

SYSTEMATIC REVIEW

Workplace-based Interventions to Increase Mammography Screening in Islamic Countries: A Systematic Review and Narrative Summary

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ABSTRACT

Introduction: Breast cancer is a contributing factor to women's death. Mammography screening uptake is low in Islamic countries compared to non-Islamic countries. In Saudi Arabia, a first step is to develop an appropriate intervention at workplace to increase mammography screening rates, this review was conducted to update current knowledge on the effectiveness of existing workplace interventions to enhance mammography screening uptake in Saudi Arabia. **Methods:** A systematic review and narrative syntheses was conducted. All studies that assessed the effectiveness of workplace interventions to increase mammography screening uptake among female employees were included. This review was registered on PROSPERO with the number CRD42021281744. **Results:** Three studies were included. All the studies evaluated a workplace educational intervention aiming to increase mammography screening uptake. It was found that workplace-based interventions increase breast mammography screening uptake while the effectiveness of the existing workplace intervention remains questionable and further research is warranted to improve our understanding of how we can successfully improve mammography screening among women in Islamic countries. **Conclusion:** This review has demonstrated that the effectiveness of the existing workplace interventions to increase mammography screening uptake remains unclear. It was also found that no studies about workplace interventions in Islamic countries.

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INTRODUCTION

Breast cancer in women is a common public health issue and is one of the leading causes of death in women globally (1). Based on GLOBOCAN 2012 estimates, about 1.7 million women were diagnosed with breast cancer in 2012, and there were 6.3 million women alive who had been diagnosed with breast cancer in the previous five years (1). Most countries in the Organization for Economic Cooperation and Development (OECD) have adopted mammography screening programs as an effective way to detect the disease early (1).

Mortality rates have declined in most OECD countries

over the past decade, which is a reflection of improvements in early detection that are attributed to mammography screening and treatment of breast cancer. For example, in the United Kingdom, mortality rates of breast cancer have been dropping steadily since 1990 and attributed to earlier detection due to mammography screening and better treatment (3). However, the importance of mammographic breast screening in reducing mortality has been questioned. In Islamic countries, levels of screening are very low, and mortality is high among younger women compared to Western countries. Thus, screening remains an important strategy in detecting breast cancers early (4).

In Gulf Cooperation Council (GCC) countries, the incidence rates of breast cancer are highest in Bahrain (49.8 per 100,000 individuals), followed by Kuwait (47.7 per 100,000 individuals) and Qatar (38.1 per 100,000 individuals). The incidence rate in Qatar is higher than in Saudi Arabia, where the incidence is 22.4, as well

as Yemen, where the incidence is 20.8 per 100,000 individuals for the same time period (1998–2001) (5).

According to the Saudi Cancer registry (6), there has been a significant increase in women presenting with late-stage breast cancer in many Islamic countries, such as Egypt, Yemen, Saudi Arabia, and Oman, particularly stages 3 and 4. The rates of late-stage disease have been reported across a number of studies that investigated mammography screening practices in Saudi Arabia (4, 7, 8). A systematic review by Najjar et al. reported findings from 18 studies, which indicated that Arab women present with breast cancer at a younger age (at least a decade earlier) than women in most Western countries. The average and median ages were 48 and 48.5 years old, respectively. Moreover, 65.6% of the women were younger than 50 years in 11 studies.4 According to the Karachi Cancer Registry, breast cancer is the most common cancer among females (34.6% of cancer cases) (9, 10).

Data indicates clearly that breast cancer incidence and mortality among women living in Islamic countries are high. Although there have been steps by Saudi Arabia to offer a free national screening programme, numbers accessing this service remain very low at 19% (11). It is unclear what strategies are being used to increase screening participation. The workplace has been recognized as an important and appropriate setting for health promotion, in general, and breast cancer education and screening in particular (12). Workplace interventions may be useful to increase mammography for the following reasons: i) workplace interventions may reach a large number of women located in one site; ii) represent a setting in which interventions may be offered repeatedly over time (13); iii) may encourage sustained peer support and positive peer pressure to attend breast screening (14). this review was conducted to update current knowledge on the effectiveness of existing workplace interventions to enhance mammography screening uptake in Saudi Arabia.

METHODS

Research strategy

Searches were performed by one reviewer (RP) using the range of databases available to the team. The databases used were: AMED, ASSIA, CINAHL, Cochrane, EmBase, ERIC, Health Business Elite, HMC, Medline, Prospero, Scopus, Web of Science and the Centre for Dissemination, York databases. Databases were searched for trials of workplace interventions regarding breast neoplasms targeting employees which are in English or Arabic with no date restriction. All titles were exported to Refworks, a web-based commercial reference management software package and checked for duplicates. The search terms used for Ovid Medline are shown in Table I. This review was registered on PROSPERO with the number CRD42021281744.

Table I: Ovid MEDLINE search terms and results

Searches	Result	Search type
Exp breast neoplasms/	250726	Advanced
exp mass screening/	111809	Advanced
1 and 2	9441	Advanced
exp mammography/	26734	Advanced
3 and 4	30016	Advanced
breast* screen*.af.	1999	Advanced
mammograp*.af.	32524	Advanced
5 or 6 or 7	35744	Advanced
breast neoplasm* or breast cancer* or breast tum?r*).af.	286330	Advanced
8 and 9	29175	Advanced
(breast self-examination or bse).af.	4837	Advanced
breast awar*.af.	69	Advanced
10 or 11 or 12	33006	Advanced
exp workplace/ or exp occupational health/	41617	Advanced
(workplac* or work-plac* or occupational*).af.	306374	Advanced
14 or 15	306374	Advanced
exp health education/ or exp health promotion/	203063	Advanced
16 and 17	8508	Advanced
intervention*.af.	696996	Advanced
18 and 19	2190	Advanced
13 and 20	7	Advanced
13 and 18	36	Advanced
21 or 22	36	Advanced

Eligibility criteria and selection process

Inclusion criteria for included studies, they were reviewed for titles and abstracts and selected based on the following criteria:

- 1) Language: any article in the English language or Arabic.
- 2) Type of study: interventional, Before-and-after studies and randomized and non-randomised controlled trials.
- 3) Type of participants: women in the workplace.
- 4) Type of intervention: a workplace intervention.
- 5) Type of outcomes: mammography uptake by self-report or verified report in a clinical database or medical record.

Data extraction processes

One reviewer (MH) screened the studies for titles and abstracts. Studies that appeared to meet inclusion criteria were checked for possible inclusion using the full paper copy by all three reviewers (MH, GH, SC). Data were then extracted from relevant studies by one reviewer (MH) and then discussed and checked by the two other reviewers (GH, SC) using the tools described below. Any disagreements at any stage were resolved through discussion among all of the reviewers.

Risk of bias

The Cochrane Risk of Bias tool (15) was used which

addressed the six specific domains (sequence generation, allocation concealment, blinding, incomplete outcome data, selective outcome reporting and other issues), judgment is then made on whether the study at high, low, or unclear risk of bias.

Study methods

The Consolidated Standards of Reporting Trials (CONSORT) (16) was used to extract information about the included studies' methods. The CONSORT Statement comprises a 25-item checklist. The checklist items focus on reporting a study's aims and objectives, methods, participants and numbers analysed, statistical methods and results of analysis and discussion (e.g., limitations, generalizability and interpretation).

Intervention description

The TIDieR checklist (17) was developed to describe interventions in sufficient detail to allow their replication. It was used in this systematic review to describe the intervention.

Intervention function

An intervention function checklist developed by Michie and colleagues (18) was used to describe the function of the workplace intervention. The checklist designates nine functions: education (e.g. increasing knowledge or understanding of the mammography screening procedures), persuasion (using communication to induce positive or negative feelings or stimulate action e.g. a photograph of a woman smiling with her family who attended mammography and as a result her breast cancer was detected early and she was successfully treated), incentivisation (creating expectation of reward e.g. a gift voucher for attending mammography), training (imparting skills e.g. teaching women the process of getting a mammography appointment), enablement (increasing means/reducing barriers to increase capability or opportunity e.g. providing transportation to attending mammography), coercion (creating expectation of punishment or cost e.g. reduce a day of annual leave), restriction (using rules to reduce the opportunity to engage in the target behaviour e.g. age restriction), environmental restructuring (changing the physical or social context e.g. mobile mammography van placed in the workplace car park), and modelling (providing an example for people to aspire to or imitate e.g. advertisement of well-known female politicians advocating mammography).

Narrative synthesis of results

Lucas et al. (2007), (19) emphasize the value of narrative synthesis as a means of synthesizing qualitative and quantitative data in literature reviews. Synthesis involves the collation, combination and summary of the findings of the individual studies included in the systematic review (20). These findings can then be presented in narrative, tabular and/or both forms (21). Narrative synthesis comprises highlighting the similarities and

differences on the interventions and methods of reports in the included studies. In addition, it also allows for the combination of both numerical and descriptive statistics in such a manner that provides explanations for both similarities and inconsistencies in research (22). It was therefore decided that a narrative synthesis would be the method of choice for the critical analysis and presentation of information in the review.

RESULTS

Included studies

The flow diagram in Figure 1 presents the selection process of the studies and the reasons for inclusion or exclusion of the articles from this systematic review. Electronic database searches identified 641 potentially relevant research studies, the number of which was reduced to 522, after 119 duplicate results were removed. The titles and abstracts of all identified studies were then screened by one reviewer (MH), based on the inclusion and exclusion criteria outlined in the methodology section of this review. As a result, 469 studies were deemed not relevant to the topic of this review, and thus were excluded from further analysis. The full texts of the remaining 53 articles were then retrieved and analysed by all three reviewers (MH, GH, SC). Of those, 50 were excluded as they did not meet the inclusion criteria, namely the type of study (18), type of participant (4), type of intervention (22), type of

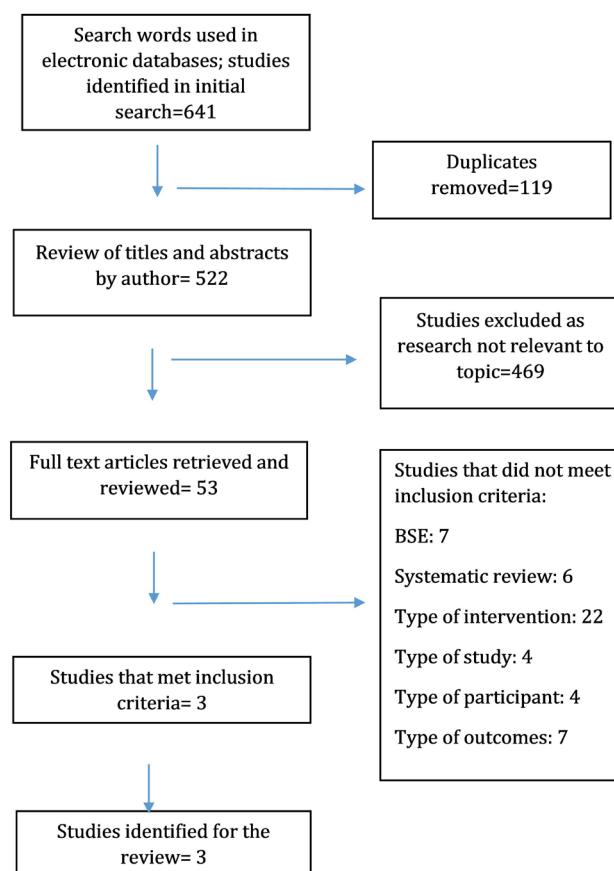


Figure 1: PRISMA Flow diagram of study selection process including exclusions

outcomes (7), type of article (6), and due to not focusing on mammography screening (7). Three articles were thus deemed appropriate for this systematic review as they met the inclusion criteria. Of those three, two studies were focused solely on mammography, and one study focused on both mammography and cervical cancer screening. Of the three intervention studies selected for the analysis in the review, two have been conducted in the United States (13, 23) and one in China (24).

Risk of bias

The results of the assessment of the bias risks are presented in the “Risk of bias” Table II for each of the three articles. The studies were evaluated to be at high risk of bias in several assessment areas, particularly in terms of allocation concealment and blinding the participants, and, subsequently, in blinding of the outcome assessment. For the three studies, there was a low risk of selective reporting and other bias (13, 23, 24).

Primary outcome (mammography screening) and target group

Two studies were carried out in the United States (Mayer et al 1993; Allen et al 2001) and one study (24) was carried out in China. The study by Ma et al. (2012) examined the impact of a workplace intervention on increasing mammography screening rates at eight worksites in Nanjing, four were assigned to the intervention (n=232) and received breast cancer education and screening navigation (24). Four were assigned to the control group (n=221) and they received general cancer education and a delayed intervention. Pre, post-program and 6 months follow-up data were collected to assess mammography uptake. At 6-month follow-up the authors reported an increase in mammography uptake in the intervention group from 10.3% at baseline to 72.6% compared to the control group that reported 5.9% at baseline with a decrease in mammography uptake of 4.7% (24).

The study by Mayer et al (1993), (23) implemented a one-year education program to promote mammography screening uptake for employees at one campus within the state university system. A second campus served as a control site. Pre and post intervention measurements were recorded. In the intervention group (ages 40-49 years) (n=216), a 17.6% increase in mammography

uptake was reported between baseline (40.3%) and one year (57.9%) compared with the control group (n=220) that reported a change of 13.6% between baseline (46.4%) and one year (60%). This was not statistically significant. In the age group ≥50 years, the intervention group (n=168) also reported a higher change in the uptake of mammography compared to the control group (n=159) that reported a change of 11.9% between baseline (55.4%) and one year (67.3%). when the control group was reported a change of 6.3% between baseline (61.6%) and one year (67.9%). A significant increase occurred at the intervention campus but not at the control campus (23).

As Allen et al (2001) findings, from one study aimed to screening uptake for breast and cervical cancer, twenty-seven worksites were allocated randomly into intervention or comparison group (13). The group discussions, outreach, and educational campaigns were used in the implemented intervention program. The use of mammogram in intervention group was high 7.2% compared to 5.6% among control group. After work site cluster and age strata were controlled for, the observed increase on mammography screening rates was not statistically significant in the intervention group (13).

Intervention description

The interventions for each study are presented in Table III. A brief narrative summary of each of the three interventions are presented below:

The Picture of Health Mammography Project (23) intervention was a one-year programme for employees at one campus of a state university system, and included a combination of print media that were distributed among the female employees, and the group workshops, including role-playing demonstrations to maximise the effectiveness of the programme.

The Woman to Woman intervention (13) was a 16-month programme that comprised a series of 19 discussion sessions performed in six small groups of participants. The sessions included role modelling and learning through vicarious experience and highlighted benefits of mammography. Additionally, the programme included the one-to-one outreach that was aimed at those individuals that did not attend the group sessions. The programme was further supplemented by events and

Table II: Risk of bias

Authors	Selection bias		Performance bias	Detection bias	Attrition bias	Reporting bias	Other bias
	Random Sequence generation	Allocation concealment	Blinding participants/ personal	Blinding outcome assessment	Incomplete data	Selective reporting	
Allen et al. [1]	Low risk	Low risk	Low risk	Unclear	Low risk	Low risk	Low risk
Ma et al. [16]	High risk	High risk	High risk	High risk	Unclear	Low risk	Low risk
Mayer et al. [17]	Unclear	High risk	High risk	High risk	Low risk	Low risk	Low risk

Table III: TIDieR

Author	Behaviours	study population numbers	Materials and support	Intervention function	Deliverers	Duration	Tailoring	Result
Allen et al. 2001 (23)	Mammography screening, clinical breast examination and cervical cancer screening (pap test)	Twenty six worksites were randomly assigned to the intervention or comparison group. Baseline n (2943) Follow up n(2747)	Peer Health Advisors(PHAs) organized and facilitated a series of 6 small-group discussion sessions based on social cognitive theory. Sessions emphasized the benefits of screening and methods for overcoming barriers to screening, based on the Health Belief model. PHAs also conducted one-to-one outreach to extend the intervention to those who did not attend small-group sessions PHAs and volunteer advisory boards planned and implemented 2 worksite-wide campaigns, at each site over the 16-month intervention period featured events and activities targeting individuals in varying stages of readiness for behaviour change based on the Transtheoretical Stages of Change model.	Education, Persuasion, Incentivisation/Training, Environmental restructuring, Modelling and enablement	PHAs(Peer health Advisors)	16-month intervention	Yes	The effect size for the intervention was small. Between baseline and follow up, the use of mammography slightly increase among women aged 40 to 50. The intervention group experienced greater increases in the percentage of women who reported a recent mammogram (7.2% vs 5.6%). After work site cluster and age strata were controlled for, the observed in mammography screening rates was not statistically significant in the intervention group the (OR= 1.14;95%CI=0.90, 1.44)
Ma et al. 2012 (34)	Mammography screening	Eight worksites in Nanjing, four of which were assigned to the intervention group(n=232) and four to the control group (n=221)	The intervention group received (i) motivational group education on the nature of evolution and probable causes of breast cancer, risk factors, early detection strategies including mammography screening procedures, and breast cancer prevention especially in the workplace; (ii) dynamic group interaction and role play discussion sessions led by trained educators in collaboration with union leaders on perceived susceptibility to breast cancer and benefits of early detection; (iii) printed educational hand-outs that complemented both didactic lectures and inter-active sessions; and (iv) mammography navigation assistance that included arrangement of appointment, transportation to mammography site and workplace financial support, and release time for mammograms. Control group participants received general health care education focusing on healthy lifestyle and disease prevention through routine health care examinations. The group received the same printed materials as the intervention group. After the 6-month assessment, women in the control group received breast cancer education navigation for breast cancer screening.	Education, Persuasion, Training, Environmental restructuring, Modelling and enablement	Team of trained researchers	pre- and post intervention assessments and 6-month follow-up on mammography screening	Yes	The workplace intervention dramatically increased the uptake of mammography from 10.3% at baseline to 72.6% at 6-month follow-up in the intervention group
Mayer et al. 1993 (33)	Mammography screening	Employees at two campuses of the California state University. At the intervention site 600 subjects were randomly selected from 923 eligible employees, and at the control site 513 subjects were randomly selected from a total of 782 eligible employees.	One-hour mammography workshops were offered on-site six times during the intervention year during the lunch hour. The workshop, facilitated by a mammography technologist breast health educator, included review of the information in the brochure, presentation of slides of early and advanced tumors and a question-answer session. Incentive to attend was provided in two types of lottery drawings. In the first, an employee entered individually when she had a mammogram with an entry form and proof of screening. In the second, four employees entered as a group, the workshops and drawing were promoted in the project brochure and newsletters, as well as in fliers mailed to individuals and the university staff-faculty newsletter	Education, Persuasion, Training, Modelling and enablement	Mammography technologists/ breast health educator and two graduate research assistants	A one-year programme	Yes	Mammography rates increased at both sites, for both those 40-49 years of age and for those ≥50years of age, but The result also were not statistically significant

activities organised around a particular theme, targeting employees via worksite-wide campaigns.

The educational intervention implemented in the third study (24) combined four educational approaches. The first approach involved motivational group education, which was focusing on general biology of breast cancer and the specific risks, detection and treatment strategies. These were accompanied by dynamic group interaction and role-play activity sessions focusing on susceptibility and benefits of early detection of breast cancer. These interventions were supplemented by handing out of the printed materials that complemented the lectures and discussion sessions (25).

Intervention function

The interventions functions for each study are presented in Table IV. A brief narrative summary of the intervention functions used by each study are presented below:

The intervention functions of the Woman to Woman intervention (13) included 'education' via educational campaigns and small-group sessions. 'Persuasion' via one-to-one outreach by peer health advisors for the intervention extension for those who did not attend the small-group session. 'incentivisation' for the employees for taking part in the surveys were also applied and 'Training' for the role-model employees. The form of incentive was not mentioned in the study by the author. Another function was 'Modelling' via role-model presentations during the small group sessions. Women employees were recruited to work as role models for attending breast screening. 'Enablement' was provided through session emphasized the benefits of screening and methods for overcoming barriers of screening and individual counselling and social support.

The six intervention functions of the study conducted by Ma et al (2012), (24) were education, persuasion, training, environmental restructuring, and modelling and enablement. 'Education' was via motivational group education and dynamic group interaction with role play and a discussion session. 'Persuasion' was via motivation group education on probable causes of breast cancer, risk factors, early detection strategies, including mammography screening procedures and breast cancer prevention especially in the workplace.

The functions of the Picture of Health Mammography Project (23) intervention ranged from 'Education' and 'Training' implemented by the group training sessions and printed material. 'Education' was provided through insurance as a one-hour mammography education workshops. The workshop included review of information in the brochure, presentation of slides of early and advanced tumors, and a question-answer session. The intervention also included persuasion and incentivisation methods, the first via newsletters that outlined the project and presented personal stories related to mammography, and the second in the form

of prize draws in two types: individual draws were held three times during the intervention and the group draws was held on Labor Day. 'Environmental restructuring' was offered via mammography workshops on site six times during the intervention year at lunch time. Another function was "modelling" via two graduate research assistance role-played demonstration passive-aggressive and assertive responses by the patient. 'Enablement' was provided through brochures mailed four-weeks before intervention initiation at their office, and the question-answer sessions. This study reports the brochures were reviewed by a mammography technologist (23).

Discussion. Three empirical studies were identified in our systematic review. Overall, the impact of workplace-based interventions was assessed by making comparisons between an intervention group and a control group. Each intervention was unique and produced different results. It appeared that the quality of the evidence indicated that each study had an unclear or higher risk of bias in several assessment areas, which might be considered to represent low standards.

Unfortunately, there were only three studies that have tested whether or how workplace interventions impacted women employees. These three studies evaluated workplace interventions to increase the rate of breast-cancer screening based on educational constructs, as indicated in Table III. One of these studies reported an effect on the mammography screening rate with significantly higher screening rates in the intervention group (72.6%) than the control group (5%) in the 6-month follow-up period (24). The remaining two studies found no significant results within the U.S. population, but the effectiveness of workplace interventions varied overall, and the results were insufficient to infer substantial changes (13, 23).

In both American studies, Allen (13) and Mayer (23) identified and addressed various factors that may have contributed to the small effect size observed. This can partly be explained by the fact that the participants had considerable experience with mammography screening at baseline, and the sample primarily consisted of well-educated, employed females, of which the majority had health insurance and access to usual sources of care. Ultimately, Allen (13) reported a modest increase in the uptake of screening as a result of the intervention and suggested that this increase was probably due to the general trend of increasing rates of mammography screening in the U.S. Similarly, the earlier U.S. study conducted by Mayer et al. (23) observed a modest increase in the screening uptake of participants, which may have accounted for the relatively high baseline rates of screening and relatively brief intervention interval.

According to Mayer, (23) however, the intervention was limited because it did not specifically target a high-risk group, who would be more likely not to adhere to the

Table IV: Intervention function

Item	Function	justification for categorising the function of the intervention Allen et al.2001	justification for categorising the function of the intervention Ma et al.2012	justification for categorising the function of the intervention Mayer et al.1993
1	Education	Each worksite conducted at least two campaigns and 6 small-group education sessions.	<ul style="list-style-type: none"> Motivational group education on the nature of, evolution, and probable causes of breast cancer, risk factors, early detection strategies, including mammography screening procedures, and breast cancer prevention especially in the workplace Printed education handout that complemented both didactic lecture and interactive session Received general health care education 	<ul style="list-style-type: none"> Educate employees regarding their insurance coverage for mammography, clinical breast exam, breast self-examination and potential barriers to mammography compliance. One hour mammography workshop facilitated by a mammography technologist/breast health educator include presentation of the slides of early and advanced tumours and a question-answer session
2	Persuasion	Peer health advisors conducted one-to-one outreach to extend the intervention to those who did not attend the small-group session	<ul style="list-style-type: none"> Motivational group education and dynamic group interaction. 	<ul style="list-style-type: none"> Employees received two project newsletters that contained stories related to screening
3	Incentivisation	Incentives were provided to survey respondents (no mention by the author what incentive was being used)	<ul style="list-style-type: none"> Workplace financial support and release time for mammograms 	<ul style="list-style-type: none"> Incentives were provided in two types of lottery drawings individually or as a group. Individually - contests included \$50 cash prizes and gift certificates for haircuts, meals and women's apparel. The group prize was a coffeemaker and four mugs.
4	Coercion	None	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> None
5	Training	Learning from vicarious experience and the role model such topics as "how to talk with your health care provider about screening "and "setting goals for your health".	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> None
6	Restriction	None	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> None
7	Environmental restructuring	Featured events and activities targeting individuals. These events were announced through company and union newsletters, fliers, and posters and through word of mouth.	<ul style="list-style-type: none"> Transportation to mammography site 	<ul style="list-style-type: none"> One hour mammography workshop was offered on-site six times during the intervention year during the lunch hour
8	Modelling	<ul style="list-style-type: none"> Women employees were recruited to serve as Peer health advisors; these women served as role models for screening behaviour The 6 small-group discussion sessions provided opportunities for role modelling and learning through vicarious experience Other events such as presentation by guest speakers and health fairs	<ul style="list-style-type: none"> Role play discussion session led by trained educators in collaboration with union leaders on perceived susceptibility to breast cancer and benefits of early detection 	<ul style="list-style-type: none"> Two graduate research assistants role-played a woman requesting a mammogram from her reluctant physician; they demonstrate passive, aggressive and assertive responses by the patient.
9	Enablement	<ul style="list-style-type: none"> Session emphasized the benefits of screening and methods for overcoming barriers of screening Provide individual counselling and social support 	Mammography navigation assistance that included arrangement of appointment, transportation to mammography site and workplace financial support, and release time for mammograms	<ul style="list-style-type: none"> One hour mammography workshop facilitated by a mammography technologist/breast health educator include review of the information in the brochure (brochures which mailed earlier four-week period before the initiation of the intervention) A question –answer session

screening guidelines. Allen et al. (13) further emphasized the concern that the intervention may not have reached women who were most in need of its message. In both of these studies, women who were perceived as "under utilizers" of the national breast cancer screening programs were not specifically targeted. In contrast, an intervention program that has been developed and implemented in China was considered highly successful (24). The success of this program might have been due to the initially low level of screening uptake in China compared to the U.S.

The findings show that Islamic countries have a consistently lower rate of mammography screening uptake compared with the United Kingdom's population. For example, according to the International Cancer Screening Network (ICSN) (2010) (26), the population of Saudi women who had a mammogram in 2012 ranged from 19.0% (6,200) among those aged 40-64 years, and 73.3% of the women in the UK reported having undergone a recent mammogram, whereas in Turkey, the mammography rate is between 10.7% and 40.6%, as noted in several studies (27-30). These low

rates of mammography noted in our study support the need for further public health interventions to improve mammography uptake. The intervention may require more personalized and intensive interventions than those offered in the three articles.

When translating the knowledge gained from the current systematic review to address the needs of Muslim females, there are a number of important considerations. Similar to other countries, there are increased prevalence rates of breast cancer in Islamic countries, where the higher mortality rates are probably due to late diagnosis. Such an issue was identified in this study, where additional research on effective workplace intervention for improving mammography screening among Muslim women is needed and may include the cultural competence and knowledge of the free mammography providers in the community, that may help women in Islamic countries to overcome these barriers. Improving screening is, therefore, of paramount importance. The evidence base suggested in this review is built primarily on a workplace intervention, using a combination of characteristics approach, such

as behavioural, theoretical and cultural constructs, especially given individuals' different backgrounds in Islamic countries. Interventions should have a theoretical basis and be tailored specifically to suit the Islamic culture. An example of this would be the provision of educational materials which are tailored to specific cultural values, beliefs, and practices. Furthermore the interventions should be language-appropriate and have culturally sensitive educational components, which will influence the overall success of the intervention. Interventions should be targeted at multiple levels and include females and health care providers, rather than singular interventions which might be purely educational or focused on raising public awareness. Finally, these interventions should be vigorous, at both the personal and cognitive levels, in order to account for psychosocial influences.

In future work, investigators should report the challenges they face when conducting a workplace intervention and information should be provided on how they address any specific concerns, while retaining a strong study design. Further workplace intervention and evaluation studies are warranted, educational programmes should be tailored to suit varied and ethnically diverse cohorts of females and the long-term sustainability of these programmes should be evaluated.

Limitations

First, in our qualitative assessment, we relied on information about the methodology. Regarding the information about the blinding outcome assessment, we scored these items as high risk, without contacting the author for verification. We judged the quality of potentially related articles independently from each other. Second, for this review, we comprehensively searched a number of databases but failed to search for unpublished literature or grey literature, and only included articles which were written in either English or Arabic. This limitation may reflect the shortage of workplace intervention studies within Muslim populations. A further limitation could perhaps be the measurement of mammography screening rates, which in these studies were self-reported measures.

CONCLUSION

This systematic review provides a summary of workplace-based interventions to increase breast mammography screening uptake. From our findings we conclude that the effectiveness of the existing workplace interventions remains questionable and further research is warranted to improve our understanding of how we can successfully improve mammography screening among women in Islamic countries. When tailoring this type of intervention to Islamic countries attitudes, to improve success, cultural beliefs should be given due consideration, as well as the unique context of their health care system.

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