



# Awareness of Breast Cancer and Mammography Among Women: A Comprehensive Public Health Review of Determinants, Barriers, and Screening

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## ***Abstract***

**Background:** Breast cancer remains the most frequently diagnosed malignancy among women worldwide and represents a major public health challenge, particularly in low- and middle-income countries where late-stage presentation is common. Despite advances in early detection and treatment, mortality rates remain disproportionately high in these settings, largely due to limited awareness, inadequate screening practices, and systemic healthcare barriers. Mammography is widely recognized as the gold standard for early detection of breast cancer and has been shown to significantly reduce mortality; however, its utilization remains suboptimal in many populations.

The aim of this review is to provide a comprehensive public health perspective on awareness of breast cancer and mammography among women, with a focus on determinants of awareness, barriers to screening uptake, and implications for preventive strategies. This review synthesizes evidence from epidemiological studies, community-based research, and national health initiatives, with particular emphasis on low-resource settings and Egypt as a representative model. The review explores key determinants influencing awareness, including sociodemographic factors, education level, cultural beliefs, and access to healthcare services. Additionally, it highlights the multifactorial barriers to mammography utilization, categorized into personal, health system, and economic barriers.

Evidence indicates that insufficient knowledge of breast cancer symptoms and risk factors remains a critical obstacle to early detection, contributing to delays in presentation and diagnosis. Cultural stigma, fear of diagnosis, misconceptions about screening procedures, and limited access to affordable healthcare services further exacerbate the problem. In many developing countries, including Egypt, screening rates remain significantly low despite the availability of national programs and mobile screening units. Public health initiatives, such as awareness campaigns and national screening programs, have demonstrated potential in improving early detection; however, their impact is often limited by gaps in implementation and accessibility.

In conclusion, improving awareness of breast cancer and promoting mammography uptake require integrated public health strategies that address both individual and systemic barriers. Tailored health education programs, community engagement, strengthening of healthcare infrastructure, and policy-level interventions are essential to enhance screening participation and ultimately reduce breast cancer morbidity and mortality worldwide.

**Keywords:** Breast Cancer, Mammography, Public Health



## Introduction

Breast cancer is the most frequently diagnosed cancer among women worldwide and represents a major public health challenge due to its high incidence and mortality. It accounts for approximately 2.3 million new cases annually and is a leading cause of cancer-related deaths among women. Despite advances in medical care, the burden of breast cancer remains substantial, particularly in low- and middle-income countries, where disparities in healthcare access and early detection contribute to poorer outcomes [1]. Early detection plays a critical role in reducing breast cancer mortality, with mammography recognized as the most effective screening tool for identifying disease at an asymptomatic stage. The success of screening programs, however, depends largely on women's awareness, accessibility to healthcare services, and participation in preventive practices. In many developing settings, inadequate awareness of breast cancer symptoms and screening methods remains a key contributor to delayed diagnosis and advanced-stage presentation [2].

Awareness of breast cancer includes knowledge of risk factors, recognition of early warning signs, and understanding of screening methods such as breast self-examination, clinical breast examination, and mammography. Low levels of awareness are strongly associated with reduced screening uptake and increased likelihood of late-stage diagnosis. Sociodemographic factors such as education, income, and place of residence, along with cultural beliefs and misconceptions, significantly influence women's knowledge and health-seeking behaviors [3].

In Egypt, breast cancer is the most prevalent cancer among women and is often diagnosed at advanced stages, reflecting significant gaps in awareness and screening practices. This pattern is influenced by multiple factors, including limited knowledge of the disease, sociocultural barriers, and unequal access to healthcare services between urban and rural populations. Despite national efforts to enhance early detection, screening participation remains low, highlighting the need for more effective public health strategies [4].

Although numerous studies have examined breast cancer awareness and screening behaviors, there remains a gap in integrating these elements within a comprehensive public health framework. Many studies focus on either knowledge or screening uptake independently, without addressing the interaction between awareness, determinants, and systemic barriers. Additionally, there is a need for context-specific analyses that consider the unique demographic and sociocultural characteristics influencing women's health behaviors in low-resource settings [5,6].

This review aims to provide a comprehensive public health analysis of awareness of breast cancer and mammography among women, focusing on the determinants influencing awareness, barriers to screening uptake, and implications for improving early detection and reducing breast cancer burden, particularly in low- and middle-income settings.

## Epidemiology and Public Health Burden of Breast Cancer

Breast cancer represents the most commonly diagnosed cancer among women globally and is a leading contributor to the global burden of disease. According to international estimates, breast cancer accounts for approximately one in every eight cancer diagnoses and constitutes a significant proportion of cancer-related morbidity and mortality among females. The global increase in incidence reflects both improved detection through screening programs and a true rise in risk factors associated with lifestyle and reproductive changes [7].

The global burden of breast cancer is not distributed equally, with marked disparities observed between high-income countries (HICs) and low- and middle-income countries (LMICs). While HICs report higher incidence rates due to widespread screening and early detection, LMICs experience disproportionately higher mortality rates. This paradox is largely attributed to late-stage presentation, limited screening programs, and restricted access to timely and effective treatment, making breast cancer a critical inequity issue in global health [8].

In Egypt, breast cancer is the most prevalent malignancy among women, accounting for a substantial



proportion of female cancer cases. Despite having a lower incidence rate compared to some developed countries, Egypt demonstrates significantly higher mortality rates and poorer survival outcomes. This reflects systemic challenges, including delayed diagnosis, inadequate awareness, and limited accessibility to early detection services, which collectively contribute to advanced-stage presentation at diagnosis [9].

A notable epidemiological feature in Egypt and other LMICs is the younger age of breast cancer presentation compared to Western countries. The median age at diagnosis is lower, and a higher proportion of cases occur in women under 50 years of age. This demographic pattern, combined with insufficient screening coverage, results in a higher likelihood of aggressive disease and late-stage detection, thereby worsening prognosis and increasing the public health burden [10].

Beyond individual health outcomes, breast cancer imposes a substantial socioeconomic burden at the family and community levels. Women affected by breast cancer are often within their most productive years, leading to loss of income, increased healthcare expenditures, and long-term financial strain on households. At the societal level, high mortality and morbidity contribute to reduced workforce participation and increased pressure on healthcare systems, particularly in resource-limited settings [11].

### **Determinants of Breast Cancer Awareness Among Women**

Breast cancer awareness among women is shaped by a complex interplay of sociodemographic characteristics, with education level being one of the most influential determinants. Women with higher levels of education are more likely to possess adequate knowledge of breast cancer risk factors, symptoms, and screening methods, which in turn promotes early health-seeking behavior. Conversely, low educational attainment is strongly associated with poor awareness and delayed presentation, particularly in low-resource settings where access to health information is limited [12].

Socioeconomic status also plays a crucial role in determining awareness levels and access to breast cancer information. Women with higher income levels are more likely to access healthcare services, participate in screening programs, and receive health education through both formal and informal channels. In contrast, women from lower socioeconomic backgrounds often face barriers such as financial constraints, limited access to healthcare facilities, and reduced exposure to health promotion campaigns, all of which negatively impact awareness and screening uptake [13].

Geographical disparities, particularly between urban and rural populations, significantly influence awareness of breast cancer. Urban women generally demonstrate higher awareness levels due to better access to healthcare services, media exposure, and educational opportunities. In contrast, women living in rural areas often have limited access to screening facilities and health education programs, resulting in lower awareness and higher likelihood of late-stage diagnosis. These disparities highlight the importance of geographically targeted public health interventions [14].

Cultural beliefs and social norms are critical determinants that shape women's perceptions of breast cancer and their willingness to seek screening. In many communities, stigma associated with cancer, fear of diagnosis, and misconceptions about the disease can discourage women from discussing symptoms or participating in screening programs. Additionally, reliance on traditional practices and negative attitudes toward healthcare systems further contribute to low awareness and delayed presentation [15].

Health system-related factors also influence awareness, particularly the role of healthcare providers and accessibility of health information. Effective communication between healthcare professionals and patients is essential in improving knowledge and promoting preventive behaviors. However, inadequate counseling, lack of organized awareness programs, and limited integration of breast health education into primary care services can significantly reduce women's understanding of breast cancer and available screening methods [16].

Finally, exposure to public health campaigns and national screening initiatives plays a vital role in enhancing awareness at the population level. Well-structured awareness programs that include education on risk factors, symptoms, and early detection methods have been shown to improve knowledge and encourage participation in screening. However, in many low- and middle-income countries, including



Egypt, these programs remain insufficiently implemented or fail to reach vulnerable populations, limiting their overall effectiveness [17].

### **Barriers to Mammography Screening Uptake**

Mammography screening uptake among women is influenced by a wide range of barriers that operate at individual, societal, and health system levels. Personal barriers are among the most significant obstacles, with lack of awareness and knowledge about breast cancer and screening being the most frequently reported factors. Many women are unaware of the importance of early detection or the role of mammography in reducing mortality, which leads to low participation in screening programs. Additionally, fear of diagnosis, anxiety about potential results, and misconceptions regarding radiation exposure further discourage women from undergoing screening [18].

Sociocultural factors also play a substantial role in limiting mammography uptake. Cultural beliefs, stigma associated with cancer, and modesty concerns can prevent women from seeking screening services, particularly in conservative communities. Fear of social consequences, reluctance to discuss breast-related issues, and reliance on traditional or non-medical remedies further contribute to delayed screening. These sociocultural barriers are particularly evident in low- and middle-income countries, where cultural norms strongly influence health-seeking behaviors [19].

Health system-related barriers significantly affect accessibility and utilization of mammography services. These include long waiting times, difficulty in obtaining appointments, inadequate availability of screening facilities, and lack of trained healthcare professionals. In many settings, especially rural areas, the absence of organized screening programs and insufficient healthcare infrastructure limits women's access to timely and reliable diagnostic services. Furthermore, poor communication between healthcare providers and patients can reduce awareness and discourage participation in screening [20].

Economic barriers represent another major challenge, particularly in low-resource settings. The cost of mammography, transportation expenses, and indirect costs such as loss of income can prevent women from accessing screening services. In many developing countries, including Egypt, a significant proportion of healthcare expenses are paid out-of-pocket, making preventive services like mammography unaffordable for many women. Financial constraints therefore play a critical role in delaying or completely preventing screening uptake [21].

Geographical disparities further exacerbate barriers to mammography screening, with rural populations facing significantly greater challenges compared to urban residents. Women living in rural areas often have limited access to healthcare facilities, fewer specialized services, and reduced exposure to awareness campaigns. These factors contribute to lower screening rates and higher likelihood of late-stage diagnosis among rural populations, highlighting the need for targeted interventions to bridge the urban-rural gap [22].

In Egypt, these barriers collectively result in extremely low screening uptake rates despite the availability of national initiatives and mobile mammography units. Studies indicate that only a small proportion of women participate in screening programs, largely due to lack of awareness, fear, financial limitations, and limited accessibility to services. Addressing these multifactorial barriers requires a comprehensive public health approach that integrates education, healthcare system strengthening, and policy-level interventions to improve screening coverage and early detection [23].

### **Knowledge, Attitudes, and Practices (KAP) Toward Breast Cancer and Mammography**

Knowledge of breast cancer among women is a fundamental determinant of early detection and prevention behaviors. Adequate knowledge includes awareness of risk factors, recognition of early symptoms, and understanding of available screening methods such as breast self-examination, clinical breast examination, and mammography. However, evidence indicates that knowledge levels remain insufficient in many low- and middle-income settings, where a large proportion of women are unable to identify key symptoms or risk factors, contributing to delayed diagnosis and poor outcomes [24].

Attitudes toward breast cancer and screening significantly influence women's willingness to engage in



preventive practices. Positive attitudes, such as perceived susceptibility to the disease and belief in the benefits of early detection, are associated with higher screening uptake. In contrast, negative attitudes, including fear of diagnosis, fatalistic beliefs about cancer, and mistrust in healthcare systems, can discourage women from seeking screening services. Emotional factors such as anxiety and stigma further shape attitudes and may lead to avoidance of mammography despite awareness of its importance [25].

Practices related to breast cancer screening, including participation in mammography, clinical breast examination, and breast self-examination, remain suboptimal in many populations. Despite the availability of screening methods, actual practice is often inconsistent with knowledge levels, indicating a gap between awareness and behavior. For example, many women who are aware of breast self-examination do not perform it regularly, and mammography uptake remains low even among those who recognize its benefits [26].

The discrepancy between knowledge and practice is often explained by the presence of multiple barriers, including psychological, cultural, and systemic factors. Women may have adequate knowledge but still fail to engage in screening due to fear, embarrassment, lack of time, or limited access to services. This highlights the importance of addressing not only knowledge deficits but also behavioral and structural barriers in designing effective public health interventions [27].

In Egypt, studies have demonstrated particularly low levels of screening practices despite increasing awareness through national initiatives. Only a small percentage of women report undergoing mammography or regular clinical examinations, and breast self-examination is also infrequently practiced. This reflects a persistent gap between knowledge and actual preventive behavior, emphasizing the need for targeted interventions that translate awareness into action [28].

Improving KAP requires comprehensive strategies that combine education, behavioral change interventions, and healthcare system support. Community-based awareness campaigns, culturally sensitive health education, and empowerment of women to take active roles in their health are essential components. Additionally, integrating breast health education into primary care services and ensuring accessibility of screening facilities can help bridge the gap between knowledge and practice and ultimately improve early detection rates [29].

### **Role of Mammography in Early Detection and Public Health Impact**

Mammography is widely recognized as the gold standard for breast cancer screening and plays a pivotal role in early detection. It is a low-dose X-ray imaging technique that allows visualization of breast tissue abnormalities before clinical symptoms appear. Early detection through mammography enables identification of tumors at a smaller size and earlier stage, which significantly improves treatment outcomes and survival rates. Consequently, mammography has become a cornerstone of secondary prevention strategies in breast cancer control programs [30].

The public health impact of mammography is evident in its ability to reduce breast cancer mortality. Studies have shown that regular screening with mammography can decrease mortality rates by approximately 20–35% among women aged 50–69 years, with additional benefits observed in younger age groups. This reduction is primarily attributed to earlier diagnosis, which allows for less aggressive treatment and better prognosis. As a result, countries with well-established screening programs have experienced significant improvements in breast cancer survival rates [31].

Despite its effectiveness, the implementation of mammography screening programs faces considerable challenges in low- and middle-income countries. These programs require substantial financial investment, specialized equipment, and trained personnel, making them difficult to sustain in resource-limited settings. Additionally, variations in healthcare infrastructure and lack of organized national screening policies further limit the widespread adoption of mammography, reducing its potential public health impact in these regions [32].

Another important limitation of mammography is its reduced sensitivity in women with dense breast tissue, particularly among younger women. In such cases, mammography may fail to detect malignancies, necessitating the use of complementary imaging techniques such as ultrasound or



magnetic resonance imaging. This limitation is particularly relevant in countries like Egypt, where a significant proportion of breast cancer cases occur in younger women, thereby affecting the overall effectiveness of mammography as a standalone screening tool [33].

In Egypt, mammography is available in both governmental and private healthcare facilities and is supported by national screening initiatives, including mobile units aimed at increasing accessibility in underserved areas. However, despite these efforts, utilization remains low due to persistent barriers such as limited awareness, financial constraints, and sociocultural factors. Consequently, the potential benefits of mammography in reducing mortality have not been fully realized at the population level [34]. To maximize the public health impact of mammography, it is essential to integrate screening programs with broader health system strengthening and awareness initiatives. Combining mammography with other early detection strategies, such as clinical breast examination and breast self-awareness, can enhance detection rates, particularly in resource-limited settings. Furthermore, policy-level interventions aimed at improving accessibility, affordability, and public awareness are crucial to increasing screening uptake and reducing breast cancer burden globally [35].

### **Public Health Strategies to Improve Awareness and Screening**

Public health strategies play a crucial role in improving breast cancer awareness and promoting early detection through screening. Health education and awareness campaigns are among the most effective interventions for increasing knowledge about breast cancer risk factors, symptoms, and the importance of early detection. These campaigns, when properly designed and implemented, can significantly influence women's health-seeking behaviors and encourage participation in screening programs. However, their success depends on cultural relevance, accessibility, and continuity, particularly in low-resource settings [36].

Community-based interventions are essential in reaching underserved and high-risk populations, especially in rural and marginalized areas. Utilizing community health workers and local outreach programs can help bridge gaps in awareness by delivering culturally appropriate education and promoting early detection practices. These interventions are particularly effective in low- and middle-income countries, where healthcare access is limited and community engagement plays a key role in influencing health behaviors [37].

Integration of breast cancer awareness and screening services into primary healthcare systems is another critical strategy. Primary care settings provide an accessible platform for delivering health education, conducting clinical breast examinations, and referring patients for further diagnostic procedures. Strengthening primary healthcare infrastructure and ensuring that healthcare providers are adequately trained in breast health education can significantly improve early detection rates and reduce delays in diagnosis [38].

At the global level, initiatives such as the World Health Organization's Global Breast Cancer Initiative emphasize the importance of comprehensive approaches that *تشمل* health promotion, early diagnosis, and effective treatment. These initiatives aim to reduce global breast cancer mortality through coordinated efforts that focus on increasing awareness, improving access to diagnostic services, and strengthening health systems. Such frameworks provide valuable guidance for countries seeking to develop or enhance their national cancer control programs [39].

In Egypt, several national initiatives have been implemented to address breast cancer awareness and screening. Programs such as the Women's Health Initiative and the "100 Million Healthy Lives" campaign have significantly expanded access to screening services and increased public awareness. These initiatives include free clinical examinations, mammography services, and health education campaigns, contributing to improved early detection rates. However, challenges remain in ensuring equitable access and sustained participation across all population groups [40].

To achieve meaningful improvements in breast cancer outcomes, public health strategies must adopt a multifaceted approach that addresses both individual and systemic barriers. This includes enhancing health literacy, reducing financial and geographic barriers to screening, and promoting policy-level support for sustainable cancer control programs. Collaboration between governments, healthcare



providers, and community organizations is essential to ensure that awareness initiatives translate into increased screening uptake and ultimately reduce breast cancer morbidity and mortality [41].

### Conclusion

Breast cancer remains a significant public health challenge worldwide, with awareness and early detection playing a pivotal role in reducing morbidity and mortality. Despite the proven effectiveness of mammography in improving survival outcomes, its utilization remains suboptimal, particularly in low- and middle-income settings. This review highlights that inadequate awareness, sociocultural influences, and systemic healthcare barriers continue to hinder timely screening and early diagnosis, ultimately contributing to late-stage presentation and poorer outcomes.

Addressing these challenges requires a comprehensive and integrated public health approach that combines education, community engagement, and health system strengthening. Improving women's knowledge, reducing barriers to access, and promoting culturally sensitive awareness programs are essential to enhancing screening uptake. Strengthening national initiatives and ensuring equitable access to mammography services will be critical in translating awareness into action and achieving meaningful reductions in the global burden of breast cancer.

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