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An Integrated Assessment of Healthcare Infrastructure, Self-Examination, and Clinical Screening in Reducing Breast Cancer Mortal ty among Women in Northern Nigeria: A Case Study of Kano State

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Abstract
Breast cancer remains the leading cause of cancer-related deaths among women in Nigeria, with Northern states like Kano facing rising incidence and mortality rates due to multiple structural and behavioral barriers. This study offers an integrated assessment of healthcare infrastructure, breast self-examination (BSE), and clinical screening practices in reducing breast cancer mortality among women in Kano State, Northern Nigeria. This study applies an Integrated Health Behavior and Systems Model of breast cancer. Method Utilizing a mixed-methods approach, data were collected through questionnaires, interviews, and secondary sources from hospitals and registries. The sample size from 30-60 and data were collected from 44 women across rural and urban Kano State. The findings highlight that while awareness levels are moderately high, significant gaps persist in healthcare infrastructure, screening accessibility, and early detection practices, resulting in late-stage diagnoses and poor outcomes. The study recommends strengthening healthcare facilities, promoting regular self-examination, and expanding affordable clinical screening services as pivotal strategies to reduce mortality.

Keywords: Breast Cancer, Healthcare Infrastructure, Self-Examination, Clinical Screening, Kano State, Northern Nigeria, Mortality Reduction.

Introduction

Breast cancer is a significant public health concern in Nigeria, representing the most common malignancy among women and accounting for substantial morbidity and mortality. According to the World Health Organization (2022), breast cancer led to over 670,000 deaths globally in 2022, with Nigeria contributing significantly to this toll. National cancer registries highlight that breast cancer accounts for about 22.7% of all new cancer cases diagnosed among Nigerian women (WHO, 2022). Kano State, the most populous state in Northern Nigeria, faces unique challenges in managing breast cancer due to limited healthcare infrastructure, cultural barriers, and low uptake of early detection practices (Usman, 2025).

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Despite advances in global cancer care, sub-Saharan Africa, including Northern Nigeria, continues to struggle with late-stage presentation and high fatality rates. While survival rates in developed countries have improved significantly due to early detection and advanced treatment, Northern Nigeria still sees up to 70% of cases presenting at stages III or IV, when treatment options are limited and prognosis is poor (Oluwatosin, 2017). Cultural misconceptions, such as beliefs attributing cancer to spiritual causes or punishment, alongside societal stigma, have further compounded the challenge of timely diagnosis and treatment (Mohammed et al., 2008).

Furthermore, the lack of organized screening programs and poor health-seeking behaviors among women exacerbate the crisis. Healthcare facilities in the region are often ill-equipped, with few trained oncology professionals and a shortage of diagnostic tools such as mammography units and pathology laboratories (Mohammed et al., 2008). The economic burden associated with cancer diagnosis and treatment also presents a significant barrier, particularly in rural areas where poverty levels are high.

This study, therefore, aims to explore the combined role of healthcare infrastructure, self-examination, and clinical screening in reducing breast cancer mortality in Kano State. By examining both systemic and behavioral factors, this research contributes to understanding how integrated interventions can improve early detection rates and ultimately reduce the high breast cancer mortality burden in Northern Nigeria.

Research Problem

Breast cancer stands as the leading cause of cancer-related deaths among women worldwide, claiming over 670,000 lives in 2022 alone (World Health Organization, 2022). In Nigeria, and particularly in Northern regions like Kano State, the situation is even more alarming. Here, breast cancer incidence is rising steadily, yet most women continue to present at late stages often stage III or IV when treatment options are limited, expensive, and less effective (Mohammed et al., 2008; Ferlay et al., 2014). Late diagnosis severely reduces survival rates, contributing to the disproportionately high mortality observed in this region compared to global averages.

Despite various awareness campaigns, early detection practices such as breast self-examination (BSE), clinical breast exams, and mammography screening remain poorly adopted among women in Kano (Oluwatosin, 2017; Usman, 2025). This gap between awareness and action reflects deeper systemic and behavioral challenges. Structurally, the healthcare system in Kano State suffers from a lack of screening facilities, limited diagnostic tools, and a shortage of female healthcare professionals, which is particularly problematic in a culturally conservative society where women prefer female providers for such intimate procedures (Yakubu & Sheshe, 2014; Leal et al., 2016).

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Financial constraints further exacerbate the situation. With 71% of women in the region earning less than $1 per day, the high cost of screening and treatment remains a critical barrier (Usman, 2025). Additionally, cultural beliefs, social stigma, and fear of a cancer diagnosis discourage many women from participating in preventive screenings, even when services are available (Gwarzo, 2009; Mohammed et al., 2008).

While global health authorities emphasize that early detection is the most effective strategy to reduce breast cancer mortality (World Health Organization, 2022), interventions in Kano State have so far failed to address the dual burden of weak healthcare infrastructure and deeply rooted behavioral obstacles (Ferlay et al., 2014). Existing programs tend to focus narrowly on awareness creation without ensuring that screening services are accessible, affordable, and culturally acceptable.

As a result, Kano State continues to witness high breast cancer mortality rates, with women diagnosed too late to benefit from life-saving treatment. Therefore, there is an urgent need for integrated, context-specific strategies that simultaneously strengthen healthcare services and address the personal, cultural, and economic barriers that prevent women from adopting early detection practices. Without such targeted interventions, the current trend of late presentation and high mortality is likely to persist, deepening health disparities and overburdening an already fragile health system in Northern Nigeria.

Research Objectives:

1. To assess the current state of healthcare infrastructure for breast cancer detection and treatment in Kano State.
2. To evaluate the knowledge, attitudes, and practices related to breast self-examination among women in Kano State.
3. To examine the utilization of clinical breast cancer screening services and the barriers to access.
4. To explore the cultural and socioeconomic factors influencing breast cancer awareness and early detection.
5. To recommend integrated strategies for improving early detection and reducing breast cancer mortality among women in Northern Nigeria.

Research Questions:

6. What are the existing gaps in healthcare infrastructure for breast cancer screening and treatment in Kano State?
7. How knowledgeable are women in Kano State about breast self-examination, and how frequently do they practice it?
8. What are the main barriers preventing women from accessing clinical breast cancer screening services?

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9. In what ways do cultural beliefs and socioeconomic status influence breast cancer awareness and screening behavior?
10. What integrated interventions can effectively enhance early detection and reduce breast cancer mortality in Kano State?

Significance of the Study:

This study is very important as it addresses the alarming rates of breast cancer mortality among women in Northern Nigeria, focusing specifically on Kano State (WHO, 2022). By providing an integrated assessment of healthcare infrastructure, screening practices, and cultural influences, the research offers valuable insights that can inform policy formulation and health program planning (Leal et al., 2016). The findings are expected to guide stakeholders including government health agencies, non- governmental organizations, and community leaders in designing targeted interventions that enhance early detection and treatment services (Usman, 2025). Furthermore, the study contributes to the academic discourse on health inequities in low-resource settings and serves as a model for similar regions grappling with the dual burden of infrastructural inadequacies and behavioral barriers to cancer care (Ferlay et al., 2014). Ultimately, implementing the study's recommendations can lead to improved survival rates, reduced mortality, and better quality of life for women affected by breast cancer in Kano State and beyond (American Cancer Society, 2025).

Literature Review

Concept of Breast Cancer

Breast cancer is a type of malignant growth originating in the breast tissues. It is characterized by the uncontrolled proliferation of abnormal cells. Although breast cancer is most commonly diagnosed in women, it can also affect men. It has reached epidemic levels, posing a significant health risk for women of all backgrounds globally (Yakubu & Sheshe, 2014). According to the WHO (2022), breast cancer is characterized by the uncontrolled growth of abnormal cells within the breast, leading to the formation of tumors. If left untreated, these tumors can spread throughout the body and may become fatal. Treatment generally involves a combination of surgery, radiation, and medication, depending on the individual, type of cancer, and its stage. The CDC (2024) defines breast cancer as the unchecked growth of abnormal cells within breast tissue, which includes lobules, ducts, and connective tissue. The two most common types of breast cancer are invasive ductal carcinoma (IDC) and invasive lobular carcinoma (ILC). IDC accounts for 70% to 80% of cases and starts in the milk ducts, potentially spreading to lymph nodes or other parts of the body via the bloodstream. ILC is the second most common type, representing 10% to 15% of cases. It begins in the lobules and can spread to surrounding breast tissue and other areas. Unlike IDC, ILC typically doesn't form a distinct lump but instead results in thickened

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connective tissue, making it harder to detect on mammograms.

Breast Cancer Burden in Nigeria

Breast cancer represents a growing public health crisis in Nigeria. The World Health Organization (2022) reports that the country records approximately 32,200 new cases and 16,300 deaths annually, making it one of the highest in sub-Saharan Africa. In Kano State, local cancer registry data reveals that breast cancer is the second most prevalent cancer among women, accounting for 18.9% of female cancer cases (Mohammed et al., 2008). This alarming statistic reflects both the high incidence and the persistently high mortality associated with late detection.

Overview of Breast Cancer from the Cancer Registry of Kano, Nigeria.

The Nigerian government initiated the creation of cancer registries in 1960 as part of its efforts to address the growing challenge of breast cancer. These registries play a crucial role in collecting accurate and detailed data on cancer cases, including incidence, prevalence, and mortality within specific regions. This information supports research, guides planning and execution of cancer control measures, and informs the allocation of resources for treatment, prevention, and other public health efforts (Parkin et al., 2008). Data from these registries are vital for shaping cancer control policies and distributing resources effectively. After the 2006 World Cancer Congress, Nigeria's Federal Ministry of Health set up a committee to draft a National Cancer Policy titled "Bridging the Gap and Transforming Knowledge into Action." In 2008, the government launched the 5-Year Nigeria Cancer Control Plan (2008–2013). However, the intended progress in advocacy, public awareness, prevention, regular screening for early detection, and cancer treatment has not been fully achieved. At the state level, various broad health policies have been adopted to enhance healthcare services and promote breast cancer awareness. Although Nigeria does not yet have a unified national cancer control policy, reproductive cancer management is included in the country's National Policy on Reproductive Health and Strategic Framework (FMOH, 2004; WHO, 2006b).

The Kano Cancer Registry (KCR), founded in 1999, functions as a hospital-based registry with its records housed in the pathology department of Aminu Kano Teaching Hospital (AKTH) in Kano. The data is gathered from cancer cases that have been histologically or cytologically confirmed, following the World Health Organization (WHO) international tumor classification (ICT).

Healthcare Infrastructure in Kano State

Healthcare infrastructure plays a pivotal role in determining breast cancer outcomes. In Kano State, the delivery of oncology care is hindered by systemic inadequacies. Aminu

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Kano Teaching Hospital (AKTH) remains one of the few tertiary institutions with oncology services, but it is often overwhelmed by patient load (Mohammed et al., 2008). Secondary healthcare facilities are poorly equipped to manage cancer cases, resulting in frequent referrals and delays.

The Kano Cancer Registry has identified significant deficiencies, including a lack of diagnostic imaging services, pathology laboratories, and oncology specialists (Mohammed et al., 2008). For instance, mammography services are limited, with only a handful of centers providing this essential screening tool. As a result, women often travel long distances, incurring high costs and facing delays that contribute to disease progression.

Role of Self-Examinat on and Clinical Screening

As per NBCF (2024), a breast self-exam is a proactive detection strategy that combines physical and visual assessments of the breasts to identify signs and symptoms of breast cancer. The goal of a breast self-exam is to become accustomed to the typical appearance and texture of the breasts. This awareness, termed breast self-awareness, aids in recognizing any changes or anomalies, such as new lumps or alterations in the skin. Any variations observed during a breast self-exam should be promptly communicated to a healthcare provider. Thus, while a breast self-exam is a valuable tool for early detection of breast cancer, it should not replace regular mammograms and clinical breast exams. Breast self-awareness is centered on understanding the normal look and feel of breasts, which can assist in identifying symptoms like lumps, discomfort, or changes in size that may warrant concern. These changes might be noted during a breast self-exam, and any observed alterations should be reported to a doctor or healthcare provider (CDC report, 2024).

Breast self-examination (BSE) and clinical screening are proven strategies for early detection, especially in low-resource settings where mammography may not be widely available. In Nigeria, awareness of BSE is relatively high, with national surveys indicating that 80.6% of women have heard about it (Oluwatosin, 2017). However, actual practice remains low, with only 22.9% regularly performing BSE.

Breast Cancer Screening Recommendat ons

The U.S. Preventive Services Task Force (2024) advises that women start routine mammography screenings at age 40, although those at elevated risk may benefit from beginning before this age. Family history is a key factor in determining if earlier screening is appropriate. For women at average risk, general recommendations include the following: women 18 years and older should have a yearly breast exam during their regular health check-ups; they are also encouraged to perform monthly self-examinations, regardless of menopausal status. Starting at age 40, undergo annual

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mammograms if they are considered at standard risk (U.S. Preventive Services Task Force, 2024).

Screening for Women at High Risk of Breast Cancer

For women identified as high-risk, beginning screenings earlier, around age 30 or as advised by a healthcare provider, is recommended by the American Cancer Society (2024). Physicians help assess individual risk levels based on family history, genetic mutations like BRCA1 and BRCA2, prior chest radiation, and other contributing factors. Additionally, women with dense breast tissue face unique screening challenges. The U.S. Food and Drug Administration (FDA, 2024) now requires that women be informed if they have dense breasts, which can obscure mammogram results, and suggests discussing supplementary screening methods with their doctors. After mastectomy, no screening is needed on the operated side, and following double mastectomy, routine breast cancer screening is typically unnecessary due to the minimal remaining breast tissue (American Cancer Society, 2024).

Benefits and Risks of Cancer Screening

According to the Centers for Disease Control and Prevention (CDC, 2024), the main benefit of cancer screening is early detection, which enhances the chances of successful treatment. However, screening is not without risks. False positives can lead to unnecessary additional tests, which may be invasive, costly, and cause undue stress. Over diagnosis is another concern, where cancers that would not have caused harm are detected, leading to overtreatment through surgery or radiation, potentially resulting in avoidable side effects. Other drawbacks include discomfort during screening procedures and minimal radiation exposure from mammograms. While small, cumulative radiation exposure over multiple screenings can pose risks. Additionally, false negatives may occur, causing delays in diagnosis and treatment (CDC, 2024).
Integrated community outreach programs is much beneficial in improving screening uptake. By leveraging leaders and deploying mobile screening units, such initiatives can overcome cultural and logistical barriers (Usman, 2025). Furthermore, digital health interventions, such as SMS reminders and educational campaigns, have the potential to enhance knowledge and encourage preventive behaviors. Therefore, overall, promoting regular BSE and expanding access to clinical screening are important aspects of a good breast cancer control strategy in Kano State and similar low-resource settings.

Theoretical Model

Integrated Health Behavior and Systems Model for Breast Cancer Control

This study adopts an Integrated Health Behavior and Systems Model to explain the

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interaction between healthcare infrastructure, individual behavior, and breast cancer outcomes among women in Kano State. This model draws upon principles from the Health Belief Model (HBM) and Systems Theory, while grounding its constructs in the contextual realities presented by Muhammed et al. (2008), Usman (2025), and Oluwatosin (2017).

Methodology

A mixed-methods design was employed, combining quantitative surveys with qualitative interviews. The target population included women aged 18-60 across rural and urban Kano, as well as oncology healthcare professionals. Stratified sampling ensured representation, with a total of 44 completed questionnaires analyzed using descriptive statistics, while thematic analysis was applied to interview data. Ethical approval was obtained, and confidentiality assured. The approach enabled triangulation of data to provide a comprehensive understanding of the challenges and opportunities for improving breast cancer care. By integrating multiple data sources, the study captures both the systemic and behavioral dimensions of breast cancer prevention and treatment.

Results and Discussion

Awareness and Early Detect on Practices

Findings indicate moderate awareness (61%) of breast cancer among women, but low rates of regular self-examination (18.2%) and clinical screening (12%). Barriers include cultural beliefs, lack of knowledge about symptoms, and limited access to screening centers, especially in rural areas (Usman, 2025). Education campaigns targeting these gaps are essential to shift behaviors and encourage timely health-seeking practices. Moreover, community-based interventions that engage religious leaders, traditional healers, and women's groups could prove instrumental in changing health behaviors and reducing stigma associated with cancer screening.

- Socio-Demographic Characterist cs of Respondents

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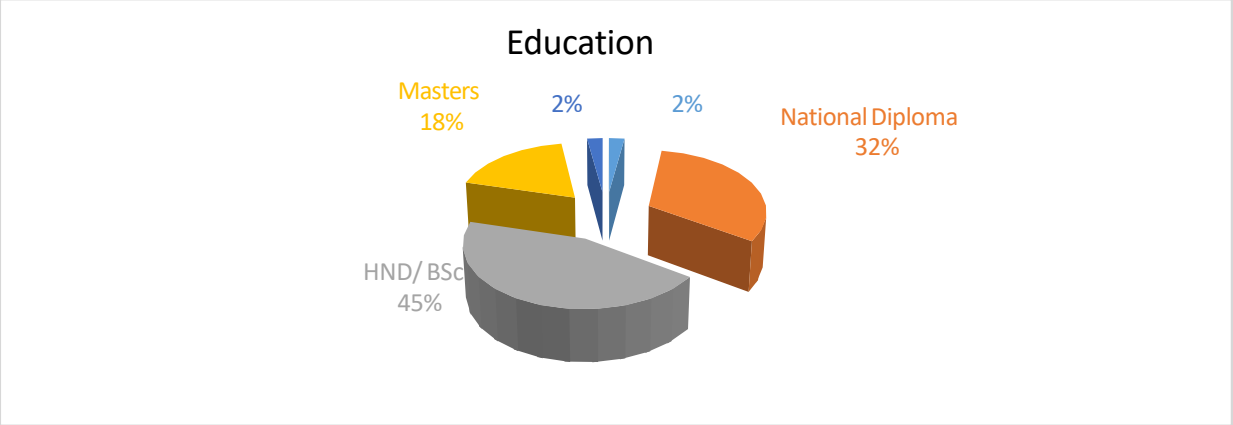
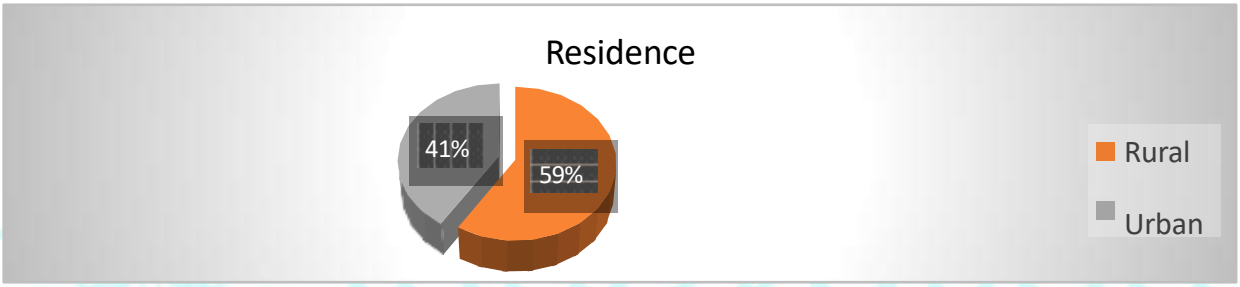
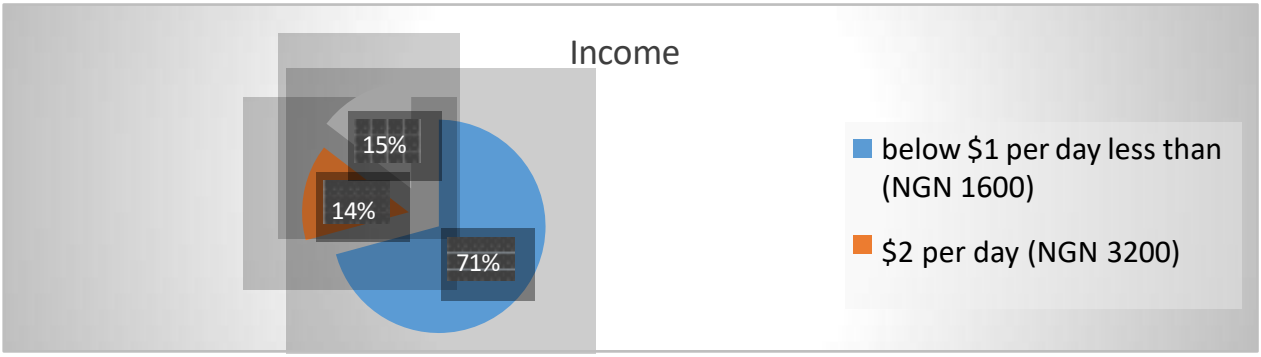
The survey shows that 45% of respondents have HND/BSc qualifications, followed by 32%



with National Diplomas, 19% with Master's degrees, and a small fraction holding PhDs or only secondary education.



A significant 59% of respondents reside in rural areas, while 41% live in urban centers. This rural majority highlights the challenge of healthcare access in Kano State, where screening facilities and oncology services are mostly urban-centered (Mohammed et al., 2008).



Notably, 71% of respondents earn below $1 per day (NGN 1600), placing them in extreme poverty, with only 15% earning above $2 daily. Low income is a well-documented barrier to accessing clinical screening and treatment services, due to high out-of-pocket costs in Nigeria's healthcare system (Yakubu & Sheshe, 2014).

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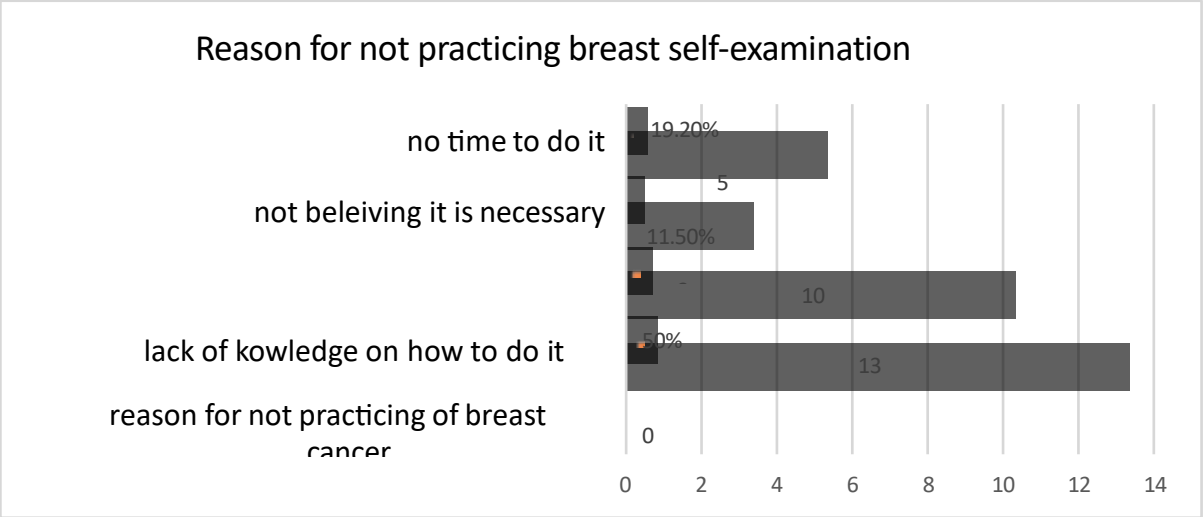
Breast Self-Examination (BSE) Practices

	Yes		no		Not sure/May be	
	Frequency	Percentage	Frequency	percentage	frequency	Percentage
Have you ever heard about breast self-examination (BSE)?	39	88.6%	5	11.4%	0	0%
Have you ever practicing breast self-examination (BSE)?	33	75%	8	18.2%	3	6.8%

While 88.6% reported having heard about BSE, only 47% practice it monthly the recommended frequency while 32% do so occasionally and 21% rarely. Despite good awareness, consistent practice is lacking, pointing to gaps in health promotion and behavioral interventions (Oluwatosin, 2017).



The reasons for poor BSE practice are telling: 50% cited a lack of knowledge on how to perform BSE properly. 38.5% feared discovering a lump, reflecting psychological barriers.19.2% said they lacked time, and 11.5% did not believe it was necessary. This

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aligns with the theoretical model's emphasis on perceived barriers and self-efficacy as critical factors (Usman, 2025).

- Clinical Screening and Professional Check-Ups

	yes		No		Uncertain/May Possible	
	frequency	percentage	Frequency	percentage	Frequency	Percenta Ge
Have you ever undergone clinical breast	27	64.3%	15	35.7%	0	0%
examination by health practitioners (Doctor/Nurse)?						
Have you ever undergone a Mammogram/ MRI (Breast Magnetic Resonance Imaging)?	35	81.4%	8	18.6%	0	0%

Despite 64.3% having undergone clinical breast examinations, key barriers remain: 45.9% reported lack of awareness about the importance of clinical screening. 37.8% feared diagnosis. 29.7% faced financial constraints. Cultural and religious beliefs (16.2%) and inadequate facilities (24.9%) also featured prominently.

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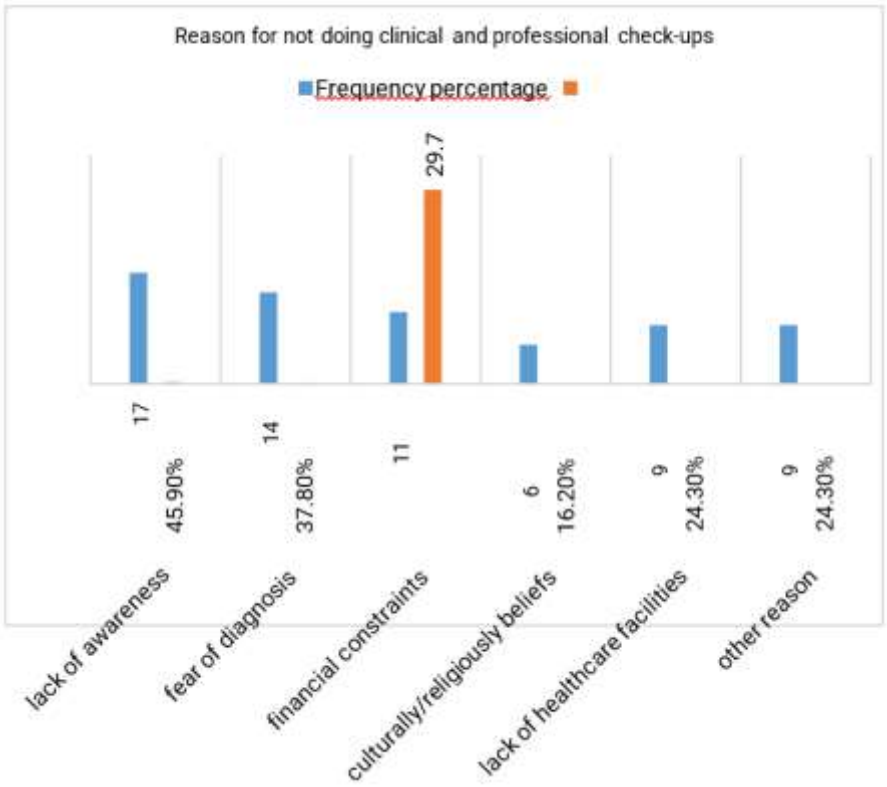

The fact that 81.4% had undergone mammograms or MRI suggests some exposure to screening, but inconsistent and inequitable access persists, particularly for rural, low- income women. This echoes Mohammed et al.'s (2008) findings about infrastructural concentration in urban Kano.

Broader Challenges and Barriers

Barriers to breast cancer awareness and screening campaigns: 75% cited lack of awareness campaigns. 57.5% pointed to lack of female healthcare providers, a critical cultural barrier in Northern Nigeria. 45% mentioned financial constraints. Cultural beliefs (30%) and social stigma (40%) were also significant.

These challenges reflect both structural weaknesses (limited female providers, facility distances) and behavioral-cultural barriers (beliefs, stigma). Structural deficits like financial barriers, facility shortages, and provider gender mismatch must be tackled through policy and resource allocation. Behavioral interventions must empower women with skills (BSE training), counter fears, and shift cultural norms through community-based campaigns. In line with the Integrated Health Behavior and Systems Model, combined interventions are necessary to move beyond awareness and achieve actual improvements in early detection and survival outcomes (WHO, 2022; American Cancer Society, 2025).

Healthcare Infrastructure Gaps

Healthcare infrastructure is identified as a major impediment to early detection. Most tertiary centers are concentrated in urban Kano, leaving rural women underserved. Facilities often lack functioning mammography units, biopsy services, and oncology specialists (Mohammed et al., 2008). Respondents reported long travel distances, high costs, and delays in diagnosis and

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treatment. Addressing these gaps through infrastructure investments and healthcare worker training will be pivotal in enhancing cancer care delivery. Policymakers must also consider establishing public-private partnerships to mobilize resources and ensure sustainable cancer care services across Northern Nigeria.

Conclusion

This study concludes that high breast cancer mortality rates among women in Kano State are the result of a combination of structural healthcare deficiencies and behavioral barriers. While awareness about breast cancer and screening methods exists at a moderate level, practical application and regular participation in early detection practices remain insufficient. The rural-urban divide, poverty, lack of female healthcare providers, and cultural beliefs continue to limit the effectiveness of screening programs. Thus, an integrated approach that addresses both infrastructural challenges and behavioral change is essential to reduce mortality and improve survival outcomes.

Recommendations

1. Strengthen Healthcare Infrastructure: Establish decentralized screening centers in rural areas equipped with diagnostic tools and staffed by trained female healthcare providers to overcome both access and cultural barriers.
2. Subsidize Screening and Treatment Implement government-funded programs or public-private partnerships to reduce financial barriers that prevent women from seeking timely care.
3. Enhance Awareness Campaigns: Launch culturally tailored breast cancer education programs that emphasize the importance of regular BSE, early detection, and dispel myths and fears surrounding the disease.
4. Empower Community Health Workers: Train and deploy local female health workers to provide BSE training, counseling, and referral services at the grassroots level.
5. Promote Male Involvement Engage men in awareness programs to reduce stigma, as their support is crucial in culturally conservative settings.
6. Improve Data Collect on: Strengthen cancer registries and surveillance systems to provide accurate data for policy formulation and monitoring progress.

Future Research Gaps

While this study has contributed valuable insights, several gaps remain that future research should address:

- Longitudinal Studies: There is a need for longitudinal studies to assess the impact of interventions over time on breast cancer outcomes in Northern Nigeria.
- Male Perspectives: Little is known about the role of male partners in influencing women's screening behaviors—future studies should explore this dimension.

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- Effect veness of Dig tal Health Tools: Research is required to evaluate the potential of mobile health (Health) technologies in promoting breast cancer awareness and facilitating screening in rural areas.
- Psychosocial Factors: Further investigation is needed into the psychological barriers, such as fear and stigma, that prevent women from participating in early detection practices.

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