Comparison of Sonographic Findings with Diagnostic Mammography

Birendra Raj Joshi,[1] Bishnu Paudel,[1] Anamika Jha[1]

Department of Radiodiagnosis and Imaging, TU Teaching Hospital ,Maharajganj, Kathmandu, Nepal.

ABSTRACT

Background: Breast cancer is the leading female cancer worldwide with a high mortality rate. Early detection of the suspicious lesion is crucial for better prognosis. Higher breast density decreases the sensitivity of mammogram. Ultrasound can differentiate between cystic and solid masses and further characterize these as benign or possibly malignant. Our objective was to compare the findings of sonography with diagnostic mammography.

Methods: This was a cross sectional study including 125 females who underwent diagnostic mammogram in a tertiary care center. The mammograms were evaluated and the patients were scanned by ultrasound and categorized as per ACR- BIRADS category. The findings of diagnostic mammography were compared with that of ultrasonography using SPSS version 25.

Results: The heterogeneously dense breast in diagnostic mammography corresponded to the heterogenous-fibroglandular breast in ultrasonography. In majority, ultrasound increased the BIRADS category for the lesion than designated by the diagnostic mammography. It was particularly useful for category 0 and 3 lesions which were indeterminate and required further imaging.

Conclusions: Ultrasound was useful in evaluation of dense breasts with ACR-BIRADS 0 and 3 in diagnostic mammogram. For category 3 and 4 in diagnostic mammogram, ultrasound showed category 1 or 2 lesions which aided to alleviate patient anxiety and avoid unnecessary biopsies. With emerging technological advances in ultrasound, it can used as a powerful tool for breast lesion detection and patient management.

Keywords: Breast density; diagnostic mammogram; ultrasonography.

INTRODUCTION

Breast cancer is the second most common (17.1%) malignancy among Nepalese women.[1] Worldwide, breast cancer accounts for almost one-fourth of all cancers, incidence being 24.5% and related mortality of 15.5%.[2]Mammography is the primary breast cancer screening tool and has demonstrated evidence in reduction of breast cancer mortality. Dense breast as well as malignant tissue both appear white on mammograms.[3] Dense tissue is echogenic on ultrasound, while breast cancer being hypoechoic and stands out in ultrasound (US). US leverages the differences in tissue characteristics to improve cancer detection in women with dense breasts.

In addition, dense breast tissue may mimic breast cancer on mammography, which increases recall rates, reduces specificity, and compromises the benefit of screening in women with dense breasts.[4]

The objective of the study was to compare Breast Imaging Reporting & Data System (BIRADS) categories of both diagnostic mammogram (DM) and Ultrasonography of breast.

METHODS

This cross-sectional observational study was performed in Department of Radiology and Imaging of a tertiary hospital in Kathmandu from July 2020 to July 2021. All female patients undergoing diagnostic mammogram were included in the study. The study was done in 125 females of different age groups (29 to 80 years) who were referred for diagnostic mammography and subsequently

Correspondence: Dr Bishnu Poudel, Department of Radiodiagnosis and Imaging, TU Teaching Hospital, Maharajganj, Kathmandu, Nepal. Email: swasulav@gmail.com.

underwent breast ultrasonography. Administrative approval of research was taken from the Institutional Review Board, Institute of Medicine. The patients were explained about the study and were included in the study after obtaining the written informed consent form. Patient's confidentiality was maintained throughout the study.

Patients with complains of breast lesions from clinical examination were sent for diagnostic mammogram. They were taken to the US Room for breast sonography. Female undergoing screening mammography, known case of malignancy or BIRADS 6, male patients undergoing mammography were excluded.

Digital mammography unit (MAMMOMAT Fusion) in the department was used. Standard mammographic views were taken for every patient along with additional views in required. The mammograms of all patients were evaluated on Syngovia work station YLXRO19095 visually using appropriate magnification tools, for density and findings based on which appropriate ACR-BIRADS category was assigned. Patients were evaluated further with sonography using high frequency (5-13 MHz) probes on Medison Acuvix A30 or Siemens S1000 units. Patients were placed in supine followed by oblique positions with arms raised and placed under the head, ensuring the coverage of all the areas. A US linear probe, lubricated with gel, was placed on the breast gently. Sonography was done in B-mode and colour Doppler was used to assess vascularity. All breast quadrants, axilla and reteroareolar region were scanned. Sonographic findings and appropriate ACR-BIRADS categories were recorded. Finally, the age, US findings along with BIRADS category and diagnostic mammogram findings along with BIRADS category was tabulated and data was analysed.

Data obtained were compiled and analyzed according to as a descriptive study. Statistical Package for the Social Sciences (SPSS) version 20 and Microsoft Excel were utilized for the data analysis and presentation.

RESULTS

The study was conducted in 125 patients with mean age of the participants 46.25 and standard deviation of 8.629. The minimum and maximum age of the participants was 29 and 80 respectively. As there is increased incidence of breast cancer in females amongst 40 years, the age of participants is categorized as upto 40 years, 41 to 60 years and above 60 years.[Fig.1]

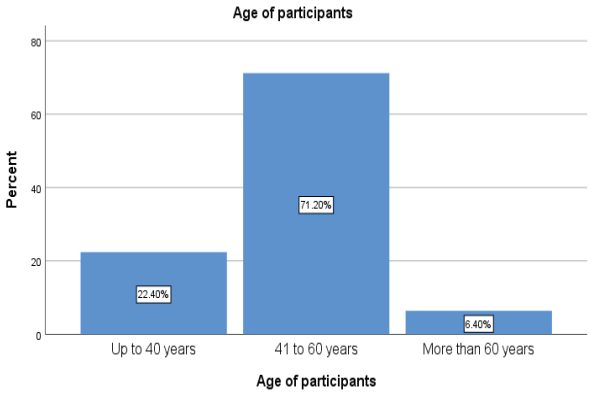

Figure 1. Bar diagram showing Age group distribution.

The study showed that right breast is the most commonly involved (40.8 %) with equal (29.6 %) involvement of left and bilateral breasts. Lump was the most common indication of examination in right and left breast whereas pain was the most common complaint in both breast examinations.

Majority (93/125; 74.4%) of breast evaluated by ultrasound were homogenous fibroglandular in composition of which 41-60 years old females constituted the highest number (66) accounting for 52.8% of total females evaluated.

Out of 125 cases, there were 38 cases in which the BIRADS category allocated by the US and diagnostic mammogram were equal. Amongst it, BIRADS equivalence of Category 1 was most commonly (9.6% of total 125 and 31.5% of 38 same category) found. It was followed by the equal detection percentage by category 3 and 5 (5.6% of total 125 and 18.4% of 38 same category). Similarly, category 2 and 4 shared same detection percentage (4.8% of total 125 and 15.7% of 38 same category). [Table 1]

Table 1. Number of equal BIRADS category.

Diagnostic Mammogram BIRADS	US BIRADS	Number of equal evaluation
Category 1	Category 1	12
Category 2	Category 2	6
Category 3	Category 3	7
Category 4	Category 4	6
Category 5	Category 5	7
Total		38

Higher BIRADS category allocation by US was seen in total 47 cases that comprised 37.6%. The category

0 comprised of 22 cases which were subsequently allocated BIRADS 1, 2, 3 and 4 after US evaluation. In 9 cases the US showed normal findings whereas simple and complex cyst were found in 7 and 4 cases out of total 22 cases. One suspicious mass was detected for Category 0 allocated in diagnostic mammogram. The incomplete Category 0 study in diagnostic MG was either due to heterogeneously dense or very dense breast which lowered the sensitivity of mammogram and warranted further evaluation. US allocated category 4 for 12 cases that were given Category 3 by diagnostic MG. There was better study of asymmetric density by US with lesion characterization. [Table 2]

Table 2. Higher BIRADS category allocation.

Diagnostic Mammogram BIRADS	US BIRADS	Number of higher evaluation
Category 0	Category 1	9
Category 0	Category 2	7
Category 0	Category 3	5
Category 0	Category 4	1
Category 1	Category 2	5
Category 1	Category 3	3
Category 2	Category 3	2
Category 3	Category 4	12
Category 4	Category 5	3
Total		47

Table 3. Lower BIRADS allocation.

Diagnostic Mammogram BIRADS	US BIRADS	Number of lower BIRADS allocated
Category 2	Category 1	10
Category 3	Category 1	8
Category 3	Category 2	20
Category 4	Category 3	1
Category 5	Category 4	1
Total		40

Total of 40 of 125 cases had been designated lower US BIRADS category in comparison to higher BIRADS category allocated by Diagnostic mammogram. For 20/125 cases categorized as BIRADS 3 by diagnostic mammogram, category 2 was allocated after adequate evaluation. These primarily comprised of asymmetric densities and suspicious 4a and 4b lesions diagnosed by diagnostic mammogram which came to be cystic lesions, lipoma, duct ectasia. Hence, suspicious lesions were averted from the possible histopathological examination and alleviated the patient's concern. [Table 3]

DISCUSSION

Majority of the indeterminate lesion indicated by mammogram were either normal or benign. Asymmetry present in the heterogeneously dense breast was found to be either normal fibroglandular tissue or other benign findings like simple cyst, fibrocystic disease. Contrary to the 3.3% incidence of asymmetric breast density in mammogram, our study showed higher number of asymmetry (31/125, 24.8%).[5,6]These densities were downgraded by US in category 1 or 2 accounting 22.4% (28/125). These findings were either summation artifact or benign cystic conditions.[7]

Echogenic fibrous tissue masks the calcification which are easily detected in mammogram, unless they are in cluster or present within the mass.[8] In our study, mammogram with BIRADS 2 category due to presence of benign calcifications were categorised as BIRADS 2 and 1by US in 5/125 cases due to presence of simple cyst and 5/125 being normal findings respectively. Only 2 cases with calcifications had duct ectasia.

Asymmetry comprised the majority (31/125) of BIRADS category 3 amongst other breast densities of suspicious pathology on mammogram. These densities, upon US evaluation were found to be of same BIRADS 3 category in 7 out of 38 equivalent scan, showed higher BIRADS Category 4 in 12 out of 47 higher scan and resulted in 20 and 8 scans of category 2 and 1 respectively in lower BIRADS allocated scan. Simple cyst (12/31), normal scan (4/31), ductal ectasia (3/31) and complex cyst (1/31) were obtained result in the study. Measurement of the size, location, margin, multicentricity and multifocality of the lesion along with the solid/ cystic nature helped to categorize the US-BIRADS category and advice for periodic follow up. In rest of the cases, the characters of the mass were used to indicate for histopathological diagnosis. Compared to study by Sperber et.al, the percentage of normal scan among the non-solid findings (4/29; 13.7%) was similar to their study of 14.5%.[9]

DM-BIRADS category 0 were allocated with higher US-BIRADS category in our study. Majority of the incomplete study in diagnostic mammogram were found to be normal (9/22) followed by US-BIRADS category 2, which consisted of simple cyst (7/22), complex cyst (4/22). Out of 15 cases evaluated as asymmetry in mammogram, US showed 11 simple cyst followed by prominent duct (2/15). Rest of the 5 cases diagnosed as mass as categorized as BIRADS 3 were found to be simple cyst. These findings in mammogram were allocated for breast density c. So, the usefulness of ultrasound on detection and characterization of lesion in dense breast cannot be

underestimated.[10]

However for mass categorized as BIRADS 5, US also categorized them as BIRADS 5. The additional benefit of US was demonstrating the satellite nodules, evaluation of axillary lymph nodes and determination of biopsy site for high yield. The vascularity of lesion as demonstrated by colour Doppler was crucial as malignant mass are highly vascular. Mammogram completely lags behind in demonstration of this physiological property of the malignant mass.

Lack of incorporation of histopathological diagnosis to the US and DM findings were the major shortcomings of the study. Apart from being operator dependent, sonographic evaluation of lesion demands expertise and experience on part of examiner.

CONCLUSIONS

Ultrasound was quite useful in evaluation of dense breasts with ACR-BIRADS 0 and 3 in diagnostic mammogram. For a higher category 3 and 4 in diagnostic mammogram, the US evaluation revealed either category 2 or 3 lesions which can alleviate the anxiety of patient and avoid unnecessary biopsies. Ultrasound has the ability to further characterize the suspicious lesion seen in diagnostic MG along with its multifocality and multicentricity with adequate evaluation of axillary lymphadenopathy.

REFERENCES

1. WHO. The Global Cancer Observatory: Nepal factsheet. Int Agency Res Cancer [Internet]. 2021;505:2020–1. Available from: https://gco.iarc.fr/today/data/factsheets/cancers/10_8_9-Colorectum-fact-sheet.pdf

2. Sung H, Ferlay J, Siegel RL, Laversanne M, Soerjomataram I, Jemal A, et al. Global Cancer Statistics 2020: GLOBOCAN Estimates of Incidence and Mortality Worldwide for 36 Cancers in 185 Countries. Vol. 71, CA: A Cancer Journal for Clinicians. 2021. p. 209–49.doi: https://doi.org/10.3322/caac.21660

3. Zhao H, Zou L, Geng X, Zheng S. Limitations of mammography in the diagnosis of breast diseases compared with ultrasonography: a single-center retrospective analysis of 274 cases. European journal of medical research. 2015 Dec;20:1-7.doi: https://doi.org/10.1186/s40001-015-0140-6

4. Youk JH, Kim EK. Supplementary screening sonography in mammographically dense breast: Pros and cons. Korean J Radiol. 2010;11(6):588–93. doi: https://dx.doi.org/10.3348%2Fkjr.2010.11.6.589 PMCID: PMC2974219 PMID: 21076583

5. Sickles EA, D'Orsi CJ, Bassett LW, Appleton CM, Berg WA, Burnside ES. Acr bi-rads® mammography. ACR BI-RADS® atlas, breast imaging reporting and data system. 2013 Feb;5:2013..

6. Zare Z, Faghihi Langroudi T. Findings of breast sonography in patients with foal asymmetric breast density on mammography. Iran Red Crescent Med J. 2011;13(6):404-6. Epub 2011 Jun 1. PMID: 22737502; PMCID: PMC3371928.

7. Winkler NS, Birdwell RL, Giess CS. Developing Asymmetries at Mammography. RadioGraphics. 2016;(Cc):322–34.doi: https://doi.org/10.1148/rg.2016150123

8. An YY, Kim SH, Kang BJ. The image quality and lesion characterization of breast using automated whole-breast ultrasound: A comparison with handheld ultrasound. Eur J Radiol [Internet]. 2015 Jul 1 [cited 2021 Nov 22];84(7):1232–5. doi: 10.1016/j.ejrad.2015.04.007 PMID: **25975896**

9. Sperber F, Metser U, Gat A, Shalmon A, Yaal-Hahoshen N. Focal asymmetric breast density: Mammographic, sonographic and pathological correlation in 97 lesions - A call to restrain biopsies. Isr Med Assoc J. 2007;9(10):720–3. PMID: 17987760

10. Samardar P, Shaw De Paredes E, Grimes MM, Wilson JD. Focal asymmetric densities seen at mammography: US and pathologic correlation. Radiographics. 2002;22(1):19–33. doi: 10.1148/radiographics.22.1.g02ja2219 PMID: **11796895**