

## RESEARCH ARTICLE

# Assessing Breast Cancer Risk among Iranian Women Using the Gail Model

Maryam Khazae-Pool<sup>1</sup>, Fereshteh Majlessi<sup>2,3\*</sup>, Saharnaz Nedjat<sup>4,2</sup> Ali Montazeri<sup>5</sup>, leila Janani<sup>6</sup>, Tahereh Pashaei<sup>7,8</sup>

## Abstract

**Background:** Breast cancer risk assessment is a helpful method for estimating development of breast cancer at the population level. **Materials and Methods:** In this cross-sectional study, participants consisted of a group of 3,847 volunteers (mean  $\pm$  SD age:  $463 \pm 7.59$  years) in a convenience sample of women referred to health centers affiliated to Tehran University of Medical Sciences in Tehran, Iran. The risk of breast cancer was estimated by applying the National Cancer Institute's online version of the Gail Risk Assessment Tool. **Results:** Some 24.9% of women reported having one first-degree female relative with breast cancer, with 8.05% of them having two or more first-degree relatives with breast cancer. The mean five-year risk of breast cancer for all participants was  $1.61 \pm 0.73\%$ , and 9.36% of them had a five-year risk of breast cancer  $>1.66\%$ . The mean lifetime risk of breast cancer was  $11.7 \pm 3.91\%$ . **Conclusions:** The Gail model is useful for assessing probability of breast cancer in Iranian women. Based on the their breast cancer risk, women may decide to accept further screening services.

**Keywords:** Breast cancer - Gail model - risk assessment - Iranian women

*Asian Pac J Cancer Prev*, 17 (8), 3759-3762

## Introduction

The rate of breast cancer in Iran is continually increasing due to the variations in reproductive patterns such as delayed marriage, having fewer kids, changes in lifestyle behaviours. Additionally, due to the improving women's health literacy, the rate of early detection has increased. While the incidence rate of breast cancer in Iranian women over 30 years is still fairly low (about 23 per 100,000), the number of patients with just detected breast cancer is increasing, and it is ranked first common cancer among Iranian women (Montazeri, 2008; Khazae-pool, 2014; Khazae-Pool, 2014). This emphasizes the importance of breast cancer preventing and screening program in Iran.

Breast cancer screening is effective approach for prevention and early detection in women. Early detection is enhanced by a follow-up screening program for "high risk" women. Consequently, it is essential to describe what is meant by "high risk" women (Bever, 2009). Although there are a number of tools for assessing risk of breast

cancer, Gail model is most commonly tool in order to predict the risk of developing breast cancer for women aged 35 and above in the next five years and within her lifetime (Gail, 1989). It was improved by the National Surgical Adjuvant Breast and Bowel Project (NSABP) to design the developing invasive breast cancer risk, which is accessible on the National Cancer Institute (NCI) website (Costantino, 1999). The main difficulty of the Gail model is that it estimates only risk of developing breast cancer in people who have a history of breast cancer in their first-degree relatives.

It is suggested having clinical breast examinations every 6-12 months and annual mammography in women aged 35 years or above with a 5-year risk of 1.7% or more (Andreeva, 2013). One helpful procedure to maximize advantages and reduce burden of disease is applying the screening program for only the women who are at a high risk of developing breast cancer. Therefore, the aim of the present study was to determine the percentage of Iranian women at high risk of developing breast cancer, using the Gail risk assessment model. It is also important knowing

<sup>1</sup>Department of Health Education and Promotion, School of Health, Zanjan University of Medical Sciences, Zanjan, <sup>2</sup>School of Public Health, Knowledge Utilization Research Center, <sup>3</sup>Department of Health Education and Promotion, School of Health, <sup>4</sup>Department of Epidemiology and Biostatistics, School of Public Health, Tehran University of Medical Sciences, <sup>5</sup>Mental Health Research Group, Health Metrics Research Center, Institute for Health Sciences Research, ACECR, <sup>6</sup>Department of Biostatistics, School of Public Health, Iran University of Medical Sciences, Tehran, <sup>7</sup>Social Determinants of Health Research Center, Kurdistan University of Medical Sciences, <sup>8</sup>Department of public health, School of Health, Kurdistan University of Medical Sciences, Sanandaj, Iran \*For correspondence: [dr\\_f\\_majlessi@yahoo.com](mailto:dr_f_majlessi@yahoo.com)

the women at high risk of developing breast cancer that is a valuable support for making a decision in health care and accepting the effect of different prevention policies.

**Materials and Methods**

This was a descriptive and cross-sectional study. A convenience sample of 3,847 women referred to Health cancers affiliated to Tehran University of Medical Sciences in Tehran, Iran, was recruited to participate in the study between August 2014 and October 2015. Inclusion criteria contained being 35 years or above (based on the Gail model).

The risk factors used were age, the number of previous breast biopsies, the presence of atypical hyperplasia in any previous breast biopsy specimen, age at first period, age at the first live birth of a child, the history of breast cancer among her first-degree relatives (mother, sisters, daughters), and the individual’s age and race. The calculation was done by using Gail model prediction from the NCI’s breast cancer Risk Assessment Tool website (which is available at <http://www.cancer.gov/bcrisktool/>). This model estimated the five-year and lifetime breast cancer risk for women aged 35 years and older (Gail, 1989).

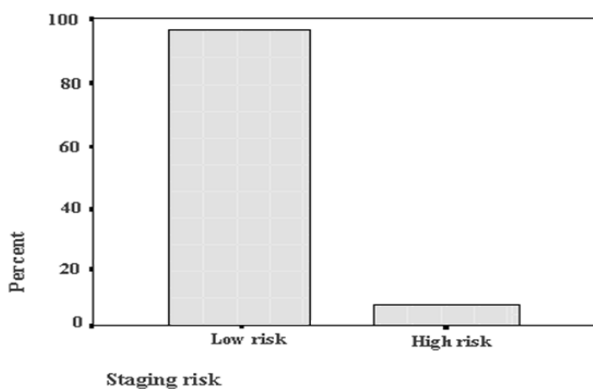
Statistics: Statistical software, namely, SPSS 22.0, was used to perform descriptive statistics counting the mean, median, standard deviation, frequency distributions, and percentage.

*Ethics of study*

This project was accepted by the ethics committee of Tehran University of Medical Sciences. Informed written consent was received from all the study participants. An effort was made to observe the ethics of the study, proposing the women the choice to give up whenever they wish, and by keeping their private information. The women were assured about the unanimity of their identities.

**Results**

In total, 3,847 women participated in this study. The average age of participants in the present study was



**Figure 1. Five-year Risk of Breast Cancer in Women Based on the Gail Model (%)**

46.27±7.59 years (range 35-71 years). It was specified that the majority of women (46.5%) where higher education, 51.86% of them were housewives, 43.44% of them had medical insurance, 46.9% of them had “middle level” family income, and 76.6% of them married (see Table 1). Additionally, results determined that the majority of them (49.96%) stated their menarche at age 7 to 11; 35.7% of women had their first live birth at the ages of 30 and over; 24.85% of participants reported having one first degree relatives affected breast cancer; 8.05% of participants stated having two or more first-degree relative with breast cancer; and 11.1% of them had one previous breast biopsies (See Table 1).

The result of the present study also shown that the

**Table 1. Distribution of Women Based on Socio Demographic Characteristics and Risk Factors Using the Gail Model (n=3847)**

Socio demographic characteristics of women	N	%
<b>Marital status</b>		
Married	2947	76.6
Single	649	16.88
Divorced/widowed	251	6.52
<b>Occupation</b>		
Housewife	1995	51.86
Employed	1852	48.14
<b>Education</b>		
Primary	318	8.3
Secondary	1739	45.2
Higher	1790	46.5
<b>Family income</b>		
High	914	23.78
Middle	1804	46.9
Low	1129	29.32
<b>Insurance</b>		
Medical insurance	1671	43.44
Social insurance	1069	27.8
No insurance	1107	28.76
<b>Risk Factors the Gail model of women</b>		
<b>Age group (years)</b>		
35-40	639	16.6
41-46	792	20.6
47-52	1610	41.85
53 and above	806	20.95
<b>Age at menarche (years)</b>		
Unknown	37	0.96
7 years old-11 years old	1922	49.96
12 years old-13 years old	1081	28.1
≥14	807	20.98
<b>Age at first live birth (years)</b>		
No children	327	8.5
≤20	217	5.63
20-24	502	13.05
25-29	1428	37.12
≥30	1373	35.7
<b>Number of first-degree relatives with breast cancer</b>		
Zero relatives	2581	67.1
One relative	956	24.85
More than one	310	8.05
<b>Biopsy</b>		
No	3371	87.62
Yes (one biopsy)	427	11.1
Yes (more than one biopsy)	49	1.28

**Table 2. Mean Five-Year and Lifetime Risk of Women Based on the Gail Model (n=3847)**

Risk	M (SD)	Minimum risk	Maximum risk
Mean five-year risk of women	1.61 (0.73)	0.2	13.8
Mean five-year risk for women of the same age without risk factors	1.57 (0.69)	0.3	2.4
Mean lifetime risk of women	11.71 (3.91)	0.6	54.7
Mean lifetime risk of women the same age without risk factors	11.62 (2.014)	4.9	13.4

mean five-year risk of breast cancer for all participants was  $1.608 \pm 0.729\%$  (range  $0.2 \pm 13.8\%$ ). The mean lifetime risk of breast cancer was  $11.705 \pm 3.91\%$  (range  $0.6 \pm 54.7\%$ ) (See Table 2). In addition, 9.36% (360 women) of them had a five-year risk of breast cancer  $>1.66\%$  (See Figure 1).

## Discussion

As the incidence rate of breast cancer is increasing in Iran, it is important to find women with a high risk of breast cancer in order to timely function for treatment. Although there are some risk assessment tools in the area of breast cancer, such as Claus model, Tyrer-Cuzick model, and several others; we applied the Gail model to estimate the risk of breast cancer for Iranian women.

Applying the Gail model, we gotten that the mean five-year risk of breast cancer for all participants was  $1.608 \pm 0.729\%$  (range  $0.2 \pm 13.8\%$ ), and 9.36% (360 women) of them had a five-year risk of breast cancer  $>1.66\%$ . As the mean five-year risk of breast cancer is higher than the average five-year risk for the same age and race. These results are in contrast with previous findings by Erbil who reported that the mean five-year breast cancer risk for all women was  $0.88 \pm 0.91\%$  (Erbil, 2015). In Seyednoori' study, the mean five-year breast cancer risk was  $0.8\% \pm 1$ , and 16.2% of the women had a five-year risk higher than the average woman of the same age, and 18.2% of them had the same risk (Seyednoori, 2012). Additionally, Yilmaz reported that the breast cancer risk was lower in housewives than academic participants, both five-year and lifetime risk of breast cancer estimated by Gail model. Besides, the mean five-year and lifetime breast cancer risk was less than 1.7% for five-year risk and 15% for lifetime risk in both housewife and academic women (Yilmaz, 2011). The Ceber (2013) study found the 5-year risk rate of breast cancer as 17.6% among the women over the age of 50 (Ceber, 2013), but the study of Mermer (2011) determined the risk of breast cancer in 18.1% of women older than 40 years of age (Mermer, 2011).

Present study results showed that the mean lifetime risk of breast cancer was more than the average lifetime risk for the same age and race while previous studies reported that the lifetime risk was commonly lower based on the Gail model amongst women (Ceber, 2006; Karakayali, 2007). In Seyednoori' study, mean breast cancer lifetime risk was  $9.0 \pm 3.9\%$ ; 11.1% of the them had higher lifetime risk and 1.6% had the same risk as the average woman (Seyednoori, 2012). In studies conducted by Dano, the risk of developing breast cancer reported the highest range in academic women compared to the other women (Dano, 2003; Dano, 2004). According to the report by Davis, the risk of breast cancer in women increased between 2%-46%, with a mean of 9% (Davis, 2004). The mean lifetime risk estimate can help women in seeking consultation

about breast cancer screening and prevention (Gao, 2012).

We found that reproductive history, women's age at first live birth, menarche, age, and having first degree relatives had breast cancer were the factors in getting risk of developing breast cancer among Iranian women. Some factors such as reproductive history, socioeconomic situation, and lifestyle factors may affect risk of breast cancer (Yilmaz, 2011). A much higher risk of developing breast cancer was shown in women had early menarche and a first live birth at 30 years of age and above (Chay, 2012). Pregnancy at an early age relates to a considerably decreased breast cancer risk. Having 30 years of age and above at first live birth is associated with increasing developing breast cancer risk (Nechuta, 2010).

We observed that participants had the history of breast cancer in their first degree relatives. This is consistent with the previous findings reported by Ceber (2013), who stated that 7.4% of the participants had a history of breast cancer in their relatives (first degree and second degree), and in Erbil (2015)' study about 6.1% of participants was reported having first degree relatives who had had breast cancer (Ceber, 2013; Erbil, 2015)

However, having a family history of breast/ovarian cancer is associated with increasing risk of breast cancer, some factors, such as type, number, and age at the beginning of cancer in affected relative families are also important in assessing the rate of risk (Sifuentes, 2015). As Abu-Rustum study (Abu-Rustum, 2001), we found that some women had previous breast biopsies. However, in the Seyednoori study, less than 7 percent of the women had a history of the previous biopsy (Seyednoori, 2012). This could be associated with a lack of suitable comparison to participants of the same age without risk factors for those of Iranian ethnicity.

Applying risk assessment models can help healthcare providers to calculate a person's risk of developing breast cancer. It has been recommended that women should have annual mammograms starting at 40. Women with a higher risk of developing breast cancer should get extra screening procedures; as well as they might also get beginning screening at an earlier age with more repeated periods (Erbil, 2015).

In conclusion, breast cancer remains a serious public health problem in women. In the present study, it was found that 9.36% of participants had a five-year risk of developing breast cancer ( $>1.66\%$ ). The calculating of breast cancer risk can assist people looking for screening and preventive services. Thus, it is necessary to highlight the importance of using breast cancer risk assessment tools to calculate a woman's probability of developing breast cancer.

Our study has some limitations. The researchers only determined risk of breast cancer among women at one province in Iran, and the convenience sampling technique

was applied to gather samples in the present study of which findings can generalize only to these samples. We also should be careful in using the Gail model as it has not been matched in the Iranian population. It seems that the validation of the Gail model to be necessary in Iranian people. This may help in the development of future screening programs in Iran.

## Acknowledgements

The authors would like to thank all participants for coming. This study was funded by Tehran University of medical sciences, Iran [Grant number 26227]. MK was involved in the study design, data collection, analysis and drafting of the paper. FM participated to study design and drafting the paper. AM and SN contributed in the manuscript drafting. LJ and TP contributed in the data analysis. All the authors read and approved the final manuscript.

## References

- Abu-Rustum N, Herbolzheimer H (2001). Breast cancer risk assessment in indigent women at a public hospital. *Gynecologic Oncol*, **81**, 287-290.
- Andreeva VA, Pokhrel P (2013). Breast cancer screening utilization among Eastern European immigrant women worldwide: a systematic literature review and a focus on psychosocial barriers. *Psycho-Oncol*, **22**, 2664-75.
- Bever TB, Anderson BO, Bonaccio E, et al (2009). NCCN clinical practice guidelines in oncology: breast cancer screening and diagnosis. *J Natl Compr Canc Netw*, **7**, 1060-1096.
- Ceber E, Mermer G, Okcin F, et al (2013). Breast cancer risk and early diagnosis applications in Turkish women aged 50 and over. *Asian Pac J Cancer Prev*, **14**, 5877-5882.
- Ceber, E., M. T. Soyer, M. Çiçeklioğlu and S. Cimat (2006). Breast cancer risk assessment and risk perception on nurses and midwives in Bornova Health District in Turkey. *Cancer Nurs*, **29**, 244-249.
- Chay WY, Ong WS, Tan PH, et al (2012). Validation of the Gail model for predicting individual breast cancer risk in a prospective nationwide study of 28,104 Singapore women. *Breast Cancer Res*, **14**, 19.
- Costantino JP, Gail MH, Pee D, et al (1999). Validation studies for models projecting the risk of invasive and total breast cancer incidence. *J Natl Cancer Inst*, **91**, 1541-1548.
- Dano H, Andersen O, Ewertz M, Petersen JH, Lynge E (2003). Socioeconomic status and breast cancer in Denmark. *Int J Epidemiol*, **32**, 218-224.
- Dano H, Hansen K, Jensen P (2004). Fertility pattern does not explain social gradient in breast cancer in Denmark. *Int J Cancer*, **111**, 451-6.
- Davis S., Stewart S, Bloom J (2004). Increasing the accuracy of perceived breast cancer risk: results from a randomized trial with Cancer Information Service callers. *Prev Med*, **39**, 64-73.
- Erbil N, Dundar N, Inan C, Bolukbas N (2015). Breast cancer risk assessment using the Gail model: a Turkish study. *Asian Pac J Cancer Prev*, **16**, 303-6.
- Ferrer J, Neyro JL, Estevez A (2005). Identification of risk factors for prevention and early diagnosis of a-symptomatic post-menopausal women. *Maturitas*, **52**, 7-22.
- Gail MH, Brinton LA, Byar DP, et al (1989). Projecting individualized probabilities of developing breast cancer for white females who are being examined annually. *J Natl Cancer Inst*, **81**, 1879-86.
- Gao F, Machin D, Chow KY, et al (2012). Assessing risk of breast cancer in an ethnically South-East Asia population (results of a multiple ethnic groups study). *BMC Cancer*, **12**, 529.
- Karakayali F, Ekici Y, Sevmiş S (2007). Gail model for determination of the risk factors of breast cancer. *Turkish J Surgery*, **23**, 129-35.
- Khazae-pool M, Majlessi F, Foroushani AR, Montazeri A, Nedjat S, Shojaeizadeh D, Tol A, Salimzadeh H (2014). Perception of breast cancer screening among Iranian women without experience of mammography: a qualitative study. *Asian Pac J Cancer Prev*, **15**, 3965-71.
- Khazae-Pool M, Montazeri A, Majlessi F, Rahimi Foroushani A, Nedjat S, Shojaeizadeh D (2014). Breast cancer-preventive behaviors: exploring Iranian women's experiences. *BMC Womens Health*, **14**, 41.
- Mermer G, Meseri R (2011). Evaluation of breast cancer risk status of women aged 40 and above, living in Kemalpaşa District, Izmir. *STED J*, **20**, 51-56.
- Montazeri A, Vahdaninia M, Harirchi I, Harirchi AM, Sajadian A, Khaleghi F, Ebrahimi M, Haghighat S, Jarvandi S (2008). Breast cancer in Iran: need for greater women awareness of warning signs and effective screening methods. *Asia Pac Fam Med*, **7**, 6.
- Nechuta S, Paneth N, Velie EM (2010). Pregnancy characteristics and maternal breast cancer risk: a review of the epidemiologic literature. *Cancer Causes Control*, **21**, 967-89.
- Seyednoori T, Pakseresht S, Roushan Z (2012). Risk of developing breast cancer by utilizing Gail model. *Women Health*, **52**, 391-402.
- Sifuentes-Alvarez A, Castaneda-Martinez LY, Lugo-Nevares M, Reyes-Romero MA (2015). Risk factors associated with breast cancer women's in Durango, Mexico. *Ginecol Obstet Mex*, **83**, 662-9.
- Yilmaz M, Guler G, Bekar M, Guler N (2011). Risk of breast cancer, health beliefs and screening behaviour among Turkish academic women and housewives. *Asian Pac J Cancer Prev*, **12**, 817-22.