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Original Article

Clinicopathological Profile and Molecular Subtypes of Breast Cancer in Bangladeshi Women: A Tertiary-Care Surgical Population Study

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Abstract

Introduction: Breast cancer in Bangladeshi women often presents at a younger age with advanced stage. The variable molecular characteristics influencing prognosis and treatment response. Local clinicopathological and subtype data remain limited in tertiary surgical settings. The aim of this study is to evaluate the clinicopathological features and molecular subtypes of breast cancer among Bangladeshi women in a tertiary level.

Methods: This prospective cohort study was conducted at Bangladesh Medical University (BMU), Dhaka, Bangladesh and East West Medical College Hospital (EWMCH), Dhaka, Bangladesh, from January 2019 to December 2022. A total of 147 histopathologically confirmed breast cancer patients were enrolled using purposive sampling. Demographic, clinical, histopathological, and immunohistochemical data Estrogen Receptor(ER), Progesterone Receptor(PR), Human Epidermal Growth Factor Receptor(HER2), Kiel 67(Ki-67) were recorded. Data were analyzed using SPSS version 23.0.

Results: Most patients were ≤50 years (62.6%) and presented with stage II–III disease (72.8%). Invasive ductal carcinoma predominated (88.4%). Tumors >2 cm (71.4%) and nodal metastasis (64.6%) were common. ER positivity was 55.1%, PR positivity was 49.0%, HER2 overexpression 27.2%, and high Ki-67 58.5%. Luminal A was most frequent (32.0%), followed by luminal B (26.5%), triple-negative (23.1%), and HER2-enriched (18.4%). Aggressive subtypes were significantly associated with higher grade and larger tumors ($p<0.05$).

Conclusion: Bangladeshi women with breast cancer frequently present at a younger age and advanced stage, with a substantial proportion of aggressive molecular subtypes. These findings highlight the need for early detection strategies and subtype-guided management in tertiary care settings.

Keywords: Clinicopathological profile, Immunohistochemistry, Molecular subtypes, Triple negative breast cancer (TNBC)

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Introduction

Breast cancer continues to be the most frequently diagnosed cancer and a leading cause of cancer-related death among women worldwide. Globally, female breast cancer has exceeded lung cancer as the most commonly diagnosed cancer, with an estimated 2.3 million new cases (11.7%), followed by lung (11.4%), colorectal (10.0 %), prostate (7.3%), and stomach (5.6%) cancers, reflecting its significant burden across diverse populations and healthcare systems [1]. The incidence and mortality rates of breast cancer vary substantially by region, with high-income countries reporting higher incidence but lower mortality compared to low- and middle-income countries due to differences in screening, early detection, and treatment access[2]. In South Asia, including

Bangladesh, limited cancer registry data suggest an increasing trend in breast cancer incidence with a tendency for younger age at presentation and more advanced disease stages at diagnosis compared with Western populations[3,4]. Breast cancer is a biologically heterogeneous disease, comprising distinct entities that differ in clinical behavior, treatment response, and prognosis. Traditional histopathological classification has now been complemented by molecular categorization based on hormone receptors like estrogen receptor (ER), progesterone receptor (PR) status and human epidermal growth factor receptor-2 (HER2) expression, often determined by immunohistochemistry as a surrogate for gene expression profiling [5]. This classification broadly divides tumors into four major molecular subtypes: luminal A, luminal B, HER2-enriched, and triple-negative breast cancer (TNBC) [6,7]. Luminal A tumors are typically ER/PR-positive and HER2-negative, with a low proliferative index, and are associated with a favorable prognosis. Luminal B tumors are hormone receptor positive with higher proliferation and/or HER2 positivity, and tend to have less favorable outcomes than luminal A. HER2-enriched subtypes, characterized by overexpression of HER2, are aggressive but responsive to targeted anti-HER2 therapies. At the same time, TNBC lacks ER/PR/HER2 expression and is associated with poor prognosis and limited targeted treatment options [8,9]. In Bangladesh, several hospital-based studies have investigated the clinicopathological characteristics and molecular subtypes of breast cancer. These studies consistently report that invasive ductal carcinoma is the predominant histological form and that a significant proportion of patients present with larger tumors and lymph node involvement at diagnosis [10]. Molecular profiling in Bangladeshi cohorts has shown varying subtype distributions, with some studies reporting high frequencies of luminal A and TNBC subtypes. In contrast, others note notable proportions of HER2 and luminal B tumors [11,12]. The variation in subtype distribution underscores the influence of genetic, environmental, and sociodemographic factors on tumor biology in this population. Despite this growing body of evidence, comprehensive prospective data evaluating the clinicopathological profile and molecular subtype distribution of breast cancer among Bangladeshi women in a surgical tertiary-care setting remain limited. Understanding these profiles has important implications for prognosis, therapeutic decision-making, and resource allocation, particularly in settings with constrained access to advanced diagnostics and therapies. The present study aims to fill this gap by prospectively assessing the clinicopathological characteristics and molecular subtypes of breast cancer in a cohort of Bangladeshi women at a tertiary-care hospital, thereby contributing valuable epidemiological and pathological insights specific to this population.

Methodology

This prospective observational cross-sectional study was conducted in the Department of General Surgery at BMU, Dhaka, Bangladesh and the Department of Surgery at EWMCH, Dhaka, Bangladesh from January 2019 to December 2022. A total of 147 female patients with histopathologically confirmed breast carcinoma were enrolled using purposive sampling. All participants were managed in a tertiary care surgical setting and underwent standard diagnostic and therapeutic evaluations. Inclusion criteria included women of any age presenting with a breast lump or suspected breast malignancy who had histopathological confirmation of primary breast carcinoma. Patients who underwent surgical treatment with available immunohistochemical reports for estrogen receptor (ER), progesterone receptor (PR), and HER2 status were eligible. Exclusion criteria included patients with recurrent breast cancer, prior history of breast malignancy, metastatic disease from other primary sites, or those who received neoadjuvant chemotherapy before biopsy. Cases with incomplete clinicopathological or immunohistochemical data were also omitted. Data were compiled and analyzed using SPSS version 23.0. Associations between molecular subtypes and clinicopathological features were assessed using chi-square or Fisher's exact test, with $p < 0.05$ considered statistically significant.

Result

A total of 147 women with histopathologically confirmed breast carcinoma were evaluated. The majority of patients were aged d"50 years (62.6%), with a mean age of 46.8 ± 10.9 years (Figure 1). Most presented with a palpable breast lump (100%), and late-stage disease was common. Stage II (38.1%) and stage III (34.7%) constituted the largest groups, while only 10.2% were diagnosed at stage I (Figure 2). Invasive ductal carcinoma was the predominant histological type (88.4%), followed by invasive lobular

carcinoma (6.1%) and other variants (5.5%) (Table 1). Regarding tumor characteristics, 71.4% had tumors larger than 2 cm, and axillary lymph node metastasis was present in 64.6% of cases (Table 2). Histological grading revealed grade II tumors in 46.3%, grade III in 32.0%, and grade I in 21.7%. Hormone receptor analysis showed estrogen receptor (ER) positivity in 55.1% and progesterone receptor (PR) positivity in 49.0% of patients. HER2 overexpression was observed in 27.2% of tumors. The Kiel-67(Ki-67) proliferative index was high (e"20%) in 58.5% of cases (Table 2). Based on immunohistochemical profiling, luminal A was the most common molecular subtype (32.0%), followed by luminal B (26.5%), triple-negative (23.1%), and HER2-enriched (18.4%). Significant associations were observed between molecular subtypes and tumor grade as well as tumor size. Triple-negative and HER2-enriched tumors were more frequently high grade (grade III) compared to luminal tumors (p = 0.012). Similarly, tumors >2 cm were significantly more common among triple-negative and HER2-enriched groups (p = 0.018). Lymph node metastasis showed a higher proportion in luminal B and HER2-enriched subtypes, though this did not reach statistical significance (p = 0.086). These findings indicate a predominance of biologically aggressive features among non-luminal subtypes in this cohort.

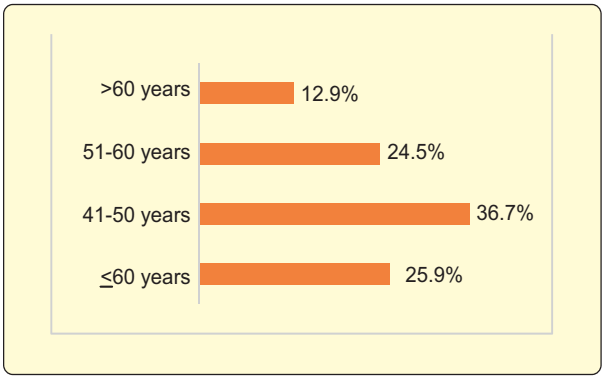

Figure 1: Age distribution of patients (N=147)

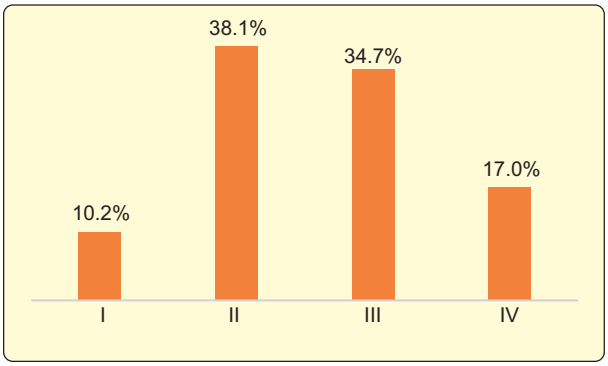

Figure 2: Clinicopathological stage at diagnosis

Table I: *Histopathological type and grade*

Variable	n	%
Invasive ductal carcinoma	130	88.4
Invasive lobular carcinoma	9	6.1
Others	8	5.5
Grade I	32	21.7
Grade II	68	46.3
Grade III	47	32.0

Table II : *Receptor status and Ki-67 index*

Marker	Positive	%
ER	81	55.1
PR	72	49.0
HER2	40	27.2
Ki-67 ≥20%	86	58.5

Table III : Molecular subtype distribution

Subtype	n	%
Luminal A	47	32.0
Luminal B	39	26.5
HER2-enriched	27	18.4
Triple-negative	34	23.1

Table IV: Association of molecular subtype with tumor grade and size

Tumor	Subtypes		p-value
	Aggressive n (%)	Luminal n (%)	
Grade III	29 (45.3)	18 (20.9)	0.012
Size> 2 cm	49 (76.6)	56 (65.1)	0.018

Aggressive subtypes = HER2-enriched + triple-negative, Statistical test: Chi-square test.

Discussion

This study demonstrates that breast cancer in Bangladeshi women presents predominantly at a younger age and at relatively advanced clinical stages, reflecting patterns reported in other South Asian and low- and middle-income settings.[13,14] This younger age distribution has important implications for screening strategies, fertility considerations, and long-

term survivorship care. Late presentation was evident, with stage II and III disease comprising the majority of cases. Similar stage distributions have been described in regional hospital-based studies, where lack of organized screening programs, low awareness, sociocultural barriers, and limited access to specialized care contribute to delayed diagnosis.[15,16] The high proportion of tumors larger than 2 cm and the substantial rate of axillary lymph node metastasis further emphasize the burden of locally advanced disease at first contact with tertiary surgical services. Invasive ductal carcinoma was the overwhelmingly dominant histological type, consistent with global and regional literature, where it accounts for 70–90% of cases.[17] The predominance of grade II and grade III tumors in this cohort suggests a biologically aggressive profile, particularly when combined with large tumor size and nodal involvement. Histological grade remains an independent prognostic factor and is strongly linked with molecular subtype and proliferative activity.[18] Hormone receptor positivity (ER and/or PR) in more than half of patients aligns with prior Bangladeshi and South Asian studies, though the proportion remains slightly lower than in many Western populations, where hormone receptor–positive disease often exceeds 65–70%.[19] HER2 overexpression in over one-quarter of tumors is also consistent with published ranges. The relatively high Ki-67 index in a majority of cases indicates a substantial burden of highly proliferative tumors, which may partly explain the aggressive clinical presentation.[20] Regarding molecular classification, luminal A was the most frequent subtype, followed by luminal B, triple-negative, and HER2-enriched tumors. This distribution broadly mirrors patterns reported in comparable regional cohorts, though the proportion of triple-negative breast cancer (TNBC) remains notable.[21] TNBC is known for its aggressive clinical course, higher grade, and limited targeted treatment options, which pose significant challenges in resource-constrained settings. The significant association observed between non-luminal subtypes (HER2-enriched and TNBC) and higher tumor grade supports established biological understanding that these subtypes exhibit greater genomic instability, higher proliferative rates, and poorer differentiation.[22] Similarly, the relationship between aggressive subtypes and larger tumor size at diagnosis may reflect rapid tumor growth and delayed detection. Although lymph node metastasis appeared more frequent in certain subtypes, the lack of statistical significance suggests that nodal spread is influenced by multiple interacting tumor and host factors. Overall, these findings highlight the dual challenge of late clinical presentation and a considerable burden of biologically aggressive molecular subtypes in Bangladeshi women. Strengthening early detection, improving access to receptor testing, and expanding the availability of targeted therapies are crucial to improving outcomes. Subtype-based management, even in limited-resource environments, can help optimize treatment allocation and prognostic stratification. [23]

Conclusion

Breast cancer in Bangladeshi women commonly presents at a younger age with advanced-stage disease and a substantial burden of high-grade and biologically aggressive molecular subtypes. Luminal tumors predominate, yet triple-negative and HER2-enriched cancers remain significant. These clinicopathological patterns emphasize the urgent need for earlier detection, routine receptor testing, and subtype-guided treatment strategies to improve outcomes in tertiary-care settings.

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Conflict of interest

The authors declare no conflict of interest

Ethical approval

The study was approved by the Institutional Ethics Review Board of Bangladesh Medical University (BMU).

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