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THE SYSTEMATIC REVIEW OF SCREENING MAMMOGRAPHY BEYOND BREAST CANCER

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ABSTRACT

Background: *It is critical to assess the effects of coordinated mammography service screening separately from modifications to breast cancer therapy. This can be achieved by calculating the fatal breast cancer incidence, which is determined by the diagnostic date rather than the death date.*

Methods: *By comparing itself to the standards set by the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) 2020, this study was able to show that it met all of the requirements. So, the experts were able to make sure that the study was as up-to-date as it was possible to be. For this search approach, publications that came out between 2013 and 2023 were taken into account. Several different online reference sources, like Pubmed and SagePub, were used to do this. It was decided not to take into account review pieces, works that had already been published, or works that were only half done.*

Result: *In the PubMed database, the results of our search brought up 109 articles, whereas the results of our search on SagePub brought up 98 articles. The results of the search conducted for the last year of 2013 yielded a total 45 articles for PubMed and 32 articles for SagePub. In the end, we compiled a total of 5 papers, 4 of which came from PubMed and 1 of which came from SagePub. We included five research that met the criteria.*

Conclusion: *In summary, mammography screening lowers the death rate from breast cancer, although the estimates are only marginally statistically significant, the effects are modest at younger ages, and the way cases were accumulated in trials affects the outcome. Screening for cancers at higher stages also lowers the risk of cancer in those 50 and older.*

Keyword: *Mammography, Breast cancer, Comparris*

INTRODUCTION

Breast cancer accounts for 14% of all new cancer cases in the US and is the most frequent malignancy in women, aside from skin cancer. Breast cancer is more common in women between the ages of 55 and 64, and its risk increases with age. With time, this rising risk presents a potential to detect breast cancer at an earlier stage, improving the patient's chances of recovery and lowering treatment-related side effects. Although early diagnosis by mammography screening has had a higher overall influence on mortality decreases, breast cancer medicines are still improving and have contributed to a decrease in mortality. In addition to describing mammography, this exercise emphasizes the importance of the interprofessional team in the care of patients undergoing this procedure.[1]

In the United States, 14% of new cases of cancer are breast cancer, making it the second most frequent malignancy in women after skin cancer. Women between the ages of 55 and 64 are most frequently diagnosed with breast cancer, and the risk rises with age. Early diagnosis lowers treatment morbidity and improves the likelihood that a patient will recover. Although early diagnosis by mammography screening has had a higher overall influence on mortality decreases, breast cancer medicines are still improving and have contributed to a decrease in mortality. All average-risk women should begin having breast cancer screenings when they turn 40, according to the American College of Radiology. Many distinct modalities, most often mammography, breast ultrasound, and magnetic resonance imaging (MRI), can suggest a diagnosis of breast cancer.[2,3]

It is outside the purview of this paper to go into great detail about how various professional bodies differ in their recommendations. The American College of Radiology states that yearly mammogram screening should start at age 40 for all women with an average risk of breast cancer and should go on for women who have at least a 5- to 7-year life expectancy, provided the patient is willing to undergo additional testing, a biopsy, and treatment.[4]

To be more precise, there is no age at which screening mammography should be stopped. Rather, the continuation of screening methods should depend on the patient's health. While the majority of cases of breast cancer are found in people between the ages of 50 and 60, screening mammography and increased risk with age present a chance to find precancerous or malignant lesions early on before they become clinically noticeable. Patients at average risk have a lifetime risk of less than 15% for breast cancer.[4]

Patients with an increased risk of developing breast cancer require special consideration since they may develop breast cancer at an earlier age or require supplemental screening modalities beyond routine mammograms. Patients are considered to have an intermediate risk or 15% to 20% lifetime risk of developing breast cancer if they have any of the following personal history of breast cancer, atypical ductal hyperplasia on a prior breast biopsy, lobular neoplasia on a prior breast biopsy.[1]

In addition to yearly screening mammograms, patients with intermediate-risk breast cancer may benefit from further screening using breast ultrasonography and potentially breast MRI. Given that increasing breast density does not limit a high-quality ultrasound examination, ultrasonography is especially helpful in the situation of thick breast fibroglandular tissue.[1]

Patients with a 20% or higher lifetime risk of developing breast cancer are considered high-risk. In addition to supplemental screening modalities, these patients also benefit from initiating breast cancer screening at a younger age. High-risk patients are those with the following women with specific gene mutations, including BRCA 1 and 2, those with a strong family history of breast cancer, even in the absence of a known gene mutation, patients that have received radiation therapy of the chest between 10 to 30 years of age.[1]

Individuals with a family history of breast cancer should start screening for the disease ten years before the youngest first-degree relative was diagnosed with the disease; that being said, these patients shouldn't begin screening before the age of thirty because there is a possibility that they will be more sensitive to the ionizing radiation that mammography uses. Given its higher sensitivity, screening breast MRI is advised for these patients in addition to mammography. It is recommended that women undergo a risk assessment by age 30 to determine the appropriate screening timeline. Screening mammography is not recommended for male patients with breast tissue, known as gynecomastia.[2]

METHODS

Protocol

By following the rules provided by Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) 2020, the author of this study made certain that it was up to par with the requirements. This is done to ensure that the conclusions drawn from the inquiry are accurate.

Criteria for Eligibility

For the purpose of this literature review, we review published literature about the mammography for screening of breast cancer. This is done to provide an explanation and improve the handling of treatment at the patient. As the main purpose of this paper, to show the relevance of the difficulties that have been identified as a whole.

In order for researchers to take part in the study, it was necessary for them to fulfil the following requirements: 1) The paper needs to be written in English. In order for the manuscript to be considered for publication, it needs to meet both of these requirements. 2) The studied papers include several that were published after 2013, but before the time period that this systematic review deems to be relevant. Examples of studies that are not permitted include editorials, submissions that do not have a DOI, review articles that have already been published, and entries that are essentially identical to journal papers that have already been published.

Search Strategy

We used "mammography" and "breast cancer" as keywords.The search for studies to be included in the systematic review was carried out using the PubMed and SagePub databases by inputting the words: *(("mammography"[MeSH Terms] OR "mammography"[All Fields] OR "mammographies"[All Fields] OR "mammography s"[All Fields]) AND ("breast neoplasms"[MeSH Terms] OR ("breast"[All Fields] AND "neoplasms"[All Fields]) OR "breast neoplasms"[All Fields] OR ("breast"[All Fields] AND "cancer"[All Fields]) OR "breast cancer"[All Fields])) AND ((ffrft[Filter]) AND (clinicaltrial[Filter]) AND (2014:2023[pdat]))* used in searching the literature.

Data retrieval

After reading the abstract and the title of each study, the writers performed an examination to determine whether or not the study satisfied the inclusion criteria. The writers then decided which previous research they wanted to utilise as sources for their article and selected those studies. After looking at a number of different research, which all seemed to point to the same trend, this conclusion was drawn. All submissions need to be written in English and can't have been seen anywhere else.

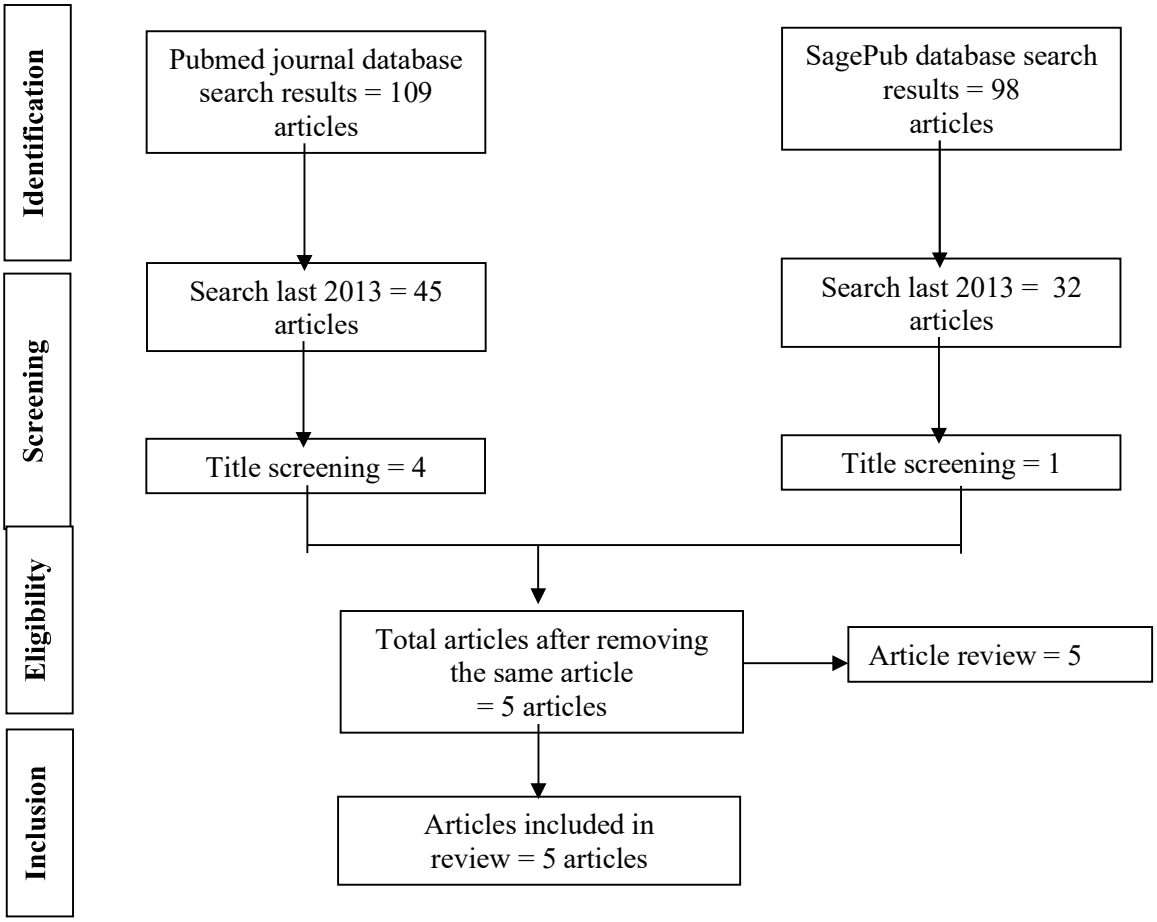

Figure 1. Article search flowchart

Only those papers that were able to satisfy all of the inclusion criteria were taken into consideration for the systematic review. This reduces the number of results to only those that are pertinent to the search. We do not take into consideration

the conclusions of any study that does not satisfy our requirements. After this, the findings of the research will be analysed in great detail. The following pieces of information were uncovered as a result of the inquiry that was carried out for the purpose of this study: names, authors, publication dates, location, study activities, and parameters.

Quality Assessment and Data Synthesis

Each author did their own study on the research that was included in the publication's title and abstract before making a decision about which publications to explore further. The next step will be to evaluate all of the articles that are suitable for inclusion in the review because they match the criteria set forth for that purpose in the review. After that, we'll determine which articles to include in the review depending on the findings that we've uncovered. This criteria is utilised in the process of selecting papers for further assessment. in order to simplify the process as much as feasible when selecting papers to evaluate. Which earlier investigations were carried out, and what elements of those studies made it appropriate to include them in the review, are being discussed here.

RESULT

In the PubMed database, the results of our search brought up 109 articles, whereas the results of our search on SagePub brought up 98 articles. The results of the search conducted for the last year of 2013 yielded a total 45 articles for PubMed and 32 articles for SagePub. In the end, we compiled a total of 5 papers, 4 of which came from PubMed and 1 of which came from SagePub. We included five research that met the criteria.

Elkin, et al[5] (2017) showed that a web-based decision support tool could help women in their 40s and their providers have more educated, tailored conversations regarding screening mammography. The majority of users then spoke with a physician about breast cancer screening, and from the professional's point of view, BSD did not negatively impact patient-clinician interactions. Based on our findings, decision support tools such as BSD could be useful in assisting women in their 40s to make customized, educated decisions on screening mammography.

Lucynska, et al[6] (2015) showed that contrast enhanced spectral mammography has the potential to be a valuable diagnostic method that enables accurate detection of malignant breast lesions, has high negative predictive value, and a false-positive rate similar to that of breast MRI.

Comstock, et al[7] (2020) showed that when it came to women undergoing screening for breast cancer and having dense breasts, AB-MR was linked to a much greater rate of invasive breast cancer detection than DBT. To have a deeper understanding of the correlation between screening techniques and clinical result, more study is required.

Table 1. The litelature include in this study

Author	Origin	Method	Sample	Result
Elkin et al, 2017[5]	USA	Retrospective study	1100 patients	Of 1,100 women invited to use *BSD*, 253 accessed the website, and 168 were eligible to participate in the pilot study. One-fifth had a family history of breast cancer, and at least 76% had any prior mammogram. At follow-up, 88% of *BSD* users reported discussing mammography at their visit, and 77% said they had a screening mammogram since the visit or that they made or were planning to make a screening mammogram appointment. The average decisional conflict score was 22.5, within the threshold for implementing decisions. Decisional conflict scores were lowest in women who said that they had or planned to have a mammogram (mean 21.4, 95% CI 18.3-24.6), higher in those who did not (mean 24.8, 95% CI 19.2-30.5), and highest in those who were unsure (mean

				31.5, 95% CI 13.9-49.1). Most *BSD* users expressed accurate perceptions of their breast cancer risk and the benefits and limitations of screening.
Luczynska et al, 2015[6]	Poland	Retrospective study	102 patients	There were 102 patients entered into CESM/MRI studies and 118 lesions were identified by the combination of CESM and breast MRI. Histopathology confirmed that 81 of 118 lesions were malignant and 37 were benign. Of the 81 malignant lesions, 72 were invasive cancers and 9 were *in situ* cancers. Sensitivity was 100% with CESM and 93% with breast MRI. Accuracy was 79% with CESM and 73% with breast MRI. ROC curve areas based on BI-RADS were 0.83 for CESM and 0.84 for breast MRI. Lesion size estimates on CESM and breast MRI were similar, both slightly larger than those from histopathology.
Comstock et al, 2020[7]	USA	Cross sectional study	1516 patients	Among 1516 enrolled women, 1444 (median age 54, range 40–75) completed both examinations and were included in the analysis. The reference standard was positive for invasive cancer with or without DCIS in 17 women, and for DCIS alone in another 6. No interval cancers were observed during follow-up. AB-MR detected all 17 women with invasive cancer, and 5/6 women with DCIS. DBT detected 7/17 women with invasive cancer, and 2/6 women with DCIS. The invasive-cancer-detection-rate was 11.8 per 1000 women [95% CI 7.4–18.8] for AB-MR versus 4.8 per 1000 women [95% CI 2.4–10.0] for DBT, a difference of 7 per 1000 women [95% CI for the difference 2.2–11.6] (exact McNemar p=0.002). For detection of invasive cancer and DCIS, for AB-MR versus DBT, sensitivity was 95.7% [95% CI 79.0–99.2] versus 39.1% [95% CI 22.2–59.2] (p=0.001). Specificity was 86.7% [95% CI 84.8–88.4]

				versus 97.4% [95% CI 96.5–98.1] (p<0.001). Additional-imaging-recommendation-rate was 7.5% [95% CI 6.2–9.0] versus 10.1% [95% CI 8.7–11.8] (p=0.02). PPV was 19.6% [95% CI 13.2–28.2] versus 31.0% [95% CI 17.0–49.7] (p=0.15).
Wang et al , 2022[8]	China	Cross sectional study	2737 patients	Among the 2737 participants, 2844 breast lesions were detected, including 1935 (68.0%) breast cancers and 909 (32.0%) benign lesions. Of the breast cancers, ultrasound detected 1851 (95.7%), whereas mammography detected 1527 (78.9%). The sensitivity of ultrasound for breast cancer diagnosis was significantly higher than that of mammography (95.7% vs. 78.9%, $p < 0.001$), whereas the specificity was significantly lower than that of mammography (42.9% vs. 62.3%, $p < 0.001$). The receiver operating characteristic curves revealed that ultrasound was more accurate in detecting breast cancer than mammography (76.8% vs. 71.3%, $p < 0.001$). Age, body mass index, and breast density did not influence ultrasound sensitivity and accuracy.
Sun et al, 2022[9]	China	Retrospective study	10821 patients	A total of 10,821 cases were screened, accounting for 28.30%. They were randomly divided into US, MAM, and CA153 and combined examination group which has no significant difference in high-risk factors. Breast cancer in high-risk population was screened by CDUS, MAM, and CA153 and combined examination. CA153 was detected by electroluminescence method. The positive detection rate of BC was 360.41/100,000 (39/10,821). The overall difference in the positive detection rate of BC among 10,821 cases in all age groups was statistically significant. The sensitivity and negative predictive value of combined examination were significantly improved compared with each

				single examination. Combined examination for BC screening can significantly improve the sensitivity of BC early diagnosis and reduce the missed diagnosis rate.

Wang, et al[8] (2022) showed that for Chinese women with suspected breast lesions, breast ultrasound is a more sensitive and accurate modality than mammography for the early detection of breast cancer. It may also apply to all women globally who have thick breasts. Mammography can be utilized in addition to ultrasonography to improve sensitivity, specificity, and accuracy in older or obese women. However, long-term follow-up is still needed to assess whether ultrasound reduces breast cancer mortality.

Sun, et al[9] (2022) showed that early detection of BC through screening of high-risk groups can lead to a large increase in the clinical cure rate. Commonly utilized screening techniques include US, MAM, and CA153; nevertheless, the efficacy of a single test is constrained. By enhancing and validating one another, the combined test can minimize misdiagnosis and increase the positive detection rate of BC screening.

DISCUSSION

This systematic review involved a total of 16.276 data of patients who have done the breast immaging mammography for screening of breast cancer in 5 observational studies.

Divergent advice from governmental and professional groups complicates breast cancer screening in the United States. Age-specific differences in the risks and benefits of breast cancer screening should be taken into consideration during joint decision-making. Women between the ages of 40 and 49 are less likely to get breast cancer than older women, but the kinds of the disease that do occur are frequently more aggressive and have a worse prognosis. In addition, younger women hope to live longer and have fewer comorbidities. By discovering malignancies at an earlier stage, screening for breast cancer can reduce breast cancer mortality, years of life lost to the disease, and the morbidity of breast cancer treatment. These are the main benefits of screening for women in their 40s.[10]

Women between the ages of 40 and 49 are more likely than older women to experience false positive recalls, biopsies, and brief anxiety during breast cancer screening. In this age group, concerns about radiation-induced cancer and overdiagnosis are negligible. Shorter screening intervals are recommended because women between the ages of 40 and 49 have a shorter lead time for breast cancer.[10]

The primary benefits of mammography screening are a reduction in breast cancer mortality, years of life lost due to breast cancer, and morbidity of breast cancer treatment. The effect of breast cancer screening on death is described by a number of measures. Greater aggressiveness in screening always leads to fewer deaths, according to all the organizations that distribute screening guidelines. The percentage of fatalities prevented as a result of a certain screening method as opposed to no screening or another screening method is known as mortality reduction. The overall mortality decrease improves with an increase in the screening frequency and age range. Between the ages of 40 and 84, annual screening mammography results in a 40% decrease in mortality as compared to no screening. The annual screening program for those aged 40 to 49 years has a specific contribution to mortality reduction of 12% to 29%.Women between the ages of 40 and 49 who were screened for breast cancer at first had similar mortality ratios (observed death rate divided by predicted death rate) compared to women over 50. The number needed to screen (NNS), which indicates how many women must be screened in order to prevent one breast cancer mortality, is another frequently used statistic. The NNS declines with age because older women have a higher prevalence of breast cancer. A systematic review's estimates yield a NNS of 753 for women between the ages of 40 and 49, compared to 462 and 355 for women between the ages of 50 and 59 and 60 and 69, respectively.[10]

Because younger women often have longer life expectancies and more responsibilities in their personal and professional lives than older women, screening them for mortality has a bigger value. Women in their 40s are predicted to lose 30% of their years of life to breast cancer. While the incidence of breast cancer rises with age, the rise does not correspond with a reduction in life expectancy. For every 20 women in their 40s who participate in annual screening, they gain one year of life; whereas, in order to gain one year of life, 45 women in their 70s must participate in biannual screening.[10]

Early detection of breast cancer is achieved by screening. Screen-detected tumors are usually smaller and do not involve lymph nodes than symptomatic malignancies. The prognosis is therefore impacted; 5-year survival rates for localized disease are 99%, for regional disease (such as axillary lymph nodes), 86%, and for distant metastatic disease, just 27%. Treatment options are also influenced by stage, with more advanced cancer necessitating more severe surgery and radiation therapy. Data comparing the treatment modalities used by screened and unscreened women show this. Compared to screened women, women between the ages of 40 and 49 who do not get screened are 2.5 times more likely to have

chemotherapy, 4.6 times more likely to have axillary node dissection, and 3.4 times more likely to have a mastectomy. Increased post-surgical problems, such as prolonged pain and lymphedema, are linked to more extensive surgery.[10]

The most commonly cited risks of mammography screening are overdiagnosis, false-positives, anxiety, and radiation injury. Overdiagnosis is the term used to describe the finding of cancer during screening that would not have become clinically apparent during the woman's lifespan. There are two types of overdiagnosis: obligatory and non-obligatory. When a woman passes away from other causes before her screen-detected cancer manifests clinically, this is known as obligatory overdiagnosis. In cases where a malignancy detected on screen does not develop to become clinically evident, this is known as non-obligate overdiagnosis. Since the goal of all screening tests is to discover patients before they exhibit symptoms, some patients are overdiagnosed. Since it is unethical to measure overdiagnosed breast cancer directly, estimates are derived from observational data and randomized controlled trials. An overall estimate of 10% or less for breast cancer overdiagnosis is provided by well-designed research.[10]

False-positive recalls and false-positive biopsies are the two categories of "false-positives" in breast cancer screening. A false-positive recall occurs when a screening mammography returns a woman without breast cancer with further images to check a suspicious location. False-positive recall refers to a request for more imaging that is found to be normal or benign, rather than a woman being told she has breast cancer when in fact she does not. Age-related differences in false-positive recall rates between women and men are seen. If a woman begins yearly screening at age 40, she will typically experience one false-positive recall every ten years, however if she begins screening at age fifty, she would experience one false-positive recall every eleven and a half years.[10]

Because women in their 40s often have longer life expectancies, fewer comorbidities, and a higher chance of developing more aggressive breast cancer, the advantages and hazards of mammography screening differ for them from those for older women. Reduction in mortality, years of life preserved, and reduced treatment morbidity are the main advantages. Younger women experience more false positive recalls and biopsies that cause momentary concern than older women do. In this age group, concerns about radiation-induced cancer and overdiagnosis are negligible. Patients and physicians should collaborate to make all medical decisions individually tailored to each patient. Reducing the hazards associated with screening mammography for women in their 40s can significantly improve patient outcomes and tip the risk-benefit ratio in the right direction.[10]

CONCLUSION

In summary, mammography screening lowers the death rate from breast cancer, although the estimates are only marginally statistically significant, the effects are modest at younger ages, and the way cases were accumulated in trials affects the outcome. Screening for cancers at higher stages also lowers the risk of cancer in those 50 and older.

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