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Original Research Article

Comparative Evaluation of Cytologic and Histologic Grading in Invasive Ductal Carcinoma Breast

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ABSTRACT

Background: Accurate pathological diagnosis is crucial for further treatment and estimation of an outcome in cases of breast cancer. The cytologic grade may provide information about the aggressive behavior of the tumor, thus guiding optimal therapy with prognostic information. The widely used Nottingham histologic grading method is a tumor grading system with strong prognostic connections.

Material and methods: This cross-sectional study was conducted over one year in the Department of Pathology in IGMC, Shimla. Our study aimed to determine the role of Robinson's grading in cases of primary infiltrating ductal carcinoma, breast, on cytology, confirm and grade the tumor on histopathology, and find the concordance between cytologic and histologic grading.

Results: On comparing cytologic and histologic grading, 37(68.5%) cases were graded based on cytology, which is comparable to most of the published data. The cytohistologic correlation was maximum in cases of grade III tumors (80%), followed by grade II tumors (70.2%), and minimum with grade I tumors (58.3%).

Conclusion: In this era of neoadjuvant chemotherapy, FNAC reports in cases of breast cancer should be incorporated with grading for prognostication. Considering the present study's data and other comparative studies, it can be concluded that Robinson's cytologic grading correlates reasonably well with the histologic grading system, especially the grade III tumors, and paves the way for recommending neoadjuvant chemotherapy. Cytologic grading correlates reasonably well with the histologic grading system, especially the grade III tumors, and paves the way for recommending neoadjuvant chemotherapy.

Keywords: Breast, Invasive ductal carcinoma, Histology, Cytology

INTRODUCTION

One of the most prevalent malignancies in women worldwide is breast cancer, and it is a significant public health problem. The prevalence rate in India is 25.8 per 100,000 in 2020, which accounts for 13.6% of all new cases and around 13.3 % of fatalities per 100,000 people.[1]

The main objectives for investigations in breast carcinoma are to establish the correct diagnosis, to detect malignancy in a very early stage, and to predict the prognosis. Accurate diagnosis of breast cancer is usually made in 99% of cases by the combination of clinical examination, mammography, and FNAC.

In developing countries with scarce means, the monetary facts force clinicians to support a radical change from invasive, over-priced, and advanced investigation to simpler, low-cost, less complicated, minimally invasive with good sensitivity and specificity.[2] In developing countries like India, FNA is one of the most commonly performed initial investigations and a reliable method for evaluating breast lumps. The treatment begins with a first-hand diagnosis of cytology. FNAC is a rapid, less invasive, simple, and cost-effective technique compared to a core needle biopsy. When interpreted carefully, cytology can give findings on many histologic features and the required prognostic and predictive data, especially for patients who might receive neoadjuvant therapy.[3] The cytologic grade may also provide information about the aggressiveness /biological behavior of the tumor. The grading mentioned in a cytology report adds to the report's objectivity, reproducibility, and authenticity. The histological grading proposed by Elston and Ellis using Nottingham modification of Scarff Bloom Richardson method for breast carcinoma is a widely accepted tumor grading system.[4] Hence, the categorization of breast carcinoma should be incorporated into cytology to evaluate the aggressiveness of tumors and enhance reproducibility among pathologists and clinicians. Keeping this in mind, the present study aims to grade Breast cancer on fine needle aspirates using Robinson's method and to find the concordance with histologic grading using Nottingham's modification of Bloom Richardson grading.

MATERIAL AND METHODS

The current cross-sectional investigation was carried out over one year in the Department of Pathology at the IGMC Shimla. The breast lump underwent FNAC by the usual protocol. Diagnosis of carcinoma was established on Giemsa/Pap stained FNA smears, and the tumor was graded using Robinson's cytologic grading system.[5] Histopathology confirmed the findings using formalin-fixed, paraffin-embedded tissue slices stained with hematoxylin and eosin. The tumor was graded according to Nottingham's modification of Bloom Richardson's grading system.[4] Cytologic grading was then compared with histopathologic grading.

Minimum criteria for evaluation: FNA smears with six or more epithelial clusters were subjected to Robinson's cytologic grading.[5] It took into account six different cytological parameters. Scores were summed to reach a final score.

Robinson's Cytologic Grading System: Scoring was summed up to reach a final score based on-

(a) Dissociation-
- Score 1- cell clusters
- Score 2- Mixture of single and cell clusters
- Score 3- Mostly single

(b) Cell size-
- Score 1- 1-2 times the RBC size
- Score 2- 3-4 times the RBC size
- Score 3- >5times the RBC size

(c) Cell uniformity-
- Score 1- Monomorphic
- Score 2- Mildly pleomorphic
- Score 3- Pleomorphic

(d) Nucleoli-
- Score 1- Indistinct
- Score 2- Noticeable
- Score 3- Prominent

(e) Cell margin-
- Score 1- Smooth
- Score 2- Folds
- Score 3- Buds/Clefts

A.	Score 6-11	Grade I
B.	Score 12-14	Grade II
C.	Score 15-18	Grade III

Histopathological grading:

Tumors were classified according to WHO classification,2003, and grading was done according to Nottingham's modification of Bloom Richardson's grading system.[4]

Nottingham's Modification of the Bloom Richardson Grading System:

Scoring was summed up to reach a final score based on (a) tubule formation, (b) nuclear pleomorphism, and (c) a number of mitoses.

(a) Tubule or gland formation-

- 1 point: >75% of tumor
- 2 points: 10-75 % of tumor
- 3 points: < 10% of tumor

(b) Nuclear pleomorphism-

- 1 point- minimal nuclear variation in size and shape, with the size of the nucleus being < 1.5 times the size of a benign epithelial cell nucleus.
- 2 points – moderate nuclear variation in size and shape, with the size of the nucleus 1.5- 2 times the size of a benign epithelial cell nucleus.
- 3 points – moderate nuclear variation in size and shape, with the size of the nucleus being >2 times the size of a benign epithelial cell nucleus.

(c) Number of mitosis in the most active area-

- 1 point- 0-9
- 2 points- 10-19
- 3 points- >20

Scoring-

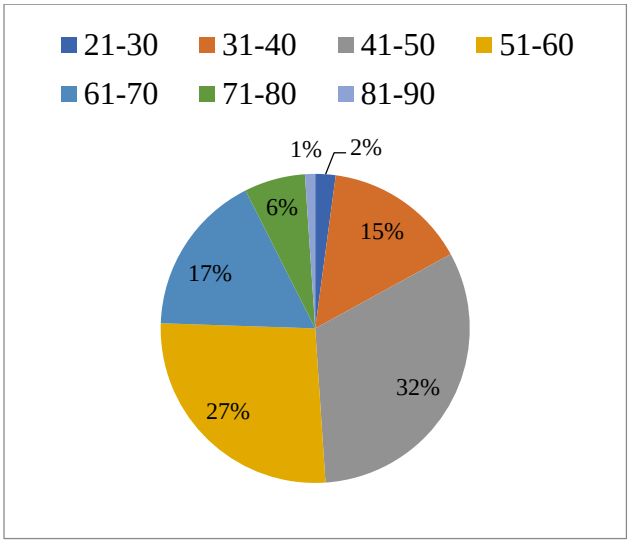
Grade 1- 3-5 points
Grade 2- 6-7 points
Grade 3- 8-9 points

RESULTS

The present cross-sectional study was conducted in the Department of Pathology at IGMC, Shimla, on 94 patients with palpable breast lump and clinical suspicion of carcinoma breast. FNAC was done in all the patients, and diagnosis of primary infiltrating ductal carcinoma was made on cytology. Fifty-four out of the 94 patients were subsequently confirmed on histopathology and were analyzed for comparison of cytologic and histologic grading of these tumors.

The following observations were made.

The patients' ages ranged from 28 to 90 years, with the mean age being 47. The maximum number of patients was 41-60 years old. (Graph 1)

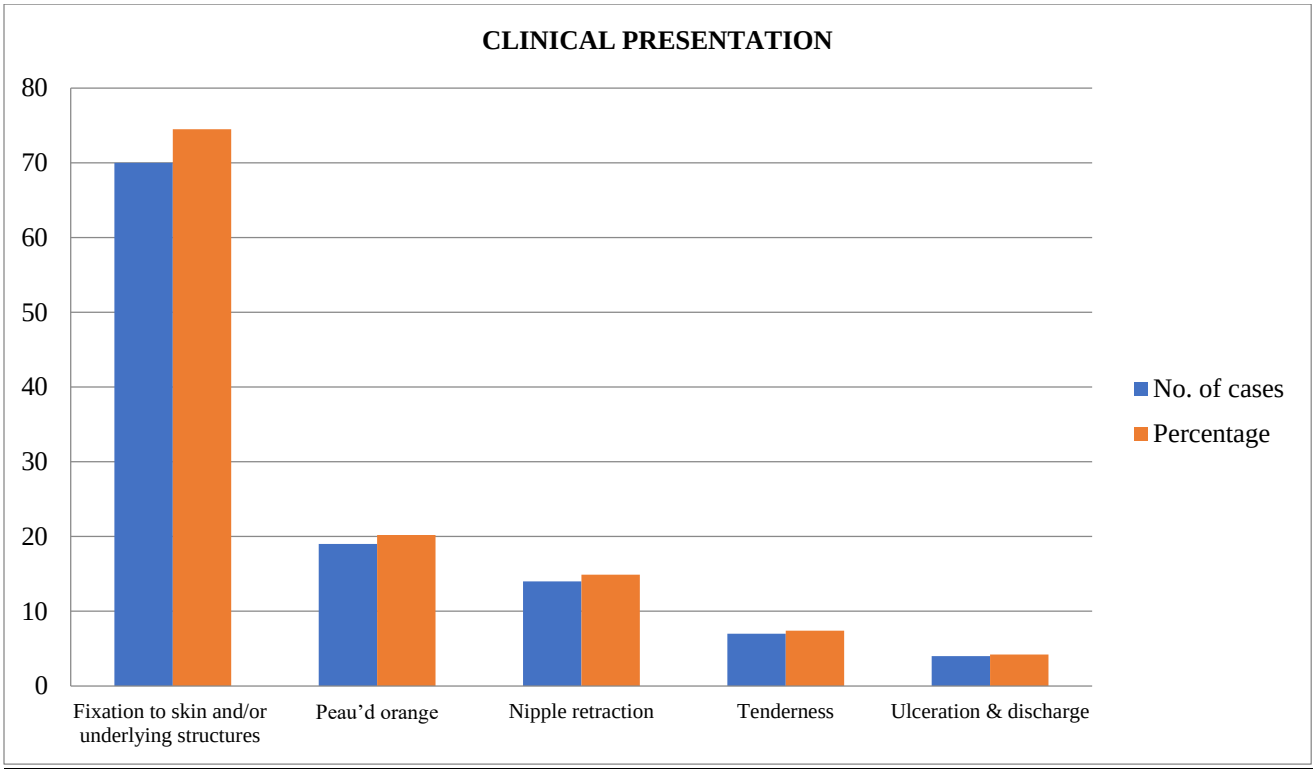


Graph-1: Age wise distribution(n=94)

Unilateral palpable breast lump (58.5%) on the left side and upper outer quadrant (74.5%) was the most common presenting complaint. The duration of the lump varied from 15 days to 24 months, with a mean of 4.2 months. The size of the lump varied from 1.0 to 10.0 cm, with a maximum (67.0%) number of patients falling in the range of 3.0 to 5.0 cm. The lump was non-tender in most cases (91.5%). Seventy out of 94(74.5%) patients had lump fixed to the underlying structures. Peau'd orange was present in 20.2%, nipple retraction in 14.9%, and ulceration/ discharge in 4.3 % of the cases. (Graph 2)

Diagnosis and Tumor Grading On Cytology-

All 94 cases were categorized as infiltrating ductal carcinoma during the cytological evaluation, and grading was performed using Robinson's grading system. (Figure 1)



Graph-2: Shows the clinical signs in decreasing order of frequency.

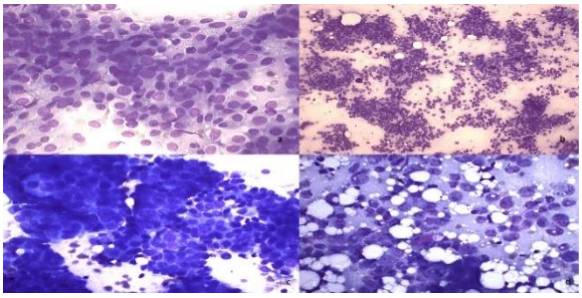
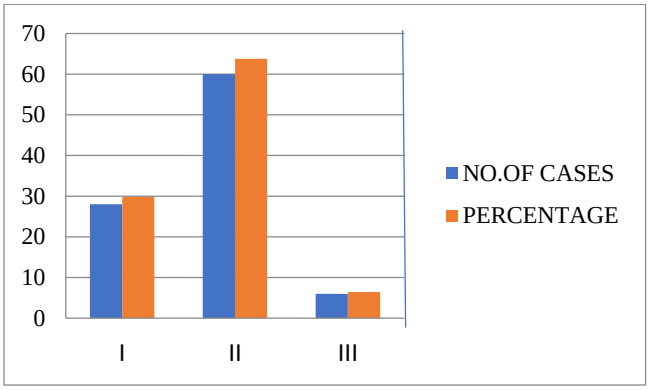


Figure-1: A. Infiltrating ductal carcinoma, Grade I (MGG,400X) B. Infiltrating ductal carcinoma, Grade II (MGG,100X) C. Infiltrating ductal carcinoma, Grade II (MGG,400X) D. Infiltrating ductal carcinoma, Grade III (MGG,400X)

Adequacy criteria included smears having six or more clusters of tumor epithelial cells. Out of 94 cases, 60 (63.8%) were diagnosed as grade II, 28 (29.8%) as grade I, and rest 6 (6.4%) as grade III tumors. (Graph-3)



Graph-3: Depicts the cytologic grade of the tumor.

In all six cases with grade III tumors, the lump was in the upper outer Quadrant and fixed to the underlying structure. Five were in the age group of 51-70, and only one patient was a 43-year-old female. The lone male patient encountered in our study also showed grade III morphology on cytology.

Diagnosis and Tumor Grading On Histopathology

In our study, 54 out of 94 patients underwent modified radical mastectomy, and in these cases, the histological grading was compared with cytologic grading. The rest of the patients either received neoadjuvant chemotherapy or were lost to follow-up. One male patient encountered in our study also went for neoadjuvant chemotherapy and was hence not included in the study. We did not receive any lumpectomy specimens. The cytologic diagnosis of malignancy (Invasive ductal carcinoma, NST) was confirmed in these 54 female patients on histopathology, and tumors were graded according to Nottingham's modification of Bloom Richardson's grading system. (Figure 2)

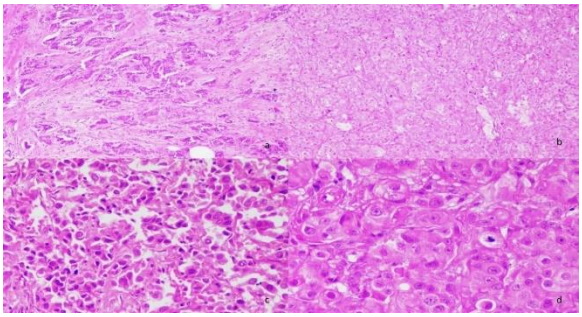


Figure-2: A. Invasive ductal Carcinoma, NST, Grade I (H&E,100X) B. Invasive ductal Carcinoma, NST, Grade II (H&E,100X) C. Invasive ductal Carcinoma, NST, Grade II (H&E,400X) D. Invasive ductal Carcinoma, NST, Grade III (H&E,400X)

The majority of the cases, i.e., 32 out of 54 (59.2%), were assigned grade II, followed by 14 (25.9%) cases of grade I and 8 (14.8%) cases of grade III tumors. (Table 1).

Table-1: Tumor Grade on histopathology with their corresponding cytologic grades(N=54)

Grade	No. in Cases in Cytology	%	No. Of Cases in Histopathology	%
I	12	22.2	14	25.9
II	37	68.5	32	59.3
III	05	9.3	08	14.8
TOTAL	54	100	54	100

Grade On Histopathology and Axillary Lymph Node Status (N=54)

All patients of IDC and NST with histologic grade III revealed metastasis in axillary lymph nodes, followed by 75% of grade II cases and only 21.4 % of cases of grade I tumors. Thus, it was evident that the lymph node involvement also increased as the grade increased. (Graph-4)

Axillary Lymph Node Status

Histopathologic examination revealed that 35 out of 54 patients (64.8%) had metastases in their axillary lymph nodes, and the number of lymph nodes positive for tumors ranged from 1 to 13

.

Absolute Concordance Between Cytologic and Histopathologic Grading Systems

On comparing cytologic and histologic grading, Robinson's grading showed an absolute concordance of 68.5% in 37 out of 54 cases of carcinoma breast. The concordance rates for grade III, II, and grade I tumors were 80.0%, 70.3%, and 58.3%, respectively (Table-8). Thus, taking histopathologic diagnosis and grading as the gold standard, we found that of the 17 cases that showed discordance between the two grading systems, 9 cases were undergraded, and 8 cases were over-graded by one grade on cytology (Table-2).

Table-2: Absolute concordance between cytologic and histopathologic grading in various grades. (n=54)

Cytologic Grade	No. of cases	Histopathologic grade			Concordance
		I	II	III	Rate
I	12	07	-	-	58.3%
II	37	-	26	-	70.2%
III	05	-	-	04	80%
Concordance Rate					68.5%

The absolute discordance came out to be 31.5%. (Table- 2). The concordance rates for grade III, grade II, and grade I tumors were 80.0%, 70.3%, and 58.3%, respectively (Table-3). Thus, taking histopathologic diagnosis and grading as the gold standard, we found that out of the 17 cases that showed discordance between the two grading systems, 9 cases were graded, and 8 cases were over-graded by one grade on cytology maximum discordance was seen in Grade I tumors (41.7%) followed by grade II tumors (29.7%). Only 1 (20%) case showed discordance in grade III tumors.

Table-3: Distribution of cases according to cytologic and histologic grading along with comparison between two grading systems(n=54)

Cytologic Grade			Histologic Grade						Concordance Rate
			GRADE I		GRADE II		GRADE III		
Grade	NO.	%	NO.	%	NO.	%	NO.	%	%
I	12	22.2	07	12.9	05	9.3	00	00	58.3
II	37	68.5	07	12.9	26	48.1	04	7.4	70.2
III	05	9.3	00	00	01	1.8	04	7.4	80
Total	54	100	14	25.9	32	59.3	08	14.8	
Absolute Concordance (37/54)								68.5%	

HISTOLOGIC GRADING

In the present study, 59.2% of the tumors fell into the grade II category, 14 % in grade I, followed by grade III tumors in 8% of cases. Table 4 depicts observations made by various other studies in the literature. On histopathology, we found a predominance of grade II tumors followed by Grade I and grade III tumors. Like our study, Das et al.[6] and Dash et al.[8] found 28.9 % and 25.8% of grade I tumors, respectively.

A study conducted by Handa et al.[8] in GMCH, Chandigarh, reported 14%of cases in grade III, which was fairly comparable to ours. However, the maximum discrepancy was seen in the grade III tumors, which varied from 1.7% to 27% in various studies. [6,7,8]

Table-4: Distribution of patients in histologic grades according to Nottingham's modification of Scarff Bloom Richardson grading system

Authors	Year	No. of Patients	Grade I	Grade II	Grade III
Robinson et al[5]	1994	52	17.3%	55.8%	27%
Das et al[6]	2003	52	28.9%	46.1%	25%
Chhabra et al[7]	2005	60	28.3%	50%	1.7%
Dash etal[9]	2010	93	25.8%	48.4%	25.8%
Handa et al[8]	2014	50	22%	64%	14%
Present study	2016	54	25.9%	59.3%	14.8%

Comparison Between Cytologic and Histopathologic Grading Systems

The concordance rate of histological and cytological grading ranged from 57% to 78% in different studies. In our research, 37(68.5%) cases were accurately graded on cytology compared to histological grading, comparable to most published data. The cytohistologic correlation was highest in grade III tumors (80%), followed by grade II tumors (70.2%), and least in grade I tumors (58.3%). In their study, Yu et al. [9] also observed consensus for grade I and II tumors with nearly perfect concordance in grade III tumors amidst cytopathology and histopathology. These results were compared with most studies in which the correlation was more for high-grade tumors. [6,10]

DISCUSSION

The standard clinical treatment of breast cancer is dependent upon traditional prognostic factors, including tumor size, tumor histological grade, and nodal status. Since a vast majority of breast carcinoma cases are diagnosed on FNAC, it is vital to perform grading on aspirates, which can provide valuable information to the treating oncologist to plan further management.

The goal of cytoprognostic grading in breast cancers is to distinguish between low-grade, slowly growing tumors that would be better suited for pretreatment with tamoxifen and fast-growing tumors (grade III), which are more likely to react to chemotherapy.[11]

In this study, the majority (58.5%) of the patients were in the 5th and 6th decade of their life, as also reported in various Indian and studies from other Asian countries.[12] In our study, the duration of the breast lump ranged from 15 days to 2 years, with the mean duration being 4.2 months. A study on the examination of hormone receptor immunostaining on FNA in carcinoma breast carried out at GMCH, Chandigarh, also revealed that the duration of the lump varied, with a mean of 6.1 months and a range of 15 days to 1.5 years.[13] The delay in presentation could be due to a lack of awareness regarding the significance of a lump in the breast, while the early presentation could be due to a sudden growth spurt in preexisting tumors.

In our study, the upper and outer quadrant was the most common (70%) location of the breast lump, followed by the upper inner quadrant (17%), which correlated very well with other studies in the literature.[14] The possible explanation for predicting carcinoma for the left breast and upper-outer quadrant is that the former is bulkier and constitutes a relatively large volume of breast tissue. In this study, the size of the palpable lump ranged from 1-10 cm, and most patients (67.0%) had a size between 3-5 cm. This is in corroboration with the studies conducted by Ahmed Z et al [14,] in which a maximum number of breast lumps were in the size range of 2-5 cm. According to a study by Stankov et al. at the National Cancer Institute of Mexico, patients with tumors less than 1 cm in diameter had a 5-year overall survival rate of 99%. In contrast, patients with tumors between 3 and 5 cm in diameter had an 86% survival rate.[15] Different cytologic grading systems have been proposed from time to time. However, Robinson's cytologic grading has shown the highest reproducibility and objectivity.

We found most grade II tumors on histopathology, followed by grade I and III tumors. Like our study, Das et al. [6] and Dash et al. [8] found 28.9 % and 25.8% of grade I tumors, respectively. A study conducted by Handa et al. [8] in GMCH, Chandigarh, reported 14%of cases in grade III, which was pretty comparable with our study. However, the maximum discrepancy was seen in the grade III tumors, which varied from 1.7% to 27% in various studies.[8] In this study, on comparing cytologic and histologic grading, 37(68.5%) cases were accurately graded on FNAC smears, which is reasonably comparable with most published data. The cytohistologic correlation was highest in cases of grade III tumors (80%), followed by grade II tumors (70.2%), and least in cases of grade I tumors (58.3%). In the current study, there were 17 discordant cases, of which 5 were in the grade I group, 11 in the grade II, and 1 in the grade III category. Seven discordant cases of grade I were reported on cytology as grade II tumors. Amongst six discordant cases in grade II, one was given as grade III, and five were given as grade III on cytology. In the discordant cases, the cytological grade was of adjacent increasing or decreasing tumor grade. No case had miscorrelation between cytologic and histologic grade of more than one grade. The disparity between cytologic and histologic observations was anticipated, and the reason may be due to many histological findings that are not included in cytological grading, which include tubule formation and mitoses as criteria for grading, which are essential histological features.

CONCLUSIONS

Considering this study's data and comparable studies, it can be concluded that Robinson's cytologic grading correlates reasonably well with the NMSBR histologic grading system, especially the grade III tumors, and paves the way for recommending neoadjuvant chemotherapy.

REFERENCES

1. Park JE. Textbook of preventive and social medicine. 25th ed. p. 433-4.

2. Shyyan R, Masood S, Badwe RA, et al. Breast cancer in limited-resource countries: diagnosis and pathology. Breast J. 2006;12(1):27-37.

3. Sood N, Nigam JS, Yadav P, Rewri S, Sharma A, Omhare et al. Comparative study of Cytomorphological Robinson's grading of Breast Carcinoma with Modified Bloom Richardson Histopathological Grading. Pathol Res Int. 2013;2013:146542.

4. Elston CW, Ellis IO. Pathological prognostic factors in breast cancer: The value of histological grade in breast cancer: Experience from a large study with long term follow up. Histopathology. 1991;19:403-10.

5. Robinson IA, McKee G, Nicholson A, et al. Prognostic value of cytological grading of fine needle aspirates from breast carcinomas. Lancet. 1994;343(8903):947-9.

6. Das AK, Kapila K, Dinda AK, Verma K. Comparative evaluation of grading of breast carcinomas in fine needle aspirates by two methods. Indian J Med Res. 2003;118:247-50.

7. Chhabra S, Singh PK, Agarwal A, Bhagoliwal A, Singh SN. Cytological grade of breast carcinoma- a multivariate regression analysis. J Cytol. 2005;22:62.

8. Dash A, Mohanty R, Mallik R, Dash K. Aspiration smear pattern as a predictor of biological behavior in breast carcinoma. J Cytol. 2005;22:19-21.

9. Yu GH, Cajulis RS, De Frias DV. Tumor cell (dys)cohesion as a prognostic factor in aspirate smears of breast carcinoma. Am J Clin Pathol. 1998;109:315-9.

10. Vasudev V, R R, V G. The cytological grading of malignant neoplasms of the breast and its correlation with the histological grading. J Clin Diagn Res. 2013;7(6):1035-9.

11. Saha K, Raychaudhuri G, Chattopadhyay BK, Das I. Comparative evaluation of six cytological grading systems in breast carcinoma. J Cytol. 2013;30:87-93.

12. Li J, Zhang BN, Fan JH, et al. A nationwide multicentre 10-year (1999-2008) retrospective clinical epidemiological study of breast cancer in China. BMC Cancer. 2011;11:364.

13. Sharma VM, Akruwala SD, Dave RI. Presentation and management of breast cancer patients in a newly started medical college hospital. Sch J Appl Med Sci. 2013;1(5):522-6.

14. Ahmad Z, Khurshid A, Qureshi A, Idress R, Asghar N, Kayani N. Breast carcinoma grading, estimation of tumor size, axillary lymph node status, staging and Nottingham prognostic index scoring on mastectomy specimens. Indian J Pathol Microbiol. 2009;52:477-81.

15. Stankov A, Bargallo-Rocha JE, Silvio AÑ-S, Ramirez MT, Stankova-Ninova K, Meneses-Garcia A. Prognostic factors and recurrence in breast cancer: experience at the National Cancer Institute of Mexico. ISRN Oncol. 2012;2012:825258.

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