Original Article

Current Tools for Investigating Breast Cancer Screening Hesitancy: A Systematic Scoping Review

Yang Liao[13], Suhaily Mohd Hairon[1*], Najib Majdi Yaacob[2], Tengku Alina Tengku Ismail[1], Li Luo[4]

ABSTRACT

Background

Breast cancer screening is essential for early detection and reducing mortality; however, hesitancy towards screening persists globally, particularly in low- and middle-income countries (LMICs). To further understand the psychological, cultural, and structural barriers we need to utilize the validated tools to measure screening hesitancy as the first step in improving participation rates in the future.

Method

This systematic scoping review uses the Arksey and O'Malley framework together with the PRISMA extension, to filter studies based on relevancy regarding breast cancer screening and analytical quality. Studies are pulled from academic databases such as PubMed, Scopus, Web of Science, and Google Scholar that include frameworks such as the Health Belief Model (HBM) and Knowledge Attitude Practice (KAP) that focus on psychological and behavioral factors. The studies are pulled from the past decade.

Results

This review identified numerous frameworks used around the globe for determining screening hesitancy. However, among the most developed countries, HBM and KAP were the most widely used frameworks. These tools have good measurements of psychometric factors, but their lack of cultural adaptation limits their application in more diverse environments, especially in LMICs.

Conclusion

The findings highlight there need to have a more culturally adaptive, and a high psychometric standard tool for measuring breast cancer screening hesitancy. In the future, research should focus on developing more adaptive tools and using digital platforms to increase accessibility. By addressing these gaps, public health strategies can better reduce screening hesitancy, enhance early detection, and improve health conditions worldwide.

Keywords

breast cancer screening, hesitancy, health belief model, knowledge-attitude-practice

INTRODUCTION

The implementation of screening programs aimed at early detection and treatment has drastically decreased breast cancer mortality, morbidity, and disability[1,2]. Countries that have successfully adopted effective preventative strategies with early screening as the key driver have achieved a 2 – 4% annual reduction in breast cancer mortality rate[3], which demonstrates the critical role of breast cancer screening in improving public health and well-being[4] . Despite the introduction of various national and international breast cancer screening programs, which have has dramatically improved screening coverage, but certain screening initiatives remain underutilized and insufficiently accepted[5] .

Because of the disparity between different regions in the screening participation rate

1. Department of Community Medicine, School of Medical Sciences, Universiti Sains Malaysia, Kubang Kerian, Kelantan, Malaysia
2. Biostatistics and Research Methodology Unit, School of Medical Sciences, Universiti Sains Malaysia, Kubang Kerian, Kelantan, Malaysia
3. The Second Affiliated Hospital of Guizhou University of Traditional Chinese Medicine, Guiyang, Guizhou, China
4. Department of Oncology, Guihang Guiyang Hospital, Guiyang, Guizhou, China

Correspondence

Suhaily Mohd Hairon, Department of Community Medicine, School of Medical Sciences, Universiti Sains Malaysia, Kubang Kerian, Kelantan, Malaysia.
Email: suhailymh@usm.my

DOI: https://doi.org/10.3329/bjms.v24i4.85383

and coverage rate [6], a more effective way to measure screening hesitancy is required. This will allow a more optimized and tailored method of resource allocation in healthcare and better public health strategies for different regions [7]. With these changes to boost the breast cancer screening will directly increase the chances of early detection, treatment, and survival rate while decreasing the mortality rate of breast cancer[8].

Health Belief Model (HBM) is a widely used framework developed by psychologists to understand behaviors that affect individual's choices regarding their health [2]. There are 6 factors in HBM, perceived susceptibility, severity, benefits, barriers, cues to action, and self-efficacy. By analyzing these factors, the policy maker and healthcare professionals can better understand the level of trust individuals have in the screening programs[9].

Another prominent framework is the Knowledge-Attitude-Practice (KAP) framework. This framework uses 3 factors, knowledge, attitudes, and practices[10]. KAP differs from HBS because it emphasizes knowledge and beliefs, while HBM focuses more on the motivators behind the individuals' actions [11,12].

HBM and KAP are particularly relevant to this study, because both frameworks offer unique psychological and behavioral insights on factors that provide important guidance in addressing this complex issue which spans across diverse populations. They form the theoretical foundation for this review, facilitating the systematic evaluation of tools used to measure breast cancer screening hesitancy and supporting the development of more effective screening strategies and public health interventions, ultimately raising screening participation rates.

Breast cancer screening encounters major challenges globally, especially in low- and middle-income countries (LMICs), where inconsistent healthcare services, cultural beliefs, stigma, and misinformation significantly contribute to screening hesitancy [13,14]. Therefore, for the reduction of the global cancer burden, it is essential to develop measurement tools that adapt to varied cultural and economic contexts. Currently, most tools have been designed in high-income countries and require localization to ensure applicability and effectiveness in diverse environments [15].

The objectives of the review are as follows: 1) To systematically examine existing tools by evaluating theoretical foundations, measurement dimensions, reliability, and validity; 2) To evaluate the applicability of these tools across different populations; and 3) To provide empirical evidence for future tool development, supporting the creation of targeted strategies and interventions to enhance breast cancer screening participation.

METHODS

This scoping review utilized the Arksey and O'Malley (2005) framework [16] to ensure comprehensive coverage, complemented by PRISMA extension for scoping reviews[17]. The main steps are as follows:

Step 1: Research Question Identification: The guiding question, "What tools are currently available for investigating breast cancer screening hesitancy?" directs the search strategy. The focus was on questionnaires, scales, and other measurement instruments used to assess screening hesitancy across diverse populations, evaluating their psychometric properties (e.g., reliability and validity) in different settings.

Step 2: Identifying Relevant Studies: A comprehensive search was conducted in databases such as PubMed, Scopus, Web of Science, and Google Scholar, covering peer-reviewed articles, grey literature, and reports from major health organizations like the WHO. The keywords and MeSH terms used cover categories such as "hesitancy," "breast cancer," and "screening" (see Table 1), ensuring broad coverage.

The search was limited to studies published between 2010 and 2024 to capture the latest advancements in screening tools and methods[18]. Citation tracking was conducted to identify key studies not captured in the initial search, ensuring thorough literature collection.

Step 3: Study Selection: Screening involved three stages—initial screening, full-text review, and applying inclusion criteria[17]. Criteria include validated tools with psychometric data, empirical studies published in English, sample sizes over 100 of participants, and studies from the last 14 years. Excluded were studies with purely theoretical discussions or invalidated tools. The search process is presented in Figure 1.

Step 4: Data Charting: A standardized form was used for data extraction, covering study characteristics (such as authors, publication year, country, and sample

characteristics) and tool specifics (such as tool name, type, format, target population, and measured domains, including knowledge, attitudes, and behaviors). As presented in Table 2, these data fields ensured a comprehensive capture of key attributes across studies. This systematic approach enhanced consistency and comparability for subsequent analysis.

Step 5: Collation and Summary: Results were summarized in Table 3 for thematic analysis.

RESULT

As shown in Tables 2, and 3, this review identified various tools used from 2010 to 2024 for measuring breast cancer screening hesitancy. Tools based on the Health Belief Model HBM have been widely applied in more than ten countries, proving its effectiveness in assessing hesitancy across different cultural settings [8,9,11,12,21,24,31,32,35,42,43]. The studies cover diverse countries and demographics. HBM-based tools, along with culturally specific frameworks, have been validated for reliability and effectively capture knowledge gaps and barriers to screening. Even though these tools are effective in diverse settings there are still limitations, such as sample area restrictions and limited causality assessment [37]. The next steps should focus on how to enhance cross-cultural adaptability and causal investigation to further refine these tools [26].

Determinants of Breast Cancer Screening Hesitancy

The determinants of breast cancer screening hesitancy refer to the factors, reasons, or causes of cancer screening hesitancy [6]. From looking at different models used in various studies, one can see there are numerous different factors used for the decision-making process in breast cancer screening[18]. The Health Belief Model (HBM) is one of the most widely models used for understanding these determinants[24]. HBM analyzes screening hesitancy by measuring the perceptions of susceptibility, severity, benefits, barriers, cues to action, and self-efficacy [28].

Another widely used model is the Knowledge-Attitude-Practice (KAP) model. Unlike the HBM, which focuses on individuals' perceptions and beliefs, the KAP model analyzes individuals' health behaviors by measuring their knowledge, attitudes, and practices related to breast cancer screening[37,43]. For example, being more knowledgeable about the effects of breast cancer and the benefits of early breast cancer screening may create a more positive attitude and a greater chance of participating in the screening programs[29]. Together, these two models will provide a more comprehensive framework for analyzing both psychological and behavioral factors in screening hesitancy across different populations.

Health Belief Model (HBM)

Perceived Susceptibility

In the context of breast cancer screening, perceived susceptibility refers to an individual's belief about their risk of developing cancer [24]. There is a correlation between a woman's perception of cancer susceptibility and their willingness to undergo breast cancer screening [42]. Individuals who believe they have a low risk of getting cancer were significantly less likely to participate in preventive screening behaviors [10]. Studies also indicate that in populations with limited health literacy, the perceived susceptibility has a greater impact on the level of priority given to breast cancer screening [11]. Therefore, informing the public on accurate cancer susceptibility information using targeted health education programs is a great way to increase screening rates [12].

Perceived Severity

Perceived severity refers to an individual's view of how much of an impact cancer would create on their lives. The ones who believe that cancer can cause severe health issues are more likely to engage in positive screening behaviors [11]. People who understand that cancer can lead to significant health deterioration, long-term disability, or death are more likely to participate in regular screenings[24]. Besides screening participation, perceived severity also affects how an individual adherence to follow-up recommendations and treatment plans [12]. Many factors can affect the perceived severity. For example, personal experiences with the disease, experiencing cancer like symptoms, seeing information on cancer's impacts, and seeing family members or friends suffer from cancer may increase the perception of the disease's seriousness[31]. Media coverage and public health campaigns can further increase cancer awareness, thus promoting preventive behaviors [21].

It is often difficult to understand cancer severity for populations with limited health literacy. This is why simple and accessible education programs are crucial in filling this gap in knowledge [42]. Perceived severity is often associated with perceived susceptibility so

individuals who believe they are at higher risk for disease which has more severe consequences will more likely participate in preventative treatments [32]. Thus, it is important to address both perceived susceptibility and severity when creating public health strategies for breast cancer prevention [31].

Perceived Benefits

Perceived benefits are defined as an individual's belief in the positive value gained from getting cancer screening. Individuals are more likely to participate in screening programs if they believe there is a strong chance of early cancer detection and in turn will improve treatment outcomes and survival rates [43]. This is another reason why educational campaigns that show the effectiveness of early screening in detecting diseases and improving prognosis are effective in increasing participation rates [32]. For example, women who are knowledgeable of the benefits that mammograms bring are more likely to perform routine screening [12]. Besides formal educational campaigns, other informal sources that promote screening benefits such as information from family, friends, and medical professionals, can promote the perceived benefits and create more confidence and positive attitudes toward screening [11,24]. Perceived benefits also apply outside of cancer-related issues, as getting cancer screening could help detect other health issues and boost overall health maintenance indirectly [21].

Perceived Barriers

Perceived barriers are obstacles that prevent individuals from getting cancer screening. There are multiple types of barriers ranging from physical, psychological, and financial, to structural [31]. Physical barriers include those with chronic illness, disability, or limited mobility which makes it difficult to access the screening facilities [32]. Psychological barriers include the fear of diagnosis, anxiety about the procedure, and privacy concerns which make individuals hesitate in getting screening[28]. Financial barriers are related to the screening costs, such as the monetary opportunity cost related to taking time off work, the cost of transportation, and other expenses, especially for those without good insurance coverage or financial resources [21]. Structural barriers are related to infrastructure and public resources. Lack of public resources could result in fewer screening programs, creating long wait times and discouraging individuals from getting screening. Due to the lack of resources, challenges related to language differences, and cultural beliefs would not be properly addressed which will negatively impact the participation rate among more diverse populations [31]. Policymakers need to understand the differences between the different types of perceived barriers and address them holistically to effectively tackle screening participation rates issue [26].

Cues to Action

Cues to action are internal and external triggers that push an individual to take proactive steps in cancer screenings[25]. Examples of external cues include public health campaigns which motivate individuals by using media advertisements, community outreach programs, and educational materials, to raise awareness and create a sense of urgency [27]. More individualistic cues to action include healthcare providers giving care recommendations and setting up follow-up appointments encouraging individuals to follow through with screening [29]. Another external cue to action could be the result of policy or environmental changes. Public policy could provide insurance incentives and push for workplace wellness programs, motivating individuals to perform regular screenings due to workplace culture [28]. Examples of internal cues include experiencing physical and psychological symptoms as a motivator for an individual to act. Physical symptoms include lumps, persistent pain, or changes in bodily functions, and psychological symptoms include anxiety regarding potential health issues from knowing someone diagnosed with the disease [34,35]. Other internal cues are caused by individuals' health beliefs, knowledge levels, and influence from family and friends [9]. Individual health belief regarding screening is favorably reinforced by having a positive healthcare experience such as getting desired outcomes from past screenings. Having a family history of illness can influence an individual's desire to get periodic health checks [8]. Strengthening both external and internal cues will give the individuals that final push for participating in screening programs [12].

Self-Efficacy

Self-efficacy is defined as the belief in one's ability to successfully perform a certain task or goal [11]. In the context of health behavior, self-efficacy will affect the amount of effort, persistence, and resilience in completing the individuals' healthcare choices [24]. For example, breast cancer screening will determine the individual's confidence in being able to complete a mammogram [12]. If the individual has a higher self-efficacy, the task of getting screenings will seem more manageable, thus increasing participation [8]. Factors

that influence self-efficacy include knowledge level, previous healthcare experiences, social support, personal health beliefs, and accessibility to healthcare facilities and resources [9].

Knowledge-Attitudes-Practices (KAP)

Knowledge

In the context of breast cancer screening, knowledge refers to the individual's understanding of the breast cancer screening that is factual [5]. Studies have shown that women with low levels of knowledge about the symptoms of breast cancer, the screening process, and the benefits of early detection would have a lower participation rate for breast cancer screening [35]. Low knowledge levels could be a result of the poor information quality and distribution provided by the healthcare system. This is especially apparent in the low to middle-income countries (LMICs), where healthcare resources and education are limited [13]. The distribution or the quality of information available about breast cancer screening could also be hindered by cultural barriers, where in some cultures and religions the discussion regarding female anatomy is frowned upon [4].

Besides the lack of knowledge, misinformation about BSC could present another threat. Some women especially those with a lower level of educational background believe that the screening process itself poses a health risk [31]. One common misconception is that radiation from mammograms causes cancer [35].

For these reasons to effectively improve the average national knowledge level more resources should be allocated to lower-income communities to fund educational programs in the communities, hospitals, and schools with the goal of spreading accurate information about BCS, informing on how early detection significantly improves cure rates and reduces mortality rates [4]. A larger pool of resources would also allow the education programs to be more tailored to different language, cultural, and religious needs [15]. This way more people will engage with the educational programs and resources and thus increase screening participation rates.

Attitudes

Attitudes describe individuals' perceptions, opinions, and beliefs toward breast cancer screening. Individuals who believe screenings are beneficial for detecting and preventing cancer will more likely participate in cancer screening. However, individuals who fear the diagnosis outcomes, the potential pains during the procedure, or the accuracy of the screening results will be hesitant or even refuse to participate in screening [11]. Even though attitudes are internal factors, they are also heavily influenced by external factors such as cultural and social norms [20]. In certain communities, there is a strong stigma for women exposing one's body. This will create a negative attitude among women who fear being judged by the community and reduce their chances of participating in screening [9]. Besides fear, there could be a lack of trust in society, such as the lack of trust in medical professionals or the lack of trust in the quality of medical resources [35]. This will also create negative attitudes in individuals and reduce their screening participation rate [32].

This is another factor that needs to be considered when creating public health strategies. Besides focusing on leveling up the knowledge base of the community, the strategies also need to consider how to reshape the perceptions related to breast cancer screening more positively [13]. Ensuring the information is accurate and straightforward will improve the trust in the system, while providing emotional support from healthcare professionals during the process will reduce the fear factor, slowly shifting the attitudes and improving the screening participation rates [24].

Practices

Practices are the actual actions the individuals take despite what their knowledge or attitude is regarding breast cancer screening [5]. Even with a high level of knowledge and a positive attitude an individual could still decide not to participate in breast cancer screening [22]. This could be attributed to barriers, such as structural and financial. Structural barriers include infrastructure challenges and logistical challenges which will increase the burden on accessing screening resources [6]. Lack of infrastructure such as the healthcare facilities where screening is performed, well-maintained public transport, or well-paved roads could all lead to increased travel times making it difficult for individuals to get to screen regardless of their knowledge and attitude[33,43]. Financial barriers also prevent individuals from accessing screening resources by making them affordable if not covered by insurance and combined with logistical challenges would create a bigger opportunity cost for the individual making the barrier larger [27]. These barriers are amplified in LMICs as

resources in these countries are scarce making screening a lower priority.

Even with the best internal conditions, high knowledge level, and positive attitude individuals still face challenges in getting breast cancer screening [13]. Thus, healthcare strategies can't ignore the very realistic external barriers individuals face and try to lower the barriers by providing financial support to cover the screening cost, creating flexible appointment times to lessen opportunity costs from taking time off work, and funding more screening locations in the rural and low-income areas [21].

DISCUSSION

Limitations of Tools and Review Processes

Many studies have employed a cross-sectional design, limiting the ability to a infer causal relationship between the determinants and the breast cancer screening rate. [21]. To combat this issue, studies have suggested follow-up studies or other designs better suited for causal inference, such as randomized controlled trials (RCTs) [7,19]. Participants' self-reports are often affected by biases, including social desirability and recall bias, which reduce the accuracy of the findings [22].

Besides the methods used, geographical and demographic factors can negatively impact the generalizability of the studies. The lack of sufficient diversity within the sample pool and the absence of external validation, as evidenced by participants being drawn solely from two hospitals in Chiang Mai, Thailand, or a single geographical area in Kuantan, Malaysia, led to sampling bias [8,12]. This limits the diversity of the knowledge level in the sample pool as the region faces many educational and informational barriers. Given the major cultural environment on individuals' attitudes toward breast cancer screening, tools and methods developed based on homogeneous sample pools need to be adapted and re-validated in different cultural settings to ensure applicability [19].

Despite current tools playing important roles in the screening process, limited tools are available to assess psychological and emotional factors[13]. These factors include anxiety, fear, trust, and many other emotions that contribute to screening hesitancy [6]. Future development should place more emphasis on integrating these factors into assessments and utilize psychological evaluation tools, such as emotional assessment scales and diagnostic anxiety questionnaires, to identify potential barriers.

Recommendations for Developing Improved Breast Cancer Screening Hesitancy Tools

By compiling current research on the tools used for evaluating BCS, nine recommendations have been formulated below to guide the development of more effective and culturally adaptable questionnaires.

1. Ensure Rigorous Psychometric Integrity: The Cronbach's alpha coefficients of the questionnaires reach 0.7 to 0.8 or higher to be considered to have a strong psychometric property [27]. Future development should not only aim to meet this minimum standard but also conduct rigorous reliability and validity testing using expert review and factor[5,13].
2. Incorporate Comprehensive Geographic and Demographic Diversity: The sample pools should cover various sources, including but not limited to healthcare facilities (public hospitals, private clinics, community health centers), different geographic regions (urban and rural areas), and diverse population backgrounds. Additionally, online surveys should be utilized, so a broader range of participants from different backgrounds could be used [4,12,15]. This will ensure that the tools are robust and applicable when used in different cultural contexts.
3. Cross-Cultural Psychometric Validation: It is important to evaluate the structural stability and validity of the tools in different cultural environments so that they are reliable and applicable in the global setting. To validate stability, particularly when assessing tools or models, Consistency is the key factor to be measured. Structural Equation Modeling (SEM) and Multi-Group Analysis (MG-SEM) are two methods that can be used to analyze consistency across different populations and confirm the structural stability in breast cancer screening [30,34].
4. Emphasize Critical Metrics: Key factors such as knowledge about breast cancer, perceived screening barriers and benefits, fear, misconceptions, and self-efficacy, should be kept as basis while other potential factors including health literacy and cultural beliefs should also be explored [29].
5. Incorporate Established Theoretical Frameworks: Utilizing multiple validated and efficient frameworks

and models will provide a more comprehensive understanding of screening behaviors [25].

6. Address Methodological Limitations: Future research should consider randomized controlled trials to explore causal relationships and validate determinants of screening behavior [10]. The utilization of multiple data collection methods can help mitigate the negative impact of self-report biases [42].
7. Development and Validation of New Tools: Many existing tools are validated in limited cultural environments, lacking diverse samples lowering their applicability when trying to use them across different backgrounds. Future research should focus on developing new measurement tools and validating them in diverse cultural and geographical environments. This will improve cultural sensitivity; help combat linguistic differences and further understand local health beliefs and behaviors to improve the effectiveness and reliability of the new tools on a global scale [10].
8. Strengthen Public Health Education Initiatives: An Increase in public awareness and participation through comprehensive health education and culturally sensitive interventions can be an effective approach to overcoming barriers [30].
9. Enhance the Application of Digital Health: With the advancement of technology and digital health, the effectiveness of existing tools can be further enhanced through online platforms and mobile applications[42]. For example, mobile applications can be used to conduct screening hesitancy surveys among people in remote areas, low-income groups, and individuals with demanding work schedules who lack the flexibility to attend an offline survey. This approach not only expands coverage but also improves participation and follow-up rates [24].

CONCLUSION

This systematic scoping review examines the tools used to measure breast cancer screening hesitancy through its historical development while analyzing shortcomings in the models and providing improvement suggestions. In the future, the focus should be on creating more adaptive tools that can account for cultural, socioeconomic, and geographical factors. Improving methodological methods such as adopting longitudinal studies and broadening geographical scope to ensure they meet high standards of reliability and validity. By utilizing these findings when making health policy communities can promote more equitable healthcare systems when allocating resources that emphasize culturally appropriate interventions and support public health strategies that reflect local needs. This more tailored approach will increase health literacy, and mitigate misconceptions and fears related to screening. These recommendations aim to further refine the tools that can identify and help remove the screening barriers, increase screening rates, promote earlier detection, and enhance health outcomes for women.

Source of fund

This study received no funding.

Conflict of Interest

All authors of the submitted manuscript have disclosed any actual or potential conflicts of interest. The authors confirm that within two years after the submission of this manuscript, they have not had any financial, personal, or other relationships with any individuals or organizations that could inappropriately influence or be perceived to influence their work. If any such relationships exist, they have been disclosed and clearly indicated in this statement. All authors declare that there are no conflicts of interest in this study.

Ethical clearance

This study is a scoping review and did not involve human or animal subjects; therefore, ethical approval was not required.

Authors' contributions

Data gathering and idea owner of this study: Yang Liao.

Study design: Yang Liao, Suhaily Binti Mohd Hairon, Najib Majdi bin Yaacob.

Data gathering: Yang Liao.

Writing and submitting manuscript: Yang Liao.

Editing and approval of final draft: Yang Liao, Suhaily Binti Mohd Hairon, Najib Majdi bin Yaacob, Luo Li, Tengku Alina Tengku Ismail.

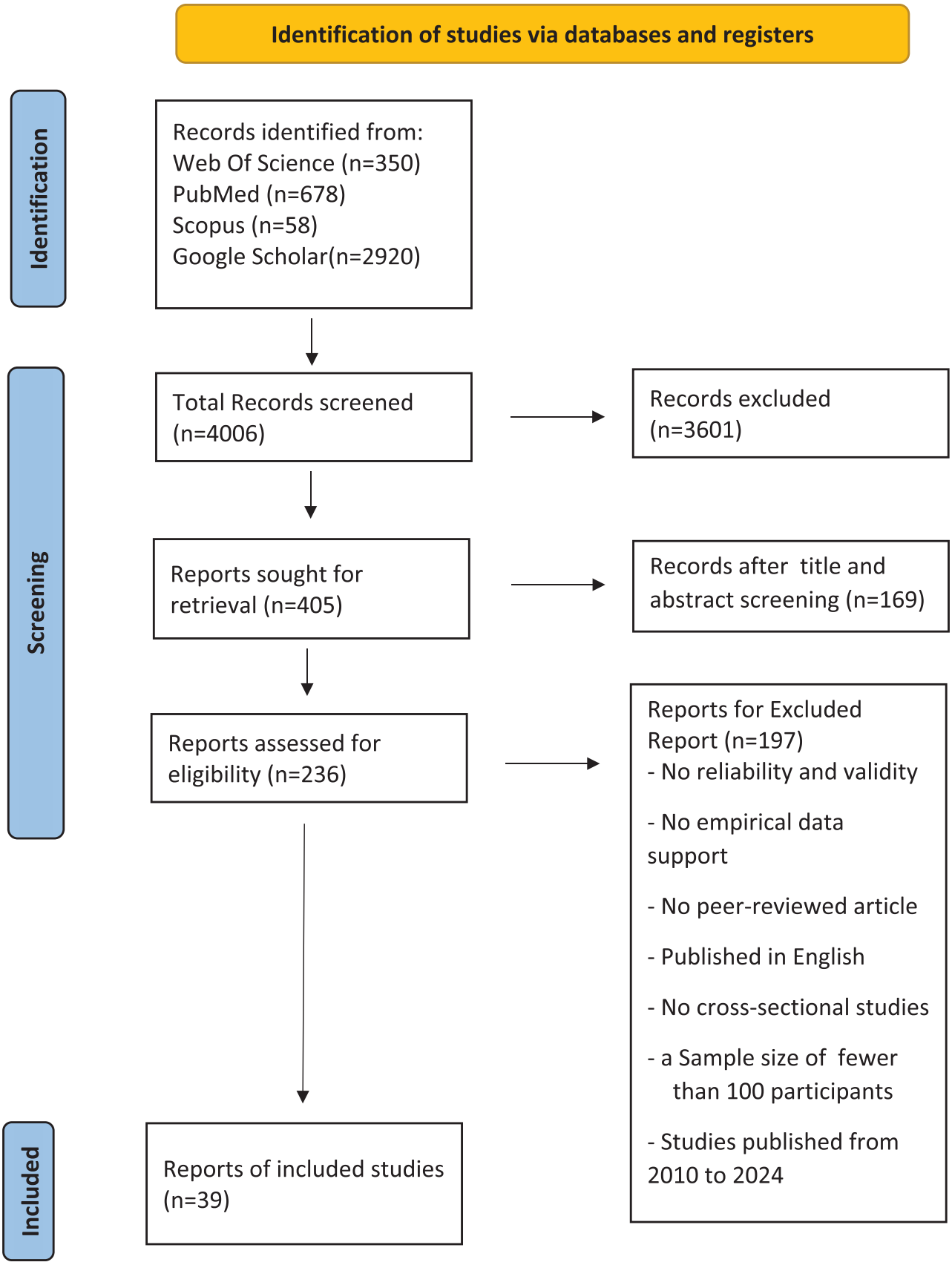
Corresponding author: Suhaily Binti Mohd Hairon.

Table 1. Search strategy

Keywords for hesitancy:
hesitancy* [Keyword□MeSH]; factor* [Keyword]; risk* [Keyword]; risk [MeSH]; "risk factor*" [Keyword]; risk factors [MeSH]; Prejudice [Keyword, MeSH]; self-conscience* [Keyword]; issue* [Keyword]; attitude* [Keyword]; attitude [MeSH]; "Attitude of Health Personnel" [MeSH]; "Attitude to Health" [MeSH]; "Health Knowledge, Attitudes, Practice" [MeSH]; uncertainty [Keyword, MeSH]; mistrust [Keyword]; obstacle* [MeSH]; hurdle* [Keyword□MeSH]; difficulty [Keyword]; difficulties [Keyword]; obstruction [Keyword]; impediment [Keyword]; Challenge* [Keyword]; confront* [Keyword]; defy [Keyword]; defiance [Keyword]; object* [Keyword]; contest* [Keyword]; question* [Keyword]; "Health Services Accessibility" [Keyword]; hinder*[Keyword]; inhibitor* [Keyword]; Indecision* [Keyword]; Doubt* [Keyword]; Uncertainty* [Keyword]; "Physician-Patient Relations" [MeSH]; "Communication Barriers" [MeSH]
Hesitation[Keyword] Reluctance
Vacillation[Keyword] Insecurity[Keyword]
Keywords for screening:
Screening [Keyword]; "Mass Screening" [MeSH]; "preventive test*" [Keyword]; "preventive investigation*" [Keyword]; 'early diagnosis' [Keyword]; "Early Diagnosis" [MeSH]
Keywords for Breast cancer:
"Breast cancer" [Keyword] "Breast Neoplasms" [MeSH]"Mammary Neoplasms" [Keyword] "Mammogram" [Keyword]"Mammography" [MeSH]"Breast screening" [Keyword] "Breast Examination" [MeSH]
- "Breast Self-Examination" [MeSH]
- "Breast self-exam" [Keyword]
- "Clinical Breast Exam" [Keyword]
- "Breast Biopsy" [MeSH]
- "Breast biopsy" [Keyword]
- "Ultrasound, Mammary" [MeSH]
- "Breast Ultrasound" [Keyword]

Table 2: Characteristics of selected studies

	Author Names	Publication Year	Publication Details (Country & Journal)	Tool Name	Tool Type	Format	Measurement Domains (Number of Items)	Scoring Methods
1	Araujo et al.[13]	2023	Peru, ecancer	Not explicitly named in the text	Survey/Questionnaire	Paper-based	Knowledge, Barriers, Attitudes (43)	Likert scale, binary (yes/no)


Identification of studies via databases and registers
Identification
Records identified from:
Web Of Science (n=350)
PubMed (n=678)
Scopus (n=58)
Google Scholar(n=2920)
Screening
Total Records screened (n=4006)
Records excluded (n=3601)
Reports sought for retrieval (n=405)
Records after title and abstract screening (n=169)
Reports assessed for eligibility (n=236)
Reports for Excluded Report (n=197)
- No reliability and validity
- No empirical data support
- No peer-reviewed article
- Published in English
- No cross-sectional studies
- a Sample size of fewer than 100 participants
- Studies published from 2010 to 2024
Included
Reports of included studies (n=39)

	Author Names	Publication Year	Publication Details (Country & Journal)	Tool Name	Tool Type	Format	Measurement Domains (Number of Items)	Scoring Methods
2	Alkhaifi et al.[4]	2023	USA, Journal of the National Medical Association		Questionnaire	Online (Arabic and English)	Beliefs, Knowledge, Spousal Support, Mammogram Utilization (51)	Likert Scale
3	Abbas & Baig[5]	2023	UAE, Asian Pacific Journal of Cancer Prevention	Not explicitly named	Questionnaire	Web-based	Knowledge of BC risk factors, symptoms, screening practices (37)	Likert scale, binary responses (yes/no)
4	Suriyong et al.[8]	2022	Thailand & USA, Healthcare Journal (MDPI)	Modified Thai Version of Champion's Health Belief Model Scale (MT-CHBMS)	Questionnaire	Paper-based	Susceptibility, seriousness, benefits—breast self-examination, benefits—mammogram, barriers—BSE, barriers—mammogram, confidence, health motivation, benefits—ultrasound, barriers—ultrasound (64)	Five-point Likert scale
5	Poon et al.[19]	2022	Hong Kong & Singapore, Frontiers in Oncology Journal	1. Health Literacy Scale (HLS-SF12) 2. Breast Cancer Screening Beliefs Questionnaire	Questionnaire	Paper-based	1. Health literacy across 12 health-related tasks(12) 2. Perceived susceptibility, severity, benefits, barriers, and cues to action for BC screening(22)	Four-point Likert scale(both)
6	O'Sullivan & O'Donovan[7]	2022	Ireland, Acta Oncologica	1. Computer-aided personal interview (CAPI) 2. Centre of Epidemiological Studies – Depression (CES-D8) Scale 3. Hospital Anxiety and Depression Scale – Anxiety (HADS-A) 4. Mini-Mental State Examination (MMSE) 5. Perceived Stress Scale (PSS-4) 6. Penn State Worry Questionnaire (PSWQ) 7. CASP-12 Scale	1. Questionnaire 2. Psychological Scale 3. Psychological Scale 4. Cognitive Scale 5. Stress Scale 6. Worry Scale 7. Quality of Life Scale	Paper-based	1. Breast cancer mammography screening, breast self-examination(2) 2. Depression(8) 3. Anxiety(Varies) 4. Cognitive impairment(Varies) 5. Stress(4) 6. Worry(Varies) 7. Quality of Life(12)	1. Yes/No questions 2. Dichotomized at a score of ≥9 3. Dichotomized at a score of ≥8 4. Categorical (Normal, Mild, Moderate) 5. Mean score 6. Mean score 7. Mean score
7	Ngan et al.[9]	2022	Vietnam, PLOS ONE	Knowledge-Attitude-Practice (KAP) Survey, Breast Cancer Awareness Measure (Breast-CAM), Champion Health Belief Model Scale (CHBMS)	Survey, Questionnaire	Paper-based	Breast cancer symptoms, risk factors, screening modalities (Breast-CAM: varies), perceived susceptibility (3), perceived benefits (5), perceived barriers (10)	Various scales (e.g., 1-5 Likert scale)

	Author Names	Publication Year	Publication Details (Country & Journal)	Tool Name	Tool Type	Format	Measurement Domains (Number of Items)	Scoring Methods
8	Milićević et al. [10]	2022	Serbia, Central European Journal of Public Health	22-item Questionnaire	Survey, Questionnaire	Paper-based	Knowledge of breast cancer symptoms and risk factors, barriers to screening, practice of early detection methods (22 items)	Various scales (e.g., Yes/No, Likert scale)
9	Esna-Ashari et al.[11]	2022	Iran, Asian Pacific Journal of Cancer Prevention	Researcher-made Questionnaire (based on Health Belief Model)	Survey, Questionnaire	Paper-based	Perceived susceptibility (3), perceived severity (10), perceived benefits (6), perceived barriers (13), cues to action (3), self-efficacy (7)	Five-point Likert scale
10	Azeez & Andsoy [20]	2022	Turkey, European Journal of Breast Health	Three Structured Questionnaires: Socio-demographic characteristics, Breast Cancer Screening Practices, Arab Culture-Specific Barriers to Breast Cancer (ACSB)	Survey, Questionnaire	Paper-based	Socio-demographic (21), BCS practices (17), ACSB (21)	Nominal, Binomial (Yes/No), and Five-point Likert scale
11	Rezaeimanesh et al. [21]	2021	Iran, Journal of Education and Health Promotion	Champion Health Belief Model Scale (CHBMS)	Survey, Questionnaire	Paper-based	Perceived susceptibility (3), perceived severity (6), perceived benefits (4), perceived barriers (8), self-efficacy (10), health motivation (5), cue to action (2)	Five-point Likert scale
12	Moey et al. [12]	2021	Malaysia, AIMS Public Health	Self-constructed questionnaire based on Health Belief Model	Survey, Questionnaire	Paper-based	Socio-demographics (6), Knowledge (10), Health Beliefs (30), Behavioral Adoption (5)	Various scales (e.g., 10-point Likert scale)
13	Ivanova & Kvalem [22]	2021	Norway, BMC Women's Health	Self-constructed questionnaire based on the Extended Parallel Process Model (EPPM)	Survey, Questionnaire	Paper-based	Perceived susceptibility (2), perceived severity (1), response efficacy (4), self-efficacy (3), breast cancer fear (3), defensive avoidance (5), intention to attend mammography (1)	Various scales (e.g., 5-point Likert scale)
14	Bhandari et al. [15]	2021	Nepal, PLOS ONE	Self-constructed questionnaire based on Theory of Planned Behavior, perceived susceptibility, perceived severity, and fatalism	Survey, Questionnaire	Paper-based	Socio-demographics, Knowledge, Attitudes, Subjective norms, Perceived behavioral control, Fatalism, Perceived susceptibility, Perceived severity, Breast cancer screening intention (Total: 60)	Various scales (e.g., Likert scale)
15	Alqahtani et al. [23]	2021	Saudi Arabia, European Review for Medical and Pharmacological Sciences	Self-administered structured questionnaire	Survey, Questionnaire	Paper-based	Demographics, Breast cancer knowledge, Breast self-examination knowledge and practice, Mammography knowledge and practice (Total: varies)	Various scales (e.g., Yes/No, Likert scale)

	Author Names	Publication Year	Publication Details (Country & Journal)	Tool Name	Tool Type	Format	Measurement Domains (Number of Items)	Scoring Methods
16	Selçuk et al. [24]	2020	Turkey, Healthcare	Sociodemographic Information Form and Champion's Health Belief Model Scale	Survey, Questionnaire	Paper-based	Sociodemographics, Susceptibility, Seriousness, Health motivation, BSE benefits, BSE barriers, BSE self-efficacy, Mammography benefits, Mammography barriers (Total: 52 items)	Five-point Likert scale
17	Sharif et al. [25]	2020	Iran, Health Promotion Perspectives	Self-constructed questionnaire based on various scales	Survey, Questionnaire	Online	Fear of negative appearance evaluation (6), Attitude towards mammography (14), Internal health locus of control (6), Cancer worry (2), Demographics (varies)	Various scales (e.g., Likert scale)
18	Ghanbari et al. [26]	2020	Iran, Journal of Research in Health Sciences	Researcher-made questionnaire	Survey, Questionnaire	Paper-based	Socio-demographics, Breast cancer screening behaviors (Total: varies)	Various scales (e.g., Yes/No, multiple-choice)
19	Alatrash [27]	2019	USA, Journal of Transcultural Nursing	Arab Culture-Specific Barriers instrument	Survey, Questionnaire	Paper-based	Sociodemographics, Barriers to clinical examinations and mammography (10), Social barriers (6), Traditional beliefs about cancer (6), Barriers to breast self-examination (4)	Five-point Likert scale
20	Wong & Cheng [28]	2019	Hong Kong, Journal of Menopausal Medicine	Modified Chinese Breast Cancer Screening Belief (CBCSB) questionnaire	Survey, Questionnaire	Paper-based	Attitudes towards general health check-ups (4), Knowledge and perceptions about breast cancer (4), Barriers to mammographic screening (3)	Five-point Likert scale
21	Solikhah et al. [29]	2019	Indonesia, Asian Pacific Journal of Cancer Prevention	Breast Cancer Awareness Scale-Indonesia (BCAS-I)	Survey, Questionnaire	Paper-based	Knowledge of risk factors (9), Knowledge of signs and symptoms (8), Attitudes towards breast cancer prevention (6), Barriers to breast cancer screening (4), Health behaviors related to breast cancer awareness (8)	Five-point Likert scale, categorical response (yes/don't know/no)
22	Perez et al. [30]	2018	USA, Journal of Immigrant and Minority Health	Researcher-developed survey	Survey, Questionnaire	Paper-based	Sociodemographics, Breast cancer screening behaviors, Psychological factors (e.g., perceived barriers to screening, depressive symptoms, perceived stress), Cancer knowledge (varies)	Various scales (e.g., categorical, Likert scale)

	Author Names	Publication Year	Publication Details (Country & Journal)	Tool Name	Tool Type	Format	Measurement Domains (Number of Items)	Scoring Methods
23	Chaka et al. [31]	2018	Ethiopia, BMC Public Health	Adapted questionnaire from Champion's Health Belief Model Scale and Powe's Fatalism Inventory	Survey, Questionnaire	Paper-based	Demographics, Knowledge of breast and cervical cancer (8), Attitudes towards breast and cervical cancer (16)	Various scales (e.g., Yes/No, Likert scale)
24	VanDyke & Shell [32]	2017	USA, The Journal of Rural Health	Modified Health Belief Model Scale	Survey, Questionnaire	Paper-based	Perceived susceptibility (3), perceived severity (3), perceived benefits of mammography (3), perceived barriers to mammography (6), demographic characteristics, mammogram frequency (varies)	Five-point Likert scale
25	Kwok et al. [33]	2017	Australia, BMC Women's Health	African version of the Breast Cancer Screening Beliefs Questionnaire (BCSBQ)	Survey, Questionnaire	Paper-based	Attitudes towards general health check-ups (4), Knowledge and perceptions of breast cancer (4), Barriers to mammographic screening (5)	Five-point Likert scale
26	Moshki et al. [34]	2017	Iran, BMC Public Health	Champion's Mammography Self-efficacy Scale (CMSS) and Champion's Breast Cancer Fear Scale (CBCFS)	Survey, Questionnaire	Paper-based	CMSS (14), CBCFS (8), Demographics	Five-point Likert scale
27	Marmarà et al. [35]	2017	Malta, BMC Public Health	Adapted CHBMS and IPQ-R	Survey, Questionnaire	Telephone-based	Demographics and health status (20), Lifetime BS practices (17), Health beliefs (36), Illness perceptions (48)	Various scales (e.g., categorical, Likert scale)
28	Valdovinos et al. [36]	2016	USA, Cancer Causes & Control	Perceived Ethnic Discrimination Questionnaire (PEDQ)	Survey, Questionnaire	Paper-based	Perceived discrimination (17), Cancer screening behaviors (varies), Demographics	Five-point Likert scale
29	Oqal et al. [37]	2016	Jordan, Journal of Pharmaceutical Health Services Research	Structured questionnaire	Survey, Questionnaire	Paper-based	Demographic data, Knowledge about breast cancer (15), Knowledge about breast cancer screening (7), Attitudes towards breast cancer education (7), Perceived barriers (9)	Various scales (e.g., categorical, Likert scale)
30	Abraído-Lanza et al. [38]	2015	USA, Health Education & Behavior	Structured interview-administered survey	Survey, Questionnaire	Paper-based	Demographics, Socioeconomic status, Acculturation (12), Fatalism (7), Barriers to mammography (11)	Various scales (e.g., categorical, Likert scale)

	Author Names	Publication Year	Publication Details (Country & Journal)	Tool Name	Tool Type	Format	Measurement Domains (Number of Items)	Scoring Methods
31	Tolma et al. [39]	2014	USA, BMC Women's Health	Women's Health Survey (WHS)	Survey, Questionnaire	Paper-based	Demographics, Knowledge of mammography screening, Attitudes, Subjective norms, Perceived behavioral control, Self-efficacy, Fatalism, Cultural affiliation, American Indian beliefs (82 items)	Various scales (e.g., Likert scale)
32	Nojomi et al. [40]	2014	Iran, International Journal of Preventive Medicine	Preventive Health Model-based Questionnaire	Survey, Questionnaire	Paper-based	Demographic data, Knowledge about breast cancer screening (12), Health beliefs (25), Self-efficacy (8), Performance barriers (12)	Various scales (e.g., categorical, Likert scale)
33	Hasnain et al. [41]	2014	USA, Journal of Women's Health	Champion Breast Health Survey, Ferrans Cultural Beliefs Scale, Suinn-Lew Asian Self-Identity Acculturation Scale	Survey, Questionnaire	Paper-based	Demographics, Breast cancer knowledge (varies), Health beliefs (varies), Cultural beliefs (varies), Acculturation (varies), Barriers and facilitators to screening (varies)	Various scales (e.g., Likert scale, categorical response)
34	Avci et al. [42]	2014	Turkey, Asian Pacific Journal of Cancer Prevention	Champion's Health Belief Model Scale for Breast Cancer, Coopersmith Self-Esteem Inventory	Questionnaire	Paper-based	Susceptibility (3), Seriousness (6), Health motivation (5), Barriers (8), Benefits (4), Self-efficacy (10)	Five-point Likert scale
35	Tsunematsu et al. [43]	2013	Japan, Asian Pacific Journal of Cancer Prevention	Health Belief Model (HBM) based Questionnaire	Questionnaire	Paper-based	Susceptibility (3), Seriousness (6), Importance (3), Benefits (3), Barriers before screening (3), Barriers at screening (3), Cues to screening (3)	Five-point Likert scale
36	Hirai et al. [44]	2013	Japan, Psycho-Oncology	Custom-developed questionnaire based on TTM, TPB, implementation intentions, and cancer worry	Questionnaire	Online	Perceived health competence (PHCS, 8), Cancer worry (4), Goal intentions (1), Implementation intentions (4), Barriers (16), Relative risk (5)	Various scales (e.g., Likert scale, categorical response)
37	Wu et al. [45]	2012	Taiwan, Asian Pacific Journal of Cancer Prevention	Chinese Mammogram Screening Beliefs Questionnaire (CMSBQ)	Survey, Questionnaire	Paper-based	Perceived benefits (10), Perceived susceptibility (6), Perceived barriers (15), Perceived risk (2), Knowledge related to breast cancer risks (7)	Four-point Likert scale
38	Pons-Vigués et al. [46]	2012	Spain, Psycho-Oncology	Custom-developed questionnaire	Questionnaire	Paper-based	Knowledge (7), Attitude (7), Vulnerability (5), Barriers (5), Benefits (5)	Five-point Likert scale

	Author Names	Publication Year	Publication Details (Country & Journal)	Tool Name	Tool Type	Format	Measurement Domains (Number of Items)	Scoring Methods
39	Kim et al. [47]	2011	China, Asian Nursing Research	Custom-developed questionnaire	Survey, Questionnaire	Paper-based	General characteristics, breast cancer screening, health promoting behaviors, perceived benefits, perceived barriers	Various scales (e.g., Likert scale, categorical response)

Table 3. Analysis and Summary of Tools for Measuring Breast Cancer Screening Hesitancy

	Author Names	Reliability	Validity	Participants' Demographics	Settings	Key Results	Tool Effectiveness	Identified Issues	Limitations	Recommendations
1	Araujo et al.[13]	Good (Cronbach's alpha: 0.793 and 0.779)	Content, Construct, Criterion	Age: 53.3 years (±9.1); 72.1% urban, 27.9% rural	Public hospitals and private clinics in 9 departments of Peru	Low levels of knowledge about BC and BCS, significant barriers (cultural, economic, geographic)	Effective in identifying knowledge gaps and barriers	High levels of fear and misconceptions about mammograms; perceived pain and cost barriers	Cannot determine causality due to descriptive design; limited to surveyed regions	Extensive education and awareness programs about BCS in Peru are needed
2	Alkhaifi et al.[4]	Good (Cronbach's alpha: 0.85, 0.67, 0.901, 0.89)	Content, Construct, Criterion	Age: Mean 50.4 years; Immigrants from Arab countries; Married; 45+ years old	USA, California, Online survey	86.6% had a mammogram at least once; 32.6% had a mammogram in the past two years	Identified beliefs, knowledge, and spousal support as significant factors	Perceived barriers, modesty, and fatalistic beliefs impacting mammogram use	Limited generalizability due to sample size and recruitment method	Increase education and awareness; involve husbands in interventions
3	Abbas & Baig [5]	Cronbach's alpha for overall reliability	Content and construct validity inferred from expert judgement	Mean age: 35.83 years; 78.6% aged 26-45; various nationalities	UAE, various settings through online platforms	- 65.8% had moderate knowledge of BC - 37.1% of women aged >40 never had a mammogram	Effective in identifying knowledge gaps and barriers	Lack of awareness, misconceptions about BC causes, cultural barriers	Cannot determine causality due to cross-sectional design; sample may not represent all demographics	Enhance educational efforts, particularly through social media and healthcare providers; address cultural barriers
4	Suriyong et al.[8]	High (Cronbach's alpha values from 0.74 to 0.93 for subscales)	High (content and construct validity)	130 Thai women aged 40 to 70 years; mostly single, Buddhists, high school to bachelor's degree level, with health security	Maharaj Nakorn Chiang Mai Hospital and San Pa Tong Hospital, Chiang Mai, Thailand	The MT-CHBMS demonstrated excellent internal consistency and the ten-factor model was best fitted to the data. It was a reliable and valid tool for measuring individuals' attitudes toward breast cancer and screening methods.	Effective in assessing Thai women's beliefs about breast cancer and screening methods, with good reliability and validity	Difficulty in differentiating between types of barriers; some items showed cross-loadings, suggesting potential redundancy	Conducted in one geographic area, limited sample size, no exclusion of participants with other breast masses or family history of breast cancer, lack of external validation and test-retest reliability	Further research with larger sample size, diverse geographic areas, test-retest reliability, and modern test theories such as item response theory and Rasch measurement model to confirm and refine the tool.
5	Poon et al. [19]	High (Cronbach's alpha = 0.85 for HLS-SF12, 0.8 for perceived barriers)	High (content and construct validity)	821 women aged 50-75 years, majority born in Hong Kong, diverse educational backgrounds	Multiple Cancer Screening Center (MCSC), Hong Kong	Low health literacy (HL) is associated with stronger perceived barriers to breast cancer (BC) screening and overestimated BC risk. Women with inadequate HL perceived higher financial, logistical, emotional, and knowledge barriers to BC screening.	Effective in identifying perceived barriers to BC screening and overestimated BC risk among women with lower HL. Provides valuable insights for designing targeted interventions to improve BC screening uptake among women with low HL.	Cultural differences may affect perception; external factors not fully addressed	Cross-sectional design limits causal inference; study participants may have higher HL than the general population; no comparison group of unscreened women	Longitudinal studies to explore causal relationships; inclusion of unscreened women for comparative analysis; development of interventions addressing identified barriers and improving HL.

	Author Names	Reliability	Validity	Participants' Demographics	Settings	Key Results	Tool Effectiveness	Identified Issues	Limitations	Recommendations
6	O'Sullivan & O'Donovan [7]	CES-D8: Cronbach's alpha = 0.85, HADS-A: alpha = 0.80	High (content and construct validity for scales)	3575 Irish women aged 50+	Irish Longitudinal Study on Ageing (TILDA)	Private health insurance and practicing BSE increase likelihood of mammogram attendance; age, BMI, quality of life, and marital status impact BSE practice	Effective in identifying factors influencing breast cancer screening and BSE among Irish women	Limited geographical representation, potential self-report bias	Encourage BSE to increase screening uptake, use longitudinal studies for further validation	
7	Ngan et al. [9]	Cronbach's alpha for CHBMS subscales ranged from 0.69 to 0.78	High (content and construct validity)	508 women aged 30-74 years, Hanoi, Vietnam	Community level, Hanoi	18% were knowledgeable about BC signs, risk factors, and screening modalities; 63% had previously received BC screening; CBE was the most common screening modality with an uptake of 51%; BC knowledge, perceived susceptibility, and perceived barriers were significant predictors of CBE uptake	Effective in assessing BC knowledge, beliefs, and screening practices	Low overall BC knowledge; discrepancies in screening uptake based on urban vs rural residence	Limited to one geographic area (Hanoi); potential response bias; cross-sectional design limits causal inference	Public health education and promotion interventions needed to increase BC awareness and screening uptake; further research in diverse geographic areas and among different populations
8	Milićević et al. [10]	High (Cronbach's alpha not reported but similar studies show good reliability)	High (content and construct validity)	403 women aged ≥30 years, visiting gynecologists at PHC Kikinda, Serbia	Primary Healthcare Centre Kikinda, Serbia	85.4% knew a lump in the breast is a symptom; 80.1% knew family history is a risk factor; 63.8% practiced self-examination, 39.1% had a clinical exam, 34.4% had ultrasound, 51.1% had mammography; barriers included lack of information, fear, and lack of funds	Effective in identifying knowledge and barriers to breast cancer screening	Low overall knowledge of risk factors and screening practices; financial and informational barriers	Limited to one geographic area (Kikinda); potential self-report bias; cross-sectional design limits causal inference	Enhance public health education, address financial and informational barriers, further studies in diverse regions and populations
9	Esna-Ashari et al. [11]	Cronbach's alpha values: perceived susceptibility (0.812), perceived severity (0.845), perceived benefits (0.782), perceived barriers (0.898), cues to action (0.847), self-efficacy (0.901)	High (content and construct validity)	458 female teachers aged 40+ years, Hamadan, Iran	Primary Health Care Centres in Hamadan, Iran	41.5% had performed mammography; perceived barriers were significant predictors of mammography uptake (OR = 0.89); higher knowledge and self-efficacy were associated with higher screening rates	Effective in identifying beliefs and behaviors related to mammography screening among female teachers in Iran	Financial and informational barriers; low overall knowledge about breast cancer	Limited to one geographic area (Hamadan); cross-sectional design limits causal inference	Public health interventions to increase awareness and reduce barriers; further studies in diverse regions
10	Azeez & Andsoy [20]	Cronbach's alpha for ACSB: 0.86 to 0.96	High (content and construct validity)	1066 women aged 20-70 years, Sulaymaniyah, Iraq	Community level, Sulaymaniyah, Iraq	41.9% practiced BSE, 37.5% had CBE, 35.1% had mammography; exposure, environment, and uneasiness barriers were significant predictors for BSE, CBE, and mammography	Effective in identifying cultural barriers affecting BCS behavior among Iraqi women	Low BCS practice rates; significant cultural barriers including exposure, environment, and uneasiness	Limited to one geographic area (Sulaymaniyah); cross-sectional design limits causal inference	Health education and culturally sensitive programs to increase BCS awareness; further studies in diverse regions
11	Rezaeimanesh et al. [21]	Cronbach's alpha: perceived susceptibility (0.89), perceived severity (0.85), self-efficacy (0.91), health motivation (0.80), perceived benefits (0.86), perceived barriers (0.81), cue to action (0.73)	High (content and construct validity)	985 women over 40 years old, Tehran, Iran	Community level, Tehran	42.1% performed mammography; significant predictors of mammography included age (OR = 4.252), housing situation (OR = 1.706), having breast problems (OR = 5.224), socioeconomic status (OR = 1.855), family income level (OR = 1.998), alcohol consumption (OR = 2.676), smoking (OR = 2.824), self-efficacy (OR = 1.935), perceived barriers (OR = 2.017), self-care (OR = 4.901), perceived susceptibility (OR = 1.971), and perceived severity (OR = 1.830)	Effective in identifying determinants of mammography behavior	Low mammography screening rate; socioeconomic and psychological barriers	Limited to one geographic area (Tehran); cross-sectional design limits causal inference	Develop comprehensive national breast cancer control programs; educational interventions focusing on benefits of mammography screening

	Author Names	Reliability	Validity	Participants' Demographics	Settings	Key Results	Tool Effectiveness	Identified Issues	Limitations	Recommendations
12	Moey et al.[12]	Cronbach's alpha: Health Beliefs constructs ranged from 0.73 to 0.91	High (content and construct validity)	520 women aged 35-70 years, Kuantan, Pahang, Malaysia	Community level, Kuantan, Pahang, Malaysia	Perceived severity, benefits, and barriers significantly influenced BSE adoption; self-efficacy mediated the relationship between age, marital status, and BSE adoption; knowledge and marital status moderated perceived benefits and BSE adoption	Effective in identifying factors influencing BSE behavior	Low overall adoption of BSE; significant barriers include perceived barriers and lack of knowledge	Limited to one geographic area (Kuantan); cross-sectional design limits causal inference	Implement educational and training programs to enhance BSE adoption; further research in diverse regions and populations
13	Ivanova & Kvalem[22]	Perceived susceptibility (Spearman-Brown coefficient = 0.81), response efficacy (α = 0.72), breast cancer fear (α = 0.69), defensive avoidance (α = 0.73)	High (content and construct validity)	270 women aged ≥18, living in Norway, no history of breast cancer	Community sample, Norway	Defensive avoidance predicted by lower perceived susceptibility (β = -0.22, p = 0.001), lower response efficacy (β = -0.33, p = 0.001), higher breast cancer fear (β = 0.15, p = 0.014), checking breasts for lumps (β = -0.23, p = 0.001); intention to attend mammography predicted by higher response efficacy (β = 0.13, p = 0.032), lower educational level (β = -0.10, p = 0.041), regular previous mammography attendance (β = 0.49, p = 0.001)	Effective in identifying psychological predictors of defensive avoidance and intention to attend mammography	Low participation rate in some areas; differences between predictors of intention and avoidance	Cross-sectional design limits causal inference; self-reported data may introduce bias; limited to Norway	Focus health promotion campaigns on psychological factors influencing both attendance and avoidance; emphasize response efficacy of mammography screening; address fear-related barriers
14	Bhandari et al.[15]	Cronbach's alpha: attitude (0.82), subjective norms (0.79), perceived behavioral control (0.81), perceived susceptibility (0.97), perceived severity (0.87), fatalism (0.88), knowledge (0.83)	High (content and construct validity)	500 women aged 40 years and above, Kathmandu Valley, Nepal	Community level, Kathmandu Valley, Nepal	Positive attitude, high subjective norms, and high perceived behavioral control significantly associated with higher screening intention; participation in awareness programs increased intention for mammography; high fatalistic beliefs reduced intention for clinical breast examination	Effective in identifying factors influencing breast cancer screening intention	Low screening rates; significant barriers include fatalistic beliefs and low perceived susceptibility	Limited to urban areas; cross-sectional design limits causal inference; potential self-report bias	Implement culturally sensitive interventions to address fatalistic beliefs; improve education on breast cancer risks and screening benefits; enhance accessibility to screening services
15	Alqahtani et al.[23]	Cronbach's alpha = 0.799	High (content and construct validity)	1021 women aged 18 years and older, Asir region, Saudi Arabia	Community level, Asir region, Saudi Arabia	93.93% were aware of breast self-exam (BSE), but only 6.37% always performed BSE; 44.76% were aware of mammograms, but 55.25% had not heard about it; main sources of information were leaflets (61.42% for BSE, 48.14% for mammogram) and doctors (21.58% for BSE, 30.63% for mammogram)	Effective in assessing knowledge and practices of breast cancer screening among women in Asir region	Low practice rates of BSE and mammograms; significant informational barriers	Limited to one geographic area (Asir region); cross-sectional design limits causal inference	Increase awareness and practice of BSE and mammograms through targeted education programs; improve accessibility to screening services
16	Selçuk et al.[24]	Cronbach's alpha: 0.84-0.96 for subscales	High (content and construct validity)	416 women aged 40 and over, semi-urban region, Bandirma, Turkey	Family Health Center, Bandirma	Rates for performing BSE (11.8%), having CBE (8.9%), and undergoing mammography (11.3%) were low; strong associations between health beliefs (susceptibility, seriousness, self-efficacy, benefits, health motivation) and screening behaviors	Effective in identifying health beliefs influencing screening behaviors	Low rates of BSE, CBE, and mammography; significant perceived barriers	Cross-sectional design limits causal inference; self-reported data may introduce bias; conducted in one region	Increase awareness and motivation through education programs; address perceived barriers to improve screening behaviors; further studies in diverse regions

	Author Names	Reliability	Validity	Participants' Demographics	Settings	Key Results	Tool Effectiveness	Identified Issues	Limitations	Recommendations
17	Sharif et al. [25]	Cronbach's alpha: FNAE (0.916), Attitude (0.893), Internal health locus of control (0.779), Cancer worry (0.776)	High (content and construct validity)	823 women aged ≥30 years, Iran	Online survey	FNAE positively correlated with negative attitude towards mammography (β = 0.144, P < 0.001); internal health locus of control, cancer worry, and age moderated the relationship between FNAE and attitude towards mammography	Effective in identifying psychological predictors of mammography attitudes	High levels of FNAE and negative attitudes towards mammography; moderating effects of internal health locus of control, cancer worry, and age	Cross-sectional design limits causal inference; self-reported data may introduce bias; limited to women with no previous mammography experience	Provide more information about the screening procedure; shift health locus of control from external to internal; address cancer worry; consider age-specific interventions
18	Ghanbari et al. [26]	Cronbach's alpha = 0.85	High (content and construct validity)	1472 married women aged 15-45 years, Rasht City, North of Iran	Urban population, Rasht City, Iran	70.7% never performed clinical breast examination (CBE); 52.2% never performed regular monthly breast self-examination (BSE); mammography performance associated with health insurance (OR=4.99) and family history (OR=1.60); CBE associated with age (OR=2.87); BSE associated with age (OR=1.67) and occupation (OR=1.65)	Effective in identifying social determinants influencing breast cancer screening behaviors	Low participation rates in breast cancer screening; significant structural and cultural barriers	Limited to one geographic area (Rasht City); cross-sectional design limits causal inference	Implement effective health education to reduce inequality and increase screening efficiency; address structural and cultural barriers
19	Alatrash [27]	Cronbach's alpha = 0.82	High (content and construct validity)	316 American Muslim and Christian women from three Arab countries (Lebanon, Jordan, Egypt), Greater Los Angeles area, USA	Community level, Greater Los Angeles area, USA	Lower mammography screening rates in Arab American women compared to national rates; cultural and religious barriers identified; Lebanese women had the highest screening rates; perceived benefits included feeling of control over health and early detection; perceived barriers included fear of diagnosis, embarrassment, and lack of time	Effective in identifying cultural and religious barriers affecting breast cancer screening behaviors	Low mammography screening rates; significant cultural and religious barriers	Limited to one geographic area (Greater Los Angeles); cross-sectional design limits causal inference	Increase awareness and practice of mammography screening through culturally sensitive education programs; involve community and religious leaders to address barriers
20	Wong & Cheng [28]	Cronbach's alpha: attitudes (0.70), knowledge (0.75), barriers (0.80), overall (0.76)	High (content and construct validity)	144 menopausal and postmenopausal Chinese women, aged 50 years or older, Hong Kong	Community center, Hong Kong	Better knowledge and perceptions about breast cancer (mean score: 14.75, SD: 3.70) and barriers to mammographic screening (mean score: 11.62, SD: 3.11); negative association with attitudes towards general health check-ups for women aged ≥50 years (B = –1.304, SE = 0.65, P = 0.046); positive association for those with regular physical exercise (B = 1.458, SE = 0.06, P = 0.017); positive association between employment and barriers to mammographic screening (B = 1.823, SE = 0.51, P < 0.001)	Effective in identifying factors influencing breast cancer screening beliefs among menopausal and postmenopausal women	Poor attitudes towards general health check-ups, especially among women aged ≥50 years and those with insufficient physical exercise	Limited to one geographic area (Hong Kong); cross-sectional design limits causal inference	Enhance education about breast cancer to improve awareness; promote regular physical exercise to improve attitudes towards health check-ups

	Author Names	Reliability	Validity	Participants' Demographics	Settings	Key Results	Tool Effectiveness	Identified Issues	Limitations	Recommendations
21	Solikhah et al. [29]	Cronbach's alpha = 0.82	High (content and construct validity)	856 Indonesian women aged 18-80 years, selected from rural and urban areas in three provinces (Yogyakarta, South of Sumatera, East Nusa Tenggara)	Community level, Indonesia	Urban women had lower knowledge of breast cancer risk factors compared to rural women; higher education levels associated with poorer attitudes towards breast cancer awareness; unmarried women and those living in South of Sumatera and Yogyakarta had higher perceived barriers	Effective in assessing breast cancer awareness, attitudes, and perceived barriers	Low overall knowledge of breast cancer risk factors; significant barriers related to cultural and social factors	Limited to three provinces; cross-sectional design limits causal inference	Increase breast cancer awareness campaigns; implement education programs targeting urban areas and higher education groups; involve community leaders to reduce perceived barriers
22	Perez et al. [30]	Perceived barriers to screening (α = 0.82), Breast cancer knowledge (α = 0.63), Depressive symptoms (α = 0.77), Perceived stress (α = 0.61)	High (content and construct validity)	222 churchgoing Latinas, aged 40-65 years, San Diego, CA	Community level, San Diego, CA	Perceived barriers inversely related to mammography and CBE screening among high-acculturation participants (OR = 0.42, OR = 0.21); depressive symptoms inversely related to CBE screening among single/non-partnered participants (OR = 0.25); significant moderators include acculturation, education, and marital status	Effective in identifying psychological and sociodemographic factors influencing breast cancer screening behaviors	Low overall screening rates; significant psychological barriers	Cross-sectional design limits causal inference; limited to one geographic area	Develop interventions targeting psychological barriers and considering sociodemographic factors; enhance support for low-acculturation and low-education groups
23	Chaka et al. [31]	KR-20 for knowledge (breast cancer = 0.62; cervical cancer = 0.83); Cronbach's alpha for attitudes (breast cancer = 0.77; cervical cancer = 0.75)	High (content and construct validity)	799 women aged 18 years and older, Ethiopia	Community level, four zones in Ethiopia	63.0% had heard of breast cancer; 21.3% had heard of breast cancer screening; 1.4% had undergone breast screening. Knowledge about risk factors for breast and cervical cancer was low. Higher education was associated with better knowledge (breast cancer: OR = 3.0, cervical cancer: OR = 1.9). Majority had negative attitudes towards both cancers (breast cancer: 67.4%; cervical cancer: 70.6%)	Effective in assessing knowledge and attitudes related to breast and cervical cancer	Low overall knowledge and negative attitudes towards breast and cervical cancer; significant barriers include lack of awareness and education	Limited to four zones in Ethiopia; cross-sectional design limits causal inference	Implement multi-faceted strategies to increase awareness through peer-education, mass media, and community-based interventions
24	VanDyke & Shell [32]	Cronbach's alpha: perceived susceptibility (0.83), perceived severity (0.77), perceived benefits of mammography (0.62), perceived barriers to mammography (0.79)	High (content and construct validity)	170 women aged 18-78 years, central Appalachia, USA	Free health clinic, central Appalachia, USA	Women with objectively elevated risks for breast cancer perceived themselves to be at higher risk. Perceived benefits and fewer barriers to mammography predicted greater mammogram frequency. Age and history of abnormal mammograms significantly predicted regular mammograms.	Effective in identifying health beliefs influencing breast cancer screening behaviors	Significant barriers to screening include lack of health insurance and perceived pain	Limited to one geographic area (central Appalachia); cross-sectional design limits causal inference	Reduce real and perceived barriers to screening; increase public awareness and availability of free or low-cost mammograms; implement programs to help women overcome existing barriers
25	Kwok et al. [33]	Cronbach's alpha: 0.80 to 0.88 for subscales	High (content and construct validity)	264 African migrant women aged 18-69 years, Sydney, Australia	Community level, Sydney, Australia	76.1% had heard of breast awareness; 11.4% practiced monthly breast awareness; 65.9% had a mammogram as recommended. Significant factors influencing participation in mammography were age and employment status.	Effective in identifying factors influencing breast cancer screening among African migrant women	Low participation rates in breast awareness and clinical breast examination; significant practical and psychological barriers	Limited to one geographic area (Sydney); cross-sectional design limits causal inference	Increase breast cancer screening awareness through targeted educational programs; address practical and psychological barriers to screening; involve community and religious leaders in promoting screening

	Author Names	Reliability	Validity	Participants' Demographics	Settings	Key Results	Tool Effectiveness	Identified Issues	Limitations	Recommendations
26	Moshki et al.[34]	Cronbach's alpha for CMSS = 0.87; CBCFS = 0.95	High (content and construct validity)	482 women aged 40 years or older, Sanandaj, Iran	Community level, Sanandaj, Iran	CMSS showed a two-factor model with strong fit indices (CFI = 0.93, TLI = 0.96, RMSEA = 0.05). CBCFS supported a one-factor model (CFI = 0.99, TLI = 0.99, RMSEA = 0.04). Higher self-efficacy and moderate fear were associated with better mammography adherence.	Effective in assessing self-efficacy and fear related to mammography among Iranian women	Low rates of mammography screening; significant psychological barriers	Cross-sectional design limits causal inference; limited to one geographic area (Sanandaj)	Increase breast cancer awareness and screening through culturally sensitive education programs; address psychological barriers to improve screening rates
27	Marmarà et al.[35]	CHBMS-MS: 0.93, IPQ-R: 0.92	High (content and construct validity)	404 women aged 50-60 years, Malta	Community level, Malta	High awareness of BC signs among Maltese women; significant factors for non-attendance included fear of result (41%), life problems, and low family income. Logistic regression showed perceived barriers as the strongest predictor of non-attendance ($p < 0.05$). Including illness representation dimensions improved model accuracy (65% vs. 38.8%).	Effective in assessing predictors of breast screening uptake among Maltese women	Fear, practical barriers, misconceptions about BC	Limited to one geographic area (Malta); cross-sectional design limits causal inference	Implement theory-based interventions targeting first BS uptake and specific barriers; enhance educational programs to improve screening uptake
28	Valdovinos et al.[36]	Cronbach's alpha for PEDQ: 0.87 (English), 0.91 (Spanish)	High (content and construct validity)	5,313 Hispanic adults aged 18-74 years, USA (Bronx, Chicago, Miami, San Diego)	Community level, four US regions	72.1% of women adherent to cervical cancer screening guidelines, 71.3% to breast cancer screening guidelines. Perceived discrimination was not significantly associated with breast or cervical cancer screening in women, modest association with colorectal cancer screening in men.	Effective in assessing perceived discrimination and its impact on cancer screening adherence among Hispanics	Health insurance coverage was the variable most associated with cancer screening adherence	Cross-sectional design limits causal inference; self-reported data subject to recall bias; limited to four urban regions	Focus efforts on increasing access to screening services, especially among the uninsured; implement policies to increase insurance coverage
29	Oqal et al.[37]	Cronbach's alpha for attitude items: 0.779	High (content and construct validity)	1000 community pharmacists, mean age 31.65 years, Jordan	Community pharmacies, Jordan	Mean knowledge score for breast cancer was 8.51/15 points. Mean knowledge score for breast cancer screening was 3.83/7 points. Pharmacists showed favourable attitudes towards involvement in breast cancer education with a mean score of 19.8/28 points. Major barriers included lack of time (63.9%), lack of privacy (57.1%), and lack of proper educational skills (56.2%).	Effective in assessing knowledge, attitudes, and perceived barriers among community pharmacists	Insufficient knowledge of breast cancer and screening; significant barriers to providing education	Self-reported data may contain inaccuracies; convenience sample limits generalizability	Improve knowledge through continuous education; address barriers such as time constraints and lack of privacy
30	Abraído-Lanza et al.[38]	Acculturation scale: α = .69; Fatalism scale: α = .81; Barriers scale: α = .65	High (content and construct validity)	318 Dominican women aged 40 years or older, New York City, USA	Community level, New York City, USA	The strongest predictor of decreased screening was perceived barriers. Acculturation assessed as language use was associated with decreased screening. Fatalistic beliefs were not associated with mammogram screening.	Effective in identifying psychosocial and logistical barriers to mammography screening among Dominican Latinas	High rate of screening (79.6% had a mammogram in the past year); significant psychosocial and logistical barriers include embarrassment, pain, cost, and not knowing how to obtain a mammogram.	Correlational design limits causal inference; self-reported data may contain inaccuracies; limited to one geographic area (New York City)	Intensify public health campaigns and use personalized messages to address barriers to screening; continue research on specific Latino subgroups to better address their needs

	Author Names	Reliability	Validity	Participants' Demographics	Settings	Key Results	Tool Effectiveness	Identified Issues	Limitations	Recommendations
31	Tolma et al. [39]	Cronbach's alpha for subscales: 0.65 to 0.96	High (content and construct validity)	255 American Indian women aged 40-66 years, rural Oklahoma, USA	Tribal clinic, Oklahoma	65% had a screening mammogram within the last two years; significant predictors of mammography included physician recommendation, knowledge of mammography guidelines, family history of breast cancer, and regular physician breast exams. Barriers included cultural affiliation, fatalistic attitudes, and perceived behavioral control barriers.	Effective in identifying predictors and barriers to mammography screening among American Indian women	Low screening rates; significant cultural and psychological barriers	Cross-sectional design limits causal inference; limited to one geographic area; self-reported data may contain inaccuracies	Enhance educational campaigns to address knowledge gaps; reduce cultural and psychological barriers through culturally sensitive interventions; improve access to screening facilities
32	Nojomi et al. [40]	Cronbach's alpha for subscales: Knowledge (0.71), Health beliefs (0.79), Self-efficacy (0.86), Performance barriers (0.80)	High (content and construct validity)	1,012 women aged 30-65 years, Tehran, Iran	Community level, Tehran, Iran	Knowledge about breast cancer screening was positively associated with the decision to undergo screening (OR = 1.32, 95% CI: 1.15-1.50). Higher self-efficacy and lower perceived barriers were significant predictors of screening intention and behavior.	Effective in identifying factors influencing breast cancer screening decisions among women in Tehran	Significant barriers include lack of knowledge, cultural beliefs, and access issues	Cross-sectional design limits causal inference; limited to one geographic area (Tehran); self-reported data may contain inaccuracies	Enhance educational campaigns to address knowledge gaps; address cultural and access barriers through community-based interventions; improve access to screening facilities
33	Hasnain et al. [41]	Cronbach's alpha for scales: 0.64 to 0.91	High (content and construct validity)	207 first-generation immigrant Muslim women aged 40 years and older, USA	Community level, USA	Lower acculturation and higher cultural beliefs were associated with lower breast cancer screening rates. Major barriers included lack of knowledge, cultural beliefs, and perceived discrimination. Facilitators included physician recommendation and social support.	Effective in identifying cultural and psychosocial factors influencing breast cancer screening among immigrant Muslim women	Low screening rates; significant cultural and psychosocial barriers to screening	Cross-sectional design limits causal inference; convenience sample may not be representative of all Muslim immigrant women in the USA; self-reported data may contain inaccuracies	Enhance educational campaigns and culturally sensitive interventions; engage community leaders to address cultural beliefs; increase physician recommendations and social support for screening
34	Avci et al. [42]	Alpha coefficient ranges from 0.64 to 0.90	Tested by Gozum and Aydin for Turkish version	Female academicians, mean age 33.9 years, 53.8% single, 58.6% no children	Ondokuz Mayis University, Turkey	Female academicians who knew and performed BSE had higher perceived benefits and self-efficacy, and fewer perceived barriers to BSE and mammography.	Effective in identifying health beliefs and self-esteem related to BSE	Younger women had more perceived barriers to mammography	Limited to female academicians at one university	Inform academicians about BSE and breast cancer risk factors, conduct further research
35	Tsunematsu et al. [43]	Cronbach's alpha ranges from 0.64 to 0.87	Content validity tested by expert review	993 women aged 40-69 years, Hiroshima, Japan	Community level, Japan	Higher perceived importance and benefits of cancer screening increased participation; perceived barriers decreased participation. Women preferred low-cost screening by female staff.	Effective in identifying psychological factors influencing screening behavior	Busy schedules and perception of good health as barriers	Conducted in a single town; limited generalizability	Increase awareness about the importance of early screening; make screening more accessible and convenient.
36	Hirai et al. [44]	Cronbach's alpha ranges from 0.64 to 0.87	Content validity tested by expert review	641 women aged 40-59 years, Japan	Online survey, Japan	Implementation intentions were the strongest predictor of mammography adoption. Goal intentions and perceived barriers also significantly affected adoption. Cancer worry influenced attitudes and intentions but was not a direct predictor of behavior. The model accounted for 41% of the variance in the stage of mammography adoption. Goal and implementation intentions significantly predicted adoption within one year.	Effective in predicting mammography adoption stages and behavior	Selection bias due to web-based sample; reliance on self-reports	Limited to online participants; potential selection bias; self-reported data may contain inaccuracies	Design interventions to enhance goal and implementation intentions; reduce perceived barriers; use cancer worry to influence attitudes and intentions but cautiously.

	Author Names	Reliability	Validity	Participants' Demographics	Settings	Key Results	Tool Effectiveness	Identified Issues	Limitations	Recommendations
37	Wu et al. [45]	Cronbach's alpha ranges from 0.72 to 0.85	Content validity and construct validity supported by factor analysis	434 Taiwanese women aged 40 and older	Community level, Taiwan	The majority of women had never had mammograms (57%) or ultrasounds (61%) in the past 5 years. Common barriers included 'no time', 'forgetfulness', 'too cumbersome', and 'laziness'.	Effective in identifying barriers and beliefs related to breast cancer screening	Lack of knowledge and awareness about breast cancer risks; low screening rates	Study limited to a specific demographic group; self-reported data may contain inaccuracies	Implement educational campaigns to address misconceptions and promote breast cancer screening; use physician recommendations to encourage screening.
38	Pons-Vigués et al. [46]	Cronbach's alpha ranges from 0.42 to 0.71	Content validity and construct validity supported by factor analysis	960 women aged 45-69 years in Barcelona, including natives and immigrants from low-income countries	Community level, Barcelona, Spain	Immigrant women had poorer knowledge, less positive attitudes, perceived fewer benefits, and more barriers to screening compared to native women. Social class, urban/rural setting, and cultural differences contributed to these disparities. Chinese women showed the greatest differences from native women, followed by Maghrebi and Filipino women.	Effective in identifying disparities in screening beliefs and barriers	Low internal consistency in some scales; high non-participation rate among some immigrant groups	Limited to one city; low participation among the most vulnerable immigrants	Tailored interventions to improve knowledge and attitudes towards breast cancer screening among immigrant women, taking into account cultural differences and social class. Utilize community and religious centers to reach out to immigrant populations.
39	Kim et al. [47]	Cronbach's alpha ranges from 0.71 to 0.93	Content validity supported by literature review and expert review	770 Chinese women aged 25-65 years	Community level, Beijing, Shanghai, Guangzhou, Xi'an	63.6% performed any breast cancer screening practices. Common barriers included 'no time', 'forgetfulness', 'too cumbersome', and 'laziness'. Women with regular screening reported better health promoting behaviors, perceived benefits, and less perceived barriers.	Effective in identifying barriers and beliefs related to breast cancer screening	Lack of knowledge and awareness about breast cancer risks; low screening rates	Convenience sampling; self-reported data may contain inaccuracies	Implement educational campaigns to address misconceptions and promote breast cancer screening; use physician recommendations to encourage screening

REFERENCE

1. Irshad K, Ahmed HH, Jamaluddin M. Mastectomy under Local Anesthesia in Locally Advanced Breast Cancer in an Unfit Patient. Bangladesh Journal of Medical Science. 2022 May 21;21(3):745–8.
2. Yedjou CG, Sims JN, Miele L, Noubissi F, Lowe L, Fonseca DD, et al. Health and Racial Disparity in Breast Cancer. Adv Exp Med Biol [Internet]. 2019 Jan 1 [cited 2024 Jun 9];1152:31–49. Available from: https://europepmc.org/articles/PMC6941147
3. Breast cancer [Internet]. [cited 2024 Jun 9]. Available from: https://www.who.int/news-room/fact-sheets/detail/breast-cancer
4. Alkhaifi S, Padela AI, Hodge F, Brecht ML. Breast cancer screening among immigrant Muslim arab women in the United States: Analyzing relationships between beliefs, knowledge, spousal support and mammogram utilization. J Natl Med Assoc [Internet]. 2023 Jun 1 [cited 2024 Jun 9];115(3):302–13. Available from: https://pubmed.ncbi.nlm.nih.gov/36967269/
5. Abbas MO, Baig M. Knowledge and Practice Concerning Breast Cancer Risk Factors and Screening among Females in UAE. Asian Pac J Cancer Prev [Internet]. 2023 [cited 2024 Jun 9];24(2):479. Available from: /pmc/articles/PMC10162630/
6. Liao Y, Hairon SM, Yaacob NM, Luo L, Ismail TAT, Liao Y, et al. A Comprehensive Model for Understanding Breast Cancer Screening Hesitancy: Integrating the Health Belief Model and the Confidence, Convenience, Complacency, Constraints, and Risk and Responsibility Calculations (5C) Model. Cureus [Internet]. 2024 Oct 16 [cited 2024 Nov 10];16(10). Available from: https://www.cureus.com/articles/295731-a-comprehensive-model-for-understanding-breast-cancer-screening-hesitancy-integrating-the-health-belief-model-and-the-confidence-convenience-complacency-constraints-and-risk-and-responsibility-calculations-5c-model
7. O'Sullivan K, O'Donovan A. Factors associated with breast cancer mammography screening and breast self-examination in Irish women: results from the Irish Longitudinal Study on Ageing (TILDA). Acta Oncol [Internet]. 2022 [cited 2024 Jun

9];61(11):1301–8. Available from: https://pubmed.ncbi.nlm.nih.gov/36369703/

8. Suriyong P, Jiraniramai S, Wongpakaran N, Pinyopornpanish K, Angkurawaranon C, Jiraporncharoen W, et al. Translation, Adaptation, and Validation of the Modified Thai Version of Champion's Health Belief Model Scale (MT-CHBMS). Healthcare (Switzerland) [Internet]. 2023 Jan 1 [cited 2024 Jun 9];11(1). Available from: /pmc/articles/PMC9819080/
9. Ngan TT, Jenkins C, Van Minh H, Donnelly M, ONeill C. Breast cancer screening practices among Vietnamese women and factors associated with clinical breast examination uptake. PLoS One [Internet]. 2022 May 1 [cited 2024 Jun 9];17(5). Available from: https://pubmed.ncbi.nlm.nih.gov/35622840/
10. Milićević MŠ, Djurin A, Terzić-Šupić Z, Todorović J, Nikolić D, Soldatović I. KNOWLEDGE AND BARRIERS TO EARLY DETECTION OF BREAST CANCER AMONG FEMALE PRIMARY CARE PATIENTS IN SERBIA. Cent Eur J Public Health. 2022 Jun 1;30(2):119–30.
11. Esna-Ashari F, Saffari N, Parsapour H, Rezapur-Shahkolai F. Factors Associated with Breast Cancer Mammographic Screening Behavior among Iranian Women. Asian Pac J Cancer Prev [Internet]. 2022 [cited 2024 Jun 9];23(12):4073. Available from: /pmc/articles/PMC9971457/
12. Moey SF, Mohamed NC, Lim BC. A path analytic model of health beliefs on the behavioral adoption of breast self-examination. AIMS Public Health [Internet]. 2021 [cited 2024 Jun 9];8(1):15. Available from: /pmc/articles/PMC7870382/
13. Araujo JM, Gómez AC, Zingg-De Jongh W, Ausejo J, Córdova I, Schwarz LJ, et al. A nationwide pilot study on breast cancer screening in Peru. Ecancermedicalscience [Internet]. 2023 Jan 9 [cited 2024 Jun 9];17. Available from: https://pubmed.ncbi.nlm.nih.gov/36816782/
14. Aboulhoda F, Hadrya F, Bejja F, Dahou B, Erefai O, Soulaymani A, et al. Epidemiological and Histological Profile of Breast Cancer in the Ghrab Chrarda Bni Hsein Region, Morocco. Bangladesh Journal of Medical Science. 2024 Oct 2;23(4):1129–36.
15. Bhandari D, Shibanuma A, Kiriya J, Hirachan S, Ong KIC, Jimba M. Factors associated with breast cancer screening intention in Kathmandu Valley, Nepal. PLoS One [Internet]. 2021 Jan 1 [cited 2024 Jun 9];16(1). Available from: https://pubmed.ncbi.nlm.nih.gov/33481894/
16. Arksey H, O'Malley L. Scoping studies: towards a methodological framework. Int J Soc Res Methodol [Internet]. 2005 Feb [cited 2024 Nov 10];8(1):19–32. Available from: https://www.tandfonline.com/doi/abs/10.1080/1364557032000119616
17. Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA extension for scoping reviews (PRISMA-ScR): Checklist and explanation. Ann Intern Med [Internet]. 2018 Oct 2 [cited 2024 Nov 10];169(7):467–73. Available from: https://www.acpjournals.org/doi/10.7326/M18-0850
18. Ehsan AN, Wu CA, Minasian A, Bass M, Sana H, Patel A, et al. Evaluation of Financial Interventions in Breast Cancer Care Worldwide: A Systematic Review. Plast Reconstr Surg Glob Open [Internet]. 2024 May 23 [cited 2024 Jun 9];12(5):E5683. Available from: https://journals.lww.com/prsgo/fulltext/2024/05000/evaluation_of_financial_interventions_in_breast.62.aspx
19. Poon PKM, Tam KW, Lam T, Luk AKC, Chu WCW, Cheung P, et al. Poor health literacy associated with stronger perceived barriers to breast cancer screening and overestimated breast cancer risk. Front Oncol. 2023 Jan 5;12:1053698.
20. Azeez SS, Andsoy II. Evaluation of Arab Cultural Barriers That Influence Muslim Arab Iraqi Women's Breast Cancer Screening Behavior. Eur J Breast Health [Internet]. 2022 Oct 1 [cited 2024 Jun 9];18(4):329. Available from: /pmc/articles/PMC9521288/
21. Rezaeimanesh M, Solhi M, Azar FEF, Sajjadi H, Rafiey H, Nejad FN, et al. Determinants of mammography screening in Tehranian women in 2018 based on the health belief model: A cross-sectional study. J Educ Health Promot [Internet]. 2021 Mar 1 [cited 2024 Jun 9];10. Available from: https://pubmed.ncbi.nlm.nih.gov/34084866/
22. Ivanova A, Kvalem IL. Psychological predictors of intention and avoidance of attending organized mammography screening in Norway: applying the Extended Parallel Process Model. BMC Womens Health [Internet]. 2021 Dec 1 [cited 2024 Jun 9];21(1):1–14. Available from: https://bmcwomenshealth.biomedcentral.com/articles/10.1186/s12905-021-01201-y
23. Alqahtani T, Alqahtani AM, Alshahrani SM, Orayj K, Almanasef M, Alamri AH, et al. Assessment of knowledge and practice of mammography and breast self-examination among the general female population in Asir region of KSA. Eur Rev Med Pharmacol Sci [Internet]. 2021 [cited 2024 Jun 9];25(23):7231–7. Available from: https://pubmed.ncbi.nlm.nih.gov/34919222/
24. Selçuk KT, Avcı D, Dündar GY, Mercan Y. Breast Cancer Screening Behaviors in Women Aged 40 Years and Over in a Semi-Urban Region in Turkey: Relationships with Health Beliefs. Healthcare (Basel) [Internet]. 2020 [cited 2024 Jun 9];8(2). Available from: https://pubmed.ncbi.nlm.nih.gov/32545805/
25. Sharif SP, Ahadzadeh AS, Ong FS, Naghavi N. Fear of negative appearance evaluation and attitude towards mammography: Moderating role of internal health locus of control,cancer

worry and age. Health Promot Perspect [Internet]. 2020 Jul 12 [cited 2024 Jun 9];10(3):220. Available from: /pmc/articles/PMC7420164/

26. Ghanbari A, Rahmatpour P, Hosseini N, Khalili M. Social Determinants of Breast Cancer Screening among Married Women: A Cross-Sectional Study. J Res Health Sci [Internet]. 2020 Dec 1 [cited 2024 Jun 9];20(1). Available from: https://pubmed.ncbi.nlm.nih.gov/32814688/
27. Alatrash M. Prevalence, Perceived Benefits, and Perceived Barriers Regarding Breast Cancer Screening Among Three Arab American Women Subgroups. J Transcult Nurs [Internet]. 2020 May 1 [cited 2024 Jun 9];31(3):242–9. Available from: https://pubmed.ncbi.nlm.nih.gov/31253074/
28. Wong FMF, Cheng WLS. Breast Cancer Screening Practice and Associated Factors in Menopausal and Postmenopausal Women. J Menopausal Med [Internet]. 2019 [cited 2024 Jun 9];25(1):41. Available from: https://pubmed.ncbi.nlm.nih.gov/31080788/
29. Solikhah S, Promthet S, Hurst C. Awareness Level about Breast Cancer Risk Factors, Barriers, Attitude and Breast Cancer Screening among Indonesian Women. Asian Pac J Cancer Prev [Internet]. 2019 [cited 2024 Jun 9];20(3):877–84. Available from: https://pubmed.ncbi.nlm.nih.gov/30912407/
30. Perez LG, Elder JP, Haughton J, Martinez ME, Arredondo EM. Socio-demographic Moderators of Associations Between Psychological Factors and Latinas' Breast Cancer Screening Behaviors. J Immigr Minor Health [Internet]. 2018 Aug 1 [cited 2024 Jun 9];20(4):823–30. Available from: https://pubmed.ncbi.nlm.nih.gov/28752364/
31. Chaka B, Sayed AR, Goeieman B, Rayne S. A survey of knowledge and attitudes relating to cervical and breast cancer among women in Ethiopia. BMC Public Health [Internet]. 2018 Aug 29 [cited 2024 Jun 9];18(1). Available from: https://pubmed.ncbi.nlm.nih.gov/30157813/
32. VanDyke SD, Shell MD. Health Beliefs and Breast Cancer Screening in Rural Appalachia: An Evaluation of the Health Belief Model. J Rural Health [Internet]. 2017 Sep 1 [cited 2024 Jun 9];33(4):350–60. Available from: https://pubmed.ncbi.nlm.nih.gov/27545099/
33. Kwok C, Ogunsiji O, Lee CF. Validation of the Breast Cancer Screening Beliefs Questionnaire among African Australian women. BMC Public Health [Internet]. 2016 Feb 4 [cited 2024 Jun 9];16(1). Available from: https://pubmed.ncbi.nlm.nih.gov/26846341/
34. Moshki M, Shahgheibi S, Taymoori P, Moradi A, Roshani D, Holt CL. Psychometric properties of the mammography self-efficacy and fear of breast cancer scales in Iranian women. BMC Public Health [Internet]. 2017 May 31 [cited 2024 Jun 9];17(1). Available from: /pmc/articles/PMC5452424/
35. Marmarà D, Marmarà V, Hubbard G. Health beliefs, illness perceptions and determinants of breast screening uptake in Malta: a cross-sectional survey. BMC Public Health [Internet]. 2017 May 8 [cited 2024 Jun 9];17(1). Available from: https://pubmed.ncbi.nlm.nih.gov/28482828/
36. Valdovinos C, Penedo FJ, Isasi CR, Jung M, Kaplan RC, Espinoza Giacinto R, et al. Perceived Discrimination and Cancer Screening Behaviors in US Hispanics: the Hispanic Community Health Study/Study of Latinos Socio-cultural Ancillary Study. Cancer Causes Control [Internet]. 2016 Jan 1 [cited 2024 Jun 9];27(1):27. Available from: /pmc/articles/PMC4842160/
37. Oqal M, Odeh M, Abudalu R, Alqudah A, Alnajjar R, Younes YB, et al. Assessing the knowledge, attitudes and barriers regarding health promotion of breast cancer among community pharmacists. Future Sci OA [Internet]. 2022 Dec 1 [cited 2024 Jun 9];8(10). Available from: /pmc/articles/PMC9979115/
38. Abraído-Lanza AF, Martins MC, Shelton RC, Flórez KR. Breast Cancer Screening Among Dominican Latinas: A Closer Look at Fatalism and Other Social and Cultural Factors. Health Educ Behav [Internet]. 2015 Oct 22 [cited 2024 Jun 9];42(5):633–41. Available from: https://pubmed.ncbi.nlm.nih.gov/25869406/
39. Tolma EL, Stoner JA, Li J, Kim Y, Engelman KK. Predictors of regular mammography use among American Indian women in Oklahoma: a cross-sectional study. BMC Womens Health [Internet]. 2014 Aug 28 [cited 2024 Jun 9];14(1). Available from: https://pubmed.ncbi.nlm.nih.gov/25169207/
40. Nojomi M, Namiranian N, Myers RE, Razavi-Ratki SK, Alborzi F. Factors Associated with Breast Cancer Screening Decision Stage among Women in Tehran, Iran. Int J Prev Med [Internet]. 2014 Feb [cited 2024 Jun 9];5(2):196. Available from: /pmc/articles/PMC3950743/
41. Hasnain M, Menon U, Ferrans CE, Szalacha L. Breast Cancer Screening Practices Among First-Generation Immigrant Muslim Women. J Womens Health [Internet]. 2014 Jul 7 [cited 2024 Jun 9];23(7):602. Available from: /pmc/articles/PMC4089017/
42. Avci IA, Kumcagiz H, Altinel B, Caloglu A. Turkish female academician self-esteem and health beliefs for breast cancer screening. Asian Pac J Cancer Prev [Internet]. 2014 [cited 2024 Jun 9];15(1):155–60. Available from: https://pubmed.ncbi.nlm.nih.gov/24528018/
43. Tsunematsu M, Kawasaki H, Masuoka Y, Kakehashi M. Factors affecting breast cancer screening behavior in Japan--assessment using the health belief model and conjoint analysis. Asian Pac J Cancer Prev [Internet]. 2013 [cited 2024 Jun

9];14(10):6041–8. Available from: https://pubmed.ncbi.nlm.nih.gov/24289622/

44. Hirai K, Harada K, Seki A, Nagatsuka M, Arai H, Hazama A, et al. Structural equation modeling for implementation intentions, cancer worry, and stages of mammography adoption. Psychooncology [Internet]. 2013 Oct [cited 2024 Jun 9];22(10):2339–46. Available from: https://pubmed.ncbi.nlm.nih.gov/23661593/
45. Wu TY, Chung S, Yeh MC, Chang SC, Hsieh HF, Ha SJ. Understanding breast cancer screening practices in Taiwan: a country with universal health care. Asian Pac J Cancer Prev [Internet]. 2012 [cited 2024 Jun 9];13(9):4289–94. Available from: https://pubmed.ncbi.nlm.nih.gov/23167330/
46. Pons-Vigués M, Puigpinõs-Riera R, Serral G, Pasarín MI, Rodríguez D, Pérez G, et al. Knowledge, attitude and perceptions of breast cancer screening among native and immigrant women in Barcelona, Spain. Psychooncology [Internet]. 2012 Jun [cited 2024 Jun 9];21(6):618–29. Available from: https://pubmed.ncbi.nlm.nih.gov/21384466/
47. Kim JI, Oh KO, Li CY, Min HS, Chang ES, Song R. Breast cancer screening practice and health-promoting behavior among chinese women. Asian Nurs Res (Korean Soc Nurs Sci) [Internet]. 2011 Sep [cited 2024 Jun 9];5(3):157–63. Available from: https://pubmed.ncbi.nlm.nih.gov/25030364/