Overview in Breast Cancer Screening in Lebanon

Eman Sbaity[1], Rachelle Bejjany[2], Malek Kreidieh[2], Sally Temraz[2], and Ali Shamseddine[2] ⬤

Abstract

Breast cancer (BC) is the most common cancer in women and men combined, and it is the second cause of cancer deaths in women after lung cancer. In Lebanon, the same epidemiological profile applies where BC is the leading cancer among Lebanese females, representing 38.2% of all cancer cases. As per the Center for Disease Control, there was a decline in BC mortality rate from 2003 to 2012 reflecting the adoption of national mammographic screening as the gold standard for BC detection by Western countries. The aim of this review study is to summarize current recommendations for BC screening and the available modalities for detecting BC in different countries, particularly in Lebanon. It also aims at exploring the impact of screening campaigns on BC early stage diagnosis in Lebanon. Despite the considerable debates whether screening mammograms provides more harm than benefits, screening awareness should be stressed since its benefits far outweigh its risks. In fact, the majority of BC mortality cases in Western countries are non-preventable by the use of screening mammograms alone. As such, Lebanon adopted a public focus on education and awareness campaigns encouraging early BC screening. Several studies showed the impact of early detection that is reflected by an increase in early stage disease and a decrease in more aggressive stages. Further studies should shed the light on the effect of awareness campaigns on early breast cancer diagnosis and clinical down staging at a national scope; therefore, having readily available data on pre- and post-adoption of screening campaigns is crucial for analyzing trends in mortality of breast cancer origin and reduction in advanced stages diseases. There is still room for future studies evaluating post-campaigns knowledge, attitudes, and practices of women having participated, emphasizing on the barriers refraining Lebanese women to contribute in BC screening campaigns.

Keywords

breast cancer, breast neoplasm, screening, early detection, prevention and control, epidemiology, Lebanon

Introduction

Breast cancer (BC) is the most common cancer in women and men combined, and it is the second leading cause of cancer deaths in women after lung cancer.[1,2] Between 2005 and 2015, BC rates in Lebanon accounted for around 20%. Data from GLOBOCAN 2018, showed that 18.6% of cancer cases are from breast origin with a mortality rate of 10.2%.[3] According to the Center for Disease Control statistics, there has been a decline in BC mortality rates by 1.9% per year from 2003 through 2012. This decline directly reflects the adoption of national mammographic screening as the gold standard for BC detection by Western countries.[4] Since this approach may be very demanding in terms of human and financial resources, it may not be the most cost-effective approach in low- and middle-income countries in which BC incidence has rapidly risen in the past few years.[5] Many alternatives to mammographic screening exist, some of which would benefit women in low- and middle-income countries. This review study summarizes current recommendations for BC screening along with the available modalities for detecting BC in different countries and particularly in Lebanon. It aims at exploring the impact of screening campaigns on BC early stage diagnosis in Lebanon.

[1]Division of General Surgery, Department of Surgery, American University of Beirut Medical Center, Beirut, Lebanon
[2]Division of Hematology and Oncology, Department of Internal Medicine, American University of Beirut Medical Center, Beirut, Lebanon
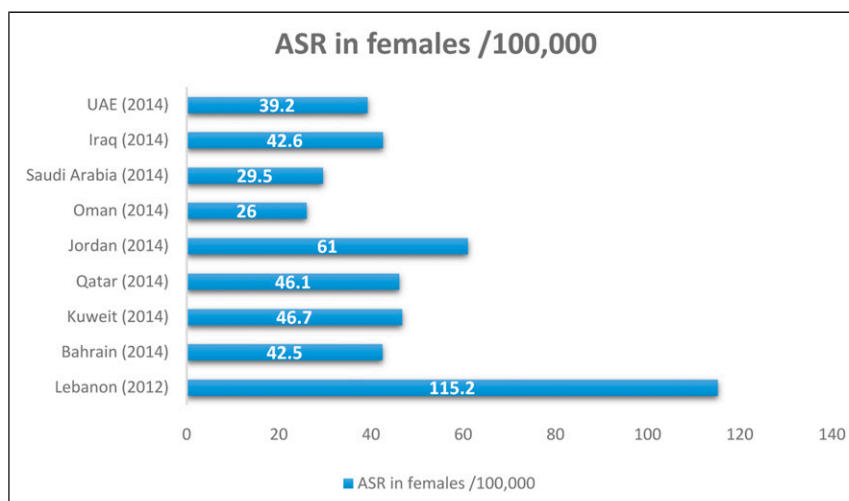
Corresponding Author:
Ali Shamseddine, American University of Beirut Medical Center, Naef K. Basile Cancer Institute, Riad El-Solh, Beirut 11-0236, Lebanon.
Email: as04@aub.edu.lb

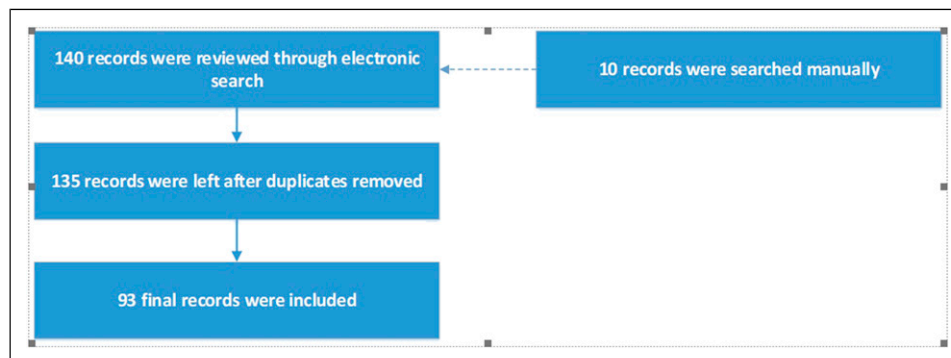**Figure 1.** Breast Cancer ASR in Lebanon in 2012 compared with neighboring countries.[6]

Figure 2. Flowchart of articles selection process.

The variations of breast cancer incidence for regional countries in 2012 are summarized in Figure 1. For comparability purposes, we compared ASR captured by the National Cancer Registry in Lebanon in 2012 with ASR of other regional countries showing that Lebanon had the highest ASR amongst the region.

The aim of breast cancer screening is to spot the disease at its earliest stages in asymptomatic patients, which in return might reduce mortality rates. Screening tools entail mammography, digital mammography and digital breast tomosynthesis, breast ultrasound, magnetic resonance imaging, self-breast exam and clinic breast exam. The debatable harm–benefit ratio for early breast cancer screening have led to the differences between the existing guidelines. Each recommendation group has reviewed the relative harms and benefits and came upon with his own guidelines (detailed throughout the article).

Materials and Methods

We searched Ovid MEDLINE and PubMed for English-language articles discussing breast cancer screening with a focus on the epidemiology studies that were done in Lebanon. We retrieved relevant articles by using the keywords breast cancer, breast neoplasm, screening, early detection, prevention and control, epidemiology and Lebanon as keywords. We also searched bibliographies manually. After reviewing 140 articles, 93 were agreed upon to answer our research question during a 4-month period.(Figure 2)

Results and Discussion

Background of Breast Cancer in Lebanon

BC is the most commonly diagnosed cancer among women in Western countries and in the member countries of the Middle East Cancer Consortium that include Cyprus, Egypt, Jordan, and Israel.[1,7] This epidemiological profile also applies to Lebanon.[8,9] Based on data extracted from the Lebanese National Cancer Registry for the year 2004, BC was the leading cancer among Lebanese females, representing 38.2% of all cancer cases.[10] It was projected to remain the most common reported cancer site in 2018 in a study based on published data from the Lebanese National Cancer Registry database

(2003–2008). The high incidence rates of BC among Lebanese females compared to other Arab populations may, in part, be attributed to better awareness of BC and to the wide implementation of screening programs in Lebanon.[10] The Lebanese Ministry of Public Health has been launching annual awareness campaigns for BC screening since 2002. These consist of calling for and facilitating access to mammography tests to women aged 40 years and above at reduced fees within non-governmental organizations (NGOs) and primary health care centers in Lebanon.[11] Advanced disease remains very common in Egypt, Tunisia, Saudi Arabia, Syria, Palestinians, and Israeli Arabs mainly due to the lack of awareness campaigns and to the rare practice of population screening.[11-15]

Age at Diagnosis

In Lebanon, the age group ranging from 25 to 54 accounts for almost half of the population (male 1,296,250/female 1,257,273); the median age for females is 34.4 years.[16]

The Lebanese cancer registry captures all newly diagnosed cancer cases in Lebanon since 2004. The data is cleaned for duplicate and is accessible on the ministry of public health webpage free of charge. The peak incidence of BC occurs at younger ages in the Middle East compared to Western countries.[11-14] Data from 1998 reveals that the age pattern at diagnosis of female BC in Lebanon is typical of that in low-risk countries such as Mexico, with an increase in the rates up to the fifth decade and a decrease thereafter.[9] Based on Lebanese reports, around 40% and 43% of female BC cases were diagnosed before the age of 50 in 2004 and 1998, respectively.[10]

Median age at diagnosis in Lebanon was 52 and 52.5 years in 1998 and 2004, respectively, compared with an almost similar median age in Mexico (1993–1996), Jordan (2005), and Palestine.[12] It is reported to be even lower in other Arab populations such as Saudi Arabia (47.0 in 2004), Kuwait (45.0 in 1993–1998), and Egypt (46.0 in 2001), and to be higher in developed countries.[12-14] In addition to relatively younger median ages at diagnosis, BC in Lebanese women features also some of the highest age-specific incidence rates worldwide for the age group 35–39 (with the exception of Israeli Jews), 40–44, and 45–49 years.[10] This confirms the Ministry of Public Health recommendations to start BC screening mammography starting the age of 40 in Lebanon.

Different Breast Cancer Screening Tools

Mammography. Ever-since its emergence in the early 20th century, mammography has evolved from film-screen mammography, to digital mammography (DM), and to tomosynthesis. Although mammograms have progressed over time, their basic objectives remained the same, namely to detect densities, calcifications, or asymmetry.[17] It was until the late 1960s that they became valuable screening and diagnostic tools for BC.[18] The American College of Radiology (ACR)

has developed the BI-RADS, a classification system for breast reporting, in order to standardize mammography. It includes four breast composition categories: (1) almost entirely fatty, (2) scattered areas of fibro-glandular densities, (3) heterogeneously dense, and (4) extremely dense) and six categories 0–6 reflecting the assessments of the X-ray interpretation: 0) incomplete, (1) negative, (2) benign, (3) probably benign, (4) suspicious, (5) highly suggestive of malignancy, and (6) known biopsy-proven malignancy (Table 1).[19]

The main limitation of conventional two-dimensional film-screen mammography is its limited overall sensitivity of 70% that decreases with the increase in breast tissue density.[20] This is mainly secondary to normal breast tissue creating some "structural noise" and obscuring a cancer.[17] Not only does this result in an increase in false-positive readings but also it results in 76% of BC cases being missed by radiologists.[21] The novel digital breast tomosynthesis (DBT) addresses these sensitivity issues and overcomes them by displaying three-dimensional views.[17]

Digital Mammography and Digital Breast Tomosynthesis. DM differs from the conventional mammography in that the X-ray film is replaced by electronics that enable taking better pictures with a lower radiation dose.[22-24] Although DM has improved BC detection rates in women with dense breast tissue compared to standard film-screen mammography, DBT seems to have higher cancer detection and lower false-positive rates.[22-25] It was first approved for use by the Food and Drug Administration (FDA) in US community practice in 2011.[25] It requires that X-ray images are taken at different angles of the breast resulting in a three-dimensional (3D) image. This overcomes the inherent limitations associated with two-dimensional (2D) imaging by enabling the characterization of structures lying in the shadows of breast densities.[17] This suggests that DBT might be of particular help in women with dense breast tissue.[23,24] One study on 2,673 higher-risk women revealed that the use of DBT in high-risk women increased the cancer detection rate from 5.1 to 8.6 per 1000 screenings when compared to its use in average-risk women.[26]

The efficacy of DBT has been evaluated by several studies. In one European prospective clinical trial by Skaane et al 12,621 women were screened with either the combination of DM and DBT or DM alone. Results revealed that invasive cancer detection improved by 40% in the combination group with a 15% reduction in the false-positive rate. Although the dose used in the combination group was 3.53 Gy, which is higher than that used in mammography alone (1.58 Gy), it is still below the limits of acceptable risk as approved by the US FDA.[27] In another European prospective comparative trial, 7,292 women were screened in two sequential phases, conventional 2D mammography alone and integrated 2D and three-dimensional mammography. Results revealed that cancer detection rates increased from 5.3 to 8.1 cancers per 1000 screens when DBT was added to 2D screening compared to when 2D screening was used alone.[28] Promising results on

Table 1. Description of Breast Imaging Reporting And Data System (BI-RADS)[41].

Category	Description	BC risk	Management
0	Incomplete	Additional testing needed	Recall
			Additional imaging evaluation
			Prior mammograms for comparison
I	Negative	Minimal	Routine mammography
2	Benign	Minimal	Routine mammography
3	Probably benign	0–2%	Short screening interval (6 months) follow-up
			Continued surveillance mammography
4	Suspicious	2–95%	Tissue diagnosis
4A	Low	2–10%	
4B	Moderate	10–50%	
4C	High	50–95%	
5	High suspicion	≥95%	Tissue diagnosis
6	Histologically confirmed cancer	Confirmed cancer	Surgical excision when clinically appropriate

the use of DBT in the clinical setting have been also obtained from an observational study in the United States conducted by Rose et al. Results revealed a 53% improvement in the invasive cancer detection rate that increased from 2.8 to 4.3 per 1000 screenings with a *p*-value of .07 and an 11% drop in biopsy rates from 15.2 to 13.5 per 1000 with a *p*-value of .59.[29]

Breast Ultrasound. Breast ultrasound (BU) has been introduced in the late 1970s, and it has been used as a BC screening and diagnostic tool starting the late 1980s and early 2000s in Europe and the US, respectively.[30] It enables the characterization of cystic vs solid and simple vs complex lesions with smooth or irregular margins. It is particularly more useful than DM in locating small, non-palpable lesions in women with dense breast tissue.[31] In the SomoInsight study, it has also been shown to be a useful adjunctive modality in breast cancer screening by detecting more cancers in conjunction with mammography as opposed to mammography alone.[32] No studies show that BUs improve detection over MRIs. A study by Berg et al showed that many cancers that were missed with BU were found on MRI. Less than 10% of biopsies taken after BU revealed cancer compared to around 30% revealing cancer following MRI. Also, many studies suggest that false-positives are higher for BU. However, the role of BU is fundamental in the interventional diagnostic procedures such as biopsy or fine needle aspirate in which BU guides the needle toward the targeted lesion.[33] There is also a role for BU in the investigation of clinical and imaging palpable lesions which is crucial for the early detection of BC. Despite it being relatively inexpensive, readily available, and non-invasive, the universal implementation of screening BU remains limited due to the shortage of and lack of uniformity among personnel.[34]

Magnetic Resonance Imaging. The use of MRI in BC diagnosis was first reported in 1986.[35] It has been shown to have higher sensitivity and better detection rates than either mammography or ultrasound in high-risk women.[36] In a study by Berg[37]

et al, 9 of 20 women whose BC was not detected on either ultrasound or mammography over three consecutive annual screenings had their cancer detected by MRI. While mammography relies on the density of breast tissue in its generated images, breast MRI with a contrast medium helps detect tumor neovascularity and surrounding inflammation which correlate with proliferation and metastatic potential and explain its higher sensitivity. Its high true positive rates and sensitivity which approaches 100% with invasive BC make it an important supplement to mammography.[38]

Current recommendations support MRI surveillance for women diagnosed with BC before age 50–65.[39-41] They also support the use of MRI in women who have a calculated risk of 20% or more, women who are BRCA mutation carriers and their untested first-degree relatives, and women who were exposed to chest radiotherapy prior to age 30.[42-44] In one study on women with a lifetime risk for BC of 20% or higher and BRCA mutation carriers, MRI was shown to have a sensitivity for BC detection of 90% compared to 37.5% for ultrasound and 37.5% for mammography.[45] Results of another study on BRCA mutation carriers showed an MRI sensitivity of 68%, compared to 32% and 37% for ultrasound and mammography, respectively.[46] Since additional mammography only adds 2% to the BC detection rate in BRCA1 mutation carriers below age 40, and since this modality has the potential to cause radiation-induced BC in this population, the current recommendations support annual MRI screening of BRCA1 carriers starting the age of 25 years followed by the addition of mammographic screening starting the age of 40 years.[46-49]

Self-Breast Exam. SBE was recommended for the detection of breast cancer for the last few decades. Programs for self-examination were first implemented in 1950 in Europe and North America,[50] whereby women are trained to perform it once per month from the 7th until the 10th day of the menstrual cycle for any abnormality detection.[51] This is a painless easy-to-apply individual self-exam in which women self-examine

and look for any breast abnormality, discharge, edema, etc.[52] Considering self-breast exam (SBE) as a tool of early breast cancer screening is still controversial. An association was found between frequent SBE and favorable clinical and pathological breast cancer staging upon diagnosis with fewer lymph nodes metastasis.[53] Another association was also found between SBE and survival: the more frequent SBE are performed, the earlier cancer is detected with less delay from symptoms appearance until histologic diagnosis. Survival rates are more in favor for women having performed SBE than those who have not.[54] In contrast, several studies had failed to determine any benefits of routine SBE. In fact, more unneeded biopsies were performed and more lesions that are benign were discovered. Women ought to be aware that SBE does not replace mammography nor clinical medical examination. Despite the fact that some do not highly recommend SBE, however, others consider it as a tool to empower women and a good opportunity to educate them about their general breast health.[55] In settings of third world countries, SBE still has a role to emphasize breast disease awareness and should be still recommended.

Clinic Breast Exam. Clinic breast exam (CBE) is an in-office exam performed by a health care professional who is trained to recognize breast abnormalities and warning signs. He checks the entire breast and underarm area and looks for differences in breasts size and shape; assesses the skin for any rash, abnormalities or dimpling and the nipple for any discharge or abnormality.[56] The indication of CBE in a screening context is still controversial. From one side, there was no difference in 13-and 25-year survival of women having a screening CBE performed alongside with mammography compared to those having only a mammography performed. On the other side, it is a well-known fact that not all cancer are detected by screening mammography that is in addition, not recommended for women of all ages. Not only CBE is a very low cost test, but it could also prompt ultrasound in negative mammography results.[57] Higher numbers of early stage BC were diagnosed when CBE is performed along an increase in the numbers of life years gained compared to the control group where no screening modalities were done.[58] Therefore, the recommendations of including CBE as an adjunctive screening modality differ from major societies.

Its use is lessening not only as screening modality but also as diagnostic tool. In low-resource settings in which imaging modalities have very limited availability, CBE might have a greater screening role and would be considered as an appropriate screening approach.[59]

Current Screening Guidelines in Lebanon

In Lebanon, the below evidence-based screening guidelines for BC have been proposed and adopted. According to the Lebanese guidelines, all women with negative personal or family history of BC should receive annual mammography screening starting the age of 40 years as long as they are in good health.[60,61] In women with positive personal or family history of BC, annual screening should begin 10 years prior to the age of onset of the first case in the family. CBE is recommended in conjunction with mammography every three years between the age of 20 and 40 years, and yearly afterward. Although BSE does not replace mammography as an effective tool for early detection, it is usually recommended 7–10 days after the beginning of menstruation. As for BU, it is not recommended in the screening of asymptomatic women but is indicated in the workup of abnormal mammograms and can complement mammography in case of dense breasts. Screening tools are available in both public and private health care sectors of rural and urban areas. During breast cancer awareness month, mammography is offered free of charge in public sectors, while echography (if needed) has been set at affordable rates. As for the private sector, the cost is indeed higher and varies depending to the center, yet, it was fixed at a very affordable rate during the BC awareness month.[62]

Screening guidelines for BC have been proposed and instituted by five primary medical organizations in the United States in 2015 and 2016. They differ mainly in terms of weighing benefits of younger age of screening and harms of exposure to unnecessary radiation, false-positive results, and over-diagnosis. As such, the National Comprehensive Cancer Network (NCCN) recommends clinical encounters and annual imaging (mammography and ultrasound) for women as of 40 years[63]; the American Academy of Family Physicians (AAFP) and the US preventive services Task Force (USPSTF) recommend a biennial screening mammography between the age of 50 and 74[64,65]; the American College of Obstetricians and Gynecologists (ACOG) recommends annual mammography as of the age of 40 in addition to the clinical breast examination[66]; the American College of Radiology (ACR) also recommends annual mammography as of the age of 40 and endorses woman with higher-than-average risk to develop BC to do more intensive screening[67]; the American Cancer Society (ACS) guidelines aim at maximizing reductions in BC mortality while minimizing associated harms among women in the United States and recommend earlier annual screening mammography in women between the ages of 40 and 45 years and continue on an annual basis until the age of 54 years.[68] Please refer to Figure 3 for more details.

Besides the aforementioned screening tools that are implemented by the MOPH, the Lebanese Breast Cancer Foundation established free-of-charge awareness campaigns since 2011. It entails sessions, workshops, educational events, and many other awareness activities. The audiences targeted are of several age groups, focusing on the young generations to promote early BC detection.[60]

Defining the age for initiating screening has been controversial given the concerns citing the risk of outweighing overtreatment over treatment benefits in some age groups.[69] Figure 3 shows the screening recommendations age-stratified as defined by several organizations. It entails screening for average-risk women who do not have a known underlying
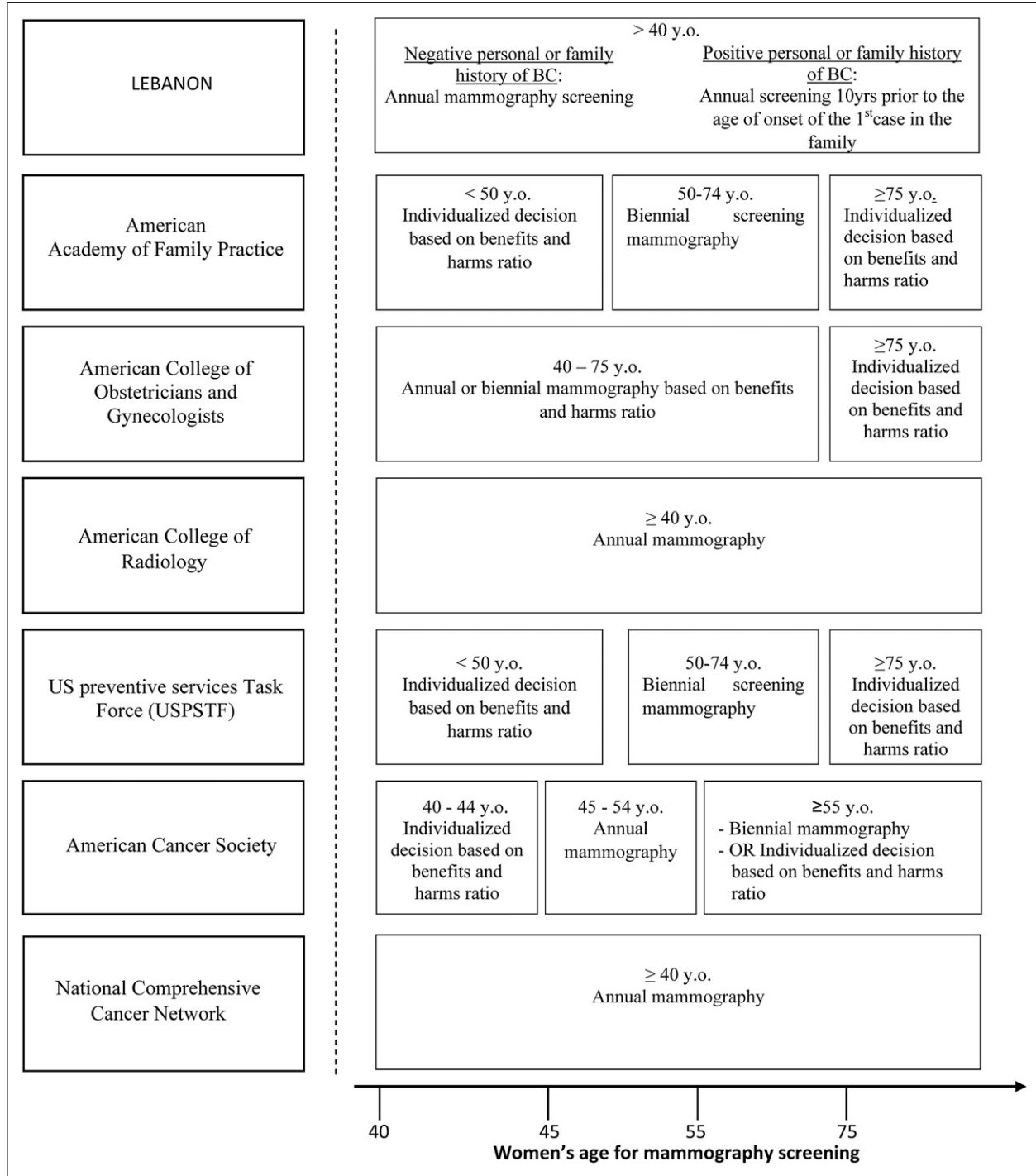
Figure 3. Age-stratified breast cancer screening guidelines for average-risk women.

genetic mutation or a pre-existing breast lesion or positive family history of cancer.

Benefits and Harms of Early Screening

Benefits of Early Screening. The rationale behind developing early screening is to advance the time of breast cancer diagnosis. Consequently, early intervention is provided leading to a better disease prognosis. Reduction in mortality rate, being the most appropriate measure of screening benefits, accounts for 20% in screened women when compared to non-screened women, corresponding to about 1300 deaths from breast cancer being prevented each year as per Marmot et al in a study published in England. This is the result of the meta-analysis of

11 randomized controlled trials (RCTs) of breast screening with 13-year follow-ups.[70] When analyzing the costs and benefits in terms of quality adjusted life years (QALYs), it is suggested that early screening would decrease the death from breast cancer by around one-third with few harms and at low cost.[71] Due to the low screening rate in the Northern Plains, breast cancer in American Indian women tend to be diagnosed at later stages and thus to be related to higher mortality rates.[72] Early screening is associated with less extensive treatment, and therefore, reduces extensive treatment modalities in breast cancer that is of substantial benefits.[35] Results of a study conducted on women from the Netherlands Cancer Registry showed that incidence of advanced cancer was higher in non-screened patients compared with screen-related group. These latter support the statement that early screening scores a down staging upon diagnosis and thus deems valuable to decrease disease burden on women.[73] Cultural and linguistically related-factors play an important factor in influencing the women's decision for participating in breast cancer screening programs. These factors include emotional barriers driven by the concern of perceiving negative expectations; knowledge barriers related to the lack of understanding of the importance of breast cancer awareness; and financial barriers allied with the cost of screening tools.[74] From an economic perspective, screening high-risk women aged between 40 and 49 years old every 3 years is more cost-effective than non-screening.[75]

Potential Harms. Decades after establishing screening programs for breast cancer, it is noteworthy to shed the light on several harms that took place afterward. Unfortunately, in Lebanon there were no studies aiming to assess the risk-benefit ratio of early screening. In other countries, most studies on screening imaging have evaluated the beneficial reduction in mortality rate; yet, none studied the potential harm that might cause.[76] False-positive result is common in all age groups, however, it accounts at its highest in women aged between 40 and 49 years old as per tumor registries and pathology databases of several Breast Cancer Surveillance consortium in the US. It is also higher in women with positive family history of cancer than those having negative history. As such, diagnosed non-malignant lesions lead to unnecessary work-up and biopsies (in some instances, it might end up with an open surgical biopsy).[77] Another potential harm resides in getting false negative result in which women are falsely reassured when cancer exists, and thus causing delay in diagnosis. This is been reported in 1–1.5 per million in screened women from American tumor registries of different Breast Cancer Surveillance associations.[78] Over-diagnosis is another potential harm associated with early screening programs. It is a serious harm that is difficult to measure. It refers to the detection of a very early staged disease that will not progress to a life-threatening disease in the patient's lifetime. The difficulty in measurement is due to the fact that progression of disease is difficult to reliably predict prospectively. This usually leads to overtreatment; as such, a patient receives cancer therapy (chemotherapy, radiation, immunotherapy, and others) and is thus exposed to cancer treatment long-run consequences and hazardous effect.[79] Another potential harm retrieved from the study using the data of Breast Cancer Surveillance centers in the US comprises the radiation-induced cancer that is considered an extremely rare screening complication. It is estimated at 10/100,000 of women doing biennial screening and much higher in patients requiring annual screening or patients with breast implants for which more views are necessary to check all the breast tissue. Another harm also considered as rare evolves the pain that is caused during mammography and might lead to discontinuation in further screening.[78] Harmful effects also include psychological responses. Women with false-positive diagnosis experience more worries during their daily activities with reduced mental activities and depressive symptoms. It is also shown that women might experience anxiety and discomfort as a consequence of repetitive useless imaging.[80]

Screening Campaigns in Lebanon

Awareness campaigns in Lebanon were officially implemented in 2002. Since then, the Lebanese Ministry of Public Health conducts from October until December of every year screening campaigns for women above the age of 40. In 2009, the mean age of women participating in the Lebanese national awareness campaign was 49; 85% were married and less than 5% were diagnosed with an ACR between 4 and 5.[81] In 2011, a data from another study conducted in Lebanese-Armenian women showed that 80% of women have never had a mammography, and around 50% have never performed BSE.[82] Another study assessing the response rate of awareness campaigns in 5 towns from different Lebanese districts showed that only 20% of women more than 40 years old have responded to the screening campaigns.[83] In the contrast, another data showed that 50% of women from different Lebanese regions had have screening mammography, and mostly those were living in suburb Beirut and were of high socio-economic level.[3] A study on patterns and determinants of the use of screening mammograms among Lebanese women showed that 2,400 women with a mean age of 50 years were recruited of whom 20% were living in Greater Beirut. 105 Lebanese women have never heard of mammography as a breast cancer screening modality, and they were significantly more likely to be living outside Greater Beirut and to be of a lower socio-economic status or educational background. 45% of women who have ever heard of mammograms were also ever-users. Those were significantly more likely to be older, of better socio-economic status, living in the Greater Beirut area, and with a higher perceived severity or susceptibility of getting breast cancer. Amongst them, women with lowest level of use were significantly more likely to have encountered an objection from their husbands and to be less educated or never married. The mean age of first-timers was 47, which is more

than the recommended starting screening age in Lebanon. While ease of access and perceived benefits attached to mammography were significantly associated with ever-use among women living in Greater Beirut, husbands' support and higher socio-economic status were also significantly associated with ever-use among women living outside this area.[3]

Factors Affecting Compliance With Screening in Women in Lebanon

In the Lebanese population, perceived barriers in BC screening are adversely related to screening behaviors. Seriousness, confidence, and motivation in Lebanese women are positively associated to BSE practice It is noteworthy to add that the fear of getting breast cancer as well as the lack of guidance from the medical team are the key elements for BC screening noncompliance. Thus, those who aim to maintain a good health and perceived the benefits of BSE are more confident in performing it regularly. Interestingly, married and divorced women are more committed to the BC screening in particular those with a high socio-economic level and high education background.[84] A study conducted by El Asmar et al also identified significant barriers in Lebanese women, such as fear of perceiving bad news, staffs being unpleasant, time-consumption, lack of awareness, unavailability of childcare during absence, and screening cost.[85] In fact, they have limited knowledge of the signs of BC, the recommended start age for mammography and the way a BSE is performed.

They are afraid of being diagnosed with BC, losing their hair and being in pain and thus becoming a burden on their families. From a socio-economic perspective, Lebanese women worry about the expenses the screening might pose, in terms of test cost, transportation, physician's visit, etc. Those with middle or high socio-economic profile are more likely to adopt BC screening. Rural residents are more prone to undergo BC screening than urban area residents, and this is due to the difference in terms of affordability and access to health care facilities.[85] In a population with a rich history of religious diversity, it was shown that there is no difference in BC screening among different religions. Unfortunately, post-campaign studies in Lebanon were not conducted to determine knowledge, attitudes, and practices of women having sought awareness campaign and to identify the need in the non-reached geographical areas.[84]

Effect of Early Implementation

Data from the Lebanese National Cancer Registry from 2003 to 2008 showed that breast cancer has been the most-reported cancer site, with an increase in age-standardized incidence rate from 78.3 in 2003 to 95.7 cases per 100,000 in 2008. The projected incidence rate for 2018 accounted for 137 cases per 100,000 being one of the most commonly diagnosed cancer expected.[8] This rate increase might stem from the wide implementation of screening and awareness campaigns that were held since 2002.[9] This rising might also reflect the change in marriage and fertility trends in Lebanon with higher age at marriage and fewer desired children.[10] Obesity also played a role in this increasing rate; in fact, a population based study in Lebanon showed the high rate of overweight and obesity as compared to developed countries, and thus this might be a reason behind the increasing rate of breast cancer.[86] Further, the underway transition from the traditional Mediterranean diet to a more Westernized diet are likely to increase the rate.[8] Data from the Lebanese Ministry of Public Health and the database registry at the American University of Beirut Medical Center (AUBMC) showed that only 30% of breast cancer cases presented to AUBMC in 2015 were stage III-IV.[87] Data published using GLOBOCAN 2018 estimates showed that in females, breast cancer seemed to be the most commonly diagnosed cancer and leading cause of cancer death; it was estimated that in 2018, breast cancer will be diagnosed in one of four cancers.[88] A study by Saghir et al showed that among the Lebanese population, 28% of the breast cancer cases were screen-detected and 65% were staged less than stage IV.[87] Results of a study assessing BRCA1 and BRCA2 mutation in breast cancer patients in Lebanese women, showed that only 8% of the patients were diagnosed with stage IV.[89] Data from UK showed that breast cancer mortality had decreased by 19% between 2004–2006 and 2014–2016[90]; unfortunately, Lebanon lacks trends for breast cancer mortality surveillance. It was in 2017 when the hospital-based Mortality System in Lebanon first time saw the light. It showed that neoplasm-related mortality accounted for 18.4% of which 9.1% are breast cancer cases[91] which is slightly higher than the percentage of cancer-related mortality worldwide as per GLOBOCAN 2018 which accounts to 6.6%.[88] It is the first leading cancer death in females (20.3%) in Lebanon.[91] In fact, early diagnosis is highly attributable to better breast cancer survival rate. Early detection and appropriate treatment are interrelated and lead to better disease outcome. Early detection attribute to a reduction of 28% to 65% of breast cancer mortality.[92] Statistics from two of the most important university hospitals in Lebanon, AUBMC and Hotel Dieu de France showed that nowadays advanced stages are only diagnosed in one-third of the cases upon presentation.[93]

Conclusion

Despite the extensive debate whether screening mammograms provides more harm than benefits, screening awareness should be stressed since its benefits far outweigh its risks. Most BC mortality cases in Western countries, in which the best screening settings exist, are non-preventable by the use of screening mammograms alone. This provides hope for the implementation of CBE in low-to middle-income countries as it could achieve almost the same mortality reduction as mammography screening, but at a much lower cost and with much less resources.

As such, Lebanon adopted a public focus on education and awareness campaigns encouraging for early breast cancer screening. Focused studies showed the impact of early detection that is reflected by increase in early stage disease and decrease in more aggressive stages. Further studies should shed the light on the effect of awareness campaigns on early breast cancer diagnosis and clinical down staging at a national scope; therefore, having readily available data on pre- and post-adoption of screening campaigns is crucial for analyzing trends in mortality of breast cancer origin and reduction in advanced stages diseases.

On the other hand, future studies evaluating post-campaigns knowledge, attitudes, and practices of women having participated should be initiated. Most importantly, it should emphasize on the barriers identified refraining Lebanese women to contribute in BC screening given that awareness is one of the factors; yet, there are several other interrelated factors that might influence women's decision in contributing in BC screening.

Appendix

Abbreviations

AAFP	American Academy of Family Practice
ACOG	American College of Obstetricians and Gynecologists
ACS	American Cancer Society
ASR	Age-standardized incidence rates
AUBMC	American University of Beirut Medical Center
BI-RADS	Breast Imaging Reporting And Data System
BC	Breast cancer
BU	Breast ultrasound
CBE	Clinical breast examination
DBT	Digital breast tomosynthesis
DCIS	Ductal carcinoma in situ
DM	Digital mammography
FDA	Food and Drug Administration
MRI	Magnetic resonance imaging
NGO	Non-governmental organization
QALY	Quality adjusted life years
RCT	Randomized controlled trial
SBI	Society of Breast Imaging
SBE	Self-breast examination
UK:	United Kingdom
US:	United States
USPSTF	United States Preventive Services Task Force
2D	Two-dimensional
3D	Three-dimensional

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ORCID iD

Ali Shamseddine https://orcid.org/0000-0003-3725-8403

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