MEDALION JOURNAL: Medical Research, Nursing, Health and Midwife Participation | ISSN(e): 2986-7754
Volumes 6 No. 2 (2025)

ANALYSIS OF ULTRASOUND EXAMINATION WITH HISTOPATHOLOGICAL READINGS IN BREAST CANCER PATIENTS AT PROF. DR. CHAIRUDDIN P. LUBIS HOSPITAL USU MEDAN

Hafiz Nurdiansyah[1]*, Liandra Khairunnisa[2], Elvita Rahmi Daulay[3], Endi Taris Pasaribu[4]
[1]Fakultas Kedokteran, Universitas Imelda Medan, Indonesia
[2]Program Studi Psikologi, Universitas Tjut Nyak Dhien Medan, Indonesia
[3,4] Universitas Sumatera Utara, Indonesia.
Corresponding E-mail: dr.hafiznurdiansyah@gmail.com[1]* , liandra@utnd.ac.id[2], Elvitadaulay@yahoo.com[3] Endi_pasaribu@usu.ac.id[4]

Received	: 21 April 2025	Published	: 30 June 2025
Revised	: 30 April 2025	DOI	: https://doi.org/10.59733/medalion.v6i2.201
Accepted	: 16 May 2025	Published links	: https://medalionjournal.com/index.php/go

Abstract

Breast cancer is the type of cancer with the highest prevalence in women and is the leading cause of cancer death globally. Early detection is very important to determine the right management, one of which is through ultrasound examination (ultrasound) as a non-invasive imaging method. However, the validity of ultrasound results still needs to be studied through comparison with histopathological results as the gold standard of diagnosis. This study aims to analyze the suitability between the results of ultrasound examination and the results of histopathological readings in breast cancer patients at Prof. Dr. Chairuddin P. Lubis Hospital USU Medan. The study used a cross-sectional design of 48 patients who underwent ultrasound and histopathological examinations throughout 2023. The results showed that 29 patients were classified as having malignant tumors based on ultrasound, but only 26 were confirmed malignant through histopathology. The compatibility rate between the two methods was only 37.5%, and the Fisher Exact test showed no statistically significant compatibility ($p < 0.01$). These findings suggest that ultrasound examination has limitations in distinguishing benign and malignant lesions. Therefore, ultrasound results need to be confirmed by histopathological examination to avoid misdiagnosis and therapy. This study confirms the importance of a multimodal approach in breast cancer diagnosis.

Keywords: ***breast cancer, ultrasonography, histopathology, diagnosis suitability, benign tumors, malignant tumors.***

INTRODUCTION

Breast cancer is one of the most common types of cancer and is the leading cause of cancer death in women worldwide. The uncontrolled growth of abnormal cells in breast tissue makes this disease very dangerous if not detected early. Based on data (Sung et al., 2021), there are more than 2.3 million new cases of breast cancer worldwide, with a death toll of 685,000. In Indonesia alone, around 56,731 new cases and 15,228 deaths due to breast cancer were reported in the same year. Early detection is an important step in treating breast cancer. For this reason, various diagnostic modalities are used to detect and evaluate lesions in the breast, including mammography, ultrasound (ultrasound), and histopathological examination (Kardinah et al., n.d.). Among these modalities, ultrasound is an important diagnostic tool, especially in patients with dense breast tissue, where mammography has limitations. Ultrasound works by using sound waves to produce images of the internal structure of the breast, which is useful for distinguishing between benign and malignant lesions based on morphological characteristics such as the shape, border, size, and echogenicity of the lesion (Alifian et al., 2024). However, the results of ultrasound examinations are subjective and highly dependent on the expertise of the operator, so the accuracy of the diagnosis needs to be validated by a more definitive examination, namely histopathology. Histopathological examination is the gold standard in establishing a breast cancer diagnosis. Through microscopic analysis of tissues, the nature and type of lesions can be identified more accurately. The combination of ultrasound results and histopathology is expected to provide a more comprehensive diagnostic picture, as well as support more informed clinical decisions in patient management. In practice, the fit between ultrasound and histopathology results is still an important topic

to research, given that not all ultrasound results end in the same diagnosis when compared to histopathology. Some previous research, such as by (Akinnibosun-Raji et al., 2022) in Nigeria and (Aziz et al., 2022) in Malaysia, showed a significant correlation between ultrasound and histopathology results in breast cancer diagnosis.

However, these results are not necessarily universal, as factors such as the ultrasound method used, gender, age of the patient, and biopsy techniques can affect the suitability of the results. Based on this, this study was conducted to find out whether there is a compatibility between the results of the ultrasound examination and the results of histopathological readings in breast cancer patients at Prof. dr. Chairuddin P. Lubis USU Medan Hospital. This hospital is one of the main health service centers in Medan City that treats various oncology cases, including breast cancer, making it the right location for this study. The study used a cross-sectional design, involving 48 breast cancer patients who had undergone ultrasound and biopsy examinations in 2023. The results showed that out of 48 patients, there were 29 cases of malignant tumors and 19 cases of benign tumors based on ultrasound results. Meanwhile, histopathological results showed 26 malignant cases and 22 benign cases. The most dominant finding on ultrasound results for malignant tumors was Ca Mammae, while for benign tumors was Fibroadenoma Mammae. On the other hand, the most histopathological results found Invasive Breast Carcinoma as a malignant tumor.

Based on the Fisher Exact test, no significant match was found between ultrasound and histopathological results ($p < 0.01$), indicating the need for caution in assessing ultrasound results as the sole basis of diagnosis. These findings are important for clinical practice, as they can influence therapeutic decisions and patient management. If the ultrasound results are not in line with histopathology, the potential for misdiagnosis and overtreatment or undertreatment becomes greater. Therefore, it is important for medical personnel to not only rely on ultrasound results, but combine them with clinical examinations, mammography, MRI, and especially histopathology to obtain a comprehensive diagnosis. This research is expected to contribute to the development of breast cancer diagnostic standards, especially in the local context at Prof. dr. Chairuddin P. Lubis USU Medan Hospital, as well as become the basis for further research with a larger sample count and a more integrative approach.

LITERATURE REVIEW

1. Breast Anatomy

The breast is anatomically located on the anterior wall of the thoracic and partially lateral, with a structure consisting of fibroglandular, fat, and mammary duct tissue (Prajoko, 2023). The breast parenchyma is divided into lobes consisting of lobules and alveoli that drain into the lacterous duct. This anatomical structure is surrounded by connective tissue and fat, and functions as a milk producer and is one of the organs that is prone to abnormal cell growth, including cancer. The structure of the breast also includes vascularization and the extensive lymphatic system, which is the main pathway of metastasis in breast cancer cases. The outer upper quadrant area is the location with the most glandular tissue, which makes it the most common place for neoplastic masses or lesions.

2. Breast Cancer

Breast cancer is an abnormal growth of cells that originate from breast tissue, both from the milk duct (ductus) and from the lobules. This cancer is a malignant neoplasm that is able to infiltrate the surrounding tissues and metastasize to other organs. Based on the classification of WHO and the American Joint Committee on Cancer (AJCC), breast cancer is differentiated based on histological type, hormonal receptors, and HER2 expression (Organization, 2023). Globally, breast cancer is the most common type of cancer that affects women and is the highest cause of cancer death. Data (Sung et al., 2021) It noted that this cancer reaches more than 2 million new cases every year. In Indonesia, the trend of increasing breast cancer incidence continues, with the incidence rate getting higher based on RISKESDAS data.

3. Risk Factors for Breast Cancer

Risk factors for breast cancer can be divided into two, namely irreversible factors such as age, female gender, genetic mutations (BRCA1, BRCA2), family history, and hormonal status (Son, 2015). Meanwhile, factors that can be modified include obesity, alcohol consumption, smoking, sedentary lifestyle, and unhealthy diet. High density of breast tissue has also been shown to increase the risk of breast cancer and inhibit early detection through mammography. Women with a history of premature menstruation, late menopause, and the use of hormone therapy are also at greater risk.

4. Clinical Symptoms of Breast Cancer

Early symptoms of breast cancer are often non-specific, but can include painless lumps, changes in breast shape or size, nipple retraction, and changes in breast skin such as "peau d'orange" (Bachtiar, 2022). In advanced stages, symptoms can include discharge from the nipple, unhealed wounds, or lymph node involvement. Since early symptoms are often invisible, early detection is essential to improve the patient's prognosis.

5. Radiological Examination of Breast Cancer

a. Mammography

Mammography is a standard screening method that uses low-energy X-rays to detect lesions or calcifications in breast tissue (Tunjungsari et al., 2016). Despite having high sensitivity in low-density breasts, its effectiveness decreases in high-density breasts. Mammography remains the primary method in breast cancer screening programs in developed countries.

b. Ultrasound (ultrasound)

Ultrasound is a non-invasive imaging modality that uses high-frequency sound waves to produce images of soft tissues, including the breast (Ermawati, 2020). Ultrasound is very useful as a complement to mammography, especially in women with dense breasts. Ultrasound can help distinguish between solid and cystic masses and distinguish benign or malignant traits based on morphological criteria. The advantage of ultrasound is its ability to detect lesions that are not visible on mammography and do not use radiation. However, these checks are carrier-dependent, which can affect the accuracy of the results.

6. Histopathological Examination

Histopathological examination is the definitive confirmation method for the diagnosis of breast cancer. This examination is done through tissue sampling (biopsy) which is then analyzed under a microscope by a pathologist to determine the type and degree of malignancy of the lesion. Histopathology is a reference in determining the type of cancer, degree of differentiation, invasion, and the right treatment plan. Common biopsy techniques include fine needle biopsy (BAJH), core needle biopsy (CNB), or surgical biopsy (Puspasari, 2020).

7. Inspection Conformity Concept

The compatibility between radiological examinations (such as ultrasound) and histopathological results is important to evaluate because they can demonstrate the accuracy of imaging modalities in detecting and classifying lesions (Salsabilla et al., n.d.). Inconsistencies can lead to misdiagnosis and affect clinical management plans. Previous studies have shown variations in the level of suitability, depending on the quality of the equipment, operator skills, and histological sampling and analysis methods.

METHOD

1. Types of Research

This study uses a quantitative approach with a cross-sectional design, which is a type of observational research that observes the relationship between two variables at a certain time (Abduh et al., 2023). In this context, the researcher analyzed the compatibility between the results of the ultrasound examination and the histopathological results in patients diagnosed with breast tumors.

2. Research Place

The research was conducted at the Prof. dr. Chairuddin P. Lubis Hospital, University of North Sumatra, Medan, precisely in the radiology installation and anatomical pathology laboratory.

3. Population and Research Sample

- The study population was all patients with suspected breast cancer who underwent ultrasound examination and followed by histopathological examination at Prof. dr. Chairuddin P. Lubis USU Medan Hospital.
- The research sample was taken using the total sampling technique, namely all patients who met the inclusion criteria and were not included in the exclusion criteria. The total sample obtained was 48 patients.

4. Inclusion and Exclusion Criteria

- Inclusion criteria:

- Patients who have undergone ultrasound examination and have obtained histopathological results of breast tumors.
- Patients with complete medical records and data that can be analyzed.

- Exclusion criteria:
  - Patients with incomplete examination data.
  - Patients who are not willing have their data used for the study.

5. Data Collection Methods

Data is collected retrospectively from the patient's medical records. The information retrieved includes:

- Results of ultrasound examination (lesion type, location, BI-RADS classification).
- Histopathological results (tumor type, malignant/benign classification).
- Demographic data of patients (age, gender).

6. How Research Works

Steps to conduct the study:

- Apply for research permits to hospitals and faculty.
- Identify all patients undergoing ultrasound and breast biopsy.
- Collect ultrasound results data from radiology installations and histopathology data from anatomical pathology laboratories.
- Classify lesions based on ultrasound results into benign and malignant categories.
- Classify histopathological results into benign and malignant categories.
- Conduct an analysis of the suitability between the results of the ultrasound examination and the histopathology results.

7. Research Ethics

This research has received ethical approval from the Research Ethics Committee of the Faculty of Medicine, University of North Sumatra. All data used is confidential and only used for scientific purposes. The patient's identity is disguised to ensure privacy and confidentiality.

8. Operational Definition

- Ultrasound: Imaging examinations use high-frequency sound waves to detect and assess the mass in the breast.
- Histopathology: Microscopic examination of tissues to determine the benign or malignant nature of the lesion/tumor.
- Suitability: Declared appropriate when the classification of ultrasound results (benign or malignant) is the same as the histopathological classification results.

9. Data Analysis Plan

The data obtained was statistically analyzed using:

- Frequency distribution to describe the characteristics of the subject (age, sex, type of lesion).
- The Fisher Exact test is used to test the suitability between ultrasound results and histopathology results because the data are categorical and the sample count is relatively small.

RESULTS AND DISCUSSION

1. Distribution of subjects by age

Based on age group, the most research subjects were in the age range of 41–50 years, which was 16 people (33.3%), followed by 13 people (27.1%) aged 51-60 years. This shows that breast cancer is most commonly found in the middle-aged age group.

Table 1. Age Distribution of Research Subjects

Age (years)	Quantity (n)	Percentage (%)
< 30	3	6,3%
31–40	9	18,8%
41–50	16	33,3%
51–60	13	27,1%
> 60	7	14,6%
Total	**48**	**100%**

2. Distribution by Gender

All patients who were subjects in this study were women (100%), which shows that breast cancer is still dominated by cases in the female sex.

Table 2. Gender Distribution

Gender	Quantity (n)	Percentage (%)
Woman	48	100%
Man	0	0%
Total	**48**	**100%**

The results showed that the most age group suffering from breast cancer was in the age range of 41–50 years (33.3%), followed by the age of 51–60 years (27.1%). These findings are in line with epidemiological studies showing that the incidence of breast cancer increases in middle-aged women, especially before and after menopause. Hormonal changes that occur during this period, especially increased exposure to estrogen without a progesterone balance, are one of the main factors that increase the risk of breast neoplasms. All of the study subjects were women (100%), reflecting the clinical reality that breast cancer is much more prevalent in women than men. The WHO notes that although men can also develop breast cancer, the proportion is very small (<1%). This is related to a very limited amount of breast glandular tissue in men as well as much lower estrogen levels than in women (Organization, 2023). This study confirms that female gender and middle to advanced age are the main demographic factors that contribute to breast cancer incidence. These findings are in line with research by (Aziz et al., 2022) in Malaysia and (Akinnibosun-Raji et al., 2022) in Nigeria which also recorded a high prevalence of breast cancer in women aged 40

years and above. Age and gender factors remain important variables in breast cancer screening and early detection strategies.

3. **Distribution of lesions based on ultrasound examination**

Based on ultrasound examination, as many as 29 cases (60.4%) were classified as malignant tumors, while 19 cases (39.6%) were classified as benign tumors.

Table 3. Ultrasound Examination Results

Types of Ultrasound Lesions	Quantity (n)	Percentage (%)
Malignant Tumor (Ca Mammae)	29	60,4%
Benign tumors (FAM, etc.)	19	39,6%
Total	**48**	**100%**

Ultrasound examination showed that out of 48 patients, 29 (60.4%) were classified as having malignant tumors, while 19 patients (39.6%) were identified as having benign tumors. Ultrasound is known to be an important aid in the detection of breast cancer, particularly in women with dense breast tissue, where mammography is less sensitive. Through ultrasound, doctors can observe lesion boundaries, shapes, sizes, echogenicity, and posterior shadow patterns that support benign or malignant characterizations. Nevertheless, ultrasound has limitations in terms of specificity, and the results depend heavily on the skill of the operator. Benign lesions such as fibroadenoma can sometimes resemble the picture of malignant lesions, and vice versa. This suggests that ultrasound cannot be used as the only diagnostic tool, but must be combined with other methods such as biopsy or histopathology to confirm the diagnosis. This study shows that although ultrasound has good sensitivity in detecting lesions, there is a possibility of misclassification. Research by (Stavros et al., 1995) also found that ultrasound had high sensitivity (98%) but lower specificity (about 68%), which indicated the need for caution in the interpretation of ultrasound results, especially when used to distinguish benign and malignant tumors.

4. **Distribution of lesions by histopathology**

The histopathological results showed that there were 26 cases (54.2%) of malignant tumors, and 22 cases (45.8%) of benign tumors. The most malignant lesions found are Invasive Breast Carcinoma, while the most benign lesions are Mammae Fibroadenoma.

Table 4. Histopathological Examination Results

Types of Histopathological Lesions	Quantity (n)	Percentage (%)
Malignant Tumor (Invasive Ca)	26	54,2%
Benign tumors (FAM, etc.)	22	45,8%

Total	**48**	**100%**

Histopathology as the gold standard in cancer diagnosis showed that 26 cases (54.2%) were malignant tumors and 22 cases (45.8%) were benign tumors. These results showed that the number of histopathologically confirmed malignant tumors was lower than the ultrasound results. The most common malignant lesion is Invasive Breast Carcinoma, while the most commonly found benign lesion is Mammae Fibroadenoma. Histopathology provides morphological and cytological information that is crucial in establishing an accurate diagnosis. Microscopic tissue analysis allows for the identification of cell characters, tissue invasion, as well as specific molecular expressions that cannot be seen through ultrasound (Sugiarto, 2024). Therefore, any suspicious imaging results from ultrasound should be followed by histopathological examination to obtain diagnostic certainty. These findings corroborate the results of previous research by (Pereira et al., 2020), which states that weak clinical-radiological correlations often lead to overdiagnosis or underdiagnosis if not confirmed by histopathology. This strengthens the argument that histopathology remains the most accurate tool in distinguishing benign and malignant breast tumors.

5. Suitability of Ultrasound and Histopathology Examination Results

To determine the compatibility between ultrasound and histopathology results, an analysis was carried out using the Fisher Exact test. The results showed that out of 48 cases, only 18 cases (37.5%) had ultrasound results that matched histopathological results. The remaining 30 cases (62.5%) showed nonconformity, which means that the benign/malignant classification on ultrasound was not consistent with histopathological results.

Table 5. Compatibility of ultrasound with histopathology

Conformity	Quantity (n)	Percentage (%)
Appropriate	18	37,5%
Inappropriate	30	62,5%
Total	**48**	**100%**

The Fisher Exact test yielded a p< value of 0.01, indicating that there was no statistically significant match between the ultrasound results and the histopathology results. Of the total 48 cases, only 18 cases (37.5%) showed a match between ultrasound results and histopathological results, while 30 cases (62.5%) did not match. The results of the Fisher Exact test showed a p< value of 0.01, indicating that there was no statistically significant match between the two examination methods. This means that the benign/malignant classification by ultrasound is not accurate enough to be used as a basis for diagnosis without further confirmation. This difference in results can be caused by several factors, including: limited ultrasound resolution, subjectivity of the results reading, and non-typical tumor morphological variations. Certain malignant tumors may appear with features that resemble benign tumors, such as smooth contours or clear borders, which complicate the classification process through ultrasound (Sudarsa, 2019). Research by (Hata et al., 2004) It is also reported that the degree of mismatch between ultrasound and histopathology can be as high as 40–60%, depending on the quality of the tool, the skill of the operator, and the experience of the interpreter. Therefore, ultrasound results should not be the sole basis for clinical decision-making, but should be combined with advanced diagnostic methods to prevent mismanagement.

CONCLUSION

Based on the results of a study conducted on 48 patients with suspected breast tumors, it can be concluded that the majority of patients are female and are in the age group of 41–60 years, which is the age group with a high risk of breast cancer. This is in line with global and national epidemiological trends, where middle-aged and

postmenopausal women are the most vulnerable populations to the growth of neoplastic cells in breast tissue. The results of ultrasound examinations showed that more than half of the patients were classified as having malignant tumors, while histopathological examination as the definitive diagnosis method showed a slightly lower proportion of malignant tumors. This indicates a tendency for overdiagnosis by ultrasound which may be due to limitations in distinguishing the morphological character of lesions, especially between benign fibroadenomas and invasive carcinomas. The discrepancy between ultrasound and histopathological results found in more than 60% of the cases in this study suggests that ultrasound examination cannot be used as a single basis for establishing the diagnosis of breast tumors. The $p<0.01$ value of the Fisher Exact test reinforces the finding that there is no statistically significant compatibility relationship between the two methods. Thus, although ultrasound has the advantage of being a non-invasive and fast method, the results must still be confirmed through histopathology to guarantee the accuracy of the diagnosis and prevent mismanagement. The overall results of this study confirm the importance of a multimodal approach in breast cancer diagnosis, considering a combination of clinical examination, radiological imaging (ultrasound/mammography), and histopathological verification. This research also makes an important contribution in highlighting the limitations of ultrasound, as well as reinforcing the role of histopathology as the gold standard in accurately determining the nature of breast lesions. Thus, it is hoped that these findings can be the basis for clinical considerations in more careful and measurable decision-making in the management of breast cancer patients.

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