e-ISSN: 0976-822X, p-ISSN:2961-6042

Available online on http://www.ijcpr.com/

International Journal of Current Pharmaceutical Review and Research 2026; 18(3); 543-549

Original Research Article

Comparison of Fine Needle Aspiration Cytology (FNAC) and Tru-cut Biopsy for the Diagnosis of Palpable Breast Lumps at a Tertiary Care Centre in Rural Area of Faridabad, Haryana

Malika M. Aggarwal[1], Shafaque Zabin[2], Shweta Chaturvedi[3], Samreen Naqash[4], Sanyam Seth[5]

[1]Associate Professor, Al Falah School of Medical Sciences and Research Centre, Dhauj, 121004
[2]Assistant Professor, Al Falah School of Medical Sciences and Research Centre, Dhauj, 121004
[3]Assistant Professor, Al Falah School of Medical Sciences and Research Centre, Dhauj, 121004
[4]Assistant Professor, Al Falah School of Medical Sciences and Research Centre, Dhauj, 121004
[5]3rd Year MBBS Student, Al Falah School of Medical Sciences and Research Centre, Dhauj, 121004

Received: 01-12-2025 / Revised: 15-01-2026 / Accepted: 21-02-2026
Corresponding author: Dr. Malika M. Aggarwal
Conflict of interest: Nil

Abstract

Background: Breast cancer is the most common malignancy among Indian women. Timely and accurate diagnosis of palpable breast lumps is critical for appropriate management. Fine Needle Aspiration Cytology (FNAC) and Tru-cut biopsy are commonly used diagnostic modalities. While FNAC is minimally invasive and cost-effective, Tru-cut biopsy provides core tissue for histopathological and immunohistochemical evaluation, potentially improving diagnostic accuracy.

Objectives: To compare the diagnostic accuracy of FNAC and Tru-cut biopsy in distinguishing benign from malignant breast lesions. To evaluate sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and overall diagnostic efficacy of both techniques.

Methods: A retrospective comparative study was conducted over 24 months at a tertiary care center in rural Faridabad, Haryana. A total of 106 patients presenting with palpable breast lumps were included, excluding those with infective or traumatic etiologies. All patients underwent both FNAC and Tru-cut biopsy, followed by histopathological correlation post-surgery.

Results: Tru-cut biopsy demonstrated superior diagnostic performance with a sensitivity of 97.37%, specificity of 96.67%, PPV of 98.67%, NPV of 93.55%, and overall accuracy of 97.16%. FNAC yielded a sensitivity of 85.53%, specificity of 86.67%, PPV of 94.20%, NPV of 70.27%, and accuracy of 85.84%. FNAC correctly identified 85.8% of cases, whereas Tru-cut biopsy showed stronger concordance with final histopathology results.

Conclusion: FNAC remains a valuable initial diagnostic tool due to its simplicity, affordability, and rapid results. However, Tru-cut biopsy offers significantly higher diagnostic accuracy and is especially beneficial in cases where FNAC results are inconclusive. Given its superior performance metrics, Tru-cut biopsy should be incorporated into routine diagnostic protocols alongside FNAC, as part of the WHO-recommended triple assessment for breast lesions.

Keywords: FNAC, Tru-cut biopsy, Breast lump, Breast malignancy, Diagnostic accuracy.
DOI: 10.25258/ijcpr.18.3.85

Introduction

Breast cancer is topmost cancer among Indian females with an age-adjusted rate as high as 25.8 per 100,000 females [1]. One in four women will experience breast disease at some point in their lives. For many years, fine needle aspiration cytology (FNAC) has been the predominant technique used for the pathological diagnosis of breast lumps, particularly in distinguishing between benign and malignant conditions [2]. Recently, Tru-cut biopsy has been introduced is considered superior to Fine Needle Aspiration Cytology (FNAC) as it provides sufficient tissue for pathologists to make an accurate diagnosis which can guide both surgeons and oncologists in designing appropriate therapeutic strategy for management of patients with breast lumps. This is also useful for both histological diagnosis and IHC evaluation. [3,4] Fine needle aspiration cytology

(FNAC) is utilized as a pre-operative assessment for breast lumps. This method is cost-effective and helps avoid unnecessary surgical procedures. The increased reliability of FNAC in identifying malignancies has led to an approximately 80% reduction in the use of frozen-section histology [4]. The introduction of the Tru-Cut biopsy (TCB) in recent years has significantly enhanced histological evaluations, providing crucial information necessary for developing appropriate treatment plans for patients. It has become the preferred method for diagnosing breast lesions before surgical intervention [5].

Aims and Objectives

1. To compare the diagnostic accuracy of fine needle aspiration cytology and tru-cut biopsy in differentiating benign and malignant lesions of palpable lumps in the breast, with cytological and histopathological correlation.
2. To analyse sensitivity, specificity, positive and negative predictive values, and the efficacy of fine-needle aspiration cytology and Trucut biopsy.

Methodology

This study is a retrospective comparative study aimed at evaluating the diagnostic efficacy of FNAC versus Tru-cut in clinically palpable breast lump. The study was conducted in the Department of Pathology at a tertiary care centre of Haryana over a period of 24 months.

Inclusion Criteria:

1. Patients having clinically palpable breast lump and giving consent for FNAC or Tru-cut biopsy investigation and willing for surgical management.

Exclusion Criteria:

1. Infective etiology (Breast abscess, tuberculosis)
2. Traumatic necrosis

Sample Size: We achieved sample size of 106 for this study.

Time of Study: December 2023 to December 2025

Place of Study: Al Falah School of Medical Sciences and Research Centre, Dhauj, 121004

Data collection: A patient presenting to the department of surgery with a palpable breast lump is subject to a detailed clinical history with physical examination and the relevant information is entered in the proforma. After obtaining informed written consent from the patient, fine needle aspiration cytology and Tru-cut biopsy from the breast lump are performed after explaining the procedures to the patient.

FNAC: Equipment required:

1. 10ml disposable plastic syringe.
2. 22 Guage disposable needles.
3. 95% ethanol.
4. Spirit swabs.
5. Glass slides.

Technique - Under aseptic precautions, parts painted and draped. Under Local anaesthesia, a needle was introduced into the breast lump. The specimen is withdrawn by aspiration with a syringe. Specimen sent for slide preparation, fixation, and cytological examination TRU-CUT

Biopsy: Equipment required:

1) Trucut gun with 18-gauge needle.

2) Sterile container with formalin.

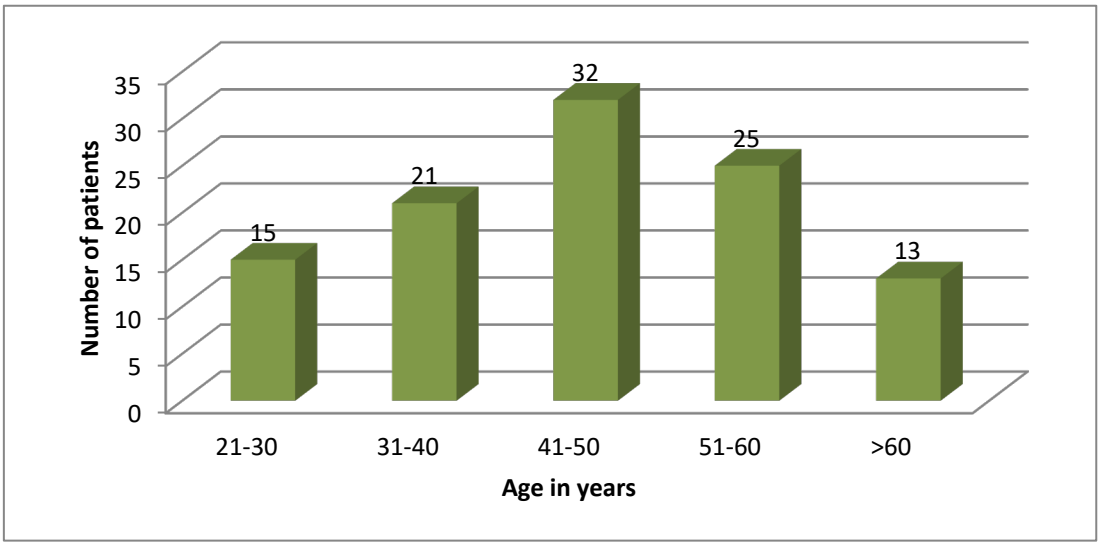
Technique: - Parts painted and draped. - Application of local anaesthesia - Manual localization and immobilization of the lesion - 5mm incision on the skin over the lesion using 11G needle.

Results

Bar Graph 1 illustrates the age distribution of patients included in the study. Most cases (32 patients) were observed in the 41–50 years age group, followed by 51–60 years (25 patients) and 31–40 years (21 patients). Fewer cases were noted in the 21–30 years (15 patients) and >60 years (13 patients) groups.

This distribution suggests a higher prevalence of the condition under study among middle-aged individuals, particularly those in their 40s and 50s

Distribution of Patients According to Age



Bar Graph 1:

Table 1 presents diagnostic performance metrics:

- **Sensitivity (97.37%)**: The test correctly identifies 97.37% of those with the condition (true positives). The CI indicates high confidence in this value, ranging from 90.82% to 99.68%.
- **Specificity (96.67%)**: The test correctly identifies 96.67% of those without the condition (true negatives), with a CI of 82.78% to 99.92%.
- **Positive Predictive Value (PPV, 98.67%)**: Of those who tested positive, 98.67% truly have the condition (CI: 91.50% to 99.80%).
- **Negative Predictive Value (NPV, 93.55%)**: Of those who tested negative, 93.55% truly do not have the condition (CI: 78.67% to 98.28%).
- **Accuracy (97.16%)**: Overall, the test correctly classifies 97.16% of cases, with a CI of 90.93% to 99.57%.

Table 1: Diagnostic Performance Metrics in Patients of Trucut Biopsy

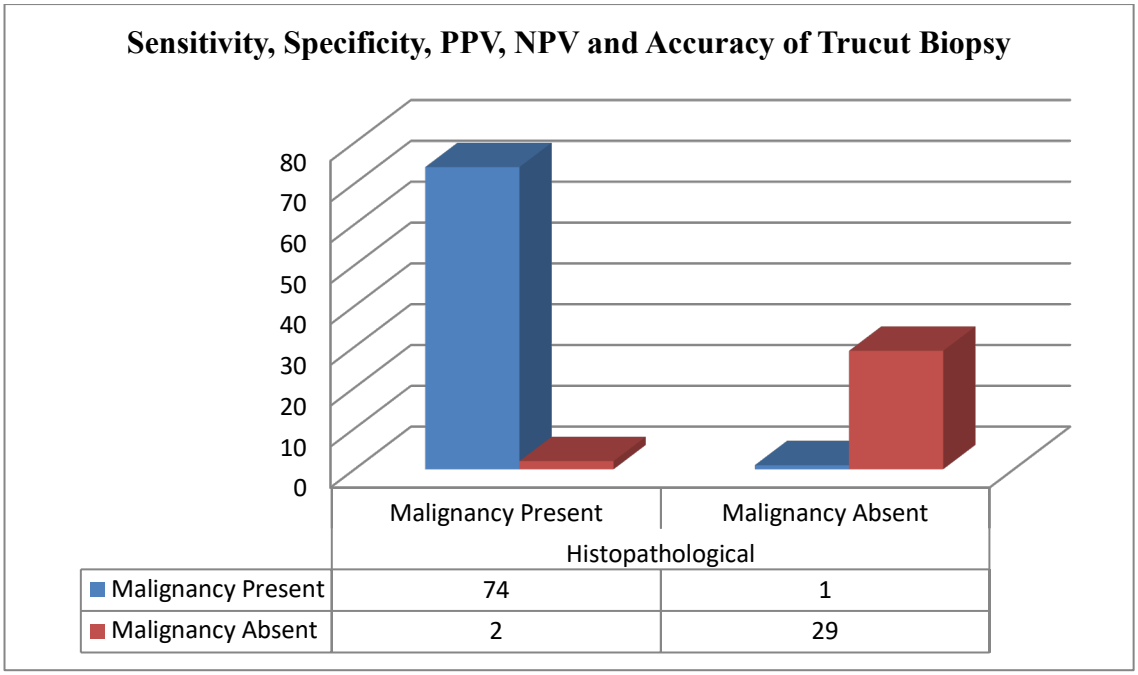
Parameter	Value	95% CI
Sensitivity	97.37%	90.82% to 99.68%
Specificity	96.67%	82.78% to 99.92%
Positive Predictive Value	98.67%	91.50% to 99.80%
Negative Predictive Value	93.55%	78.67% to 98.28%
Accuracy	97.16%	90.93% to 99.57%

Bar Graph 2 summarize the diagnostic performance of Trucut biopsy for detecting malignancy, using histopathology as the reference standard.

Confusion Matrix Summary:

- **True Positives (TP):** 74 cases — Trucut and histopathology both detected malignancies.
- **False Positives (FP):** 1 case — Trucut detected malignancy, but histopathology did not.
- **False Negatives (FN):** 2 cases — Trucut missed malignancy that histopathology found.
- **True Negatives (TN):** 29 cases — Both Trucut and histopathology found no malignancy.

- **Performance Metrics (based on the data):**
- **Sensitivity:** 97.37% (74 / [74 + 2]) — High ability to detect true malignancy.
- **Specificity:** 96.67% (29 / [29 + 1]) — High ability to rule out malignancy when it's not present.
- **Positive Predictive Value (PPV):** 98.67% (74 / [74 + 1]) — Most positive results are truly malignant.
- **Negative Predictive Value (NPV):** 93.55% (29 / [29 + 2]) — Most negative results are truly benign.
- **Accuracy:** 97.16% ([74 + 29] / 106) — Overall high correctness in diagnosing malignancy.



Bar Graph 2: Sensitivity, Specificity, PPV, NPV and Accuracy of Trucut Biopsy

The diagnostic performance of the evaluated test was assessed using standard statistical parameters, including sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and overall accuracy.

In below given Table 2, the sensitivity of the test was found to be 85.53% (95% Cl: 75.58% to 92.55%), indicating a high ability to correctly identify individuals with the condition. This suggests that the test has a low false-negative rate, making it effective in detecting true positive cases.

The specificity was 86.67% (95% Cl: 69.28% to 96.24%), reflecting a strong capability of the test to correctly identify those without the disease, i.e., true negatives. This indicates a relatively low false-positive rate. The positive predictive value (PPV) was notably high at 94.20% (95% Cl: 86.66% to 97.60%), signifying that among those who tested positive, a large majority truly had the disease. This is critical in clinical settings where the consequences of false positives may lead to unnecessary treatment.

In contrast, the negative predictive value (NPV) was 70.27% (95% Cl: 57.34% to 80.60%), suggesting a moderate level of confidence that a negative test result indicates the absence of disease. While lower than PPV, this still offers substantial reassurance in ruling out the condition.

Finally, the overall accuracy of the test was 85.84% (95% Cl: 75.49% to 93.66%), underscoring its reliable performance across both positive and negative cases. This measure reflects the proportion of total correct diagnoses (both true positives and true negatives) among all subjects tested.

Table 2: Diagnostic Performance Metrics in Patients of FNAC

Parameter	Value	95% Cl
Sensitivity	85.53%	75.58% to 92.55%
Specificity	86.67%	69.28% to 96.240%
Positive Predictive Value	94.20%	86.66% to 97.60%
Negative Predictive Value	70.27%	57.34% to 80.60%
Accuracy	85.84%	75.49% to 93.66%

Bar Graph 3 displays a 3D bar chart and contingency table comparing FNAC results with histopathological diagnoses for malignancy detection. Histopathology served as the gold standard. Out of 106 cases:

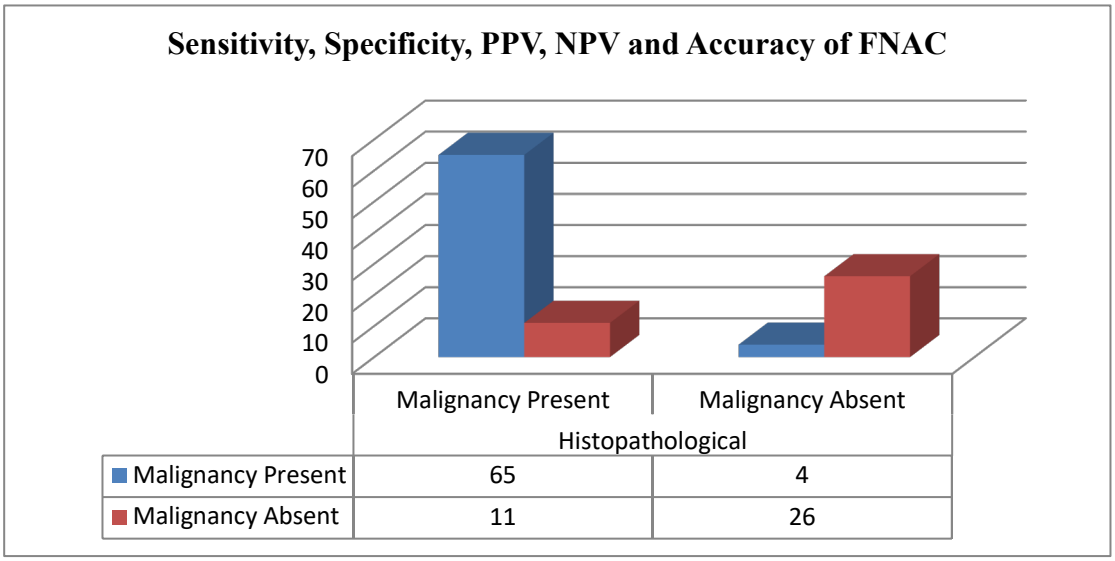
- **True Positives (TP):** 65
- **False Positives (FP):** 11
- **False Negatives (FN):** 4
- **True Negatives (TN):** 26

Based on these values, the diagnostic performance of FNAC was calculated as follows:

- **Sensitivity:** 85.53%
- **Specificity:** 86.67%
- **Positive Predictive Value (PPV):** 85.53%
- **Negative Predictive Value (NPV):** 86.67%
- **Accuracy:** 85.84%

The chart visually represents the distribution of FNAC outcomes against histopathological findings.

The high sensitivity and specificity indicate that FNAC is a reliable diagnostic tool for malignancy, though minor discrepancies highlight the need for confirmatory histopathological findings.



Bar Graph 3: Sensitivity, Specificity, PPV, NPV and Accuracy of FNAC

Discussion

In the present study, majority of the patients (30.2%) were in the age group of 41-50 years followed by 23.6% in the age group of 51-60 years, 19.8% in the age group of 31-40 years, 14.2% in the age group of 21-30 years and 12.2% in the age group of >60 years.

Singh S et al [6] did a retrospective study of 104 cases in which 2 patients were Males and rest 102 cases were Females. Age of the patients ranged from 15-65 years with mean age of 33yrs. Shastri RK [7] in a prospective study found most common age group having breast lump was 25-34 years. The incidence of malignant lesions was found mostly in 45-70 years age group.

Saha A et al [8] in a prospective study reported age ranged from 26 to 75 years, mean age being 47.4 years ± 21.4 (2SD). Breast carcinoma most commonly was found in the age group of 31-40 years. Except for one male rest were female. Samantaray S et al [9] did a retrospective study and reported peak age incidence of breast lesions was between 41 to 50 years. Rikabi Aet al [10] did a cross sectional study on two hundred and seventy five patients and observed that median age of patients was 43 years old.

It was observed in the present study that Trucut Biopsy was more accurate than FNAC with highest sensitivity (97.37% in Trucut as compared to 85.53% in FNAC). Bukhari et al [11] observed sensitivity, specificity, PPV, NPV of FNAC as 80%,99%,99%,87% and for Trucut biopsy as 94%,100%,100%, 89% respectively.

Ajitha MB et al [12] in a prospective study reported for malignant breast disease, FNAC showed sensitivity and specificity of 86.84% and 100% respectively. In 5 cases, results were false negative by FNAC. Positive predictive value was 100% while Negative predictive value by FNAC was 86.49%. While the sensitivity and specificity of Trucut biopsy was 97.14% and 100% respectively. Also, positive predictive value was 100% and negative predictive value was 97.30%.

Saha A et al [13] in a prospective study reported that sensitivity, negative predictive value, diagnostic accuracy was higher in case of CNB than those in case of FNAC. Detection of false negative cases was also lower in CNB assessment. Regarding specificity, positive predictive value, and detection of true negative cases (i.e. which patients really did not have definite malignant lesion); both the procedures turned out to be similar.

Homesh NA et al14 and Usami S et al [14] compared CNB & FNAC and reported very high sensitivity (91–99%), specificity (96–100%), positive predictive value (100%), and negative predictive value (100%) for CNB which are better than results for FNAC for both palpable and nonpalpable lesions.

In the present study, FNAC findings correlated with the histopathological findings in 91 of 106 cases (85.8%), which included 26 of 30 (86.7%) of the benign lesions and 65 of 76 (85.5%) of the malignant lesions. 3 cases were wrongly diagnosed as malignant on FNAC findings and one case as

suspicious. Eight cases were falsely diagnosed as benign, while 2 cases and 1 case were diagnosed as suspicious and unsatisfactory in FNAC findings. The association was found to be statistically significant ($p<0.05$).

In the present study, the Sensitivity, Specificity, Positive Predictive Value (PPV) and Negative Predictive Value (NPV) of FNAC were 85.53%, 86.67%, 94.20% and 70.27% respectively.

Table 3: Comparison of Present Diagnostic Metrics with Other Studies

Authors	Hatada T et al [15]	Singh S et al [6]	Berner et al [16]	Present Study
Sensitivity	**86.9%**	**96%**	**92.9%**	**85.53%**
Specificity	**84%**	**100%**	**63.7%**	**86.67%**

Several studies have evaluated the diagnostic performance of FNAC and core needle biopsy (CNB). Hatada et al. reported FNAC sensitivity of 86.9%, specificity of 84%, and accuracy of 89%, while biopsy showed slightly higher specificity (95.8%) with comparable sensitivity (86.2%) and accuracy (89%). Berner et al. found FNAC sensitivity at 92.9% but with a lower specificity of 63.7%. Mitra et al. noted FNAC sensitivity ranging from 77% to 97% and specificity from 92% to 99%, emphasizing that its diagnostic accuracy depends on factors like the cytopathologist's expertise, presence during the procedure, and lesion characteristics. Singh et al. found FNAC matched histopathology in 48 out of 50 cases, with two discordant cases involving atypical hyperplasia and necrotic material. Shastri et al. reported 25 benign FNAC cases, 21 confirmed histologically, with 5 false negatives and no false positives. Saha et al. documented 29 true positives and 13 false negatives for FNAC, with no false positives and 8 true negatives, highlighting the potential for missed malignancies in some cases.

Conclusion

Fine-needle aspiration cytology (FNAC) remains a rapid, straightforward, affordable, and dependable technique for the preliminary pathological evaluation of breast cancer, particularly in resource-constrained settings like ours. It allows for accurate diagnosis of most malignant breast conditions. However, in cases where FNAC yields inconclusive results, core needle biopsy (CNB) serves as a valuable secondary diagnostic approach, helping reduce the likelihood of missed cancer diagnoses.

Tru-cut biopsy, a form of CNB, has demonstrated itself as a practical, cost-efficient, safe, and highly accurate method for identifying breast lesions. In this study, it achieved impressive diagnostic metrics, including a sensitivity of 97.37%, specificity of 96.67%, positive predictive value of 98.67%, negative predictive value of 93.55%, and an overall diagnostic accuracy of 97.16%. Compared to FNAC, tru-cut biopsy offers superior detection of potentially malignant breast lumps and surpasses open biopsy in terms of safety, reduced hospital stays, lower costs, and fewer post-procedural complications.

Based on these findings, CNB—specifically tru-cut biopsy—can be confidently incorporated into routine diagnostic protocols, aligning with the World Health Organization's (WHO) recommended triple assessment strategy for evaluating suspicious breast lesions at our facility.

References

1. Malvia S, Bagadi SA, Dubey US, Saxena S. Epidemiology of breast cancer in Indian women. Asia Pac J Clin Oncol. 2017;13(4):289-295.
2. Kamal MZ, Banu NR, Alam MM, Das UK, Karmoker RK. Evaluation of Breast Lump - Comparison between True-cut Needle Biopsy and FNAC in MMCH: A Study of 100 Cases. Mymensingh Med J. 2020 Jan;29(1):48-54. PMID: 31915335
3. Rikabi A, Hussain S. Diagnostic Usefulness of Tru-Cut biopsy in the diagnosis of breast lesions. Oman Medical Journal. 2013;28:125–127.
4. Samantaray S, Panda N, Besra K, Pattanayak L, Samantara S, Dash S. Utility of Tru-Cut Biopsy of Breast Lesions - An Experience in a Regional Cancer Center of a Developing Country. J Clin Diagn Res. 2017;11(3):EC36-EC39.
5. Kinjal JS, Faruq IM, Gupta M. Diagnostic Usefulness of Tru Cut Biopsy at a Tertiary Care Centre. J Med Sci Health 2023; 9(1):23-28
6. Singh S, Chandra P, Jitendra S. Diagnostic Accuracy of Fine Needle Aspiration Cytology of Breast Lump in Rural Population of Western U.P. Sch. J. App. Med. Sci., 2015; 3(1G):467-469.
7. Shastri RK. Fine Needle Aspiration Cytology Verses Trucut Biopsy In Preoperative Planning Of Surgical Treatment Of Breast Lumps. Journal of Dental and Medical Sciences (IOSR-DMS). 2016; 15(7): 74-80
8. Saha A, Mukhopapadhyay M, Das C, Sarkar K, Saha AK, Sarkar DK. FNAC Versus Core Needle Biopsy: A Comparative Study in Evaluation of Palpable Breast Lump. Journal

of Clinical and Diagnostic Research. 2016 Feb,10(2): EC05-EC08
9. Samantaray S, Panda N, Besra K, Pattanayak L, Samantara S, Dash S. Utility of Tru-Cut Biopsy of Breast Lesions - An Experience in a Regional Cancer Center of a Developing Country. JCDR. Volume: 11 Issue : 3 Page : EC36 - EC3
10. Rikabi A, Hussain S. Diagnostic Usefulness of Tru-Cut Biopsy in the Diagnosis of Breast Lesions. Oman Medical Journal. 2013;28(2):125-127..
11. Bukhari MH, Akhtar ZM. Comparison of accuracy of diagnostic modalities for evaluation of breast cancer with review of literature. Diagn Cytopathol. 2009;37:416–24.
12. Ajitha MB, Babu VB and Singh AC. Comparative study of fine needle aspiration cytology, trucut biopsy and final histopathological examination in breast lumps. International Journal of Biomedical Research 2017; 8(03): 154-157.
13. Saha A, Mukhopapadhyay M, Das C, Sarkar K, Saha AK, Sarkar DK. FNAC Versus Core Needle Biopsy: A Comparative Study in Evaluation of Palpable Breast Lump. Journal of Clinical and Diagnostic Research. 2016 Feb,10(2): EC05-EC08
14. Homesh NA, Issa MA, El- Sofiani HA. The diagnostic accuracy of fine needle aspiration cytology versus core needle biopsy for palpable breast lump(s).Saudi Med J 2005; 26(1): 42-46
15. Hatada T, Ishii H, Ichii S, Okada K, Fujiwara Y, Yamamura T. Diagnostic value of ultrasound-guided fine-needle aspiration biopsy, core-needle biopsy, and evaluation of combined use in the diagnosis of breast lesions. J Am Coll Surg. 2000;190:299–303
16. Berner A, Davidson B, Sigstad E, Risberg B. Fine-needle aspiration cytology vs. core biopsy in the diagnosis of breast lesions. Diagn Cytopathol. 2003;29:344–8.