Breast carcinoma among patients undergoing breast ultrasonography in a tertiary care center: A descriptive cross-sectional study

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Abstract

Introduction: Ultrasonography (USG) is one of the modality of choice for detection of breast lesions due to its advantage over radiation exposure, differentiation between solid tumor and cyst filled with fluid, especially for imaging of young age females. The aim of the study is to find out the prevalence of breast cancer among the patients undergoing scanning of USG and estimate its sensitivity, specificity and accuracy to detect breast lesion in comparison with histopathology. **Materials and Methods:** A descriptive cross-sectional study was conducted from 15th April to 10th September, 2022. A sample size of 426 was taken in convenience sampling method. Collected data were entered and analyzed on SPSS 25.0. Sensitivity, specificity and accuracy of USG to detect breast lesion in comparison to histopathology findings. **Results:** Among 426 patients sample coming from OPD, breast cancer was seen in 53 (12.44%) patients. Among 426, 418 were female and 8 were male patients. Age ranged from 13-75 years. The sensitivity, specificity, negative predictive value, positive predictive value and accuracy of USG to detect breast lesion are 94%, 100%, 94.23%, 100% and 97% respectively. **Conclusion:** The sensitivity, specificity, negative predictive value, positive predictive value and accuracy of USG to detect breast lesion is quite high. USG is highly recommended in examination of breast lesions.

Keywords: Breast Carcinoma, Fibroadenoma, Mastalgia, Ultrasonography (USG)

Introduction

Breast cancer is an emerging public health problem in developing countries. It accounts for more than 1 in 10 new cancer diagnoses each year.[1] It is the second most common cause of death among women after heart disease.[2] As of 2021, breast cancer was the most common type of cancer in the world, accounting for 12% of all new cancer cases according to World Health Organization.[3]Youlden *et al* [4]found that breast cancer was the most prevalent cancer among women in Asia also. Breast cancer has gradually increased over the past ten years, and it is currently also one of the common cancers of women in Nepal. Mortality is 12.7 per 100,000 women, and the age-adjusted rate is as high as 25.8 per 100,000.[4] The development of efficient screening techniques has made it feasible to identify breast cancer early in different countries.[5] Early detection of breast cancers have better prognosis. Early-stage cancers have 5-year survival rate of 100%. Stage II and stage III breast cancer have 5-

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year survival rates of roughly 93% and 72%, respectively. Only 22% of stage IV breast cancer patients will make it through the following five years follow up.[1]

The long-term mortality rates from breast cancer could be lowered by early identification of cancer. The most important step for the best prognosis includes finding cancer at an early stage. The main approaches for early diagnosis is triple test, which includes clinical examination, imaging in the form of Ultrasonography/ Mammography and pathology test in the form of cytology (Fine needle aspiration cytology (FNAC) or trucut biopsy.[6] Ultrasonography (USG) is a non-invasive diagnostic tool without ionizing radiation for breast lesion. Especially in young females with dense breast parenchyma, USG has better performance. This is safe in pregnant women as well. Due to advancement in technology, use of Ultrasound toward oncology is increasing. It increases the likelihood of finding both benign and malignant breast lesions.[7] Also being in Nepal, a low to medium income country, ultrasound is regarded as a feasible tool for screening of palpable breast lesions.[8] A study conducted by Gonzaga MA found the sensitivity for detecting breast lumps to be 92.5%. Additionally, the sensitivity and specificity to detect breast cancer was 57.1% and 62.8% respectively.[9] Furthermore, the positive and negative predictive value was found to be 68.1% and 99.5% respectively. As Ultrasonography is easily accessible in different clinics and being a painless imaging technique, its use is handy.

In our present study, we have evaluated the diagnostic accuracy of USG in breast diseases in B. P. Koirala Memorial Cancer Hospital.

Method

Study Design and Study Population

A descriptive cross-sectional study was conducted in the Department of Radio-diagnosis, Imaging & Nuclear Medicine and Department of Pathology of BP Koirala Memorial Cancer Hospital, Bharatpur, Nepal. This study was conducted between 15th April 2022 to 10th September, 2022 and 426 populations were included. This study was conducted among patients who came for Ultrasound (USG) exam of breast from OPD. A convenience sampling was done to get sample size of 426. All suspicious cases underwent Fine Needle Aspiration Cytology (FNAC) or trucut biopsy for conformal diagnosis.

Only those patients who came for ultrasound breast examination from OPD were consecutively included in our study. Minimum sample size was calculated using below formula

$$n = Z^2 \; x \; \frac{p \; x \; q}{e^2}$$

$$= 303$$

Where, n= minimum required sample size Z= 1.96 at 95% Confidence Interval (CI)

p= prevalence of the disease, 12.44%

[Prevalence of the diseases (p) =$\frac{T_{disease}}{Total}$ X 100]

q= 1-p and e= margin of error, 2%

The required minimum sample size calculated was 303. In this Study, 426 patients were enrolled. All the clinical details related to patients were collected with informed consent.

Sensitivity, Specificity and Accuracy were calculated using following formulas: -

True positive (TP) = Patient with both Ultrasonography and Histopathology report positive

False positive (FP) = Patient with Ultrasonography positive but Histopathology negative

True negative (TN) = Patient with both Ultrasonography and Histopathology report negative

False negative (FN) = Patient with Ultrasonography negative but Histopathology positive

Accuracy: The accuracy of a test is its ability to differentiate the patient and healthy cases correctly. To estimate the accuracy of a test, we should calculate the proportion of true positive and true negative in all evaluated cases. Mathematically, this can be stated as:

$$Accuracy = \frac{TP + TN}{TP + TN + FP + FN}$$

Sensitivity: The sensitivity of a test is its ability to determine the patient cases correctly. To estimate it, we should calculate the proportion of true positive in-patient cases. Mathematically, this can be stated as:

$$Sensitivity = \frac{TP}{TP + FN}$$

Specificity: The specificity of a test is its ability to determine the healthy cases correctly. To estimate it, we should calculate the proportion of true negative in healthy cases. Mathematically, this can be stated as:

$$Specificity = \frac{TN}{TN + FP}$$

Data were entered and analyzed in IBM SPSS Statistics version 25.0. Point estimate at 95% Confidence Interval was calculated along with frequency and percentage for binary data and mean with standard deviation for continuous data.

Results

Among the total 426 patients, there were 418 female and 8 male patients, with age ranging from 13-75 years (Mean 37.45 with Std. Deviation 11.82%) years. All had Ultrasonography (USG) as a diagnostic work up. Breast Carcinoma was diagnosed in 53 (12.44%), (95% CI) cases. Among the 53 patients with Breast Carcinoma, the most common breast carcinoma were *Invasive ductal carcinoma* 43 (81.13%), followed by Intra-d*uctal carcinoma* in 7 (13.2%) and *Inflammatory Breast Carcinoma in 3* (5.66%) patients [Table No 1].

Table 1: Histopathological findings of all 53 patients	Total
Ductal Carcinoma	7
Inflammatory Carcinoma	3
Invasive ductal Carcinoma	43
Total	53

Patients who were included in this study have various complain related to breast but major complains are breast pain, painful lump, painless lump, nipple discharge, nipple erosion, axillary discharging sinus and burning breast. All the characteristics of a patient's complains are summarized in table 2.

Table 2: Summary of all Major Complain of all 426 Patients		
	Frequency	Percent%
Breast Pain	225	52.8
Nipple Discharge	23	5.4
Nipple Erosion	1	.2
Painful Lump	109	25.6
Painless Lump	65	15.3
Axillary Discharge Sinus	1	.2
Burning Breast	2	.5
Total	426	100.0

There are various characteristics of USG finding found of all patients. Among all 426 patients, most number of 117 (27.5%) are normal. All the

characteristics of Ultrasonography (USG) Findings are summarized in table 3.

Among the 426 patients who participated in this study, only a total of 102 patients underwent for histopathological test. Some of them histopathological tests are advised by radiologist & clinician and some of them gone their own request. Most histopathological finding among total 102 patients are invasive carcinoma 43 (42.15 %) and fibroadenoma 19 (18.62%). All the characteristics of Histopathological findings are summarized in table 4.

Table 3: Summary of all USG findings of all 426 Patients		
	Frequency	Percent %
Normal	117	27.5
Fibroadenosis	15	3.5
Fibrocystic changes	22	5.2
Prominent Fibro-fatty Tissue	40	9.4
Galactocele	2	.5
Gynaecomastia	7	1.6
Hidradentis	4	.9
Inflammatory Carcinoma	1	.2
Invasive Carcinoma	40	9.4
Lipoma	8	1.9
Mastitis	27	6.3
Axillary Lymphadenopathy	32	7.5
Papillary Neoplasm	1	.2
Complex Cyst	2	.5
Benign Lesion	9	2.1
Breast Abscess	9	2.1
Cyst	15	3.5
Dense Breast	5	1.2
Ductal Carcinoma	7	1.6
Ductal Ectasis	19	4.5
Fibroadenoma	44	10.3
Total	426	100.0

All 102 patients who underwent histopathological test (Fine Meddle Aspiration Cytology FNAC and True Cut Biopsy), only 53 patients are positive for breast carcinoma. After comparing USG findings with histopathological reports, 49 patients were true negative (TN), 50 patients were true positive (TP), 3 patients were false negative (FN), no one is false positive (FP). The sensitivity, specificity, negative predictive value, positive predictive value and accuracy of USG to detect breast lesion are 94%, 100%, 94.23%, 100% and 97% respectively. Characteristics of clinical findings of all 53 positive patients are summarized in table 5.

Table 4: Summary of all Histopathology findings of all 102 Patients		
	Frequency	Percent %
Invasive Carcinoma	43	42.2
Inflammatory Carcinoma	3	2.0
Lobule of adipocytes	2	2.0
Lymphadenopathy	1	1.0
Mastitis	7	6.9
Gynaecomastia	3	2.9
Fibroadenoma	19	18.6
Benign Breast Disease	8	7.8
Breast Abscess	3	2.9
Breast Cyst	2	2.0
Ductal Carcinoma	7	6.9
Ductal Ectasia	2	2.0
Fat Necrosis	1	1.0
Galactocele	2	2.0
Total	102	100.0

The prevalence of breast cancer of patients underwent screening was found quite higher and it recommended that more screening should followed up for patients have breast related complain. The sensitivity, specificity and accuracy of Ultrasonography (USG) in compare with Gold Standard test (Histopathology) to detect breast carcinoma are very good so this study extremely recommend Ultrasonography (USG) screening for breast carcinoma screening.

Table 5: Efficacy of USG in compare with Gold Standard Test	
True Negative (TN)	49

True Positive (TP)	50
False Negative (FN)	3
False Positive (FP)	0
Accuracy	97%
Sensitivity	94%
Specificity	100%
Positive Predictive Value	100%
Negative Predictive Value	94.23%

Discussion

Breast cancer remains a worldwide public health problem and is currently the most common tumor in females around the globe. Awareness of breast cancer and advancement in breast imaging has made a positive impact on recognition and screening of breast cancer. Breast cancer is life-threatening disease in females and the leading cause of mortality among them. For the previous two decades, studies related to breast cancer has guided to astonishing advancement in our understanding of the breast cancer, resulting in further proficient treatments. Amongst all the malignant diseases, breast cancer is considered as one of the leading causes of death in post-menopausal women accounting for 23% of all cancer deaths.[10] Prevention and early detection of disease is the only solution to reduce mortality.

Despite awareness, some cancers are still diagnosed in their advanced stages. Self-breast examination, and clinical examination though easy, but are not widely performed. One useful tool in breast cancer screening imaging is Ultrasonography (USG). Since a breast ultrasound does not use radiation, it is generally safe for people who need to avoid x-rays. It increases the likelihood of finding of both benign and malignant breast lesions especially in young females.[7]

According to a systematic meta-analysis conducted in Nepal, the pooled estimates demonstrated that the overall knowledge of breast self-examination and awareness were inadequate. Therefore, prompt capacity building measures i.e., awareness, knowledge of self-breast examination are the crucial steps in intervention.[11] For Imaging part, according to some research articles, Ultrasonography (USG) can overcome the limitations of mammography in some patients. It's also portable and technically not challenging in interpretation as well. So, USG has also been used extensively for the screening and diagnosis of breast cancer, with a high sensitivity of 76% and specificity of 84%.[12] Screening with USG increases the breast cancer detection rate in women at average risk. Additionally, breast magnetic resonance imaging (MRI) can be a valuable supplement to mammography and USG. It has been reported in several studies that MRI provides considerable increased detection in high-risk women than combination of USG and MG screening, with some disadvantage of more false-positive results.[12] Our study can nicely show that sensitivity, specificity and accuracy of ultrasound are better. We need to be cautious in the sense that we carried out this study in the OPD patients of a cancer hospital, and not is a mass testing setup. It looks like with proper interpretation training, USG breast can give good yield.

Conclusion

The use of USG in breast diseases is a very good option. It has high sensitivity, specificity and accuracy in detecting even breast cancers. Since breast ultrasound does not use radiation and investment wise economic, It may well serve as a good screening tool in our national scenario.

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