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## A critical appraisal of mammography utilization in Nigeria: Challenges and prospects

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### Abstract

**Background:** Mammography is a critical tool for the early detection of breast cancer, reducing morbidity and mortality rates. However, in Nigeria, its utilization remains limited due to infrastructural deficits, financial barriers, and sociocultural factors. Addressing these challenges is vital to improving women's health outcomes and aligning with global standards for cancer control.

**Objective:** To critically appraise mammography utilization in Nigeria, focusing on challenges, current trends, and potential strategies to enhance uptake and accessibility.

**Methods:** A review of literature was conducted using databases such as PubMed, Scopus, and Google Scholar, focusing on studies published between 2013 and 2024. Search terms included "mammography utilization," "breast cancer screening in Nigeria," and "barriers to mammography." Articles highlighting infrastructural gaps, demographic disparities, financial constraints, and policy implementation in Nigeria were prioritized. Comparative insights from other low- and middle-income countries were also reviewed.

**Conclusion:** Nigeria faces significant challenges in mammography utilization, including inequitable distribution of equipment, insufficient skilled personnel, and financial and sociocultural barriers. However, opportunities exist in adopting digital mammography, leveraging public-private partnerships, and implementing community-based awareness programs. Strengthening national cancer screening policies and integrating mammography into universal health coverage schemes can further enhance accessibility and affordability. A multi-stakeholder approach involving policymakers, healthcare providers, and community leaders is crucial to improving breast cancer screening services, reducing mortality rates, and advancing health equity for Nigerian women.

**Keywords:** Mammography utilization, challenges, prospects, Nigeria

### Introduction

Mammography, a specialized radiological technique, plays a pivotal role in detecting breast cancer at its earliest stages, significantly improving prognosis and survival rates.<sup>[1]</sup> As a non-invasive imaging modality, it identifies microcalcifications and subtle tissue changes, enabling the diagnosis of malignancies before clinical symptoms manifest. The public health implications of mammography are profound, as early detection reduces the burden of advanced disease, lowers mortality, and minimizes treatment costs<sup>[2]</sup>. Breast cancer remains the most commonly diagnosed cancer among women worldwide and the leading cause of cancer-related deaths<sup>[3]</sup>. Mammography has been the cornerstone of breast cancer screening programs in high-income countries, contributing to significant declines in mortality rates over the past three decades<sup>[3]</sup>. In these settings, widespread awareness, robust healthcare systems, and routine screening have ensured high utilization rates. However, disparities persist in low- and middle-income countries (LMICs), where access to mammography services is often constrained by inadequate infrastructure and socioeconomic barriers<sup>[4]</sup>. Nigeria, like many LMICs, faces a growing breast cancer burden, with increasing incidence and mortality rates over the past two decades<sup>[5]</sup>. Late-stage presentations are common due to limited awareness, cultural stigmas, and poor access to diagnostic and treatment facilities<sup>[6]</sup>. Despite the existence of tertiary healthcare centers equipped with mammography machines, the distribution is uneven, with rural areas significantly underserved.

Furthermore, the financial cost of mammography remains prohibitive for many Nigerian women, compounded by the lack of widespread health insurance coverage.

This review critically appraises mammography utilization in Nigeria, examining the challenges and exploring actionable prospects. The review is structured to address the global and national context of mammography, focusing on barriers such as infrastructure deficits, financial constraints, and socio-cultural factors. It also highlights opportunities for leveraging technological advancements, public-private partnerships, and policy reforms to enhance utilization. By synthesizing evidence from local and international literature, this article aims to provide a comprehensive framework for improving mammography access and uptake in Nigeria, ultimately contributing to better breast cancer outcomes.

### **Breast Cancer and Mammography in Nigeria**

Breast cancer is the leading malignancy among Nigerian women, with an alarming increase in incidence and mortality rates over the last two decades [7]. According to Chan, Nigeria recorded over 26,000 new cases of breast cancer annually, accounting for approximately 22% of all female cancers in the country [8]. Mortality rates remain high, with an estimated case fatality ratio of 50%, largely attributed to late-stage presentation and limited access to timely treatment [9]. Sociocultural and demographic factors significantly influence breast cancer patterns in Nigeria. Women in urban areas tend to report higher incidence rates due to better diagnostic facilities and heightened awareness, while rural communities often lack basic healthcare infrastructure [10, 11]. Cultural stigmas, fear of mastectomy, and reliance on traditional medicine contribute to delayed healthcare-seeking behavior [10]. Additionally, younger women under 50 years frequently present with more aggressive subtypes, underscoring the need for early detection strategies tailored to the demographic reality [12].

Mammography is a low-dose X-ray imaging technique designed to detect abnormalities in breast tissue, particularly microcalcifications and masses, that may indicate malignancy [13]. It remains the gold standard for breast cancer screening and early diagnosis, significantly improving survival rates by identifying cancers at an asymptomatic stage [14]. Globally, mammography utilization is guided by benchmarks established in high-income countries. For instance, the U.S. Preventive Services Task Force recommends biennial mammograms for women aged 50 to 74, contributing to a 40% reduction in breast cancer mortality in this cohort [15]. European nations similarly report high utilization rates due to organized screening programs and universal health coverage [16]. In contrast, many low- and middle-income countries, including Nigeria, face challenges such as limited access to functional mammography machines, cost barriers, and a lack of trained radiologists, leading to suboptimal screening coverage [17].

While mammography is critical for early detection, the disparities in utilization highlight the urgent need for equitable access and awareness campaigns, particularly in resource-constrained settings like Nigeria [17].

### **Mammography Utilization in Nigeria**

Mammography utilization in Nigeria remains suboptimal, reflecting significant barriers to accessibility and availability [18]. According to a study, fewer than 40% of tertiary healthcare facilities in Nigeria have functional

mammography units, with services predominantly concentrated in urban areas [19]. Rural regions, where over 50% of the population resides, are often underserved due to infrastructural limitations and a lack of trained personnel. Additionally, cost remains a significant deterrent, with mammography fees ranging between ₦10,000-₦20,000 (\$6-\$12), rendering it unaffordable for many women [20, 21].

Usage rates are disproportionately low, with a national screening rate estimated at less than 5% for eligible women [22]. Age, education, and socioeconomic status are critical determinants of mammography uptake [23]. Women in higher socioeconomic classes and those with tertiary education are more likely to access services, whereas those in lower-income brackets face greater barriers. Regional disparities further exacerbate inequities, with southern Nigeria exhibiting higher utilization rates compared to the northern regions, where cultural and religious factors often restrict women's access to preventive healthcare [24]. Awareness of mammography among Nigerian women is alarmingly low. Studies reveal that fewer than 30% of women are aware of mammography as a screening tool, and even fewer understand its role in early detection of breast cancer [24-26]. Knowledge gaps are particularly pronounced in rural and less educated populations, where health education campaigns are limited [24].

Sociocultural norms, fear of cancer diagnosis, and mistrust in healthcare systems influence perceptions of mammography and healthcare-seeking behavior. Many women associate mammography with pain or radiation risks, deterring them from undergoing the procedure [26]. Additionally, the stigma surrounding breast cancer often leads to secrecy and delays in seeking medical help [27]. Healthcare providers also play a critical role in shaping attitudes; inadequate counseling on the importance of regular screenings and a lack of culturally sensitive communication often result in missed opportunities to encourage mammography use [24].

### **Challenges in Mammography Utilization**

The availability and distribution of mammography machines in Nigeria are grossly inadequate. A recent assessment indicated that fewer than 25% of public hospitals are equipped with mammography units, and these are unevenly distributed, with a majority located in urban centers [22]. This concentration limits access for rural populations, where over half of Nigerian women reside. Maintenance and technological gaps exacerbate the issue. Aging equipment, frequent breakdowns, and a lack of spare parts hinder the consistent delivery of mammography services [28]. Additionally, the absence of digital mammography units in many facilities reduces the accuracy and efficiency of screenings.

Nigeria faces a critical shortage of skilled radiologists and mammography technicians [29]. With fewer than 300 radiologists available to serve a population of over 200 million, the capacity to deliver mammography services is severely constrained [19, 30]. This shortage is further aggravated by brain drain, as many trained professionals migrate to high-income countries for better opportunities. Training programs for radiology and mammography are limited, and existing curricula often lack components tailored to the country's unique healthcare challenges [19].

The high cost of mammography is a significant deterrent for many Nigerian women. With less than 5% of the population

covered by health insurance, out-of-pocket expenses dominate healthcare financing [31]. The absence of universal health coverage for cancer screening services further exacerbates disparities, leaving many women without access to potentially life-saving diagnostics. Cultural and religious beliefs significantly influence attitudes toward mammography. The stigma surrounding breast cancer often leads to secrecy, with many women reluctant to seek screening for fear of being labeled as having a terminal illness [26]. Policy and governance challenges further impede mammography utilization. While Nigeria's National Cancer Control Plan includes provisions for breast cancer screening, implementation remains weak due to inadequate funding and poor coordination [32]. Government spending on health is below the 15% Abuja Declaration target, limiting investments in cancer screening infrastructure and workforce development. Furthermore, the absence of targeted subsidies for mammography undermines efforts to make it accessible to low-income populations.

### Prospects and Opportunities

The introduction of digital and portable mammography offers a promising solution to address Nigeria's limited healthcare infrastructure [33]. Digital mammography, with its higher image resolution and efficiency, enables quicker diagnoses and reduces the need for repeat scans, thus improving patient throughput. Portable mammography units, which are lightweight and easily transportable, can reach underserved rural areas, bringing essential services closer to the population [34]. Moreover, integrating mammography services with telemedicine platforms allows radiologists to interpret images remotely, bridging the gap caused by the shortage of skilled personnel in remote areas [35, 36]. This approach has shown success in similar low-resource settings globally, demonstrating its potential to transform breast cancer screening in Nigeria.

Public-private partnerships (PPPs) represent a viable strategy for expanding mammography services in Nigeria [37, 38]. NGOs and private healthcare providers have been instrumental in bridging gaps in cancer screening by establishing affordable and accessible facilities. For instance, the Nigerian Cancer Society, in collaboration with international organizations, has initiated community-based breast cancer screening programs [32]. These partnerships can also attract funding for equipment procurement and workforce training. Sustainable funding models, such as corporate social responsibility initiatives and micro-health insurance schemes, can ensure the continuity of services. Additionally, collaboration between the public sector and private entities can enhance service delivery through shared infrastructure and resources.

Strengthening national policies for cancer screening is critical for increasing mammography utilization. Nigeria's National Cancer Control Plan offers a foundation but requires robust implementation strategies to achieve widespread impact. This includes integrating breast cancer screening into existing primary healthcare services, and ensuring routine screening becomes a standard practice. Pilot programs, such as mobile screening initiatives in urban slums, have demonstrated the feasibility of reaching hard-to-reach populations. Scaling up these pilots nationally, with adequate funding and policy support, could significantly improve coverage. Establishing a centralized cancer registry will also aid in monitoring progress and identifying gaps for

targeted interventions [4].

Community engagement and awareness campaigns are essential to overcoming sociocultural barriers and improving healthcare-seeking behaviors. Grassroots advocacy involving local leaders, community health workers, and cancer survivors can help demystify breast cancer screening and promote its benefits. Programs like door-to-door awareness campaigns have shown success in other public health initiatives and can be replicated for mammography services. Leveraging traditional and social media platforms can also amplify these efforts. Radio programs, television campaigns, and targeted social media content can reach diverse demographics, including younger women who are more likely to engage with digital platforms. Additionally, school-based programs can educate adolescent girls about the importance of breast health, fostering a culture of early detection from a young age [39].

### Lessons from Other Countries and Implications for Research and Practice

Successful mammography programs in low- and middle-income countries (LMICs) provide valuable lessons for Nigeria. For instance, Brazil has demonstrated how a robust national policy can drive widespread breast cancer screening [40]. Through its "SUS Saúde da Mulher" initiative, Brazil integrated mammography into primary healthcare services, enabling early detection and treatment [41]. This was achieved by subsidizing screening costs and training healthcare workers, which significantly improved coverage in underserved regions [42]. Similarly, Mexico's mobile mammography units, supported by public-private partnerships, have extended screening services to rural and Indigenous populations, addressing geographical disparities [43]. In sub-Saharan Africa, Rwanda has leveraged community health workers to raise awareness and facilitate referrals for breast cancer screening [44]. This grassroots approach, coupled with investments in training radiologists, has strengthened the country's diagnostic capacity. These examples highlight the importance of integrating mammography into broader healthcare systems, ensuring affordability, accessibility, and sustained advocacy. Nigeria can adopt similar strategies, focusing on decentralizing services, building capacity, and leveraging community-based approaches to bridge gaps in mammography utilization.

Addressing mammography utilization in Nigeria requires identifying and closing existing research gaps. One critical area is the need for region-specific data on access, coverage, and utilization. Studies that map the distribution of mammography facilities across Nigeria's geopolitical zones can illuminate disparities and inform equitable resource allocation [45]. Additionally, cost-effectiveness studies are essential to guide policymakers in optimizing resource use. For instance, comparative analyses of fixed and mobile mammography units can help determine the most viable approach for expanding services in rural areas.

From a practice perspective, healthcare providers must prioritize culturally sensitive approaches to encourage mammography uptake. Training modules for radiologists and technicians should include communication skills to address fears and misconceptions about breast cancer screening. Policymakers, on the other hand, must advocate for dedicated funding streams for breast cancer screening within the National Health Insurance Scheme (NHIS).



Subsidizing screening costs will reduce financial barriers, particularly for low-income women.

Community leaders and influencers can play pivotal roles in dispelling myths about breast cancer screening and fostering a culture of early detection. Tailored awareness campaigns should be designed to resonate with specific demographics, leveraging local languages and cultural nuances. Public health professionals should also explore partnerships with tech companies to create digital platforms for appointment scheduling and result tracking, enhancing service efficiency.

### Recommendation and Conclusion

Improving mammography utilization in Nigeria requires addressing critical challenges through actionable and collaborative strategies. The barriers include inadequate infrastructure, a shortage of skilled professionals, financial constraints, sociocultural resistance, and gaps in policy implementation. However, significant opportunities lie in leveraging technological advancements, fostering public-private partnerships, strengthening national policies, and enhancing community awareness.

To overcome infrastructural challenges, the government should prioritize the equitable distribution of mammography machines, particularly in underserved areas. Portable and digital mammography units, integrated with telemedicine, can expand access to rural communities. Strengthening maintenance protocols and establishing centralized hubs for servicing equipment will enhance operational reliability. The acute shortage of trained radiologists and technicians necessitates investments in specialized training programs and continuous professional development <sup>[19]</sup>. Collaborations with academic institutions and international organizations can facilitate skill transfer and capacity building. Financial barriers must also be addressed by incorporating mammography services into the National Health Insurance Scheme (NHIS) to subsidize costs and ensure affordability for low-income women.

Sociocultural factors, including stigma and misconceptions about breast cancer screening, require targeted grassroots campaigns. Engaging community leaders, faith-based organizations, and social influencers to advocate for early detection can shift societal attitudes and normalize mammography. Similarly, leveraging media platforms to disseminate accurate information in local languages will broaden the reach of awareness efforts. Policy and governance reforms are essential. A comprehensive national cancer screening policy should be developed, emphasizing implementation at the primary healthcare level. Pilot programs, such as mobile screening units, can be scaled up with robust monitoring and evaluation frameworks to measure impact. Moreover, fostering public-private partnerships will ensure sustainable funding and service delivery models.

Addressing the challenges of mammography utilization in Nigeria requires a multi-stakeholder approach involving policymakers, healthcare providers, non-governmental organizations, and community leaders. Collaborative efforts must focus on building resilient infrastructure, expanding human resource capacity, and fostering awareness and acceptance of breast cancer screening. These measures, aligned with global best practices and tailored to Nigeria's unique context, will improve early detection rates, reduce breast cancer mortality, and enhance health outcomes for women nationwide. This call to action emphasizes the

urgency of mobilizing resources, partnerships, and political will to make mammography accessible and affordable for all Nigerian women, ensuring no one is left behind in the fight against breast cancer.

### Conflict of Interest

Not available

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