RESEARCH ARTICLE

Cihat Ustun[1]
Ersan Gursoy[2]

[1] Adana City Hospital, Family Medicine Clinic, Adana, Türkiye
[2] Erzincan Binali Yıldırım University Faculty of Medicine Department of Family Medicine, Erzincan, Türkiye

Corresponding Author:
Ersan Gursoy
mail: ersangursoy@gmail.com

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konuralptipdergi@duzce.edu.tr
konuralptipdergisi@gmail.com
www.konuralptipdergi.duzce.edu.tr

Comparing Personal Risk Communication with Generic Information on Breast Cancer Screening Attendance: A Randomized Controlled Trial

ABSTRACT

Objective: This study sought to discern the differential impacts of communicating individualized breast cancer risk versus disseminating generic breast cancer information on women's proclivity towards breast cancer screenings.

Method: A structured experimental design was used, including 300 female volunteers aged between 40-69, who had not previously been diagnosed with breast cancer, in Erzincan. Data collection entailed a face-to-face administration of a 22-item questionnaire complemented by the ASSISTS scale. Participants were randomized into two conditions: one receiving a standardized briefing on breast cancer screening modalities, and the other being apprised of their lifetime risk of breast cancer development based on the modified Gail model.

Results: Post-intervention, 55.8% (n=72) of the risk-informed cohort and 40.5% (n=41) of the generic information cohort expressed a willingness to undergo screening (p=0.022). Notably, the group informed of their personalized risk exhibited a more pronounced uptick in requests for breast self-examination, clinical breast examination, and mammography screening compared to their counterparts.

Conclusions: The communication of personalized breast cancer risk proves to be a more efficacious and time-efficient strategy than generic information dissemination in bolstering screening participation rates.

Keywords: Breast Neoplasms, Breast Cancer, Mammography, Secondary Prevention, Early Diagnosis of Cancer.

Meme Kanseri Taramasına Katılmada Kişisel Risk Bildirimi ile Genel Bilgilendirmenin Etkisinin Karşılaştırılması: Randomize Kontrollü Bir Çalışma

ÖZET

Amaç: Bu çalışma, bireyselleştirilmiş meme kanseri riski bildirimi ile genel meme kanseri hakkında bilgilendirme yapmanın kadınların kanser taramasına katılım eğilimleri üzerindeki etkilerini anlamayı amaçlamaktadır.

Yöntem: Bu çalışma, Erzincan ilinde, daha önce meme kanseri teşhisi konmamış 40-69 yaş arasındaki 300 kadın gönüllü üzerinde yapılandırılmış bir deneysel tasarım kullanılmıştır. Veri toplama, 22 maddelik bir anketin yüz yüze uygulanması ve ASSISTS ölçeğinin kullanılması ile gerçekleştirilmiştir. Katılımcılar iki gruba ayrılmıştır: bir grup standart meme kanseri tarama yöntemleri hakkında bilgilendirilmiş, diğer grup ise modifiye Gail modeline dayalı olarak ömür boyu meme kanseri geliştirme riskleri hakkında bilgilendirilmiştir.

Bulgular: Müdahaleden sonra, risk bilgilendirilmiş grubun %55.8'i (n=72) ve genel bilgi grubunun %40.5'i (n=41) tarama yaptırmaya istekli olduklarını ifade etmiştir (p=0.022). Özellikle, kişiselleştirilmiş riskleri hakkında bilgilendirilen grup, genel bilgilendirme yapılan gruba kıyasla daha fazla meme kendi kendine muayene, klinik meme muayenesi ve mamografi taraması talebinde bulunmuştur.

Sonuç: Kişiselleştirilmiş meme kanseri riski bildiriminin, genel bilgi verilmesine göre tarama katılım oranlarını artırmada daha etkili ve zaman açısından daha verimli bir strateji olduğu görülmektedir.

Anahtar Kelimeler: Meme Neoplazmları, Meme Kanseri, Mamografi, Sekonder Koruma, Kanserin Erken Teşhisi.

INTRODUCTION

Breast cancer has recently become more prevalent than lung cancer worldwide according to the International Agency for Research on Cancer (IARC) 2020 data (1, 2). It is not only the most commonly diagnosed cancer in women but also the primary cause of cancer related deaths among them responsible, for 15.5% of such cases (1). Currently, there is no established methodology for the outright prevention of breast cancer. Nonetheless, routine screenings and examinations can significantly enhance life expectancy and even facilitate full recovery if the diagnosis occurs during the early stages of the disease(3, 4). This highlights the need to combat this disease with successful prevention methods especially through early detection and screening known to enhance survival rates and decrease mortality.

In Turkey the number of cases of breast cancer is quite high with the Global Cancer Observatory (GLOBOCAN) stating a rate of 46.6 per 100,000 women in 2020 higher than the 45.6 reported in 2016 by the Ministry of Health of Turkey (1, 5). Despite this rate not many women are getting screened for breast cancer according to the Health Statistics Yearbook (HSY) from 2016 which shows that 71.1% of women aged 15 and above have never had a mammography screening (6). This concerning data points out a gap, in the healthcare systems efforts to promote and facilitate these potentially life saving screenings.

Existing strategies aimed at increasing breast cancer screening rates in Turkey have shown mixed results, necessitating a detailed evaluation to identify where these approaches fall short (7). This assessment is essential for crafting interventions that can more effectively bridge the gap between availability and utilization of screening services, particularly mammography. Despite the proven effectiveness of mammography in decreasing breast cancer mortality, its adoption among Turkish women remains insufficiently widespread (8, 9). This gap highlights a crucial need for targeted educational and outreach programs that can overcome cultural, logistical, and informational barriers to screening participation.

Building on the findings from previous studies, our research further explores the dynamics between breast cancer risk perception and screening participation. Earlier research has highlighted the crucial role of effective communication in enhancing screening uptake, indicating a need for clearer conveyance of breast cancer risk to improve engagement (10-12). Additionally, studies have identified gaps in healthcare professionals' perspectives on risk stratification versus disease screening, suggesting that there may be an underutilization of screening appointments as opportunities for risk assessment and tailored prevention advice (12). Our study aims to address these gaps by comparing the effectiveness of personalized risk information versus general health advice, aiming to determine which method more effectively motivates women to participate in breast cancer screenings, thereby refining communication strategies to increase screening rates effectively.

This study aims to delve into the perceptions and attitudes of Turkish women towards breast cancer screenings. We seek to identify not only the barriers to participating in these screenings but also to explore how different communication strategies might influence women's decisions to undergo mammography. Specifically, the research will compare the impact of general health information versus personalized risk assessments on the willingness of women to participate in breast cancer screenings, aiming to pinpoint more effective methods for increasing screening rates among this target demographic.

In this context, our objectives are twofold: to clarify the factors that deter women from participating in breast cancer screenings and to determine whether tailored interventions based on personalized risk or general information are more effective in motivating them to engage in such preventive measures. By addressing these points, the study will contribute valuable insights into enhancing breast cancer screening rates and, consequently, reducing mortality from the disease in Turkey.

MATERIAL AND METHODS

Study Design and Population: This study was designed as a randomized controlled trial. The target population comprised female patients aged 40-69 years, residing in the central district of Erzincan, Turkey. Participants were recruited during their scheduled visits as well as opportunistically when they visited the family health center for other health concerns, ensuring a broad representation of the target demographic. These participants visited a family health centre between December 1, 2022, and April 1, 2023, and had no prior diagnosis of breast cancer.

Sample Size Determination: Utilizing the confidence interval method with a type 1 error of 0.05 and a power of 0.95, and anticipating a 20% difference between the two groups with a sensitivity of 0.05, the sample size was estimated to be 264. This anticipated difference was based on clinical expectations and expert opinion regarding the potential impact of personalized risk communication versus generic information dissemination on screening participation rates. As no similar studies were found in the literature to provide a basis for this estimate, we relied on our clinical expectations and expert judgment. To account for an approximate 10% data attrition, the study ultimately included 300 participants, with 150 individuals in each group.

Data Collection Instruments: A comprehensive questionnaire was formulated by the research team after an extensive literature review. This questionnaire encompassed demographic details, inquiries about participants' perspectives on breast cancer screenings, and questions derived from the modified Gail risk scoring system. The Gail risk model, which originated from the Breast Cancer Detection and Demonstration Project (BCDDP) data, incorporates various risk factors to provide a lifetime breast cancer development risk as a percentage(13).

Subsequently, the ASSISTS scale, a 33-item instrument developed by Khazaee et al. in 2016 and later validated in Turkish by Turan et al., was administered(14, 15). This scale, devoid of a specific cut-off, operates on the premise that higher scores indicate heightened awareness of breast cancer preventive behaviors. Each item on the ASSISTS scale is rated on a Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). The scale is designed to gauge women's attitudes, knowledge, and perceptions related to breast cancer and its screening practices. The total score is calculated by summing the responses to all items, with potential scores ranging from 33 to 165. A higher score indicates a greater awareness and understanding of breast cancer preventive behaviors. In terms of internal consistency, the ASSISTS scale has demonstrated a Cronbach's alpha of 0.81 in previous studies, indicating good reliability.

Prior to and immediately following the interventions, participants responded to three Likert-scale items, which ranged from 1 (indicating 'Strongly Disagree') to 10 (indicating 'Strongly Agree'). These items gauged their inclination towards undergoing mammography, BSE (breast self-examination), and CBE (clinical breast examination) in the subsequent year.

Randomization Procedure: People were split into two groups depending on the order of their visits to the health center. One group was for those with odd visit numbers and the other was for those with even numbers. This strategy of using visit numbers to assign groups was an effective way to randomize making sure that each person had a fair shot at being placed in either group and reducing the risk of bias, in selection. One cohort received concise information, a 212-word text derived from the "Breast Cancer Prevention, Screening, Diagnosis, Treatment and Follow-up Clinical Guide" by the Cancer Department of the Ministry of Health. Conversely, the other group was informed solely about their lifetime risk percentage of developing breast cancer, as determined by the modified Gail risk model(8). Information and risk communication were administered orally by the same researcher, who read from a previously standardized script to ensure consistency and accuracy. This method was chosen to guarantee that all participants received the same information in a controlled manner, facilitating a uniform understanding across the study. This approach also helped maintain the integrity of the intervention by ensuring that the delivery was uniform and unvarying, thus supporting the reliability of the study's findings. Upon study conclusion, all participants were provided both the standard information text and their Gail risk score (Figure 1).

Ethical Considerations: The study secured ethical approval from the Erzincan University Faculty of Medicine Clinical Research Ethics Committee on October 27, 2022, under the reference number 04/10. Additionally, permission was granted by the Erzincan Provincial Health Directorate to administer the questionnaire in family health centres. Informed consent, both verbal and written, was obtained from all willing participants. Participants' data were stored anonymously, ensuring no identifiers or personal information that could lead to disclosure were used. There were no conflicts of interest associated with this study. To ensure the well being of the participants all interviews and conversations took place in spaces, within each family health center to maintain confidentiality and privacy. The study followed the guidelines laid out in the updated Helsinki Declaration diligently. CONSORT guideline rules were followed in all phases of the trial study.

Statistical Analysis: Data were inputted and analyzed using IBM SPSS Statistics 25 (SPSS, Chicago, IL). Quantitative data were summarized using either mean ± standard deviation for normally distributed variables or median (minimum – maximum) for non-normally distributed variables. Categorical variables were expressed as frequency (%). The Kolmogorov-Smirnov test was utilized to verify the assumption of normality, and the Levene test assessed the homogeneity of variances.

For comparing two groups, the Student's t-test was applied to normally distributed data, while the Mann-Whitney U test was used for non-normally distributed data to analyze differences in median values. For comparisons involving more than two groups, one-way ANOVA was employed for normally distributed data to compare means, and the Kruskal-Wallis test was used for non-normally distributed data to compare medians. The relationship between two categorical variables was examined using the Chi-Square test.

A p-value of less than 0.05 was deemed statistically significant.

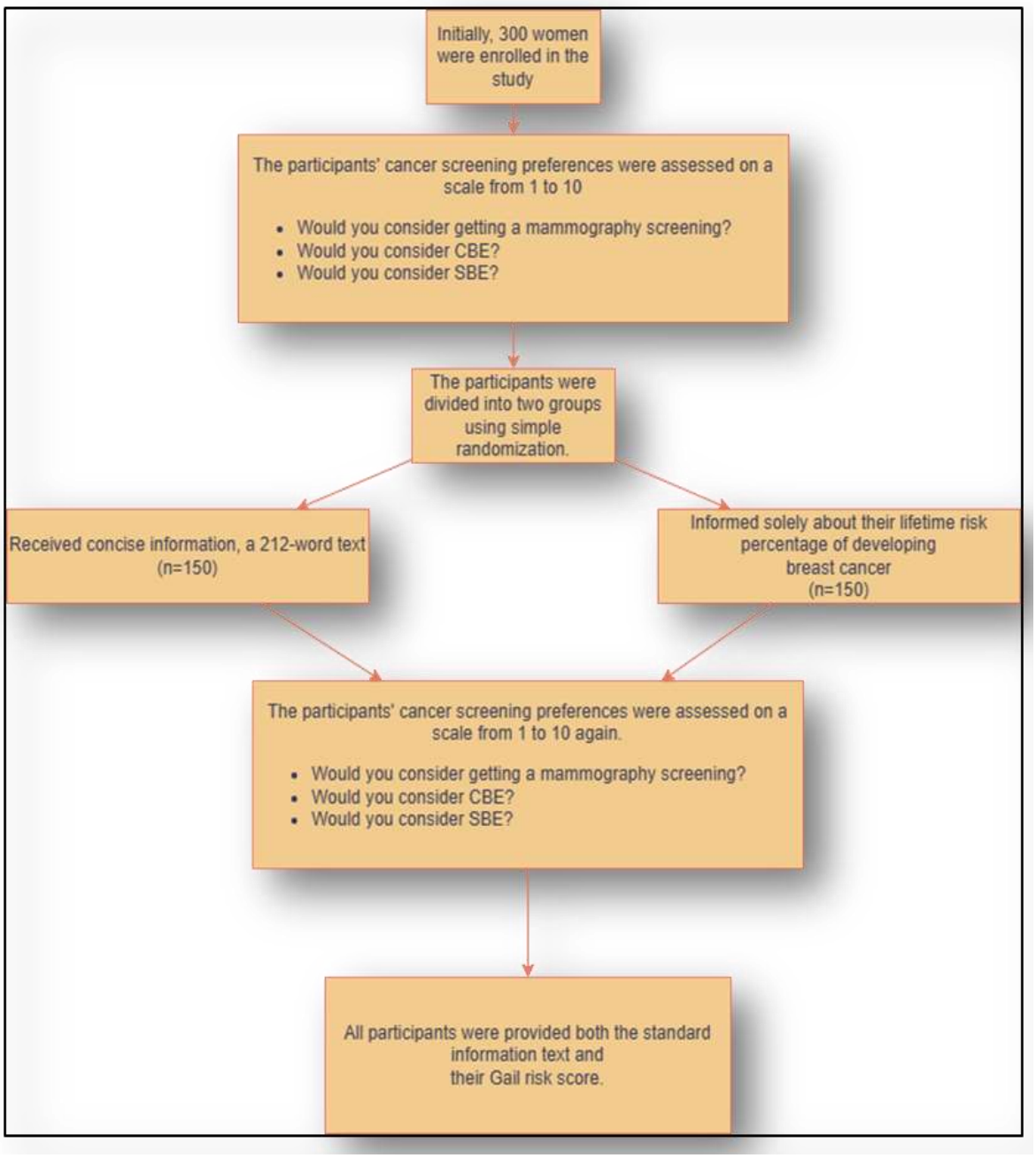


Figure 1. Flowchart of the study.
* SBE (self breast examination); **CBE (clinical breast examination)

RESULTS

Demographic Characteristics: A total of 300 participants were enrolled in this study, with an average age of 53.49±8.03 years (min=40, max=69). The participants reported a mean age of menarche at 13.25±1.60 years (min=9, max=20). Among those who had experienced childbirth, the mean age at first live birth was 21.27±4.68 years (min=15, max=44). The mean score achieved by participants on the ASSISTS scale, which has a maximum attainable score of 165, was 123.92±11.318 (min=97, max=162). Detailed demographic characteristics of the participants and their relationship with the ASSISTS scale are presented in Table 1.

Cancer Screening Status: The cancer screening behaviors of the participants are delineated in Table 2. The primary reason cited for not conducting CBE, by participants was a lack of knowledge as reported by 90.3% (n=254) with a minority of 4.3% (n=13) attributing it to feeling healthy. Similarly when it came to reasons for skipping BSE the majority of non performers mentioned lack of awareness at 68.3% (n=115). Feeling healthy at 21% (n=63). In the case of mammography similar trends emerged; 52.7% (n=158) highlighted knowledge as the deterrent, followed by 24.7% (n=74) citing good health and 4.7% (n=14) stating they did not see the necessity, for screening.

Table 1. Demographic data of participants and comparison of participants' scores on the ASSISTS scale

		n	%	Avg	p
Marital status	Married	260	86.67	124.51 ± 11.38	**0.048**
	Single	8	2.67	123.25 ± 11.26	
	Widowed	32	10.66	123.92 ± 9.95	
Do any of your first-degree relatives have breast cancer?	No	288	96	123.84 ± 11.33	0.551
	Yes	12	4	125.83 ± 11.27	
Do you have a friend who has breast cancer?	No	109	36.33	120.17 ± 10.44	**p<0.001**
	Yes	191	63.67	126.06 ± 11.26	
Do you do BSE*	No	84	28	116.43 ± 9.14	**p<0.001**
	Yes	160	53.33	129.04 ± 10.53	
	Partly	56	18.67	120.54 ± 8.69	
Have you had a mammogram before?	No	102	34	119.16 ± 10.05	**p<0.001**
	Yes, regularly every two years	37	12.33	135.49 ± 12.35	
	Yes... years ago	161	53.67	124.28 ± 9.78	
Have you been CBE** before?	No	158	52.67	119.35 ± 9.84	**p<0.001**
	Yes, regularly, once a year	20	6.67	140.25 ± 10.79	
	Yes... years ago	122	40.66	127.16 ± 9.52	
Source of information	Media	106	35.33	120.20 ± 9.92	**p<0.001**
	Family	11	3.67	133.55 ± 9.33	
	Friend	27	9	119.96 ± 11.99	
	Internet	18	6	126.50 ± 11.73	
	Doctor	138	46	126.45 ± 11.16	
Requesting a mammogram screening	Have had a mammogram screening within the last two years	70	23.33	129.69 ± 11.97	**p<0.001**
	Eligible but do not want	117	39	119.87 ± 9.65	
	Eligible and Want	113	37.67	124.67 ± 10.90	

* BSE (breast self-examination)
**CBE (clinical breast examination)

Table 2. Breast cancer screening status of participants

		n	%
Have you had a mammogram screening before?	No	102	34
	Yes, regularly every two years	37	12.3
	Yes, I have had it before	161	53.7
Do you do breast self-examination?	No	116	38.7
	Yes, regularly	95	31.7
	Partly	89	29.7
Have You Had a Clinical Breast Examination Before	No	158	52.7
	Yes, regularly, once a year	19	6.3
	Yes, I have been before	123	40.7

* SBE (self breast examination)
**CBE (clinical breast examination)

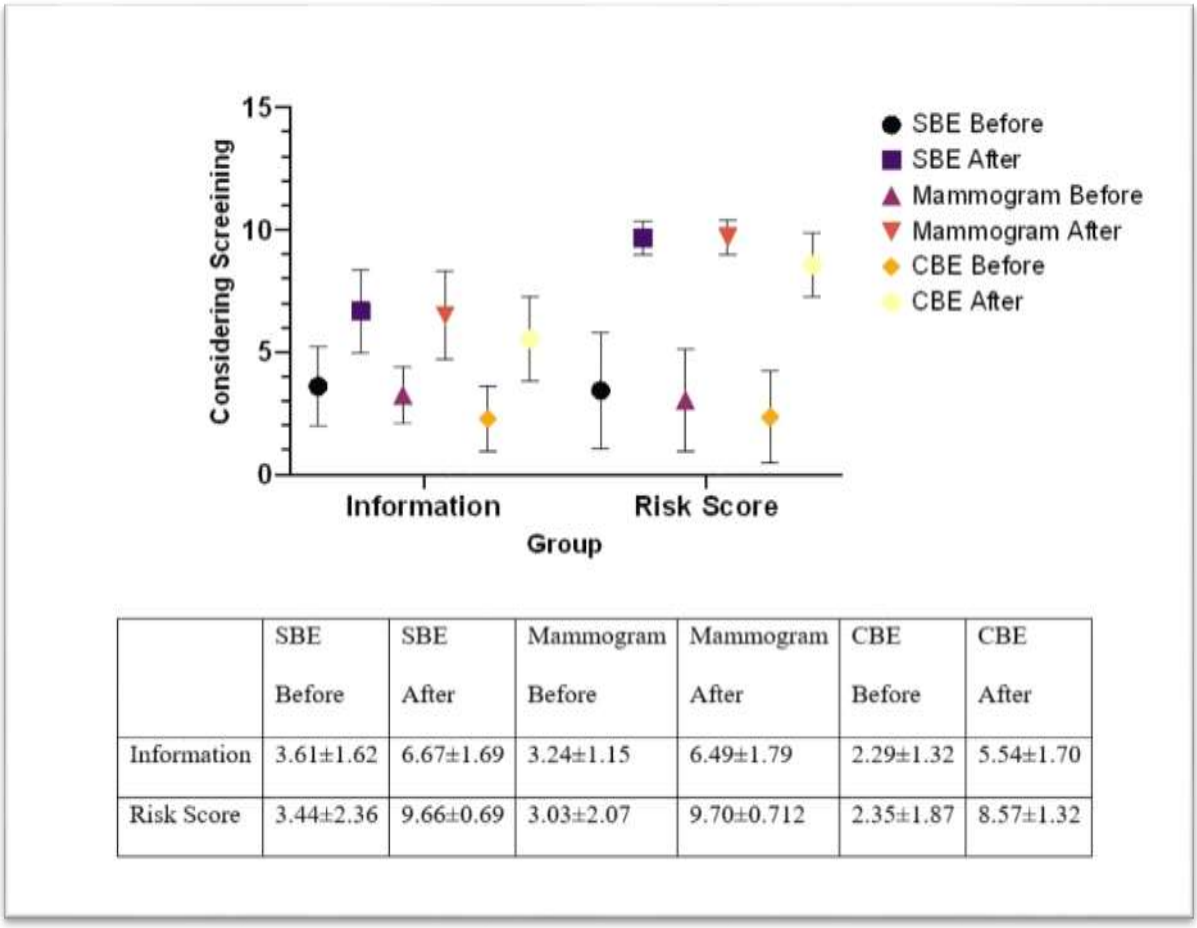
Sources of Breast Cancer Knowledge: When participants were queried about their primary sources of information regarding breast cancer, 46% (n=138) cited physicians, 35.3% (n=106) attributed it to media, 9% (n=27) to friends, 6% (n=18) to the internet, and 3.7% (n=11) to family members.

Gail Lifetime Risk Assessment: For participants subjected to the Gail risk-scoring model, the average lifetime risk of developing breast cancer was determined to be 8.12±3. In comparison to the general population, 82.7% (n=124) were categorized as having a low risk, 4.7% (n=7) an equivalent risk, and 12.6% (n=19) a heightened risk.

Mammography Screening Post-Intervention: At the outset of the study, the mammography screening rate among the cohort was relatively low, with only 23.3% (n=70) of participants having undergone mammography within the previous two years, and of these, just 12.3% (n=37) were doing so on a regular basis. Following the disclosure of cancer risks or when pertinent information was provided to those needing screening, participants were asked about their willingness to undergo mammography. Of those informed, 40.5% (n=41) expressed a

willingness to undergo screening, and this percentage increased to 55.8% (n=72) among those who were informed of their specific risk level (p=0.022). This marks a significant increase from the baseline screening behavior observed at the start of the study.

Attitudinal Shift Post-Intervention: A comparative analysis of the differential in scores pre- and post-intervention, pertaining to attitude-related questions among groups informed of their risk or provided with general information, is elucidated in Figure 2. According to the results, providing information based on risk scores led to a statistically significant increase in demand across all screening methods when compared to standard information provision (all p<0.001). When examining the effectiveness of interventions among groups that had previously undergone mammography screening and those that had not, the same result was observed (all p<0.001). On the other hand, whether the Gail score was low, equal, or high, it did not influence the desire for mammography screening (p=0.690).



	SBE Before	SBE After	Mammogram Before	Mammogram After	CBE Before	CBE After
Information	3.61±1.62	6.67±1.69	3.24±1.15	6.49±1.79	2.29±1.32	5.54±1.70
Risk Score	3.44±2.36	9.66±0.69	3.03±2.07	9.70±0.712	2.35±1.87	8.57±1.32

Figure 2. Participants' willingness to undergo cancer screening according to information and risk score groups.
* SBE (self breast examination); **CBE (clinical breast examination)

DISCUSSION

Breast cancer, despite its global prevalence, lacks a definitive preventive measure. However, early diagnosis through regular screenings can significantly improve prognosis and even facilitate complete recovery. Consequently, the importance of breast cancer screening programs cannot be overstated(5, 8). Early detection through screening not only reduces mortality rates but also lessens the burden on healthcare systems by enabling less aggressive treatment options and better patient outcomes. Our findings underscore the efficacy of communicating an individual's lifetime risk of developing breast cancer over generic information dissemination in guiding them towards breast cancer screenings.

Mammography is considered the gold standard due to its high sensitivity and ability to detect early-stage cancers, thus reducing mortality rates. However, it is not untouched by controversies the problems of overdiagnosis and false positives that complicate the picture and may actually lead to unnecessary treatment and anxiety. CBE and BSE are preferred choices, especially in settings with low access to mammography (16). On one hand, while some studies have raised questions on the role of CBE and BSE in decreasing mortality, others have emphasized their role in increased breast awareness and detection early, particularly in resource-constrained settings (16). Differences aside, all the three in combination, as a part of comprehensive screening, can optimize early

detection and better the outcome of the breast cancer patient. Acknowledging the disparities in empirical foundations, it is crucial to consider the context in which each method may be appropriate. For example, in low-resource settings, CBE and BSE can be vital tools for early detection when mammography is not readily available.

Our study highlights significant discrepancies in adherence rates to regular mammography compared to national averages and global benchmarks. Compliance rates in our group are below the national average (18.7%) reported by the Ministry of Health for mammography and, unfortunately, still fall far short of global standards and the domestic target of 70% mammography coverage (6). Notably, the national data from the Ministry of Health reflect mammography rates over the past two years without accounting for regularity. This implies that individuals may have undergone mammography in the past two years but not consistently before, suggesting that the true rate of regular mammography could be lower than reported. Our findings align with existing literature that highlights challenges in implementing organized screening programs, such as those reported in Brazil and Germany, indicating that similar issues may be present in our cohort (17, 18). Emphasizing these comparisons is crucial for understanding the broader implications of our study and advocating for strategies to enhance screening adherence rates.

Moreover, our study revealed that social and psychological determinants such as marital status, personal connections to breast cancer, and primary sources of information significantly influence breast cancer screening behaviors. Addressing these factors is essential in designing effective screening promotion strategies, as they play a pivotal role in shaping individuals' attitudes and decisions towards screening. A salient observation from our study was the pivotal role of information accessibility in influencing breast cancer screening behaviors, a finding corroborated by existing literature (19, 20). The imperative of enlightening women about the merits of cancer screening for early detection and management is evident. Prior research indicates a direct correlation between heightened awareness of cancer screening and increased participation rates (21). Given that 46% (n=138) of our participants cited physicians as their primary source of breast cancer information, healthcare professionals are uniquely positioned to champion cancer prevention and control strategies.

Our study further revealed that the ASSISTS scores were significantly influenced by factors such as adherence to regular breast cancer screening methods, marital status, having a friend diagnosed with breast cancer, and family being the primary information source. These findings underscore the intricate interplay of social and psychological determinants in shaping breast cancer screening behaviors. To bolster screening participation, it is paramount to equip women with accurate and up-to-date breast cancer information, elucidate the advantages and limitations of screening tests, and ensure their accessibility and affordability(22). Additionally, the role of spouses, family, friends, and healthcare professionals in guiding women towards screening cannot be overstated(23).

Our intervention demonstrated a marked shift in participants' inclination towards BSE, CBE, and mammography post-intervention, with the most pronounced change observed in the cohort informed of their lifetime cancer risk. This group also exhibited a significantly higher proclivity for mammography screening compared to their counterparts provided with generic information. These findings advocate for the efficacy of personalized risk communication over generic information dissemination, especially considering its time efficiency, making it a potentially preferable approach for clinicians.

However, the mode of risk communication warrants consideration. Digital platforms, such as web-based tools or applications, could be harnessed to facilitate breast cancer risk estimation, thereby reaching a broader audience. While this method offers the advantage of enhanced comprehension and recall, it presupposes technological accessibility and literacy, potentially excluding certain demographics.

It's imperative to acknowledge that enhancing breast cancer screening participation is multifaceted, necessitating considerations beyond mere information dissemination. Factors encompassing cost, availability, quality, and the structural organization of screening programs can significantly influence screening decisions(24). The pivotal role of healthcare professionals in this endeavor cannot be overstated, necessitating their active involvement in guiding, educating, and advising women on breast cancer screening(24). A holistic, multi-pronged strategy is indispensable to optimize breast cancer screening participation.

Study Limitations: This study is not without limitations. Its single-center design, reliance on participant self-reporting, and cross-sectional nature potentially limit the generalizability of the findings. Furthermore, behavioral intentions do not always predict actual behaviors, and our study did not facilitate the longitudinal tracking of participants' cancer screening behaviors. These limitations highlight the need for cautious interpretation of the results. Future research should consider conducting multi-center studies with extended follow-up periods to track participants' screening behaviors longitudinally. Such studies could provide more comprehensive insights into the long-term effectiveness of different breast cancer screening strategies and address the current study's limitations by offering a broader and more diverse

sample, reducing bias, and enhancing the generalizability of the findings.

CONCLUSION

Breast cancer, as the foremost global cancer type, necessitates community-centric screening programs to mitigate its morbidity and mortality. Enhancing patient motivation for screenings is pivotal, and our findings suggest that communicating individualized lifetime breast cancer risk is more efficacious than protracted information dissemination. This approach could potentially address the time constraints faced by clinicians in guiding patients towards screenings. However, a comprehensive strategy, encompassing both personalized risk communication and generic information provision, could further elevate screening participation rates. Policymaking that incentivizes physicians in this regard is imperative.

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