

Comparative Study of Mouriquand's Cytological Grading with Histopathological Grading in Carcinoma Breast at a Tertiary Centre, Mandya

Sushrutha R.¹, Muralidhar Bhat Y.², Shivakumar S.³

^{1, 2, 3} Department of Pathology, Mandya Institute of Medical Sciences, Mandya, Karnataka, India.

ABSTRACT

BACKGROUND

Fine needle aspiration cytology (FNAC) has become the standard primary diagnostic method in carcinoma breast. It is also a useful tool for surgical treatment and prognosis. The present study is designed to correlate cytological grading using Mouriquand's grading method with histological grading using modified Bloom-Richardson grading method.

METHODS

This was an observational study. A total of 45 cases of breast carcinoma, aged 30 to 80 years, underwent FNAC and the smears were graded using Mouriquand's criteria. All the cases were correlated with Bloom-Richardson grade on histopathology in mastectomy specimens.

RESULTS

There were a total of 44 cases of infiltrating ductal carcinoma and 1 case of mucinous carcinoma on cytology. Patients' age ranged from 30 to 80 years with a mean of 53.27 years. In terms of cytology, 15 (33.3 %) grade I cases, 27 (60 %) grade II and 3 (6.7 %) grade III. In histopathology, 19 (42.2 %) were grade I, 21 (46.7 %) were grade II and 5 (11.1 %) were grade III. Grade I showed a sensitivity of 52.6 % and specificity of 84.6 % with positive predictive value of 71.4 % and negative predictive value of 71 %. Grade II showed a sensitivity of 76.2 % and specificity of 50.0 % with positive predictive value of 57.1 % and negative predictive value of 70.6 %. Grade III showed a sensitivity of 20 % and specificity of 95 % with positive predictive value of 33.3 % and negative predictive value of 90.5 %. Concordance rate between cytology and histology of grade I, grade II and grade III tumours was 73.3 %, 59.25 % and 33.3 % respectively. The absolute concordance rate was 62.2 %.

CONCLUSIONS

Thus, cytological grading of breast carcinoma correlates well with histopathological grading. In the era of multiple treatment modalities and neoadjuvant therapy, cytological grading can be used as a prognostic factor for better management of patients.

KEYWORDS

Breast Carcinoma, Mouriquand's Grading, Bloom-Richardson Grading

Corresponding Author:

Dr. Sushrutha R.,
Postgraduate Student,
Department of Pathology,
Mandya Institute of Medical Sciences,
Mandya - 571401, Karnataka, India.
E-mail: sushusushrutha@gmail.com

DOI: 10.18410/jebmh/2021/445

How to Cite This Article:

Sushrutha R, Bhat YM, Shivakumar S.
Comparative study of Mouriquand's
cytological grading with histopathological
grading in carcinoma breast at a tertiary
centre, Mandya. J Evid Based Med
Healthc 2021;8(27):2399-2404. DOI:
10.18410/jebmh/2021/445

Submission 19-03-2021,
Peer Review 29-03-2021,
Acceptance 21-05-2021,
Published 05-07-2021.

Copyright © 2021 Sushrutha R. et al.
This is an open access article distributed
under Creative Commons Attribution
License [Attribution 4.0 International (CC
BY 4.0)]

BACKGROUND

Breast cancer is the leading cause of cancer death, with more than 1,000,000 cases occurring worldwide annually.¹ The risk of breast cancer is increasing and shifting towards younger age group. Of all epithelial malignancies of the breast, up to 80 % of breast carcinoma fall into infiltrating ductal carcinoma (IDC) of no special type (NST).² In recent years, fine needle aspiration cytology (FNAC) has become the standard primary diagnostic method in carcinoma of breast. It is the valuable tool in pre-operative assessment of breast masses and shows high accuracy, sensitivity and specificity. The FNAC can be easily carried out as an outpatient procedure with minimal complications.³ Assessing the biological aggressiveness of the cancer before surgery is valuable. The FNAC helps in the assessment of tumour in-situ, hence guides the selection of most suitable treatment pre-operatively and avoids morbidity.⁴

Among many prognostic factors, microscopic grading is one of the very important factors. Recently, cytological features seen in the FNAC smears has added additional information about the prognosis of the disease. The National Cancer Institute (NCI), Bethesda, sponsored conference also recommended tumour grading on FNAC material to be incorporated in fine needle aspiration (FNA) reports for prognostication.⁵

Much attention is being focused on grading of breast carcinoma on FNAC smears, as neoadjuvant chemotherapy is gaining popularity as the primary modality of medical treatment of breast cancer and helps in the judicious use of chemotherapy. As the grade becomes higher, it gives more response to neoadjuvant chemotherapy. Grading of breast cancer on FNAC is also useful in patients with locally advanced disease, in cases which are at a high risk for surgery, in older patients with chronic disease and patients who reject surgery.⁶

Among various cytological grading systems like Fisher's modification of Black's nuclear grading, Mouriquand's grading system and Robinson's grading, the Mouriquand's grading is used in the present study for FNA grading of breast carcinoma.⁷ Similarly, among various histological grading systems, Elston's modification of Bloom-Richardson system is the most widely accepted tumour grading system.⁸ The studies on correlation of cytological grading with histological grading in breast carcinoma showed a range of concordance from 65 % to 90 %. Hence, the present study is designed to correlate cytological grading using Mouriquand's grading method with histological grading using modified Bloom-Richardson grading method.

Objectives

- To grade breast cancer cytologically according to Mouriquand's grading system at the time of diagnosis
- To detect histopathological grade of the tumours by Bloom Richardson grading system
- To determine the correlation of Mouriquand's grading system in the fine needle aspiration with histopathological grading.

METHODS

This was an observational study conducted in the Department of Pathology of Mandya Institute of Medical Sciences (MIMS), Mandya from July 2019 to April 2020. Total of forty-five cases diagnosed cytologically as carcinoma of breast and later confirmed by histopathology following mastectomy were included in the study.

The FNA was done using 22-gauge disposable needle and 10 ml disposable syringe fitted to a syringe holder. For each lesion, 2 to 4 passes were made in to – and - from manner. Aspirated material in the needle was expelled onto the glass slides. Wet smears fixed in alcohol were stained with haematoxylin and eosin (H and E) stain and air-dried smears were stained with Giemsa stain. Detailed study of the cytomorphology of tumour cell population on all 45 cases of breast carcinoma was done. The cytological grading of FNAC smears was done as per the criteria described by Mouriquand J and Pasquier D⁷ (table 1). The grading was based on 5 parameters – tumour cells, nuclear features, nuclei, enlarged nucleoli and mitosis. Each parameter was given a score of 0, 1, 2 or 3. The scores were added up to give the final grade.

The mastectomy specimens were fixed in 10 % formalin for 24 hours and then grossed and the findings were noted. Several bits were taken from appropriate sites for tissue processing and paraffin embedding. A 4 to 5 microns thickness sections were cut from each block and stained with H and E stain for histopathological examination under light microscope.

Histopathological grading was done by Elston's modification of Bloom-Richardson system (table 2) based on 3 parameters - tubule formation, nuclear pleomorphism and mitosis. Each parameter was given a score of 1, 2 or 3 and the scores were added up to give the final grade. Mitotic figures were scored using a microscope with a field diameter of 0.44 mm. A prior approval was obtained from institutional ethics committee for conducting the study.

	Feature	Score
Tumour cells	Clusters	0
	Isolated	3
Nuclear features	Anisokaryosis	2
	Large size	3
Nuclei	Budding	2
	Naked	3
	Hyperchromasia	2
	Hypochromasia	3
Enlarged nucleoli	Blue	2
	Red	3
Mitosis	> 3 per slide	1
	> 6 per slide	3

Table 1. Mouriquand's Cytological Grading System of Carcinoma Breast

Based on these criteria, breast carcinoma was graded into grade I (score < 5), grade II (score 5 to 9) and grade III (score ≥ 10).

Feature	Score 1	Score 2	Score 3
Tubule formation	> 75 %	10 – 75 %	< 10 %
Nuclear pleomorphism	Small, regular uniform cells	Moderate variation in size/shape	Marked nuclear pleomorphism
Mitosis per 10 hpf	0 - 5	6 - 10	≥ 11

Table 2. Modified Bloom-Richardson Grading of Carcinoma Breast

Score of 3 to 5 were graded as grade I (well differentiated), 6 to 7 as grade II (moderately differentiated) and 8 to 9 as grade III (poorly differentiated).

Inclusion Criteria

1. Age more than 18 years.
2. All slides diagnosed cytologically as carcinoma of breast and later confirmed by histopathology.

Exclusion Criteria

1. Patients with recurrence of breast carcinoma after mastectomy.
2. Patients with history of chemotherapy or radiotherapy prior to mastectomy were excluded from the study.

Statistical Analysis

Data was entered in Microsoft Excel software. Analysis was done using Epi info software. Cytological scores were compared with the histological grade of the tumours and the results were analyzed by Spearman's correlation coefficient and by the chi-square test (the significance level was set to $P < 0.05$). Sensitivity, specificity, diagnostic accuracy, concordance and discordance rates were calculated. Other suitable statistical tests were also applied.

RESULTS

The age ranged from 30 to 80 years with a mean age of 53.27 years. Maximum number of cases were in the age group of 40 to 49 years with 17 (37.8 %) cases followed by 50 to 59 years with 11 (24.4 %) cases and 60 to 69 years with 10 cases (22.2 %). Out of 45 cases, 44 cases were females accounting for 97.8 % and one male accounting for 2.2 %. Total of 29 cases were involving right side of breast accounting for 64.4 % and 16 cases were involving left side of breast accounting for 35.6 %. Out of 45 cases, 44 cases were reported as infiltrating ductal carcinoma of no special type accounting for 97.8 %. One case of mucinous carcinoma was reported. The breast aspirates were graded using the Mouriquand's criteria and the results showed grade I (figure 1A) category in 15 cases accounting for 33.3 %, grade II (figure 1B) category in 27 cases accounting for 60 % and grade III (figure 1C) category in 3 cases accounting for 6.7 % (table 3).

Modified radical mastectomy specimens of all 45 cases were obtained. The histopathological diagnosis of the cases was tabulated as in table 4. Out of 45 cases, 41 were reported as IDC, NST accounting for 91.1 %. One case each of cribriform carcinoma, invasive micropapillary carcinoma, medullary carcinoma and invasive papillary carcinoma were diagnosed which were reported as IDC in FNAC. Cytological diagnosis of one case of mucinous carcinoma was diagnosed as IDC in histopathology.

Grade	Frequency	Percentage
Grade I	15	33.3
Grade II	27	60.0
Grade III	03	06.7
Total	45	100.0

Table 3. Mouriquand's Grading of Breast Carcinoma

Type	Frequency	Percentage
Infiltrating ductal carcinoma, NST	41	91.1
Cribriform carcinoma	01	02.2
Invasive micropapillary carcinoma	01	02.2
Medullary carcinoma	01	02.2
Invasive papillary carcinoma	01	02.2
Total	45	100.0

Table 4. Histopathological Diagnosis of Breast Carcinoma

The breast carcinomas were graded histopathologically by modified Bloom-Richardson grading system and the results showed grade I (figure 1A) category in 19 cases accounting for 42.2 %, grade II (figure 1B) category in 21 cases accounting for 46.7 % and grade III (figure 1C) category in 5 cases accounting for 11.1 % (table 5).

Grade	Frequency	Percentage
Grade I	19	42.2
Grade II	21	46.7
Grade III	05	11.1
Total	45	100.0

Table 5. Modified Bloom-Richardson Grading of Breast Carcinoma

Grade	No. of Concordant Cases between each Cytological and Histological Grade	No. of Cases in each Cytological Grade	Concordance Rate (%)
I	11	15	73.3
II	16	27	59.2
III	01	03	33.3
Total = 28	Total = 45	Absolute concordance rate = 62.2	

Table 6. Comparison of Concordance Rates between the Cytological and Histopathological Grades

It was observed that majority of cases according to Mouriquand's grading and modified Bloom-Richardson grading were in grade II. Correlation of Mouriquand's cytological grading system with modified Bloom Richardson histopathological grading system was done. Out of 45 cases, 28 cases had cytological and histopathological correlation accounting for 62.2 %. Whereas, 17 cases had no correlation.

Sensitivity and specificity between grade I, II and III of Mouriquand's and Bloom-Richardson grading system was done. Grade I showed a sensitivity of 52.6 % and specificity of 84.6 % with positive predictive value of 71.4 % and negative predictive value of 71 %. Grade II showed a sensitivity of 76.2 % and specificity of 50.0 % with positive predictive value of 57.1 % and negative predictive value of 70.6 %. Grade III showed a sensitivity of 20 % and specificity of 95 % with positive predictive value of 33.3 % and negative predictive value of 90.5 %.

The study showed a correlation coefficient of 0.469 with the P value of < 0.001 indicating a very high level of statistical significance. The study also showed a concordance rate of 73.3 % in grade I tumours, 59.2 % in grade II and 33.3 % in grade III tumour cases with the absolute concordance rate of 62.2 % (table 6).

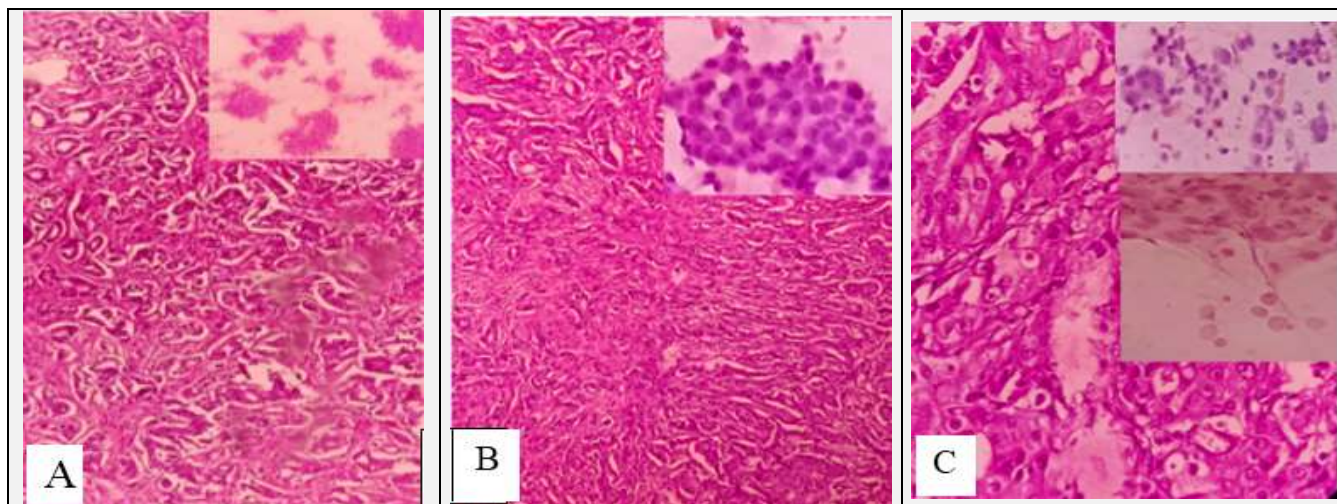


Figure 1 (A). Infiltrating Ductal Carcinoma Histological Grade I - Predominantly Tubular Differentiation, Mild Nuclear Pleomorphism and Few Mitotic Figures. Inset (Mouriquand's Cytological Grade I): Cohesive Cluster of Ductal Epithelial Cells Exhibiting Mild Anisokaryosis, Nuclear Hyperchromasia and no Nucleoli (H & E, $\times 100$; Inset: H & E, $\times 400$). Figure 1 (B). Infiltrating Ductal Carcinoma Histological Grade II - Exhibiting Cords and Islands with Tubular Differentiation, Moderate Nuclear Pleomorphism and Mitotic Figures. Inset (Mouriquand's Cytological Grade II): Less Cohesive Cluster of Tumour Cells with Moderate Anisokaryosis, Hyperchromatic Nuclei and Blue Nucleoli with Few Mitotic Figures (H & E, $\times 100$; inset: H & E, $\times 400$). Figure 1 (C). Infiltrating Ductal Carcinoma Histological Grade III - Very Minimal Tubular Differentiation, Marked Nuclear Pleomorphism, Vesicular Chromatin, Prominent Nucleoli and Brisk Mitosis. Inset (Mouriquand's Cytological Grade III): Isolated Tumour Cells with Large Nuclei, Nuclear Budding, Prominent Nucleoli and Increased Mitotic Figures (H & E, $\times 400$; Inset: H & E, $\times 400$).

DISCUSSION

The FNAC is a routinely used investigation for rapid diagnosis of breast cancer which can be easily carried out as an outpatient procedure with minimal complications. The ability to predict the accurate grade on cytology smears will add to the diagnostic value of FNAC. The purpose of prognostic grading on cytology is to identify high-grade tumours that are more likely to respond to chemotherapy than the low-grade tumours.⁹

The present study is designed to correlate cytological grading using Mouriquand's grading method with histological grading using modified Bloom-Richardson grading method.

Our study included 45 cytologically confirmed carcinoma breast cases which were later correlated histologically with sections obtained from modified radical mastectomy specimens.

The age ranged from 30 to 80 years with a mean age of 53.27 years. Majority were in the age group of 40 to 49 years. There were 44 females and 1 male in the study. Out of 45 cases, 29 cases involved right breast and rest 16 were left side. But the laterality is of no importance in prognosis and treatment protocol.¹⁰

In the present study based on Bloom-Richardson grading system, most of the cases belong to histological grade II, 21 (46.7 %), followed by grade I, 19 cases (42.2 %) and 5 cases (11.1 %) grade III.

These results were similar to the results of Younis R et al.¹¹ and Ahmed I et al.¹² In studies done by Chandanwale SS et al.¹³ and Chalisa S et al.¹⁴ majority of the cases were grade II (63.8 %), (65.51 %), followed by grade III (22.4 %), (24.14 %) and grade I (13.8 %), (10.35 %) respectively. We observed a slight increased preponderance of breast cancer in the right breast (64.4 %), which correlated with study done by Pandey P et al.¹⁵ (63.33 %),

whereas in the study done by Sood N et al.¹⁶ left sided breast was predominantly involved.

Histopathologically, 41 cases were infiltrating ductal carcinoma, no special type and one each of cribriform carcinoma, invasive micropapillary carcinoma, medullary carcinoma and invasive papillary carcinoma.

There is unequal distribution and maximum number of cases falling into grade II noted in our study which was similar to other studies.

Even though there is a relatively clear prognostic separation between grade I, grade II and grade III cases, grade II cases often overlap with grade I and grade III. Black and Speer were the first to introduce nuclear grading,¹⁷ which was latter modified by other workers and finally a composite cytonuclear grading was introduced by Robinson IA et al.¹⁸

Grade II tumours comprised the predominant group in Mouriquand's grading (60 %) which was similar to studies done by Chandanwale SS et al.¹³ (88 %), Pandey P et al.¹⁵ (83.33 %), Das AK et al.¹⁹ (69.2 %) and Arul P and Masilamani S²⁰ (59.6 %). Unlike our study, Saha K et al.⁸ reported grade III tumours (70.2 %) in Mouriquand's grading.

The concordance between Mouriquand's cytological grading with Bloom-Richardson histological grading in our study was 62.2 % which is almost similar to the studies done by Pandey P et al.¹⁵ (66.6 %) and Einstein D et al.²¹ (68 %). The studies done by Saha K et al.⁸ (77.19 %) and Das AK et al.¹⁹ (71.2 %) showed slightly higher concordance.

The discordance between Mouriquand's cytological with Bloom-Richardson grading was 37.7 % which is almost similar to the study done by Pandey P et al.¹⁵ (33.33 %) and Einstein D et al.²¹ (32 %). The studies done by Saha K et al.⁸ (22.81 %) and Das AK et al.¹⁹ (28.8 %) showed lower discordance compared to the present study. The

discordance in the present study was observed in all the grades. Among 15 grade I cases, 4 were upgraded to grade II in histology. Among 27 grade II cases, 7 were downgraded to grade I and 4 were upgraded to grade III in histology. Among 3 grade III cases, 1 was downgraded to grade I and II each in histology.

The cause for discrepancy may be due to much importance given to the nuclear features in cytological grading, observer variability and subjectivity during assessment of cytological features.²² The second reason might be due to the large tumour size or tumour heterogeneity in breast carcinomas which need multiple passes to sample the most undifferentiated areas of the tumour, which is a pitfall of FNAC.²³ Development of a grading system common to both cytology and histology can significantly reduce the discordance.²⁴

The FNAC is especially useful in low resource settings, where core biopsy is not routinely performed for diagnosis, and the treatment is often based on the cytology report itself.^{25,26} The NCI, Bethesda sponsored conference has recommended that tumour grading on FNAC material should be incorporated in cytology reports for prognosis.^{4,27}

Some studies show association of tumour grade with ER/PR content. Low cytoprognostic scores are associated with positive oestrogen receptor (ER) and progesterone receptor (PR).

High cytoprognostic score is associated with positive expression of HER2 / neu, p53 and ki-67.^{28,29} Utility of cytologic grading is to detect fast growing grade III tumours which are more likely to respond to chemotherapy than low grade (slow growing) tumours. Slow growing tumour may be better suited to pre-treatment with tamoxifen.³⁰ Therefore, it can be stated that cytological grading is comparable to histological grading of tumours to assess the tumour behaviour and prognosis.

CONCLUSIONS

Thus, cytological grading of breast carcinoma correlates well with histopathological grading. In the era of multiple treatment modalities and neoadjuvant therapy, cytological grading can be used as a prognostic factor for better management of patients.

Limitation

Small sample size, observer variability and subjectivity during assessment of cytological features and variation of cytological features in different areas of tumour on histopathology, which cannot be appreciable on cytology because of limited area of approach.^{22,23}

Data sharing statement provided by the authors is available with the full text of this article at jebmh.com.

Financial or other competing interests: None.

Disclosure forms provided by the authors are available with the full text of this article at jebmh.com.

REFERENCES

- [1] Rosai J, Ackerman LV. Rosai and Ackerman's surgical pathology. 11th edn. Vol. 2. Edinburgh: Reed Elsevier India Private Limited 2018:1434-1503.
- [2] Kujur P. Fine-needle aspiration cytology of the palpable breast lump of 106 cases and correlation with histologic diagnosis: a prospective analysis. *International Journal of Scientific Study* 2015;3(9):111-5.
- [3] Berner A, Sauer T. Fine-needle aspiration cytology of the breast. *Ultrastruct Pathol* 2011;35(4):162-167.
- [4] Pal S, Gupta ML. Correlation between cytological and histological grading of breast cancer and its role in prognosis. *J Cytol* 2016;33(4):182-6.
- [5] Sinha SK, Sinha N, Bandyopadhyay R, et al. Robinson's cytological grading on aspirates of breast carcinoma: Correlation with Bloom Richardson's histological grading. *J Cytol* 2009;26(4):140-3.
- [6] Vasudev V, Rangaswamy R, Geethamani V. 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.
- [7] Mouriquand J, Pasquier D. Fine needle aspiration of breast carcinoma: a preliminary cytoprognostic study. *Acta Cytol* 1980;24(2):153-9.
- [8] Saha K, Raychaudhuri G, Chattopadhyay BK, et al. Comparative evaluation of six cytological grading systems in breast carcinoma. *J Cytol* 2013;30(2):87-93.
- [9] Rosa M, Mohammadi A, Masood S. The value of fine needle aspiration biopsy in the diagnosis and prognostic assessment of palpable breast lesions. *Diagn Cytopathol* 2012;40(1):26-34.
- [10] Khemka A, Chakrabarti N, Shah S, et al. Palpable breast lumps: fine needle aspiration cytology versus histopathology: a correlation of diagnostic accuracy. *The Internet Journal of Surgery* 2008;18(1).
- [11] Younis R, Muhammad I, Zubair A, et al. Cytological grading of breast cancer according to Robinson's grading system. *Pak Armed Forces Med J* 2016;66(4):490-493.
- [12] Ahmed I, Jahan R, Mosarrat SS, et al. Robinson's cytological grading of breast carcinoma in fine needle aspirates: association with Elston and Eliss' modified bloom-Richardson histological grading. *Journal of Histopathology and Cytopathology* 2017;1(1):31-8.
- [13] Chandanwale SS, Mishra N, Kaur S, et al. Comparative analysis of six cytological grading systems in breast carcinoma. *Clin Cancer Investig J* 2016;5:409-15.
- [14] Chalise S, Jha A, Neupane PR, et al. Correlation between Robinson's cytological grading with Modified Bloom-Richardson histopathological grading for Breast carcinoma. *Journal of pathology of Nepal* 2015;5(10):791-7.
- [15] Pandey P, Dixit A, Chandra S, et al. A comparative and Evaluative study of two cytological grading: an important Prognostic factor. *Anal Cell Pathol* 2014;2014:1-6.
- [16] Sood N, Nigam JS, Yadav P, et al. Comparative study of cytomorphological Robinson's grading for breast carcinoma with modified bloom- Richardson

- histopathological grading. *Patholog Res Int* 2013;2013:146542.
- [17] Black MM, Speer FD. Nuclear structure in cancer tissues. *Surg Gyneacol Obstet* 1957;105(1):97-102.
- [18] 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.
- [19] Das AK, Kapila K, Dinda AK, et al. Comparative evaluation of grading of breast carcinomas in fine needle aspirates by two methods. *Indian J Med Res* 2003;118:247-50.
- [20] Arul P, Masilamani S. Comparative evaluation of various cytomorphological grading systems in breast carcinoma. *Indian J Med Paediatr Oncol* 2016;37(2):79-84.
- [21] Einstein D, Omprakash BOP, Ganapathy H, et al. Comparison of 3-tier cytological grading systems for breast carcinoma. *ISRN Oncol* 2014;2014:252103.
- [22] Bukya VP, Nandyala R, Banoth M, et al. Comparative Study of Robinson's and Mouriquand's Cytological Grading Systems and Correlation with Histological Grading in Breast Carcinoma. *Journal of Clinical and Diagnostic Research* 2018;12(6):EC04-EC08.
- [23] Ohri A, Jetly D, Shukla K, et al. Cytological grading and breast neoplasia and its correlation with histological grading. *Indian J Pathol Microbiol* 2006;49(2):208-13.
- [24] Rupom TU, Choudary T, Banu SG. Study of fine needle aspiration cytology of breast lump: correlation of cytologically malignant cases with their histological findings. *Bangabandhu Sheikh Mujib Medical University Journal* 2011;4(2):60-64.
- [25] Rekha TS, Nandini NM, Dhar M. Validity of different cytological grading systems of breast carcinoma--a hospital-based study in south India. *Asian Pac J Cancer Prev* 2011;12(11):3013-3016.
- [26] Zoppi JA, Pellicer EM, Sundblad AS. Cytohistologic correlation of nuclear grade in breast carcinoma. *Acta Cytol* 1997;41(3):701-704.
- [27] The uniform approach to breast fine-needle aspiration biopsy. National cancer institute fine-needle aspiration of breast workshop subcommittees. *Diagn Cytopathol* 1997;16(4):295-311.
- [28] Masood S. Prognostic factors in breast cancer: use of cytologic preparations. *Diagn Cytopathol* 1995;13(5):388-95.
- [29] Jayaram G, Elsayed EM. Cytologic evaluation of prognostic markers in breast carcinoma. *Acta Cytol* 2005;49(6):605-10.
- [30] Pandya AN, Shah NP. Comparative evaluation of Robinson's cytological grading with Elston and Ellis' Nottingham modification of bloom Richardson histopathological grading for breast carcinoma. *Natl J Community Med* 2012;3(3):491-495.