



A Scoping Review of 20 Years Breast Cancer Screening Programs in Iran

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Abstract

Background: Breast cancer (BC) is the leading cancer among women globally. Early detection through screening is vital for reducing mortality, complementing advancements in treatment.

Methods: We aimed to overview BC screening practices in Iran over two-decades to inform policymakers for future research directions and prompt timely diagnoses. A scoping review was conducted on BC studies in Iran from 2000 to 2023, following PRISMA guidelines.

Results: We analyzed 129 articles on BC in Iranian women, and finding six main areas.

Conclusion: Iran's health system lacks an organized BC screening initiative, facing challenges like inadequate infrastructure, sociocultural barriers, unintegrated health insurance packages, and limited research on key indicators.

Keywords: Breast cancer; Burden; Epidemiology; Iran

Introduction

Cancer ranks second among NCD-related deaths globally, with 9.3 million deaths in 2019. Predictions indicate it could cost \$25.2 trillion by 2050 (1). Breast cancer (BC) ranks third in economic cost among cancer types, with 75.1% of deaths occurring in low- and middle-income countries (2). BC is the foremost cause of women death, with significant mortality rates in the Mena region, including Iran, reaching 35,405 deaths, and 1,222,835 DALYs in 2019 (3, 4). Iranian studies

suggest BC onset almost a decade earlier than global counterparts, 71% of cases are diagnosed at advanced stages (5, 6). Screening and early detection programs (S&EDPs) identify diseases in asymptomatic and initial stages, significantly improving outcomes (7, 8). However, population-based BC S&EDPs are lacking in Iran, despite the country's aging population trend.

Therefore, this review aims to address below fundamental questions:



- 1- What are incidence and mortality rate related to BC among Iranian women?
- 2- What are risk factors, barriers and challenges related to managing BC-S&EDP?
- 3- What BC-S&EDP strategies have been implemented for Iranian women over the last two decades?

Given limited review articles on BC S&EDPs in Iran and narrow study scopes, this review aimed to offer a comprehensive perspective to guide health policymakers in enhancing these programs, establishing BC registries, and developing infrastructure and research plans (9, 10).

Methods

We reviewed Iranian BC research from the late 20th century to October 2023, following scoping review standards outlined by Peters et al. and

Tricco et al.'s, using the PRISMA-ScR checklist for standardized methodology (11-12).

Search Strategy

We searched databases on BC-S&EDPs, including PubMed, Google Scholar, Scopus, and Web of Science for English, and MagIran and SID for Persian publications. The study selection process is outlined in Fig. 1.

Protocol Template

The selection criteria for articles were those published within the last 20 years focusing on breast cancer screening issues in Iran, with a minimum of 200 female participants aged 20 to 80, with a key concept on the management of BC-ED programs in Iran. Consensus was achieved through discussion and interaction among the authors' team to select the articles.

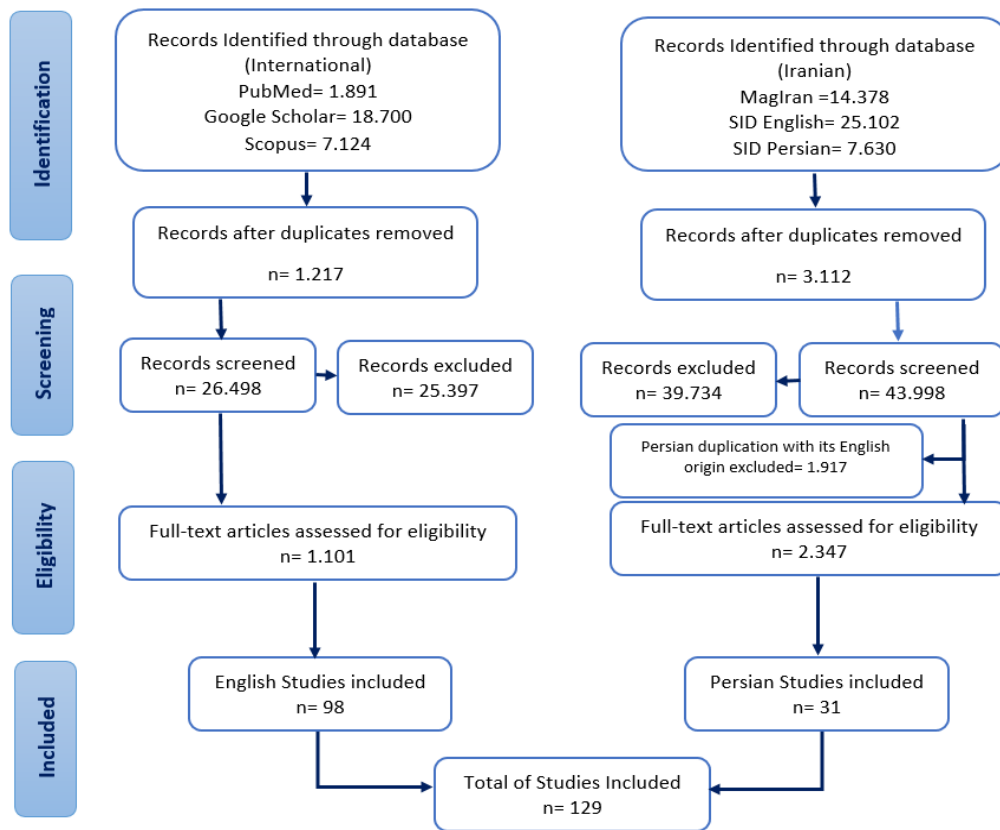


Fig. 1: Study selection process flow diagram

Results

We examined 129 articles, divided into six strata on BC in Iranian context, outlined in Fig. 2.

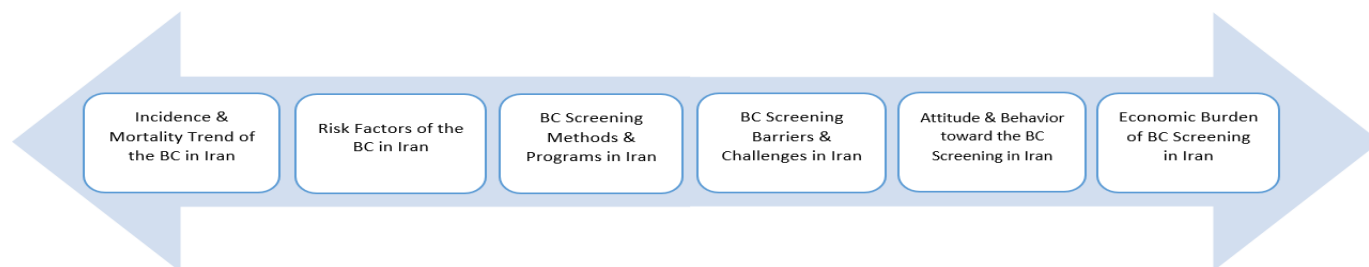


Fig. 2: Six Strata of BC Screening in Iran

Incident & Mortality Trend

This subsection contains 17-articles. Recent studies showed BC in Iran with an ASR of 32.1/100,000, comprising 24.4% of all cancers; ranking fifth in cancer deaths and first malignancy diagnosed (13-15). Othaghvar et al. reported 6,160 malignancy cases annually with a 20% mortality rate (15). In 2021, 40,000 cases were diagnosed, with 7,000 new cases each year (15, 16). The Iranian Ministry of Health's National Cancer

Registration Program (IMOH-NCRP) reported female BC-ASR rates at 44.43/100,000 (17). Most patients were aged 40-49 (18).

Table 1 illustrates rising trend of BC across provinces from 2015 and 2018, these changes are marked with arrows, with some regions showing significant increases such as North-Khorasan with the highest rise (73%) followed by Alborz-68%, Kurdistan-66%, Gilan-59%, and Tehran-57%.

Table 1: BC trends across Iran's Provinces IMOH-NCRP data of 2015 and 2018

Provinces	ASR of BC		Provinces	ASR of BC	
	2018(20)	2015(19)		2018(20)	2015(19)
East Azerbaijan	↑37.06	25.17	Sistan_Baluchestan	↑17.48	12.45
West Azerbaijan	28.39	25.72	Fars	49.62	36.95
Ardabil	22.41	16.85	Qazvin	25.85↓	27.47
Isfahan	52.38	45.05	Qom	45.08	Not Reported
Alborz	↑63.85	37.82	Kurdistan	↑34.00	20.78
Ilam	33.58	29.41	Kerman	32.78	32.49
Bushehr	29.79	25.14	Kermanshah	↑37.38	26.49
Tehran	↑62.69	39.59	Kohkiloye_Boyerahmad	25.19↓	28.87
Chaharmaha_Bakhteyari	↑28.86	19.71	Golestan	40.64	35.76
South Khorasan	24.62	23.08	Gilan	↑51.41	32.44
North Khorasan	↑21.25	12.48	Mazandaran	↑56.40	39.88
Central Khorasan	34.59	32.58	Araak	↑42.99	28.64
Khuzestan	49.96	37.73	Hormozgan	30.45	26.42
Zanjan	18.05↓	19.36	Hamadan	29.63	22.17
Semnan	39.29	37.89	Yazd	52.98	44.46

Conversely, some provinces experienced declines such as Kohgiluyeh (19, 20). ASR rates varied

from 1.18 to 19.7/100,000 in the west and east, and between 29.3 and 29.7 in the south and cen-

ter of Iran (17). Urban areas had an ASR of 15/100,000, while large cities recorded 34.6. Iran exhibits increasing BC incidence, especially in Tehran (14, 21-23). Other provinces like Ardabil, Mazandaran, and Kurdistan showed diverse trends, likely due to differing lifestyles, age demographics, and individual health behaviors (23, 24). Haghighat et al. reported a rise in female BC-ASR from 15.96 to 40.72/100,000 in 2003-2017 (13). Hamedan rose from 48.2 in 2004 to 115.0 in 2009 and Tabriz from 21.68 in 2007 to 36.91 in 2016 (25, 26).

Risk Factors

This subsection with 31-articles, categorizing them into modifiable, non-modifiable, and protective factors.

Modifiable Risk Factors

Obesity and high body mass index are major risk factors (27-36). Another debated factor is a woman's age at first childbirth. Young (≤ 18 yr) and old (≥ 35) age at the first pregnancy could notably increase the risk of BC (27, 30, 33, 35, 37-42). Other factors include induced abortion history, oral contraceptives, marriage age, nutritional habits characterized by high consumption of dairy, sweets, and meat, marital status, night shifts occupations (flight attendant), stress, alcohol and drug consumption, hormone replacement therapy, and surprisingly, fathers' age at the time of the baby's birth (30, 31, 41-46). Contrary to the expected association between smoking and BC, passive smoking, along with hookah use, has been affirmed as a higher risk-factor in women compared to direct smoking (27, 30, 32, 35, 42, and 47).

Non-Modifiable Risk Factors

Family history of BC, especially among first-degree-relatives, was the most frequently cited risk-factor (27, 28, 30, 31, 33, 34, 36, 37, 42, 44, 45, 48-52). Other risk-factors include the age at menarche and at menopause (30, 31, 34, 36, 38, 40-42, 44, 45, 49, 50, 53-56). History of chest radiation exposure, increasing age, stillbirth history, ethnicity, and race have been mentioned in some

studies (28-30, 33, 34, 38, 39, 44, 46, 51, 54, 55, and 57).

Protective Factors

Various factors have been identified as potential protective elements; extended breastfeeding period and the number of pregnancies (27, 33, 42, 45, 49, 51, 55, 58). Some studies suggesting a protective effect for five or more pregnancies (32, 35, 39, 41, 42, 53). While others find no significant association (29, 50). Physical activity and healthy dietary habits (vegetable consumption) are associated with a reduced risk of BC, while a sedentary lifestyle may increase the risk (34, 35, 42, 47, 51, 52, 59-60). However, the role of educational attainment in BC-risk is mixed and there are conflicting findings (29, 35, 38, 44, 55, 59).

Screening Methods & Programs

This subsection with 15-articles on BC-S&ED modalities in Iran, focuses on BSE, CBE, and mammography, as recommended by the American Cancer Society (2). Some RCTs found no mortality reduction with BSE and CBE, but they still contribute to awareness enhancement. Mammography, offered opportunistically or organized screening, is crucial for detecting breast tumors < 2 -cm, enabling timely treatment and enhancing survival (63-65). Two studies found no organized national Iranian BC screening, with screening being opportunistic. Results showed regularly 14.3% performed BSE, 20.7% received CBE, and only 3.5% underwent mammography every three-years (66, 67). Among women > 20 -yr, regularly 12.3% practiced BSE, 6% CBE, and 2.4% underwent mammography (68). Similar rates were reported in Ardabil and in Tabriz among women > 20 -yr. Jalilian et al. found inequalities in access to CBE among Kurdish women, with a concentration index of 0.188 across urban and rural regions (68, 69). Age positively impacted mammogram uptake in Tehran (70). Mirfarhadi et al. found delays in mammogram uptake: 16.8% system delays, 13% delays in diagnosis-treatment, and 60% personal delays of up to one-month, with 30% enduring delays of over three-months (71).

Barriers & Challenges

Through 17-articles of this subsection, BSE and CBE are the primary methods in Iran (72). A recent study identified four barriers: health system, community, individual, and interpersonal (73). We address them here and in the next subsection. In Zahedan, only 8.3% of women were familiar with BC screening. Among them, 4.5% regularly performed BSE, 4.1% CBE, and just 1.3% had a mammogram (74). A study conducted 15 years later in there revealed barriers to mammography, including absence of breast symptoms-62.7%, discomfort with male health workers-57.5%, no perceived test priority-57.2%, reliance on health workers' examination-55.8%), and embarrassment during mammography-51.5% (75). In Golestan Province only 4.0% of Turkmen women had sufficient information about BC (76). In Yazd and Sirjan 80% of women never consulted a specialist, only 3% regularly performed CBE, and just 15.4% of those with close-relatives with BC had a mammogram (74, 77, 78). Safarpour et al. discovered only 22.3% of northern Iranian participants had good knowledge about BC screening, while Montazeri et al. showed that 61% in Tehran acquired information through electronic media like television (34%) and radio (14%) (76, 79). A decade later, two studies found 42.1% and 44.3% of Tehran and Isfahan participants had undergone mammography respectively (80, 81). This range in Rasht and Tabriz was 45% and 38.2% (82, 83).

Attitude and Behavior

This subsection with 26-articles, explores how social determinants of health (SDH) affect screening acceptance. Women with positive attitudes show higher participation rates: 21.9% BSE, 15.8% CBE, and 16.7% for mammography (84). Studies stress the significant of public awareness initiatives, targeted group sensitization, self-efficacy, and positive attitudes toward mammography adoption, particularly within Muslim communities (56, 85-87). Awareness deficits are particularly prominent among women in rural areas of Iran (78, 88). Furthermore, factors like monthly income, possession of health insurance,

and having social support display a positive correlation with their engagement in BC screenings (78, 80, 81, 85, 89-91). Various access barriers, including cultural obstacles, geographical limitations, language barriers, along with prolonged waiting lists and financial constraints are significant factors (82-86). Low socioeconomic status discourages participation, while middle-income status (80, 88, 92, 93). Feelings of embarrassment and shame, fear of results, pain, and the associated stigma, fatalistic and religious beliefs, and past negative experiences negatively impact women's attitudes toward BC screening (28, 71, 78, 79, 89, 93-98). Conversely, positive impacts on women's decision-making regarding these programs arise from healthy beliefs having a family history, and sensitization (74, 78, 80, 83, 93, 96, 99, 100).

Economic Burden

This subsection reviews 23-articles primarily focusing on treatment, with some estimating the economic impact of BC screening (22, 59, 101-115). A study in Tehran evaluated the cost-effectiveness of a national mammography BC screening for women > 35, finding a total cost of \$77,797 and \$5,742 per case detected, indicating limited cost-effectiveness for women under 50 (116). In Shiraz BC screening, including sonography and mammography, for women > 25 cost \$5,847,544.96 for age groups 25-34 and those aged ≥35, underlining the considerable expense of screening programs (117). In 2016, Haghghat et al. evaluated mammography rounds in a BC screening, finding an initial ICER of \$37,350/QALY gained (118). Later rounds showed higher ICERs, reaching \$389,148, with mammography proving cost-effective in 53% of cases. In Kerman a cost-effectiveness study of 19,651 rural women aged 35-69 revealed a total cost of \$7,067.69 for a mammography screening (119). The ICER for DALYs averted was \$6,264 compared to no-screening interventions. In 2022, researchers in Shiraz using Purchasing Power Parity, found the expected screening cost to be \$7,556, compared to \$7,840 for no screening. Screening demonstrated dominance with a 16% difference in effectiveness (120). In Tehran, re-

searchers examined the economic evaluation of mobile mammography across Iran's provinces, noting comparable sensitivity-&-specificity between fixed and portable devices (121). Mobile screening costs approximately \$37,000 per QALY. A study, comparing mammography and ultrasonography techniques found that ultrasonography's sensitivity for detecting BC was not significantly higher than that of mammography (122).

Discussion

BC poses a significant threat to women in developing nations like Iran, being a leading cause of mortality. Data suggests Iranian women may face BC at earlier ages than those in developed countries (6, 8). Statistics highlight challenges for Iranian women, including delayed diagnosis and a higher occurrence of non-palpable lesions (123). A recent study predicts a significant rise in new cancer cases in Iran, with BC being a major contributor. BC has shown a significant increase in the ASR from 32.63/100,000 in 2015 to 44.43 in 2018 (124). Projections indicate a rise from 112,000 cases to 160,000 during 2016-2025, marking a substantial 42.6% increase. Of these, 13.9% and 28.7% are attributed to changes in risk-factors and demographic shifts, respectively (9, 13, 19, 20). The ASR rate over the last two-decades, has fluctuated across Iranian provinces, with consistently higher rates in southern and central regions (17). Disparities persist between rural and metropolitan areas. Recent analysis reveals a significant 15.2% increase in female BC incidence (125). The lowest significant increase was observed in the 40-44 age group, contrasting with previous findings indicating a majority of patients in the 40-49 age range (18). BC screening method adoption in Iran varies by region due to barriers such as geographical remoteness, infrastructure gaps, and cultural beliefs (66). The lack of a structured screening policy and limited public awareness contribute to low mammography utilization rates, even in major urban areas like Tehran (2, 126). While some studies indicate par-

tial cost-effectiveness of national BC screening, low participation rates among specific demographics pose challenges in integrating these programs into health insurance packages (118, 121). Limited data on mammography efficacy in women over 69 exist, but studies suggest it's comparable to younger counterparts. Individualizing screening for older women in Iran, given its aging population, becomes crucial, considering their health status and life expectancy (127, 128). Modifiable BC risk factors like obesity and lifestyle choices, along with protective factors such as regular physical activity and healthy dietary habits, can be addressed or modified to mitigate BC-risk (27-36, 38, 42, 44, 50, 57). Educational interventions and health promotion interventions effectively raise BC screening rates by improving knowledge, sensitization, perceived behavioral control, and subjective norms (129). A quasi-experimental study demonstrated significant improvement in knowledge, attitude, and a 78% intent to undergo mammography six months after the intervention in the experimental group compared to the control group (129, 130).

Conclusion

Iran's healthcare system faces challenges like inadequate infrastructure, sociocultural barriers, and economic constraints, preventing comprehensive BC screening plans. In response to the study questions, our findings suggest three potential-options:

1. Conduct targeted local research to gather national data and identify key indicators. Offer policy insights for policymakers to enhance healthcare infrastructure and allocate resources effectively.
2. Implementing a comprehensive program targeting priority modifiable risk factors and SDH in investment strategies can indirectly reduce BC incidence.
3. Engage community leaders and NGOs in educational programs to address BC effectively.

Journalism Ethics considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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Conflict of interest

The authors declare that there is no conflict of interests.

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