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ORIGINAL RESEARCH

Correlation of Cytological and Histological Grading Systems and the Clinical Relevance of Invasive Ductal Carcinoma and Lymphovascular Invasion in Breast Cancer

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ABSTRACT

Background: Breast cancer is the most prevalent malignancy in women globally, with histological and cytological grading systems playing a critical role in determining tumor aggressiveness and guiding treatment strategies. This study aimed to evaluate the concordance between histological grades and three cytological grading systems—Robinson's, Fisher's, and Howells—and to assess the prevalence of invasive ductal carcinoma (IDC) and lymphovascular invasion (LVI) among breast cancer patients. **Methods**: A retrospective analysis of 60 breast cancer cases was conducted, examining the correlation between histological grades and cytological grading systems using Kendall's tau-b and Spearman correlation coefficients. The distribution of tumor grades, LVI status, and histological subtypes, including IDC, was analyzed. Statistical significance was determined using Chi-square tests. **Results:** The strongest concordance with histological grades was observed for Robinson's grade (Kendall's tau-b = 0.655, Spearman r = 0.692). Grade 2 tumors were most prevalent, accounting for 55% of cases across grading systems. IDC was the predominant subtype, representing 95% of cases. LVI was present in 30% of patients, underscoring its prognostic importance. **Conclusion:** This study validates the reliability of Robinson's grading system in aligning with histological grades and highlights the clinical relevance of LVI and IDC in breast cancer prognosis. These findings reinforce the importance of standardized grading systems in improving diagnostic accuracy and guiding personalized treatment approaches.

Keywords: Breast cancer, cytological grading, histological grading, Robinson's grade, Fisher's grade, Howells grade, invasive ductal carcinoma (IDC), lymphovascular invasion (LVI), tumor aggressiveness, diagnostic correlation

INTRODUCTION

Breast carcinoma is one of the most common malignancies affecting women worldwide, accounting for a significant proportion of cancer-related morbidity and mortality. Early and accurate diagnosis, coupled with precise grading, plays a pivotal role in determining treatment strategies and predicting outcomes. Fine-needle aspiration cytology (FNAC) is a minimally invasive, cost-effective, and widely used diagnostic tool for assessing breast lesions. One of its key utilities is the cytological grading of breast cancer, which can serve as an initial prognostic indicator, complementing histopathological evaluation.[1,2]

Cytological grading systems aim to replicate the prognostic value of histological grading by analyzing features such as nuclear pleomorphism, mitotic activity, and overall cellular architecture. Among histological grading systems, the Nottingham modification of the Scarff-Bloom-Richardson (SBR) method remains the gold standard, offering robust prognostic and predictive value.[3,4] This method evaluates tubule formation, nuclear pleomorphism, and mitotic count, generating a grade that correlates with clinical outcomes.However, there is a growing need to establish a stronger concordance between cytological grading and histological grading to enhance the reliability of FNAC in preoperative decision-making. While various cytological grading

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systems have been proposed, including Robinson's, Mouriquand's, and Howell's systems, their association with histological grades has been inconsistent across studies.[5,6]The objective of this research is to evaluate the association of the cytological grade of breast carcinoma with histological grading using the Nottingham modification of the Scarff-Bloom-Richardson method. This study aims to determine the degree of concordance between these methods and assess the prognostic implications of cytological grading as a standalone diagnostic tool. Establishing such correlations could reinforce the role of FNAC in resource-limited settings and streamline preoperative evaluation.

METHODS

The study was conducted at the Postgraduate Department of Pathology, Government Medical College, Jammu (GMC Jammu), and its associated hospitals to evaluate the association between the cytological grade of breast carcinoma and histological grading using the Nottingham modification of the Scarff-Bloom-Richardson (SBR) method. This hospital-based observational study spanned two phases: a retrospective analysis from August 1, 2021, to July 31, 2023, and a prospective analysis from August 1, 2023, to July 31, 2024.The study population included patients diagnosed with breast carcinoma who underwent fine-needle aspiration cytology (FNAC) followed by surgical excision and histopathological examination. Inclusion criteria encompassed patients with confirmed diagnoses based on FNAC and histopathology, with complete clinical data and follow-up details. Cases with inadequate cytological smears, incomplete histopathological data, or recurrent/metastatic carcinoma at presentation were excluded.

In the retrospective phase, data were retrieved from pathology records at GMC Jammu. FNAC slides of archived cases were graded using Robinson's grading system, while histological grades were noted from records based on the Nottingham modification of the SBR method. In the prospective phase, FNAC was performed on new cases using a 23-gauge needle, with the aspirates stained by Papanicolaou and Hematoxylin-Eosin (H&E) techniques. Grading was conducted using Robinson's system, which evaluates nuclear features, cell size, and mitotic activity. Subsequently, patients underwent surgical excision or biopsy, with histological grading performed using the Nottingham modification of the SBR method, assessing tubule formation, nuclear pleomorphism, and mitotic count.

All lumpectomy and mastectomy specimens were received in 10% aqueous neutral buffered formalin to ensure proper fixation. Each specimen was measured and weighed, followed by a detailed gross examination. Multiple representative sections were taken from the specimens following standardized grossing methods described in *Rosai and Ackerman's Surgical Pathology* textbook. The tissues from these representative areas were processed using either an automated tissue processor or manually. Manual processing involved fixing the sections in 10% neutral buffered formalin, dehydrating them through ascending grades of alcohol, clearing them in xylene, and embedding them in paraffin wax. Thin sections measuring 0.3–0.5 μm were cut on a rotary microtome, dewaxed, mounted on egg albumin-coated slides, and routinely stained with hematoxylin and eosin (H&E).

The H&E staining procedure was performed as per the protocol outlined by Bancroft JD and Layton C (2019). Sections were deparaffinized in two changes of xylene for 10 minutes each, rehydrated in two changes of absolute alcohol for 5 minutes each, and immersed in 95% alcohol for 2 minutes and 70% alcohol for another 2 minutes. They were then washed briefly in distilled water before staining in Harris hematoxylin solution for 8 minutes, followed by a wash under running tap water for 5 minutes. Differentiation was achieved in 1% acid alcohol for 30 seconds, after which sections were washed in running tap water for 1 minute. Sections were then blued in 0.2% ammonia water or saturated lithium carbonate solution for 30 seconds to 1 minute and washed again in running tap water for 5 minutes. After rinsing in 95% alcohol with 10 dips, counterstaining was performed using eosin-phloxine solution for 30 seconds to 1 minute. The sections were then dehydrated through 95% alcohol, followed by two changes of absolute alcohol for 5 minutes each, cleared in two changes of xylene for 5 minutes each, and mounted with a xylene-based mounting medium. This staining process yielded blue nuclei and pink-to-red cytoplasm under microscopic examination.The stained sections were examined microscopically and graded according to the Modified Bloom-Richardson Histological Grading System. This system evaluates tumors based on three key parameters: tubule formation, nuclear pleomorphism, and mitotic count. Tubule formation was scored as 1 for >75%, 2 for 10–75%, and 3 for <10% of the tumor. Nuclear pleomorphism was scored as 1 for small, uniform cells, 2 for moderate size/variation, and 3 for marked variation. Mitotic counts were scored as 1 for 0–5, 2 for 6–10, and 3 for >11 mitotic figures per 10–40 high-power fields. The total score determined the histological grade: Grade 1 (well-differentiated) with a score of 3–5, Grade 2 (moderately differentiated) with a score of 6–7, and Grade 3 (poorly differentiated) with a score of 8–9.Finally, the results from cytological smears stained with Giemsa and Papanicolaou, along with H&E-stained histological sections, were analyzed. The cytological grades were compared and correlated with the histological grades determined using the Modified Bloom-Richardson system. This comprehensive methodology ensured a

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robust and reliable comparison of cytological and histological grading in breast carcinoma.

Ethical approval for the study was obtained from the Institutional Ethics Committee of GMC Jammu. Written informed consent was secured from prospective participants, and confidentiality was rigorously maintained. Statistical analyses included the kappa coefficient for measuring agreement between the grading methods and Pearson's chi-square test to evaluate associations. A p-value of <0.05 was considered statistically significant.

RESULTS

In this section, the results of the study will be described:

In the present study, a total of 60 cases were analyzed. Cytological grading demonstrated that Grade 2 was the most prevalent category across all grading systems, comprising 55.0% in both Robinson and SBR grades, 51.7% in Fisher's grade, and 56.7% in Howells grade. Grade 1 was identified in 26.7%, 28.3%, 25.0%, and 18.3% of cases in Robinson, Fisher's, Howells, and SBR grades, respectively. Grade 3 accounted for 18.3% in both Robinson and Howells grades, 20.0% in Fisher's grade, and 26.7% in SBR grade. These results underscore a consistent pattern of grade distribution across the different grading systems, emphasizing their reliability and concordance in tumor classification.

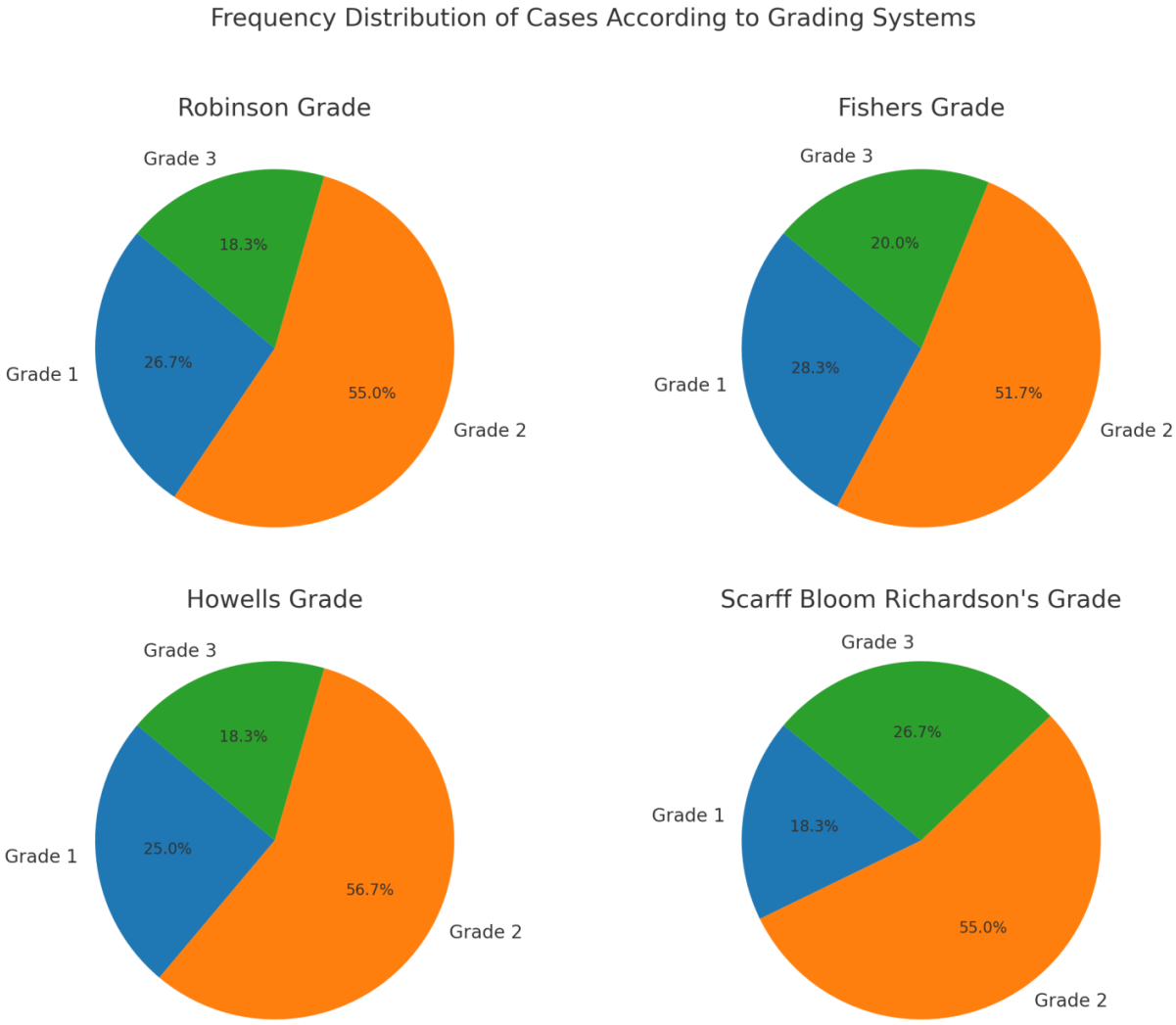

Fig 1 presents the frequency distribution of cases according to Robinson, Fisher's, Howells, and Scarff-Bloom-Richardson (SBR) histological grading systems.

Fig 2 presents the distribution of cases based on histological types among the study participants. The majority of cases were diagnosed as invasive ductal carcinoma, accounting for 57 cases (95.0%). In contrast, invasive papillary carcinoma, poorly differentiated carcinoma, and medullary carcinoma of the breast each constituted 1 case (1.7%). The total number of cases analyzed was 60, with invasive ductal carcinoma being the most prevalent histological type, representing the overwhelming majority of the sample population at 95.0%.

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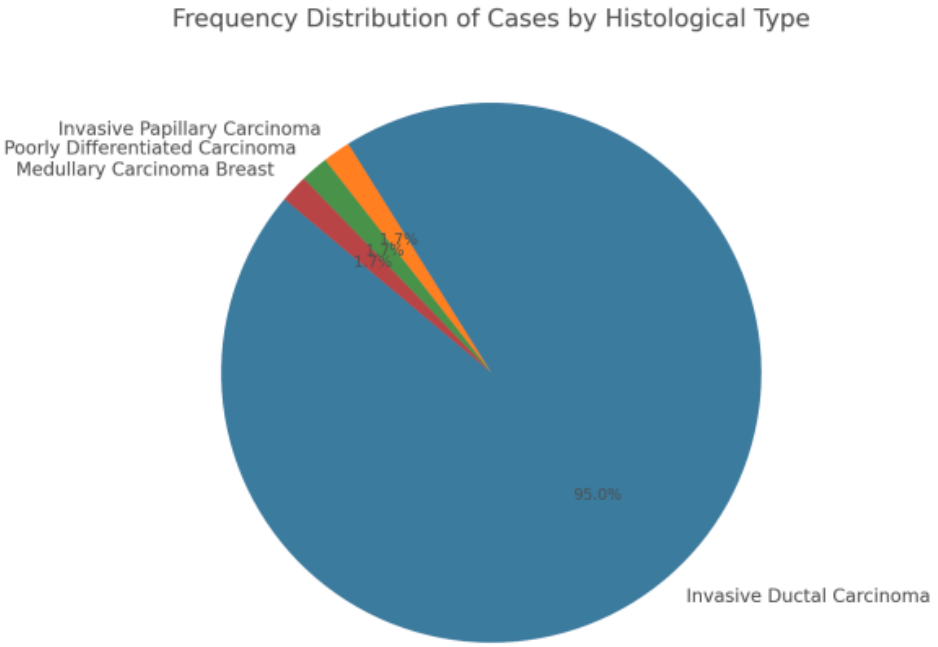

Fig 2 presents the distribution of cases based on histological types among the study participant

Table 1: Frequency Distribution of Lympho-Vascular Invasion among Participants

Lympho-Vascular Invasion	No. (%)
Present	18 (30%)
Absent	42 (70%)
Total	**60 (100%)**

Table 1 presents the distribution of lympho-vascular invasion among the study participants. Out of the total 60 cases, lympho-vascular invasion was observed in 18 cases (30%), while 42 cases (70%) showed no evidence of lympho-vascular invasion. This indicates that a majority of the participants did not exhibit lympho-vascular invasion, with its absence noted in 70% of the cases.

Table 2: Association of Histological grade with Robinson grade among participants

Histological Grade	Robinson Grade-1	Robinson Grade-2	Robinson Grade-3	Total	Chi-square Value	P-value
Grade-1	8 (50%)	3 (9.1%)	0 (0.0%)	11	40.661	0.000**
Grade-2	8 (50%)	24 (72.7%)	1 (9.1%)	33		
Grade-3	0 (0.0%)	6 (18.2%)	10 (90.9%)	16		
Total	16	33	11	60		

*P-value ≤ 0.05 Significant; **P-value ≤ 0.01 Highly Significant

Table 2 demonstrates the association between histological grades and Robinson grades among the participants. Histological Grade 1 was predominantly associated with Robinson Grade 1, observed in 8 out of 11 cases (50%), with fewer cases distributed in Robinson Grade 2 (9.1%) and none in Robinson Grade 3. For Histological Grade 2, the majority of cases (72.7%) were classified under Robinson Grade 2, while 50% aligned with Robinson Grade 1 and 9.1% with Robinson Grade 3. Histological Grade 3, however, exhibited a strong association with Robinson Grade 3, with 10 out of 16 cases (90.9%) falling in this category, and the remainder distributed in Robinson Grade 2 (18.2%) and none in Robinson Grade 1.The chi-square value of 40.661 and a highly significant p-value of 0.000** indicate a statistically significant correlation between the histological grading and Robinson grading systems. This association underscores the concordance between the two grading methodologies in categorizing breast carcinoma cases.

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Table 3: Association of Histological grade with Fisher's grade among participants

Histological Grade	Fisher's Grade-1	Fisher's Grade-2	Fisher's Grade-3	Total	Chi-square Value	P-value
Grade-1	7 (41.2%)	4 (12.9%)	0 (0.0%)	11	14.545	0.006**
Grade-2	10 (58.8%)	15 (48.4%)	8 (66.7%)	33		
Grade-3	0 (0.0%)	12 (38.7%)	4 (33.3%)	16		
Total	17	31	12	60		

*P-value ≤ 0.05 Significant; **P-value ≤ 0.01 Highly Significant

For participants with a Grade-1 histological grade, 41.2% (7 participants) were classified under Fisher's grade-1, 12.9% (4 participants) under grade-2, and none under grade-3, totaling 11 participants. Among those with a Grade-2 histological grade, 58.8% (10 participants) were classified under Fisher's grade-1, 48.4% (15 participants) under grade-2, and 66.7% (8 participants) under grade-3, totaling 33 participants. For Grade-3 histological grade, none of the participants (0.0%) were classified under Fisher's grade-1, 38.7% (12 participants) under grade-2, and 33.3% (4 participants) under grade-3, totaling 16 participants. In total, 17 participants were classified as Fisher's grade-1, 31 as grade-2, and 12 as grade-3, across the 60 participants analyzed. The association between histological grade and Fisher's grade among participants was evaluated, and the results revealed a significant relationship (Chi-square value = 14.545, P-value = 0.006, highly significant).These findings underscore a statistically significant association between histological grade and Fisher's grade.

Table 4: Association of histological grade with Howells grade among participants

Histological Grade	Howells Grade-1	Howells Grade-2	Howells Grade-3	Total	Chi-square Value	P-value
Grade-1	5 (33.3%)	6 (17.6%)	0 (0.0%)	11	11.306	0.023*
Grade-2	10 (66.7%)	15 (44.1%)	8 (72.7%)	33		
Grade-3	0 (0.0%)	13 (38.2%)	3 (27.3%)	16		
Total	15	34	11	60		

*P-value ≤ 0.05 Significant; **P-value ≤ 0.01 Highly Significant

The association between histological grade and Howells grade among participants was assessed, and the results indicated a statistically significant relationship (Chi-square value = 11.306, P-value = 0.023). For participants with a Grade-1 histological grade, 33.3% (5 participants) were classified under Howells grade-1, 17.6% (6 participants) under grade-2, and none under grade-3, totaling 11 participants. Among participants with a Grade-2 histological grade, 66.7% (10 participants) were classified under Howells grade-1, 44.1% (15 participants) under grade-2, and 72.7% (8 participants) under grade-3, totaling 33 participants. For participants with a Grade-3 histological grade, none (0.0%) were classified under Howells grade-1, 38.2% (13 participants) under grade-2, and 27.3% (3 participants) under grade-3, totaling 16 participants. In total, 15 participants were classified as Howells grade-1, 34 as grade-2, and 11 as grade-3, across 60 participants. These findings confirm a significant association between histological grade and Howells grade.

Table 5: Kendall's tau-b (τ) and Spearman Correlation (r) of Histological Grade with Robinson Grade, Fisher's Grade, and Howells Grade

Correlation	Robinson Grade		Fisher's Grade		Howells Grade	
	Value	P-Value	Value	P-Value	Value	P-Value
Kendall's tau-b (τ)	0.655	0.000**	0.373	0.000**	0.285	0.001**
Spearman (r)	0.692	0.000**	0.419	0.001**	0.322	0.012*

Table 5 highlights the correlation of histological grade with Robinson, Fisher's, and Howells grading systems using Kendall's tau-b (τ) and Spearman correlation (r). A strong positive correlation was observed between histological grade and Robinson grade (τ = 0.655, r = 0.692, both P = 0.000), indicating a robust agreement. Fisher's grade showed a moderate positive correlation with histological grade (τ = 0.373, P = 0.000; r = 0.419, P = 0.001). A weaker but significant positive correlation was found between histological grade and Howells grade (τ = 0.285, P = 0.001; r = 0.322, P = 0.012). These findings demonstrate varying degrees of concordance among the grading systems, with Robinson grade showing the strongest correlation with histological grade.

DISCUSSION

Breast cancer remains the most common malignancy among women globally, accounting for a significant proportion of cancer-related morbidity and mortality.

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Accurate prognostic assessment is crucial for tailoring treatment strategies and improving patient outcomes. This study aims to evaluate the association between histological grades and cytological grading systems, such as Robinson, Fisher's, and Howells grades, to determine their prognostic relevance and potential utility in guiding clinical management.The distribution of histological grades across various grading systems, including Robinson, Fisher's, Howells, and Scarff-Bloom-Richardson (SBR), demonstrates a consistent trend, with Grade 2 being the most prevalent in all systems. Specifically, Grade 2 comprised 55.0% in Robinson and SBR grades, 51.7% in Fisher's grade, and 56.7% in Howells grade. This consistency across grading systems indicates a general agreement in tumor classification, thereby reinforcing the reliability of these systems in assessing tumor aggressiveness. Grade 1 tumors were observed in 18.3% to 28.3% of cases, while Grade 3 tumors were found in 18.3% to 26.7% of cases, depending on the grading system used. Notably, the Nottingham modification of the Bloom-Richardson grading system exhibited a similar distribution, with 55.0% of tumors classified as Grade-2, further corroborating findings from other grading systems. This underscores the predominance of Grade-2 tumors in this cohort, a key factor in understanding disease progression and prognosis.These findings align with the study by Das AK et al. (2003), who reported 17.3% Grade-1, 55.8% Grade-2, and 26.9% Grade-3 cases, thus supporting the observed distribution.[7] According to the American Cancer Society, Grade-2 tumors exhibit intermediate growth, being more aggressive than Grade-1 tumors but less so than Grade-3 tumors.[8] This pattern is critical in guiding clinical decision-making and further emphasizes the importance of standardized grading systems in accurately assessing tumor severity and predicting clinical outcomes.

In the present study, the majority of breast cancer cases were classified as Invasive Ductal Carcinoma (IDC), comprising 95% of the cohort. This finding is consistent with the existing literature, which universally identifies IDC as the most prevalent histological subtype of breast cancer, accounting for the majority of cases globally. Elston et al. (1991) and Badowska et al. (2017) have reported that IDC represents more than 80% of all breast cancer cases, underscoring its dominance in clinical presentations.[9,10] The predominance of IDC in this cohort highlights the aggressive and invasive nature of this carcinoma, which is characterized by its capacity to infiltrate surrounding breast tissue, contributing to its widespread occurrence and clinical significance. The small proportion of cases classified as Medullary Breast Carcinoma, Invasive Papillary Carcinoma, and Poorly Differentiated Carcinoma, each representing 1.7% of the cohort, is also in line with their recognized rarity in clinical practice, as noted by Uwamariya et al. (2020).[11] These rarer subtypes are often associated with more aggressive clinical behaviors and poorer prognoses compared to IDC, reinforcing the importance of early detection and tailored therapeutic strategies for these less common but more challenging breast cancer subtypes. The distribution of IDC and its relative predominance in this study reflect its clinical relevance and the need for ongoing research into its pathogenesis and treatment approaches.

Lymphovascular invasion (LVI) is a well-recognized prognostic marker in breast cancer, as it is strongly associated with an increased risk of metastasis and poorer clinical outcomes. Its presence significantly influences treatment planning, often necessitating more aggressive therapeutic approaches. In the present study, LVI was observed in 30% of patients, while the remaining 70% did not exhibit evidence of LVI.The prevalence of LVI in this cohort aligns closely with findings reported by He et al. (2017), who documented an LVI rate of 25.1% in their study.[12] However, earlier studies, such as those by Nime et al. (1977) and Kahn et al. (2002), have shown considerable variability in LVI prevalence, ranging from 8.8% to 86%.[13,14] This wide range may be attributed to several factors, including variations in study populations, differences in tumor biology, the criteria used for diagnosing LVI, and differences in histopathological evaluation methods.The prevalence observed in this study may reflect the characteristics of the patient cohort and the standardized methodology applied in assessing LVI. These findings emphasize the importance of consistent diagnostic practices to accurately identify LVI and its implications for breast cancer prognosis and management. Further research is needed to better understand the factors contributing to the variability in LVI prevalence and to explore its role as a predictive marker in diverse populations.

The present study revealed a significant association between histological grading and Robinson's grading system among participants. Specifically, 50% of histological Grade-1 tumors were classified as Robinson's Grade-1, while 72.7% of Robinson Grade-2 tumors corresponded to histological Grade-2. Moreover, an overwhelming 90.9% of histological Grade-3 tumors were categorized as Robinson's Grade-3. This association was statistically significant, as evidenced by a Chi-Square value of 40.661 and a p-value ≤ 0.001.These findings are consistent with those of Patel et al. (2018), who also reported a statistically significant correlation between histological and Robinson's grades ($P = 0.00$).[15] Additionally, studies conducted by Robinson et al. (1995) and Sushrutha et al. (2021) further support the strong correlation between these grading systems.[16,17] The alignment of the present findings with these studies underscores the reliability and robustness of Robinson's grading system in reflecting histological tumor characteristics.Comparable results have also been observed in earlier studies by Frias et al. (1993), Lingegowda et al. (2011), Saha et al. (2013), and

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Einstien et al. (2007), all of which demonstrated a strong positive correlation between histological grades and Robinson's grading system.[18-21] The consistency of these findings across multiple studies suggests that Robinson's grading system effectively stratifies tumor aggressiveness in alignment with histological grading, providing a valuable tool for prognostic assessment.The observed strong correlation may be attributed to the shared criteria and overlapping parameters used in both grading systems, such as mitotic count, nuclear pleomorphism, and tubule formation. These similarities likely enhance the concordance between histological and Robinson's grades, making them complementary in clinical and pathological evaluations of breast cancer.

The correlation between histological grading and Fisher's and Howells grading systems also demonstrated significant associations, highlighting their relevance in tumor classification and prognostication in breast cancer.Among the participants, 7 cases (41.2%) of Fisher's grade-1 corresponded to histological grade-1, while 10 cases (58.8%) were classified as histological grade-2. For Fisher's grade-2, a diverse distribution was observed: 12 cases (38.7%) were histological grade-3, 15 cases (48.4%) were histological grade-2, and 4 cases (12.9%) were histological grade-1. Fisher's grade-3 primarily included histological grade-2 (8 cases, 66.7%), followed by histological grade-3 (4 cases, 33.3%). These findings were statistically significant, with a Chi-square value of 14.545 and a p-value of 0.006, indicating a strong correlation between Fisher's and histological grades. These results are consistent with the study by Pal S. et al. (2016), which also reported a statistically significant correlation ($p<0.001$).[22] The consistency across studies reinforces the reliability of Fisher's grading in aligning with histological grades. For the Howells grading system, 10 cases (66.7%) of histological grade-2 were categorized as Howells grade-1, while 15 cases (44.1%) and 8 cases (72.7%) of histological grade-2 fell under Howells grades-2 and -3, respectively. Among histological grade-1 participants, 5 cases (33.3%) corresponded to Howells grade-1. Histological grade-3 participants were distributed as 13 cases (38.2%) in Howells grade-2 and 3 cases (27.3%) in Howells grade-3. The statistical significance of this correlation (Chi-square value = 11.306, $p = 0.023$) underscores the concordance between Howells and histological grading systems. These findings align with the study by Koshalya R. et al. (2018), which also reported a significant correlation ($p<0.05$), further validating the utility of Howells grading in reflecting tumor aggressiveness.[23] The observed associations emphasize that both Fisher's and Howells grading systems also align closely with histological grades, enabling consistent tumor classification. The statistical significance of these correlations suggests that these grading systems can serve as reliable tools for stratifying breast cancer severity and guiding clinical decision-making. Differences in the distribution across grades may reflect variations in tumor biology and grading criteria, underscoring the need for standardized protocols in histopathological evaluation. Additionally, the strong alignment of findings with previous studies reinforces the robustness of these grading systems across different cohorts.

The comparison of cytological grading systems—Robinson's, Howells, and Fisher's grades—with histological grading revealed that Robinson's grading system demonstrated the strongest positive and statistically significant correlation with histological grades. This was evidenced by Kendall's tau-b (t) value of 0.655 and Spearman's rank correlation (r) value of 0.692, indicating a high degree of concordance between Robinson's grades and histological grades. The superior correlation of Robinson's grading system can be attributed to its comprehensive evaluation criteria, which include cellularity, nuclear features, and mitotic activity, closely mirroring the parameters used in histological grading. This alignment allows for a more accurate representation of tumor aggressiveness, making Robinson's grading a reliable predictor of histological grade. The ability of Robinson's system to capture nuanced cytological features likely explains its better performance compared to Howells and Fisher's grades. In contrast, while Howells and Fisher's grading systems also showed significant correlations, the strength of these associations was relatively lower, suggesting potential differences in criteria or weightage given to specific features. These findings underscore the robustness of Robinson's grading system in reflecting the underlying histopathological characteristics of breast cancer and highlight its clinical utility in preoperative tumor assessment. By providing a reliable cytological estimate of tumor grade, Robinson's system can guide initial treatment decisions and prognostication, particularly in resource-limited settings where immediate histological analysis may not be feasible.

CONCLUSION

This study underscores the importance of cytological and histological grading systems in the classification and prognosis of breast cancer. Across multiple grading systems, a consistent pattern of tumor distribution was observed, reflecting the reliability and concordance of these methods in assessing tumor aggressiveness. Among the cytological grading systems, Robinson's demonstrated the strongest correlation with histological grading, affirming its utility as a preoperative diagnostic tool with high predictive value.The study also highlighted the significant role of lymphovascular invasion (LVI) as a marker of metastatic potential and adverse outcomes, emphasizing its importance in treatment planning. The predominance of invasive ductal carcinoma (IDC) as the most common subtype is consistent with global

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patterns, underscoring its invasive nature and clinical relevance.These findings validate the utility of standardized grading systems in providing critical insights into tumor behavior, aiding clinicians in tailoring management strategies. Continued research integrating molecular, clinical, and pathological parameters will further enhance the precision of breast cancer diagnosis and prognosis, ultimately improving patient care.

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