

***Prediction of Breast Cancer Risk in Women over 35 Years Old Living in Villages of Zanjan: A Study Based on Gail Model***

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**Abstract**

**Background:** Breast cancer is one of the most important malignancies in both developed and developing countries.

**Objectives:** To reduce the burden of this disease, the prediction of individuals at risk and implementation of efficient preventive interventions can be effective. The present study was aimed at investigating five-year and lifetime risks of the breast cancer in a rural community in Zanjan province, Iran.

**Methods:** A total of 435 subjects aged 35 years old were randomly selected using systematic randomization in a rural community in Zanjan. The participation rate was 92.4% (402 women). Data collection instrument was a questionnaire in which all associated variables of Gail model and demographic information were included. The data were analyzed using SPSS software version 18, and mean cancer risks were reported.

**Results:** Family history of breast cancer and history of breast biopsy were found to be positive in 3.5% and 0.3% of participants, respectively. Out of all participants, 84.3% were under 60 years old and 13.2% were illiterate. Five-year and lifetime mean risks were found to be 0.74% and 7.6%, respectively. About 2% of the participants had a higher cancer risk >1.66%.

**Conclusion:** The findings demonstrated that based on the Gail model, the lifetime risk of the participants will be one out of 13 women. Given the lower estimations of Gail model in the prediction of breast cancer, we suggest general population interventions and high-risk strategies be implemented to decrease problems associated with the breast cancer in the future.

**Keywords:** *breast cancer, five-year risk, gail model, ninety-year*

**Introduction**

Breast cancer is deemed as the leading cause of death in women in both developed and developing countries [1]. The rate of this disease is increasing worldwide, particularly in countries with a low rate of this illness. Recently, an increased rate of the breast cancer has been reported in Iran [2,3]. Furthermore, the breast cancer also is known as the most common diagnosed cancer in Iran, and

25% of diagnosed diseases in Iran are attributed to this type of cancer [4,5].

In 2015, 571,000 mortalities from breast cancer were reported across the world [6]. Despite an increase in the breast cancer incidence, its rate has recently declined in Western countries [7,8]. Early diagnosis may play a critical role in an effective prognosis in the breast cancer. Thus, patients with the breast cancer can enjoy long-term disease-free survival [9].

The breast cancer also poses a high economic burden. For instance, the overall cost of treatment of the breast cancer is triple as much as prostate cancer that is the most common malignancy in men. The annual cost of the breast cancer is higher than that of cervical, liver, lung, and colorectal cancers [10-12]. In one study, the annual cost of the breast cancer was estimated to be \$947374468 in Iran [13].

An individual risk assessment and associated preventive interventions may be appropriate approaches in reducing the burden of the breast cancer. Thus, Gail model is widely applied in clinical practices in Western countries [14].

Although a number of studies have been conducted to estimate the risk of the breast cancer in Iran through Gail model, to the best of our knowledge, it is an under-researched area in the context of Zanjan province. As mentioned above, the breast cancer poses a high economic burden to patients. On the other hand, Iran as a developing country, is adopting the Western lifestyle leading to the higher burden of the breast cancer in the future. This study was carried out to estimate five-year and lifelong breast cancer risks in a rural community in Zanjan province.

### Methods

As a descriptive study, this study is part of a medical student's thesis with an ethic code of ir.zums.res.1395.2.21. We randomly selected 435 subjects aged 35 years old mostly from a rural area in Zanjan by a multistage sampling method from April to July in 2017. First, one healthcare center was selected, and its all five affiliated health houses were considered to be included in this study. We randomly selected the participants based on health records using a systematic sampling method. The subjects were invited to participate in the present study in collaboration with staff of health houses. We assured all participants that their personal information will remain strictly confidential.

We collected demographic information and other relevant data to calculate breast cancer risk based on Gail model. Thus, the participants' age, race, age of the first menstruation, age of the first parturition, history of breast cancer in first degree relative, and history of breast biopsy were collected.

We applied breast cancer risk tool to estimate five-year and lifelong risks in the participants. This tool reveals the risk rates based on percentage. A cut-off of 1.66% was considered to determine individuals with a higher five-year risk. It is noteworthy that the Gail model was developed based on the absolute risk. The absolute (crude) risk is the probability that one with a set of risk factors in an assumed age of  $a$  develops disease (breast cancer) in an assumed age of  $a + \tau$  [ $\tau$  refers to the time based on years] [15,16].

The data were analyzed using SPSS software, the calculated risks, and other relevant data. In descriptive analysis, the pertinent percentages and frequencies were determined and reported in tables. The mean risks and confidence intervals were computed. Kolomogrov-Smearnov test was run to ensure normal distribution of data. If the normal distribution of data was verified, the independent t-test was run to compare the data between two groups, and one way ANOVA was run to compare the data among more than two groups. If the data did not have normal distribution, the Mann-Whitney and Kruskal-Wallis tests were run to compare data between two groups or among more than two groups. The significant level was set at 0.05 for all analyses.

### Results

Participate rate was 92.4 % (n=402) in this study. Mean age was 47 years old. Based on the results, 84.3% of the participants were below 60 years old and 13.2% were illiterate. The rates of family history of breast cancer and history of breast biopsy were 3.5% and 0.3%, respectively.

**Table 1: Patients' demographic information**

variable	Frequency(percent) n=402	
<b>Positive family history</b>	14(3.5%)	
<b>Underwent Biopsy</b>	1(0.3%)	
<b>Age group</b>	<60 year	339(84.3%)
	≥60 year	63(15.7%)
<b>Age at first childbirth</b>	No childbirth	8(2%)
	<20 year	251(62.4%)
	≥20 year	143(35.6%)
<b>education</b>	literate	349(86.8%)
	illiterate	53(13.2%)
<b>Marital status</b>	married	396(98.5%)
	Single(divorced/widow)	6(1.5%)

While the mean score of five-year risk was found to be 0.74%, the mean score of lifelong risk was reported to be 7.6%. In other words, the findings indicate that one out of each 13 women in this is at the lifelong risk of the breast cancer. Whereas the five-year risk was significantly higher in women ≥60 years old than women <60 years old (P value <0.001), the lifelong risk was

significantly higher in women <60 years old. Both five-year and lifelong risks were significantly higher in women with a positive family history than other participants. More details were presented in Table 2. Finally, 2% of the participants were classified as patients with a higher-risk of breast cancer based on the cut-off of 1.66%.

**Table 2: The means of 5-year and lifelong risks considering age, family history, literacy, and age at first childbirth**

variable	category	5-year risk		Up to 90 risk	
		mean±SD	P value	mean±SD	P value
<b>age</b>	<60 year	0.64±0.58	<0.001	8.25±4.17	<0.001
	≥60 year	1.31±0.93		3.95±2.27	
<b>Family history</b>	yes	0.69±0.59	<0.001	7.12±2.83	<0.001
	no	2.11±1.52		20.17±11.64	
<b>literacy</b>	literate	0.65±0.58	<0.001	8.13±4.16	<0.001
	illiterate	1.33±1.01		3.92±2.55	
<b>Marital status</b>	married	0.72±0.33	0.925	12.92±3.95	0.020
	Single(divorced/widow)	0.74±0.70		7.49±4.19	
<b>Age at first childbirth</b>	No child	0.69±0.30	<0.001	12.45±3.45	<0.001
	<20 year	0.85±0.83		6.72±4.85	
	≥20 year	0.56±0.28		8.81±2.10	

## Discussion

The findings revealed that the mean score of five-year breast cancer risk was 0.74% in women of 35 years old in a rural community in Zanjan province. Moreover, the lifelong risk was estimated to be 7.6%. Ewaid et al. estimated the five-year and lifelong risks to be 0.94% and 11.5%, respectively in females in Baghdad-Iraq [17]. The higher estimated risks in Baghdadi women compared to those in Zanjani females can

be attributed to the higher modifiable or non-modifiable risk factors in women in Baghdad. On the other hand, political insecurities of the last three decades in Iraq could play a role in various adverse medical outcomes including breast cancer in Baghdad. However, other studies should be conducted to focus on intervening factors involved in the rate of breast cancer and to assess risk factors.

Khazaei et al. (2014-2015) reported a higher five-year (1.61%) and lifelong risks (9.36%) in women in Tehran than risk factor rates found in this study [18]. They also indicated that 9.36% of their participants had a five-year risk of more than 1.66%. These results demonstrate that there are higher modifiable and non-modifiable risk factors in Tehrani women than Zanjani females. In addition, risk factors such as urbanization and air pollution might have influenced the findings of Khazaei et al.'s, which needs to be confirmed by other studies.

Mirghafourvand et al. (2013-2014) found that 5-year and lifelong breast cancer risks were 0.6% and 8.9%, respectively in Tabriz, which is a city in the northwest of Iran [19]. Their results were quite similar to those found in this study, which can be ascribed to cultural similarities between the two populations and similarity in modifiable risk factors applied in the Gail model in the two studies.

Hosseinpour et al. (2008-2012) reported that five-year and lifelong risks were 0.55% and 8.2%, respectively in Yasouj, Iran [20]. While they obtained a lower five-year risk than that found in this study, they reported a higher lifelong risk than that of this study. This can be attributed to difference in mean age of participants in two populations. Whereas mean age was 47 years old in our participants, it was 41 years old in Hosseinpour et al.'s study. Thus, we could expect a higher five-year risk and a lower lifelong risk in our study than Hosseinpour et al.'s study. In line with our study, Hosseinpour et al. reported that 2.5% of their participants had a higher risk than cut-off 1.66%.

Based on Yüksel et al.'s study, almost 10% of women in Istanbul-Turkey had five-year breast cancer risk higher than 1.66% or history of family breast cancer [21].

Although mean risk in our participants was not very low in comparison to the findings of above-mentioned studies, the frequency of women with a breast cancer risk higher than 1.66% was less than that of aforementioned studies. This finding can be explained by a homogenous distribution of breast cancer risk in small rural communities due to a balanced distribution of economic and

cultural factors affecting variables in the Gail model in these communities.

Based on health belief model, a better perceptions of the seriousness of a disease can have a positive impact on voluntary behavior leading to healthy lifestyle. As a result, individual or community risk assessments can be instrumental in an efficient appraisal of the susceptibility to an illness. Hence, the Gail model or similar other models may be valuable in preventive programs if they have appropriate predictive ability.

To evaluate the predictive ability of the Gail model, we were required to conduct cohort studies with at least five years follow up or several decades to assess five-year or lifelong breast cancer risks. Thus, other studies with a bigger sample size need to be carried out to evaluate the predictive ability of the Gail model in the community investigated in this study.

Lack of outcomes to evaluate the calibration of models was the most important limitation in this study. As mentioned above, longitudinal studies with a bigger sample size should be conducted. We were also not able to suggest an optimal cut-off point for the model, which was required to determine the calibration of the model and its predictive ability.

Although the data collection in this model was carried out by conducting interviews, recall biases may affect the estimation of risk. Furthermore, other potential risk factors such as obesity, breast feeding, and contraception consumption were not considered in the analysis of data by the Gail model.

On the other hand, this study was conducted in a rural community, and the low literacy in participants may have influenced the validity of the data. However, the Gail model was developed based on important life events, so recall biases may not be considered a determining factor.

The non-randomized sampling method in the first stage was another limitation in this study. Thus, our findings should not be generalized to all rural communities in Zanjan province. Additionally, we may not have considered the potential effects of some mediators such as geographical differences and environmental pollution. Finally, to compare breast cancer risk between rural and urban areas,

we suggest this study be conducted in an urban area too.

The findings demonstrated that the lifetime risk of the participants will be one out of 13 women based on the Gail model. Considering the lower estimations in the prediction of the breast cancer based on the Gail model, we recommend that general population interventions or high-risk strategies be implemented to reduce the burden of disease in the future.

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### References

1. Jemal A, Bray F, Center MM, Ferlay J, Ward E, Forman D. Global cancer statistics. *CA Cancer J Clin.* 2011; 61(2): 69-90.
2. Montazeri A, Vahdaninia M, Harirchi I, et al. Breast cancer in Iran: need for greater women awareness of warning signs and effective screening methods. *Asia Pac Fam Med.* 2008; 7(1): 6.
3. Jafari-Koshki T, Schmid VJ, Mahaki B (2014). Trends of breast cancer incidence in Iran during 2004-2008: a Bayesian space-time model. *Asian Pac J Cancer Prev.* 2014; 15(4), 1557-61.
4. Sadjadi AR, Nouraie M, Mohagheghi MA, et al. Cancer occurrence in Iran in 2002, an international perspective. *Asian Pac J Cancer Prev.* 2005; 6(3), 359-63.
5. Safaee A, Moghimi-Dehkordi B, Zeighami B, et al. Predictors of quality of life in breast cancer patients under chemotherapy. *Indian J Cancer.* 2008; 45(3), 107-11.
6. Mousavi SM, Gouya MM, Ramazani R, Davanlou M, Hajsadeghi N, Seddighi Z. Cancer incidence and mortality in Iran. *Ann Oncol.* 2008; 20(3): 556-63.
7. Ferlay J. World Health Organization. Mortality database. <http://www.who.int/mediacentre/factsheets/fs297/en/>. 2009.
8. Hulka BS, Moorman PG. Breast cancer: hormones and other risk factors. *Maturitas.* 2001; 38(1): 103-13.
9. Sant M, Francisci S, Capocaccia R, et al. Time trends of breast cancer survival in Europe in relation to incidence and mortality. *Int J Cancer.* 2006; 119(10), 2417-22.
10. Hoerger TJ, Ekwueme DU, Miller JW, et al. Estimated effects of the national breast and cervical cancer early detection program on breast cancer mortality. *Am J Prev Med.* 2011; 40(4), 397-404.
11. Kim SG, Hahm MI, Choi KS, Seung NY, Shin HR, Park EC. The economic burden of cancer in Korea in 2002. *Eur J Cancer Care.* 2008; 17(2): 136-144.
12. Lamerato L, Havstad S, Gandhi S, Jones D, Nathanson D. Economic burden associated with breast cancer recurrence: findings from a retrospective analysis of health system data. *Cancer: Interdisciplinary International Journal of the American Cancer Society.* 2006; 106(9): 1875-82.
13. Yabroff KR, Lund J, Kepka D, Mariotto A. Economic burden of cancer in the united states: Estimates, projections, and future research. *Cancer Epidemiol Biomarkers Prev.* 2011; 20(10): 2006-14.
14. Daroudi R, Sari AA, Nahvijou A, Kalaghchi B, Najafi M, Zendehtdel K. The economic burden of breast cancer in Iran. *Iranian journal of public health.* 2015; 44(9): 1225.
15. Adams-Campbell LL, Makambi KH, Frederick WA, Gaskins M, Dewitty RL, McCaskill-Stevens W. Breast cancer risk assessments comparing Gail and CARE models in African-American women. *Breast J.* 2009; 15(1): S72-S5.
16. Gail MH. Personalized estimates of breast cancer risk in clinical practice and public health. *Stat Med.* 2011; 30(10): 1090-104.

17. Gail MH. Twenty-five Years of Breast Cancer Risk Models and Their Applications. *J Natl Cancer Inst.* 2015; 107(5): djv042.
18. Ewaid SH, Al-Azzawi LH. Breast cancer risk assessment by Gail Model in women of Baghdad. *Alexandria journal of medicine.* 2017; 53(2):183-6.
19. Khazae-Pool M, Majlessi F, Nedjat S, Montazeri A, Janani L, Pashaei T. Assessing Breast Cancer Risk among Iranian Women Using the Gail Model. *Asian Pac J Cancer Prev.* 2016; 17(8): 3759-62.
20. Mirghafourvand M, Mohammad-Alizadeh-Charandabi S, Ahmadpour P, Rahi P. Breast Cancer Risk Based on the Gail Model and its Predictors in Iranian Women. *Asian Pac J Cancer Prev.* 2016; 17(8): 3741-5.
21. Hosseinpour R, Hajinasrollah E, Rangpour F, et al. evaluation of the risk of breast cancer based on the Gail model in women of more than 35 years old at health centers of Yasouj during 2010-2011. *Iranian journal of surgery.* 2012, 20 (3): 13-20.
22. Yüksel S, Uğraş GA, Cavdar I, et al. A risk assessment comparison of breast cancer and factors affected to risk perception of women in turkey: A cross-sectional study. *Iranian journal of public health.* 2017; 46(3): 308-317.