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DIAGNOSTIC ACCURACY OF FINE NEEDLE ASPIRATION CYTOLOGY OF BREAST LUMP IN A TERTIARY TEACHING HOSPITAL

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ABSTRACT

Background: Breast cancer is the second most common cancer in women after carcinoma cervix. It is sometimes difficult to determine whether a suspicious lump in the breast is benign or malignant simply from clinical assessment. Fine Needle Aspiration Cytology (FNAC) is a relatively simple, rapid, reliable and economic procedure for the evaluation of lump lesions. **Aims and Objectives:** To determine the diagnostic accuracy of FNAC of palpable breast lesions done in 1507 patients over a period of ten years in a tertiary teaching hospital. **Materials and Methods:** Retrospective and prospective clinical data and cytology findings were obtained of all patients presenting with palpable breast lump during the period of August 2006 to September 2016. The FNAC results were correlated with histopathological findings and the data was analyzed to determine the diagnostic accuracy of FNAC. **Results:** FNAC was performed on 1507 cases and 523 cases had histopathological examination. Age 21 to 40 yrs was the most common age for presentation of breast lump. Fibroadenoma was the commonest benign lesion (44.3%) and Invasive Ductal carcinoma was the commonest malignant lesion (7.8%) on cytology. Accuracy of detecting breast lesion cytologically was 97.51% over histopathology with sensitivity of 95.29% and specificity of 98.58%. **Conclusion:** FNAC is a highly effective, simple, minimally invasive tool for diagnosis of breast lesion and the results compare well with histopathology findings. Thus, preoperative categorization of breast lesions by FNAC is utmost important for proper management of patients with palpable breast lumps.

KEYWORDS: Breast lesion, cyto-histology correlation, diagnostic accuracy.

INTRODUCTION

Breast cancer is the most common cancer among women in the western world. In India, breast cancer is the second most common cancer among women after carcinoma cervix. It is the leading cause of death in women with more than 10, 00,000 cases occurring worldwide annually.[1] It is sometimes difficult to determine whether a suspicious lump is benign or malignant simply from clinical assessment. Therefore a method of definitive diagnosis of patients who present with breast lumps at the outpatient clinic is needed in order to reassure the patients and to offer the best possible treatment.[2] FNAC is a relatively simple, reliable, atraumatic, economical and complication free procedure for the evaluation of mass lesions. It can be easily repeated if an adequate aspirate is not obtained, is done as an out-patient procedure, results are rapidly available, and is economical with a high rate of accuracy.[2] A confident diagnosis can be made in 95% of the cases through a combination of Fine needle aspiration cytology (FNAC), radiological imaging: (Mammography and Ultrasonography) and clinical examination (Triple assessment), have become the standard approach, to the investigation of palpable breast lumps.[3] FNAC has superseded the use of frozen section examination in the diagnosis and management of patients with breast cancer. It has taken a fundamental role in the diagnosis of both palpable and non palpable lesions as it gives the necessary information of various breast lesions for surgical management of patients.[4,5] The main purpose of FNAC of breast lump is to confirm cancer preoperatively and to avoid surgery especially in benign conditions. Sensitivity of FNAC in the diagnosis of breast cancer is 90-95% in most series.[5] Fine needle aspiration cytology alone; however is subjected to inaccuracies and does not definitely diagnose breast cancers with the reliability of

an open biopsy. However aspiration cytology is not a substitute for conventional surgical histopathology as a definitive diagnosis is not always possible by cytology. So, this study was conducted to evaluate our experience with FNAC in a series of patients with palpable breast lump and compare its findings with histopathology results.

MATERIALS AND METHODS

This was a retrospective and prospective unicenter study carried out in Department of Pathology at Dr. D. Y. Patil Medical College, Hospital and Research Centre, from August 2006 to September 2016 and the retrospective data was obtained from clinical and laboratory data from August 2006 onwards. A total of 1500 patients were included in the study. All women in age group between 10 & 80 years with a palpable breast lump undergoing FNAC followed by excision biopsy /lumpectomy/or mastectomy were included in this study; while patients not willing, with suppurative and inflammatory lesions, with ulcerated breast lump and with recurrent malignancies were not included in this study. The standard FNAC procedure was implemented and smears of the aspirated material were obtained. The cytological smears were stained with Leishmann, H&E, and Papanicolou stains. For Histopathological examination, the lumpectomy and biopsies specimens were received in 10% formalin and staining of the slides was done using H&E stain.

RESULTS

Among the total 1507 cases in the present study, maximum number of cases i.e. 1231 (81.7%) had benign breast lump and 276 (18.3%) cases with malignant breast lump (Figure 1).

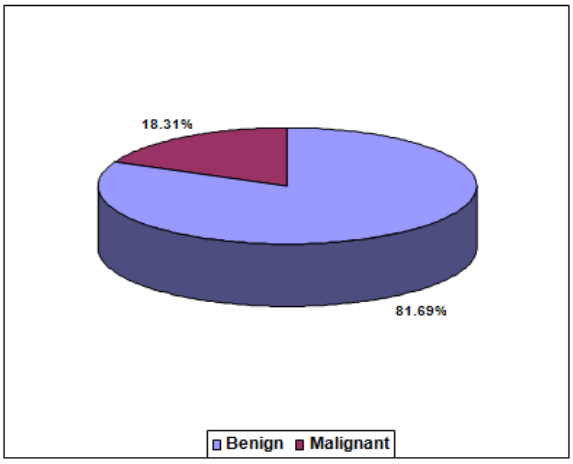


Figure 1: Distribution of cases on basis of nature of Breast Lump on FNAC

Among the total 1507 cases in the present study maximum number of cases i.e. 524 (34.8%) were in the age group 21 to 30 yrs, followed by 382 (25.3%) cases in the age group 31 to 40 yrs. Minimum cases with palpable breast lump were 26 (1.7%) in the age group more than 70 yrs (Figure 2).

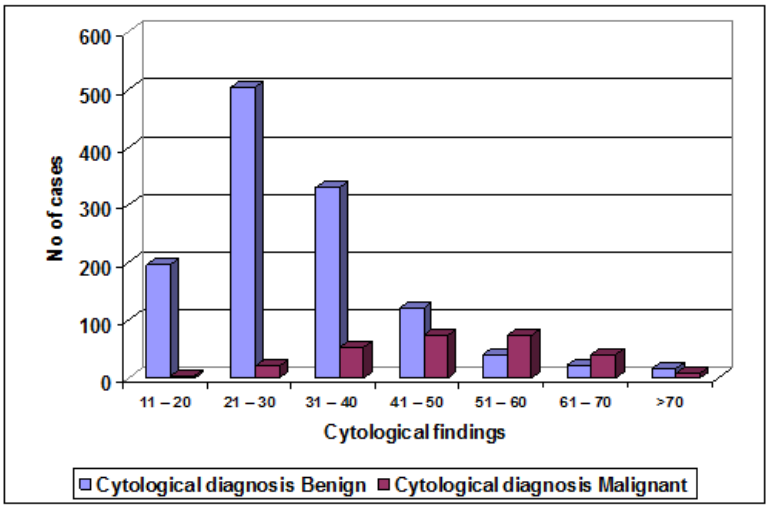


Figure 2: Age wise distribution of cases

875 (58.1%) cases had right side breast lump, followed by 606 (40.2%) cases with left side breast lump. 26 (1.7%) cases had bilateral breast lumps (Figure 3).

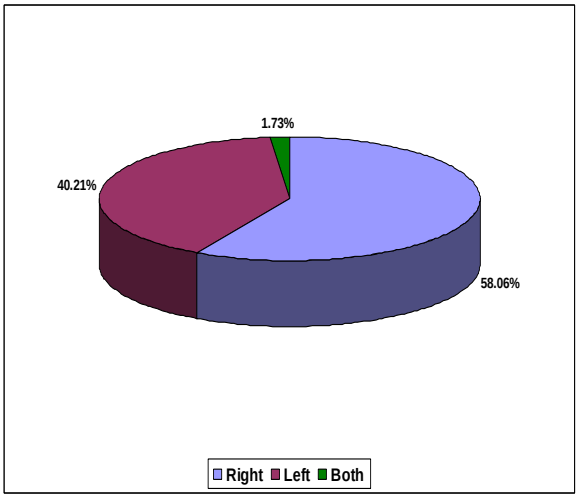


Figure 3: Distribution of cases according laterality

Distribution of cases according to quadrant revealed majority with superolateral lump 846(56.1%) cases, followed by 401(26.6%) cases with superomedial lump & 210 (13.9%) cases with inferolateral lump. Only 50(3.3%) cases presented with inferomedial breast lump (Figure 4).

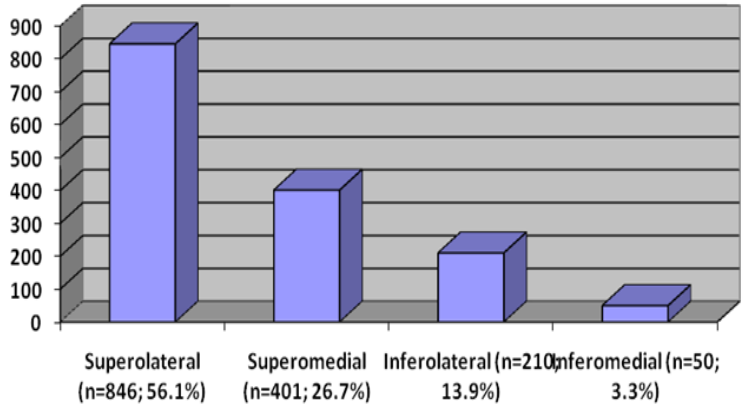


Figure 4: Distribution of cases according to Quadrant

Clinical presentation of the cases showed pain was the commonest presentation with breast lump 612 (40.6%) cases; followed by 255 (16.9%) cases with nipple discharge; 256 (17%) cases had ulceration and 253 (16.8%) cases presented with enlarged lymph nodes with breast lump (Figure 5).

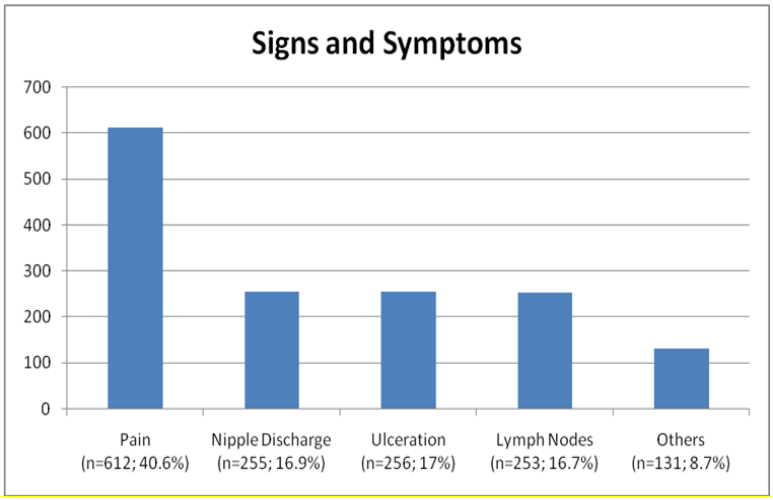
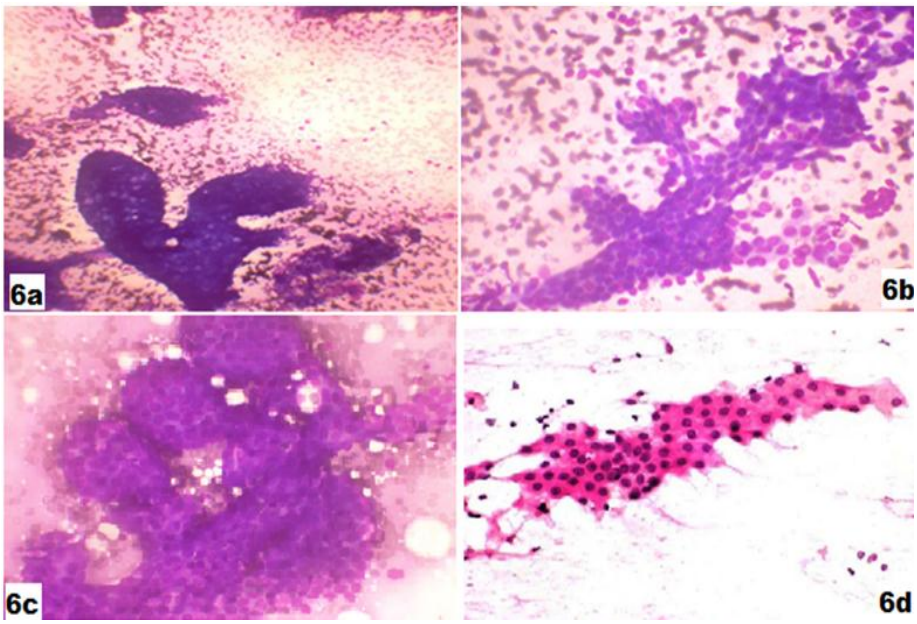


Figure 5: Types of clinical presentation

Among the benign cytological finding, 667 (44.3%) cases had fibroadenoma with staghorn pattern of cohesive ductal epithelial cells (Figure 6a, b). 247 (16.4%) cases revealed fibrocystic disease with benign ductal epithelial cells, apocrine cells and cyst macrophages (Figure 6c, d). and 67 (4.4%) cases had suppuration. Among malignant breast lump showing discohesive malignant cells (Figure 7a, b), cytological

finding was invasive ductal carcinoma among 118 (7.8%) cases, 148 (9.8%) cases had suspicious/atypical finding on cytology (Table 1).



6a. Cytology of fibroadenoma showing staghorn pattern and numerous bare oval nuclei (Leishman, 100x).
6b. Cytology of Fibroadenoma showing cohesive clusters of ductal cells with few myoepithelial cells (Leishman, 400x).
6c. Cytology of Fibrocystic disease showing benign ductal cells with myoepithelial cells and foamy macrophages (Leishman, x 400x).
6d. Cytology showing apocrine cells in fibrocystic disease (Haematoxylin Eosin, 400x).

Figure 6

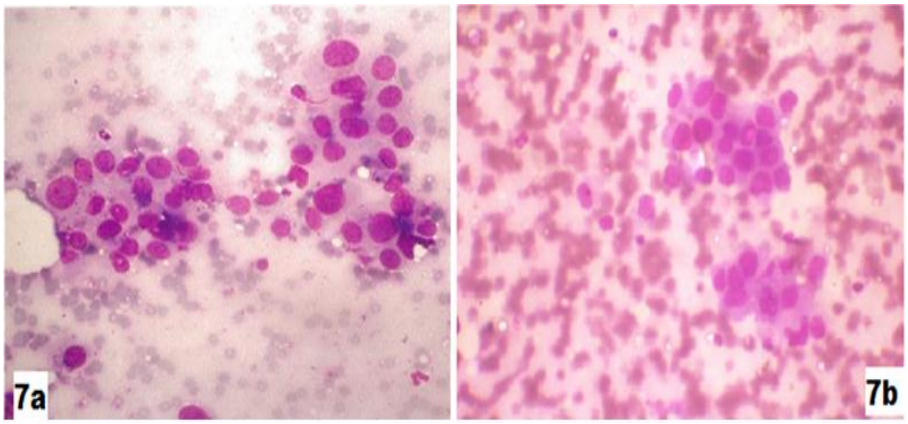


Figure 7:
7a. Cytology showing discohesive malignant cells of invasive ductal carcinoma (Leishmann, 400x)
7b. Cytology of lobular carcinoma showing dispersed malignant cells (Leishmann, 400x).

Table 1: Distribution of cases according to FNAC diagnosis

		No of cases	%
Benign	Suppuration	67	4.4
	Tuberculosis	4	0.3
	Ductal ectasia	4	0.3
	Non specific	58	3.8
	Insufficient	45	3.0
	Fibro adenoma	667	44.3
	Fibrocystic	247	16.4
	Others	139	9.2
Malignant	Invasive ductal Ca	118	7.8

	Ductal Ca	4	0.3
	Lobular	3	0.2
	Medullary	3	0.2
	Suspicious/Atypical	148	9.8
Total		**1507**	**100**

Among 523 cases where HPE was done, diagnosis of 278 cases with fibroadenoma (Figure 8a), 36 cases with fibrocystic disease (Figure 8b), 129 with invasive ductal carcinoma (Figure 9a), 3 cases invasive lobular carcinoma (Figure 9b) and 29 with suspicious/atypical findings were revealed.

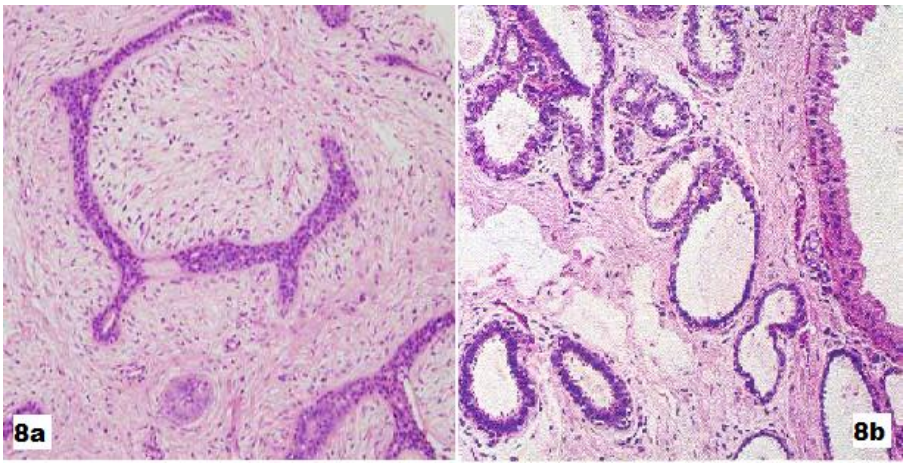


Figure 8:
8a. Histology of Fibroadenoma, intracanalicular pattern (Haematoxylin Eosin, 100x).
8b. Histology showing apocrine change in fibrocystic disease (Haematoxylin Eosin, 400x).

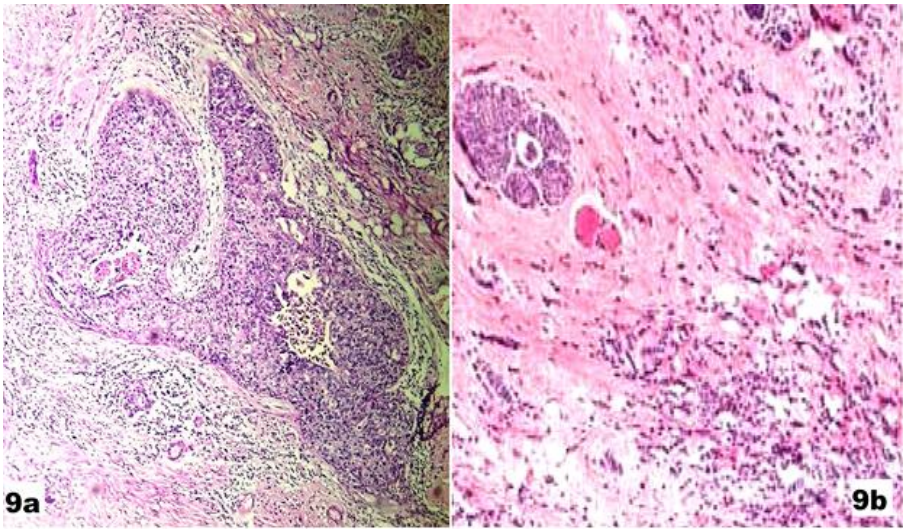


Figure 9:
9a. Histology of invasive ductal carcinoma (Haematoxylin Eosin, l00x).
9b. Histology of invasive lobular carcinoma showing Indian File pattern (Haematoxylin Eosin, l00x).

Table 2: Association between FNAC diagnosis and HPE diagnosis

Cytological diagnosis	HPE diagnosis		Total
	Malignant	Benign	
Malignant	162	5	167
Benign	8	348	356
Total	170	353	523

Table 2 shows association between cytological diagnosis and HPE diagnosis in study group. Among 167 cases with malignant diagnosis cytologically, 162 were correctly diagnosed as malignant on histopathology and 5 cases were detected benign on histopathology. Among 356 benign cases, 348 cases were diagnosed as benign on

histopathology and 8 cases were detected malignant on histopathology. To test whether this difference is statistically significant, Pearson's Chi-square test was applied as a test of significance. The chi-square value was 465.25, which was statistically very highly significant ($p<0.0001$). Sensitivity and specificity of clinical diagnosis over HPE is also calculated. Cytological diagnosis had sensitivity of 95.29% with 98.58% specificity. Positive predictive value of cytological diagnosis is 97.01% with negative predictive value of 97.75%. Overall accuracy of detecting type of lesion is 97.51%.

Table 3: Correlation between Cytological diagnosis and HPE diagnosis

Cytological diagnosis		HPE diagnosis												
		Tuberculosis	Ductal ecasia	Fibro adenoma	Fibrocystic	Others #	Phylloides	Invasive ductal Ca	Ductal Ca	Lobular	Medullary	Mucinous	Metaplastic Ca	Total
		Benign						Malignant						
Benign	Suppuration	0	0	1	0	9	0	0	0	0	0	0	0	10
	Tuberculosis	2	0	0	0	0	0	0	0	0	0	0	0	2
	Ductal ectasia	0	2	0	0	0	0	0	0	0	0	0	0	2
	Non specific	0	0	0	0	2	0	0	0	0	0	0	0	2
	Insufficient	1	0	2	0	0	1	1	0	0	0	0	0	5
	Fibro adenoma	0	0	274	0	1	1	0	1	0	0	0	1	278
	Fibrocystic	0	0	1	36	2	0	1	0	0	0	0	1	41
	Others	0	0	0	0	15	0	1	0	0	0	0	0	16
Malignant	Invasive ductal Ca	0	0	0	0	1	0	100	0	0	0	0	0	101
	Ductal Ca	0	0	0	0	0	0	0	2	0	0	0	0	2
	Lobular	0	0	0	0	0	0	0	0	3	0	0	0	3
	Medullary	0	0	0	0	0	0	0	0	0	3	0	0	3
	Suspicious/Atypical	0	0	0	0	4	9	26	3	0	0	3	13	58
	Total	3	2	278	36	34	11	129	6	3	3	3	15	523

Gynaecomastia, Fat necrosis, Granulomatous mastitis, Chronic mastitis with abscess formation, Chronic inflammatory lesion, Lipoma.

Table 3 shows correlation between cytology and histopathology examination in the study group. Among 278/523 (53.15%) cases with fibroadenoma on cytology, 274/278 (98.56%) were detected same on histopathology. Among 101/523 (19.31%) cases invasive ductal carcinoma on cytology, 100/101 (99.01%) cases were detected same on histopathology, 2/523 (0.38%) cases with tuberculosis on cytology, 2/2 (100%) were detected by histopathology. Among 41/523 (7.84%) cases with fibrocystic, 36/41 (87.80%) cases were detected same on histopathology.

DISCUSSION

In the present study, the pattern of breast lump cytology by Fine Needle Aspiration Cytology (FNAC) and its correlation with clinical and histopathological findings was studied. Triple assessment by clinical, radiological and FNAC can produce 99% accuracy for both benign and malignant lesions as false negative results can mislead a clinician and cause a delay in appropriate investigation, diagnosis and treatment.[6] Early screening and diagnosis of breast lesions and categorization into different groups of breast pathology can be helpful in accurate management of breast lesions.[7] FNAC has some pitfalls in the diagnosis of fibrocystic diseases, adenosis and epithelial hyperplasia with/without atypia, apocrine metaplasia and papilloma which may have to be correlated with imaging studies to rule out malignancy.[4]

However, FNAC in the context of a rapid assessment of breast lesions allows the same day diagnosis and early treatment of breast cancer, with the immediate reassurance and discharge of those cases with benign disease. When a large majority of patients have benign disease, FNAC provides an equivalent, if not better, method of evaluation of patients in a triple assessment.[8] FNAC is not only useful in diagnosis and further planning of treatment without need for biopsy, but also helpful in prognostication of the tumor factors such as nuclear grading, mitotic index, hormone receptor status and DNA contents.[9]

The present study was retrospective and prospective carried out over a 10 year period. The patients with breast lesions were evaluated by clinical examination followed by cytological examination and histopathology was done amongst the suspected cases with breast lesions.

A total of 1507 cases were enrolled based on inclusion and exclusion criteria. Age 21 to 40 years was the most common among all the cases for breast lump, while minimum number of cases was in the age group of 51 to 60 years. Similar finding was reported in a study conducted by Chiragkumar L Prajapati *et al* (2014) where 278 (50.55%) out of total 550 cases enrolled in the study were in the age group of 21 to 40 years.[10]

Right sided breast lump was more common compared to left side with 58.1% of total cases. This is in discordance with a study conducted by Rathi Monika *et al* (2015) who reported breast lesions 49.18% in left breast, 44.26% in right breast and 6.55% presented bilaterately.[11]

Upper and outer quadrant of the breast (56.1%) was the commonest site of the breast lump in our study group followed by 26.6% in upper and inner quadrant. This is in concordance with a study conducted by Chandni Ravi et al (2012).[12]

Pain was the commonest symptom in 40.6% of our cases followed by nipple discharge among 16.9% and enlarged lymph nodes in 16.7% cases and ulceration in 17% of the cases in our study group. Clegg-Lamptey JN *et al* (2009) reported similar finding with pain 50.2%, lump 28.7% and nipple discharge 8.3%.[13]

Clinically out of 1507 cases, 82.8% cases were detected as benign lesions and 17.2% as malignant lesions. While as per FNAC finding, 81.7% cases were detected as benign lesions and 18.3% cases as malignant lesions. These findings are similar to a study conducted by Savita Bharat Jain *et al* (2015) who reported 74% benign cases, 20% of malignant and remaining (6%) to be inflammatory.[14]

Fibroadenoma was the most common benign lesion while Invasive Ductal Carcinoma was the commonest malignant lesion. Similar findings were also observed by Mayun AA *et al* (2008)[15] and by A .F. Ale *et al* (2016).[16]

Table 4: Comparison of Sensitivity and specificity of FNAC with HPE by Different studies

Author	Year	Accuracy (%)	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)
Shah S.H. et al[17]	1998	88.2	89.2	86.1	93	-
Ariga R et al[18]	2002	-	98	97	99	86
Sonali Saraf et al[19]	2006	98.13	98.27	99.49	98.92	97.8
Touhid U R et al[20]	2011	100	100	100	-	-
Jindal U et al[21]	2012	97.7	96.42	100	100	93.4
Yalavarthi Sushma et al[22]	2014	95.24	100	88.5	84	-
Sangita Singh et al[23]	2015	96	96	100	-	-
Present study	2016	97.51	95.29	98.58	97.01	97.75

Accuracy of detecting breast lesion cytologically was 97.51% over histopathology with sensitivity of 95.29% and specificity of 98.58%; which was comparable with previous studies done in literature. (Table 4).

Thus, our study revealed high concordance between FNAC results and histopathology diagnosis.

CONCLUSION

FNAC can significantly reduce mortality as well as morbidity of patients by making early and accurate diagnosis of benign and malignant breast lesions due to its high accuracy, sensitivity and specificity with significant histopathology correlation, which is the gold standard for diagnosis. Thus, preoperative categorization of breast lesion by FNAC as a efficient diagnostic tool is important for proper management of patients with palpable breast lumps.

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