

A Systematic Review on Clinical Trials on the Different Approaches of Breast Cancer Screening Uptake in Improving Screening Attendance

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Background: The early stage of cancer can be asymptomatic. Thus, different strategies were utilized to increase breast screening attendance which resulted in better treatment outcomes. Therefore, this review aimed to provide evidence on the effectiveness of the different approaches of breast screening uptake in improving screening attendance.

Objectives: The primary objective of this systematic review was to determine the effectiveness of the different approaches to breast screening uptake in improving screening attendance. The secondary objective was to identify the socio-geographic profile that affects the screening uptake.

Methods: Online databases, such as PubMed and Cochrane Central Register of Controlled Trials, were searched for studies published between January 2010 to December 2020. This review only included comparative randomized clinical trials involving humans as the research participants. In addition, reference lists of included studies were reviewed to identify additional relevant papers.

Results: The study included the review of 12 randomized controlled trials. Seven studies were conducted in a European setting, two in the United States of America, another two studies in Asia, and one study conducted in Canada. The intervention strategy to increase screening uptake were diverse in different studies. Ten of these studies used multiple strategies, while the remaining two studies utilized individualized strategies. Most of the studies were individual-based interventions. One study was a group-based intervention. The results showed that these interventions increase the uptake of breast cancer screening than no intervention at all.

Conclusions: The review confirmed that any interventions to increase breast screening uptake showed favorable outcomes in increasing breast screening attendance. However, the effectiveness of any one specific intervention cannot be made as these interventional studies greatly varied in terms of their intervention, study population, and geographical area.

Key words: Systematic review, breast cancer screening

INTRODUCTION

Globally, cancer is one of the most common leading causes of death in women.¹ In 2018, among the various cancers, breast cancer is the most common type comprising 25.4% of the total number of new cancer cases.² In the Philippines, about 3 of every 100 Filipino women were estimated to develop breast cancer in their lifetime.³ According to Medscape, “breast cancer is the common term for a set of breast tumor subtypes with distinct molecular and cellular origins and clinical

behavior”.⁴ During the early stage, breast cancer could show no sign and symptom. Thus, could only be detected during diagnostic work-up and screening.⁵ Cancer screening is vital to improve cancer outcomes such as decreasing the likelihood of metastasis and cancer death.⁶ Different cancer screening programs are developed to address the issue of late cancer detection that subsequently results in poor prognosis. With early detection and proper screening approach, women diagnosed with breast cancer may have improved survival; may undergo less invasive and cost-effective treatment; and improved quality of life.⁷

According to the American Cancer Society, breast cancer screening, or breast screening, refers to the routine examinations and diagnostic tools used to find a disease in asymptomatic people.⁵ At present, there are three methods/approaches for screening that are cost-effective,

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practical, and reliable: 1) Mammography, 2) Clinical Breast Examination, and 3) Breast Self-examination.⁸ However, generally, mammography is recommended and once malignancy is highly suspected a needle biopsy is done.^{9,5}

Various breast screening programs hope to increase “breast screening uptake rate”. Breast screening uptake rate means the proportion of women qualified for screening who undergo mammography.¹⁰ The U.S. Preventive Services Task Force (USPSTF) recommends to have a biennial screening mammography by the age of 50 to 70 years.¹¹ On the other hand, the American Cancer Society 2015 Guideline for Breast Cancer Screening recommends that at the age of 40-44 annual screening can be started, but women aged 45 to 54 should be screened annually.⁵ Above 55 years old screening can be decreased to every two years.⁵

Patients’ adherence to the recommendation of a health provider regarding breast screening is however challenging because patients feel healthy. Hence, different strategies and approaches to increase screening attendance must be utilized to maximize the benefit of the screening. As early as the 1930s, the American Cancer Society campaigned through motivational messages of early detection.⁸ In a study conducted by Kiran, et al.¹², the uptake of a phone call was compared to a mailed letter, which showed that “phone calls were more effective than mailed letters at increasing uptake for cervical, breast, and colorectal cancer screening among women”. Moreover, a scoping review entitled “Interventions to increase breast and cervical cancer screening uptake among rural women” done by Atere-Roberts, Smith, and Hall¹³ revealed that interventions to improve attendance include patient navigation strategies, educational outreach programs, peer counseling, and small media initiatives.¹³ Research studies were conducted to estimate the magnitude of the effects of a specific strategy or multiple strategies to increase breast screening uptake, however, in the past five years, there were no latest systematic review or meta-analysis done to compare these different strategies to know which is more effective in increasing breast screening attendance. The last systematic review and meta-analysis done in 2013 by Gardner, Adams, and Jeffreys¹⁴, showed that multiple interventions were most effective. However, all the studies included were conducted in the United States of America.

The data from the previous studies and lack of latest reviews to identify approaches for breast screening uptake to improve attendance led the researchers to conduct this systematic review. With updated information, family physicians will be able to provide an appropriate recommendation that will enable the patient to have better chances of cure, over-all survival and quality of life.

General Objective

To conduct a systematic review on the different clinical trials regarding different approaches of breast screening uptake in improving screening attendance.

Specific Objectives

1. To determine the effectiveness of the different approaches to breast screening uptake in improving screening attendance.

2. To identify the socio-geographic profile that affects the screening uptake.

METHODS

This systematic review only included comparative randomized clinical trials involving humans as the research participants published in peer-reviewed journals of PubMed and clinical trials registered Cochrane Central Register of Controlled Trials. We used a search strategy which combined using the Boolean Operator “AND”, text-words and subject headings (MeSH or equivalent) representing the concepts relevant to our research question: Concept One: breast cancer screening or breast neoplasms screening or mammogram; Concept Two: uptake or screening attendance or intervention or program. We limited studies published as of January 2010. The language was limited to research studies in English. Reference lists of included studies were also reviewed to identify additional relevant papers.

Inclusion criteria for articles were: 1) eligible participants who are women of at least 40 years old with or without co-morbidities; 2) the study provided a description of a breast screening program through mammography, and 3) Interventions to increase screening attendance are different approaches such as a letter of invitation, person-to-person conversation, text messaging, phone call, electronic mails, etc. We excluded studies that evaluated other screening tests along with breast cancer screening.

All the titles and the abstracts retrieved by electronic searching were downloaded. Duplicate studies were then removed. Two independent reviewers initially screened the title and abstract that met the criteria then the full-text copy of all the articles that met the criteria was retrieved. In cases of doubt regarding the inclusion of the study based on abstracts, the articles were included for full-text article review. The two reviewers evaluated the full-text article and decided if the study should be included or not. Studies were assessed by each author in all aspects of study selection, “risk of bias” assessment, and data extraction. The decision to include or exclude was cross-checked by each reviewer.

Assessment of risk of bias for each study was applied using the criteria outlined in the Cochrane Handbook for Systematic Reviews of Interventions. The following were the domains: 1) Bias arising from the randomization process, 2) Bias due to deviations from intended interventions, 3) Bias due to missing outcome data, 4) Bias in measurement of the outcome, 5) Bias in selection of the reported result, and 6) any other source of bias. Each potential source of bias was judged as: “high” “low” or “some concerns”. A summary of the “Risk of bias” judgments across different studies for each domain was listed. An overall “Risk of bias” assessment (low risk of bias; some concerns; or high risk of bias) to each of the included studies was also assigned as follows: 1) Studies with low risk of bias for all key domains, or where it seems unlikely for bias to seriously alter the results were assigned to have a “low risk of bias”; 2) Studies to have some concerns in at least one domain, but not to be at a high risk of bias for any domain were assigned to “some concerns” bias, and 3) Studies with a high risk of bias in at least one domain or judged to have serious concerns for multiple domains in a way that substantially lowers confidence in the result

were assigned to have a “high risk of bias”. However, this overall risk bias assessment of the individual studies was not a ground to exclude studies, but it was included in the report for transparency. Disagreement in the above process was resolved by discussion between reviewers and opinions from a third reviewer.

We synthesized the data from our included studies that met inclusion criteria for this review by collating the study design, population, intervention strategies, control, and outcome. The 12 studies that met inclusion criteria for the review were found to be very heterogeneous thus meta-analysis was not done. Since the study design was already limited to a randomized control trial, the Jadad scoring system was not used. The results of this systematic review were reported following the PRISMA 2020 Statement.

This study was approved by the Cluster Ethics Review Committee (CERC) of the Department of Health Region XI Southern Philippines Medical Center. It was exempted from ethics review with a protocol registration number of P20112901. Likewise, this study was registered

in the Health Research and Development Information Network with a registration code of PHRR201120-003165.

RESULTS

The authors have identified 4,029 studies through a systematic search utilizing PubMed and 15 more through non-systematic search. After the duplicates were removed, there were only 3,893 studies left subjected for screening. The 3,800 studies were excluded based on the title alone. Out of 93 studies, 35 were excluded based on their abstract. Through this process, 58 studies were selected for full-text review.

Finally, 12 studies were able to meet the inclusion criteria and were considered in this review.

All 12 studies were conducted as a randomized controlled trial, as presented in Table 1. Aside from the study design, the authors also included the citation, sample size, study population, study setting, the intervention and control groups, and the outcome measurement.

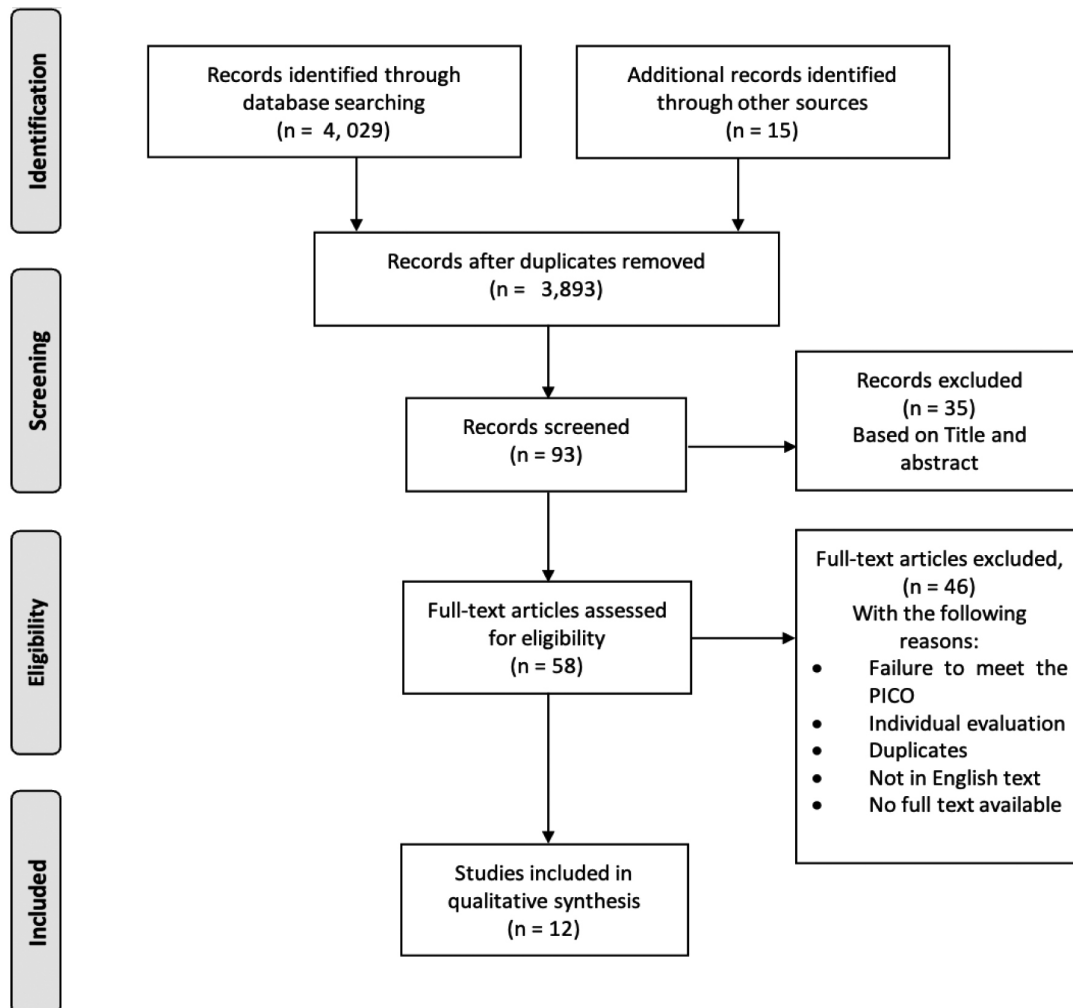


Figure 1. PRISMA flow diagram of studies.

Table 1. The Summary of characteristics of the included studies.

| Citation | Study Design | Sample Size | Study Population | Study Setting | Intervention Control | Outcome Measures |
|--|---|-------------|---|----------------------|---|--|
| GOELEN, et al. (2010) ¹⁷ | Individual-level randomized trial | 1 940 | 50-69 YEARS OLD | BELGIUM | I: Usual care + telephone reminder call C: Usual Care: Invitation letter and information leaflet | Screening mammogram obtained by target women within 4 weeks verified by screening database review |
| GIORDANO, et al. (2011) ¹⁵ | Multi-centric population-based randomized trial | 5 649 | 40-45 YEARS OLD | ITALY | I: (1) Pre-fixed appointment + standard leaflet (reference group) (2) Pre-fixed appointment + comprehensive booklet (3) Pre-fixed appointment + comprehensive booklet + the offer of a counseling session (4) Invitation to contact the center to get information and arrange participation (letter without any appointment) | Compliance at 12 months after the initial intervention |
| HEGENSCHIED, et al. (2011) ¹⁸ | Prospective Randomized Controlled Trial | 5 407 | 50-69 YEARS OLD | GERMANY | I: Written reminders + telephone counseling C: Written Reminders | Mammography utilization within 3 months. The screening unit provided a list of all women who participated. |
| ISHIKAWA, et al. (2012) ¹⁶ | Prospective Randomized Controlled Trial | 1 895 | 51 - 59 YEARS OLD (except 55 years old) | JAPAN | I: Tailored print reminder: (A) High Screening Intention (B) Low screening intention/ high cancer worry (C) Low screening intention / low cancer worry C: Non-Tailored print reminder: (A) High Screening Intention (B) Low screening intention/ high cancer worry (C) Low screening intention / low cancer worry | Participation in Community-organized mammography (Mammogram attendance data) within 5 months. |
| HEYDARI, & Noroozi, (2015) ²⁵ | Random Clinical Trial | 120 | OVER 40 YEARS OLD; elementary school teachers | IRAN (Bushehr, Iran) | I: HEALTH BELIEF MODEL: (1) Group Education (2) Multimedia Education | Screening results were taken |

| | | | | | | |
|--|---|--------|--|---|--|---|
| KERRISON, et al. (2015) ¹⁹ | A single-blind randomized controlled trial | 2 240 | 47-53 YEARS OLD | LONDON | I: Invitation in a standard office hour with a text message reminder C: Invitation in a standard office hour without a reminder | Breast screening attendance at the appointment. The secondary endpoint was attendance after 60 days of the appointment. Breast screening end codes available on the Breast Cancer Screening System were used to verify attendance |
| ALLGOOD, et al. (2016) ²⁰ | Randomized controlled trial | 22 828 | 50 - 70 YEARS OLD | ENGLAND (North-west) | I: Invitation reminder letter C: Usual invitation procedures no letter reminder | Self-report |
| BOURMAUD, et al. (2016) ²¹ | A randomized, multicenter, controlled trial | 15 844 | 50-74 YEARS OLD | FRANCE | I: DECIDEO Leaflet (decision aid group) C: Standard information leaflet | Attendance at the breast cancer screening |
| CHAMPION, et al. (2016) ²³ | Prospective Randomized Controlled Trial | 1 638 | 51-75 YEARS OLD | NORTH CAROLINA, UNITED STATES OF AMERICA | I: Tailored Interventions: (1) tailored interactive DVD (2) Computer-tailored telephone counseling C: Usual Care (Non-tailored interventions) | Attendance via Medical Records |
| GATHIRUA-MWANGI, et al. (2016) ²⁴ | Randomized controlled trial | 244 | 41-65 YEARS OLD African American Women | NORTH CAROLINA, UNITED STATES OF AMERICA | I: (1) DVD Intervention (2) Phone Intervention C: Usual Care | Mammography adherence via self-report or medical records |
| ALLGOOD, et al. (2017) ²² | An open, two-arm, randomized controlled trial | 26 054 | 50-70 YEARS OLD | ENGLAND (Derby, Hull, Plymouth, Sheffield, Southeast London, and West London) | I: Invitation to the second appointment with a fixed date and time C: Open invitation (Second invitation that consisted of a letter with a telephone number that the women should call to rebook) | Attendance |
| CHAN, et al. (2018) ²⁶ | Randomized double-blind trial | 5 498 | 51-73 YEARS OLD | CANADA | I: Reminder postcard + the signed letter together C: Reminder postcard alone | SMP database was queried to determine the attendance |

The 12 studies were published between 2010-2017. The total sample size was 89,357 with an individual study sample sizes ranging from 120 to 26,054. All involved in the studies were women who are not yet diagnosed with breast cancer or breast mass before. One study restricted only to women ages 40-45 years old.¹⁵ Another study included only women ages 51-59 years old with the exclusion of women aged 55 years old since a free screening coupon was provided by the local government.¹⁶ While the rest of the study had population ranges from 40 years old and above.

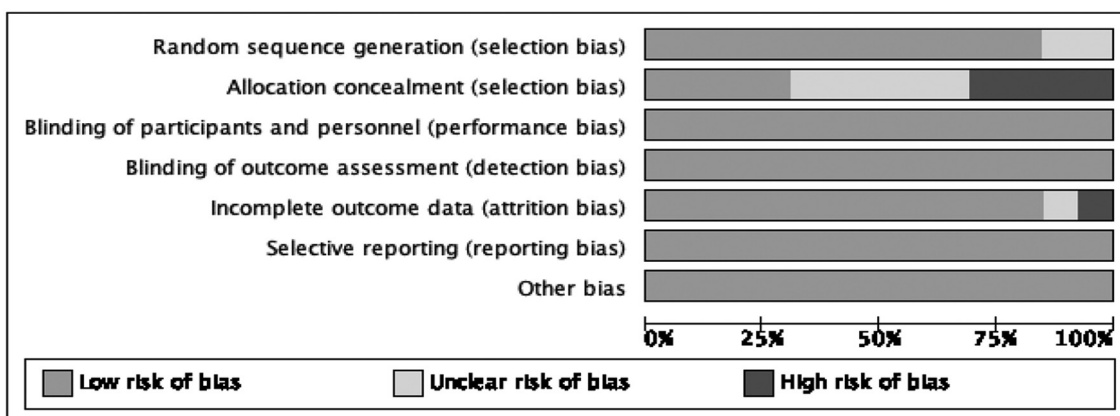
Most of the studies were conducted in a European setting.^{15,17-22} Two studies were conducted in the same state of the United States of America.^{23,24} Two studies were conducted in Asia: one in Japan and one in Iran.^{16,25} Furthermore, one study was conducted in Canada.²⁶

There is a diverse intervention strategy used in different studies. Most of these studies used multiple strategies (10/12) compared to individual strategies (2/12). One study was noted to be a group-based intervention in which it was patterned to the health belief model and the rest are individual-based interventions. These interventions include invitation letter or reminder letter, giving of an informative leaflet,

telephone reminder call, pre-fixed appointment, comprehensive booklet, counseling session via phone or face-to-face, text-message reminder, tailored print reminder, use of DVD, postcards, and signed letter.

A summary of this risk of bias is presented in figure 2. The study by Kerrison, et al.¹⁹, was divided into two since the interventions and the control groups were tested/evaluated twice: at the first appointment and then those who were not able to go with their first appointment were followed up after 60 days.

The blinding of participants and personnel, the blinding of the outcome assessment, selective reporting, and other biases were low in all studies. In random sequence generation, two studies showed an unclear risk of bias as the sequence for allocation was not sufficiently described. For the attrition bias, one study was considered to have an unclear risk of bias since it was not described, while one study revealed a high risk of bias. For the allocation concealment, four studies showed high-risk bias and five studies showed unclear bias. Overall, the risk of bias was considered low in the trials, despite the minor limitation in selection.



A.

| Study | Random sequence generation (selection bias) | Allocation concealment (selection bias) | Blinding of participants and personnel (performance bias) | Blinding of outcome assessment (detection bias) | Incomplete outcome data (attrition bias) | Selective reporting (reporting bias) | Other bias |
|----------------------|---|---|---|---|--|--------------------------------------|------------|
| Allgood 2017 | + | + | + | + | + | + | + |
| Bournaud 2016 | + | ? | + | + | + | + | + |
| Champion 2016 | ? | ? | + | + | + | + | + |
| Chan 2018 | + | ? | + | + | + | + | + |
| Gathirua-Mwangi 2016 | + | + | + | + | + | + | + |
| Giordano 2011 | + | + | + | + | + | + | + |
| Goelen 2010 | + | + | + | + | + | + | + |
| Hegenscheid 2011 | + | + | + | + | + | + | + |
| Heydari 2015 | ? | - | + | + | + | + | + |
| Ishikawa 2012 | + | - | + | + | + | + | + |
| Kerrison (1) 2015 | + | ? | + | + | + | + | + |
| Kerrison (2) 2015 | + | ? | + | + | + | + | + |
| Maxwell 2016 | + | + | + | + | + | + | + |

B.

Figure 2. Summary of risk of biases of the individual studies.

Table 2. Summary of the results of the interventions and the study limitations.

| Citation | Sample Size | Intervention and Control | Primary Outcome | Secondary Outcomes | Limitations |
|--|--|---|---|--|--|
| GOELEN, G., et al. (2010) ¹⁷ | 1 940 (358 control; 1582 intervention) | I: Usual care + telephone reminder call C: Usual Care: Invitation letter or information leaflet | Overall, 4% more women in the intervention group had screening mammography at 22% versus 18% in control, corresponding with a relative risk of 1.22 (p = 0.002) | | Baseline characteristics of the participants were not collected |
| GIORDANO, L., et al. (2011) ¹⁵ | 5 649 (no control group; Intervention group 1: 1615; group 2: 807; group 3: 807; group 4: 2420) | I: (1) pre-fixed appointment + standard leaflet (reference group) (2) Pre-fixed appointment + comprehensive booklet (3) Pre-fixed appointment + comprehensive booklet + the offer of a counseling session (4) Invitation to contact the center to get information and arrange participation (letter without any appointment) | Overall participation rate after 1st mailing was 28.3%, increasing to 38.7% after postal reminders. Compared with Group 1, the participation after the 1st mailing was up by 3.4% in Group 2, and down by 20 % in Group 4. After the reminders, the participation was up by 2.7% in group 2 and down by 2.7% in Group 4 (p = 0.23) No significant difference was observed in Group 3 compared with Group 1 (reference group), both after the first mailings (-0.7%) and reminders (-0.8%) (p= 0.74) There is a significant impact of the postal reminders observed among those allocated in Group 4, where the percentage of women attending after the postal reminder is at 18.6% versus 4.4% in the Reference group (p <0.001) | Regardless of intervention, attendance was higher for married women (OR=1.28, 95% CI 1.12-1.46), white-collar workers (OR=1.59, 95% CI 1.33-1.84), and women born in northern and central Italy (OR=1.14, 95% CI 1.00-1.29). The participation rate is increased among women living in areas where bus traveling time to reach was shorter less than 20 minutes (OR=1.67, 95% CI 1.45-1.92) and among those listed in rosters of collaborative GP (OR=1.09, 95% CI 1.00-1.26). Women with a female GP showed higher compliance compared to those with male GP (OR=1.12, 95% CI 1.00-1.26). | No analysis was done on how to improve women's knowledge and factors affecting their awareness in choosing to participate. the study involved only younger women. |
| HEGENSCHIED, K., et al. (2011) ¹⁸ | 5 407 (2952 control; 2455 intervention) | I: Written reminders + telephone counseling C: Written Reminders | Those in the intervention group showed a slightly higher attendance rate at 29.7 % (728/2455) versus 26.1% (770/2952) in control (p=0.0035) The subgroup of women for whom telephone numbers can be retrieved, the intervention group showed a significantly higher participation rate at 35.5% (574/1619) versus 29.7% (523/1762) in the control group (p = 0.0004) | | No demographic data collected The Cost-effectiveness of the intervention was not included |

ISHIKAWA, Y., et al. (2012)¹⁶ 1 895 (465 control; 1394 intervention)

I: Tailored print reminder: (A) High Screening Intention (B) Low screening intention/ high cancer worry (C) Low screening intention / low cancer worry

C: Non-Tailored print reminder: (A) High Screening Intention (B) Low screening intention/ high cancer worry (C) Low screening intention / low cancer worry

Tailored intervention group has higher participants at 19.9% (277/1394) versus 5.8% (27/465) in the non-tailored intervention group (OR: 4.02 (95% CI: 2.67-6.06) p<0.001)

Logistic regression analysis revealed that in Segment A, the tailored group has higher participants at 25.5% versus 7.3 % in the non-tailored group (p<0.001). In Segment B, the tailored group still has higher participants at 17.3 % versus 4.7 % in the non-tailored group (p=0.001). And in Segment C, the tailored group still has higher participants at 13.3% versus 4.6 % in the non-tailored group (p=0.009)

No significant difference between the intervention group and the control group when compared to Psychological Variable: (a) Subjective norms for screening (p=0.629) (b) Barriers toward screening (p=0.349) (c) Barriers to screening (p=0.899) (d) Lack of importance of screening (p=0.971) (e) Perceived health competence (p=0.219)

HEYDARI, E., Noroozi, A. (2015)²⁵ 120 (60 control; 60 intervention)

I: HEALTH BELIEF MODEL: (1) Group Education (2) Multimedia Education

Performed mammography: Significantly higher in Group Training 80% and 55% in the multimedia group (p=0.003)

No significant difference in demographic characteristics between the intervention and control groups.

KERRISON, R.S., et al. (2015)¹⁹ 2 240 (1118 control; 1122 intervention)

I: Invitation in a standard office hour with a text message reminder

C: Invitation in a standard office hour without the reminder

At first appointment: significantly higher among assigned to the text-message reminder arm of the study: 64.35% versus 59.12% in the no reminder arm (p= 0.01)

There was no significant difference between age groups (OR=0.97 (95% CI 0.82-1.16) p=0.74). But was socio-economically graded (OR = 1.25 (95% CI 1.16-1.34) p<0.001).

The differences in attendance between the subgroups of the population was not assessed due to the study design

After 60 days, text-message reminder arm remained significantly higher: 67.65% versus 62.88% in the no reminder arm (p = 0.02)

ALLGOOD, P. C., et al. (2016)²⁰ 22 828 (11445 control; 11383 intervention)

I: Invitation reminder letter

C: Usual invitation procedures no letter reminder

Within 30 days, those receiving the invitation letter reminder were significantly higher at 68.2% versus 64.2% in those who did not receive it (OR: 1.19 (95% CI: 1.13-1.26) p<0.001)

No significant difference between those who received the intervention group compared with the control group, for socioeconomic status, age at the first open appointment, or the timing of the screening.

the convenient use of odd and even SX numbers for allocation to the trial arm rather than formal randomization

Within 90 days, those receiving the invitation letter reminder were still significantly higher at 74.1% versus 71.1 % in those who did not receive it (OR: 1.16 (95% CI: 1.09-1.23) p<0.001)

| | | | | | |
|--|---|--|--|---|---|
| | | | <p>Within 180 days, those receiving the invitation letter reminder were significantly higher at 74.8% versus 72.1% in those who did not receive it (OR: 1.14 (95% CI: 1.08-1.22) $p < 0.001$)</p> <p>Overall, those receiving the invitation letter reminder were significantly higher at 49.9% versus 45.6% in those who did not receive it ($p < 0.001$)</p> | | |
| BOURMAUD, A., et al. (2016) ²¹ | 15 844 (7959 control; 7885 intervention) | <p>I: DECIDE0 Leaflet (decision aid group)</p> <p>C: Standard information leaflet</p> | The participation rate at 12 months, was significantly higher in the control group: 42.13% versus 40.25 % in the decision aid group ($p = 0.02$) | <p>Post-hoc analyses showed a heterogeneous effect of the decision aid. Mostly women living in two departments (Loire and Haute Loire $p < 0.0001$) or with lower estimated household income ($p = 0.03$) had a lower rate of screening attendance in the intervention group</p> <p>After logistic regression analyses, being in the intervention group (OR = 0.86; 95% CI [0.79-0.94] $p = 0.0008$), having previously attended breast cancer screening (OR = 15.7; 95% CI [14.2 - 17.4] $p < 0.0001$) and Household income between 25 000 and 35 000 euros (OR = 1.13; 95% CI [1.03-1.2] $p = 0.01$) was found out to be independently associated with attendance screening.</p> | <p>No variables assess decision-making processes such as knowledge, anxiety, decisional conflict, and preferences.</p> <p>Imbalance in the number of women excluded from analysis due to screening attendance before reception of the invitation (115 vs 41 in the intervention and control groups, respectively)</p> |
| CHAMPION, V.L., et al (2016) ²³ | 1 638 (537 control; 1101 intervention (a. DVD group=542; b. Telephone group=559)) | <p>I: Tailored Interventions: (1) tailored interactive DVD</p> <p>(2) Computer-tailored telephone counseling</p> <p>C: Usual Care (Non-tailored interventions)</p> | <p>Mammography adherence did not differ by the group after adjusting for co-variates when comparing DVD or Phone versus Usual Care.</p> <p>DVD versus phone were also tested using this model and this main effect was not significant ($p = 0.89$)</p> | <p>The following variables significantly predict adherence to mammography screening:</p> <ol style="list-style-type: none"> (1) Age (OR=1.03, 95% CI 1.02-1.05, $p < 0.0001$) (2) Baseline stage (Contemplation vs Pre-contemplation) (OR= 3.95, 95% CI 2.98-5.23, $p < 0.0001$) (3) Knowledge (OR=0.99, 95% CI 0.89-1.10, $p = 0.8739$) (4) Perceived Susceptibility (OR=1.03, 95% CI 1.00-1.107, $p = 0.051$) (5) Perceived barriers (OR=0.98, 95% CI 0.97-0.99, $p = 0.0018$) | <p>10% of the sample was missing medical record data and self-report data were substituted raising the probability of social desirability thereby influencing participant responses.</p> |

GATHIRUA-
MWANGI, W.G., et
al (2016)²⁴

244
(72 control; 172
intervention (87 DVD
intervention, 85 phone
intervention))

I: (1) Mailed Tailored
interactive DVD
(2) Tailored telephone
counseling

C: Usual Care (may range
from nothing to a post-card
reminder)

Overall mammography
uptake increased similarly
among all the three groups:
DVD intervention at 41%
(OR: 1.64, 95% CI: 0.80-
3.39), Phone intervention at
42% (OR: 1.24; 95% CI:
0.61-2.50) and usual care at
35% (p=0.6491)

Adjusting for baseline
demographic characteristics
showed neither DVD
intervention nor phone
intervention was more
efficacious when compared
to usual care.

Income and the intervention
on mammography adherence
were significant indicating a
moderation effect (p=0.026).
Among those with high
income (>+75K), those in the
control group were found to be
significantly higher at 47.1%
versus 35.3% in the DVD group
(OR=0.63, 95% CI 0.41-0.97,
p=0.0364). Phone group were
also significantly higher at
45.5% versus 35.3% in the
DVD group (OR=0.57, 95% CI
0.37-0.88, p=0.0106).
However, there was no
significant difference when the
phone group at 45.4% as
compared to 47.1% in the
control group (OR=1.11, 95%
CI 0.73-1.68, p=0.6393)

For those in the low and
Middle income (<75K), those
in the DVD group were found
significantly higher at 41.2%
versus 35.6% in the control
group (OR= 1.51, 95% CI 1.08,
2.13, p=0.0170). While both
telephone group versus control
and DVD versus Phone group
were found to have no
significant difference
(p=0.0977 and p=0.4471,
respectively)

By baseline stage-change:
Women who were in the
contemplation stage had
higher odds (OR=8.8, 95% CI
2.91-26.52) of adherence
compared to those in the pre-
contemplation stage.

By physician recommendation:
Women who had
mammography recommended

by their physicians were 3.2
times more likely to have a
mammogram compared to
women who did not have a
recommendation (OR =3.16,
95% CI 1.32-7.58).

By income group: for those
with income of ≤30k DVD was
more effective than usual care
(RR=5.34, 95% CI 1.12-25.42).

Although randomly
assigned, the usual
care group had
significantly higher
education levels.

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| ALLGOOD, P.C., et al. (2017) ²² | 26 054 (13247 control; 12807 intervention) | I: Invitation to the second appointment with a fixed date and time C: Open invitation (Second invitation that consisted of a letter with a telephone number that the women should call to rebook) | Within 90 days of the first offered appointment, those who received a second appointment with a fixed date and time were significantly higher at 22% versus 12 % in the control (RR=1.81, 95% CI 1.70-1.93, p<0.0001). Within 180 days, those who received intervention group were significantly higher at 24% versus 13% in the control (RR=1.77, 95% CI 1.67-1.88, p<0.0001) | Between age groups, participation in the younger women (50-52 years) within 90 days of the first offered appointment is significantly higher in the intervention group at 17% versus 7% in the control group (RR=2.42, 95% CI 1.99-2.95, p<0.0001). Within 180 days, the participation was still significantly higher in the intervention than in the control group (18% vs 8%, RR=2.33, 95% CI 1.93-2.80, p<0.0001) Those aged 53-70 years, within 90 days of the first offered appointment are significantly higher in the intervention group at 7% versus 2% in the control group (RR=3.58, 95% CI 2.80-4.58, p<0.0001). Within 180 days, the participation was still significantly higher in the intervention than in the control group (7% vs 2%, RR=3.28, 95% CI 2.61-4.13, p<0.0001). Although the number of women participating was diminishing with increasing time, all results were significantly higher in the intervention group than in the control group. When analyzed according to the national IMD quintile, the most deprived quintile (1 & 2) has higher RRs than the other quintiles. For the 3 rd to 5 th quintile, RRs decrease for the affluent women. All of which are significantly in favor of the intervention group than the control group regardless of whether within 90 or 180 days. | 20% of women were excluded after the randomization The use of pseudo-randomization, allocating to trial group by whether the SX number odd or even. |
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| CHAN, E.K., et al. (2018) ²⁶ | 5 498 (2749 control; 2749 intervention) | I: Reminder postcard + the signed letter together C: Reminder postcard alone | After six months, Women who attended for screening mammography in the letter arm were significantly higher at 34.4% versus 24.0% in the control arm (RR: 1.43 (95% CI:1.32-1.56) p<0.001) | Women in the letter arm were more likely to return for screening mammography than women in the control arm (RR=1.41, 95% CI 1.30-1.54); those who are aged 60-73 were more likely to attend than those at the age group of 51-59 (RR=1.03, 95% CI 0.95-1.11). Those who have more than one previous screening mammogram are more likely to return than the initial screeners (R=1.85, 95% CI 1.60-2.15). And women who are 6-14 months overdue are more likely to return than those >15 months overdue (RR=1.57, 95% CI 1.43-1.73). | It was not determined whether reminder letters would be as effective if signed by another health professional. The study did not determine if electronic signatures or text message reminders would be as effective as letters with handwritten signatures. |
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Written Reminders / Invitation Letters

Among the 12 studies, four studies used invitation reminders or written letters as an intervention to increase breast cancer screening uptake, and one study used invitation letters as part of the reference group. The study by Allgood, et al.²⁰ in 2016 found evidence that those women in England receiving the invitation reminder letter were more likely to attend than those who did not receive an invitation letter (68.2% vs 64.2%, OR 1.19 (95% CI = 1.13-1.26), p<0.001). The study's secondary endpoint revealed the same results within 90 days, 180 days, and at the date and time of the first offered appointment (FOA) favoring usual care with invitation reminder letter than not receiving an invitation letter.²⁰ In 2017, Chan, et al.²⁶, after 6 months of mailing reminder postcards or letters, found out that more women in Canada attended for mammography in those who received postcard reminders plus the signed letter together than those who receive the postcard alone (34.4% (947/2747) vs 24.0% (660/2749), RR: 1.43 (95% CI:1.32-1.56) p<0.001). In the same year, another study was published that was conducted in England which revealed that those women who received an invitation letter with a fixed date and time for a second appointment were more likely to attend than those with open invitation (22% (2861/12807) vs 12% (1632/13247); RR 1.81 (95% CI: 1.70-1.93) p<0.0001).²² In the study by Giordano, et al.¹⁵, there is a note of a higher uptake of breast cancer screening when invitation letters were given after the first contact of the participants.

In 2012, the study done in an urban area in Japan, the tailored print reminder was more effective by 19.9% (277/1394) versus 5.8% (27/465) in the non-tailored print reminder (OR: 4.02 (95% CI: 2.67-6.06) p<0.001).¹⁶ Even with the Logistic regression analysis, the results revealed that the respondents within the tailored intervention group were more likely to attend breast cancer screening than those in each corresponding segment in the non-tailored intervention group.¹⁶

Information Leaflet/Booklet

Two of the studies used information leaflets or booklets as interventions. In a study with women registered with the French Health Insurance Systems, the use of Decision Aid or the DECIDEO leaflet reduced the attendance rate than those who received the standard information leaflet after 12 months (40.25% vs 42.13%, p= 0.02).²¹ While a study in Italy found out that neither providing a letter with a fixed appointment along with a comprehensive booklet and/or with an opportunity to arrange a face-to-face encounter significantly affects the uptake of breast cancer screening when compared to a letter with a fixed appointment and the standard informative leaflet.¹⁵

Telephone Calls

Two studies in a European setting studied the use of telephone calls in increasing breast cancer screening uptake. The study by Goelen, De Clercq, and Hanssens¹⁷ concluded that more women in Belgium were given invitation letters with telephone call reminders had screening mammography versus invitation letters alone which correspond to a relative risk of 1.22. A study conducted in Germany conceded the same results in favor of written reminders with telephone counseling compared to written reminders alone.¹⁸

Text-Message Reminder

Only one study used text-message as an intervention to a hard-to-reach population in London. At the first appointment, the text-message reminder was effective in increasing breast cancer screening attendance than those with no reminder (64.35% vs 59.12%, OR: 1.26 (95% CI: 1.05-1.48) p=0.01). In the same study by Kerrison, et al.¹⁹, for the non-attendees initially, text message reminder was still effective 60

days after the initial appointment (67.65% vs 62.88%, OR:1.23 (95% CI: 1.04-1.47) $p=0.02$).

Multimedia

Two separate studies conducted in the African American women in Indiana and women in Texas utilized new technology using available media such as DVD. Both studies concluded that neither the DVD nor telephone counseling intervention was more effective when compared to usual care.^{23,24}

Lastly, one study in Iran compared multimedia education with the use of DVD to group education (both interventions were based on the Health Belief Model). Among the female elementary school teachers in Iran, group education yielded higher participation rates versus in the multimedia group after 3 months (80% (48/60) vs 55% (33/60), $p=0.003$).²⁵

Factors Affecting Breast Cancer Screening Uptake

The researchers also summarized factors such as socio-geographic profile affecting the uptake of breast cancer screening in table 2. Among the 12 studies included in this review, three studies did not assess baseline characteristics of the participants; hence, no association was done.

Among the 12 studies, two studies have no significant sociodemographic characteristics according to two groups.^{20,25} Along with Kerrison, et al.¹⁹, these studies agreed that age had no significant difference. However, two studies stated that older women were more likely to obtain a mammogram, and that age significantly increases the uptake of breast cancer screening in the intervention group.^{23,26}

While five studies discussed the significance of the socio-economic profile of the participants. Four studies concluded that those with lower income had increased the mammography uptake.^{19,22-24} However, in the study by Bourmaud, et al.²¹, women with a lower estimated household income had a lower screening attendance.

One study in Italy revealed that being married, having a white-collar job, and being born in Northern and Central Italy are more likely to increase mammography attendance regardless of intervention.¹⁵ Geographically, one study in England showed that those who live in Bolton are 1.30 times more likely to increase attendance in the intervention group than those enrolled at Wigan and Liverpool.²⁰ It was also noted that women with a travel time of less than 20 minutes to the screening site were 1.67 times more likely to participate.¹⁵

According to Ishikawa, et al.¹⁶ there was no significant difference between the intervention group and the control group when compared to the psychological variable. However, according to Gathirua-Mwangi, et al.²⁴, women in the contemplation stage had higher odds of adherence than those in the pre-contemplation stage. This was also supported by Champion, et al.²³, stating that women at the contemplating stage at baseline and those who had fewer perceived barriers were more likely to adhere to mammography screening.

Two studies showed that having a collaborative general physician or GP showed an increased participation rate.^{23,24} One study also mentioned that women are more likely to adhere to breast cancer

screening when they have a female GP than a male GP.²³ Lastly, those women who already have previously attended breast cancer screening were more likely to adhere to mammography screening.^{21,26}

Overall, the factors that affect the uptake of the breast cancer screening were found out to be heterogeneous and would vary depending on the approach of the intervention group and control group.

DISCUSSION

The twelve studies in this systematic review synthesized the effectiveness of the different approaches of breast cancer screening uptake in improving screening attendance. The results showed that these interventions increase the uptake of breast cancer screening than no intervention at all. In addition, the researchers could not make a generalizable conclusion on the effectiveness of any one specific intervention as these interventional studies varied greatly in terms of their intervention (multiple vs single interventions), study population, and geographical area. Similar results were also noted in two systematic reviews on interventions to increase the uptake of breast cancer screening.^{14,27}

In terms of interventions, there were no novel interventions administered to the study population. Most of the multiple interventions were observed to be more effective than single intervention or no intervention at all.^{15,17-19,26} This finding was supported by Lu, et al.¹⁷ stating that using a combination of multiple strategies will be more likely to be successful than single interventions especially in a targeted population.

This review also identified factors that are associated with breast cancer screening uptake among women. Based on the 12 studies, these are the mentioned factors that yielded a positive effect in breast cancer screening uptake: Being older, being married, having a white-collar job, living near the screening site, or those with lesser travel time to the screening sites, those who are in contemplating stage, having a collaborative physician, especially female physicians, and those who have previously attended breast cancer screening.

These findings were congruent with the findings of Mandrik, et al.²⁸ in their recent systematic review addressing the assessment of the determinants of the participation rates in breast cancer screening programs which revealed that healthcare provider's recommendations, organizational factors, interventions such as fixed appointments, reminders, and providers' prompts resulted to positive effects (increasing mammography rates).

This review also found an inconsistent result regarding the socio-economic profile of participants when three studies stated that those in lower economic status are more likely to attend/participate while only one study stated that those with lower estimated household income had a lower screening attendance.^{19,21-24} This is probably due to the intervention used and geographical factors.²¹ These socioeconomic disparities were also similar to a systematic review by Mandrik, et al.²⁸ However, one study using the cross-sectional time series analysis of the 17 European countries concluded that socioeconomic variables were not associated with participation rates.²⁹ Thus, supports the findings on the geographic differences in screening outcomes since most of the

European Health Systems offers free or inexpensive settings. Overall, the effectiveness of interventions varies with the population, the geographical area, and the mode of delivery of the intervention.

Despite the efforts to identify all relevant data, the researchers may have missed some important literature related to the topic. Most of the studies in this systematic review were conducted in non-Asian countries except for Japan, thus, the applicability of the results in the Philippines may be different.

CONCLUSIONS AND RECOMMENDATION

In conclusion, this review confirmed that any interventions may it be single or multiple approaches to increase breast screening uptake showed favorable outcomes in increasing breast screening attendance. However, a generalizable conclusion on the effectiveness of any one specific intervention can't be made as these interventional studies varied greatly in terms of their intervention, study population, and geographical area. The application of the study results may also vary considering the health care system inequalities.

It is therefore highly recommended that more randomized controlled trials will be done in the future, especially here in the Philippines, so that another systematic review, and possibly a meta-analysis can be conducted.

REFERENCES

- World Health Organization. (2020, November 9). Newsroom. Retrieved from World Health Organization: <https://www.who.int/news-room/fact-sheets/detail/cancer>
- International WC. (n.d.). Worldwide Cancer Data: Global cancer statistics for the most common cancers. Retrieved from World Cancer Research Fund International: <https://www.wcrf.org/dietandcancer/cancer-trends/worldwide-cancer-data#:~:text=Breast%20cancer%20was%20the%20most,non%20melanoma%20skin%20cancer>.
- Cudis C. (2019, March 6). Top diseases that kill women in PH. Retrieved from Philippine New Agency: <https://www.pna.gov.ph/articles/1063773#:~:text=Doctors%20estimate%20that%20three%20out,known%20cause%20of%20breast%20cancer>.
- Chalasan P. (2020). Breast Cancer. Medcape, 1.
- American Cancer Society. (2019). Breast Cancer Facts and Figures 2019-2020. Atlanta, Georgia, United States of America.
- Barrat A e. (2002). Cancer screening. *BMJ*, 900.
- Desreux JA. Breast Cancer Screening in Young Women. *European J Obstet Gynecol Reprod Biol* 2018; 208-11. DOI:DOI: 10.1016/j.ejog rb.2018.05.018.
- Coleman C. Early detection and screening for breast cancer. *Sem Oncol Nurs* 2017; 141-55. DOI:DOI: 10.1016/j.soncn.2017.02.009.
- American Cancer Society, Inc. (2020, November 17). American Cancer Society Recommendations for the Early Detection of Breast Cancer. Retrieved from American Cancer Society: https://www.cancer.org/cancer/breast-cancer/screening-tests-and-early-detection/american-cancer-society-recommendations-for-the-early-detection-of-breast-cancer.html#written_by
- Public Health Agency. (n.d.). Public Health Agency: Young Person and Adult Screening Team. Retrieved from Northern Ireland Cancer Screening Programmes Website: http://www.cancerscreening.hscni.net/Breast_Uptake_Rates.htm
- U.S. Preventive Services Task Force. (2016, January 11). Breast Cancer: Screening. Retrieved from U.S. Preventive Services Task Force: <https://www.uspreventiveservicestaskforce.org/uspstf/recommendation/breast-cancer-screening>
- Kiran T, Davie S, Moineddin R & Lofters A. Mailed letter versus phone call to increase uptake of cancer screening: A pragmatic, randomized trial. *J Am Board Fam Med* 2018; 857-68.
- Atere-Roberts J, Smith J & Hall I. Interventions to increase breast and cervical cancer screening uptake among rural women. 2020. Retrieved from Springer Link: <https://link.springer.com/article/10.1007/s10552-020-01340-x>
- Gardner MP, Adams A & Jeffreys M. Interventions to increase the uptake of mammography amongst low-income women: A systematic review and meta-analysis. 2013. Retrieved July 14, 2021. *PLoS ONE* 8(2): e55574. <https://doi.org/10.1371/journal.pone.0055574>
- Giordano L, Stefanini V, Senore C, Figerio A, Castagno R, Marra V, Segnan N. The impact of different communication and organizational strategies on mammography screening uptake in women aged 40-45 years. *Eur J Public Health* 2011; 413-8.
- Ishikawa Y, Hirai K, Saito H, Fukuyoshi J, Yonekura A, Harada K, Nakamura Y. Cost-effectiveness of a tailored intervention designed to increase breast cancer screening among a non-adherent population: A Randomized Controlled Trial. *BMC Public Health* 2012; 760.
- Goelen G, De Clercq G & Hanssens S. A community peer-volunteer telephone reminder call to increase breast-screening attendance. *Oncol Nurs Forum* 2010; e312-e317.
- Hegenscheid K, Hoffmann W, Fochler S, Domin M, Weiss S, Hartmann B, Hosten N. Telephone counseling and attendance in a national mammography-screening program: A randomized controlled trial. *Am J Prev Med* 2011; 421-7.
- Kerrison R, Shukla H, Cunningham D, Oyebo O & Friedman E. Text-message reminders increase uptake of routine breast screening appointments: A randomised controlled trial in a hard-to-reach population. *Br J Cancer* 2015; 1005-10.
- Allgood PC, Maxwell AJ, Hudson S, Offman J, Hutchison G, Beattie C, Duffy S. A randomised trial of the effect of postal reminders on attendance for breast screening. *Br J Cancer* 2016; 171-6.
- Bourmaud A, Soler-Michel P, Oriol M, Regnier V, Tinquaut F, Nourissat A, Chauvin F. Decision aid on breast cancer screening attendance rate: Results of a large-scale, randomized, controlled study by the DECIDE0 group. *Oncotarget* 2016; 12885-92.
- Allgood PC, Maroni R, Hudson S, Offman J, Turnbull AE, Peacock L, Duf Effect of second timed appointments for non-attenders of breast cancer screening in England: A randomised controlled trial. *Lancet Oncol* 2017; 972-80.
- Champion VL, Rawl SM, Bourff SA, Champion KM, Smith LG, Buchanan AH, Skinner CS. Randomize trial of DVD, telephone, and usual care for increasing mammography adherence. *J Health Psychol* 2016; 916-26.
- Gathirua-Mwangi WG, Monahan PO, Stump T, Rawl SM, Skinner C & Champion VL. (2016). Mammography adherence in African American women: Results of a randomized controlled trial. *Ann Behav Med* 2016; 70-8.
- Heydari E & Noroozi A. Comparison of two different educational methods for teachers' mammography based in the health belief system. *Asian Pacific J Cancer Prev* 2015; 6981-6.
- Chan EK, Wilson C, Tyldesley S, Olivotto IA, Lai A, Sam J, Nichol A. Signed family physician reminder letters to women overdue for screening mammography: A randomized clinical trial. *J Med Screen* 2018; 149-54.
- Lu M, Mortiz S, Lorenzetti D, Straus L, Straus S & Quan H. A systematic review of interventions to increase breast and cervical cancer screening uptake among Asian women. *BMC Public Health* 2012; 413.
- Mandrik O, Tolma E, Zielonke N, Meheus F, Ordonez-Reyes C, Severens J & Murillo R. (2021). Systematic review as a "lens of evidence": Determinants of participation in breast cancer screening. *J Med Screen* 2021; 70-9.
- Gianino MM, Lenzi J, Bonaudo M, Fantini MP, Siliquini R, Ricciardi W & Damiani G. Organized screening programmes for breast and cervical cancer in 17 EU countries: Trajectories of attendance rates. *BCM Public Health* 2018; 1236.