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Histopathological Spectrum of Breast Carcinoma and the Distribution of ER, PR, and HER2/neu Receptor Status: A Retrospective Study

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Abstract

Background

Breast carcinoma is a biologically heterogeneous malignancy in which morphology alone does not reliably predict clinical behavior. Estrogen receptor (ER), progesterone receptor (PR), human epidermal growth factor receptor 2 (HER2/neu), and the proliferation marker Ki-67 are routinely used to refine prognostic assessment and to guide systemic therapy. The present study aimed to describe the histopathological spectrum of breast carcinoma at a tertiary care center in western India and to document how immunohistochemical receptor expression is distributed across histological grades.

Materials and methods

This retrospective observational study examined 67 histopathologically confirmed breast carcinomas reported in the Department of Pathology, Dhiraj Hospital, Sumandeep Vidyapeeth (Deemed to be University), Vadodara, between May 2023 and May 2025. Histological typing followed the fifth edition of the World Health Organization classification, and grading followed the Nottingham modification of the Scarff-Bloom-Richardson system. ER and PR were scored by the Allred method, HER2/neu was interpreted using the American Society of Clinical Oncology/College of American Pathologists criteria, and the Ki-67 labelling index was recorded. Cases were then assigned to immunohistochemistry-based surrogate molecular subtypes. Only descriptive statistics were applied; no inferential or correlation testing was performed.

Results

Invasive breast carcinoma of no special type accounted for 56 (83.6%) of 67 tumors. The age band of 41-50 years was the largest, with 34 (50.7%) patients, and 38 (56.7%) tumors measured 2-5 cm. Axillary nodal metastasis was present in 45 (67.2%) cases. Grade 2 tumors predominated, numbering 34 (50.7%). ER was positive in 34 (50.7%) cases, PR in 27 (40.3%), and HER2/neu in 27 (40.3%); the Ki-67 index was 14% or higher in 50 (74.6%) tumors. Luminal A was the commonest surrogate subtype at 24 (35.8%) cases, followed by luminal B at 18 (26.9%), triple-negative at 14 (20.9%), and HER2-enriched at 11 (16.4%). Triple-negative tumors clustered in grade 3, where 11 (64.7%) of 17 grade 3 carcinomas were triple-negative, whereas luminal A, luminal B, and HER2-enriched tumors were encountered most often among grade 2 lesions.

Conclusions

The cohort displayed wide histopathological and immunophenotypic variation. Reporting histological grade alongside ER, PR, HER2/neu, and Ki-67 status yielded a more complete description of each tumor than morphology alone and supports individualized treatment planning. The findings are descriptive and hypothesis-generating, and require confirmation in larger cohorts with formal statistical analysis.

Categories: General Surgery, Pathology
Keywords: breast carcinoma, estrogen receptor, her2/neu, ki-67, nottingham histological grade, progesterone receptor, surrogate molecular subtype

Introduction

Disorders of the breast span a wide pathological range, from benign proliferative change through in situ neoplasia to frankly invasive carcinoma, and collectively they account for a substantial share of illness among women [1]. Malignant disease dominates this burden. Breast cancer is now the tumor most often diagnosed in women worldwide and remains a leading contributor to cancer mortality. GLOBOCAN estimated roughly 2.3 million new cases globally in 2022, close to one in four malignancies diagnosed in women. Within India, breast cancer has displaced cervical cancer as the leading female malignancy, and incidence continues to rise across both urban and rural districts [2].

Morphology alone is an imperfect guide to how an individual breast carcinoma will behave. Tumors that appear similar under the microscope may follow markedly different clinical courses, which is why molecular pathology has been directed at biomarkers capable of adding prognostic and predictive information. Three such markers, estrogen receptor (ER), progesterone receptor (PR), and human epidermal growth factor receptor 2 (HER2/neu), are now assessed as a matter of routine in every newly diagnosed invasive carcinoma [3,4].

ER and PR are nuclear hormone receptors, and their presence signals that tumor growth retains a degree of hormonal dependence. Receptor-expressing carcinomas tend to be of lower grade, to progress more slowly, and to carry a more favorable outlook; of greater practical consequence, they identify the patients in whom endocrine treatment is likely to work [5]. HER2/neu occupies the opposite pole. A transmembrane receptor tyrosine kinase encoded by ERBB2, it is overexpressed or amplified in roughly 15-20% of invasive breast carcinomas, a finding linked to faster tumor growth, a higher likelihood of recurrence, and shorter survival in the absence of targeted treatment [6].

Read together, these three markers underpin the surrogate molecular classification of breast carcinoma. The resulting subtypes differ from one another in clinicopathological profile, in response to treatment, in the pattern and timing of relapse, and in survival, which is why receptor status is reported alongside conventional histopathological parameters in contemporary practice [7].

Published series have repeatedly described patterns linking hormone receptor expression to histological grade, tumor size, nodal status, lymphovascular invasion, and composite indices such as the Nottingham Prognostic Index. High-grade carcinomas are disproportionately HER2-positive or triple-negative, while well-differentiated tumors are more often ER and PR positive. Familiarity with these patterns helps the reporting pathologist and the treating clinician anticipate tumor behavior and tailor management [8].

Although gene-expression profiling has refined breast cancer taxonomy, immunohistochemistry remains the method that is practical, affordable, and widely deployable, and it is the only option available in many laboratories serving resource-constrained populations. Documenting how histopathological features and receptor expression are distributed within a defined local population therefore carries both epidemiological and operational value, informing laboratory protocols and treatment pathways [9].

The present study was designed with two aims: to characterize the histopathological spectrum of malignant breast tumors reported at a single tertiary center and to describe the distribution of ER, PR, and HER2/neu expression across those tumors.

Materials And Methods

Study design and setting

This was a retrospective observational study conducted in the Department of Pathology, Dhiraj Hospital, Sumandeep Vidyapeeth (Deemed to be University), Vadodara, Gujarat, India. Archived histopathology records of patients diagnosed with invasive breast carcinoma over the two-year period from May 2023 to May 2025 were retrieved and reviewed.

Ethical considerations

The study protocol was reviewed and approved by the Institutional Ethics Committee of Sumandeep Vidyapeeth (Deemed to be University) (SVIEC/UN/Medi/RP/SEP/26/8). The study was conducted in accordance with the Declaration of Helsinki. Because the analysis was confined to archived tissue blocks and anonymized records, the Committee granted a waiver of individual informed consent; patient identifiers were removed before analysis.

Inclusion and exclusion criteria

Consecutive patients who underwent modified radical mastectomy during the two-year study period, whose specimens were reported histologically as breast malignancy, and in whom immunohistochemistry for ER, PR, and HER2/neu had been performed were eligible for inclusion. Cases were excluded if the diagnostic material consisted only of a Tru-Cut needle biopsy without a subsequent resection specimen, if clinical, histological, or immunohistochemical data were incomplete, if the lesion proved to be benign on histological review, or if the tissue was poorly preserved and therefore unsuitable for reliable morphological and immunohistochemical assessment. In addition to this, patients who received neoadjuvant chemotherapy were also excluded to avoid treatment-induced alterations in histomorphology and biomarker expression. After these criteria were applied, 67 cases formed the final study group.

Data collection

Age, tumor size, and axillary lymph node status were abstracted from patient records, while histomorphological pattern, histological type, and tumor grade were taken from the corresponding

pathology reports. Histological typing followed the fifth edition of the World Health Organization classification of breast tumors [1], and grading was performed using the Nottingham modification of the Scarff-Bloom-Richardson system, which scores tubule formation, nuclear pleomorphism, and mitotic count [8,10]. ER, PR, HER2/neu, and Ki-67 were assessed on formalin-fixed, paraffin-embedded tissue using the standardized protocol described below.

Immunohistochemistry protocol

A representative tumor block was selected for each case. Sections cut at 4-5 micrometers were mounted on poly-L-lysine-coated slides, deparaffinized, and rehydrated. Antigen retrieval used Tris-EDTA buffer at pH 9.0, heated in a microwave oven at 95 degrees Celsius for three cycles. Endogenous peroxidase activity was quenched with 3% hydrogen peroxide for 10 minutes.

Sections were then incubated with primary antibodies directed against ER, PR, HER2/neu, and Ki-67 according to the manufacturer's instructions. A polymer-based horseradish peroxidase detection system was applied, followed by development with diaminobenzidine chromogen. Slides were counterstained with hematoxylin, dehydrated, cleared, and mounted.

The antibody panel comprised anti-ER rabbit monoclonal antibody, anti-PR rabbit monoclonal antibody (clone EP2), anti-HER2/neu mouse monoclonal antibody (clone CB11), and anti-Ki-67 mouse monoclonal antibody (clone MIB-1), all supplied by BioGenex (Fremont, CA, USA). Appropriate positive and negative controls accompanied every staining run.

Interpretation of immunohistochemistry

ER and PR were scored by the Allred method, which sums a proportion score and an intensity score; a total score of 3 or more was recorded as positive [11]. HER2/neu membrane staining was graded from 0 to 3+ following American Society of Clinical Oncology/College of American Pathologists (ASCO/CAP) criteria, with 3+ regarded as positive and 0 or 1+ as negative [6]. The Ki-67 proliferation index was expressed as the percentage of tumor nuclei showing unequivocal staining, counted in the areas of highest proliferative activity, and a threshold of 14% was applied [12].

Surrogate molecular subtyping

Each tumor was assigned to one of four immunohistochemistry-based surrogate molecular subtypes using the St. Gallen International Expert Consensus framework [12]. Tumors positive for ER and/or PR, negative for HER2/neu, and showing a Ki-67 index below 14% were classified as luminal A. Tumors positive for ER and/or PR were classified as luminal B when they were either HER2-positive, irrespective of the Ki-67 value, or HER2-negative with a Ki-67 index of 14% or above. Tumors negative for ER and PR but positive for HER2/neu were designated HER2-enriched, and those negative for all three markers were designated triple-negative. These categories are immunohistochemical surrogates; gene-expression profiling was not undertaken.

Statistical analysis

Data were compiled in Microsoft Excel (Microsoft Corporation, Redmond, WA) and summarized using descriptive statistics alone. Categorical variables are reported as absolute frequencies with corresponding percentages in the format n (%), with percentages calculated against the total of 67 cases unless a different denominator is stated. No correlation coefficients, tests of association, or other inferential statistics were computed, and no hypothesis testing was performed; consequently, all relationships described in this report are descriptive rather than statistical. Percentages are given to one decimal place, and thus column totals may differ marginally from 100% because of rounding.

Results

The study group comprised 67 cases of breast carcinoma. Their demographic, histopathological, and immunohistochemical characteristics are presented below.

Invasive breast carcinoma of no special type (IBC-NST) was by a wide margin the commonest histological type, accounting for 56 (83.6%) of the 67 tumors. IBC-NST with a medullary pattern was found in four (6.0%) cases. Invasive solid papillary carcinoma and metaplastic breast carcinoma with heterologous differentiation were the least frequent diagnoses, each represented by a single tumor (1.5%) (Table *1*).

Histological type	Number of cases, n (%)
IBC-NST	56 (83.6)
IBC-NST with medullary pattern	4 (6.0)
Invasive lobular carcinoma	3 (4.5)
IBC-NST with mucinous differentiation	2 (3.0)
Invasive solid papillary carcinoma	1 (1.5)
Metaplastic breast carcinoma with heterologous differentiation	1 (1.5)
Total	67 (100.0)

TABLE 1: Histopathological distribution of malignant breast lesions

Percentages are calculated against the total of 67 cases and are rounded to one decimal place; the column sums to 100.1% because of rounding.

IBC-NST, invasive breast carcinoma of no special type

The fifth decade contributed the largest group of patients, with 34 (50.7%) women aged 41-50 years, followed by 16 (23.9%) women aged 51-60 years. Only one (1.5%) patient was aged 30 years or below, making this the smallest category (Table *2*).

Age group (years)	Number of cases, n (%)
30 or below	1 (1.5)
31-40	5 (7.5)
41-50	34 (50.7)
51-60	16 (23.9)
61-70	8 (11.9)
71-80	3 (4.5)
Total	67 (100.0)

TABLE 2: Age distribution of patients with malignant breast lesions

Percentages are calculated against the total of 67 cases and rounded to one decimal place.

Most tumors fell into the intermediate size band: 38 carcinomas (56.7%) measured 2-5 cm at the time of resection, compared with 17 (25.4%) below 2 cm and 12 (17.9%) above 5 cm (Table *3*).

Tumor size	Number of cases, n (%)
Less than 2 cm	17 (25.4)
2-5 cm	38 (56.7)
Greater than 5 cm	12 (17.9)
Total	67 (100.0)

TABLE 3: Distribution of cases according to tumor size

Percentages are calculated against the total of 67 cases and rounded to one decimal place.

Axillary metastasis was identified in 45 (67.2%) of the 67 patients. Within this node-positive group, 27 (40.3% of the whole cohort) patients had between one and three involved nodes, while 18 (26.9%) had four or more. The remaining 22 (32.8%) patients had no nodal involvement (Table *4*).

Lymph node status	Number of cases, n (%)
Negative	22 (32.8)
Positive, 1-3 nodes involved	27 (40.3)
Positive, 4 or more nodes involved	18 (26.9)
Total node-positive	45 (67.2)
Total	67 (100.0)

TABLE 4: Distribution of cases according to axillary lymph node status

Percentages are calculated against the total of 67 cases and rounded to one decimal place.

Moderately differentiated tumors predominated. Grade 2 carcinomas accounted for 34 (50.7%), with 17 (25.4%) grade 3 tumors and 16 (23.9%) grade 1 tumors making up the remainder (Table *5*).

Histological grade	Number of cases, n (%)
Grade 1	16 (23.9)
Grade 2	34 (50.7)
Grade 3	17 (25.4)
Total	67 (100.0)

TABLE 5: Distribution of cases according to the Nottingham modification of the Scarff-Bloom-Richardson grade

Percentages are calculated against the total of 67 cases and rounded to one decimal place.

Immunohistochemistry for ER, PR, and HER2/neu was available for every case. ER was positive in 34 (50.7%) tumors and PR in 27 (40.3%), while HER2/neu positivity was recorded in 27 (40.3%) tumors. Proliferative activity was high in most of the cohort: 50 (74.6%) carcinomas showed a Ki-67 index of 14% or above, against 17 (25.4%) below that threshold (Table *6*).

Parameter	Number of cases, n (%)
ER	
Positive	34 (50.7)
Negative	33 (49.3)
PR	
Positive	27 (40.3)
Negative	40 (59.7)
HER2/neu	
Positive	27 (40.3)
Negative	40 (59.7)
Ki-67 index	
Below 14%	17 (25.4)
14% or above	50 (74.6)

TABLE 6: ER, PR, HER2/neu, and Ki-67 status of breast carcinomas

Each marker was assessed in all 67 cases; percentages are calculated against 67 and rounded to one decimal place.

ER, estrogen receptor; PR, progesterone receptor; HER2/neu, human epidermal growth factor receptor 2

Luminal A was the most frequently assigned surrogate subtype, comprising 24 (35.8%) tumors, followed by luminal B with 18 (26.9%) and triple-negative with 14 (20.9%). HER2-enriched tumors were the least common, numbering 11 (16.4%) (Table *7*). These designations rest on immunohistochemistry alone, as gene-expression profiling was not available.

Surrogate molecular subtype	Number of cases, n (%)
Luminal A	24 (35.8)
Luminal B	18 (26.9)
Triple-negative	14 (20.9)
HER2-enriched	11 (16.4)
Total	67 (100.0)

TABLE 7: Distribution of immunohistochemistry-based surrogate molecular subtypes

Subtypes are immunohistochemical surrogates assigned per the St. Gallen consensus framework; gene-expression profiling was not performed. Percentages are calculated against 67 and rounded to one decimal place.

Luminal A tumors were encountered most often among grade 2 carcinomas, where 14 (41.2%) of 34 tumors carried this phenotype, although the subtype also accounted for 7 (43.8%) of 16 grade 1 tumors. Luminal B showed a comparable pattern, appearing in 8 (50.0%) of 16 grade 1 tumors and 9 (26.5%) of 34 grade 2 tumors. HER2-enriched carcinomas were concentrated in grade 2, accounting for 8 (23.5%) of 34 tumors in that grade and 8 (72.7%) of the 11 HER2-enriched tumors overall. The triple-negative phenotype behaved differently: it was absent from grade 1, accounted for 3 (8.8%) of 34 grade 2 tumors, and rose sharply to 11 (64.7%) of 17 grade 3 tumors; thus, 11 (78.6%) of the 14 triple-negative carcinomas in the series were poorly differentiated (Table *8*).

Histological grade	Luminal A, n (%)	Luminal B, n (%)	HER2-enriched, n (%)	Triple-negative, n (%)	Total, n (%)
Grade 1 (n = 16)	7 (43.8)	8 (50.0)	1 (6.3)	0 (0.0)	16 (100.0)
Grade 2 (n = 34)	14 (41.2)	9 (26.5)	8 (23.5)	3 (8.8)	34 (100.0)
Grade 3 (n = 17)	3 (17.6)	1 (5.9)	2 (11.8)	11 (64.7)	17 (100.0)
Total (n = 67)	24 (35.8)	18 (26.9)	11 (16.4)	14 (20.9)	67 (100.0)

TABLE 8: Distribution of surrogate molecular subtypes across histological grades

Percentages in the grade rows are row percentages calculated against the number of cases in that grade; percentages in the total row are calculated against all 67 cases. Row totals may differ marginally from 100% because of rounding. No test of association was applied.

Discussion

Breast cancer is the leading malignancy among women globally and poses a particular challenge in developing countries, where a large proportion of patients present with advanced disease. In India, the tumor is not only the commonest female cancer but also tends to arise roughly a decade earlier than in Western populations; thus, a greater share of the disease burden falls on premenopausal women [13].

Histological type

IBC-NST accounted for 56 (83.6%) of the 67 tumors in this series, a proportion closely matching that documented in other Indian institutional cohorts in Jharkhand [14].

Age distribution

Patients in their fifth decade formed the largest group, numbering 34 (50.7%), with the sixth decade contributing a further 16 (23.9%). This pattern is consistent with earlier reports from comparable settings [15,16].

Tumor size

Tumors measuring 2-5 cm dominated the cohort at 38 (56.7%) cases, with 17 (25.4%) below 2 cm and 12 (17.9%) exceeding 5 cm. A similar concentration in the 2-5 cm band has been described by other investigators [17,18]. The relative scarcity of tumors under 2 cm is consistent with presentation after the lesion has become clinically palpable, which is the usual route to diagnosis where organized mammographic screening is not in place.

Lymph node status

Axillary metastasis was present in 45 (67.2%) of 67 patients, with 27 (40.3%) harboring one to three involved nodes. Compared with cohorts from high-income countries, Indian breast cancer cohorts frequently demonstrate a substantial burden of axillary lymph node involvement at presentation. This pattern has been reported in recent Indian studies and is consistent with the findings of the present study [19]. The difference plausibly reflects later stage at presentation rather than any intrinsic biological distinction.

Histological grade

Grading by the Nottingham system placed 34 (50.7%) tumors in grade 2, 17 (25.4%) in grade 3, and 16 (23.9%) in grade 1. This distribution is comparable with published series applying the same system [7,8]. Higher grade reflects loss of tubular differentiation, greater nuclear pleomorphism, and increased mitotic activity, and carries independent prognostic weight [20]. That a quarter of tumors in this cohort were grade 3 indicates a meaningful burden of aggressive disease.

Hormone receptor, HER2/neu, and Ki-67 expression

ER positivity was recorded in 34 (50.7%) tumors, broadly in line with the roughly half of breast carcinomas reported as hormone receptor positive in the ASCO/CAP guideline literature [21]. ER expression identifies tumors likely to benefit from endocrine treatment and is generally associated with a more favorable outlook, as reiterated by Curigliano et al. in the 2017 St. Gallen consensus [22]. PR was positive in 27 (40.3%) cases. Desai et al., in a series of 798 Indian tumors, reported ER positivity of 32.6% and PR positivity of 46.1%, both below the rates then being published from Western centers [23]. Against that benchmark, ER positivity in the present cohort was higher and PR positivity somewhat lower, a pattern that may reflect differences in fixation and antigen retrieval, in scoring thresholds, or simply the small size of the present series. Taken together, the finding that half the tumors expressed ER suggests that a substantial proportion of these

patients are candidates for endocrine therapy.

HER2/neu positivity was recorded in 27 (40.3%) tumors. This figure is appreciably higher than the 15-20% overexpression rate described in the study conducted by Ross et al. [6]. HER2 scoring in this study rested on immunohistochemistry alone, without reflex in situ hybridization for equivocal 2+ results, and thus any 2+ tumors counted as positive would inflate the rate. Pre-analytical variables such as cold ischemic time and fixation duration are known to affect membrane staining, and the cohort was restricted to modified radical mastectomy specimens from a tertiary referral center, which selects for larger and more advanced tumors than a population-based sample would contain. Accurate HER2 assignment carries direct therapeutic consequences, as HER2-positive tumors are biologically aggressive yet responsive to trastuzumab and related agents [24], and the rate observed here should therefore be regarded as provisional pending confirmation by in situ hybridization.

The Ki-67 index was 14% or above in 50 (74.6%) tumors and below that threshold in 17 (25.4%) tumors, indicating that most carcinomas in this cohort were proliferatively active. Ki-67 interpretation is, however, notably sensitive to methodology. Focke et al. demonstrated that the proportion of tumors classified as luminal A-like shifts substantially depending on how the index is counted and which fields are selected, and inter-observer variation compounds the problem [25]. The high proportion of tumors above the 14% threshold in this series should accordingly be read in conjunction with the ER, PR, HER2/neu status and histological grade rather than as a standalone prognostic statement.

Surrogate molecular subtype distribution

Luminal A was the commonest surrogate subtype at 24 (35.8%) cases, which accords with the predominance of luminal tumors described since the original molecular portraits of breast cancer were published [26]. Of greater concern is the triple-negative fraction of 14 (20.9%) tumors, a proportion at the upper end of what is generally reported. Triple-negative carcinoma lacks any established receptor-directed treatment option, recurs more often, and carries a poorer prognosis than the luminal subtypes [27], and thus a fifth of this cohort falls outside the reach of both endocrine and anti-HER2 therapy.

Relationship between histological grade and receptor expression

The distribution in Table *8* shows hormone receptor-expressing subtypes concentrated in grade 1 and grade 2 tumors and the triple-negative phenotype concentrated in grade 3, where it accounted for 11 (64.7%) of 17 tumors. A decline in ER and PR expression with rising grade is well recognized, and the loss of receptor expression has been linked to reduced differentiation [28]. It should be emphasized that this pattern is presented here as a descriptive distribution. No test of association was applied, and the direction and strength of any relationship cannot be inferred from these data.

HER2-enriched tumors in the present cohort were encountered predominantly among grade 2 carcinomas, 8 (72.7%) of the 11 such tumors falling into that grade. Although HER2 amplification is generally regarded as a marker of aggressive biology, HER2-positive tumors have been reported to cluster in grade 2 disease in other series, with no significant association with grade in others [29]. Grade 2 is a biologically heterogeneous category that accommodates tumors of varied molecular character, which may partly explain the observation.

An additional and more prosaic explanation deserves emphasis. Grade 2 was by far the largest grade category in this cohort, comprising 34 (50.7%) of 67 tumors, and thus it would be expected to contribute the greatest absolute number of cases in almost any subtype. Expressed as a proportion of tumors within each grade rather than as raw counts, HER2-enriched carcinomas accounted for 8 (23.5%) of 34 grade 2 tumors and 2 (11.8%) of 17 grade 3 tumors, a difference that rests on very small numbers and that no statistical test was applied to evaluate. Differences in cohort size, population characteristics, grade distribution, HER2 assay methodology, and the evolving ASCO/CAP interpretive criteria all limit comparison with published series.

Limitations

Several constraints qualify these findings. The study was retrospective and confined to a single tertiary care institution, and thus the cohort reflects referral patterns rather than the population at large, and the results may not generalize. The sample of 67 cases is small, and several subgroups, particularly the grade 1 and grade 3 strata in Table *8*, contain very few tumors; thus, the proportions derived from them are unstable.

Only descriptive statistics were applied. No correlation coefficients, tests of association, or multivariable analyses were performed, and no adjustment was made for potential confounders such as age, tumor size, or nodal status; the distributions reported here are therefore observations rather than demonstrated relationships.

Restricting inclusion to modified radical mastectomy specimens excluded patients diagnosed on core biopsy alone, those treated with neoadjuvant chemotherapy, and those with inoperable or metastatic disease, introducing a selection bias toward operable tumors. HER2 status was determined by immunohistochemistry

without reflex in situ hybridization; thus, equivocal 2+ results could not be resolved, and this is the most likely contributor to the unusually high HER2 positivity rate observed. Ki-67 was scored visually in hotspot areas without image analysis or a formal standardization protocol, a method known to be subject to inter-observer and inter-method variability.

Molecular subtypes were assigned from immunohistochemical surrogates rather than gene-expression profiling, and surrogate classification is an approximation of the intrinsic subtypes. Finally, no clinical follow-up, treatment, recurrence, or survival data were available; thus, the prognostic implications discussed here are drawn from the published literature rather than demonstrated within this cohort. Larger multicenter studies incorporating in situ hybridization confirmation, standardized Ki-67 assessment, formal statistical analysis, and longitudinal outcome data are needed to substantiate these observations.

Conclusions

This series confirms that invasive breast carcinoma at a single tertiary center in western India is a morphologically and immunophenotypically varied disease. IBC-NST was the dominant histological type, and grade 2 was the dominant histological grade. ER- and PR-expressing tumors were encountered mainly among grade 1 and grade 2 carcinomas, while the triple-negative phenotype was concentrated in grade 3, where it accounted for close to two-thirds of tumors. HER2-enriched carcinomas, by contrast, were found most often among moderately differentiated tumors in this cohort, indicating that HER2 positivity was not restricted to high-grade disease here.

Reporting histological grade together with ER, PR, HER2/neu, and Ki-67 status yields a fuller characterization of each tumor than either component alone, and routine immunohistochemical assessment of every invasive breast carcinoma remains justified on that basis. The observations presented are descriptive and derive from a small single-center cohort without statistical testing or outcome data; they should be treated as hypothesis-generating and tested in larger, prospectively designed studies.

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

Concept and design: Deepali T. Shukla, Vidhi Jain

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Drafting of the manuscript: Deepali T. Shukla, Vidhi Jain

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Supervision: Deepali T. Shukla

Disclosures

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