

## Prevalence and Sonographic Characteristics of Focal Breast Lesions in Clinically Suspected Patients at Khyber Teaching Hospital, Peshawar

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### Abstract

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Breast lesions are a significant clinical concern worldwide and may be associated with considerable morbidity and mortality. With the advancement of ultrasonography, it has become possible to characterize benign cysts and solid masses with a high degree of confidence. Ultrasonography is particularly useful in women with dense breast tissue, where small, non-palpable masses may not be detected clinically but can be identified using ultrasound imaging.

The present study was conducted to determine the prevalence and sonographic characteristics of focal breast lesions and to differentiate benign and malignant lesions using sonography. This cross-sectional study was conducted in the Department of Radiology, Breast Imaging Section, Khyber Teaching Hospital (KTH), Peshawar.

Ultrasonography was performed to evaluate patients presenting with various breast symptoms. Patient data were assessed using clinical history and examination. A structured questionnaire was used to collect relevant information, including demographic details, medical history, and ultrasound features. Data analysis was performed using SPSS, and results were presented as frequencies and percentages. A total of 206 cases were evaluated, of which 69 (69%) were normal and 31 (31%) had focal breast lesions. Most female patients were in the age groups 17–30 years (15.5%), 31–50 years (55.82%), 51–70 years (27.7%), and 71–90 years (1.0%). Lesions were more common in the right breast (21%) than the left breast (10%). The upper outer quadrant was the most frequently involved site (13%), followed by the upper inner quadrant (7%), lower outer quadrant (6%), and lower inner quadrant (5%). Benign breast lesions (n=17) were mainly categorized as U2 and U3, with round (11%) and oval (7%) shapes. Malignant lesions (n=14) were categorized as U4 and U5, typically showing irregular (9%) and lobulated (4%) shapes. Most lesions were cystic (14%), solid (7%), and complex (10%), with echogenicity patterns including hypoechoic (11%), anechoic (5%), isoechoic (6%), and hyperechoic (9%). The study demonstrated that ultrasound is an effective modality for identifying and characterizing breast lesions. It helps differentiate solid from cystic lesions and benign from malignant lesions based on shape, echogenicity, and other sonographic features.

**Keywords:** Breast lesions, Ultrasonography, Sonographic characteristics, BI-RADS, Prevalence

### Introduction

Breast lesions represent a heterogeneous group of conditions ranging from benign abnormalities to malignant tumors, with varying clinical presentation, imaging characteristics, and biological behavior. Breast cancer remains one of the most common malignancies among women worldwide and is a leading cause of cancer-related mortality. Increasing awareness, improved screening practices, and better diagnostic facilities have led to a rise in the number of patients presenting to breast clinics with symptoms such as palpable lumps, breast pain, nipple discharge, and asymmetry. Early and accurate evaluation of these symptoms is essential to differentiate benign from malignant lesions and to guide appropriate management (Mukhtar et al., 2021; Kevin et al., 2020). The appearance of a breast lump often causes significant anxiety for patients and their families. The primary goal of clinical evaluation of a breast lump is to exclude malignancy. The standard approach to breast lump assessment includes detailed history, clinical examination, imaging, and tissue diagnosis, commonly referred to as the triple assessment. Although histopathology remains the gold standard for diagnosis, studies

have shown that approximately 70–80% of palpable breast lesions are benign. Therefore, non-invasive imaging modalities play an important role in reducing unnecessary biopsies and guiding management decisions (Takhellambam et al., 2013; Rakha et al., 2016).

Ultrasonography is widely used as a primary imaging modality for evaluation of breast lesions, particularly in younger women and those with dense breast tissue. The ability of ultrasound to differentiate cystic from solid lesions, assess lesion margins, shape, orientation, posterior acoustic features, and vascularity makes it a valuable diagnostic tool. In addition, ultrasound is radiation-free, relatively inexpensive, widely available, and well tolerated by patients. These advantages make it especially useful in resource-limited settings and in symptomatic patients presenting for initial evaluation (Sadeghi et al., 2017; Mohammad et al., 2020). Breast imaging findings depend on differences in tissue density and acoustic impedance between lesions and surrounding breast parenchyma. Ultrasonography is particularly helpful in detecting small, non-palpable lesions in women with dense breasts where mammography sensitivity is reduced. Several studies have demonstrated that combining ultrasound with mammography improves detection rates and diagnostic accuracy, especially in dense breast tissue. Ultrasound also plays a complementary role in characterizing lesions detected on mammography and guiding interventional procedures such as fine needle aspiration cytology (FNAC) and core needle biopsy (Divya et al., 2020; Alexandre et al., 2023).

Various risk factors are associated with the development of breast lesions and breast cancer. These include increasing age, early menarche, late menopause, family history of breast cancer, obesity, hormonal contraceptive use, delayed childbearing, reduced breastfeeding, and sedentary lifestyle. These factors contribute to the rising incidence of breast cancer globally, particularly in developing countries where screening programs are limited and patients often present at advanced stages. Early identification and characterization of breast lesions are therefore essential for improving prognosis and reducing mortality (Nouf et al., 2021; Roxana et al., 2024). Breast lesions may be broadly classified into benign, indeterminate, and malignant categories. Benign lesions include fibroadenomas, cysts, fibrocystic changes, and inflammatory conditions, while malignant lesions include invasive carcinoma and in situ carcinoma. Imaging-based classification systems such as the Breast Imaging Reporting and Data System (BI-RADS) have been developed to standardize reporting and improve communication between radiologists and clinicians. BI-RADS classification also assists in risk stratification and decision-making for follow-up, biopsy, or intervention (Poonum et al., 2023).

Technological advancements in ultrasound have further improved lesion characterization. High-frequency linear probes, harmonic imaging, compound imaging, Doppler evaluation, elastography, and three-dimensional ultrasound imaging have enhanced diagnostic accuracy. These developments allow improved assessment of lesion morphology, echogenicity, vascularity, and tissue stiffness, which are important parameters in differentiating benign and malignant lesions. Despite these advancements, ultrasound remains operator-dependent, and proper scanning technique and experience are required for accurate interpretation (Mohammad et al., 2020). Breast lesions commonly present with symptoms such as palpable lump, pain, nipple discharge, or focal asymmetry. Most breast lesions are benign, especially in younger women; however, malignancy must always be excluded. Ultrasound is particularly useful in evaluating symptomatic patients, guiding biopsy, and monitoring benign lesions during follow-up. In patients younger than 30 years, ultrasound is often the first-line imaging modality, whereas mammography is typically recommended for older women or when suspicious features are identified (Alexandre et al., 2023).

In Pakistan, breast cancer incidence is among the highest in Asia, with a significant proportion of women presenting with advanced disease. Limited screening programs, lack of awareness, and socioeconomic factors contribute to delayed diagnosis. Ultrasound is widely available in tertiary care hospitals and plays a major role in the initial assessment of breast lesions. Determining the prevalence and sonographic characteristics of focal breast lesions in local populations can help improve diagnostic accuracy, guide clinical decision-making, and optimize patient management.

### **Methodology**

#### **Study Design**

This study was a cross-sectional study conducted to determine the prevalence and sonographic characteristics of focal breast lesions in clinically suspected patients.

#### **Study Setting**

The study was conducted in the Department of Radiology, Breast Imaging Section, Khyber Teaching Hospital (KTH), Peshawar.

#### **Study Duration**

The study was completed over a period of four months after obtaining ethical approval.

#### **Sample Size**

The sample size for the study was  $n = 206$  patients.

#### **Sampling Technique**

Non-probability convenience sampling technique was used to recruit patients presenting to the radiology department for breast ultrasound.

### Inclusion Criteria

- Patients aged 17–90 years
- Clinically suspected cases of focal breast lesion
- Patients presenting with symptoms such as breast lump, mastalgia, nipple discharge, focal pain, or inverted nipple
- Patients with complete ultrasound examination

### Exclusion Criteria

- Pregnant or breastfeeding women
- History of breast surgery or radiation therapy
- Inadequate imaging data
- Patients with medical conditions affecting sonographic evaluation

### Data Collection Procedure

Ethical approval was obtained from the institutional review board prior to data collection. Data were collected from patients referred to the Radiology Department for breast ultrasonography. A structured questionnaire was used to record demographic details, clinical history, and sonographic findings. Ultrasound examination was performed using a high-resolution linear array transducer (12–14 MHz). Patients presented with various clinical symptoms including breast lump, mastalgia, nipple discharge, focal pain, and inverted nipple. Sonographic features such as lesion location, size, shape, margins, echogenicity, and BI-RADS category were documented. Ultrasound-guided FNAC or core needle biopsy was performed in selected suspicious cases where required. Patient confidentiality was maintained, and data were used only for research purposes.

### Data Analysis

Data were entered and analyzed using SPSS version 22. Descriptive statistics were applied, and results were presented as frequencies and percentages in tables and charts.

### Result

#### Age-wise patients' distribution

Age	Frequency	Percentage
17 to 30 years	32	15.5
31 to 50 years	115	55.8
51 to 70 years	57	27.7
71 to 90 years	2	1.0
Total	206	100.0

## History of Marital Status

Marital Status	Frequency	Percentage
Single	28	13.6
Married	178	86.4

## Clinical Symptoms of Breast Lesion

Symptoms	Frequency	Percentage
Palpable Lump	97	47.1
Pain	67	32.5
Nipple Discharge	29	14.1
Skin Changes	13	6.3
Total	206	100.0

## Frequency Distribution of Breast Lesion

	Frequency	Percentage
Normal Patients	142	69
Patients with breast lesion	64	31
Total	206	100.0

## Side of Breast Lesion

Side	Frequency	Percentage
Right	43	21
Left	21	10
Normal	142	69
Total	206	100.0

## Position of Breast Lesion

Position	Frequency	Percentage
9 to 12 o'clock (Upper outer quadrant)	26	13
12 to 3 o'clock (Upper Inner quadrant)	14	7
3 to 6 o'clock (Lower Inner quadrant)	11	5
6 to 9 o'clock (Lower outer quadrant)	13	6
Normal	142	69
Total	206	100.0

**Nature of Breast Lesion**

Nature	Frequency	Percentage
Solid	14	7
Cystic	29	14
Complex	21	10
Normal	142	69
Total	206	100.0

**Shape of Breast Lesion**

Shapes	Frequency	Percentage
Oval	14	7
Round	22	11
Irregular	19	9
Lobulated	9	4
Normal	142	69
Total	206	100.0

**Echogenicity of Breast Lesion**

Echogenicity	Frequency	Percentage
Anechoic	11	5
Hypoechoic	21	11
Isoechoic	13	6
Hyperechoic	19	9
Total	206	100.0

**Doppler Flow of Breast Lesion**

Doppler Flow	Frequency	Percentage
Present	26	13
Absent	38	18
Normal	142	69
Total	206	100.0

**Discussion**

The present study was conducted to determine the prevalence and sonographic characteristics of focal breast lesions in clinically suspected patients at Khyber Teaching Hospital, Peshawar. A total of 206 patients were evaluated using ultrasonography, and focal breast lesions were identified in 31% of cases, while 69% of patients showed normal findings. These results indicate that although many patients present with breast-related symptoms, the majority of cases are benign or normal, highlighting the importance of ultrasound as a non-invasive modality to avoid unnecessary invasive

procedures. Similar findings have been reported in previous studies where most symptomatic breast patients had benign or non-significant findings on ultrasound examination (Sadeghi et al., 2017; Mohammad et al., 2020).

Age-wise distribution in the present study demonstrated that the highest proportion of patients belonged to the 31–50 years age group (55.8%), followed by 51–70 years (27.7%), and 17–30 years (15.5%). Only 1% of patients were above 70 years. This finding suggests that breast-related symptoms are more common in middle-aged women. Similar age distribution has been reported in previous literature where benign breast lesions such as fibroadenoma and cysts are more common in reproductive-age women, while malignant lesions increase with advancing age. The higher frequency of patients in the 31–50 years group may also reflect increased awareness and healthcare-seeking behavior among women in this age group (Roxana et al., 2024; Nouf et al., 2021). In the present study, the majority of patients were married (86.4%), while only 13.6% were single. This finding is consistent with previous studies that reported a higher number of married women presenting with breast symptoms, possibly due to hormonal influences, pregnancy-related breast changes, and increased breast awareness. Hormonal and reproductive factors such as parity, breastfeeding, and contraceptive use are known to influence breast tissue and contribute to the development of benign breast lesions (Kevin et al., 2020).

Clinical presentation of breast lesions in this study revealed that palpable lump was the most common symptom (47.1%), followed by breast pain (32.5%), nipple discharge (14.1%), and skin changes (6.3%). These findings are consistent with previous studies where palpable lump remains the most common presenting complaint in patients with breast disease. Breast pain is also a frequent symptom and is commonly associated with benign conditions such as fibrocystic disease and cysts. Nipple discharge and skin changes are less common but may be associated with suspicious or malignant lesions and therefore require careful evaluation (Alexandre et al., 2023; Raunak et al., 2021). The side-wise distribution of breast lesions in the present study showed that lesions were more common in the right breast (21%) compared to the left breast (10%). Similar findings have been reported in previous studies, although no strong biological explanation exists for side predominance. Some authors suggest that slight anatomical asymmetry and dominant-hand usage may contribute to this variation. However, most studies indicate that breast lesions may occur equally in either breast (Divya et al., 2020).

Quadrant-wise distribution revealed that the upper outer quadrant was the most commonly involved site (13%), followed by upper inner quadrant (7%), lower outer

quadrant (6%), and lower inner quadrant (5%). This finding is consistent with previous literature, which reports that the upper outer quadrant contains a greater amount of glandular tissue and is therefore more prone to both benign and malignant lesions. The high frequency of lesions in this quadrant has also been reported in breast cancer epidemiology studies (Kevin et al., 2020; Poonum et al., 2023). Regarding the nature of lesions, cystic lesions were the most common (14%), followed by complex lesions (10%) and solid lesions (7%). This indicates that benign cystic conditions are more frequent in symptomatic patients. Ultrasound plays an important role in differentiating cystic from solid masses, which significantly reduces unnecessary biopsies. Previous studies have also reported that cystic lesions represent a large proportion of benign breast abnormalities, particularly in women aged 30–50 years (Mohammad et al., 2020; Sadeghi et al., 2017).

The shape of lesions in this study showed that round (11%) and oval (7%) shapes were more common compared to irregular (9%) and lobulated lesions (4%). Round and oval lesions are typically associated with benign pathology such as fibroadenoma and cysts, whereas irregular and lobulated shapes are more suggestive of malignancy. These findings are consistent with BI-RADS ultrasound descriptors, where shape plays a significant role in lesion characterization and risk stratification (Poonum et al., 2023; Alexandre et al., 2023). Echogenicity analysis revealed that hypoechoic lesions were most common (11%), followed by hyperechoic (9%), isoechoic (6%), and anechoic lesions (5%). Hypoechoic lesions are commonly associated with both benign and malignant solid masses, whereas anechoic lesions typically represent simple cysts. The variation in echogenicity helps in differentiating lesion types and guiding further management. Similar echogenicity patterns have been reported in previous ultrasound-based breast lesion studies (Divya et al., 2020; Mohammad et al., 2020).

Doppler flow assessment in the present study showed vascularity in 13% of lesions, while 18% showed no vascularity. Increased vascularity is often associated with malignant lesions due to neovascularization, whereas benign cystic lesions usually lack internal vascularity. However, vascularity alone is not sufficient for diagnosis and must be interpreted with other sonographic features. These findings align with previous studies emphasizing the role of Doppler ultrasound in improving diagnostic accuracy (Roxana et al., 2024; Nouf et al., 2021).

Overall, the findings of this study highlight the importance of ultrasonography in the evaluation of focal breast lesions. Ultrasound provides valuable information regarding lesion location, shape, margins, echogenicity, and vascularity. It also plays a significant role in differentiating benign from malignant lesions and guiding further

management. In addition, ultrasound is particularly useful in dense breast tissue and younger patients, where mammography sensitivity is limited. The results of the present study are consistent with previous research demonstrating that ultrasound is an effective and reliable modality for evaluating breast lesions (Sadeghi et al., 2017; Alexandre et al., 2023). The prevalence of focal breast lesions in this study (31%) suggests that a considerable number of symptomatic patients require imaging evaluation. However, the majority of lesions showed benign characteristics, emphasizing the importance of proper sonographic assessment to avoid unnecessary invasive procedures. Early detection and characterization of suspicious lesions using ultrasound can lead to timely diagnosis and improved patient outcomes. Therefore, ultrasound should be considered a first-line imaging modality in clinically suspected breast lesions, particularly in resource-limited settings.

### Conclusion

Ultrasonography is an effective and reliable modality for identifying and characterizing focal breast lesions. It helps differentiate solid and cystic lesions based on sonographic features such as shape, echogenicity, and vascularity. Ultrasound is a preferred first-line imaging technique for women presenting with breast symptoms because it is non-invasive and free from ionizing radiation. In this study, most patients presented with symptoms such as palpable lump, breast pain, nipple discharge, and skin changes. The majority of affected women were in the middle age group and married. Lesions were more commonly observed in the upper outer quadrant, particularly in the right breast. Most lesions demonstrated benign characteristics, while fewer showed suspicious features requiring further evaluation. Cystic lesions were more common, followed by solid and complex lesions. Overall, ultrasound plays a vital role in early detection and differentiation of benign and malignant focal breast lesions.

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