosis applications, Turkish midwives/nurses

Breast cancer is an important public health problem affecting the health of women (1). It is the most common type of cancer both in Turkey and globally (in the developed and developing countries alike). Breast cancer is the most frequently diagnosed cancer and the leading cause of cancer death among females, accounting for 23% of the total cancer cases and 14% of the cancer deaths (2).

The rate of breast cancer in Turkey is 40,6 per 100,000 women, and it is ranked first among the types of cancer occurring in women (3). Incidence of breast cancer has been increasing recently especially because of increased life-span in the countries with low- and intermediate-level of income, increased rate of urbanization, and adoption of Western life-style. In its 2014 report, The International Agency for Research on Cancer called attention to this sharp rise in breast cancer. International Cancer Agency specified that incidence of breast cancer in 2012 increased by 20% and deaths from breast cancer increased by 14% compared to 2008 (4).

There are some risk factors considered to affect the development of breast cancer. Major risk factors for breast cancer include advanced age, female gender, family history of breast cancer, atypical hyperplasia, and mutations in BRCA-1 and BRCA-2 gens. Minor risk factors have been defined as follows: longer interval between menarche and menopause, nulliparity, giving first birth after 30 years of age, alcohol consumption more than one cup per day, and fatty diet (1, 5).

Detecting high-risk women for breast cancer is of importance because curative treatment is possible in the case of early diagnosis and it is also possible to advice women about some preventive methods. Mortality of breast cancer may be reduced by achieving participation of these high-risk women in cancer screening programs (6). Thus, each society should determine

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risks and risk groups for breast cancer and apply common screening programs. In Turkey, monthly breast self-examination (BSE) is advised for women aged 20 and over. Clinical breast examination (CBE) is advised as every two years for the 20-39 years age group and every year for those who are 40 years and over. Mammography (MMG) is recommended every two years for the 40-69 years age group. There is also a program for national breast cancer control (7).

Several tools have been developed for risk detection. Gail's model is one of the commonly used risk determining tools. It was created in 1989 by Gail et al. (8). Gail-1 model determining both non-invasive and invasive breast cancer was created followed by Gail-2 model (GM) modified to detect the risk of only invasive breast cancer, which is available on the National Cancer Institute (NCI) website (9). The modified GM calculates a woman's risk of developing breast cancer within the next 5 years and within her lifetime by using individual risk factors. These factors are age, menarche age, age of first live birth or no birth, the number of first-degree relatives who have had breast cancer, number of breast biopsies, breast biopsy with atypical hyperplasia, and race/ethnicity. The model calculates and prints 5-year and lifetime projected probabilities of developing invasive breast cancer and can be used to identify individuals at increased risk (women with 5-year GM scores >1.67% are accepted to be "at risk"). The sensitivity and specificity of this model have been reported over %90 in recent studies (10). This model is validated in some studies with different demographic characteristics such as race, age and cultural ethnicity and nationality. The Gail model has also been found to be a reliable model for the Turkish female population in the calculation of individual risk in terms of breast cancer development (9).

Health-care providers, especially nurses and midwifes have a central role in detecting risk and providing the society with psycho-social support and consultancy for maintaining health and management of cancer risk (7).

It is extremely important that midwives and nurses have accurate and adequate knowledge on protective healthcare services against cancer because of their educational and counselling roles. For this purpose, midwives and nurses must firstly be aware of the up-to-date developments on breast cancer screening and on the risk factors that are considered to be influential on the development of breast cancer. It is also necessary that they are skillful and experienced in the application of screening of breast cancer. Midwives and nurses have the responsibility of caring for their own healthcare and the healthcare of other women in the society. Midwives and nurses must apply the precautions that are needed for the early diagnosis of breast cancer on themselves on a regular basis and teach these precautions to other women around them, which are their responsibilities in this context. These roles and responsibilities require that midwives and nurses have active roles in early diagnosis and prevention of the diseases (11). In the literature, risk perception is defined as the perceived probability, anxiety, and sensitivity. It was reported that high risk perceptions cause that more protective behaviors appear. Risk perception in the society on breast cancer is an important finding to benefit from early diagnosis methods for breast cancer and healthy lifestyle behaviors (12).

Because of these reasons, determining the breast cancer risks and breast cancer risk perceptions, which may affect the applications of midwives and nurses on breast cancer, who are the role models for other women in the society, and defining the effect of breast cancer risk perception on the behaviors intended for protection from breast cancer are extremely important.

Answers for the following questions have been sought in the present study.

1. What are breast cancer risk level calculated with the Gail Model in midwives and nurses? What are the factors influencing breast cancer risk levels calculated with the Gail Model?
2. What is the breast cancer risk levels perceived in midwives and nurses? What are the factors influencing breast cancer risk level?
3. How is the relation between the level of risk perceived and breast cancer early diagnosis practices in midwives and nurses (mammography, practice of BSE, having regular CBE).

Materials and Methods

In our country, according to the "National Standards for Breast Cancer Screening in Women" released by the Ministry of Health, Cancer Department, "the women between 40-69 living in predefined regions" were defined as the target population for breast cancer screening in the society.

Mammography (MMG) practice in the national breast cancer screening program is recommended every two years for the 40-69 years age group. Therefore, sample of the present cross-sectional study consisted of all midwives and nurses who were 40-year-old and over employed in family health centers in Izmir (N = 806). We tried to reach all the midwives and nurses without using a sampling method. A total of 750 midwifes and nurses were included in the present study (participation rate = 93.1%).

Data were collected by the authors of the study using the questionnaire prepared in February-March 2014. Prior to the questionnaire, aims of the study were explained to the participants and their oral consents were taken. The study protocol was approved by the ethical review board of Izmir Public Health Directorate. As data-collecting tool, "Form of socio-demographic characteristics" prepared by the authors was used, and the Gail's model was used to estimate the risk level of breast cancer. In this context, Breast Cancer Risk Assessment Tool V.2.0.1 prepared by National Cancer Institute for estimation of breast cancer (National Cancer Institute, Bethesda, MD, USA) was utilized (13). The data obtained in this manner in the present study were analyzed in the above-mentioned software, and 5-year and life-long risk of breast

cancer was calculated for the women using Gail's model. Calculating a woman's 5-year risk of breast cancer above 1.67% means that risk of breast cancer of that woman within the next 5 years is higher; estimating life-long risk of breast cancer above 20.0% means that the woman has higher life-long risk (9, 13). Breast self-examination (BSE), mammography (MMG), clinical breast examination (CBE) were queried as early diagnostic modalities. "Perceived risk" was investigated with regards to verbal measures. For estimating the perception risks in the questionnaire, the 5-Point Likert Scale was used. The verbal measure was asked as, "Do you think that you have risk of having breast cancer in the future?", and answered by 5-Point Likert Scale, namely as *very low*, *low*, *moderate*, *high*, *very high*. For the final analyses for risk perception, these variables dichotomized to low and high risk. Low risk included "very low / low" replies for verbal measure, while all others were included in "high risk".

The data entry and the analyses were performed by using the SPSS v.13.0 Software. The Chi-Square test, *t*-test, Multivariate Linear Regression Analysis, and the Logistic Regression Analysis were used to evaluate the data.

Results

Mean age of the participants was 42.4 ± 5.2 years (range: 40 - 63 years). 62% of them were employed as midwife, and 36% as nurse. Professional duration of work was more than 20 years in 54.5% of them. Socio-demographic characteristics of the participants and distribution of their risk factors for breast cancer based on Gail's model are given in Table 1.

When the women's reproductive functions were evaluated in terms of the breast cancer risk, it was determined that 64.1% had their menarche at 12-13 years of age, and 44.5% delivered their first child at the age of 20-24. Additional study results revealed that 6.4% of participants reported having first degree relatives who had breast cancer. Only eight women reported more than one first-degree relative with breast cancer (1.1%), and 18.1 % of participants had undergone prior breast biopsies. 10.3% of participants reported having atypical hyperplasia It was determined that 58.4% of the participants perceived individual breast cancer risk as low, and 39.5% perceived it at a high level. The 5-year breast cancer risk level of 7.1% of the participants was found to be over 1.67% according to the Gail Model (Table 1).

Table 2 gives risk status of the women based on Gail's model. According to Gail's model, the mean five-year risk of breast cancer for all participants was 0.80 ± 0.52% (range: 0.20 - 4.80). The mean lifetime risk of breast cancer was 11.03±4.46% (range 5.50-38.90) (Table 2).

In the results of bivariate tests, we found a relationship between the 5-year risk of breast cancer and variables such as age, age at menarche, age of first birth, positive familial history of breast cancer, the number of people with positive breast cancer in a family, history of the previous breast biopsy and history of the having atypical hyperplasia (P<0.05).

Table 1. Socio-demographic characteristics, breast cancer risk factors, calculated and perceived risk levels in the participants

	n	%
Socio-demographic characteristics		
Marital status		
Married	616	82.1
Single	56	7.5
Widowed/Divorced	78	10.4
Profession in the institution		
Midwife	465	62.0
Nurse	285	36.0
Professional Period		
Under 10	40	5.4
10-20 years	301	40.1
20 years and over	409	54.5
Risk factors the Gail Model in midwives and nurses		
Age (years)		
40-44	511	68.2
45-49	155	20.6
≥50	84	11.2
Age at menarche (years)		
Unknown	11	1.5
7-11	89	11.9
12-13	481	64.1
≥14	169	22.5
Age at first live birth (years)		
No children	47	6.2
≤20	46	6.1
20-24	334	44.5
25-29	249	33.2
≥30	74	9.9
Number of first-degree relatives with breast cancer		
Unknown	5	0.6
Zero relatives	689	91.9
One relatives	48	6.4
More than one	8	1.1
Biopsy		
Unknown	11	1.5
Yes	136	18.1
No	603	80.4
Report having atypical hyperplasia		
Yes	14	10.3
No	122	89.7
The breast cancer risk level calculated by Gail model in midwives and nurses		
High risk (scores >1.67%)	53	7.1
Low risk	697	92.9
Level of risk perceived in midwives and nurses		
High risk	296	39.5
Low risk	438	58.4

These variables were entered in multivariate linear regression model. Finally, the variables of age, age of first birth, positive familial history of breast cancer, the number of people with positive breast cancer in a family, history of the previous breast biopsy and history of having atypical hyperplasia are among the predictors of breast cancer risk in the next five years (P<0.05) (Table 3).

Table 2. Mean five-year risk of participants and mean lifetime risk of participants according to the Gail Model (n=750)

Risk	Mean five-year risk of participants	Mean lifetime risk of participants
Mean	0.80	11.03
Standard deviation	0.52	4.46
Minumum risk	0.20	5.60
Maximum risk	4.80	38.90

Results of bivariate tests demonstrated that there was a relationship between the perceived risk and variables of age, age of first birth, marital status, a positive familial history of breast cancer, the number of people with positive breast cancer in a family, history of the previous breast biopsy, the calculated risk, the application of mammography, the regular BSE and CBE (P<0.05). The difference between the breast cancer risk perception level of the participants and the 5-year breast cancer risk level calculated according to the Gail Model was significant (p<0.01). 42.6% of those considering to have high individual risk for breast cancer had mammography examination (p<0.01); 24.5% of them had regularly visited physicians for breast examination (p<0.01) and 93.5% of them were performing breast self-examination (BSE) regularly (P<0.05). It was observed; however, that more than half of the midwifes and nurses (57.4%) did not have mammography at all and about three fourth of them (75.5%) did not visit physicians regularly for breast examination although they perceived their risk for breast cancer as high.

Table 3. The factors influencing the breast cancer risk level calculated by Gail model (linear regression analysis)

	Standard Beta	t	*p*
Age	0.270	5.644	<.001
Age of first birth (>30)	0.112	2.487	<.01
History of breast biopsy	0.299	5.709	<.001
History of the having atypical hyperplasia	0.509	9.866	<.001
Family history of breast cancer	0.334	6.678	<.001
The number of people with positive breast cancer in a family (>1)	0.624	5.149	<.001

R=0.847 R^2=0.718 Durbin – Watson= 1.96 (p<.001)

Table 4. The factors influencing the breast cancer risk level perceived among midwives and nurses (logistic regression analysis)

Risk Factors	Adjusted Odds Ratio	95 % C.I. (Confidence Interval)	*p*
Higher age	2.041	1.087-3.834	<.01
History of breast biopsy	2.408	1.111-5.218	<.001
Family history of breast cancer	5.821	3.604-9.400	<.001
Higher calculated risk	1.930	1.275-2.921	<.01
Practice of mammography	2.164	1.501-3.121	<.01
Practice of regular BSE	1.200	1.122-2.283	<.05
Practice of regular CBE	1.572	1.135-2.178	<.01

These variables were entered in logistic regression model. In the logistics regression analysis, the high-risk perception was associated with higher age (OR: 2.041, GA: 1.087-3.834), history of the previous breast biopsy (OR: 2.408, GA:1.111- 5.218), the presence of the positive familial history of breast cancer (OR: 5.821, GA: 3.604-9.400), having higher calculated risk (OR: 1.930, GA: 1.275-2.92) , the application of mammography (OR: 2.164, GA: 1.501-3.121), practice of BSE (OR: 1.200, GA: 1.122-2.283) , and regular CBE (OR: 1.572, GA: 1.135-2.178) (P<0.05) (Table 4).

Discussion

In breast cancer risk calculations, many assessment tools like the Gail Model, Claus model, Tyrer-Cuzick model and similar other models are used. The most frequently used one among these is the Gail Model, which is used in many countries. The Gail Model has several limitations. The major limitation is that it considers only the first-degree relatives (mothers, sisters, and daughters), and causes that the breast cancer risk is assessed at a low level at a rate of 50% in women who have breast cancer history in family because it does not consider the age of the patient when the diagnosis is made. Since the Gail Method considers a series of well-proven risk factors, it is the best assessment tool for a general women society that does not have a strong family history despite having passed mammographic screenings. The validity of Gail 1 and Gail 2 Models has been proven with many clinical studies (14). It is possible to see many studies on Gail Model in our country. Karakayalı et al. concluded that Gail 2 Model is a reliable model for the Turkish society in terms of calculating individual risks and breast cancer development (9). For this reason, we applied Gail Model to predict the breast cancer risk in midwives and nurses.

We found that the mean five-year breast cancer risk for all women was 0.80±0.52% (min= 0.20, max: 4.80), and 7.1% of women had a five-year breast cancer risk >1.67%. In two studies from Turkey, rate of the women with high 5-years risk for breast cancer was 6.2% and 7.4%, respectively (14, 15). In a case-control study by Ulusoy et al. (16), rate of the women with a risk level above 1.67% based on Gail's model was found as 8%. In another case-control study carried out by Farahmand et al. in Iran, it was determined that 5-year breast cancer risk rate was 7.2% among women (17). In a study carried out by Adams-Campbell et al. (18) in the U.S., 883 women over the age of 35 were compared in terms of breast cancer risk through the Gail and CARE models, and the risk was 7% higher according to the Gail model. 5-year risk for breast cancer calculated based on Gail's model for women in the present study was consistent with those studies conducted in Turkey and abroad.

In our present day, although it is not known well with which causes breast cancer appears, it has been determined that some risk factors are influential on breast cancer development. In

breast cancer development, age is an independent risk factor alone. It was reported that further age is an important risk factor in having breast cancer. It was also reported in previous studies that early mélange associated with being exposed to endojen estrogens produced by ovaries (<12 years of age), late menopause (>55 years of age), not having birth, having the first pregnancy at further ages (>30 years of age) increased the breast cancer risk. It was reported that non-proliferative lesions detected in women who had previous breast biopsy, and proliferative lesions that do not show atypia, increase breast cancer risk at a 1,5-2-fold; and the proliferative lesions that show atypia increased the breast cancer risk at a rate of 3,5-5-fold (14, 19, 21). The breast cancer development risk increases for a woman with the familial breast cancer history. The risk of a woman who has breast cancer in two or more first-degree relatives is higher nearly at a rate of 5-fold. In previous studies, it was proven that family history was the risk factor that increased the breast cancer development at the highest level (14, 15, 19-21). Consistent with the literature, it was determined in our study that further age, breast cancer history in 1st degree relatives, breast cancer history in two or more 1st degree relatives, previous breast biopsy history the existence of proliferative lesions showing atypia and the first term pregnancy at further age (>30 years of age) are the factors that increased breast cancer development risk.

Breast cancer risk perception is important. Various studies were conducted on Gail Model or the perceived risk and the breast cancer prediction. In several of these studies, it was determined that the breast cancer risk perceptions of women were higher than the risk level calculated according to Gail model (20, 22, 23). In a study conducted by Graves et al. in Latin America, it was found that nearly one fourth of the women predicted their breast cancer risks as being high, and according to the Gail Model, which is considered as an objective model, the group with high risk was found as 6,9% (24). The results of our study support the findings reported in the literature and are parallel to them. When the perceived risk status was analyzed in our study, it was determined that 39.5% of the participants perceived that their risk for having breast cancer in the future was high. However, according to Gail Model, the rate of the women who had high risk for cancer within 5-year period was 7.1%.

It was reported in the literature that the sociodemographic and reproduction properties of women could affect their risk perception. In previous studies, it was reported that there were relations between some variables like age, history of breast cancer in family, educational level, income level, culture, breast cancer anxiety, individual breast disease history, breast biopsy history, menopausal period, malnutrition, not doing exercise, and smoking (12, 20, 22-26). Further age, breast biopsy history, breast cancer history in family, and perceived high breast cancer risk are associated factors (27, 28). The results of our study support the data in the literature by showing a significant relation between the risk perception and age, family history, and breast biopsy history.

In general, high risk perceptions are expected to guide individuals to protective behaviors. In terms of cancer, it is assumed that people who see that they have a high risk for cancer act in a way that will be protective for cancer. Studies that investigated the relation between the risk perceptions for breast cancer and the use of early diagnosis methods claim that risk perceptions affect the application of early diagnosis methods intended for breast cancer. In studies that support these assumptions, a positive relation was reported among performing mammography with high risk perceptions, having clinical breast examination and breast self-examination (BSE) for breast cancer. High risk perceptions increase the frequency of breast self-examination (BSE), mammography (MMG) and clinical breast examination (CBE) (12, 25, 29, 30). The results of or study support the literature by showing that the risk perception levels are higher in women who have mammography, have regular clinical breast examination (CBE), apply breast self-examination (BSE), and in women who have high 5-year breast cancer risk according to Gail Model. It may be possible that the evaluation of cancer risk perception with one single question (although used in previous studies) has not reflected how the participants perceived their cancer risks in a full manner. The findings of the present study must be evaluated by considering this limitation.

Conclusion

In our study, it was determined that the breast cancer risk perceptions of midwives and nurses are higher than the objective breast cancer risk perception values calculated by the model. The midwives and nurses considering themselves as being at high risk group in terms of breast cancer development may be due to their receiving training on the topic during their trainings in curricula. Again, in our study, it was observed that the midwives and nurses that had high perception levels in terms of breast cancer risk development in the future applied early diagnosis methods for breast cancer more. We believe that the trainings on breast cancer screening activities and risk factors during vocational education period ensured that the midwives and nurses, who already had high risk perception levels, became more sensitive about the early diagnosis tests for breast cancer. However, the fact that more than half of the midwives and nurses in this group that perceived the risk of having breast cancer in the future (57.4%) did not have any mammography, and one third (75.5%) of them had not performed any regular clinical examinations has made us become anxious about the present situation. For this reason, it was concluded in our study that the attitudes of healthcare staff about their self-care are inadequate.

As a conclusion, healthcare staff has the duty of providing curative services as well as transferring and applying protective healthcare services to the society. Midwives and nurses, who are important members of the healthcare staff are the basic executives of healthcare education programs in the healthcare

system intended for people. It is extremely important that midwives and nurses have accurate and adequate knowledge in protective healthcare services against cancer because of their educational and counselling roles. In addition, midwives and nurses have their own responsibilities as well as the responsibility of other individuals in the society. For these reasons, in-service and continuous training programs must be organized in relevant institutions because there is a need for well-educated and more knowledgeable healthcare staff in order to increase the awareness of women to participate in screening programs and in order to run the screening programs in early diagnosis of breast cancer. Especially healthcare staff must be made to fully understand the importance of clinical breast examination and periodical and regular mammography. In addition, it is also necessary that in-service training programs are needed to show changes in their attitudes and behaviors about their self-care to apply the early diagnosis methods for breast cancer.

Resumen

Objetivo: Este trabajo tiene como objetivo identificar el riesgo de cáncer de mama con el uso del modelo Gail por las enfermas y las parteras, que pueden desempeñar un papel importante para la sociedad. Métodos: En 2014 se realizó una investigación transversal con una muestra de 750 enfermas y parteras. El riesgo de cáncer de mama se calcula con el ''Herramienta de Evaluación de Riesgo Gail". Se hizo una comparación para calcular el riesgo de cáncer de mama en comparación con otros riesgos. El análisis de los datos se basó en el análisis de las estadísticas y en el análisis de Chi2.Resultados: Durante 5 años, los puntos del riesgo de cáncer de mama son de media 0.80% ± 0.52 y los puntos de la vida del cáncer de mama son de media 11.03% ± 4.46. Por las enfermas y parteras, para los próximos 5 años, 7.1% tienen un riesgo de desarrollar el cáncer de mama. Según el modelo de Gail, se muestra que estas mujeres son los más en sujetos de riesgo de cáncer de mama. Nadie piense nunca de contraer cáncer y aún menos enfermas y parteras, es por esto que deben hacer más mamografías y más controles de mama en clínico. Conclusión: Teniendo en cuenta el hecho de que los participantes son profesionales de la salud, el resultado de las enfermeras y parteras, en mamografías y controles de mama logrado clínicamente, revele ser menor de lo esperado.

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