



# Clinicopathological Patterns of Invasive Ductal Carcinoma in Bangladeshi Women Based on Core Biopsy Findings

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## KEYWORDS

Invasive ductal carcinoma, Core needle biopsy, Nottingham grading, Breast cancer, Bangladesh.

## ABSTRACT:

**Background:** Breast cancer is the most common malignancy among women worldwide and represents a growing public health challenge in low- and middle-income countries. Invasive ductal carcinoma is the predominant histological subtype and demonstrates variable clinicopathological characteristics. Tumor grading on core biopsy plays a critical role in prognostic assessment and treatment planning. This study aimed to evaluate the clinicopathological patterns of invasive ductal carcinoma in Bangladeshi women based on core biopsy findings.

**Methods:** This cross-sectional observational study was conducted at the Department of Surgery, Bangladesh Medical University (BMU), Dhaka, from January to December 2025. A total of 125 female patients with histopathologically confirmed invasive ductal carcinoma on core needle biopsy were included. Demographic and histopathological data were analyzed using SPSS version 25.0.

**Results:** The mean age was  $46.8 \pm 13.3$  years and 58.4% of patients were below 50 years. Right breast involvement was observed in 62.4% of cases. The median largest core dimension was 1.5 cm and the median number of tumor-involved cores was 5. Grade 2 tumors predominated (71.2%), followed by Grade 1 (15.2%) and Grade 3 (13.6%). Most tumors demonstrated intermediate scores for tubule formation, pleomorphism and mitotic activity. Grade 2 tumors were consistently common across all age groups.

**Conclusion:** Intermediate-grade invasive ductal carcinoma predominates among Bangladeshi women diagnosed on core biopsy, with a substantial proportion presenting at a relatively younger age. Accurate histological grading remains essential for guiding management strategies.

## Introduction

Breast cancer remains the most frequently diagnosed malignancy and the leading cause of cancer-related mortality among women worldwide [1]. According to GLOBOCAN 2020 estimates, breast cancer accounts for a substantial proportion of global cancer incidence and deaths, reflecting its significant public health burden [2]. The World Health Organization has recognized breast cancer as a priority health concern, particularly in low- and middle-income countries where late presentation and limited resources contribute to poorer outcomes [3].

Recent global projections suggest a continued rise in incidence and mortality by 2040 and beyond, underscoring the need for region-specific data to inform effective control strategies [2,4].

Invasive ductal carcinoma (IDC), also referred to as invasive carcinoma of no special type, constitutes the majority of breast cancer cases. Histologically, IDC demonstrates marked heterogeneity in morphological patterns and biological behavior [5]. Tumor grade, determined by the Nottingham modification of the Bloom–Richardson system, is a well-established



prognostic indicator and plays a pivotal role in therapeutic decision-making. The grading system evaluates tubule formation, nuclear pleomorphism and mitotic activity to stratify tumors into Grades 1, 2 and 3 [6]. Higher grades are generally associated with aggressive clinical behavior and poorer prognosis [7].

Globally, several clinicopathological studies have examined the distribution of tumor grades and their association with demographic factors [8,9]. In Asian populations, including South Asia, breast cancer often presents at a relatively younger age compared to Western countries [10,11]. Younger age at diagnosis has been linked to more aggressive tumor characteristics in certain cohorts [12]. However, variations exist across regions, emphasizing the importance of localized data.

In Bangladesh, breast cancer incidence has been steadily increasing, with challenges related to delayed diagnosis, limited screening programs and disparities in access to care [13,14]. Previous local studies have described the histopathological spectrum of breast lesions and clinicopathological profiles of breast carcinoma cases [15,16]. Nevertheless, comprehensive analyses focusing specifically on invasive ductal carcinoma based on core biopsy findings remain limited. Core needle biopsy is widely regarded as a reliable diagnostic modality for preoperative assessment, offering accurate histological characterization and grading [17].

Understanding the clinicopathological patterns of IDC at the time of core biopsy is crucial for early risk stratification and treatment planning. While several international studies have reported tumor grade distributions and their clinical correlations [8,9], data from Bangladeshi tertiary care settings remain sparse. This gap restricts the development of context-specific management strategies and limits comparative evaluation with regional and global trends.

Therefore, the present study aimed to evaluate the clinicopathological patterns of invasive ductal carcinoma among Bangladeshi women based on core biopsy findings. By analyzing age distribution, tumor laterality, histological grade and Nottingham grading components, this study seeks to contribute to the existing body of evidence and provide regionally relevant data to inform clinical practice and future research.

## Materials & Methods

This cross-sectional observational study was conducted at the Department of Surgery, Bangladesh Medical University (BMU), Dhaka, Bangladesh. The study period extended from January to December 2025. The study population comprised female patients diagnosed with invasive ductal carcinoma on core needle biopsy during the study period. A total of 125 consecutive cases were included in the final analysis.

### Selection Criteria:

#### Inclusion criteria:

- Female patients aged 18 years and above.
- Histopathologically confirmed invasive ductal carcinoma on core needle biopsy.
- Patients who underwent biopsy at BMU during the study period.
- Availability of complete clinicopathological data.

#### Exclusion criteria:

- Patients with non-ductal histological subtypes of breast carcinoma.
- Cases diagnosed as ductal carcinoma in situ without invasion.
- Inadequate or poorly preserved biopsy specimens.

### Data Collection Procedure

Data were collected prospectively from patients presenting with clinically or radiologically suspicious breast lesions who underwent core needle biopsy at the Department of Surgery, BMU. A structured data collection form was used to record demographic variables, including age and laterality, along with detailed histopathological findings from core biopsy specimens. Core needle biopsies were performed under aseptic precautions using standard techniques, guided by clinical and imaging findings where appropriate. Specimens were fixed in 10% neutral buffered formalin and processed according to standard histopathological protocols. Paraffin-embedded sections were stained with hematoxylin and eosin for microscopic evaluation. Histological grading was performed using the Nottingham modification of the Bloom–Richardson system, assessing tubule formation, nuclear pleomorphism and mitotic count. Each component was



scored from 1 to 3 and the total score was used to determine tumor grade. All slides were reviewed by experienced pathologists to ensure diagnostic accuracy and consistency. Data were cross-checked with pathology registers and patient records to maintain reliability. Informed consent was obtained from all participants before inclusion in the study. Confidentiality was ensured by anonymizing patient identifiers and restricting data access to the research team.

### Statistical Analysis

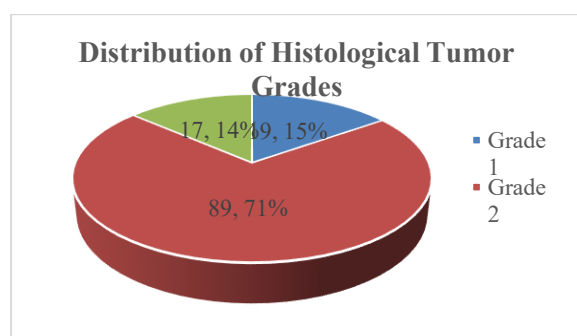
Data were entered and analyzed using SPSS version 25.0. Descriptive statistics were applied to summarize demographic and clinicopathological variables. Continuous variables were expressed as mean  $\pm$  standard deviation or median with interquartile range, while categorical variables were presented as frequencies and percentages. Cross-tabulation was performed to assess the distribution of tumor grades across age groups.

### Results

**Table 1. Baseline Characteristics of Patients with Invasive Ductal Carcinoma (N=125)**

Characteristic		Frequency (n)	Percentage (%)
Age (Years)	<40	41	32.8
	40–49	32	25.6
	$\geq 50$	52	41.6
	Mean $\pm$ SD	46.8 $\pm$ 13.3	
Laterality	Right breast	78	62.4
	Left breast	47	37.6
Largest Core Dimension (cm)	Median (IQR)	1.5 (1.2-1.5)	
Total Cores Involved by Tumor	Median (IQR)	5 (5-6)	

Table 1 presents the age distribution, tumor laterality and core biopsy features of the study population. The highest proportion of patients was aged  $\geq 50$  years (41.6%), followed by <40 years (32.8%) and 40–49 years (25.6%). The mean age was 46.8  $\pm$  13.3 years. Right breast involvement was observed in 62.4% of cases, while 37.6% involved the left breast. The median largest core dimension was 1.5 cm (IQR 1.2–1.5). The median number of tumor-involved cores was 5 (IQR 5–6).



**Figure 1: Distribution of Histological Tumor Grades (N=125)**

Figure 1 shows the frequency of tumor grades according to the Nottingham grading system. Grade 2 tumors were the most common, accounting for 71.2% of cases. Grade 1 tumors constituted 15.2%, while Grade 3 tumors comprised 13.6% of the total cases.

**Table 2. Distribution of Nottingham Grading Components (N=125)**

Characteristics	Category	Frequency (n)	Percentage (%)
Bloom–Richardson score	Mean $\pm$ SD	6.2 $\pm$ 1.02	
Tubule score	1	2	1.6
	2	107	85.6
	3	16	12.8
Cellular pleomorphism	1	10	8.0
	2	102	81.6
	3	13	10.4



Mitosis score	1	16	12.8
	2	85	68.0
	3	24	19.2

Table 3 presents the detailed scoring of individual Nottingham grading components. The mean Bloom–Richardson score was  $6.2 \pm 1.02$ . For tubule formation, 85.6% of tumors had a score of 2, while scores of 1 and 3 were observed in 1.6% and 12.8%, respectively. Regarding cellular pleomorphism, 81.6% had a score of 2, with scores of 1 and 3 observed in 8.0% and 10.4%, respectively. For mitotic activity, 68.0% of tumors had a score of 2, whereas scores of 1 and 3 were recorded in 12.8% and 19.2% of cases, respectively.

**Table 3. Distribution of Tumor Grade Across Age Groups (N=125)**

Age Group	Grade 1	Grade 2	Grade 3
<40 years	4 (9.8%)	32 (78.0%)	5 (12.2%)
40–49 years	7 (21.9%)	20 (62.5%)	5 (15.6%)
≥50 years	8 (15.4%)	37 (71.2%)	7 (13.5%)
Total	19 (15.2%)	89 (71.2%)	17 (13.6%)

Table 3 presents the distribution of tumor grades stratified by age group. Among patients aged <40 years, 78.0% had Grade 2 tumors, while 9.8% and 12.2% had Grade 1 and Grade 3 tumors, respectively. In the 40–49 year group, 62.5% had Grade 2 tumors, with 21.9% and 15.6% having Grade 1 and Grade 3 tumors, respectively. Among patients aged ≥50 years, 71.2% had Grade 2 tumors, while 15.4% and 13.5% had Grade 1 and Grade 3 tumors, respectively. Overall, Grade 2 tumors predominated across all age categories.

### Discussion

The present study evaluated the clinicopathological characteristics of invasive ductal carcinoma diagnosed on core biopsy in a tertiary care setting in Bangladesh. The findings demonstrate that the majority of patients were aged 50 years or above, with a mean age of 46.8 years and that Grade 2 tumors predominated across all age groups. Right breast involvement was more common and most tumors exhibited intermediate scores for tubule formation, nuclear pleomorphism and mitotic activity.

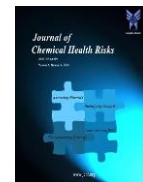
Globally, breast cancer remains the leading malignancy among women, with rising incidence trends reported by Sung et al. and Arnold et al. [1,2]. Although higher incidence rates are observed in high-income countries, the burden in low- and middle-income nations is increasing steadily [2]. Studies from South Asia have consistently reported a comparatively younger age at diagnosis than in Western populations. Nessa et al. observed that a substantial proportion of Bangladeshi women develop breast cancer before the age of 50, which aligns with the current study where more than half of the patients were below 50 years [10].

The predominance of invasive ductal carcinoma in the present series is consistent with global and regional data indicating that IDC constitutes the majority of breast malignancies. Makki emphasized the morphological heterogeneity of IDC and its clinical relevance [5]. Similarly, Smolarz et al. highlighted that invasive carcinoma of no special type remains the most common histological subtype worldwide [18].

Tumor grading using the Nottingham system is a critical prognostic determinant [6]. In the current study, Grade 2 tumors accounted for over two-thirds of cases. Comparable findings were reported by Asrar et al., who observed a predominance of intermediate-grade tumors in their cohort [8]. Saha et al. also documented a higher frequency of Grade 2 lesions in a tertiary care setting [9]. These observations suggest that intermediate-grade carcinoma may represent the most frequent histopathological presentation in similar populations.

The distribution of individual Nottingham components in this study revealed that most tumors had a score of 2 for tubule formation, pleomorphism and mitotic count. Rakha and Ellis described that intermediate scores in these parameters are common in moderately differentiated tumors and are associated with variable biological behavior [6]. Cserni et al. emphasized the importance of standardized grading and reporting to ensure prognostic consistency and guide treatment decisions [19].

Age-stratified analysis demonstrated that Grade 2 tumors predominated in all age categories, including patients younger than 40 years. Previous research has suggested that younger patients may present with higher-grade and biologically aggressive tumors. Sharmin et al. reported a higher proportion of advanced or aggressive features



among younger Bangladeshi women [12]. However, the present findings indicate that intermediate-grade tumors remain common even in younger patients, highlighting potential heterogeneity within age groups.

Right-sided breast involvement was more frequent in this study. Although laterality does not consistently influence prognosis, Chen et al. noted that tumor location may have implications for clinical outcomes in certain contexts [20]. The observed right-sided predominance may reflect random distribution or underlying anatomical and hormonal factors, although definitive conclusions cannot be drawn from descriptive data alone.

Core needle biopsy served as the diagnostic modality in this study. Tse and Tan emphasized that core biopsy provides a reliable histological assessment and allows accurate grading before definitive surgery [17]. The consistency of grading patterns in the present analysis supports the reliability of core biopsy in evaluating IDC in routine clinical practice.

The predominance of intermediate-grade carcinoma has important clinical implications. Zhang et al. demonstrated that histological grade significantly correlates with survival outcomes in invasive ductal carcinoma [7]. Intermediate-grade tumors often require individualized management strategies based on additional prognostic markers, including hormone receptor status and HER2 expression. Waks and Winer underscored the necessity of integrating histopathological grade with molecular profiling to optimize treatment selection [21]. Gradishar et al. also emphasized guideline-directed management tailored to tumor biology [22].

Collectively, the findings of this study are consistent with regional and international literature demonstrating the predominance of invasive ductal carcinoma and intermediate tumor grades. The data contribute valuable context-specific information regarding clinicopathological patterns in Bangladeshi women and reinforce the importance of accurate histological grading in guiding clinical decision-making.

### Limitations of the study

This study was conducted at a single tertiary center with a relatively limited sample size. Molecular subtyping and long-term follow-up data were not included, which

restricts correlation with survival outcomes and comprehensive prognostic evaluation.

### Conclusion

Invasive ductal carcinoma in this cohort predominantly affected women below 50 years, with intermediate-grade tumors being most common across all age groups. Core biopsy reliably demonstrated consistent Nottingham grading patterns. These findings provide valuable clinicopathological insights for early risk stratification and informed therapeutic planning in Bangladeshi women.

**Conflicts of interest:** There are no conflicts of interest.

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