Original Article :

Breast Cancer Screening Programme in Riyadh Peripheral Provinces: Coverage Rate, Participation Rate, and Recall Rate.

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Abstract

Background & Aims:

Assessing the performance of Breast Cancer screening programmes is essential to detect and remedy weaknesses and to improve the quality of the screening services. This study aimed to assess the coverage rate, participation rate, and recall rate of the Breast Cancer Screening in Riyadh Region.

Methods:

This was a retrospective study in 11 Riyadh peripheral provinces. We used secondary data of women referred for screening and women who underwent mammography screening. Outcomes of the study included: Coverage rate by invitation; Coverage rate by examination; Participation rate; Recall rate.

Results:

The invitation coverage rate was 5.2%, and it was highest among women in the age group 50-59 years (32.7%). The examination coverage rate was 1.1%, with women in the age group 50-59 years constituting the highest proportion (7%). The participation rate was 21.4% and was highest among women in the age group 50 to 69 years (22.4%). The recall rate was 10.1% and was highest among women in the age group < 40 years (18.6%).

Conclusion:

In this study to assess the performance of the breast cancer screening programme, we detected low coverage and participation rates, most probably due to the opportunistic approach followed in inviting the target population, in addition to the geographical accessibility problem of the mammography testing sites. The recall rate aligned with the level set by the Saudi National Breast Cancer Screening Programme.

Keywords:

Breast cancer screening, coverage rate, participation rate, recall rate, Saudi Arabia.

Introduction:

Breast cancer (BC) accounted for 11.7% and 6.9% of global cancer cases and deaths in 2020 respectively. It is the most frequent type of cancer affecting women, accounting for 2,261,419 new cases and 684,996 deaths among them in 20201-[3].

In Saudi Arabia, BC is the most frequently occurring type of cancer among females, accounting for 30.9% of all cancer cases in 2017. The Age Standardized Rate (ASR) was 29.7/100,000 for the Saudi female population. Regarding mortality, BC ranked as the ninth cause of death among females in 20104,[5]. Riyadh region ranked as the second region of the kingdom regarding BC burden, with an ASR of 37/100,0004. The BC burden is expected to increase in Saudi Arabia due to the increased life expectancy, population growth, fertility-related factors, and lifestyle-related factors[2,5,6]

Despite the increase in BC incidence, the global cancer estimates show decreasing mortality trends. The factors contributing to this decline in mortality include the early detection of BC through the use of screening mammography and the provision of therapy to the detected cases[3,7]. Mammography, by detecting the earlier stages of BC, contributes to preventing around 20% to 40% of BC-associated deaths[3,8,9].

The Saudi National Breast Cancer Screening Programme (SNBCSP) was launched in 2012 with the main goal of reducing breast cancer associated mortality through early detection. One of the SNBCSP strategies is to screen asymptomatic women at average risk (aged 40 to 69 years) and those at increased risk to BC using mammography[10]. Women eligible for screening are referred from Primary Health Care Centers (PHCC) to hospitals where mammography is performed. Women for whom the findings of the screening mammography examination are interpreted as positive are referred for further assessment on recall. Due to the lack of a system that identifies all eligible women at the community level and invites them to screening, the programme follows an opportunistic approach based on referring eligible women seeking care from PHCCs.

Assessing the performance of BC screening programmes is essential to detect and remedy weaknesses, improve the quality of screening services, optimize resources use and ultimately reduce BC associated mortality[7,11,12]. Performance indicators used for monitoring BC screening programmes include coverage rate, participation rate, and recall rate[11,12].

Coverage rate is an important indicator for the evaluation of the effectiveness of the screening programme[13]. Coverage rate is defined as the degree to which the eligible population within a specific period of time

is covered by the screening programme [12-14]. There are two types of coverage rate indicators; coverage rate by invitation, which is the percent of eligible women invited for screening, and coverage rate by examination, which is the percent of eligible women actually screened[12,14].

A performance indicator that is related to the coverage rate is the participation rate. This is also an indicator of the effectiveness of the BC screening programme, and is defined as the proportion of women who undergo mammography screening out of the invited/referred women [11,12,14].

Coverage and Participation rates depend on the degree of availability and accessibility to the health facilities providing BC screening services and the characteristics of the eligible population[13]

Another important performance indicator for BC screening programmes is the recall rate, which refers to the proportion of women asked to attend for further investigation out of all the women who had a mammography screening test. These women are recommended to attend to investigate an abnormal screening examination finding[14]. The recall rate is an important indicator of the quality and efficiency of the BC screening services[9].

Previous studies assessing the performance of breast cancer screening campaigns in different regions of Saudi Arabia reported modest coverage rates ranging from 15% in Dammam to 52% in Jeddah. The recall rate reported by previous studies was better, ranging from 7.9% in the Eastern Region[15] to 10.9% in Riyadh[2]. However, these were mainly pilot projects of limited scale; prior to establishing the National organized BC screening programme by the Ministry of Health. To our knowledge, no studies have been conducted to assess the performance of this current organized BC screening programme in the context of Riyadh Peripheral Provinces (RPP). Regular assessment of this programme is vital to monitor its implementation and evaluate the continuous efforts to improve its performance. The aim of this study was to assess the coverage rate, participation rate, and recall rate of the BC Screening Programme in RPPs.

Materials and Methods

Study setting and population

Riyadh Region constitutes the central Riyadh Province, surrounded by 30 peripheral provinces. The Ministry of Health is almost the sole provider of health services in RPPs, providing care through government hospitals and a network of 313 PHCCs. Other health care providers in RPPs include other governmental sectors, such as the Ministry of National Guard, and the private sector. The services of the Nation-

al Breast Cancer Screening Programme are currently provided in eleven of these RPPs, in the radiology departments of twelve general hospitals.

We conducted this retrospective study in the eleven RPPs where BC screening services are currently provided. To assess the coverage rates, the study population was women at average risk to breast cancer and eligible for breast cancer screening, residing in the catchment areas of the eleven RPPs (1,799 women). To assess the participation rate, the study population consisted of records of women at average risk to breast cancer who were referred for screening mammography (2600 women). To assess the recall rate, the study population was women at average risk and women at increased risk to breast cancer who underwent mammography screening (1884 women) at the designated BC screening centers in RPPS. The study included the records of all types of study populations from October 2020 to June 2021.

Study variables and outcomes

The study utilized secondary data stored in two electronic databases: Database (1): The eligible referred women database, which included data collected from women at average risk to BC invited and referred to undergo mammography screening (e.g. province, health center name, participant age). These data were collected by the primary health care center staff at the time of the referral. Database (2): The screened women database, which included data collected from women at average risk and increased risk to BC who underwent mammography screening (e.g. province, participant age, result of the mammography screening). These data were collected by the hospital staff where the screening was performed. We matched women from database (1) with women from database (2) to identify which women in database (1) had complied with the referral recommendations and underwent screening mammography. Women in database (1) who had results of mammography screening recorded for them in database (2) were considered to have complied, and women who had no recoded results were considered to have not complied. Outcomes of the study were the Mammography Screening Coverage rate by invitation, the Mammography Screening Coverage rate by examination, the Mammography Screening Participation rate, and the Mammography Screening Recall rate.

Data analysis

The data were analyzed using the Statistical Package for Social Sciences (SPSS) version 21. The coverage rate by invitation was calculated by dividing the number of women at average risk to BC referred for

screening by the total number of women at average risk to BC and eligible for screening. The coverage rate by examination was calculated by dividing the number of women at average risk to BC who underwent screening by the total number of women at average risk to BC and eligible for screening. The participation rate was calculated by dividing the number of women at average risk to BC who underwent screening by the total number of women at average risk to BC referred for a screening. Finally, the recall rate was calculated by dividing the number of women at average risk or increased risk to BC who had mammography results interpreted as suspected by the number of women at average risk or increased risk to BC who underwent screening. The study protocol was approved by the Central Institutional Review Board of the Ministry of Health (IRB log No:21-86 M).

Results

In the period from October 2020 to June 2021, 2234 eligible women were referred for mammography screening. As shown in table (1), the highest proportion of the referred women was in the age group 40 to 49 years old (45.2 %), while women in the age group 70 and above constituted the lowest proportion (1.6%). Table (1) also shows that in the same period 1637 women at average risk and increased risk to BC underwent screening mammography. Almost half of these screened women were in the age group 40 to 49 years old, while women in the age group 70 and above were the least screened groups (1.1%).

Table (1) Age distribution of women at average risk to breast cancer referred to screening mammography and women at average and increased risk to breast cancer undergoing screening mammography, Riyadh Peripheral Provinces 2020-21.

	Frequency	Percent
Age distribution of Referred women		
40 - 49	1010	45.2
50 - 59	902	40.4
60 - 69	287	12.8
70 - 74	35	1.6
Total	2234	
Age distribution of Screened women		
less than 40	59	3.6
40 - 49	808	49.4
50 - 69	752	45.9
70 and above	18	1.1
Total	1637	100.0

Coverage by invitation

The proportion of women at average risk referred to perform screening mammography was only 5.2% of all women at average to BC and eligible for screening in the catchment area of the 11 provinces. The invitation coverage rate was highest among women in the age group 50-59 years (32.7%), while women in the age group 70 years and above were the least invited group, with only 8.6% of them referred for screening (table2).

Table (2) Breast cancer screening coverage by investigation and by examination among women at average risk to breast cancer, Riyadh peripheral provinces 2020-21.

	Population (study period)	Women invited	Invitation coverage %	Women screened	Examination coverage %
All	42674	2234	5.2 %	477	1.1%
By age group					
40 – 49 years	5983	1010	16.9%	207	3.5%
50 – 59 years	2759	902	32.7%	194	7.0%
60 – 69 years	1441	287	19.9%	72	5.0%
≥ 70 years	405	35	8.6%	4	1.0%

Coverage by examination:

The proportion of women at average risk to BC who underwent screening mammography was only 1.1% of all the women at average risk to BC and eligible for screening in the catchment area of the 11 provinces. Coverage by examination was highest among women in the age group 50-59 years (7%). Only 1% of women in the age group 70 years and above were screened (table 2).

Participation rate:

Table (3) shows that around one fifth of the women who had been referred for screening had actually complied with the invitation and underwent the screening. Women in the age group 50 to 69 years old had the highest compliance, where 22.4% of them underwent the screening mammography. Women in the age group 70 and above had the least compliance, with a participation rate of only 11.4%.

Table (3). Breast cancer screening Participation rate among women at average risk to breast cancer, Riyadh peripheral provinces 2020-21.

	Women invited	Women screened	Participation rate %
All	2234	477	21.4%
By age group			
45 – 49 years	1010	207	20.5
50 – 69 years	1189	266	22.4
≥ 70 years	35	4	11.4

Recall rate:

Table (4) shows that 10.1% of the women who underwent mammography screening were recalled for further assessment based on the interpretation of their mammography screening results. The highest recall rate was among the women in the age group less than 40 years old (18.6%) and the least was among the age group 40 to 49 years (9.3%).

Table (4). Screening mammography Recall Rate among women at average risk and increased risk to breast cancer undergoing screening mammography, Riyadh peripheral provinces 2020-21.

	Women screened	Screening test positive	Recall rate %
All	1637	165	10.1%
By age group			
< 40 years	59	11	18.6
40 – 49 years	808	75	9.3
50 – 69 years	752	76	10.1
≥ 70 years	18	3	16.7

Discussion

Our study aimed to assess the coverage rates, participation rate, and recall rate of the BC screening programme at RPPs. Our results showed that the coverage rates (by investigation and by examination) were low. In the RPP, only 5.2% of the women at average risk to BC had been referred to perform BC screening by mammography, while only 1.1% of the target population actually underwent the mammography screening.

Due to the COVID 19 epidemic during the study period, the SNBCSP set a coverage target of only 5.3% of the eligible population to be screened. Based on the targets set by the SNBCSP, our results demonstrate that the invitation coverage rate was achieved. However, the examination coverage rate was well below the target set by the programme. The coverage rate from our study is lower than that reported from Al Qaseem region, where 17.9% of the target population was covered during a pilot BC screening project[16]. Our rate was also low when compared to coverage rates from other countries. In the European Union countries, the average invitation coverage was 78.9%, ranging from 21% to 100%, and the average examination coverage was 49.2%, ranging from 17% to 84%[17].

The success of the BC screening programmes in lowering BC mortality depends on the degree to which the target population is covered[18,19]. The coverage rates in turn depend – partly- on the cancer screening programme implementation status. Population-based BC screening progammes implement a systemic approach to identify the eligible women in the programme area. These women are then personally invited to attend for screening, thus leading to universal coverage of the eligible women[19,20]. Such programmes need to be highly organized in the sense that the targeted population, the screening test, the screening interval, and the programme policy and protocols are clearly stated to assure the reliability and effectiveness of the invitational activities[17,21]. Such population-based, organized programmes are associated with high coverage rates.

On the other hand, BC screening programme implementation could follow an opportunistic approach, where the invitations for screening are initiated during encounters between women and health care providers in health facilities. Opportunistic screening is a passive kind of screening, and it excludes those who do not have regular contact with health facilities. Therefore, unlike population-based screening, it is associated with a lower rate of screening among the general population[22,23].

In RPP, the BC screening programme is an organized programme, with nationally set guidelines that define the eligible women, the screening procedures, the frequency of screening, and follow-up and management of screen-detected abnormalities[10]. However, it differs from Al Qaseem pilot project and the European programmes in that it follows an opportunistic approach for identifying and referring eligible women for screening, an approach that is associated with low population coverage as mentioned above[23]. Within the European Union, the countries that did not apply population-based BC screening programmes had low invitation and examination coverage rates[18,20,21,24].

Nevertheless, the fact that the Saudi BC screening programme is an organized one, provides an opportunity for increasing the coverage despite the opportunistic approach of invitation, because organized systems set the ground for educating the healthcare providers, reminding them, and compelling them to comply with the screening recommendations[23]. This could be improved through interventions such as provider's assessment and feedback, which has been found to increase screening for breast cancer[25]. Efforts to encourage eligible women to self-refer themselves using strategies such as group education, and one-on-one education, could further improve the situation[25].

Our results showed a relatively better participation rate in RPP, where around one-fifth of the women referred for mammography screening had, in reality, undergone screening. Our rate was within the range of participation rates reported from the European countries (6.2% to 83.5%)[19]. However, it was well below the participation rate reported from the BC screening pilot project in Jeddah region, where 52% of the invited women took the screening test[26].

Besides the organization of a BC screening programme, the participation rate relies on the affordability and accessibility to the health services[22,23]. As with other organized BC screening programmes[23], the SN-BCSP services are publicly funded and are provided to eligible women free of charge, thus removing the financial barrier. However, the geographical accessibility to BC

screening centers in RPP may constitute a deterrent to utilizing these screening services. In other countries, poor accessibility to health care (longer distance and lack of transportation) decreased the probability of screening, especially in rural areas[18,23,27]. In RPP, the mammography screening sites are located in provincial hospitals in the main cities of the provinces, making it difficult for women from remote villages to access them, especially in the absence of a public transport system. Restrictions in traveling alone and lack of public transport were mentioned as factors hindering the ability of women to attend for BC screening in the Eastern Region of Saudi Arabia[15]. In Jeddah where a high participation rate was observed, mammography screening was provided within the primary health care centers, which were more accessible than hospitals[26].

Mobile screening units can be implemented in settings where geographical accessibility is considered an obstacle to attend for BC screening. Such units are specifically beneficial in areas of low population density, such as the situation in RPP. This can reduce the travel time associated with long distances and improve acceptance and compliance with the referral recommendations[18,23]. Mobile clinics for BC screening have been implemented previously in RPP; however, studies are needed to assess their effect on the uptake of BC screening in this setting.

Examination coverage and participation rates are also affected by individual-level barriers, such as cancer awareness, attitudes and beliefs, anxiety and negative expectations of screening, procedural barriers, socio-demographic and economic characteristics, lifestyle factors and distrust of the medical system[18,19,23,24,27]. These factors should be thoroughly investigated to identify their possible effects before interventions are designed to improve the situation.

In mammography screening, the recall rate is the frequency with which the results of a screening mammography examination are interpreted as positive, thus recalling women for additional investigations to reach a diagnosis[28,29]. Our study revealed a recall rate of 10.1%. This rate was slightly less than the recall rate reported in Riyadh in 2013 (10.9%)[2], but it was higher than the recall rate reported by the Eastern Region BC screening programme (7.9%)[15]. Our recall rate complied with the standard level set by the SNBCSP of a recall rate of not more than 10%[10].

Globally, different regions set different targets for the recall rate. The American College of Radiology recommends a level of 10% and a range of 5–12% to maximize sensitivity and specificity[29,30]. Nonetheless,

the recall rate reported by the USA was 15.1%[31].

The European standard for the acceptable level of recall rate is lower (<5 %), and the average level reported by these countries was 5.2%. However, the range was wide, with some countries reporting a recall rate as low as 1.6 % and others reporting higher rates (11.8%)[17].

Recall rate is commonly used as a performance measure in mammography practice and is considered one of the main quality indicators that assess a radiologist's performance[28,29].

A too low recall rate may be associated with increased false-negative results and low sensitivity. On the other hand, a too high recall rate may result in lower specificity and high false-positive results, high medical associated expenditure due to unnecessary investigations, patient anxiety, and may also lead to overtreatment[23,28,29,32,33]. As with other countries, the recall rate reported in our study was higher among younger age groups[9,17,29]. Younger age is associated with higher breast density, which impacts the mammography image and leads to a higher recall rate[9,29]. Our recall rate was highest among the age group <40 years, and these are mainly women at increased risk to breast cancer and expected to have high recall rates[28]. Our results also indicated a high recall rate among older women. These high recall rates should be further investigated to identify the positive predictive values, which is the proportion of the true cancer cases identified by the screening test[34]. This will give an indication of the accuracy of the screening mammography performed at RPPs. Also, a comparison of the radiological features that led to recall with the final diagnosis may identify the radiological features that necessitate further investigations and inform the radiologist's decision regarding the interpretation of the mammography images[35]. Furthermore, identifying factors that lead to the high recall rates, such as those related to the patient population, the radiologist, and the health system, is vital to designing appropriate remedial interventions in RPPs. These recall reduction measures are essential since evidence has shown that when the recall rate exceeds 12%, there is an increase in the false-positive results with little to no gain in the detection rate of BC [29].

The strength of this study is that we ascertained the performance of screening mammography through a review of patient records rather than depending on reports by the patients. However, the use of secondary data has limited our ability to include patient and health system-related data, which could have enabled us to compare the different subgroups of the population.

Also, we had access only to data relevant to the peripheral provinces of Riyadh region, which limited the generalizability of the results to the other regions of the country.

Conclusions

We detected a low coverage and participation rate in BC screening in RPP. This was most probably due to the opportunistic approach followed in inviting the target population, in addition to the geographical accessibility problem of the mammography testing sites. More efforts to increase the demand by the target population, improve the delivery of the screening services by the healthcare providers, and improve accessibility through mobile BC screening units are needed. The recall rate aligned with the acceptable level set by the SN-BCSP, but efforts are needed to reduce the recall rate.

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