



Ultrasonography (USG) Accuracy in Diagnosing Breast Cancer; a Cross-sectional Study at Prima Medika General Hospital Denpasar

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ABSTRACT

Background: Ultrasonography (USG) radiological examination can be an early detection of breast tumors before they develop into malignancy. The aim of our study was to determine the accuracy of USG examination in diagnosing breast cancer at Prima Medika Hospital.

Methods: We conducted a cross-sectional study from January to December 2021 at Prima Medika Hospital Denpasar in patients who had symptoms of breast cancer had breast USG examinations and biopsy examinations of 51 samples. We collected data by tracing medical records and in descriptive analysis and cross-tabulation analysis to determine the sensitivity, specificity, positive predictive values and negative predictive values.

Results: 72.5% of 51 patients were over 36 years old, 47.1% symptoms of a lump in their left breast. USG examination in detecting breast cancer has a sensitivity of 90.9%, a specificity of 93.1% then a positive predictive value of 92.9% and a negative predictive value of 90.1%.

Conclusion: USG examination has a high accuracy in diagnosing breast cancer. Radiology specialists are expected to use USG examination as an early detection tool before conducting a histopathological gold standard examination.

Keywords: Breast cancer; ultrasonography; accuracy.

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Introduction

The World Health Organization (WHO) reports that the most deadly type of cancer in women aged 20-59 years worldwide is breast cancer. Breast cancer ranks first in reports of cancer incidence and is one of the main causes of death from cancer in Indonesia¹. The Global Burden of Cancer Study (Globocan) reported that the number of new cases of breast cancer in 2020 reached 68.858 cases (16.6%) of a total of 396.914 new cases of cancer in Indonesia with the number of deaths reaching more than 22.000 people². The prevalence of breast cancer on women in Bali Province is reported to be 0.6% with an estimated absolute number of 1.233 people³.

Breast cancer is a malignancy of cells found in breast tissue, which can originate from glandular components (epithelial ducts and lobules) or non-glandular components such as fatty tissue, blood vessels and innervation of breast tissue⁴. The initial symptom that is often complained of by patients with a diagnosis of breast cancer is a palpable lump in the breast. These lumps can be accompanied by pain, changes in the shape of the breast, changes in the skin around the breast, as well as reddish discharge and discharge from the nipples⁵.

One of the reasons for the high incidence of breast cancer in Indonesia is due to low public awareness of early detection and clinical examination of breast cancer. It was reported that 70.0% of women were already at an advanced stage when carrying out clinical examinations⁶.

Radiological examination can be one of the early detection efforts to detect breast tumors before they become malignant. Radiological examinations that are commonly performed are mammography and/or breast Ultrasoundography (USG) depending on the condition of the patient with breast tumors⁷. The working principle of this USG uses ultrasonic waves. USG can be used in the initial assessment of organ systems because ultrasonic waves are considered effective in differentiating various tissue structures without radiation⁵.

From a financing perspective, the use of USG also requires a lower cost than other

examinations, is non-invasive and is widely available in hospitals. USG examination has also been shown to reduce the mortality rate of breast tumor patients. Appropriate clinical examination and radiological examination of the breast should be carried out prior to histopathological examination⁸. Anatomical pathology biopsy is the gold standard examination to assess the presence of breast cancer in a person. Biopsy can differentiate between benign and malignant tumors significantly through the cytological appearance found through microscopy⁵.

A study conducted by Hasbie Neno Fitriyani found that the validity of breast USG seen from a reported sensitivity of 84.0% and specificity of 81.0%. Breast USG has good accuracy for diagnosing breast cancer⁹. A study conducted by Ruthie Aviana also found almost the same results that breast USG had a sensitivity value of 96.7%, a specificity value of 50.0%, a positive predictive value of 96.7%, a negative predictive value of 50.0%¹⁰.

Research conducted by Dian Ara Minta Ramadhania actually obtained different results from previous studies, that breast USG has a sensitivity of 50.0%. This study shows that breast USG has poor sensitivity for diagnosing breast cancer¹¹. Based on various results of previous studies, it shows that breast USG shows inconsistent accuracy, so it is worth conducting further research. Our study aims to determine the accuracy of USG examination in diagnosing breast cancer at Prima Medika Hospital Denpasar.

Method

We conducted a cross-sectional study which was carried out at Prima Medika Hospital Denpasar for 12 months from January to December 2021. The study population was patients who had symptoms of breast cancer. The sample is part of the population that has had breast USG examination and biopsy examination selected by consecutive sampling. The minimum sample size was calculated using a diagnostic test which obtained 51 samples.

We collected data including age, symptoms, USG results and histopathology results through medical record searches. Data is processed using a computer with the help of

Statistical Product and Service Solutions (SPSS) version 25 software.

We performed a descriptive analysis to describe the frequency distribution of age and symptoms and a cross tabulation analysis to compare the USG results with histopathological results to determine the sensitivity, specificity, positive predictive value and negative predictive value.

Results

Table 1. Patient Characteristics

Variable	n=51 (%)
Age (years)	
<25	1 (2.0)
25-36	13 (25.5)
>36	37 (72.5)
Symptoms	
Right breast lump	17 (33.3)
Left breast lump	24 (47.1)
Right and left breast lump	2 (3.9)
Right breast wound	2 (3.9)
Left breast wound	1 (2.0)
Right breast pain	1 (2.0)
Left breast pain	4 (7.8)

Table 2. Diagnostic Validity Test Results

Variable	Histopathological Examination Results	
	Positive n (%)	Negative n (%)
USG Examination Results		
Positive	20 (90.9)	2 (6.9)
Negative	2 (9.1)	27 (93.1)

Table 3. USG Accuracy Calculation Results

Indicator Accuracy	%
Sensitivity	90.9
Specificity	93.1
Positive predictive value	92.9
Negative predictive value	90.1

Based on Table 1, we found that most of the patients were over 36 years old (72.5%) with the most common symptoms being a lump in the left breast (47.1%).

Based on Table 2, from the results of the cross-tabulation analysis between the results of USG and histopathological examinations, we found that 90.9% of patients who tested positive (malignant tumors) from the results of USG and histopathological examinations and

there were 93.1% of patients also tested negative (benign tumor) from the results of USG and histopathological examination.

Based on Table 3 of the results of the accuracy calculation, we found that USG examination in detecting breast cancer had a sensitivity of 90.9%, a specificity of 93.1%, then a positive predictive value of 92.9% and a negative predictive value of 90.1%. These results indicate that the results of USG examination have good accuracy for detecting breast cancer.

Discussion

Breast cancer is one of the most frequently found cancers worldwide. Breast cancer is also the leading cause of death in women. The risk of developing breast cancer in women reaches 12.2%¹².

The diagnosis of breast cancer can be enforced from the results of one examination, one of which is a supporting examination. Radiological examination can be used to detect the occurrence of breast cancer through Ultrasonography (USG). USG is a relatively inexpensive and effective method of differentiating cystic breast masses non-invasively from solid breast masses that usually require a biopsy. USG can also provide information on the nature and extent of solid masses and other breast lesions¹².

USG is a modality that is generally used in women aged 35 years or younger because it has good accuracy in detecting breast cancer¹³. This can be proven through this study which found that USG examination has good sensitivity, specificity, positive predictive value and negative predictive value in detecting breast cancer.

USG sensitivity is the ability to detect breast cancer. Our research found that the sensitivity of USG in detecting breast cancer was 90.9%. The results obtained are very high so that the use of USG to be used as an early detection tool for breast cancer is very appropriate.

The results of this study are in accordance with research conducted by Ruthie Aviana at Sanglah Hospital Denpasar in 2019 which also found that the sensitivity of the USG device for predicting the occurrence of breast cancer

reached 96.7%¹⁰. Research conducted by Muthia Kintan at DR. Wahidin Sudirohusodo Makassar also got the same result that the sensitivity of the USG tool used to predict breast cancer reached 92.9%¹³.

A systematic literature review conducted by Rahmi Hidayanti Pelu also found that the sensitivity of gray scale USG examination reached 75-94.4%¹⁴. Another study conducted by Sidharta Himawan Giri at one of the largest hospitals in the city of Surabaya also obtained the same result, that the sensitivity of USG in diagnosing breast cancer reached 96.3%¹⁵. This shows that the USG diagnostic tool has good sensitivity so it is appropriate to use it to detect breast cancer.

USG specificity is the ability to give a negative picture or not breast cancer in patients who do not have breast cancer. Our study found that the specificity of the USG obtained reached 93.1%. These results tend to be the same as various previous studies. Research conducted by Muthia Kintan at DR. Wahidin Sudirohusodo Makassar also got the same result that the specificity of the USG tool used to predict breast cancer reached 90.0%¹³.

Research conducted by Sidhartha Himawan Giri at one of the largest hospitals in the city of Surabaya obtained the same result that the specificity of USG in diagnosing breast cancer reached 84.6%¹⁵. A systematic literature review conducted by Rahmi Hidayanti Pelu also obtained the same result that the specificity of gray scale USG examination reached 18,8-81.8%¹⁴. However, the results obtained tend to be quite wide. This shows that the USG diagnostic tool has good specificity to be used to detect breast cancer.

However, the results of this study are different from the research conducted by Ruthie Aviana at Sanglah Hospital, Denpasar, which found that the specificity of USG used to detect breast cancer only reached 50.0%. These results are very different from the results of this study. Researchers suspect that many factors lead to inconsistencies in the results that occur, such as the variety of tools used, the method of measurement and the severity of the disease. This can indirectly affect the results obtained¹⁰.

The positive predictive value is strongly influenced by the value of sensitivity and

specificity¹⁰. We got the results of a positive predictive value produced by an USG examination to detect the incidence of breast cancer of 92.9%. The estimated value obtained is very good for predicting the occurrence of breast cancer so that it is appropriate to be used as a supporting examination for early detection of breast cancer.

The results of our study are the same as those of various studies. Research conducted by Ruthie Aviana got the same result that the positive predictive value of an USG device in predicting the occurrence of breast cancer was 96.7%¹⁰. Research conducted by Rahmi Hidayanti Pelu actually found better results that the positive predictive value of USG in predicting the occurrence of breast cancer could reach 100.0%¹⁴. Research conducted by Sidharta Himawan Giri also obtained the same result that the positive predictive value of USG to predict the occurrence of breast cancer reached 92.8%¹⁵.

Positive predictive value refers to the probability that a patient with an USG result positive for breast cancer will actually have breast cancer. A high positive predictive value can indicate the ability of USG to predict the truth of the presence of breast cancer¹⁰. Based on the findings of this study combined with various studies, the positive predictive value of USG in predicting breast cancer is very good.

While the negative predictive value obtained is 50.0%. Negative predictive value is the probability that a person with a negative USG result for breast cancer will not actually have breast cancer. Based on the results, the positive predictive value obtained is much higher than the negative predictive value. This can be caused by deficiencies in sampling and operator expertise in using USG equipment. The accuracy value obtained is 93.9%¹⁰.

The negative predictive value is also strongly influenced by the sensitivity and specificity values. We found that the negative predictive value of USG in predicting the occurrence of breast cancer reached 90.1%. Negative predictive value is the probability that a person with a negative USG result for breast cancer will not actually have breast cancer.

The results of this study are consistent with various studies. Research conducted by

Sidhartha Himawan Giri found that the negative predictive value of USG to detect breast cancer reached 91.6%¹⁵. Research conducted by Rahmi Hidayati Pelu also obtained the same result that the negative predictive value of USG reached 91.7-100.0%¹⁴. Research conducted by Muthia Kintan also obtained the same result that the ability of negative predictive value USG in predicting the occurrence of breast cancer reached 94.7%¹³.

However, research conducted by Ruthie Aviana found that the negative predictive value of USG in predicting the incidence of breast cancer was only 50.0%¹⁰. Likewise, a study conducted by Neno Fitriani Hasbie, who obtained a negative predictive value USG of only 75.0%. The low value obtained is thought to be due to limitations in sampling so that the samples used are less varied⁹.

Conclusion

Ultrasonography (USG) examination has a high accuracy in diagnosing breast cancer with a sensitivity of 90.9%, a specificity of 93.1%, a positive predictive value of 92.9% and a negative predictive value of 90.1%. Radiology specialists are expected to use USG examination as an early detection tool before conducting a histopathological gold standard examination to detect breast cancer.

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