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Original Research Article

Evaluation of triple assessment performance against NICE breast cancer standards: a prospective breast clinic audit assessing guideline compliance and diagnostic outcomes in a rural hospital in Bangladesh

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ABSTRACT

Background: Breast cancer is a leading cause of mortality worldwide, and early detection is crucial for improving survival. The National Institute for Health and Care Excellence (NICE) breast cancer diagnostic standards provide a structured pathway, but their implementation in resource-constrained, rural settings remains challenging. This study aims to evaluate compliance with NICE diagnostic standards and assess the outcomes of the triple assessment pathway (clinical examination, imaging, and histology) in a rural breast clinic in Bangladesh.
Methods: A prospective audit was conducted on 150 patients attending the breast clinic at Bangladesh Korea Friendship Hospital from February to July 2025. Demographic data, compliance rates with triple assessment, diagnostic outcomes, and delays were recorded. The association of resource constraints with compliance and outcomes was evaluated using appropriate statistical tests.
Results: Compliance with NICE standards for clinical examination, imaging, and histology was 87%, 76%, and 58%, respectively, with an overall pathway compliance of 73%. Diagnostic outcomes revealed malignancy in 39.5% of patients and benign conditions in 48.6%. The mean time from referral to final diagnosis was 24 days. Inadequate diagnostic tools ($p=0.032$) and medical facilities ($p=0.045$) were significantly associated with lower compliance and poorer diagnostic performance.
Conclusions: The triple assessment pathway can be implemented in a rural setting, but significant compliance gaps exist due to resource and staffing limitations. Addressing these barriers is essential to improve diagnostic accuracy and ensure timely breast cancer diagnosis in similar contexts.

Keywords: Breast cancer, NICE standards, Diagnostic compliance, Rural healthcare, Triple assessment, Resource constraints, Bangladesh

INTRODUCTION

Breast cancer is the most frequently diagnosed malignancy among women worldwide and remains a leading cause of cancer-related mortality, particularly in low- and middle-income countries (LMICs) where late presentation and limited access to diagnostic services are common.[1,2] Globally, an estimated 2.3 million new cases are diagnosed annually, with a disproportionate rise in incidence and mortality observed in South Asia[1]. In Bangladesh, breast cancer represents a significant and growing public health concern, compounded by delayed health-seeking

behaviour, inadequate screening programmes, and resource constraints within rural healthcare facilities.[3]

Early and accurate diagnosis is critical to improving survival outcomes. The triple assessment pathway-comprising clinical examination, imaging (mammography and/or ultrasound), and histopathological evaluation-has become the gold standard for breast cancer diagnosis[4]. When performed systematically, triple assessment achieves high sensitivity and specificity, minimising false-negative results and facilitating timely treatment planning.[5] The NICE provides evidence-based breast cancer diagnostic guidelines that emphasise prompt referral, coordinated assessment, and defined performance standards to ensure safe and effective care.[6]

However, translating these standards into practice in rural and resource-limited settings remains challenging. Deficiencies in imaging equipment, pathology services, trained personnel, and infrastructure often hinder full compliance with international guidelines.[7] Delays between referral, imaging, biopsy, and final diagnosis further compromise outcomes, particularly where health systems face workforce shortages and logistical barriers.[8] Studies from LMICs suggest that adherence to structured diagnostic pathways improves cancer detection rates but is frequently undermined by systemic constraints.[9,10]

Clinical audit serves as a powerful quality-improvement tool to evaluate adherence to established standards and identify performance gaps.[11] In rural hospitals, such audits are particularly valuable for highlighting operational barriers and guiding targeted interventions. Despite the growing burden of breast cancer in Bangladesh, there is limited evidence assessing how effectively international diagnostic standards are implemented in rural healthcare settings. Understanding these factors is essential for improving diagnostic accuracy, reducing delays, and enhancing patient outcomes.

Therefore, this study aims to evaluate the performance of the triple assessment pathway against NICE breast cancer diagnostic standards in a rural breast clinic in Bangladesh. By examining compliance rates, diagnostic accuracy, and the impact of resource limitations, this audit seeks to assess whether internationally recognized standards can be effectively implemented in a resource-constrained rural context and to identify areas requiring strategic improvement.

METHODS

This prospective clinical audit was conducted at Bangladesh-Korea Friendship Hospital, a rural secondary-level healthcare facility located in Ziranibazar, Savar, Dhaka, Bangladesh. The study period extended from February 2025 to July 2025. The audit evaluated the performance of the triple assessment pathway for breast cancer diagnosis in accordance with the NICE guidelines.

A total of 150 female patients who attended the breast clinic during the study period were included. Patients presenting with breast-related complaints and undergoing at least one component of the triple assessment (clinical examination, imaging, and/or histopathological evaluation) were eligible. Patients with incomplete records were excluded. Data were collected from medical records using a structured data extraction form. Variables recorded included demographic characteristics, referral source, duration of symptoms, compliance with each component of the triple assessment, diagnostic outcomes (malignant, benign, or inconclusive), and time intervals between referral and final diagnosis. Resource-related factors such as availability of imaging equipment, pathology services, and trained personnel were also assessed.

Data analysis

Data were entered and analyzed using statistical software. Descriptive statistics were calculated, and associations between resource constraints, compliance rates, and diagnostic outcomes were evaluated using appropriate statistical tests. A $p<0.05$ was considered statistically significant.

RESULTS

This table summarizes the demographic characteristics of the 150 patients involved in the study. The mean age of participants was 45 years with a standard deviation of 10 years. All patients were female, with 73% referred by general physicians and 27% self-referring. The mean duration of symptoms was 6 months with a standard deviation of 2 months, providing insight into the patient profile for breast cancer diagnostics in a rural setting (Table 1).

Figure 1 highlights the compliance rates with the NICE breast cancer diagnostic standards within the clinic. The overall compliance with clinical examination was 87%, imaging (e.g., mammogram, ultrasound) was 76%, and histology (biopsy) was 58%. The overall compliance rate across all three components of the triple assessment pathway was 73%, underscoring both strengths and areas for improvement in the diagnostic process.

This Figure 2 presents diagnostic outcomes based on the triple assessment components. The malignancy detection rate was highest with histology at 45.3%, followed by imaging at 38.5% and clinical examination at 34.8%. The benign diagnosis rate was 60.2% for clinical examination, 51% for imaging, and 34.6% for histology. The inconclusive rate was lowest for clinical examination (5%) and highest for biopsy (20.1%).

Table 2 provides the timing of diagnostic stages, revealing delays in the overall diagnostic process. The average time from referral to clinical examination was 8 days, from clinical examination to imaging was 2 days, and from imaging to biopsy was 10 days. The mean total time from

referral to final diagnosis was 24 days, highlighting the need for optimizing the diagnostic timeline in rural settings.

This table compares the diagnostic accuracy of the audit results with the NICE standards. The clinical examination showed a significant gap, with the audit accuracy at 44% compared to 76.9% in NICE standards. Imaging accuracy in the audit was 77%, which was below the NICE standard of 94.9%. The biopsy modality was closer to the NICE standard, with an accuracy of 87% compared to 94.7% (Table 3).

Table 4 examines the impact of various resource constraints on diagnostic outcomes. Imaging equipment availability was a major factor, causing a 30% delay in diagnoses for 45 patients. Pathology services and clinical staff availability were also limiting factors, causing 20% delays in diagnoses for 37 and 40 patients, respectively, highlighting significant challenges in the rural healthcare setting.

This table provides the follow-up and long-term outcomes of the 150 patients. On average, follow-up occurred 60 days after diagnosis. Among the patients, 28.0% underwent surgery (mastectomy or lumpectomy), 18.0% received chemotherapy, and 9.33% were monitored for recurrence. Additionally, 20% were considered recovered post-treatment, while 18.67% remained under ongoing treatment. And 6% refused to continue treatment for different reasons (Table 5).

Table 6 investigates how various factors influenced compliance with the NICE breast cancer diagnostic standards. Factors such as inadequate medical facilities, diagnostic tools, and trained staff showed a significant impact on compliance, with p values ranging from 0.021 to 0.045. These factors underline the barriers faced by rural clinics in achieving full compliance with established diagnostic standards.

Table 7 explores the association between different factors and diagnostic outcomes. The p values for factors like inadequate medical facilities, diagnostic tools, and manpower were statistically significant, influencing the rates of malignant, benign, and inconclusive diagnoses. The results emphasize the critical role these factors play in diagnostic accuracy and the need for targeted interventions to improve outcomes in rural settings.

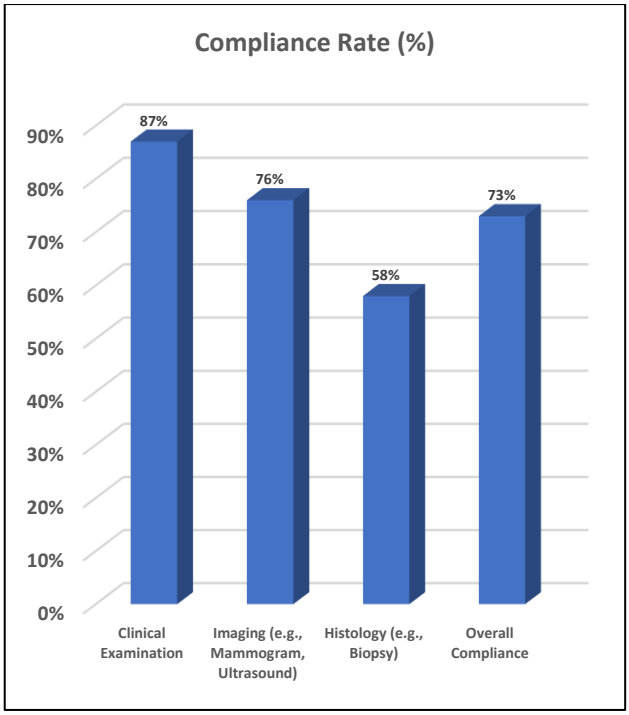

Figure 1: Compliance with NICE triple assessment standards.

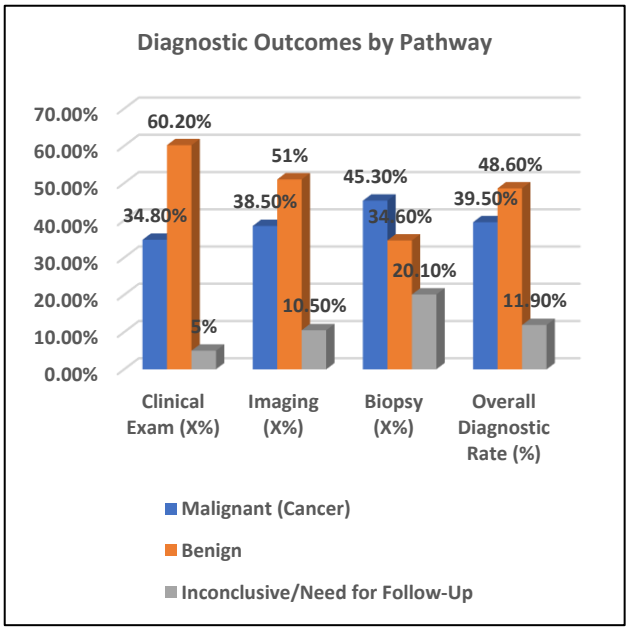

Figure 2: Diagnostic outcomes by pathway.

Table 1: Demographics characteristics of study participants, (n=150).

Demographic characteristic	Value
Total number of patients	150
Age (mean±SD) (in years)	45±10
Gender (M/F)	0/150
Referral source	General physician (73%), self-referral (27%)
Duration of symptoms (in months)	6±2

Table 2: Diagnostic delays and timing of triple assessment.

Time interval	Mean (days)±SD
Time from referral to clinical examination	8±3
Time from clinical examination to imaging	2±1
Time from imaging to biopsy	10±4
Time from referral to final diagnosis	24±5

Table 3: Comparative analysis of diagnostic accuracy (Audit vs NICE standards).

Diagnostic modality	Audit diagnostic accuracy	NICE standard diagnostic accuracy	Difference
Clinical examination	44%	76.9%	-32.9%
Imaging (e.g., Mammogram)	77%	94.9%	-17.9%
Histology (Biopsy)	87%	94.7%	-7.7%

Table 4: Impact of resource constraints on diagnostic outcomes.

Resource constraint category	N	Impact on diagnostic process
Imaging equipment availability	45	30% delayed diagnoses due to equipment malfunction
Pathology services	37	20% delayed diagnoses due to backlog in lab testing
Clinical staff availability	40	20% delays in diagnosis due to shortage of trained staff

Table 5: Follow-up and long-term diagnostic outcome.

Outcome category	N	Total patients
Total follow-up time (from diagnosis to follow-up)	60±15 days	-
Surgery (Mastectomy/lumpectomy)	42	28.0%
Chemotherapy	27	18.0%
Observation (Monitored for recurrence)	14	9.33%
Recovered (post-treatment)	30	20.0%
Under treatment (Ongoing)	28	18.67%
Refused continuation of treatment (due to poverty/advanced stage of disease)	9	6%

Table 6: Associated factors and compliance with NICE triple assessment standards.

Factors	Clinical exam compliance	Imaging compliance	Histology compliance	Overall compliance	P value
Inadequate medical facilities	80%	70%	55%	68%	0.045
Inadequate diagnostic and pathological tools	75%	70%	50%	65%	0.032
Inadequate manpower and trained staff	85%	80%	60%	75%	0.021
Distance of medical facilities from home	80%	72%	56%	66%	0.061
Inadequate transport facilities	77%	71%	53%	64%	0.048
High cost of treatment	82%	75%	57%	70%	0.078
Lack of awareness	79%	68%	52%	63%	0.054

Table 7: Associated factors and diagnostic outcomes.

Factors	Malignant diagnosis rate	Benign diagnosis rate	Inconclusive diagnosis rate	P value
Inadequate medical facilities	40%	45%	15%	0.038
Inadequate diagnostic and pathological tools	43%	42%	15%	0.026
Inadequate manpower and trained staff	41%	46%	13%	0.015
Distance of medical facilities from home	37%	48%	15%	0.069
Inadequate transport facilities	42%	44%	14%	0.055
High cost of treatment	39%	46%	15%	0.074
Lack of awareness	41%	45%	14%	0.052

DISCUSSION

This audit evaluated the performance of the triple assessment pathway against NICE breast cancer diagnostic standards in a rural secondary-level hospital in Bangladesh. The overall compliance rate of 73% demonstrates that structured breast cancer diagnostics can be implemented in resource-constrained settings, although notable gaps remain, particularly in histopathological assessment. The lower compliance in biopsy services (58%) reflects infrastructural and workforce limitations that are commonly reported in LMICs.[14,15]

Malignancy detection rate of 39.5% highlights high burden of clinically significant breast disease in symptomatic women presenting to rural clinics. Similar diagnostic yields have been reported in hospital-based cohorts in South Asia, where late-stage presentation remains common.[16] Mean referral-to-diagnosis interval of 24 days, while shorter than reported delays in some LMIC settings, still exceeds optimal timelines recommended for timely cancer care.[17] Diagnostic delays known to contribute to disease progression and poorer survival outcomes.[18]

Imaging compliance (76%) was higher than histology but below international benchmarks. Access to mammography and ultrasound in rural regions remains uneven, with equipment malfunction and technician shortages frequently reported barriers.[19] Furthermore, pathology backlog significantly affected turnaround times, consistent with findings that pathology capacity is a critical bottleneck in cancer systems strengthening.[20]

The significant association between resource constraints and both compliance and diagnostic outcomes underscores systemic challenges. Studies across LMICs demonstrate that strengthening infrastructure, decentralizing diagnostic services, and training mid-level providers improve early cancer detection.[8,21] Financial barriers and transport limitations also influence adherence to diagnostic pathways, as seen in comparable rural populations.[22]

While triple assessment remains the gold standard due to its high combined sensitivity, its effectiveness depends on coordinated service delivery.[4] The reduced accuracy observed in clinical examination compared with NICE benchmarks may reflect variability in examiner expertise and limited continuing professional development opportunities in rural facilities.

This study has limitations. As a retrospective audit, it relied on existing documentation, which may have introduced information bias. The single-centre design may limit generalisability. However, the findings provide valuable insight into real-world implementation of international standards within a rural Bangladeshi context.

Overall, the results suggest that although the triple assessment pathway is feasible in rural Bangladesh, improvements in pathology services, imaging infrastructure, and workforce capacity are essential. Strategic investment in diagnostic systems, supported by policy-level cancer control planning, is crucial to improving early detection and aligning rural practice more closely with international standards.

CONCLUSION

This audit demonstrates that the triple assessment pathway for breast cancer diagnosis is feasible in a rural Bangladeshi hospital setting, despite significant resource limitations. Overall compliance with NICE standards was moderate, with notable gaps in histopathological services. Diagnostic delays and reduced accuracy were strongly associated with infrastructural and manpower constraints. Strengthening imaging facilities, pathology capacity, and trained workforce availability is essential to improve compliance and outcomes. Targeted investment and system-level support are necessary to enhance early breast cancer diagnosis in rural healthcare settings.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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