

Diagnostic Accuracy of Ultrasonography and Mammography in the Evaluation of Palpable Breast Masses by Taking Histopathology as a Gold Standard

Maimoona Rasool

College of Allied Health Professionals, Government College University Faisalabad

Corresponding Author Email: maimoonamit@yahoo.com

Maria Rasool

College of Allied Health Professionals, Government College University Faisalabad

Maham Nadeem

College of Allied Health Professionals, Government College University Faisalabad

Aqsa Javed

Riphah International University Faisalabad

Sobab Paul Calvin

College of Allied Health Professionals, Government College University Faisalabad

Muhammad Nusair Zubair Tarar

College of Allied Health Professionals, Government College University Faisalabad

Sabira Sultana

Department of Eastern Medicine, Government College University Faisalabad

Sabahat Abbas

QCNM, Indus Hospital and Health Network QF, NST and SMP Campus, Jubilee Town, Lahore, Pakistan

Abdul Wadood Chishti

Department of Eastern Medicine, Superior University Lahore

Muhammad Akram

Department of Eastern Medicine, Government College University Faisalabad Pakistan

ABSTRACT

Background: Worldwide, breast cancer is the leading cause of death among females. Accurate and early diagnosis by the use of different imaging modalities like ultrasonography and mammography along with histopathology play a crucial role in the detection of breast palpable masses. **Objective:** To find out the diagnostic accuracy of ultrasonography and mammography by taking histopathology as a gold standard for the evaluation of palpable breast masses. **Materials and Methods:** A cross-sectional analytical study was performed by taking data of 30 patients from Radiological Department of ALLIED HOSPITAL FAISALABAD from March 17, 2024 to April 30, 2024. Comparison of diagnostic accuracy of ultrasonography and mammography was performed to evaluate palpable breast masses along with

histopathology as a gold standard. **Results:** Total sample size in this study was 30 female and mean age was 49.57 years. Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) , disease prevalence , positive likelihood ratio , negative likelihood ratio and accuracy of ultrasonography for the detection of palpable breast masses is 87.5%, 71.43%,58.33%,, 77.78%, 46.67%, 5.7144, 0.3263 and 80% respectively. While for mammography Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) , disease prevalence , positive likelihood ratio , negative likelihood ratio and accuracy is 57.14%, 43.75%, 53.85%, 46.06%, 55.33%, 1.0204, 0.9837 and 50% respectively. **Conclusion:** The diagnostic accuracy of ultrasonography for the detection of palpable breast masses is higher in comparison to mammography by taking histopathology as a gold standard.

Keywords: Palpable breast masses, ultrasonography, mammography, histopathology, lymphadenopathy, calcification, BIRADS, cyst, echogenicity differences and density of breast tissues.

Intoduction

Breast anatomical and physiological features are complex, along with different structures as well as hormonal coordination to aid their actions [1]. Endocrine tissues in breast are arranged in lobules in addition to channels .Tissues that surround the endocrine tissues provide dimensions and stability. [2] The maturation and activity of the breast are largely influenced by it. .Formation of the mammary glands starts during the embryonic stage and proceeds until adolescence. Ducts begin to form and split due to adolescence hormones, but the gestation phase stimulates additional growth [3] [4].

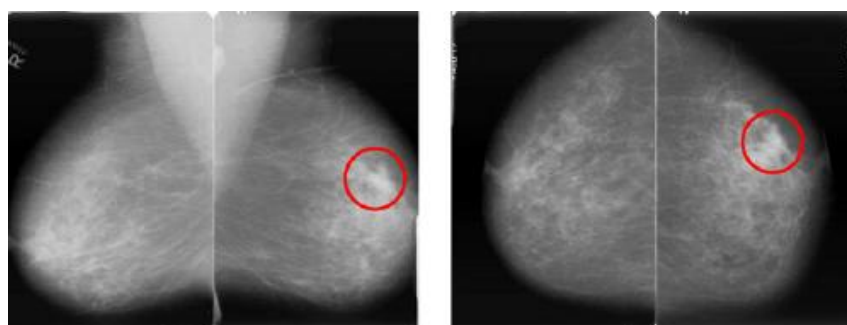


Figure 1 (a) MLO and (b) CC views

Analyzing and assessing different anatomical properties observed on scans including a mammogram and ultrasonography .Because of having a greater density than fatty tissue, endocrine tissue manifests as hyperechoic, and thick regions on mammography [5] .Since fatty tissues has a less dense structure than other tissues, it looks opaque or black on mammography. Areola and nipple cannot be detected on mammography until some kind of pathology is present, pathologies like retraction of nipple and calcification in this region [6]. When viewed in a CC VIEW, axillary tail can appear like projection of the breast tissue into the axillary region. Because endocrine tissues are denser than Fatty tissue, it appears as hypoechoic (darker) patches on ultrasonography. Fatty tissues is less dense, it appeared hyperechoic, or more vibrant, on ultrasonography [7].

WHO projects that there will be over two million new instances for breast cancer identified worldwide in 2020 [8] [9] [10]. If expressed in population rate in Asia, about 4.6 billion individuals are affected by breast cancer annually [11] [12] [13] .Faisalabad is a big city of Punjab province and has population over 3 million. The incidence rate of breast cancer in it is about 30 to 35% [14] [15] . This study analyze how well mammogram and ultrasound can identify particular features of lesion, like its dimensions, forms, borders. Also determine whether there are any variations within two modalities. Also deals with the financial effects of employing mammography with ultrasound to evaluate breast mass by doing cost-effectiveness assessment. [16][17]

Objective

The primary objective of the study is assess the diagnostic accuracy of ultrasonography and mammography in the evaluation of palpable breast masses, using histopathology as the gold standard.

Problem Statement

Breast cancer is a life-threatening disease. A Recent, study was conducted in 2022, revealed that approximately 2.3 million women were at risk of breast cancer, and of these 670, 000 died globally. For the detection of palpable breast masses, diagnostic capabilities of ultrasound and mammography remains a challenge, that results in inappropriate diagnoses. Despite modifications in radiography, the problem of

accurately differentiating between benign and malignant masses at an early stage remains a significant challenge.

Materials And Methods

Area of research is ALLIED HOSPITAL FAISALABAD and research design is observational study. The sampling technique is convenient (Non probability). Scans are performed by mammography machine (FUJI AMULET) and Ultrasonography machine (TOSHIBA NEMIO XG). The whole patient data is in Performa authorized by HOD and Medical Superintendent. Duration of study is 40 days from March 17, 2024 to April 30, 2024. Routine mammography and ultrasonography of 30 patients were included. Like all female patients with breast pain, nipple discharge, obvious masses, skin changes and nipple retraction were included in the study. 10 patients were excluded who had cystic breast lesion, pregnancy and age below 30 years.

After the collection of data, the analysis was done by using IBM SPSS (Statistical package for Social Sciences) 26.0 version. Calculated results were represented by graphs and tables. The chi square test (Two-Tail) was applied to compare the sensitivity and specificity. Comparison study will be applied between ultrasonography and mammography by taking histopathology as a gold standard. P-Value less than 0.05 will be considered significant. The whole collected data about the age, gender, marital status, breast sides and quadrants and ultrasonographic findings such as lymphadenopathy, calcification, cyst etc. were gathered in a prearranged Performa. Mammography examination was performed KVP of 20-25 and MAs of 100. Ultrasound was done by TOSHIBA NEMIO XG machine by using transducer of 7-12MHz frequency.

Results

Out of 30 women, the mean age was 49 years. Moreover, the maximum age was 75 years and minimum age was 36 years as shown in the table 1.

Table 1. Descriptive Statistics of the Age of Patients.

Statistics		
AGE (Years)		
N	Valid	30
	Missing	0

Mean	49.57
Median	48.00
Mode	48
Std. Deviation	9.623
Minimum	36
Maximum	75

Total population included 30 patients in which 28 women were married with percentage of 93.3 % and only 2 women were single with percentage of 6.7 %. As represented in table 2 .

Table 2 Descriptive Statistics Of Marital Status Of Patients

MARITAL STATUS					Cumulative
		Frequency	Percent	Valid Percent	Percent
Valid	Single	2	6.7	6.7	6.7
	Married	28	93.3	93.3	100.0
	Total	30	100.0	100.0	

Data was collected from 30 patients in which 8 women had palpable breast masses in upper outer quadrant with percentage of 26. 7%. Only one patient presented with breast mass in upper inner quadrant with percentage of 3.3%, 3 women were detected for masses in lower outer quadrant with percentage of 10% and also only one woman was diagnosed with mass in lower inner quadrant with percentage of 3.3%.In upper outer/lower outer, upper inner/lower inner, lower inner/lower outer, upper inner/upper outer quadrants, frequency rate was only one with percentage of 3.3% respectively.

Similarly for lower outer/axilla, lower inner/axilla and upper inner/axilla, the masses were found only in one female with percentage of 3.3% respectively. Within 30 patients, 5 patients had palpable breast masses in upper outer/ axilla and in lower outer/axilla with percentage of 16.7% respectively. The upper outer, upper inner, lower outer, lower inner and axillary regions also represent the presence of lymphadenopathy. This all data is represented in the following table 3 and figure 3 .

Table 3 Distribution Of Breast Masses In Different Breast Quadrants

BREAST QUADRANTS AND AXILLA					Valid	Cumulative
				Frequency	Percent	Percent
Valid	Upper Outer			8	26.7	26.7
	Upper	Outer	/	2	6.7	33.3
	Lower Outer					
	Upper	Inner	/	1	3.3	36.7
	Lower Inner					
	Lower	Inner	/	1	3.3	40.0
	Lower Outer					
	Upper	Inner	/	1	3.3	43.3
	Upper outer					
	Upper Inner			1	3.3	46.7
	Lower Outer			3	10.0	56.7
	Axiila			5	16.7	73.3
	Upper	Outer	/	5	16.7	90.0
	Axiila					
	Lower	outer	/	1	3.3	93.3
	Axiila					
	Lower	Inner	/	1	3.3	96.7
	Axiila					
	Upper	Inner	/	1	3.3	100.0
	Axiila					
	Total			30	100.0	100.0

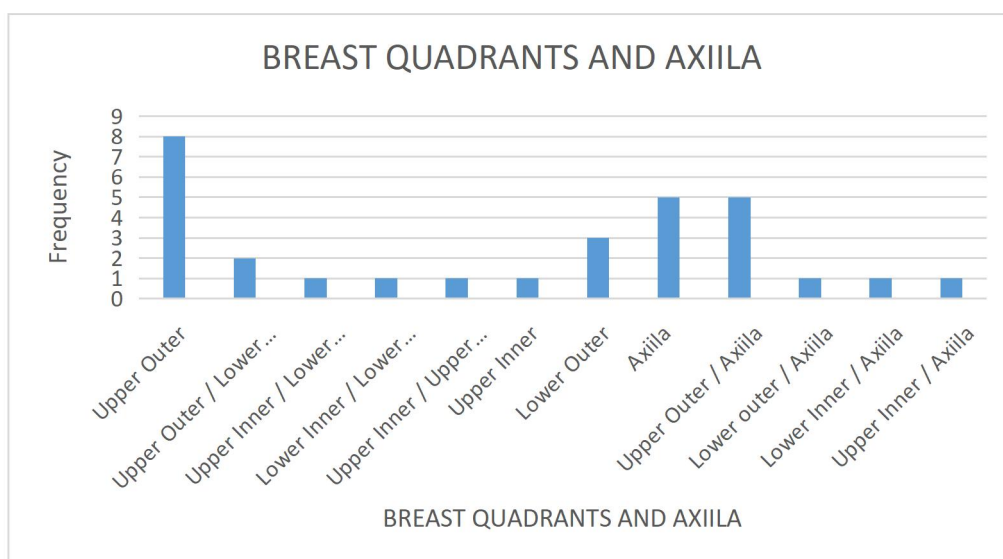


Figure 2 Distribution of breast masses in upper outer, upper inner, lower outer, and lower inner quadrants

From 30 patients, histopathology results evaluate benign masses in 11 patients with percentage of 36.7 % and malignant masses in 3 patients with percentage of 10%. And 16 patients in this study was normal in which no benign or malignant masses were found on histopathology with percentage of 53.3% illustrated in following table 4 and figure 3.

Table 4 Histopathology Results for Breast Masses

HISTOPATHOLOGY RESULTS					Cumulative
		Frequency	Percent	Valid Percent	Percent
Valid	Normal	16	53.3	53.3	53.3
	Benign	11	36.7	36.7	90.0
	Malignant	3	10.0	10.0	100.0
	Total	30	100.0	100.0	

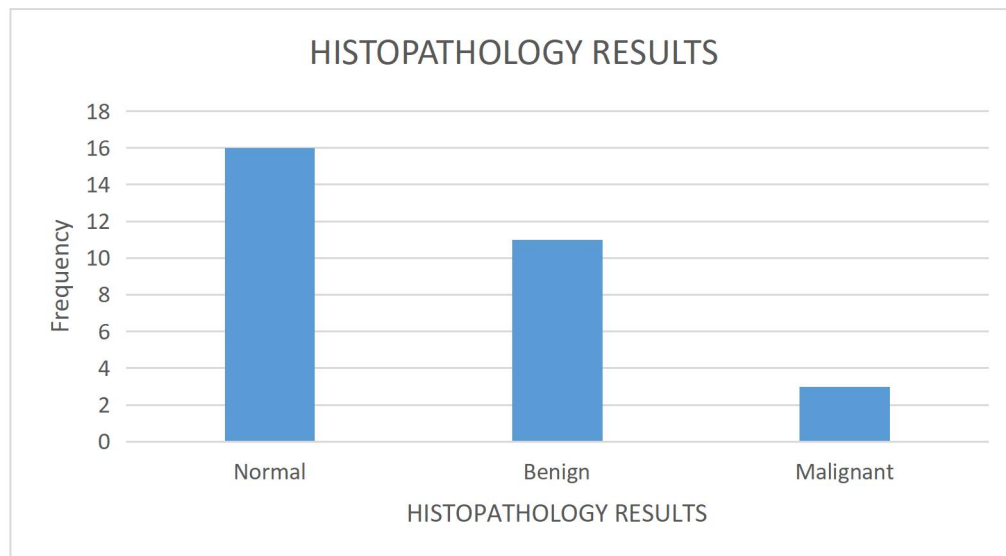


Figure 3 . Distribution graph of masses under Histopathology.

Among all of 30 patients, ultrasonography results diagnose benign masses in 20 patients with percentage of 66.7% and malignant masses in 10 patients with percentage of 33.3% demonstrated in table 5 and figure 4 below.

Table 5. Ultrasonography Results for Palpable Breast Masses

ULTRASONOGRAPHY MASSES					Cumulative
		Frequency	Percent	Valid Percent	Percent
Valid	Yes	20	66.7	66.7	66.7
	No	10	33.3	33.3	100.0
	Total	30	100.0	100.0	

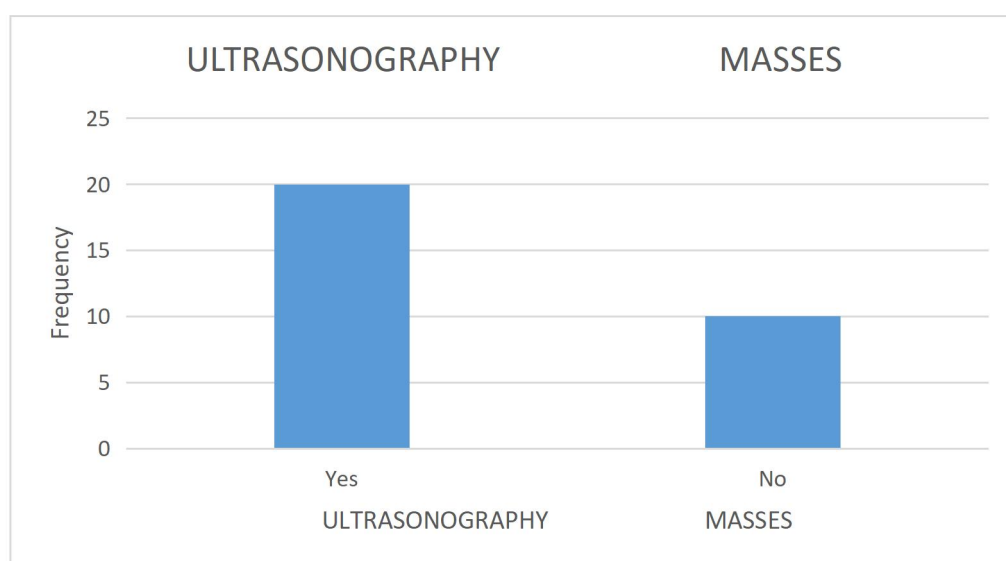


Figure 4 Distribution of palpable breast masses in 20 patients and 10 patients diagnosed normal under ultrasonography.

Table 6 Number Of Positive And Negative Cases Identified Under Ultrasonography

Cases identified	Number of true and false cases
True positive(TP)	10
True negative (TN)	14
False positive (FP)	2
False negative(FN_	4

Table 7. Sensitivity And Specificity Of Ultrasonography While Taking Histopathology As Gold Standard.

Statistic	Value	95 % CI
Sensitivity	87.5%	77.18% to 94.75%
Specificity	71.43%	54.92% to 85.30%
Positive Likelihood Ratio	5.7144	2.6625 to 9.2213
Negative Likelihood Ratio	0.3263	0.1424 to 0.8674
Disease prevalence	46.67%	-----
Positive Predictive Value	58.33%	55.28% to 91.74%

Negative Predictive Value 77.78% 66.31% to 93.69%

Accuracy 80% 69.61% to 90.39%

From a pool of 30 patients included in study, mammography results detected 8 patients with benign masses having percentage of 26.6% and 73.3% patients were found with malignant masses with percentage of 90%% shown in table 8 and figure 5 below.

Table 8 Mammography Results Representing Palpable Breast Masses

MAMMOGRAPHY MASSES					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	8	26.6%%	26.6%%	26.6
	No	22	73.3%%	73.3%%	100.0
	Total	30	100.0	100.0	

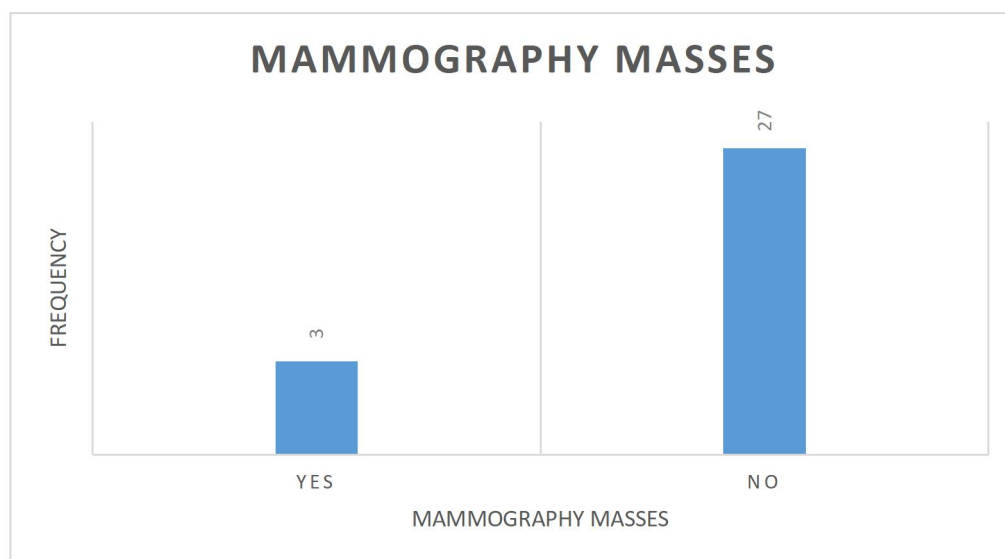


Figure 5 . Breast masses evaluated under Mammography with Histopathology as a Gold standard.

Table 9 Number Of Positive And Negative Cases Identified Under Ultrasonography

Cases identified	Number of true and false cases
True positive(TP)	7
True negative (TN)	8
False positive (FP)	6
False negative(FN_	9

Table 10 Sensitivity And Specificity Of Mammography While Taking Histopathology As Gold Standard

Statistic	Value	95% CI
Sensitivity	57.14%	33.42% to 75.35%
Specificity	43.75%	21.48%,to63.73%
Positive Likelihood Ratio	1.0204	0.6505 to 1.4756
Negative Likelihood Ratio	0.9837	0.5977 to 1.4002
Disease prevalence	55.33%	-----
Positive Predictive Value	53.85%	30.39% to 72.98%
Negative Predictive Value	46.06%	25.45% to 67.49%
Accuracy	50%	31.22% to 68.78%

Throughout 30 patients, 18 patients were detected for lymphadenopathy under ultrasonography with percentage of 60% and 13 patients were normal with percentage of 40% represented in table 11 and figure 6 below.

Table 11. Lymphadenopathy Diagnosed Under Ultrasonography In 18 Patients Out Of Total 30 Patients

LYMPHADENOPATHY					Cumulative
		Frequency	Percent	Valid Percent	Percent
Valid	Yes	18	60.0	60.0	60.0

Online ISSN

3007-3197

Print ISSN

3007-3189

<http://amresearchreview.com/index.php/Journal/about>

No	12	40.0	40.0	100.0
Total	30	100.0	100.0	

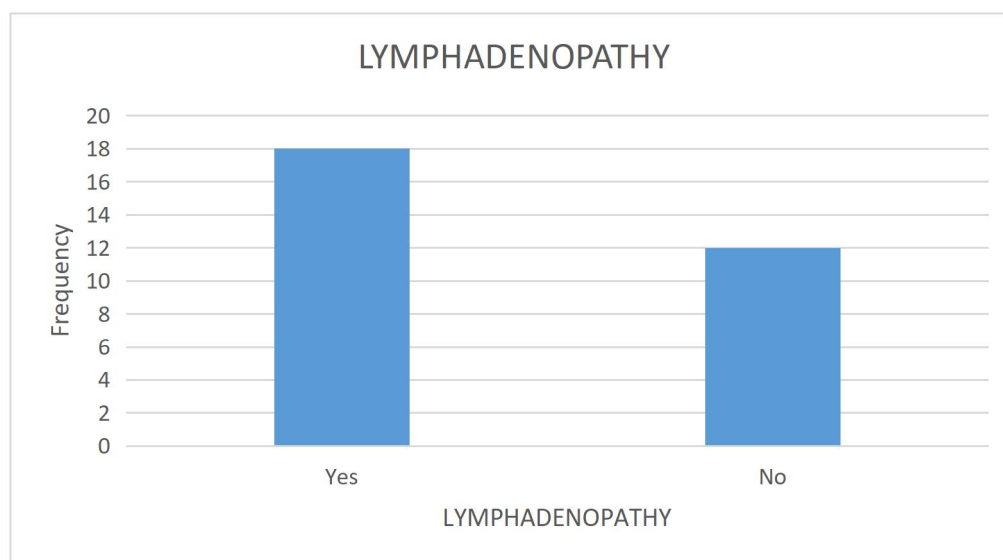


Figure 6 *Ultrasonographic evaluation of lymphadenopathy.*

In ultrasonography findings, 17 patients had breast echogenicity difference with percentage of 56.7% within total 30 patients and 13 patients were found normal with percentage of 43.3% represented in table 12 and figure 7 below

Table12 Echogenicity Differences Under Ultrasonography In 17 Patients Out Of 30 Patient

ECHOGENICITY DIFFERENCE					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	17	56.7	56.7	56.7
	No	13	43.3	43.3	100.0
	Total	30	100.0	100.0	

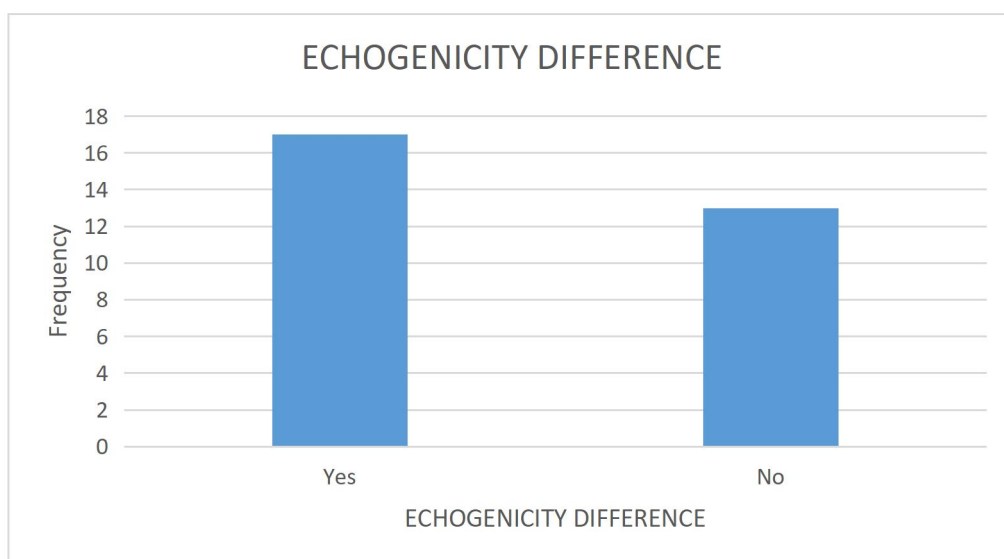


Figure 7 .Graphic representation of echogenicity differences in 30 patients

Within the circle of 30 patients, 25 patients were detected for density differences with percentage of 83.3% under ultrasonography and 5 patients were normal in which there was no density difference detected with percentage of 16.7% as illustrated below in table 13 and figure 8 .

Table 13 Density Differences Evaluated Under Ultrasonography

DENSITY					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Normal	25	83.3	83.3	83.3
	Increased	5	16.7	16.7	100.0
	Total	30	100.0	100.0	

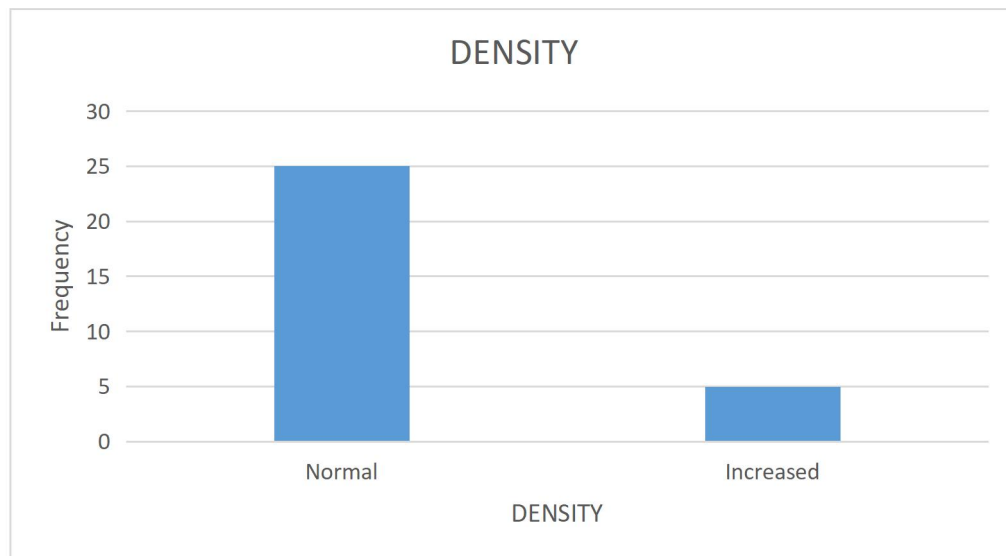


Figure 8 .Density Differences detected under ultrasonography by taking histopathology as a Gold standard.

Amongst 30 patients, 16 patients with percentage of 53.3% fall in different BIRADS categories under ultrasonography and 14 patients were diagnosed normal as demonstrated in table 14 and figure 9.

Table 14 Ultrasonographic Evaluation Of Patients Under Different BIRADS Categories

BIRADS				Valid	Cumulative
		Frequency	Percent	Percent	Percent
Valid	Yes	16	53.3	53.3	53.3
	No	14	46.7	46.7	100.0
	Total	30	100.0	100.0	

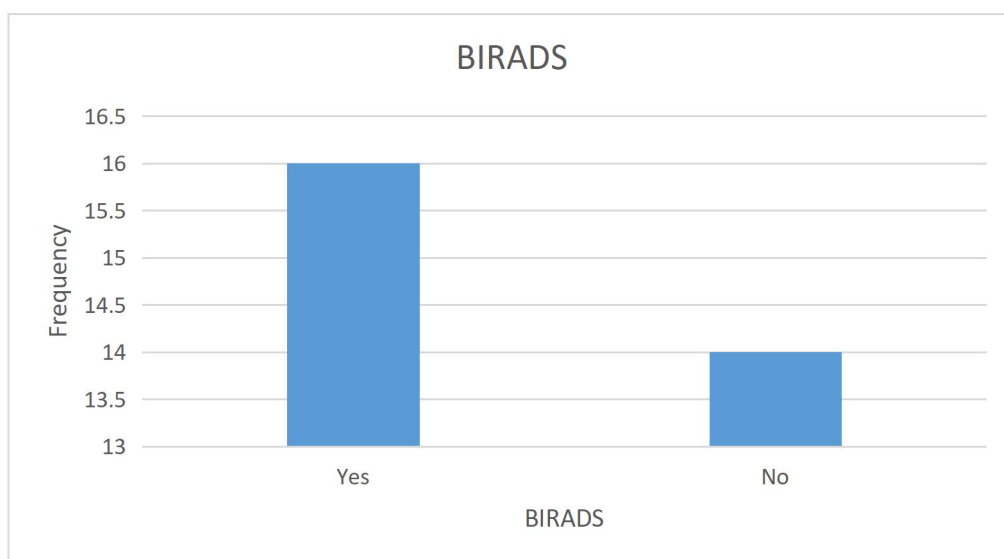


Figure 9 Patient's distribution under different BIRADSA categories

From total of 30 patients, only 3 patients were diagnosed for cyst with percentage of 10% and 27 patients were declared normal with percentage of 90% under ultrasonography demonstrated below in table 15 and figure 10.

Table 15. Ultrasonography Results Evaluate Cystic Masses In 3 Patients Out Of 30 Patients

CYCST					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	3	10.0	10.0	10.0
	No	27	90.0	90.0	100.0
	Total	30	100.0	100.0	

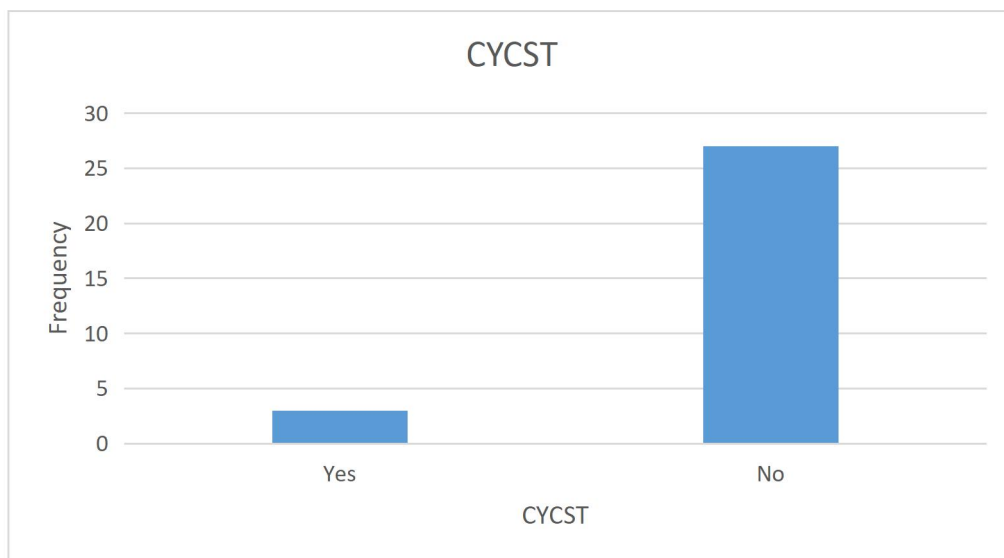


Figure 10 Cystic masses evaluation under ultrasonography.

Among the group of 30 patients, Females who were detected for calcification was 11 with percentage of 36.7% and 19 females had no calcification with percentage of 63.3% under ultrasonography represented in table 16 and figure 11 below.

Table 16. Calcifications Evaluated Under Ultrasonography In 11 Patients Out Of Total 30 Patients

CALCIFICATION					Cumulative
		Frequency	Percent	Valid Percent	Percent
Valid	Yes	11	36.7	36.7	36.7
	No	19	63.3	63.3	100.0
Total		30	100.0	100.0	

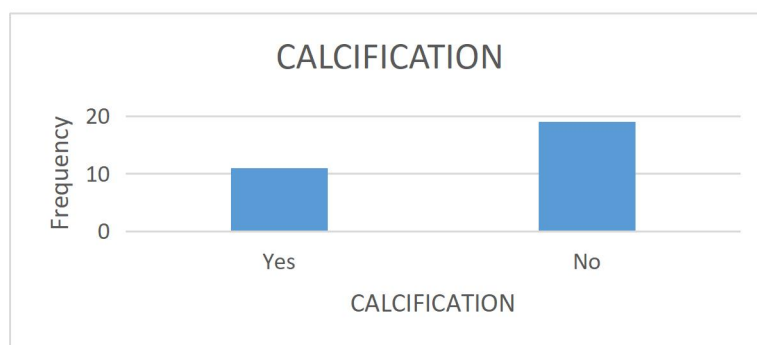


Figure11. Distribution graph of calcification under ultrasonography

Discussion

Breast cancer is the most common cancer affecting women worldwide, and early detection is crucial for effective treatment. In Asian countries, Pakistan is declared on second rank. Palpable breast masses may act as a best indicator of breast cancer. This study was conducted to find out the diagnostic accuracy of ultrasonography and mammography for evaluation of palpable breast masses by taking histopathology as a gold standard. The use of triple assessment method like physical examination which deals with signs and symptoms like discharge of blood from nipple, nipple retraction, changes in size and shape of breast, edematous changes, breast lump that is palpable and have thickening different from surrounding tissues, mammography and biopsy, is a gold standard management for evaluation of breast masses. Ultrasonography uses non-ionizing radiations and has less health hazards in comparison to mammography which use x-rays which impose many bio-effects and biopsy is an invasive procedure. With different modifications like Doppler and 3D ultrasound, now palpable breast masses are easily diagnosed in early stage with differentiation in benign and malignant masses. Histopathology was taken as a gold standard in this study.

In this study, the diagnostic accuracy of mammography and ultrasonography findings was evaluated for the distinction between benign and malignant breast masses. The parameters included in this data was age, gender, marital status etc. without any distinction in malignant or benign breast masses. Out of 30 women, the mean age was 49 years. Moreover, the maximum age was 75 years and minimum age was 36 years. Mammography has low sensitivity for the detection of breast masses in age below 30. Among 30 patients, 28 women were married with percentage of 93.3 % and only 2 women were single with percentage of 6.7 %. The study was conducted by *Donnelly, J et al*, according to which 58.11 % of women were below the age of 30 years, 31.20 % were between the age of 31 and 50 years, and 10.60 % were above the age of 50 years. 71% were married, and 29% were single. Palpable breast mass was clinically diagnosed in 64% of the women, and 36% had changes signs and symptoms [18].

In our study out of total number of 30 cases, 8 cases with percentage of 26.6% belong to age group 36 -45 years, 15 cases with percentage of 50% belong to age

group 45-54 years , whereas 6 cases with percentage of 20% belong to age group 55-75 years. Another study was performed by Patel *et al.* showing similar findings that 6.0% of the 200 patients were in the range of 21 to 29 years, along with pain as a commonest sign in majority. A previously conducted study also confirmed that the size and age of mass had a considerable relationship with incidence of breast disease, but length of lesion has no such interrelation [19].

In our study as discussed above in breast sides and quadrants that data was collected from 30 patients in which 16 women with relative percentage of 53.3 % had palpable masses or lymphadenopathy in right side of the breast, 11 women with relative percentage of 36.7% had it in left side of breast and only 3 women with relative percentage of 10% had masses in bilateral breast sides. 8 women had palpable breast masses in upper outer quadrant with percentage of 26. 7%. Only one patient presented with breast mass in upper inner quadrant with percentage of 3.3%, 3 women were detected for masses in lower outer quadrant with percentage of 10% and also only one woman was diagnosed with mass in lower inner quadrant with percentage of 3.3%. In upper outer/lower outer, upper inner/lower inner, lower inner/lower outer, upper inner/upper outer quadrants, frequency rate was only one with percentage of 3.3% respectively. Similarly for lower outer/axilla, lower inner/axilla and upper inner/axilla, the masses were found only in one female with percentage of 3.3% respectively. Within 30 patients, 5 patients had palpable breast masses in upper outer/ axilla and in lower outer/axilla with percentage of 16.7% respectively. The upper outer, upper inner, lower outer, lower inner and axillary regions also represent the presence of lymphadenopathy. In our study the breast lesions are more common in upper and outer quadrant.

So, as the abundance or high proportion of masses in these quadrants reflect high percentage of breast tissues in these two quadrants. Another study conducted by Andrew H.S. Lee showed the similar results in different quadrants like in upper outer quadrant the percentage of benign and malignant was 57% and 62% respectively. In his study, the incidence rate of benign and malignant breast masses was 20% and 18% respectively in upper inner quadrant, in lower inner quadrant the percentage was 6% and 5% for benign and malignant masses respectively, in lower outer quadrant, benign masses had percentage of 13% and malignant had percentage

of 9%.^[20].

In our current study, from 30 patients, histopathology results evaluate benign masses in 11 patients with percentage of 36.7 % and malignant masses in 3 patients with percentage of 10%. And 16 patients in this study was normal in which no benign or malignant masses were found on histopathology with percentage of 53.3. Ultrasonography results diagnose benign masses in 20 patients with percentage of 66.7% and malignant masses in 10 patients with percentage of 33.3% and, mammography results detected 7 patients with benign masses having percentage of 23.3% and 23 patients were found with malignant masses with percentage of 76.7%.

A study was conducted by *Ayesha et al.* that showed similar results like out of total 134 cases 24 women with percentage of 17.9% were evaluated benign and 110 with percentage of 82.1% were diagnosed as malignant on histopathology results. Similarly, benign masses evaluated on ultrasonography were 20 with percentage of 14.9% and malignant cases evaluated were 114 with percentage of 85.1 %. Evaluation of their study under mammography for benign and malignant had shown similar results like ultrasonography as benign masses in 20 patients with percentage of 14.9% and malignant cases evaluated were 114 with percentage of 85.1 %.^[21]

Lymphadenopathy of axillary nodes was present with fluctuations and also due to low sensitivity of imaging modalities, it is often difficult to diagnose it. In our study, throughout 30 patients, 18 patients were detected for lymphadenopathy of axillary lymph nodes with percentage of 60% and 13 patients were normal with percentage of 40% in different quadrants and specifically for lower outer/axilla, lower inner/axilla and upper inner/axilla, the lymphadenopathy was found only in one female with percentage of 3.3% respectively. Within 30 patients, 5 patients inflamed axillary lymph nodes in upper outer/ axilla and in lower outer/axilla with percentage of 16.7% respectively Study was conducted by *Cutuli et al.* in 74 patients had represented lymphadenopathy in different breast quadrants and axillary region, they concluded that there was high percentage pf lymphadenopathy in upper outer and lower outer quadrant with percentage of 68% in 50 patients. Least incidence of lymphadenopathy was reported in upper inner and lower inner quadrants with percentage of 10 patients with percentage of 13%.^[22]

In current study, 17 patients had breast echogenicity difference with percentage of

56.7% within total 30 patients and 13 patients were found normal with percentage of 43.3%. Patients were only evaluated for variations in echogenicity and was not categorized as hypoechoic, hyperechoic and isoechoic. Assessment of literature has shown that margin of benign and malignant masses is one of the best feature to define their morphology. Women with high breast density are at greater risk of developing breast cancer. A study was conducted by Sachin et al who had taken a sample of total of 212 women aged 18 - 65 years in which echogenicity differences among the benign and malignant masses was evaluated under ultrasonography. His study had represented echogenicity differences of masses as heteroechoic, hypoechoic and isoechoic. Total heteroechoic masses were found in 16 patients with percentage of 7.5% in which 7 were malignant masses with percentage 9.2% and 9 were benign with percentage 6.6%. Similarly, about 187(88.2%) patients were evaluated with hypoechogenicity of breast masses in which 65(85.5%) were malignant and 122(89.7%) were benign. [23]

In our current study, Within the circle of 30 patients, 25 patients were detected for density differences with percentage of 83.3% under Ultrasonography and 5 patients were normal in which there was no density difference detected with percentage of 16.7%. Study was performed by Sachin et al had shown that out of total 212 women , 112(56.3%) were evaluated with high density in which 47 were malignant and 65 were benign masses , 76(38.2%) had intermediate density in which 24 had malignant and 52 had benign masses, and 11(5.5%) had low density evaluated under mammography. [24]

Breast Imaging Reporting and Data System (BIRADS) results in our study was like out of 30 patients, 16 patients with percentage of 53.3% fall in different BIRADS categories under Ultrasonography and 14 patients were diagnosed normal. Out of 16 patients, 4 women with percentage of 13.31% fall in BIRADS- I category, 3 patients with percentage 10% were declared in BIRADS- II category, in BIRADS - III category , 3 patients were evaluated with percentage 10%, under BIRADS-IV , 5 women were diagnosed with percentage 16.6% and only one women was detected for BIRADS-V category. Similar results for different BIRADS categories were reported by Leddy et al. which shown out of 257 cases, for BIRADS-I 145 (70%) patients were reported, 22 (11%) patients were declared for BIRADS-II in their study, for

BIRADS-III the reported women were 11(5%), two patients with percentage of 1% were detected for BIRADS-IV, and only one patient with percentage of 0.5% fall under BIRADS-V. [25]

In our current study, from total of 30 patients, only 3 patients were diagnosed for cyst with percentage of 10% and 27 patients were declared normal with percentage of 90%. Most of the cysts evaluated under ultrasonography are benign but sometime can become cancerous. Previous study was conducted by Tiwari et al. has reported that out of 106 patients , 89 women were diagnosed under ultrasonography and from which 6 patients with percentage 6.7% had breast cyst [26.] Another study was performed by Zhao et al. which referred out of 274 cases. 8 women were diagnosed with breast cyst with percentage of 2.9%. [27].

Reported by Gary J Whiteman et al. that under mammography, benign calcifications are easily identifiable, larger and most common in comparison to malignant calcifications. Our study has evaluated that among the group of 30 patients, females who were detected for calcification was 11 with percentage of 36.7% and 19 females had no calcification with percentage of 63.3% under Ultrasonography. If we compare our results of calcifications with previous study done by Badu et al. which reported that in 20 cases calcifications were detected, out of which 16 were macro- calcifications with percentage 38.1% and only 4 had micro-calcifications with percentage 9.5%. [28]

In our current study the total sample size is 30 female and mean age is 49.57 years. Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) , disease prevalence , positive likelihood ratio , negative likelihood ratio and accuracy of ultrasonography for the detection of palpable breast masses is 87.5%, 71.43%, 58.33%, 77.78%, 46.67%, 5.7144, 0.3263 and 80% respectively. While for mammography Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) , disease prevalence , positive likelihood ratio , negative likelihood ratio and accuracy is 57.14%, 43.75%, 53.85%, 46.06%, 55.33%, 1.0204, 0.9837 and 50% respectively.

Previously, a study was conducted by Ahmed ZT et al. which had shown the mean age of female was 47.8 years, Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and accuracy of ultrasonography was 94.1%,

89.3%, 77.4%, 97.5%, and 90.7% respectively. [29]. Another study was performed by Kolb TM et al which represented that specificity, sensitivity, positive predictive value, negative predictive value of mammography for the detection of palpable breast masses was 73.0%, 80.0%, 85.2%, and 65.3% respectively. [3

Conclusion

Diagnostic accuracy of ultrasonography as a screening modality for the detection of palpable breast masses even in early stage is higher in comparison to mammography by taking histopathology as a gold standard. Both ultrasonography and mammography along with histopathology play crucial role in differentiation of benign masses from malignant breast masses.

Limitations

Our research is a single center study. Many of the multi centric studies which involves different cities of Pakistan will provide more validity to the results. The inclusion criteria of our study is palpable breast masses (benign or malignant), breast density, age, echogenicity differences, architectural distortion, cyst and BIRADS. .

The Factors specifically age, breast density and biopsies may affect the accuracy of mammography and ultrasonography and also complicate the explication of results. So current study only focuses on palpable breast masses and excludes non palpable breast masses which are detected on screening programs.. Therefore, the depiction of role of mammography and ultrasonography by taking histopathology as a gold standard in detection of numerous breast masses can be improved by including these factors.

Recommendations

Further studies with longer durations are needed to prove the usefulness of ultrasound and mammography in early detection of palpable breast masses leading to a reduction in the amount of biopsies done. Studies should also be done to include non-palpable masses because ultrasound accuracy has been shown to vary according to palpability of the lesion

References

1. Johnson MC, Cutler ML. Anatomy and Physiology of the Breast. Management of Breast Diseases. 2016:1-39.
2. Solomon EP. Introduction to human anatomy and physiology. Elsevier Health

Online ISSN

3007-3197

Print ISSN

3007-3189

<http://amresearchreview.com/index.php/Journal/about>

- Sciences; 2015 Oct 15.
3. Solomon EP. Introduction to human anatomy and physiology. Elsevier Health Sciences; 2015 Oct 15.
 4. Ellis H, Mahadevan V. Anatomy and physiology of the breast. Surgery (Oxford). 2013 Jan 1;31(1):11-4.
 5. De Benedetto D, Abdulcadir D, Giannotti E, Nori J, Vanzi E, Capaccioli L. Radiological anatomy of the breast. Italian Journal of Anatomy and Embryology. 2016 Jun 3:20-36.
 6. Ma AK, Gunn S, Darambara DG. Introducing DeBRa: A detailed breast model for radiological studies. Physics in Medicine & Biology. 2009 Jun 26;54(14):4533.
 7. Keyriläinen J, Fernández M, Bravin A, Karjalainen-Lindsberg ML, Leidenius M, von Smitten K, Tenhunen M, Kangasmäki A, Sipilä P, Nemoz C, Virkkunen P. Comparison of in vitro breast cancer visibility in analyser-based computed tomography with histopathology, mammography, computed tomography and magnetic resonance imaging. Journal of synchrotron radiation. 2011 Sep 1;18(5):689-96.
 8. Pilevarzadeh M, Amirshahi M, Afsargharehbagh R, Rafiemanesh H, Hashemi SM, Balouchi A. Global prevalence of depression among breast cancer patients: a systematic review and meta-analysis. Breast cancer research and treatment. 2019 Aug 15;176:519-33.
 9. Benson JR, Jatoi I. The global breast cancer burden. Future oncology. 2012 Jun;8(6):697-702.
 10. Kim Y, Yoo KY, Goodman MT. Differences in incidence, mortality and survival of breast cancer by regions and countries in Asia and contributing factors. Asian Pacific Journal of Cancer Prevention. 2015;16(7):2857-70.
 11. Fan L, Goss PE, Strasser-Weippl K. Current status and future projections of breast cancer in Asia. Breast care. 2015 Dec 15;10(6):372-8.
 12. Masood K, Masood A, Zafar J, Shahid A, Kamran M, Murad S, Masood M, Alluddin Z, Riaz M, Akhter N, Ahmad M. Trends and analysis of cancer incidence for common male and female cancers in the population of Punjab province of Pakistan during 1984 to 2014. Asian Pacific Journal of Cancer Prevention. 2015;16(13):5297-304.

13. Nazir S. A STUDY OF FACTORS OF BREAST CANCER AMONG WOMEN PATIENTS OF DHQ HOSPITAL FAISALABAD. Independent Journal of Allied Health Sciences. 2019;2(04):235-43.
14. Hameed S, Javed N, Subhani H, Hussain A. Analysis of the Prevalence of cancer in Faisalabad: A single centre study. Annals of Punjab Medical College (APMC). 2009 Dec 12;3(2):114-8.
15. Kalim MS, Ahmed A, Awan WS, Sarfraz S. Diagnostic Accuracy of Combining Sonoelastography with Mammography in Solid Breast Lesions Keeping Histopathology as Gold Standard. Biomedica. 2022 Mar 10;38(1):10-7.
16. Ayesha S, Bacha R, Akhter T, Fatima M, Gilani SA, Farooq SY, Yousaf M, Uzair M, Liaqat M, Rasool M. Diagnostic Accuracy of Mammographic and Sonographic Findings in the Differentiation of Palpable Breast Masses taking Histopathology as a Gold Standard. RADS Journal of Pharmacy and Pharmaceutical Sciences. 2021 Jun 25;9(1):18-24.
17. Donnelly J. Breast lump detection: who is more accurate, patients or their GPs?. International journal of clinical practice. 2010 Mar;64(4):439-41.
18. Gayatri L, Patil LS, Rajashri D, Vijayanath V, Anitha MR. Benign Breast Disease at the Gynaecology Out Patient Clinic. Journal of Medical research and Practice, North America. 2013;3:212-7.
19. Lee AH. Why is carcinoma of the breast more frequent in the upper outer quadrant? A case series based on needle core biopsy diagnoses. The Breast. 2005 Apr 1;14(2):151-2.
20. Ayesha S, Bacha R, Akhter T, Fatima M, Gilani SA, Farooq SY, Yousaf M, Uzair M, Liaqat M, Rasool M. Diagnostic Accuracy of Mammographic and Sonographic Findings in the Differentiation of Palpable Breast Masses taking Histopathology as a Gold Standard. RADS Journal of Pharmacy and Pharmaceutical Sciences. 2021 Jun 25;9(1):18-24.
21. Cutuli B, Velten M, Martin C. Assessment of axillary lymph node involvement in small breast cancer: analysis of 893 cases. Clinical breast cancer. 2001 Apr 1;2(1):59-65.
22. Khanduri S, Chaudhary M, Sabharwal T, Usmani T, Goyal A, Khanduri S, Bhagat S, Huda F, Yadav S, Katyal G. A low-cost, low-skill model for efficient

Online ISSN

3007-3197

Print ISSN

3007-3189

<http://amresearchreview.com/index.php/Journal/about>

- breast cancer screening in low resource rural settings of a developing country. *Cureus*. 2017 Aug 16;9(8).
23. Khanduri S, Chaudhary M, Sabharwal T, Usmani T, Goyal A, Khanduri S, Bhagat S, Huda F, Yadav S, Katyal G. A low-cost, low-skill model for efficient breast cancer screening in low resource rural settings of a developing country. *Cureus*. 2017 Aug 16;9(8).
24. Leddy R, Irshad A, Zerwas E, Mayes N, Armeson K, Abid M, Cluver A, Campbell A, Ackerman S, Lewis M. Role of breast ultrasound and mammography in evaluating patients presenting with focal breast pain in the absence of a palpable lump. *The Breast Journal*. 2013 Nov;19(6):582-9.
25. Tewari V, Sharma S, Ranjan R. SONOMAMMOGRAPHIC EVALUATION OF BREAST MASSES. *J. Anat*. 2018 Dec;26(2):50-3.
26. 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.
27. Badu M, Simkhada R. Combined Mammographic and Sonographic Evaluation of Palpable Breast Mass. *Journal of Universal College of Medical Sciences*. 2015 Dec 28;3(4):1-5.
28. Ahmed I, Nazir R, Chaudhary MY, Kundi S. Triple assessment of breast lump. *Journal of the College of Physicians and Surgeons—pakistan: JCPSP*. 2007 Sep 1;17(9):535-8.
29. Kolb TM, Lichy J, Newhouse JH. Comparison of the performance of screening mammography, physical examination, and breast US and evaluation of factors that influence them: an analysis of 27,825 patient evaluations. *Radiology*. 2002 Oct;225(1):165-75.