FNAC – A Valuable Tool in Diagnosing Breast Lesions and its Correlation with Histopathology

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ABSTRACT

Background: Fine needle aspiration cytology (FNAC) is a renowned diagnostic tool to assess palpable lesions worldwide. It is easy, cost effective, widely accepted, minimally invasive, safe, rapid, comparatively painless, out-patient based and inexpensive technique. Based on the cytological findings especially in breast lesions, a diagnosis can be made and further evaluation and treatment can be planned in most cases without further invasive investigations. **Objective:** To evaluate diagnostic utility of fine needle aspiration cytology in palpable breast lesions and to compare the result with histomorphological diagnosis in the cases draining at Madinah Teaching Hospital (MTH), in a decade. **Study Design:** Retrospective analysis. **Settings:** Cytology clinic of Pathology Department, Madinah Teaching Hospital, Faisalabad Pakistan. **Duration:** From January 2011 to December, 2020. **Methods:** Data from female patients aged between 10 to 65 years presenting with breast lump and undergoing FNAC followed by histopathology of resected specimen were included. Standard procedure of FNAC and Histopathology were followed in all cases. **Results:** FNAC of 663 patients was included out of which 392 were benign and 271 were malignant. Fibroadenoma was most common benign entity followed by fibrocystic disease. In malignant variants, invasive intraductal was common followed by in situ carcinomas. Cyto-histological correlation was done in 630 cases - 366 benign and 264 malignant out of which 2 benign cases were found to be false negative on FNAC. Accuracy of FNAC was 99.02%. **Conclusion:** FNAC is vital in diagnosing breast lesions on the basis of palpation, examination and cytology. In comparison to Histopathology, FNAC has a high Accuracy and specificity with very low false negative rate. Combined with mammography or other easy accessible radiological adjuncts (triple assessment), presumptive diagnosis can be made and invasive procedures can be avoided.

Keywords: FNAC, Diagnosis, Breast lesions, Palpable.

INTRODUCTION

An estimated 19.3 million new cancer cases and 10.0 million cancer deaths occurred in 2020 out of which female breast cancer exceeded all the other types amounting to estimated 2.3 million new cases (11.7%) in a study encompassing 185 countries worldwide.[1] Widespread use of social media and educational campaigns being carried out regarding health care awareness and wellbeing, and the palpation of breast during routine health examination, breast lumps have become an easy and approachable diagnostic ailment in women of this era.[2] For the past two decades, FNAC has become a diagnostic utility for detection of palpable lesions.[3] The cost effectiveness, easy accessibility, rapid on-site evaluation and the advantage of cytological sampling of deep seated as well as superficial lumps have made it a first line investigation of choice.[4]

Palpable breast lumps are commonly encountered pathologies in health centers running across the country. The augmented awareness regarding breast malignancies has led to increase in self-detected swellings as well as apprehension on the part of the victims.[5] Using the triple

assessment approach, Bishop and Colleagues narrated that triple test is positive if any of the three components (physical examination, imaging technique and cytology) is positive and negative if all the three components are negative predicting its 99.6% sensitivity and 93% specificity.[6] The combination of palpation, mammography and cytology has been found to considerably increase the diagnostic accuracy in breast lesions.[7]

Our study aims at providing a satisfactory statistics over a decade of observation regarding breast lesions and the diagnostic accuracy of non-invasive fine needle aspiration cytology in comparison to histopathology.

METHODS

Our aim was to categorize the distribution of various lesions in breast and to assess the diagnostic utility and accuracy of FNAC in diagnosing breast lesions and its correlation with histopathology in females aged between 10 to 65 years attending outpatient department of Madinah teaching hospital, Faisalabad, after approval from ethical committee. 630 subjects with unknown primary diagnosis of breast lesions undergoing FNAC followed by excision biopsy/ lumpectomy or mastectomy were included in the study. People who failed to follow up after excision were excluded from the study. After taking written informed consent and explanation of the procedure, the procedure was performed by a trained cytopathologist without anesthesia. The skin over the lump was cleaned by alcohol pad having 70% isopropyl alcohol and discarded after single use. Needle is inserted and with retracted plunger suction is applied and drawn in and out for a period of five seconds till sufficient material was seen in the needle hub. The aspirated material was expelled onto the slides. Six to eight slides were prepared for each patient. One of the slides was fixed in methanol and stained with H & E, the remaining slides were air dried and stained with giemsa. Whereas in histological sections, the labeled specimens from Madinah teaching hospital were received, fixed in 10% formalin. The specimens were cut and further fixed in 10% formalin for another 24 hours. Thin sections were obtained after tissue processing, embedding and cutting on microtome, further stained with H & E stain with standard staining procedure.

RESULTS

The total patients that underwent a diagnostic FNAC were 663. Cyto-histological correlation was done in 630 cases -366 benign and 264 malignant out of which 2 benign cases were found to be false negative. The age distribution of women presenting with breast lumps ranged between 10 to 65 years (Figure 1). The maximum number of women was in the age group 40-49 years followed by 25-29. There was only one female that presented in 10-14 years.

Figure 1: Age distribution of women with breast lesions (n = 630)
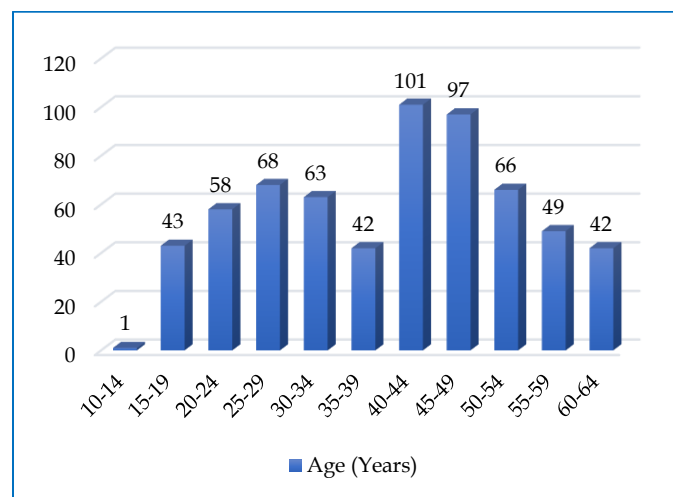
In our study, Fibroadenoma was most common (60.38%) benign entity followed by fibrocystic disease (19.12%) (Figure 2). In malignant variants, invasive intraductal (35.22%) was common followed by in situ carcinomas (33.71%) (Figure 3).

Figure 2: Cytological diagnosis of benign breast lesions (n = 366)
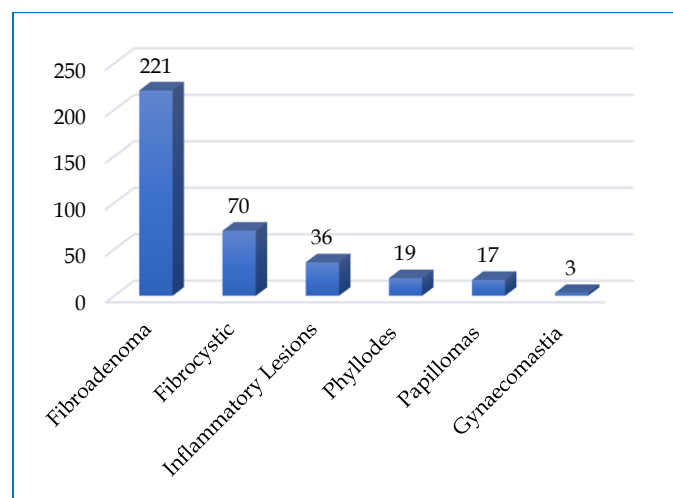
Histolopathological correlation of benign cases (Table 1) reveals Fibroadenoma (59.83%) as the most common entity followed by fibrocystic (19.94%). Inflammatory lesions including acute and chronic mastitis, duct ectasia and breast abscess were the third common entity accounting for 9.01%. Benign Phyllodes was 5.4% followed by Papillomas which was 4.9%. Gynaecomastia was 0.8% in males who presented with painless unilateral or bilateral breast lumps.

Table 1: Histopathological correlation of benign cases on cytology

Breast lesion	Cytology	HPE
Fibroadenoma	221	219
Fibrocystic	70	73
Inflammatory lesion	36	33
Phyllodes	19	20
Papillomas	17	18
Gynaecomastia	3	3

The sensitivity of FNAC of the benign lesions (Table 2) was found to be 99.45% calculated by the formula.

$$\text{Sensitivity} = \frac{\text{True Positive}}{\text{True Positive + False Negative}} \times 100$$

Table 2: Cytohistological correlation of benign lesions

FNAC / Histopathological Correlation of Benign Lesions	Diseased	Not Diseased
Positive	364	-
Negative	2	-
Total	366	

Likewise, the cytological comparison of malignant lesions (Table 4) accounts for intraductal carcinoma as the most common entity (35.22%) followed by in situ carcinoma (33.71%). Papillary variant was 12.12% and very rare Medullary tumor was 4.5% followed by invasive lobular that was 4.1%. The tumors that were poorly differentiated and could not be specifically diagnosed on histopathology further required confirmation through immunochemistry were 10.22%.

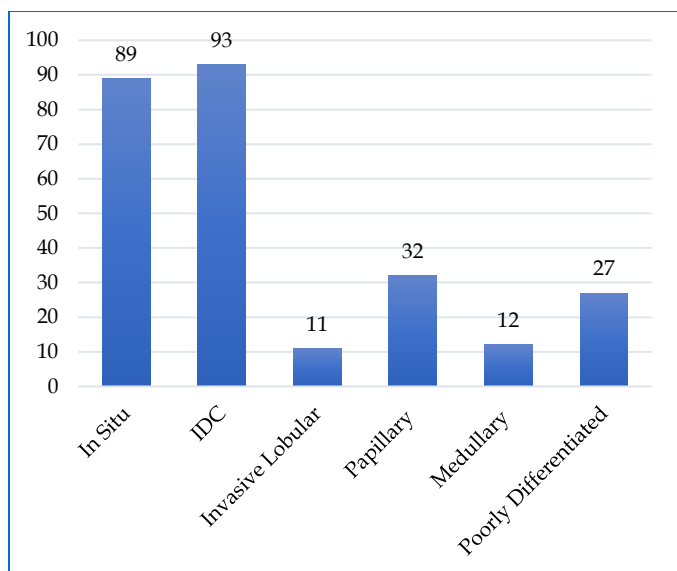### Figure 3: Cytological diagnosis of malignant lesions (n=264)

Table 3: Cytohistological correlation of malignant lesions

Correlation of Malignant Lesions	Diseased	Not Diseased
Positive	264	-
Negative	00	-
Total	264	-

Out of the 2 patients in which FNAC didn't match, one showed benign proliferative disorder and the other showed Papilloma on FNAC. An excision biopsy of the lump was performed in both the cases and both showed IDC (then they further underwent surgery in the form of modified radical mastectomy). The sensitivity of FNAC of the malignant lesions was found to be 100% (Table 3).

Table 4: Cyto-histological correlation of malignant lesions

| Type of Malignancy	Cytology	HPE
In situ	27	28
IDC	89	87
Invasive lobular	11	14
Papillary	32	37
Medullary	12	09
Poorly differentiated	93	89
Total	264	

The specificity of a test is the ability of the study to identify correctly the candidate who does not have the disease. In our study, only candidates with a lump in their breast were selected. Therefore, in statistical terms, there are no normal individuals. Hence, the ability of FNAC as a diagnostic tool to identify correctly those individuals not having the disease (i.e., true negatives) could not be calculated since in every patient in our study, FNAC would reveal some result (Table 5). So, to give a wider spectrum to our interpretation of the results, we calculated the specificity of FNAC for malignant lesions against benign entities i.e., "how specific is FNAC as a diagnostic tool in diagnosing malignant lesions in a breast lump?" (Figure 4). So, the specificity would be calculated as;

$$\text{Specificity} = \frac{\text{True Negative}}{\text{True Negative + False Positive}} \times 100$$

The specificity of FNAC for diagnosing malignant lesions is 100%.

Table 5: Cyto-histological correlation of all breast lesions

Cytological Diagnosis	Histological diagnosis		Total
	Benign Breast Lesions	Malignant Breast Lesions	
Benign breast lesions	364	2	366
Malignant breast lesions	00	264	264
Total	630	266	630

Figure 4: Analysis of Results
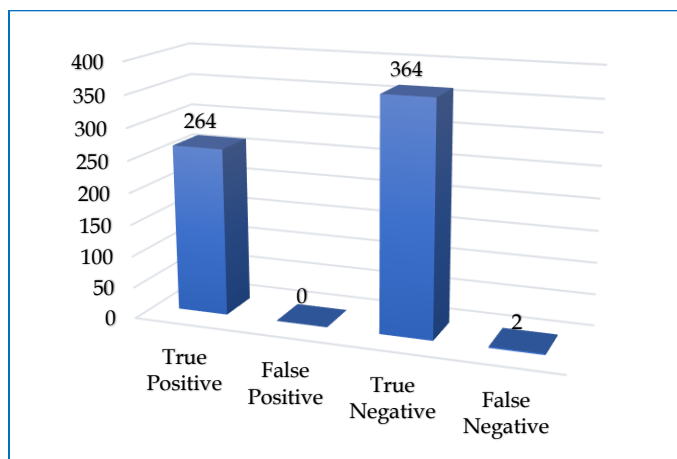
DISCUSSION

The patterns of incidence and type of breast lesion vary across countries and are attributable to multiple factors including demography, inheritance, environmental influences and life style.[8] In the current study of 630 patients, the youngest age of the patient presented was 11 years as compared to a study by Panwar *et al* in which the youngest age of presentation was 15 years.[9] Similarly the age distribution of women presenting with breast lumps ranged between 10 to 65 years as compared to study by Sagar *et al* in which the maximum age limit was 80 years.[10] The maximum number of women inclined to breast lesions irrespective of benign or malignant potential was 40-49 years in accordance to a study of 100 females in which the highest cases were seen in age group 31-50 years.[11]

Considering the type of benign lesion to which the most females are prone to, Fibroadenoma is the most common entity (60.38%) further confirmed on histopathology, similar to a study incorporating 232 cases bearing maximum percentage (13.9%).[12] In contrast, a study by Lilleborge *et al*, adenosis is the most common (50%) benign condition observed followed by Fibroadenoma (32%).[13] A similar study of 100 cases proved Fibroadenoma as the most common entity (47.27%) among all benign breast lesions.[14] The overall sensitivity (95% confidence interval) of benign cases was 99.45% as compared to 98.2% in a study by Agarwal A *et al*[15] and 94.3% in a study by Verma *et al*.[16] Likewise the cytological comparison of malignant lesions that were also further confirmed by histopathology revealed intraductal carcinoma as the most common entity which correlated with many other studies.[17,18,19] For calculating the specificity for malignant lesions, the result interpretation can be broadened by calculating the negative predictive value of the test for malignant lesions. The specificity for calculating malignant lesions is 100% in our study comparable with 99.5%[20] and 98.8%[21] in other areas with similar studies. The high values of sensitivity, specificity and diagnostic accuracy in our study results from the fact that only palpable lumps were incorporated in the study.

CONCLUSION

In resource constrained environment like our national health system, when performed by FNAC is an easy, accessible, cheap, repeatable and reliable adjunct in the diagnosis of breast lesion. High specificity of FNAC in diagnosing malignant lesions should be frequently utilized as a prelude step to avoid unnecessary invasive and expensive investigations and surgery.

LIMITATIONS

Cytology is a good tool for diagnosis but further work up may be required to categorize the lesion and for receptor status which may be needed for patient management and data collection.

SUGGESTIONS / RECOMMENDATIONS

Cytology should be the preliminary step in diagnosing breast lesions.

CONFLICT OF INTEREST / DISCLOSURE

The authors declare no conflict of interest.

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REFERENCES

1. Sung H, Ferlay J, Siegel RL, Laversanne M, Soerjomataram I, Jemal A, Bray F. Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA: a cancer journal for clinicians. 2021 May;71(3):209-49.
2. Gao YH, Zhu SC, Xu Y, Gao SJ, Zhang Y, Huang QA, Gao WH, Zhu J, Xiang HJ, Gao XH. Clinical Value of Ultrasound-Guided Minimally Invasive Biopsy in the Diagnosis or Treatment of Breast Nodules. Cancer Management and Research. 2020;12:13215.
3. Al-Bahkaly S, Alshamrani A, Hijazi LO, Almegbel MM, Pharaon MM. Diagnostic accuracy of fine-needle aspiration cytology with histopathology of thyroid swellings in king Abdulaziz Medical City. Journal of Nature and Science of Medicine. 2020 Apr 1;3(2):121.

4. Shanker B, Masood S, Rahat N, Majid A, Siddiqui R. Diagnostic yield of FNAC: Our Experience. Journal of Muhammad Medical College, Mirpurkhas. 2020;11(1):18-20.

5. Chakrabarti I. FNAC Versus CNB: Who wins the match in breast lesions?. Journal of cytology. 2018 Jul;35(3):176.

6. Ogbuanya AU, Anyanwu SN, Iyare EF, Nwigwe CG. The role of fine needle aspiration cytology in triple assessment of patients with malignant breast lumps. Nigerian journal of surgery: official publication of the Nigerian Surgical Research Society. 2020 Jan;26(1):35.

7. Rajani T, Gupta P, Popat VC, Desai NJ. Sensitivity of ultrasonography in predicting benign and malignant masses of breast lump at a tertiary care hospital with its cytological and histological correlation.

8. Asiri S, Asiri A, Ulahannan S, Alanazi M, Humran A, Hummadi A. Incidence rates of breast cancer by age and tumor characteristics among Saudi women: recent trends. Cureus. 2020 Jan;12(1).

9. Panwar H, Ingle P, Santosh T, Singh V, Bugalia A, Hussain N. FNAC of breast lesions with special reference to IAC standardized reporting and comparative study of Cytohistological grading of breast carcinoma. Journal of cytology. 2020 Jan;37(1):34.

10. Sagar A, Iyengar S, Sikarwar S, Mangal KS. Clinical and Histocytological Correlation of Breast Lesions. IOSRJDMS. 2020;19(5):6-12.

11. Sharif A, Tabassum T, Riaz M, Akram M, Munir N. Cytomorphological patterns of palpable breast lesions diagnosed on fine needle aspiration cytology in females. European Journal of Inflammation. 2020 Jul;18:2058739220946140.

12. Davidson T, Ravid MM, Nissan E, Sklair-Levy M, Nissan J, Chikman B. Correlations Between Core Needle Biopsy and Excisional Biopsy Findings in Suspected Breast Lesions: A Single Center Study. The Israel Medical Association journal: IMAJ. 2018 Jul 1;20(7):401-4.

13. Lilleborge M, Falk RS, Sørlie T, Ursin G, Hofvind S. Can breast cancer be stopped? Modifiable risk factors of breast cancer among women with a prior benign or premalignant lesion. International Journal of Cancer. 2021 May 14.

14. Umat PD, Desai H, Goswami H. Correlation between bi-rads categories and cytological findings of breast lesions. International journal of clinical and diagnostic pathology 2020;3(3):43-48

15. Agarwal A, Singh D, Mehan A, Paul P, Puri N, Gupta P, Syed A, Rao S, Chowdhury N, Ravi B. Accuracy of the International Academy of Cytology Yokohama system of breast cytology reporting for fine needle aspiration biopsy of the breast in a dedicated breast care setting. Diagnostic Cytopathology. 2021 Feb;49(2):195-202.

16. Verma P, Sharma R, Sharma N, Gulati A, Parashar A, Kaundal A. Fine-Needle Aspiration Cytology versus Core-Needle Biopsy for Breast Lesions: A Dilemma of Superiority between the Two. Acta Cytologica. 2021 Jun 30:1-6.

17. Srivastava V, Arun J, Muddha SS. Cytohistological correlation and effectiveness of FNAC as Single Primary Diagnostic Modality in Palpable Breast Lesions. Annals of the Romanian Society for Cell Biology. 2021 May 7:15222-8.

18. Suman PK, Kumari R, Mishra RK. To correlate cytological findings with histopathological findings and to determine the accuracy of FNAC in the diagnosis of breast lesions. International Journal of Health and Clinical Research. 2020 Nov 1;3(8):233-8.

19. Khattak MS, Ahmad F, Rehman KU. Role of fine needle aspiration cytology in diagnosis of palpable breast lesions and their comparison with histopathology. Journal of Ayub Medical College Abbottabad. 2020 Jan 23;32(1):83-6.

20. Marabi M, Aphivatanasiri C, Jamidi SK, Wang C, Li JJ, Hung EH, Poon IK, Tsang JY, Tse GM. The International Academy of Cytology Yokohama system for reporting breast cytopathology showed improved diagnostic accuracy. Cancer Cytopathology. 2021 May 24.

21. De Rosa F, Migliatico I, Vigliar E, Salatiello M, Pisapia P, Iaccarino A, Russo D, Insabato L, Accurso A, Arpino G, Palombini L. The continuing role of breast fine-needle aspiration biopsy after the introduction of the IAC Yokohama system for reporting breast fine needle aspiration biopsy cytopathology. Diagnostic Cytopathology. 2020 Dec;48(12):1244-53.