

Diagnostic Accuracy of Mammography for Breast Cancer Diagnosis, Taking Histopathology as Standard Investigation

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ABSTRACT

Objective: To find out the exact accuracy of diagnosis of mammography for females presented with breast lump.

Study Design: A cross-sectional observational study

Place and Duration of Study: Jinnah Postgraduate Medical Center, Karachi Pakistan, from Sep Dec 2021.

Methodology: Total 210 female patients above 35 years of age, with breast lump presented in outpatient department of Jinnah postgraduate Medical Centre enrolled in this study. Out of 210 patients, 80 patients were provisionally diagnosed as benign breast lump i-e BIRADS I, II and III, and 130 as malignant i-e BIRADS IV, V, and VI were included on the basis of Mammography done from Radiology department. Trucut biopsy of the breast lump of more than 2cm and excision biopsy of the lump less than 2cm was done. Final diagnosis of histopathological report compared with provisional diagnosis. Results were noted on Performa and analyzed.

Results: A total of 210 patients were enrolled in the study on the basis of mammography. Out of 210 patients, 130(61.9%) patients were considered as malignant and 80(38.1%) patients as benign lumps. Diagnostic accuracy of mammography was 96.19%, taking histopathology as standard investigation. The sensitivity, specificity, positive predictive value, and negative predictive value, were 98.41%, 92.86%, 95.38%, and 97.50%, respectively.

Conclusion: Mammography proved significantly diagnostic for carcinoma of breast.

Keywords: Breast Cancer, Histopathology, Mammography, Radiology.

How to Cite This Article: Latif S, Perveen S, Iqbal M, Ahmed T, Bux KM, Z Soomro JA. Diagnostic Accuracy of Mammography for Breast Cancer Diagnosis, Taking Histopathology as Standard Investigation. *Pak Armed Forces Med J* 2024; 74(SUPPL_2): S127-S131.

DOI: <https://doi.org/10.51253/pafmj.v74iSUPPL-2.7157>

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INTRODUCTION

Breast cancer incidence is increasing especially in the low socioeconomic group and presented in advance stage in 68% of patients.¹ Early diagnosis of breast lump as carcinoma is mandatory to save the life of the patient and usually present with a painless mass and only with the painful mass in 5% of the patients.²⁻⁴

Recent advances show that ultrasound can detect occult breast cancer.⁵ However, histopathological evidence is still considered as the confirmatory test for breast cancer. It is the part of triple assessment and the final code of decision for breast cancer. It has a significant role in diagnosis like trucut and the core needle biopsy for precise surgical Management.⁶

Another tool for detection of breast cancer is FNAC which has 97.2% sensitivity and 98.9% specificity. Its overall diagnostic accuracy is 98.2 percent.⁷

Trucut biopsy can only be done if the lump is more than 2cm and excision biopsy should be done in the size less than 2cm. Moreover, trucut biopsy is

extremely painful therefore, trucut biopsy should be avoided until actually required. The incidence of breast cancer is increasing with each passing year and more alternatives for diagnosing breast cancer as early as possible should be sought. However, regional data is either limited or outdated.

The rationale behind this study was to highlight the role of mammography in the accurate diagnosis of breast cancer. Since the prognosis of advanced breast cancer is poor we want to see if early diagnosis can be established by mammography. By reporting the accuracy of mammography in evaluating breast cancer, we can persuade the scientific community to recommend mammography as the first line of investigations since it is non-invasive and less time-consuming. The objective of this study was to find out the accurate diagnostic accuracy of mammography, comparing it with pathological diagnosis of breast cancer.

METHODOLOGY

A prospective, observational study was conducted in a large tertiary care hospital of Karachi – Jinnah Postgraduate Medical Centre. The participants were recruited from the Department of Surgery after

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Received: 26 Jul 2021; revision received: 18 Feb 2022; accepted: 24 Mar 2022

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obtaining ethical approval from the College of Physicians and Surgeons, Pakistan (CPSP) (#SGR-2018-186-9952). Data was collected from Sep to Dec 2021.

To calculate the sample size, a prevalence of 34.6%⁶ for breast cancer with a confidence interval of 95% and a margin error of 5.3% was considered. The participants were recruited using a consecutive sampling technique.

All women presenting to the outpatient's department at the surgical department between the ages of 18-75 years were included in the study. To prevent the influence of contextual factors, women aged <18 years, pregnant patients, and those having metastatic breast carcinoma were excluded from the study.

History and physical examination of breast was done in the outpatient department. Provisional diagnosis was made as a benign lump or carcinoma breast on the basis of Mammography. 130 patients considered as carcinoma breast and 80 patients as benign breast lump. Mammography was carried out in all patients. Mammographic findings of BIRADS category III or below, was considered as benign, BIRADS IV and V as suspicious of malignancy and category VI as a biopsy proven carcinoma of breast. Data was collected and recorded through a pre-defined proforma. Information about the patient's sociodemographics, tumor site, histological subtype, and other parameters were collected by the principal author.

Suspected patients of the carcinoma of the breast were confirmed by histopathological report. Trucut biopsy was performed in the breast lump if the size of the lump was more than two cm and excisional biopsy was done in the lump of size less than two centimeters. Histopathological diagnosis was considered as the final diagnosis of the benign or malignant breast lump.

After diagnosis of the cancer the metastatic workup of the patients was done. CT scan abdomen, chest and bone scan was done. Results were analyzed and accuracy of the Mammography was confirmed by histopathological examination report.

The data was analyzed using the Statistical Package for Social Sciences (SPSS) version 26. Both mean and standard deviation were used to represent the continuous variables, such as age. All categorical data were provided as percentage and frequency,

including the kind of tumor and diagnostic accuracy measures.

For accurate measures; true positive (TP) was defined as, an established case of the positive lesion from histopathological examination and both the ultrasound and FNAC), true negative (TN) was considered when a benign lesion was diagnosed through histopathology. Likewise, an established case of malignancy via ultrasound and a negative result on histopathology was described as false positive (FP). Lastly, False-negative (FN) was characterized as a negative malignancy case on ultrasound that turned out to be positive in histopathological examination.

The frequency of TP was divided by the sum of TP + FN to calculate the sensitivity, while TN was divided by the sum of TN + FP to obtain specificity. TP was divided by TP + FP for positive predictive value (PPV), while TN was divided by TN + FN for negative predictive value (NPV). Furthermore, the diagnostic accuracy was computed by adding TP and TN in all of the patients.

RESULTS

A total of 210 patients were enrolled in the study on the basis of Mammography. Out of 210 patients, 130(61.9%) patients were considered as malignant and 80(38.1%) patients as benign lumps. The patients with suspected malignancy had a median age of 52 years (35-75). The majority of the patients i.e. 48(36.9%) with malignant lesions were between the age of 46-55 years.

In patients with benign lumps, the median age was 50(35-75). One-half of the patients with benign lesions i.e. 40(50%) were between 35-45 years of age. were 50%, 46-55 years were 18.75%, 56-65 years were 16.25% and 66-75 years were 15%.

Tables-I and II illustrate the diagnostic accuracy of mammography. It was found that mammography accurately detected 124(95.38%) cases out of the 126 cases (Table-I). In fact mammography overdiagnosed 6 cases which were negative on histopathology.

Table-I: Diagnostic Parameters of Mammography keeping Histopathology as Gold Standard

	Histopathology (Gold Standard)	
	Positive	Negative
Mammography		
Positive	124(95.38%)	6(4.62%)
Negative	2(2.50%)	78(97.50%)

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Diagnostic accuracy of Mammography was 96.19%, taking histopathology as standard investigation. The sensitivity, specificity, positive predictive value, and negative predictive value, were 98.41%, 92.86%, 95.38%, and 97.50%, respectively (Table-II).

Table-II: Diagnostic Accuracy Indices of Mammography keeping Histopathology as Gold Standard

Diagnostic Parameters	Values
Sensitivity = True Positive/(True Positive +False Negative)	98.41%(94.38% to 99.81%)
Specificity = True Negative/(True Negative +False Positive)	92.86%(85.10% to 97.33%)
Positive Predictive Value = True Positive/(True Positive+False Positive)	95.38%(90.53% to 97.81%)
Negative Predictive Value = True Negative/(True Negative +False Negative)	97.50%(90.78% to 99.36%)
Diagnostic Accuracy = (True Positive +True Negative)/All Patients	96.19%(92.63% to 98.34%)

The majority of the patients i.e. 60(28.57%) belonged to BIRADS IV category. The individual distribution with respect to BIRADS is illustrated in Table-III.

Table-III: BIRADS Categories on the Basis of Mammography Report.

BIRADS Categories	No of patients (out of 210)
BIRADS I	34(16.19%)
BIRADS II	28(13.33%)
BIRADS III	18(8.57%)
BIRADS IV	38(18.09%)
BIRADS V	60(28.57%)
BIRADS VI	32(15.23%)

DISCUSSION

Breast cancer is the leading cause of death all over the world. In our country there is no clear cut data for incidence. Breast cancer is common above 40 years of age, incidence between 41-50 years is commonest.⁹ In this study the Peak occurrence was fifth decade and mean age was 52 years.

Self-Breast examination and the clinical examination by a trained health professional is a reliable screening tool. Takalkar *et al.*, revealed in his study that patients with breast cancer is usually presented with lump (100%), lump with pain (5%) and nipple discharge (0.38%).¹⁰ In this study 4 out of 130 patients (3.07%) had mastalgia along with the lump. We reported the diagnostic accuracy of mammography as 96.19% while the sensitivity and specificity were 98.41% and 92.86%, respectively.

Physical examination is an important part of the triple assessment. Malignant lumps are irregular

marginated and surfaced, firm to hard in consistency, with skin dimpling, tethering, Peud' orange appearance, fixed to the skin, muscle and chest wall. There can be associated axillary lymph nodes palpable which are fixed and hard are also suggestive of breast cancer. Huang *et al.*, revealed that out of over three thousand participants that were screened, 33 breast cancers were diagnosed. With mammography a total of 28 cancers were detected while ultrasound detected 24. Furthermore, the authors found that by paralleling mammography with ultrasound, highest sensitivity for breast cancer screening (93.9%) was attained.¹¹ However, Zafar *et al.*, reported that with the help of clinical examination, breast cancer can be detected in 66.66% of patients.¹² Certain alarming clinical signs including the fungating lesions and locally advanced disease are vital signs for malignancy.¹³ Clinical examinations have a significant diagnostic role. We should train our general practitioners for clinical breast examination so that investigations are advised and cases of breast cancer can be detected at early stages and cured.

Brown *et al.* revealed that mammography proved to be an effective tool to evaluate breast lumps. In about 27(35.0%) of 77 malignant lumps, mammography aided by delineating the extent of the disease and also helped in the evaluation of 26 of 858 benign lumps. About six percent of patients had incidental findings that led to a need for further evaluation. Interestingly, according to their study about 23 of the 52 cases were originally diagnosed with ultrasound only. However, the use for mammography remained important as it also showed evidence of incidental malignancies in areas which were nonpalpable while ultrasound could only detect one incidental malignancy.¹⁴ In contrast to Brown *et al.*, Devolli-Disha E reported that ultrasound findings were true positive in 97.5% and false negative in only 2.5% cases.¹⁵ In another study authored by Haghghi in 2017, ultrasonography sensitivity was found to be as high as 95.53%.¹⁶ Mammography is a strong diagnostic tool for breast cancer detection, for screening purposes and recurrence of breast cancer.¹⁷ Taking BIRADS IV-A or higher as a positive standard, accuracy, sensitivity, and specificity of mammogram is 87.40%, 90.80% and 84.60% respectively.¹⁸ MRI is another useful imaging modality for diagnosis of breast cancer specifically for recurrence. There is no difference between ultrasound and MRI image compared to histopathological results.¹⁹ In this study, 124 out of 130 patients were proved to be malignant on histopathological

investigations, which were provisionally diagnosed on mammography as breast cancer, with the false positive results in only 6 patients. BIRADS V was commonest (28.57%), with false negative result in 2.5% (2 out of 80 patients provisionally diagnosed as benign). In triple assessment, radiological investigation has a significant role and is cost effective.

Biopsy must be done in all the patients with suspected malignancy to detect cancer at early stages. Every lump should be considered malignant and confirmed by histopathology. Only disadvantage is the scar mark. Histopathology is most significant for diagnosis. Sensitivity is 100% for core biopsy and 95% for FNAC.²⁰

Our study findings coincided with existing literature and revealed mammography to be diagnostically crucial for suspected breast cancer cases. Considering that Pakistan is a resource constrained country, it would be more cost-effective to perform ultrasound followed by mammography where indicated.

LIMITATION OF STUDY

The study had certain limitations. Due to the fact that the study was only conducted in one single center, relying on the current findings to devise strategies to combat breast cancer would be inadvisable. Since, the undiversified and small sample size leads to bias thus rendering the study unfit for generalizing the findings to the entire population. We recommend that further large-scale studies with diversified sample size should be conducted to explore the subject in a more comprehensive manner.

CONCLUSION

Mammography has a significant role to detect the cancer of the breast in early stages and has the key role for better outcomes.

Conflict of Interest: None.

Funding Source: None.

Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

SL & SP: Study design, drafting the manuscript, data interpretation, critical review, approval of the final version to be published.

MI & TA: Data acquisition, data analysis, approval of the final version to be published.

KMB & JAS: Critical review, concept, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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