

Mammographic Screening in the Occupied Palestinian Territory: A Critical Analysis of Its Promotion, Claimed Benefits, and Safety in Palestinian Health Research

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PURPOSE To critically review the evidence and opinions expressed about mammographic screening (MS) in research reports on breast cancer in the occupied Palestinian territory (oPt) and to assess whether benefits and harms in MS are presented in a balanced way.

METHODS Searches of PubMed, Cochrane, MEDLINE, EMBASE, CINAHL, and gray literature identified 14 eligible research reports relating to the oPt. We reviewed these documents and then used a thematic analysis to describe and analyze the evidence and the opinions about MS expressed in them.

RESULTS All 14 research reports mentioned that MS would improve survival rates in the oPt. Only three gave information on major harmful effects, and only two emphasized that MS must be accompanied by effective treatment to have any beneficial effects on population mortality. There was no consistency in the recommended frequency of MS.

CONCLUSION Most information presented by Palestinian health researchers was selective and failed to address the important established harms of MS. Thus, calls to support MS in the oPt are not based on a measured discussion of the risks and benefits for women or grounded in the systemic readiness of health care necessary for its effectiveness. As long as diagnostic and treatment facilities remain deficient, screening cannot lead to reduced mortality from breast cancer.

JCO Global Oncol 6:1772-1790. © 2020 by American Society of Clinical Oncology

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INTRODUCTION

Since its introduction, the relative harms and benefits of mammographic screening (MS) have been the subject of continuing debate. A balanced evidence-based presentation of both the benefits and harms of screening to women will always be required to avoid confusion, misleading information, and genuine harm. Also, regardless of a pro- or anti-MS policy stance, there is general agreement that improvements in early presentation and diagnosis, and evidence-based combined-modality treatment (surgery, radiotherapy, and systemic drug therapy) should occur before any decision is made to initiate population MS or not.¹ Despite the lack of such essential prerequisites, MS has been promoted in many low- and middle-income countries despite a lack of evidence in these contexts, including data on system-specific cost effectiveness or parallel improvements in diagnostic and treatment facilities.^{2,3}

In the occupied Palestinian territory (oPt), a politically volatile low-income country, the focus on MS and the provision of mammography machines has involved the Palestinian government, as well as international

humanitarian and local nongovernmental organizations. In its 2017-2022 national health strategy document,⁴ the Palestinian government states that providing more MS services is one of its top priorities. There are 19 mammographic machines in the West Bank and 20 mammographic machines in Gaza (19 in the government sector, with the remainder in the private and nongovernmental sector).⁵ However, 90% of these machines are either nonfunctioning or underutilized, partly because there are no well-trained personnel to operate them and interpret mammographic films or because of frequent strikes in the health system because of wages having been withheld.⁵ Despite this, many health facilities are devoting more of their budgets to purchasing mammographic machines. In September 2017, the government celebrated the inauguration of a digital mammographic machine in a government clinic in Gaza at a cost of USD 130,000.⁶ This was followed by the purchase of a three-dimensional mammographic machine in the first breast cancer unit in Palestine in the West Bank in December 2018,⁷ with these purchases being facilitated by donations from international organizations.

ASSOCIATED CONTENT

Appendix

Author affiliations and support information (if applicable) appear at the end of this article.

Accepted on May 5, 2020 and published at ascopubs.org/journal/go on November 18, 2020: DOI <https://doi.org/10.1200/JGO.19.00383>

CONTEXT

Key Objective

Are the benefits and harms of mammographic screening presented in a balanced way in Palestinian health research?

Knowledge Generated

Most Palestinian health research studies included in our review encourage women to undergo mammographic screening without informing them about its important harmful effects, such as overdiagnosis and subsequent overtreatment. They also publish conflicting recommendations on the frequency of mammographic screening.

Relevance

Because sound policies rest on good information, benefits and harms in mammographic screening need to be assessed and presented in a balanced way. Information on this intervention should also reflect the level of scientific uncertainty, allowing women to understand the possible benefits and harms of screening and reach a decision by themselves.

As more MS machines are being purchased, the call for Palestinian women to undergo screening becomes louder. Every year in October, the oPt turns pink with street banners and campaigns by international and local organizations encouraging women to undergo screening because early detection saves lives, mixing two different issues, that is, population-based MS screening and early detection. There is no doubt that these campaigns can be successful in raising awareness of breast cancer symptoms and early detection, and in tackling disease-related stigma and fatalism, but they tend not to be well targeted and are subject to biased presentation of information regarding the relative harms and benefits of MS. The only available awareness information on MS at the Palestinian Ministry of Health-Ramallah website simply tells women 40-50 years of age to get screened every other year and every year for those over the age of 50 because “MS helps to detect breast cancer in an early stage when treatment is most successful. It is quick, safe, does not cause pain, and available for free in governmental facilities.”⁸ The situation is no different at the Palestinian Ministry of Health-Gaza website, which also exaggerates the benefits but neglects to highlight the harms and simply encourages women to undergo MS.⁹

The country's policies and campaigns for MS do not mention the nature of the evidence that has been used, nor whether the campaigns relied on local evidence in their recommendations. Therefore, in this article, we critically review the evidence reported about MS in reports of research on breast cancer in the oPt to assess whether local campaigns could be a reflection of the evidence available in Palestinian health research. By reviewing the evidence, we aimed to understand whether Palestinian health research presents MS benefits and harms in a balanced way or whether it tends to exaggerate benefits and fails to highlight the harms involved, as does worldwide research.¹⁰ We also aimed to understand whether the opinions expressed about MS in Palestinian health research are in line with the country's local policy making and practice.

METHODS

Research Question

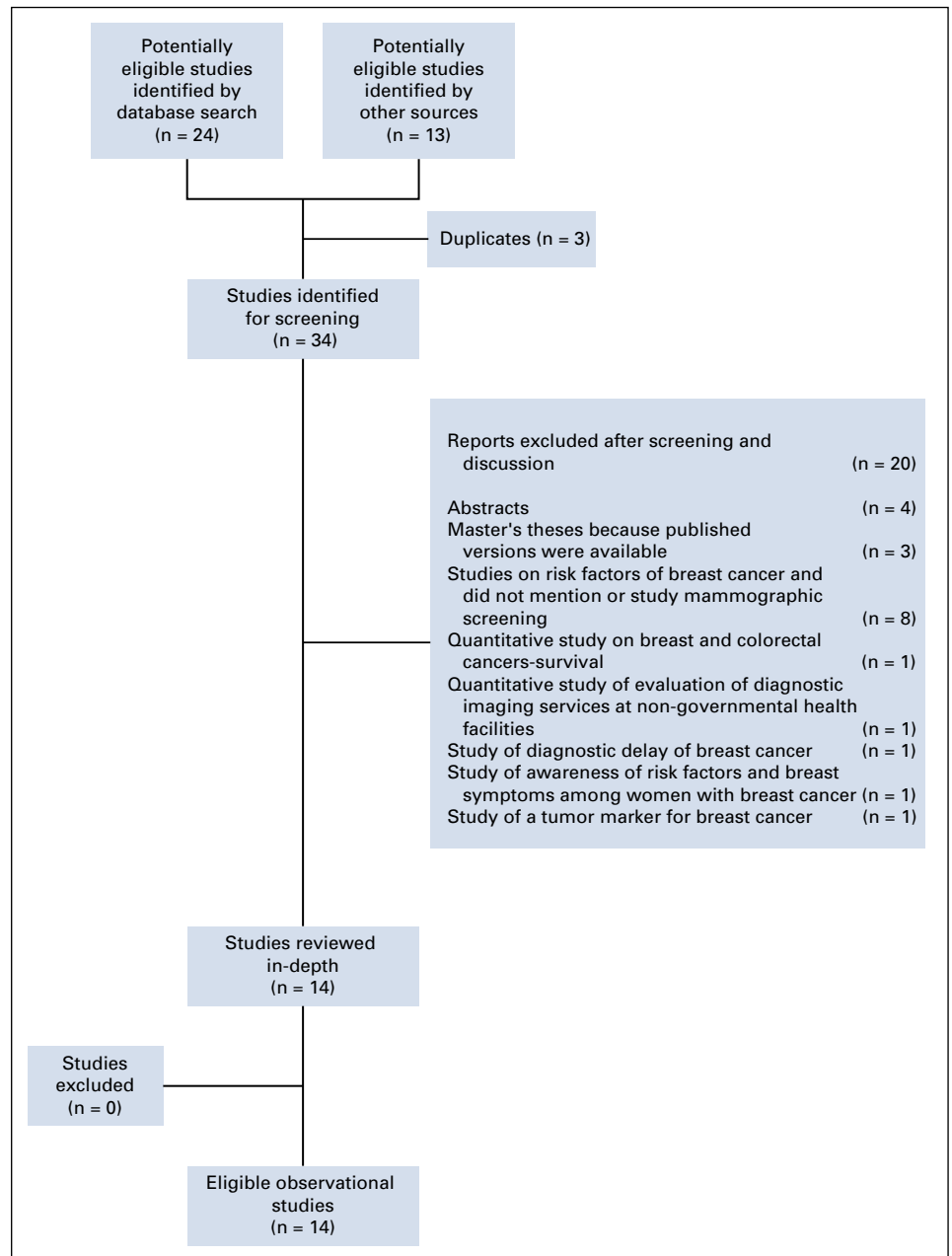
The research question for this review was: Are the benefits and harms of MS presented in a balanced way in Palestinian health research? The elements of the PICO question (patient/population, intervention/indicator, compare/control, outcome, time/type of study, or question) included in this review were:

- population of interest: Palestinian health research documenting any MS benefit or harm, or both;
- intervention: MS;
- comparator: no comparison group was studied; and,
- outcomes: the primary outcome was evidence on MS benefits and harms documented in Palestinian health research on breast cancer.

Search Strategy and Selection Criteria

We included all Palestinian health research articles on MS that described a benefit or a harm, or both, and were published in Arabic or English until the end of December 2019. We excluded reports that were abstracts or conference proceedings, studies that focused on palliative care for women with breast cancer, studies that concentrated exclusively on breast cancer survival statistics, and reports that did not provide any evidence on MS. A three-step search strategy without language restrictions was used by S.A.W. to identify potentially relevant research reports. First, the following five academic databases were searched: PubMed, CINAHL, EMBASE, MEDLINE, and Cochrane Central Register of Controlled Trials. The search terms included: mammography, screening, early detection, mammogram, breast cancer, breast tumour, women with cancer, malignant, carcinoma, neoplasm, Gaza, East Jerusalem, Palestine, West Bank, Palestinian women, and occupied Palestinian territory. Second, reference lists of reports retrieved in the first step were screened for potentially relevant research reports. Third, additional online platforms, including Google searches for gray literature,

FIG 1. Selection of studies for this review.



EThOS (Electronic Theses Online Service), and the Lancet-Palestinian Health Alliance conference abstracts were searched. Finally, after a review of research reports, some researchers were contacted to obtain relevant unpublished reports. If several full-text reports were found for a single study, the report that was published in a scientific journal was the one that was selected for additional analysis in our review, and we only used master's theses when there was no alternative. Master's theses were included in our review because the oPt is a low-income country that lacks an academic community to support research resources necessary for articles to be commonly published in scientific journals. We also hypothesized that the output of these

theses would be relevant because the opinions about MS expressed in them were likely to reflect current practice if the authors had been employed by a health care facility at the time the theses were published. The process of screening for selection of the included studies was performed by full-text review by S.A.W., and then the results of the screening were reviewed by E.A.D. Data from the selected research reports were read and discussed by S.A.W., K.M., I.C., and E.A.D. Data were extracted by two reviewers: E.A.D. extracted data from the reports, and S.A.W. cross-checked these for accuracy. Five main categories of data were extracted for each study: author names and affiliation at the time of publication, characteristics of the sample,

TABLE 1. Characteristics of Observational Studies Included in Thematic Analysis for MS

Research	Region	Sample Size	Age Range (mean age), Years	Method of Data Collection	Sampling Procedure
Abu-Shammala and Abed, 2017 ¹⁶	Gaza	370 women without breast cancer	35-45 (40)	Self-administered questionnaire	Stratified
Badawi, 2016 ²⁰	Biet Jala in the West Bank	194 women with breast cancer	Not reported	Face-to-face questionnaire	Convenience
Jaddallah A: Evaluation of mammogram services in the Gaza Strip Governorates [master's thesis]. Al-Quds University, Palestine, 2016	Gaza	400 women (diagnosis with breast cancer was unclear) and four health care providers	Not reported (46)	Face-to-face questionnaire	Unclear
Nazzal et al, 2016 ¹⁴	North, middle, and south West Bank	271 women without breast cancer	40-59 (46)	Self-administered questionnaire	Convenience
Younes, 2015 ¹⁵	Nablus city in the West Bank	269 women without breast cancer	30-60 (not reported)	Self-administered questionnaire	Convenience
Al-Agha L: Survival determinants of breast cancer cases in Gaza Governorates. [master's thesis]. Al-Quds University, Palestine, 2014	Gaza	118 women with breast cancer	≥ 25 (53)	Case note analysis	Women registered and diagnosed with breast cancer in 2007
Al-Hasanat, 2014 ¹⁷	Bethlehem	455 women without breast cancer who did not undergo mammography	≥ 40 (not reported)	Self-administered and face-to-face questionnaire	Stratified
PNIPH and WHO, 2014 ²²	Gaza and the West Bank	6,746 women in the West Bank and 699 women in Gaza who underwent mammography	Not reported	Case note analysis	All patients in the cancer registries and 12 mammogram registries in the West Bank and Gaza
Sarahneh, 2014 ²³	Southern area of the West Bank	100 women with breast cancer; 100 women without breast cancer	18-74 (48)	Case-control study using face-to-face questionnaire	Unclear
Odeh, 2011 ¹⁸	Gaza and the West Bank	334 women with breast cancer; 102 from Gaza and 232 from the West Bank	22-79 (47)	Face-to-face questionnaire	Unclear
Shaheen et al, 2011 ²¹	Gaza and other countries	155 women (11 had breast cancer); 100 women living IG, and 55 women living OG	IG: 35-70 (45); OG: 35-89 (46)	Self-administered questionnaire; telephone interview; face-to-face interview	Unclear
Musmar and Abu Shmais, 2010 ²⁴	Nablus City in the West Bank	556 women who underwent mammography (37 had breast cancer)	≥ 15 (42)	Case note analysis	Mammography test reports in one nongovernmental organization in 2007-2008
Azaiza et al, 2010 ¹³	Bethlehem, Hebron, Nablus, and Ramallah in the West Bank	397 women (diagnosis with breast cancer was unclear)	30-65 (42)	Face-to-face questionnaire	Stratified
Nissan et al, 2004 ¹⁹	Jerusalem	312 women with breast cancer: 159 were AJ, 82 were SJ, and 65 were PA.	23-88 (AJ: 56), (SJ: 53), (PA: 52)	Case note analysis	Women operated on for breast cancer in Hadassah University Hospital in 1994-1999

Abbreviations: AJ, Ashkenazi Jews; IG, in Gaza; OG, outside Gaza; PA, Palestinian Arabs; PNIPH, Palestinian Institute of Public Health; SJ, Sephardic Jews.

TABLE 2. Presence of Information Items About MS for Breast Cancer in the Research Studies Included in This Review

Information Item	No. of Reports Mentioning Information Item
Lifetime risk of developing breast cancer in the oPt	0
Lifetime risk of dying from breast cancer in the oPt	0
Survival from breast cancer in the oPt	4 (Jaddallah A: Evaluation of mammogram services in the Gaza Strip Governorates [master's thesis]. Al-Quds University, Palestine, 2016; Al-Agha L: Survival determinants of breast cancer cases in Gaza Governorates [master's thesis]. Al-Quds University, Palestine, 2014) ^{19,21}
Relative risk reduction of death from breast cancer	8 (Jaddallah A: Evaluation of mammogram services in the Gaza Strip Governorates [master's thesis]. Al-Quds University, Palestine, 2016; Al-Agha L: Survival determinants of breast cancer cases in Gaza Governorates [master's thesis]. Al-Quds University, Palestine, 2014) ^{14,15,17,20,22-24}
Absolute risk reduction of death from breast cancer	0
No. needed to screen to avoid one death from breast cancer	2 (Al-Agha L: Survival determinants of breast cancer cases in Gaza Governorates [master's thesis]. Al-Quds University, Palestine, 2014) ²²
Proportion of screened women who would be recalled	0
Proportion of breast cancers detected by mammography (sensitivity)	4 (Jaddallah A: Evaluation of mammogram services in the Gaza Strip Governorates [master's thesis]. Al-Quds University, Palestine, 2016) ^{15,22,24}
Proportion of women without breast cancer who would have a negative mammogram (specificity)	2 (Jaddallah A: Evaluation of mammogram services in the Gaza Strip Governorates [master's thesis]. Al-Quds University, Palestine, 2016) ¹⁵
Relative risk reduction of total mortality	0
Carcinoma in situ	2 (Jaddallah A: Evaluation of mammogram services in the Gaza Strip Governorates [master's thesis]. Al-Quds University, Palestine, 2016) ²²
Overdiagnosis and overtreatment	3 (Jaddallah A: Evaluation of mammogram services in the Gaza Strip Governorates [master's thesis]. Al-Quds University, Palestine, 2016; Al-Agha L: Survival determinants of breast cancer cases in Gaza Governorates [master's thesis]. Al-Quds University, Palestine, 2014) ²²
Effect of screening on No. of mastectomies or lumpectomies	0
Risks related to radiotherapy	0
Psychological distress related to false-positive results	3 (Jaddallah A: Evaluation of mammogram services in the Gaza Strip Governorates master's thesis]. Al-Quds University, Palestine, 2016) ^{15,22}
Pain at mammography	7 (Jaddallah A: Evaluation of mammogram services in the Gaza Strip Governorates [master's thesis]. Al-Quds University, Palestine, 2016) ^{13-15,17,20,21}

NOTE. Adapted from Jørgensen and Gøtzsche.¹²

Abbreviation: oPt, occupied Palestinian territory.

methodologic approach, results, and the evidence cited about MS.

Data Analysis

A thematic analysis was performed by S.A.W., as described by Clarke and Braun¹¹ to document the source of authors' opinions about MS. S.A.W. read each report several times to make notes about the opinions expressed and then assessed whether the information presented in the research reports gave a balanced account of the possible benefits and harms of MS. The results were checked by E.A.D., discussed with S.A.W., and reviewed by I.C., and any disagreements were settled by discussion. To facilitate the process, a data sheet that contained the same 16 information items as in the study published by Jørgensen and

Gøtzsche¹² was used to report the information on benefits and harms from MS in the included studies.¹²

RESULTS

Of the 37 research reports identified, three were excluded because they were duplicates, leaving 34 reports that we screened for potential relevance (Fig 2). Among these, we identified 14 full-text research reports that provided data relevant to MS in the oPt (Table 1; Appendix). Of these, six studies provided data on factors underlying the low use of MS (Jaddallah A: Evaluation of mammogram services in the Gaza Strip Governorates [master's thesis]. Al-Quds University, Palestine, 2016),¹³⁻¹⁷ three documented the characteristics of women at diagnosis and assessed which features were associated with length of survival (Al-Agha L:

TABLE 3. Examples of Authors' Supporting Statements for the Themes Identified in the Analysis

Theme	Examples of Authors' Statements
Recommendations on MS	"Screening mammography should be done annually after the age of 40." ¹⁸
	"To provide additional mammography machines to cover all five districts in the Gaza Strip and enable national mammography screening." ²²
	"We believe that a widespread and aggressive screening effort including increasing awareness among Palestinian Arab women and their health care providers will improve these presently dismal outcomes of breast cancer diagnosis and therapy." ¹⁹
Information on benefits of MS	"Screening mammography is one of the best techniques that can find majority of breast cancer cases in women over 50...Over the past twenty years, several large studies in different Western countries concluded that mammography screening programs decreased breast cancer mortality rate." ²⁴
	"Although incidence rates are increasing, mortality rates are stable, representing an improved survival rate. This improvement can be attributed to effective means of early detection." ²³
	"...screening by mammography is a determinant stage at diagnosis irrespective of race or ethnicity...and stage at diagnosis is the leading determinant of cancer survival" (Al-Agha L: Survival determinants of breast cancer cases in Gaza Governorates [master's thesis]. Al-Quds University, Palestine, 2014).
Information on important harms	"...potential harms, including pain, anxiety and psychological distress, radiation exposure, false positive or negative, and possible over-diagnosis" (Jaddallah A: Evaluation of mammogram services in the Gaza Strip Governorates [master's thesis]. Al-Quds University, Palestine, 2016).
	"...it and can give a false-positive result about 1 in 10. Also, it [can] have a potential problems like financial, pain, emotional and radiation." ¹⁵
	"Fear from bad results, and being diagnosed with breast cancer, and painful of the procedure, prevent women to assess to screening." ¹⁷

Abbreviation: MS, mammographic screening

Survival determinants of breast cancer cases in Gaza Governorates [master's thesis]. Al-Quds University, Palestine, 2014),^{18,19} one reported factors affecting stage of diagnosis among women with breast cancer,²⁰ one focused on factors affecting early presentation among women,²¹ one reported breast cancer detection rates by MS and the quality and completeness of cancer registry data,²² one reported risk factors for breast cancer,²³ and one investigated the characteristics of women who undergo diagnostic mammography and MS (Table 2).²⁴ Four themes emerged from the thematic analysis of Palestinian health research on breast cancer. The reports (1) recommend MS and give inconsistent recommendations on its frequency; (2) misinterpret survival statistics and overstate the benefit of MS; (3) ignore the important established harms of MS; and (4) do not seem to be improving in quality over time (Table 3).

Recommendations on MS

Eleven of the 14 reports recommended population MS despite the lack of the necessary infrastructure to provide and maintain high-quality screening programs and follow-up care (Table 4).^{14-18,20,22-24} Data in the research reports

revealed inconsistencies in the recommended frequency of MS. Seven reports agreed that MS should be performed annually for all women after the age of 40 years.^{13-15,17,18,22,24} Younes¹⁵ claimed that the Palestinian Ministry of Health also recommended MS every 3 years for all women 20-30 years of age, but Jaddallah (Evaluation of mammogram services in the Gaza Strip Governorates [master's thesis]. Al-Quds University, Palestine, 2016) stated that mammograms are not recommended for women under 40 years of age. Badawi²⁰ maintained that MS should be performed every 3 years for all women 35-40 years of age, every other year for women aged 40-50 years of age, and annually for those over the age of 50 years. These recommendations were not based on any evidence available at the time of issue.

Only two reports emphasized that population MS requires concomitant efficient and effective treatment to have any important effects on population mortality from breast cancer.^{13,21} One other recommended a good surveillance system and early detection through screening for high-risk groups (eg, for women who had already received breast cancer treatment), so that cancers could be detected when they are small and potentially more curable (Al-Agha L:

TABLE 4. Primary Research Studies Included in This Review

Author	Population, Main Objective, and Methods	Main Findings	Authors' Main Conclusions or Recommendations
Abu-Shammala and Abed (2017), <i>Gaza, International Journal of Science and Research</i>	<p>In 2012, 370 teachers from 12 randomly selected governmental schools completed a survey on barriers to accessing breast cancer screening. Information on women's knowledge of breast cancer risk factors, women's knowledge of detection methods, family support, and attitude toward breast screening were collected.</p> <p>Eligibility criteria and the sampling frame were mentioned. There might be a selection bias, but the limitations of the sample was acknowledged.</p>	<p>Mean age of women was 40 years, 85% (316 of 370) were married, 84%^a had children, and 23%^a had a family history of breast cancer.</p> <p>46%^a were not willing to undergo screening because of fear that they might be diagnosed, 47%^a for fear of changes in their appearance, 45%^a for fear of rumors about them, 42%^a for fear of changes in their sexual relationship, 44%^a for fear of neglecting their children, and 42%^a for fear of dying if they were diagnosed with breast cancer. Women with children appeared to express more negative attitudes toward screening; 40%^a agreed that they would prefer not to attend and not to know anything about their disease.</p>	<p>Limited health care resources available in Gaza might contribute to women's lack of confidence in health services provided. Access to MS services is limited.</p>
Badawi (2016), West Bank, MPH thesis freely available online ²⁰	<p>A convenience sample of 194 women with breast cancer at Biet Jala government hospital were interviewed between November 2015 and May 2016 to identify factors associated with delay of breast cancer diagnosis among women being treated. Descriptive statistics were presented together with χ^2 tests of associations of patient or provider delays with stage of disease.</p>	<p>30% (59 of 194) aged \leq 45 years, 36% (70 of 194) aged 46-60 years, and 34% (65 of 194) aged \geq 60 years; 92% were unemployed, and 64% were living below the poverty line. Staging information was missing for 10 women; 47% of those with staging information had stage 3 or 4 disease (87 of 184); 10% (20 of 194) of women had previously had mammography; 46% (89 of 194) consulted within the first month of noticing symptoms, 17% (33 of 194) within 3 months, and 37% (72 of 194) waited longer. Provider delay of over 1 month from first visit to diagnosis occurred for 47% (91 of 194) of women. There was an association between longer delays before going to see the doctor and more advanced stage of disease (χ^2 and <i>P</i> value not given).</p>	<p>Patient and provider delays were associated with advanced disease.</p> <p>Recommendations included: Implementing population-based screening programs. Encouraging women to seek medical advice when they encounter suspicious symptoms. Husbands and families should be involved in awareness programs.</p>

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TABLE 4. Primary Research Studies Included in This Review (Continued)

Author	Population, Main Objective, and Methods	Main Findings	Authors' Main Conclusions or Recommendations
Jaddallah (2016), Gaza (Jaddallah A: Evaluation of mammogram services in the Gaza Strip Governorates [master's thesis]. Al-Quds University, Palestine, 2016)	In 2014, 400 women who had undergone either MS, diagnostic mammography, or other health services in six health facilities completed a questionnaire about early detection methods of breast cancer, perceptions and beliefs about mammography, and accessibility and affordability of the mammogram services. Qualitative interviews with four heads of the mammography units asked about the availability of policies and guidelines, and barriers to MS.	During the study period, 160 women visited the centers to undergo mammography and 240 to access other health services. Their mean age was 46 years; 88% (352 of 400) of the total sample were married, and 91% (363 of 400) were unemployed; 91% (362 of 400) had national health insurance, and 22% (88 of 400) had a family history of breast cancer. The majority of women undergoing mammography were aged ≥ 40 years; 50% (80 of 160) underwent screening, and 50% (80 of 160) underwent mammography for diagnostic purposes. Most women agreed that mammography could cause a lot of fear and anxiety about being diagnosed with cancer (78%; 313 of 400), and approximately one half (47%; 186 of 400) agreed that it is embarrassing. Only a minority agreed that mammography was culturally unacceptable (5%; 21 of 400) and that religion prohibited it (3%; 12 of 400). Among those who underwent mammography, 83% (132 of 160) thought registration was easy, and 83% (133 of 160) thought that their questions were answered in a professional way, but only 13% (20 of 160) reported that providers introduced themselves.	Most study participants received no health education about breast cancer or its early detection during their visit. The main sources of information were health education sessions at the primary health care centers, TV radio programs, and friends. More than two thirds of participants had positive views about mammography. Barriers to screening included pain, psychological distress, fear, and the time-consuming nature of the test. Cost, culture, and religion were not barriers.
Eligibility criteria were mentioned. The sampling frame was unclear.	Qualitative interviews with directors highlighted the following themes: breast cancer is a problem in Gaza; the methods of its early detection, the availability (and the lack of availability) of mammography services, including the availability of guidelines and the experience and training of staff; access barrier to mammography services; and the scaling up of these services.	<p>Recommendations included: Develop a national policy for early detection of breast cancer screening that should include clear guidelines for mammography. Enhance the role of the media (TV/radio, newspaper, and magazines) in increasing awareness about breast cancer and screening. Give pre-mammography counseling to reduce fear and anxiety levels among women. Increase the No. of mammography units with at least one unit in each governorate focusing on screening and being provided with films and spare parts.</p>	

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TABLE 4. Primary Research Studies Included in This Review (Continued)

Author	Population, Main Objective, and Methods	Main Findings	Authors' Main Conclusions or Recommendations
Nazzal et al (2016), West Bank, <i>Asian Pacific Journal of Cancer Prevention</i> ¹⁴	A convenience sample of 271 female health care workers completed and returned a questionnaire about MS uptake to identify major motivators and barriers that affect screening uptake among health care workers in governmental primary health care facilities. Those who underwent diagnostic mammography were excluded.	Mean age of women was 46 years; 85% (229 of 271) were nurses, and 88% (239 of 271) were married; 63% (172 of 271) had excellent knowledge, and 32% (86 of 271) had moderate knowledge about mammography. Screening uptake was reported by 50% (135 of 271). Of these, 70% ^a had undergone mammography only once. Only 21% ^a (11% ^a of all participants) complied with regularly scheduled annual MS; 90% (121 of 135) believed that early detection was important for breast cancer management. Factors most hindering women were being busy (47%; 63 of 136) and perceived lack of susceptibility, with 42% (56 of 136) believing they were not at risk.	A comprehensive, concerted joint effort should be initiated to improve and sustain female health care workers' compliance with MS at optimal levels. Recommendations included: Educational programs to improve compliance with MS.
Younes (2015), West Bank ¹⁵	A convenience sample of 269 women without a history of breast cancer and living in Nablus completed a questionnaire (used by Azaiza et al ¹³) about breast cancer screening tests, including CBE, BSE, and mammogram, and barriers to using these tests.	60% (163 of 269) were between 30 and 40 years old, 78% (209 of 269) were married, and 20% (55 of 269) reported a family history of breast cancer; 12% (33 of 269) reported undergoing mammography every 6 months, and 74% (199 of 269) had never had a mammogram; 60% (162 of 268 ^b) had never had a CBE. Analysis of variance showed no relationship between age and reported barriers to undergoing mammography or CBE, or performing BSE. Women living in villages and camps reported more barriers to mammography. Fear of suffering (75.1% ^a), fear of change in appearance (72.9% ^a), and fear of being abandoned by husbands (53.1% ^a) were barriers to screening.	Fear of positive results, financial constraints, feeling shy about undergoing the tests, and pain during the screening test were barriers to MS.
MPH thesis freely available online	Eligibility criteria and the sampling frame were mentioned.	a,b	Recommendations included: Increase the role of health care professionals in increasing women's knowledge about breast screening tests and that mammogram does no harm and is not painful. A female physician in every clinic should encourage women to undergo CBE and mammography.

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TABLE 4. Primary Research Studies Included in This Review (Continued)

Author	Population, Main Objective, and Methods	Main Findings	Authors' Main Conclusions or Recommendations
Al-Agha (2014), Gaza (Al-Agha L; Survival determinants of breast cancer cases in Gaza Governorates [master's thesis]. Al-Quds University, Palestine, 2014)	A case note analysis for 118 women diagnosed with breast cancer in 2007 in Gaza to estimate 5-year survival and to explore factors affecting survival.	Follow-up was possible for 116 of 118 women. The crude 1-year survival was 84% (97 of 116), decreasing to 67% (78 of 116) at 3 years and 53% (62 of 116) at 5 years. Most women (62%; 73 of 118) were \geq 50 years, married (74%; 83 of 113), and had at least one child (74%; 78 of 106). Missing data were high for family history of breast cancer (58%; 69 of 118), progesterone (30%; 35 of 118), estrogen receptor status (30%; 35 of 118), and radiotherapy treatment (34%, 40 of 118). Missing data were moderate for disease stage (25%; 29 of 118), tumor size (25%; 29 of 118), nodal status (25%; 29 of 118), surgery (24%; 28 of 118), chemotherapy (23%; 27 of 118), and hormonal treatment (28%; 33 of 118).	This study demonstrated a relatively low 5-year overall survival. Recommendations included: Periodic routine audits to ensure quality of the medical reports. Screening programs for high-risk groups to detect cancers when they are small and more curable. A comprehensive national program including promotion of awareness and continued discussion at professional meetings through social media and in cooperation with health advocacy organizations to keep breast cancer in the forefront of policy makers' minds.
Al-Hasanat (2014), West Bank, MPH thesis freely available online ¹⁷	455 women aged \geq 40 years from Bethlehem District in the West Bank completed a validated questionnaire to document women's characteristics and factors affecting their use of MS.	40% (46 of 118) of the overall sample presented with disease recorded as stage 3 or 4, 35% (41 of 118) with tumors \geq 5 cm. 60% (272 of 455) were between 40 and 49 years old; 88% (398 of 455) were Muslims, and 78% (353 of 455) were married; 25% (115 of 455) did not have any type of health insurance. Most women (71% ^a) said they live 1-5 km away from a health facility that provides an MS service; 65% (294 of 455) had high to moderate knowledge about BSE, and approximately 35% (161 of 455) knew little or nothing about BSE; 33% (153 of 455) never heard of MS, and 57% (260 of 455) never read about it. Approximately one half reported that they did not know that MS was available free of charge in governmental health facilities. TV/radio followed by health care professionals were the two main sources of information about MS. Fear of positive results, financial constraints, lack of a female specialist, lack of privacy, long waiting time, and pain during the screening test were barriers to MS. Only one half (49% ^a) reported that health staff would respect their privacy and keep the test results confidential. Among those who underwent mammography (19%; 86 of 455), 51% (44 of 86) received it in a governmental health facility, and 42% (36 of 86) received it in either a private health facility or a special radiology center.	Women aged 40 years and more in Bethlehem had low knowledge about breast self-examination and MS. The low knowledge about MS resulted in low participation rate. Women believed it is not important to have MS if they have no complaint. Fear of positive results and pain during the screening test were the two main barriers to MS. Recommendations included: MS should be performed annually after the age of 40 years. Health staff and advocacy and media campaigns must encourage women to undergo MS.

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TABLE 4. Primary Research Studies Included in This Review (Continued)

Author	Population, Main Objective, and Methods	Main Findings	Authors' Main Conclusions or Recommendations
PNIPH and WHO (2014), Research freely available online ²²	Data were collected from 12 mammogram registries in the West Bank, the Ministry of Health in the West Bank, cancer and death registries in the West Bank and Gaza, and the referral department at MoH. Interviews were conducted with 15 mammography technicians, 12 supervisors, and three MoH doctors to examine the performance of national MS programs in the West Bank and Gaza. The study also tracked abnormal screening results in 2011 until 2013.	West Bank: cancer detection rates: 6.2% (417 of 6,746) of women undergoing mammography had abnormal test results; 136 tests were diagnostic and 6,610 were screening mammography. Among 281 patients who were screened and had abnormal results, 41 were diagnosed with breast cancer (false-positive rate was 85%; 240 of 281). Only 21 of the 41 diagnosed patients could be found in the cancer registry. Only one of the 21 cancers detected had a stage recorded in the registry. There was no information on the age of women screened or variability of detection rate by district.	Additional support is needed in developing guidelines for mammography and the referral of women with suspected cancer, improved infrastructure, and to improve the completeness and quality of cancer registry data by improving communications between health care professionals. The large proportion of false-positive patients may indicate that the screening program is not reaching women at high risk of breast cancer.
Gaza: 699 women were screened for breast cancer and 17 suspected patients were detected; 4 of 17 were confirmed as having cancer. Three out of four patients were found in the registry. False-positive rates were 77% (13 of 17). No information was given on the age of women screened.	Gaza: 699 women were screened for breast cancer and 17 suspected patients were detected; 4 of 17 were confirmed as having cancer. Three out of four patients were found in the registry. False-positive rates were 77% (13 of 17). No information was given on the age of women screened.	Recommendations included: To develop MS guidelines. To improve the completeness and quality of the cancer registry coverage of high-risk groups.	
Only 5 of 12 clinics had screening guidelines and only one conducted educational outreach to invite women; three to 18 tests were performed each day. In Gaza, technicians received no training, no health education material was available in the waiting room, and no maintenance of the mammography machine (which was broken down for 5 months) was performed.	Only 5 of 12 clinics had screening guidelines and only one conducted educational outreach to invite women; three to 18 tests were performed each day. In Gaza, technicians received no training, no health education material was available in the waiting room, and no maintenance of the mammography machine (which was broken down for 5 months) was performed.	Recommendations included: To develop MS guidelines. To improve the completeness and quality of the cancer registry coverage of high-risk groups.	
Sarahneh (2014), West Bank, MPH thesis freely available online ³	100 women with breast cancer and 100 women without breast cancer aged 18-74 years and living in two districts in the West Bank completed a questionnaire on the risk factors of breast cancer in the oPt. The selection criteria were mentioned. The sampling frame was unclear.	Mean age of women with breast cancer was 48 years; 6% (12 of 200) were aged < 20 years, 25% (49 of 200) were between 20 and 39 years, and 70% (139 of 200) were 40 years or older; 86% (171 of 200) were married, 74% (147 of 200) were unemployed, and 50% (50 of 100) of women with breast cancer and only 13% (13 of 100) of women without breast cancer reported a family history of breast cancer. Among those who had breast cancer, 92% (92 of 100) underwent either MS or diagnostic mammography. Early age at menarche, marriage at an early age (< 20 years), Early age at menarche, use of oral contraceptive pills, smoking, and family history of breast or/and ovarian cancer were risk factors for breast cancer among Palestinian women.	Early age at menarche, use of oral contraceptives, smoking, and environmental factors (living near an industrial area) may have contributed to the increase in breast cancer among Palestinian women. Recommendations included: Identify high-risk groups. Educational programs to improve women's knowledge of the risks of breast cancer. Tobacco control efforts among young women.

(Continued on following page)

TABLE 4. Primary Research Studies Included in This Review (Continued)

Author	Population, Main Objective, and Methods	Main Findings	Authors' Main Conclusions or Recommendations
Odeh (2011), West Bank, MPH thesis freely available online ¹⁸	334 women treated at the Augusta Victoria Hospital in Jerusalem completed a questionnaire on risk factors for breast cancer in the oPt; 31% of women were from Gaza and the rest were from other areas. Data on any declining participation or nonresponses to risk factor questions were missing, and there was no comparison group.	34% (123 of 334) of women were aged ≥ 50 years, 91% (304 of 334) were married, and 12% (40 of 334) had a family history of breast cancer in a first-degree relative; 92% (306 of 334) underwent fine-needle biopsy, 30% (100 of 334) had a lumpectomy, and 70% (234 of 334) had a mastectomy; 52% (174 of 334) of histology reports were available and showed invasive ductal carcinoma in 89% (155 of 174), invasive lobular disease in 7% (13 of 174), and metastatic disease in 3% (6 of 174).	Few data on breast cancer were available. Recommendations included: Staging according to TNM should be standardized by all pathologic centers. Screening mammography should be performed annually after 40 years of age. Radiotherapy should be available in Palestine. Genetic testing should be performed for all women with a strong history of breast cancer.
Shaheen et al (2011), Gaza, <i>The Breast Journal</i> ¹	100 women WIG and 50 WOG completed a survey interview about breast cancer risk factors, cultural and religious values, and accessibility of medical services to identify whether there was a difference in barriers and women's attitudes based on where they live. The sampling frame and the selection criteria were not mentioned. Average age of WIG was 45 years (range, 35-70 years), and the relatively young age was not justified.	WIG were less often college educated than WOG (50% of 100 v 73%; 40 of 55), more likely to have breastfed (83% of 100 v 62%; 34 of 55), but did not differ on other risk factors. Equal proportions (90%; 90 of 100 v 93%; 51 of 55) were willing to undergo a mammogram for a breast complaint, to seek medical advice for a breast complaint (92%; 92 of 100 v 95%; 52 of 55), to have a diagnostic breast workup (98%; 98 of 100 v 95%; 52 of 55), and to be interested in lowering their breast cancer risk (92%; 92 of 100 v 93%; 51 of 55). WIG were less willing to undergo screening than WOG (27%; 27 of 100 v 51%; 28 of 55) and more likely not to see screening as a priority (49%; 49 of 100 v 20%; 11 of 55). WIG were also more likely to be embarrassed (30%; 30 of 100 v 7%; 4 of 55) and dissatisfied with breast health care equipment (28%; 28 of 100 v 7%; 4 of 55). WIG were less likely to know that breast cancer was treatable (52%; 52 of 100 v 89%; 49 of 55). They also reported being less often encouraged to undergo mammography by family than WOG (32%; 32 of 100 v 53%; 29 of 55) or friends (39%; 39 of 100 v 64%; 35 of 55).	The concept of screening for breast cancer was not popular among women living in Gaza. This may be attributable to a combination of misconceptions, socioeconomic barriers, and lack of availability and accessibility to medical care. Recommendations included: Creating infrastructure for proper treatment and management of breast cancer. Educational programs promoting breast cancer screening in Gaza.

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TABLE 4. Primary Research Studies Included in This Review (Continued)

Author	Population, Main Objective, and Methods	Main Findings	Authors' Main Conclusions or Recommendations
Musmar and Abu Shmais (2010), <i>West Bank, ANU Medical and Health Sciences Journal</i> ²⁴	A case note analysis for 556 women who had underwent screening and diagnostic mammography in one nongovernmental organization in Nablus city in 2007 to identify demographic and reproductive factors associated with mammography use. No information was gathered on women who had not undergone mammography.	33% (182 of 556) of women undergoing mammography were aged 15-34 years; 39% (219 of 556) were 35-47 years, and 26% (145 of 556) were ≥ 48 years; 86% (481 of 556) were married, 61% (340 of 556) had a secondary or higher education, 71% (392 of 556) had three or more children, and 74% (411 of 556) had breastfed. No information was available on the percentage of women who presented with symptoms and those who did not; 4% (24 of 556) had a positive mammography result in 2007, with no information about follow-up confirmation results.	Level of awareness of mammography among women in Nablus city is good. Recommendations included: Implement a national screening program. Encourage more women to undergo MS.
Azaiza et al (2010), <i>West Bank, Cancer</i> ³	397 women aged 30 to 65 years from four districts in the West Bank completed a validated questionnaire about early detection of breast cancer to document barriers to screening. The year in which the study was conducted was not stated. The only selection criterion was age. Information on personal and/or family history of breast cancer was not collected.	Mean age of women was 42 years; 48% (191 of 397) did not know the recommended frequency for CBE compared with 30% (117 of 397) for BSE; 46% (184 of 397) performed BSE at recommended times or more frequently, but 38% (151 of 397) never did. Of 87 women aged ≥ 50 years, none knew the frequency recommended for mammography, and only 26% (23 of 87) had ever undergone mammography. Those undergoing CBE were more likely to perform BSE (χ^2 , 39.48, $P < .001$). Women expressed medium levels of fatalism and barriers to undergoing mammography. They were more likely to undergo mammography if they were less religious (OR, 0.59; 95% CI, 0.47 to 0.81), expressed lower personal barriers (OR, 0.59; 95% CI, 0.29 to 0.76), or had lower fatalism (OR, 0.39; 95% CI, 0.28 to 0.63).	There are cultural and personal barriers to screening, with barriers in cost, accessibility and inaccurate knowledge. The casual screening practiced today is insufficient because it does not reach high-risk women. Recommendations included: Priority of developing treatment facilities. Educational programs to improve women's knowledge of breast symptoms, and to reduce cultural and social barriers. Implementation of CBE by physicians.

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TABLE 4. Primary Research Studies Included in This Review (Continued)

Author	Population, Main Objective, and Methods	Main Findings	Authors' Main Conclusions or Recommendations
Nissan et al. (2004), Jerusalem, <i>The American Journal of Surgery</i> ¹⁹	A case note analysis for 312 women undergoing surgery 1994-1999 at Hadassah University Hospital Mount Scopus to document Arab women's characteristics, compared with Jewish women in Jerusalem; 159 were AJ, 82 were SJ, and 65 were PA.	Proportion of PA women seen increased from 14% ^c to 23% ^c during 1994-1999. PA women were younger at diagnosis (52 years v 53 years in SJ and 56 years in AJ women). Diagnosis by screening in 9% (6 of 65) of PA, 13% (11 of 82) of SJ, and 26% (41 of 159) of AJ women ($P = .007$). Tumor size was larger in the PA group (38.8 mm) than the SJ group (31.1 mm; $P < .03$) and the AJ group (24.7 mm; $P < .001$). PA women had a higher proportion of axillary lymph node metastases (53% ^c v 47% ^c in SJ and 39% ^c in AJ women). There were no differences in estrogen or progesterone receptor status. Five-year disease-specific survival was 58% for PA, compared with 77% for AJ ($P < .05$). Independent predictors were positive axillary lymph nodes, tumor grade, and size.	Compared with Jewish women, PA women had more advanced cancers, more delays in diagnosis, and lower survival. The main recommendation was implementing a widespread screening program.

Abbreviations: AJ, Ashkenazi Jewish; BSE, breast self-examination; MoH, Ministry of Health; MPH, Master of Public Health degree; MS, mammography screening; OR, odds ratio; PA, Palestinian Arabic; PNIPH, Palestinian National Institute of Public Health; SJ, Sephardic Jewish; WIG, women in Gaza; WOG, women outside of Gaza.

^aUnderlying No. not reported.

^bMissing values.

^cUnderlying No. not reported. Confusion in reporting median or mean and inconsistent rounding of ages in tables and Results section. Table 1 reports percentages rather than numbers and P values rather than exact test performed or comparison groups.

Survival determinants of breast cancer cases in Gaza Governorates [master's thesis]. Al-Quds University, Palestine, 2014).

Claimed Benefits of MS

All reports asserted that MS would improve breast cancer survival rates in the oPt. The benefit mentioned most often was a relative reduction in breast cancer mortality, and estimates varied from an 18% to 45% reduction. No report mentioned absolute risk reduction in breast cancer mortality or how many women might benefit. Many of these reports significantly overestimated the benefits plausibly attributable to MS. Nazzal et al¹⁴ argued that mammography is the only effective breast cancer screening method. One report claimed that MS can detect up to 90% of patients with breast cancer,¹⁵ whereas another claimed that MS can detect breast cancer 2 years before a lump can be felt.¹⁷ All reports emphasized possible benefits in a way that would encourage women to undergo MS. Three reports indicated that screening leads to better treatment options,^{14,17,23} and one stated that it contributed to fewer mastectomies.¹⁵ Of the 14 research reports, only five cited evidence from systematic reviews of MS (Jaddallah A: Evaluation of mammogram services in the Gaza Strip Governorates [master's thesis]. Al-Quds University, Palestine, 2016; Al-Agha L: Survival determinants of patients with breast cancer in Gaza Governorates [master's thesis]. Al-Quds University, Palestine, 2014),^{13-15,22} whereas others based their recommendations on individual studies. This led to a less balanced perspective in their conclusions.

Information on Important Harms

Of the 14 reports, only one published and two unpublished reports mentioned important harmful consequences related to cancers that may never progress, including overdiagnosis and overtreatment (Jaddallah A: Evaluation of mammogram services in the Gaza Strip Governorates [master's thesis]. Al-Quds University, Palestine, 2016; Al-Agha L: Survival determinants of breast cancer cases in Gaza Governorates [master's thesis]. Al-Quds University, Palestine, 2014; (Table 2).²² Three reports mentioned anxiety or psychological distress related to false-positive results (Jaddallah A: Evaluation of mammogram services in the Gaza Strip Governorates [master's thesis]. Al-Quds University, Palestine, 2016).^{15,22} One report stated that the rate of false-positive results among women undergoing MS is 85.4% (240 of 281) in the West Bank and 76.5% (13 of 17) in Gaza,²⁰ but the reasons for these high rates were not considered or investigated. They may indicate reporting issues or that the screening program was not reaching women at high risk for breast cancer. Seven reports mentioned the potential pain during the mammographic procedure (Jaddallah A: Evaluation of mammogram services in the Gaza Strip Governorates [master's thesis]. Al-Quds University, Palestine, 2014).^{13-15,17,20,21} The other five did not mention any possible harmful effects and referred only to the claimed positive effects. None provided estimates of the cost effectiveness of the intervention in a low-income country such as the oPt.

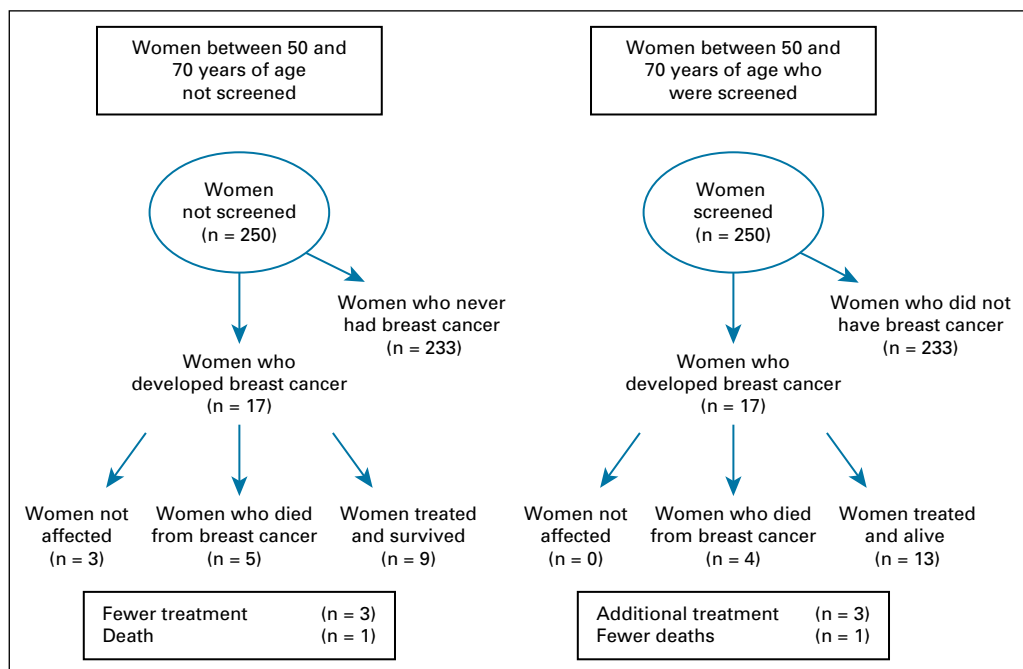


FIG 2. Tree diagram showing the consequences for 250 women undergoing mammographic screening presented by David Spiegelhalter, OBE, FRS (developed based on Informed Choice About Cancer Screening at King's Health Partners, 2012).

Author Affiliation at the Year of Publication

Of the 14 reports, seven were master's theses, mainly for public health programs (with five of them from the same university; Jaddallah A: Evaluation of mammogram services in the Gaza Strip Governorates [master's thesis]. Al-Quds University, Palestine, 2016; Al-Agha L: Survival determinants of breast cancer cases in Gaza Governorates [master's thesis]. Al-Quds University, Palestine, 2014).^{15,17,18,20,23} In all theses, it was not clear whether authors were employed. Three reports were from authors working at higher education institutions,^{13,19,21} and one report was published by a governmental research organization in support of an international body.²² We could not establish a possible relationship between author affiliation and the quality of evidence cited on MS, nor could we detect any significant improvement in the quality of evidence cited on MS in relation to the year of publication. We would expect that the quality for evidence reported would improve over time, but that does not appear to be the case.

DISCUSSION

Summary of Main Findings

Despite deficiencies in cancer services, the Palestinian Ministry of Health has promoted and prioritized MS. As a result, many health facilities are devoting more of their budgets to purchasing mammographic machines, seemingly with limited analysis of their cost effectiveness or the need for parallel improvements in diagnostic and treatment facilities. Facilities also encourage women to undergo MS without informing them about its potential harmful effects. We critically reviewed the opinions expressed about MS in reports of research on breast cancer in the oPt to assess whether the country's policies on MS are guided by the evidence available in Palestinian health research and whether MS benefits and harms are presented in a balanced way. Our review makes clear that the authors of most research reports on MS for breast cancer in the oPt see it as their duty to promote the intervention, regardless of the lack of evidence or logic for this. Many reports significantly overestimated the reduction in breast cancer deaths plausibly attributable to MS, even in high-functioning, high-income health care systems. The established harmful consequences of MS, which are overdiagnosis and subsequent overtreatment, were mentioned by three reports only. The fact that many reports included were master's degree theses is not surprising. Along with many other low- and middle-income countries, the oPt lacks sufficient health research capacity, with most studies conducted by single researchers.

Comparison With Findings From Previous Research

To our knowledge, this analysis is the first to consider the promotion, claimed benefits, and safety of MS research in the oPt. It provides sufficient evidence that the interests of Palestinian women are not being well served. Our findings are consistent with previous evidence in other countries, suggesting that invitations to MS tend to exaggerate benefits and omit harms while encouraging women to undergo MS.^{10,12,25,26}

Up-to-date evidence from systematic reviews is available to help develop a balanced presentation of benefits and harms in MS,²⁷⁻³¹ and the use of such evidence could help improve the quality of Palestinian health research and policy on breast cancer in the future. Researchers should explain benefits and harms in a transparent and balanced way, as illustrated in the information leaflet developed by the Nordic Cochrane Centre or as presented in [Figure 2](#) by Spiegelhalter.^{32,33}

Strengths and Weaknesses of the Study

To our knowledge, this review is the first to consider the promotion, claimed benefits, and safety of MS in the oPt. In doing so, we have considered both the research evidence presented and a thematic analysis of opinions expressed within it. Although our search strategy has located many relevant studies, many of the research reports included were master's degree theses, and the lack of basic information about most aspects of breast cancer in the oPt inevitably imposed limitations on our review.

Implications for Practice, Policy, and Future Research

Palestinian women with breast cancer are usually diagnosed at an advanced stage, and limited resources mean that early detection, diagnosis, and treatment cannot be efficiently promoted. There is little routine data in Gaza and the West Bank available on breast cancer with which to estimate the trends in mortality, but the extant data reveal that the 5-year survival rate after the diagnosis of breast cancer is considerably low.³⁴ Poor survival for women with breast cancer in the oPt may reflect at least two factors: first, most women with breast symptoms present to the health services with advanced-stage disease (Al-Agha L: Survival determinants of breast cancer cases in Gaza Governorates [master's thesis]. Al-Quds University, Palestine, 2014)²¹; second, facilities for diagnosis and treatment are inadequate and fragmented, with no clear referral pathways established among providers. Radical mastectomy is widely used,⁵ partly because radiotherapy is not available in Gaza and the West Bank but only provided in East Jerusalem. Palestinian authors were aware of the inadequate diagnostic and treatment services for breast cancer in the oPt. Yet, there is a big mismatch between the strength of support of MS and the lack of support for basic diagnostic and treatment facilities for women with breast cancer in the oPt.

As Bywaters and Knox³⁵ pointed out more than 40 years ago, MS cannot be of any benefit unless it is accompanied by effective and specific diagnosis and treatment pathways. Because sound policies rest on good information, possible benefits and harms in MS need to be assessed and presented in a balanced way. Information on this intervention should also reflect the level of scientific uncertainty, allowing women to understand the possible benefits and harms of screening and reach a decision by themselves.

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SUPPORT

Funded in part through the UK Research and Innovation Global Challenges Research Fund Research for Health in Conflict (R4HC-MENA [Middle and Near East]), developing capability, partnerships, and research in the MENA ES/PO10962/1. S.A.W. had full access to all the data in the study and had final responsibility for the decision to submit for publication.

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Data analysis and interpretation: All authors

Manuscript writing: All authors

Final approval of manuscript: All authors

Accountable for all aspects of the work: All authors

AUTHORS' DISCLOSURES OF POTENTIAL CONFLICTS OF INTEREST

The following represents disclosure information provided by authors of this manuscript. All relationships are considered compensated unless otherwise noted. Relationships are self-held unless noted. I = Immediate Family Member, Inst = My Institution. Relationships may not relate to the subject matter of this manuscript. For more information about ASCO's conflict of interest policy, please refer to www.asco.org/rwc or ascopubs.org/go/site/misc/authors.html.

Open Payments is a public database containing information reported by companies about payments made to US-licensed physicians [Open Payments](http://OpenPayments).

Richard Sullivan

Honoraria: Pfizer

Consulting or Advisory Role: Pfizer (Inst)

No other potential conflicts of interest were reported.

ACKNOWLEDGMENT

We thank Angela Raffle, MD, and Jill Donnelly, MD, for commenting on earlier drafts of this report.

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APPENDIX

List of Excluded Studies

Four abstracts:

Al-Ramahi R, Nazzal D, Mstafa D, et al: Evaluation of types and treatment protocols for breast cancer among Palestinian women: A retrospective study. *Lancet* 393:S42, 2019(suppl 1).

Nabaa' HA, Shelleh N: Barriers preventing Palestinian women from having a mammogram: A qualitative study. *Lancet* 391:S16, 2018 (suppl 2).

Lafi MA, Shaheen R: Needs assessment of breast health care in the Gaza Strip. *J Emerg Med Trauma Acute Care* 2016;83, 2016.

Lahham A, AlMasri H, Kameel S: Estimation of female radiation doses and breast cancer risk from chest CT examinations. *Radiat Prot Dosimetry* 179: 303-309, 2018.

Three master's theses because published versions were available:

Abu-Shammala B: Breast cancer screening among female school teachers Gaza City [master's thesis]. Al-Quds University, Palestine, 2012.

Abu Shmais FB: Use of mammography test pattern and percentage of breast cancer detected in Nablus District [master's thesis]. Al-Quds University, Palestine, 2010. https://scholar.najah.edu/sites/default/files/all-thesis/use_of_mammography_test_pattern_and_percentage_of_breast_cancer_detected_in_nablus_district.pdf.

Al Shiekh SS: Evaluation of the used diagnostic imaging methods for breast cancer in Gaza Governorates [master's thesis]. Al-Quds University, Palestine, 2018. https://dspace.alquds.edu/bitstream/handle/20.500.12213/2076/MT_2018_21511018_8081.pdf?sequence=1&isAllowed=y.

Eight studies of risk factors of breast cancer or did not mention any benefit or harm of mammographic screening:

Darweesh A: Risk factors of breast cancer among Palestinian women in North West Bank [master's thesis]. An-Najah National University, Nablus, Palestine, 2009.

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