CHARACTERISTIC OF MAMMOGRAPHY COMPARED WITH HISTOPATHOLOGY RESULT AT RSUP DR. KARIADI

by Lydia Kuntjoro

Submission date: 23-May-2023 11:36AM (UTC+0700)
Submission ID: 2099802059
File name: 30166-70120-1-PB.pdf (435.71K)
Word count: 4675
Character count: 25486

DIPONEGORO MEDICAL JOURNAL
(Jurnal Kedokteran Diponegoro)
Online : http://ejournal3.undip.ac.id/index.php/medico
E-ISSN : 2540-8844
Volume 10, Number 4, July 2021

CHARACTERISTIC OF MAMMOGRAPHY COMPARED WITH HISTOPATHOLOGY RESULT AT RSUP DR. KARIADI

Molly Inta Sari[1], RR. Lydia Purna Widyastuti Setjadiningrat Kuntjoro[2*], Edmond Rukmana Wikanta[3], Sukma Imawati[2]
[1]Undergraduate Program, Faculty of Medicine, Diponegoro University, Semarang, Indonesia
[2]Department of Radiology, Faculty of Medicine, Diponegoro University, Semarang, Indonesia
[3]Department of Surgery, Faculty of Medicine, Diponegoro University, Semarang, Indonesia
*Corresponding Author's Email : lydiakuntjoro@gmail.com

ABSTRACT

Background: Breast tumors are common lesions found in women. Mammography is Food and Drugs Administration (FDA) approved modality for screening and diagnosing breast tumors. **Aim:** To know the characteristic and comparison of mammography results with histopathology diagnosis as the gold standard in breast tumors patients at RSUP Dr. Kariadi. **Methods:** This research used the diagnostic test method. Data were taken from medical records in RSUP Dr. Kariadi, Semarang from 2017 2019 with a consecutive sampling method. The collected samples were 55 mammography imaging. Next, the data were described as frequency distribution and percentages, and then the diagnostic test values were counted. **Result:** Benign breast tumors in RSUP Dr. Kariadi was found in 40-50 years old patients with 77,8% oval-shaped and 72,2% circumscribed margin mass seen in the mammogram, while breast cancer was found in >50 years old patients with 57,1% irregular-shaped and 54,3 spiculated margin mass seen in the mammogram. Mammography in RSUP Dr. Kariadi has 89% sensitivity, 89% specificity, 94% positive predictive value, 81% negative predictive value, and 89% accuracy. **Conclusion:** Benign breast tumors in RSUP Dr. Kariadi is mostly found in 40-50 years old patients with oval-shaped and circumscribed margin mass seen in the mammogram, while breast cancer is mostly found in >50 years old patients with irregular shape and spiculated margin mass seen in the mammogram. The diagnostic test score of mammography in RSUP Dr. Kariadi is high.
Keywords : *mammography, histopathology*

INTRODUCTION

Breast tumors are common lesions found in women. [1] Benign breast tumors are 4 to 5 times more often than breast cancers.[2] About 90% of patients who did breast examination have a benign lesions, while breast cancer is the most common cancer found in women and the second most common cause of death due to cancer in women.[3,5,6] According to GLOBOCAN data, the incidence and mortality of breast cancer in Indonesian women ranks first compared to other type of cancers with 58,256 new cases and 22,692 deaths in 2018.[7]

Sooner, various attempts have been made to detect breast cancer as early as possible, both clinically and in imaging techniques.[8,9] Mammography has a very important role in early detection and diagnosis of breast abnormalities.[2,3] Mammography is Food and Drugs Administration (FDA) approved modality for screening and diagnosing breast tumor, whereby screening is performed to find all lesions that are not detected on physical examination of the breast before manifesting itself. In addition, mammography is also used as a diagnostic tool to determine whether breast abnormalities that previously detected on physical examination are benign or malignant.[2,9] A study conducted by Hongjun Li et.al. about clinical value of mammography in diagnosis and identification of breast tumors, mentioned that the sensitivity, specificity and accuracy of mammography was 90.80%, 84.60%, and 87.40% which means that mammography has a significant clinical value in diagnosing and identifying breast tumors.[10]

The diagnosis of breast abnormalities imaging used the Breast Imaging and Reporting System (BI-RADS)

DIPONEGORO MEDICAL JOURNAL
(Jurnal Kedokteran Diponegoro)
Online : http://ejournal3.undip.ac.id/index.php/medico
E-ISSN : 2540-8844
Volume 10, Number 4, July 2021

mammography which was proposed by the American College of Radiology (ACR) in 1993, and currently the latest edition of BI-RADS is the 5th edition published in 2013. [11] Based on BI-RADS 5th edition, BI-RADS assessment are categorized from 0 to 6, in which 0 means incomplete, 1 means negative, 2 means benign findings, 3 means probably benign, 4 means suspicious abnormality, 5 means highly suspicious of malignancy , and 6 means known biopsy proven malignancy. [12] Those classifications are determined based on several components that can be seen in mammography, such as mass, calcification, related features, and location of findings. Breast density is also an assessed component of the standard reporting system on mammography, and is classified into densities A to D, where A means the breasts are almost entirely fatty, B means there are scattered areas of fibroglandular density, C means heterogeneously dense which may obscure small masses, and D means extremely dense. The higher breast density can make mammography less effective in detecting suspicious breast lesions.[13] Breast density in each region can be different, as stated from the Del Carmen study that Asian women have a higher breast density than African and American women. [14]

Based on the data above, the description of mammography lesion is important for detecting and predicting the predispotition of malignancy and determining if biopsy was necessary. Data for breast tumors prevalence and breast characteristic in Central Java, and even in Indonesia are still limited. Therefore, researchers wanted to determine the characteristics of breast and diagnostic test value from the result of mammography examination in comparison with histopatological examination in RSUP Dr. Kariadi Semarang.

METHODS

This study is a descriptive retrospective study with diagnostic test approach that compares mammogram to histopathology as the gold standard. Data for this study was taken from RSUP Dr. Kariadi Semarang from January 2017 until Desember 2019. The research and data collection were done from July 2020 until September 2020. The inclusion criteria for this study were women aged >35 years old with benign or malignant breast tumors who underwent mammography ecamination at RSUP Dr. Kariadi Semarang within January 2017 until Desember 2019 and the mammography result was included in BI-RADS criteria 2,3,4, or 5. The exclusion criteria for this study were patients whose mammography results classified as BI-RADS criteria 0, 1, and 6.

Samples were taken from radiology expertise and medical record gathered from Januari 2017 until December 2019 at RSUP Dr. Kariadi. The sampling method used is consecutive sampling, which was done by collecting medical records data from each patients that complied the inclusion criteria and didn't comply the exclusion criteria. The sample size used was the entire accessible population at RSUP Dr. Kariadi.

The independent variable of this study was the morphology of the lesion from the patient's mammography and the dependent variable of this study was the result of the patient's histological examination. Data were taken from secondary data obtained through patient's medical records .

Data processing and analysis was done descriptively for each characteristic and presented the frequency distribution tables. After that, the calculation of the diagnostic test values which includes sensitivity, specificity, positive predictive value, negative predictive value, and accuracy was calculated.

RESULTS

Based on the histopathological conclusions, the age of subjects with most malignant findings were >50 years old, including as many as 23 subjects (50%). Meanwhile, for benign findings, the most subjects were between 40-50 years old, which includes 11 subjects (57.89%). Regardless of the findings, the majority of subjects were married. There were only 2 unmarried subjects and each in different criteria (1.82%).

Table 1. Distribution of age and marital status

Patients characteristics	Malignant	Benign
Age		
<40	1 (1,82%)	2 (3,64%)
40-50	12 (21,82%)	11 (20%)
>50	23 (41,82%)	6 (10,91%)
Marital status		
Married	35 (63,64%)	18 (32,73%)
Single	1 (1,82%)	1 (1,82%)

Table 2. Distribution of mammography imaging based on the characteristics of the lesion and histopathological conclusions

Characteristics of the lesions	Maligna	Benigna	Total
Mass	35 (63,64%)	18 (32,73%)	53 (96,36%)
Calcification	16 (29,09%)	3 (5,45%)	19 (34,54%)
Architectural distortion	12 (21,82%)	0 (0%)	12 (21,18%)
Assymetry	1 (1,82%)	1 (1,82%)	2 (3,64%)

Based on the characteristics of lesions seen in mammogram, in both malignant and benign findings, mass was the most common characteristic found in either malignant or benign findings, including as many as 53 mammogram (96.36%). Calcifications were mostly found in malignant findings, including 16 imaging (29.09%). All architectural distortions found were malignant with a total of 12 imaging (21.82%). Asymmetry were found in 2 imaging (3.64%), each malignant and benign.

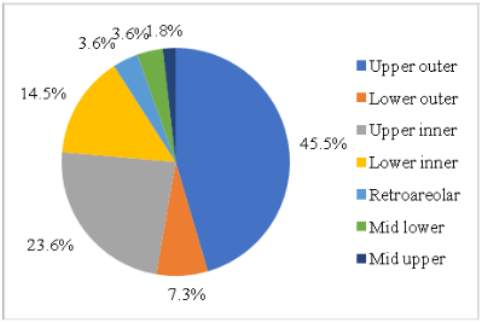

Figure 1. Distribution of lesion locations on mammography imaging.

DIPONEGORO MEDICAL JOURNAL
(Jurnal Kedokteran Diponegoro)
Online : http://ejournal3.undip.ac.id/index.php/medico
E-ISSN : 2540-8844
Volume 10, Number 4, July 2021

Based on the location of the masses on the mammogram, the location of the masses was mostly found in the upper outer quadrant with 25 mammography imaging (45.5%), then the upper inner quadrant with 13 mammography imaging (23.6%), the lower inner quadrant with 8 mammography imaging (14.5%), the lower outer quadrant with 4 mammography imaging (7.3%), the retroareolar and mid lower areas had the same count with 2 mammography imaging (3.6%), and mid upper with 1 mammography imaging (1.8%).

Based on 55 mammogram studied, the most often found breast density was density C with 33 imaging (62.3%), then density B with 16 imaging (29.09%), following density D with 4 imaging (7.27%), and density A which was not found on any.

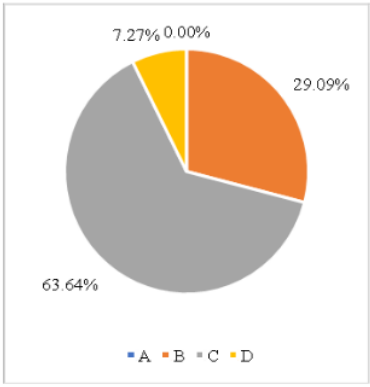

Figure 2. Distribution of mammography imaging based on breast density

Table 3 . Distribution of mammography imaging based on mass characteristics

Mass characterictics		Histopathology	
		Maligna	**Benigna**
Shape	Oval	14 (40%)	14 (77,8%)
	Round	0 (0%)	2 (11,1%)
	Lobulated	1 (2,9%)	1 (5,6%)
	Ireguler	20 (57,1%)	1 (5,6%)
Margin	Circumscribed	4 (11,4%)	13 (72,2%)
	Microlobulated	3 (8,6%)	3 (16,7)
	Obscured	6 (17,1%)	2 (11,1%)
	Spiculated	19 (54,3%)	0 (0%)
	Indistinct	3 (8,6%)	0 (0%)
Density	High density	23 (65,7%)	10 (55,6%)
	Equal density	12 (34,3%)	8 (44,4%)
	Low density	0 (0%)	0 (0%)

In the benign histology classification, the most commonly found mass shape was oval with 14 mammography imaging (77.8%), the most common margin was circumscribed with 13 mammography imaging (72.2%), and the most common density was high density with 10 mammography imaging (55.6 %). Whereas

in the malignant histopathology, the most commonly found mass shape was irregular with 20 imaging (57.1%), the most common margin was spiculated with 19 imaging (54.3%), and the most common density was high density with 23 imaging (65.7%).

Table 4 . Distribution of mammographic imaging based on calcifications

Calcification	Histopathology		Total
	Maligna	Benigna	
Malignant calcification			7 (36,84%)
Amorphous	2 (9,09%)	0 (0%)	2 (9,09%)
Fine pleomorphic	3 (13,64%)	0 (0%)	3 (13,64%)
Fine linear	2 (9,09%)	0 (0%)	2 (9,09%)
Benign calcification			6 (31,58%)
Round	2 (9,09%)	0 (0%)	2 (9,09%)
Popcorn like	1 (4,55%)	0 (0%)	1 (4,55%)
Coarse	2 (9,09%)	1 (4,55%)	3 (13,64%)
Other calcification			9 (40,91%)
Microcalcification	3 (13,64%)	1 (4,55%)	4 (18,18%)
Macrocaltification	2 (9,09%)	0 (0%)	2 (9,09%)
Multiple calcification	1 (4,55%)	0 (0%)	1 (4,55%)
Punctata	1 (4,55%)	0 (0%)	1 (4,55%)
Calcification	1 (4,55%)	0 (0%)	1 (4,55%)

Based on 19 mammogram that contain calcification, the most common type of calcification was malignant calcification with 7 mammography imaging (36.84%).The most common malignant calcifications in the malignant histopathology results was the fine pleomorphic type with 3 imaging (13.64%). The most common benign calcifications found in malignant histopathology was round type with 2 imaging (9.09%).

Table 5 . Distribution of mammography images based on histopathological diagnosis

Histopathological diagnosis	Total	Percentage
Malignant tumor	**47**	**85,45%**
Invasive carcinoma of NST	25	45,45%
Invasive lobular carcinoma	8	14,55%
Ductal carcinoma in situ	6	10,91%
Lobular carcinoma	4	7,27%
Borderline phylloides tumor	1	1,82%
Intraductal papillary carcinoma in situ	1	1,82%
Invasive breast carcinoma with neuroendocrine differentiation	1	1,82%
Malignant phylloides tumor	1	1,82%
Benign tumor	**19**	**34,54%**
Atypical ductal hyperplasia	6	10,91%
Fibroadenoma mammae	5	9,09%

DIPONEGORO MEDICAL JOURNAL
(Jurnal Kedokteran Diponegoro)
Online : http://ejournal3.undip.ac.id/index.php/medico
E-ISSN : 2540-8844
Volume 10, Number 4, July 2021

Usual ductal hyperplasia	5	9,09%
Intraductal papilloma	2	3,64%
Flat epithelial atypical	1	1,82%
Other lesion	**18**	**32,73%**
Fibrocystic change	15	27,27%
Chronic granulomatous mastitis	1	1,82%
Microglandular adenosis	1	1,82%
Sclerosing adenosis	1	1,82%

Based on the histopathologic diagnosis there were 47 malignant tumors (85.45%), 19 benign tumors (34.54%), and 18 other breast lesions (32.73%). From 55 imaging studied, the most common malignant tumors found is invasive carcinoma of no special type with 25 imaging (45.45%). The most common benign tumors found was atypical ductal hyperplasia with 6 mammography imaging (10.91%). While the most common other lesions found is fibrocystic change, with 15 imaging (27.27%).

Table 6 . Correlations between mammography and histopathology examination results

Mammography	Histopathology		Total	p*
	Malignant	Benign		
Malignant	32	2	34	0,687
Benign	4	17	21	
Total	35	18	55	

*MC Nemar test

There was a significant correlation between mammography and histopathology examination result. Based on Mc Nemar test results, the significance value was 0.687. Because the p value is > 0.05, it can be concluded that there is a correspondence between the suspected level of malignancy based on the results of mammography and histopathological examinations.

Mammography sensitivity was 89%, with 89% specificity, 94% positive predictive value, 81% negative predictive value, and 89% accuracy.

DISCUSSION

Breast tumors is one of the most common lesions in women. Breast tumors were divided into benign and malignant tumors. One of the modalities that can be used to detect and diagnose breast tumors in women is mammography [2,9,15]

Age is a risk factor for breast tumors. Benign breast tumors were mostly found in the age group of 40-50 years old (47.89%), while breast cancer was mostly found in the age group of >50 years old (50%). These results are consistent with previous research which states that 80% of breast malignancies are found in women aged > 50 years old, which is the age of menopause for women.[16] The marital status that most commonly found in patients was married. These results were not consistent with previous research which stated that unmarried and single women are more likely to develop breast cancer.[17] However, research by Faida showed similar results, where women with breast tumors that have been married are more likely to develop breast cancer.[18]

DIPONEGORO MEDICAL JOURNAL
(Jurnal Kedokteran Diponegoro)
Online : http://ejournal3.undip.ac.id/index.php/medico
E-ISSN : 2540-8844
Volume 10, Number 4, July 2021

Based on Figure 1, the majority of mass were located in the upper outer quadrant (45.45%). This was in accordance with Richard et al. that the mass in the breast most often occured in the outer upper quadrant because most breast glandular tissue could be found in this quadrant.[19]

In both benign and malignant breast tumors, the most frequent breast density is C density. Breast density is often associated with ethnicity. This study was conducted in Indonesia and all subjects were definitely Asian women. Previous research stated that the breast density of Asian women was denser than American and African women.[14]

Breast mass on a mammogram was assessed based on its shape, margin, density, and calcification. The most common mass shape found in malignant histopathological result was irregular shape (57.1%) and in the benign histopathological results, it was oval (77.8%). The margin of the mass on the mammogram that was most often found in the malignant histopathology result was the spiculated margin (54.3%), while in the benign histopathology result, it was circumscribed margin (72.2%). Comparison of the results of mammography and histopathology shows a tendency for malignant tumors on the mammogram to be irregular shaped with spiculated margin and for benign tumors to be oval shaped with circumscribed edges. This is consistent with the literature which states that well-edged masses with oval and round shapes are usually benign, and irregular-shaped masses tend to be malignant.[20,21] The most common mass density on mammogram, both malignant and benign histopathology results, is high density. From these results, it could be seen that the type of mass density on mammography did not dictate a tendency for benign or malignant diagnosis on mammography. But overall, the most commonly mass density according to mammography results compared to histopathological results was high density. These results are inconsistent with previous studies by Jackson and Wood which stated that mass density can be one of the determinants of malignancy in breast tumors, where high density masses tend to be malignant.[22,23]

The type of calcification that was most frequently found on the mammography imaging was malignant calcification (36.84%). The most common calcification morphology was fine pleomorphic (13.64%). These results are in accordance with previous research by Amanda et al. which stated that the type of calcification that most often developed in breast cancer was fine pleomorphic. The most common calcification morphology in DCIS was fine pleomorphic and coarse.[24]

The most common histopathological diagnosis found was invasive carcinoma of no special type (45.45%). Several previous studies have also suggested that the most common type of breast cancer was invasive carcinoma of No. special type.[6] Meanwhile, atypical ductal hyperplasia (ADH) was the most common type of benign breast tumors(10.91%). These results were inconsistent with several studies which stated that the most commonly found benign tumors in women was fibroadenoma mammae.[25] However, ADH is also a common benign tumors in women and is a precursor lesion of ductal carcinoma in situ and invasive carcinoma.[26] Another breast lesion that was most frequently found was fibrocystic change (27.27%). These results are in accordance with the literature that stated that fibrocystic change as the most common breast disorder and affects more than 50% of women over the age of 30 years.[25]

From the results of statistical tests using the Mc Nemar test in assessing the correlation between mammography examination results and histopathological examination, the significance figure was 0.687. Because the p value is > 0.05, it can be concluded that there is an agreement between the suspected level of malignancy based on the results of mammography and histopathological examinations at RSUP Dr. Kariadi.

Mammography diagnostic test in Table 22 shows that mammography has a relatively high sensitivity of 89%, with specificity of 89%, positive predictive value of 94%, negative predictive value of 81% and accuracy of 89%. Similar results were found in research by Zeeshan et.al. which states that mammography has a sensitivity of 97%, specificity of 64.5%, positive predictive value of 89%, negative predictive value of 89% and accuracy of 89.3%.[27] Similarly, the research of Sulistijawati et.al. showed that mammography has a sensitivity of 90.47%, specificity of 91.30%, positive predictive value of 90%, and a negative predictive value of 97.50%.[28] This suggests that mammography plays an important role in diagnosing benign and malignant breast tumors. However, it should be noted that the accuracy of mammography readings was quite dependent on the ability of the radiologist who interpreted it.[29]

This study still has several limitations, such as the data on the results of mammography samples was only obtained from expertise without confirming from the mammogram. Additionaly, most of the breast density on mammography imaging was type C density, while high breast density can reduce the sensitivity of mammography so that it affects the number of false positives and false negatives.

CONCLUSION

Percentage of benign tumors of the breast that was found on mammography compared with histopathologic examination results at RSUP Dr Kariadi was 34.54% with the most common diagnosis being atypical ductal hyperplasia. Meanwhile, breast cancer percentage was 85.45%, with the most common diagnosis being invasive carcinoma of no special type. From the results of mammography examination compared with histopathology in RSUP Dr. Kariadi, the highest density of the breast is the density C. Benign breast tumors are mostly found in patients aged 40-50 years with the most common characteristic of the mass was oval-shaped and circumscribed margin, while most malignant tumors were found in patients > 50 years old with the most common mass characteristic was irregular shaped mass with spiculated margin. There was a significant correlation between mammography examination compared with histopathology at RSUP Dr. Kariadi and high diagnostic test values, with 89% sensitivity, 89% specificity, 94% positive predictive value, 81% negative predictive value, and 89% accuracy.

Breast density is one of the factors that affect the sensitivity of mammography so that mammography examination in future studies should be performed on patients with either type A or B breast density. In future studies, it is hoped that mammography data will not only be taken from the patient's expertise, but reviewed alongside the mammogram. It is also necessary to extend the thoroughness of the data in the patient's medical record because often times there were no available data regarding the results of the examinations even though the patients had been assesed.

REFERENCES

[1] Hilbertina N. Peranan Patologi Dalam Diagnostik Tumor Payudara. Maj Kedokt Andalas. 2015;38(2):1.
[2] Sardanelli F, Fallenberg EM, Clauser P, Trimboli RM, Camps-Herrero J, Helbich TH, et al. Mammography: an update of the EUSOBI recommendations on information for women. Insights Imaging. 2017;8(1):11–8.
[3] Paepke S, Metz S, Brea Salvago A, Ohlinger R. Benign Breast Tumours-Diagnosis and Management. Vol. 13, Breast Care. S. Karger AG; 2018. p. 3–12.
[4] Epidemiology of Benign Breast Diseases in Females of Child Bearing Age Group [Internet]. [cited 2020 Mar 14]. Available from: https://www.bhj.org.in/journal/2000_420

jan00/original_141.htm
[5] Kumar N, Prasad J. Epidemiology of benign breast lumps, is it changing: a prospective study. Int Surg J. 2019;6(2):465.
[6] Simon A, Robb K. Cancer: Breast. In: Cambridge Handbook of Psychology, Health and Medicine, Second Edition. Cambridge University Press; 2014. p. 577–80.
[7] Global Cancer Observatory. Indonesia ct Sheets. 2019.
[8] Wang L. Early diagnosis of breast cancer. Sensors (Switzerland). 2017 Jul 7(7).
[9] Elmore JG, Armstrong K, Lehman CD, Fletcher SW. Screening for breast cancer. Vol. 293, Journal of the American Medical Association. NIH Public Access; 05. p. 1245–56.
[10] Li H, Zhang S, Wang Q, Zhu R. Clinical value of mammography in diagnosis and identification of breast mass. Pakistan J Med Sci [Internet]. 2016 Jul 1;32(4):1020. Available from: nc/articles/PMC5017071/
[11] Liberman L, Menell JH. Breast imaging reporting and data system (BI-RADS). Vol. 40, Radiologic Clinics of North America. StatPearls Publishing; 2020. p. 9–30.
[12] Sickles EA, D'Orsi CJ, Bassett LW, Appleton CM, Berg WA, Burnside ES et al. ACR BI-RADS® Mammography. In: ACR BI-RADS® Atlas, Breast Imaging Reporting and Data System. 5th ed. Reston, VA: American College of diology; 2013.
[13] Barazi H, Gunduru . Mammography BI RADS Grading [Internet]. StatPearls. StatPearls Publishing; 2019 [cited 2020 Mar 15]. Available from: http://www.ncbi.nlm.nih.gov/pubmed/30 9638
[14] Del Carmen MG, Halpern EF, Kopans DB, Moy B, Moore RH, Goss PE, et al. Mammographic breast density and race. Vol. 188, American Journal of Roentgenology. 2007. p. 1147–50.
[15] Indrati A, Madenda S. Ekstraksi Fitur Bentuk Tumor Payudara. Semin Nas Apl Teknol Inf [Internet]. 2009; Available from: http://repository.gunadarma.ac.id/203/1/EKSTRAKSI FITUR BENTUK MOR PAYUDARA_UG.pdf
[16] Kamińska M, Ciszewski T, Łopacka-Szatan K, Miotła P, Starosławska E. Breast cancer risk factors [Internet]. Vol. 14, Przeglad Menopauzalny. ermedia Publishing House Ltd.; 2015 [cited 2020 Nov 2]. p. 196–202. Available from: /pmc/articles/PMC4612558/?report=abstr ct
[17] Li M, Han M, Chen Z, Tang Y, Ma J, Zhang Z, et al. Does marital status correlate with the female breast cancer risk? A systematic review and meta-analysis of observational studies. PLoS One [Internet]. 2020 [cited 2020 Nov 2];15(3). Available from: /pmc/articles/PMC7058335/?report=abstr
[18] Faida EW. Analisa Pengaruh Faktor Usia, Status Pernikahan Dan Riwayat Keluarga Terhadap Pasien Kanker Payudara Di Rumah Sakit Onkologi Surabaya. J Manaj Kesehat Yayasan Dr Soetomo. 2016 Apr 23;2(1):1.
[19] Levenson RM, Krupinski EA, Navarro VM, Wasserman EA. Pigeons (Columba livia) as Trainable Observers of Pathology and Radiology Breast Cancer Images. Coles JA, editor. PLoS One [Internet]. 2015 Nov 1 cited 2020 Apr 1];10(11):e0141357. Available from: https://dx.plos.org/10.1371/journal.pone. 0141357
[20] Barr RG, Zhang Z, Cormack JB, Mendelson EB, Berg WA. Probably benign lesions at screening breast US in a population with elevated risk: Prevalence

and rate of malignancy in the ACRIN 6666 trial. Radiology [Internet]. 2013 Dec [cited 2020 Oct 17];269(3):701–12. Available from: /pmc/articles/PMC4228709/?report=abstract

[21] Bassett LW, Conner K, MS I. The Abnormal Mammogram. 2003 [cited 2020 Oct 17]; Available from: https://www.ncbi.nlm.nih.gov/books/NBK12642/

[22] Jackson VP, Dines KA, Bassett LW, Gold RH, Reynolds HE. Diagnostic importance of the radiographic density of noncalcified breast masses: Analysis of 91 lesions. Am J Roentgenol [Internet]. 1991 [cited 2020 Oct 17];157(1):25–8. Available from: https://pubmed.ncbi.nlm.nih.gov/1646560

[23] Woods RW, Sisney GS, Salkowski LR, Shinki K, Lin Y, Burnside ES. The mammographic density of a mass is a significant predictor of breast cancer. Radiology [Internet]. 2011 Feb [cited 2020 Oct 17];258(2):417–25. Available from: /pmc/articles/PMC3029888/?report=abstract

[24] Demetri-Lewis A, Slanetz PJ, Eisenberg RL. Breast calcifications: The focal group. Vol. 198, American Journal of Roentgenology. 2012.

[25] Stachs A, Stubert J, Reimer T, Hartmann S. Benign breast disease in women. Dtsch Arztebl Int. 2019 Aug 19;116(33–34):565–73.

[26] Myers DJ, Wall AL. Atypical Breast Hyperplasia [Internet]. StatPearls. StatPearls Publishing; 2019 [cited 2020 Nov 7]. Available from: http://www.ncbi.nlm.nih.gov/pubmed/29261937

[27] Zeeshan M, Salam B, Khalid QSB, Alam S, Sayani R. Diagnostic Accuracy of Digital Mammography in the Detection of Breast Cancer. Cureus. 2018 Apr 10(4).

[28] Sulistijawati RS. Uji diagnostik mammografi, ultrasonografi payudara dan kombinasi mammografi ultrasonografi payudara pada massa payudara palpabel. 2008;

[29] PDQ Screening and Prevention Editorial Board. Breast Cancer Screening (PDQ®): Health Professional Version [Internet]. PDQ Cancer Information Summaries. 2002 [cited 2020 Nov 4]. Available from: http://www.ncbi.nlm.nih.gov/pubmed/26389344

CHARACTERISTIC OF MAMMOGRAPHY COMPARED WITH HISTOPATHOLOGY RESULT AT RSUP DR. KARIADI

ORIGINALITY REPORT

23%	19%	18%	15%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	ijirms.in Internet Source	1%
2	www.sbi-online.org Internet Source	1%
3	Submitted to Brown University Student Paper	1%
4	repository.maranatha.edu Internet Source	1%
5	(8-25-14) http://72.167.3.158/images/magazine/2014/june/DLM-MAJune2014.pdf Internet Source	1%
6	impactfactor.org Internet Source	1%
7	www.scarnet.net Internet Source	1%
8	"Breast Diseases", Springer Science and Business Media LLC, 2019 Publication	1%

9	Submitted to Indiana University Student Paper	1 %
10	eprints.poltekkesjogja.ac.id Internet Source	1 %
11	Submitted to Universitas Jenderal Soedirman Student Paper	1 %
12	Submitted to University of Lancaster Student Paper	1 %
13	libstore.ugent.be Internet Source	1 %
14	repositorio.unal.edu.co Internet Source	1 %
15	www.ijars.net Internet Source	1 %
16	biblio.ugent.be Internet Source	1 %
17	www.mastology.org Internet Source	1 %
18	Submitted to Associatie K.U.Leuven Student Paper	1 %
19	Submitted to Universiti Teknologi MARA Student Paper	1 %
20	Submitted to Vrije Universiteit Brussel Student Paper	1 %

21	www.frontiersin.org Internet Source	<1 %
22	Lawrence W. Bassett, Stephanie Lee-Felker. "Breast Imaging Screening and Diagnosis", Elsevier BV, 2018 Publication	<1 %
23	ris.utwente.nl Internet Source	<1 %
24	ouci.dntb.gov.ua Internet Source	<1 %
25	repository-tnmgrmu.ac.in Internet Source	<1 %
26	ijsurgery.com Internet Source	<1 %
27	Shimaa Mahdy, Omnia Hamdy, Mohamed A.A. Eldosoky, Mohammed A. Hassan. "Influence of Tumor Volume on the Fluence Rate Within Human Breast Model Using Continuous-Wave Diffuse Optical Imaging: A Simulation Study", Photobiomodulation, Photomedicine, and Laser Surgery, 2023 Publication	<1 %
28	test.dovepress.com Internet Source	<1 %
29	M Stampanoni, Z Wang, T Thüring, C David et al. "Toward clinical differential phase contrast	<1 %

mammography: preliminary evaluations and image processing schemes", Journal of Instrumentation, 2013
Publication

30	medcraveonline.com Internet Source	<1 %
31	123dok.com Internet Source	<1 %
32	ejrnm.springeropen.com Internet Source	<1 %
33	docksci.com Internet Source	<1 %
34	Submitted to Universiti Sains Islam Malaysia Student Paper	<1 %
35	definingmomentscanada.ca Internet Source	<1 %
36	karyailmiah.unisba.ac.id Internet Source	<1 %
37	www.coloproctol.org Internet Source	<1 %
38	www.verywellhealth.com Internet Source	<1 %
39	Submitted to University of Queensland Student Paper	<1 %

40	modernonco.orscience.ru Internet Source	<1 %
41	www.karger.com Internet Source	<1 %
42	Submitted to University of Auckland Student Paper	<1 %
43	Xin-Bao Zhao, Ji-Yi Yao, Xin Zhou, Shao-Yun Hao, Wen Mu, Lu-Jing Li, Wen-Jing Zhong, Zhi Hui. "Strain Elastography: A Valuable Additional Method to BI-RADS?", Ultraschall in der Medizin - European Journal of Ultrasound, 2018 Publication	<1 %
44	repositorio.usil.edu.pe Internet Source	<1 %
45	basicmedicalkey.com Internet Source	<1 %
46	medicopublication.com Internet Source	<1 %
47	www.biorxiv.org Internet Source	<1 %
48	www.jepublichealth.com Internet Source	<1 %
49	"Poster Abstracts", European Journal of Cancer, 2016.	<1 %

	Publication	
50	Catherine N. Chinyama. "Benign Breast Diseases", Springer Nature, 2014 Publication	<1 %
51	Ronnie L. Shammas, Gloria Broadwater, Roger W. Cason, Adam D. Glener et al. "Assessing the Utility of Post-Mastectomy Imaging after Breast Reconstruction", Journal of the American College of Surgeons, 2020 Publication	<1 %
52	Submitted to University of Sydney Student Paper	<1 %
53	core.ac.uk Internet Source	<1 %
54	library.unisel.edu.my Internet Source	<1 %
55	pjms.com.pk Internet Source	<1 %
56	research-repository.griffith.edu.au Internet Source	<1 %
57	www.effectivehealthcare.ahrq.gov Internet Source	<1 %
58	www.ijnhs.net Internet Source	<1 %
59	www.medicinescience.org Internet Source	

		<1%
60	www.pafmj.org Internet Source	<1%
61	"Breast & Gynecological Diseases", Springer Science and Business Media LLC, 2021 Publication	<1%
62	"Breast Imaging", Springer Science and Business Media LLC, 2016 Publication	<1%
63	"Management of Breast Diseases", Springer Science and Business Media LLC, 2016 Publication	<1%
64	A. Istomin, A. Masarwah, H. Okuma, A. Sutela, R. Vanninen, M. Sudah. "A multiparametric classification system for lesions detected by breast magnetic resonance imaging", European Journal of Radiology, 2020 Publication	<1%

Exclude quotes	Off	Exclude matches	Off
Exclude bibliography	Off		