



Data survey on breast cancer diagnostic methods in Brazil in women 40 to 59 years old

Levantamento de dados sobre os métodos diagnósticos de câncer de mama no Brasil em mulheres de 40 a 59 anos

DOI: 10.56238/isevjhv3n1-010

Receipt of originals: 12/29/2023

Publication Acceptance: 01/18/2024

Luana Tifany Lima Silva¹, Maria Karollyna do Nascimento Silva Leandro², Raíra Justino Oliveira Costa³, Raimundo Azevedo Vilarouca Neto⁴, Ana Victória Mota Lima⁵, Pedro Vitor Ferreira Máximo⁶.

ABSTRACT

The present study aimed to analyze the diagnostic methods provided by the SUS that are performed in Brazil for BC and to explain the relevance of these approaches in the early detection of this pathology. This was a longitudinal, retrospective and quantitative study, where data collection was carried out through the Department of Information and Informatics of SUS (DATASUS), through the Tabet platform, on the use of diagnostic tests for breast cancer and positive mammogram results for breast lesions in the period from 2017 to 2021. In addition, data were obtained from the Mortality Information System (SIM) on the breast cancer mortality rate from 2015 to 2019. The study chose the age group of 40 to 59 years for data analysis, as they are the most susceptible ages for the development of BC. Regarding the exams performed from 2017 to 2021, mammography (MMG) is the most used exam with 8,109,591, followed by breast histology with 73,008 in total and cytological with the lowest number of 38. 945. The MC mortality rate of the female population aged 40 to 59 years, in the years 2015 to 2019, with 32,561 deaths. This study concludes that mammography is the most widely used test by the Brazilian population for the early diagnosis of BC, but there is a need for new methods to aid in its detection. Another observation identified was the increase in the number of deaths in Brazil over the years.

Keywords: Breast cancer, DATASUS, Exams.

1 INTRODUCTION

Breast cancer (BC) is the most predominant carcinogenic process among women and the main reason for mortality in females (Bonacho; Rodriguez; Liberal, 2019). One of the explanations for the high rate of deaths is metastasis in vital organs (Liang et al., 2020) BC

¹ ORCID: 0000-0002-5118-0748

² ORCID: 0000-0002-2215-4110

³ ORCID: 0000-0002-6248-6187

⁴ ORCID: 0000-0003-1802-7263

⁵ ORCID: 0000-0001-9323-6319

⁶ ORCID: 0000-0003-3288-6275



presents different variations morphologically, phenotypically, and clinically (Rakha; Pareia, 2020).

Worldwide, 1 in 5 people develop cancer in their lifetime, one in 8 men, and one in 11 women die from this disease. Considering new estimates from the *International Agency for Research on Cancer* (IARC), female breast cancer has become the most diagnosed cancer in the world, with 2.3 million cases in 2020, surpassing lung cancer (IARC, 2021).

The National Cancer Institute (INCA) described 626,030 cases of cancer in Brazil in 2020, with the most frequent cancer in females being breast cancer (29.7%), colon and rectum (9.2%), cervical cancer (7.5%) and respiratory system (5.6%) (INCA, 2018).

Risk factors that contribute to the development of BC are habits related to inadequate lifestyle, such as tobacco use, alcohol consumption, a diet rich in carbohydrates, low consumption of vitamin D and fiber, and lack of physical exercise (Romieu; Amadou; Chajes, 2017).

On the other hand, there are factors that are not related to lifestyle, but to the characteristics of the body, such as hormones, immune system, genetic mutations, and epigenetic changes, which can individually or jointly contribute to the development of tumors (Mangueira, 2019).

The diagnosis of BC can be made by mammography, MRI, clinical examination, blood tests, radiography, biopsy, and detection of BRCA1 and BRCA2 gene mutation. However, women who use the SUS (Unified Health System) have greater obstacles to diagnosis and treatment (Tomazelli; Silva, 2017).

In order to provide data on the procedures that are performed to confirm the diagnosis of breast cancer, the Breast Cancer Control Information System (SISMAMA) was implemented in 2008. Among the exams monitored by this system, mammography, cytopathological and histopathological tests can be mentioned (INCA, 2018).

It is noted that underdeveloped countries, including Brazil, have a great lack of health education. This study shows the importance of knowledge, as the population's lack of information decreases the chances of quality of life (Bernades et al., 2019).

Considering the lack of access of the population, the early diagnosis of breast cancer in Brazil may have difficulties to happen, thus resulting in an increase in the number of severe cases of BC and consequently deaths. The present study aimed to analyze the diagnostic methods provided by the SUS that are performed in Brazil for BC and to explain the relevance of these approaches in the early detection of this pathology.

2 METHODOLOGY

This was a longitudinal, retrospective and quantitative study, where data collection was carried out through the Department of Information and Informatics of SUS (DATASUS), through the Tabnet platform, on the use of diagnostic tests for breast cancer and positive mammogram results for breast lesions in the period from 2017 to 2021. In addition, data were obtained from the Mortality Information System (SIM) on the breast cancer mortality rate from 2015 to 2019. The study chose the age group of 40 to 59 years for data analysis, as they are the most susceptible ages for the development of BC.

The study was based on data from female patients aged 40 to 59 years who underwent mammography, histology and cytology in Brazil, described in the Cancer Information System (SISCAN) on the DATASUS platform. The information was acquired from the SISCAN database, on the results of positive mammograms for breast lesions of female patients aged 40 to 59 years, from 2017 to 2021, from the 5 regions of the country, North, Northeast, South, Southeast and Midwest.

Another point analyzed was the breast cancer mortality rate of the group of female patients between 40 and 59 years old in the year 2015 to 2019, registered in SIM on the DATASUS platform, due to the lack of registration in the database it was not possible to collect records from the years 2020 and 2021.

The data obtained were tabulated and arranged in tables and graphs of the *Microsoft Office Excel® 2010 program*.

3 RESULTS AND DISCUSSION

From the search carried out in DATASUS, it was possible to obtain important data about the performance of the exams that are used for the diagnosis of breast cancer in Brazil for 5 years. The number of tests performed is shown in **Table 1**.

Table 1- Tests performed for the diagnosis of breast cancer in Brazil between the years 2017-2021 in women aged 40 to 59 years.

Year	NUMBER OF TESTS PERFORMED		
	Mammography	Cytology	Histologia
2017	1.765.385	8.305	11.384
2018	1.876.004	8.098	13.246
2019	2.044.253	10.328	19.314
2020	1.252.868	6.899	15.824
2021	1.171.441	5.315	13.240
Total	8.109.951	38.945	73.008

Source: Cancer Information System (SISCAN), 2021



Regarding the exams provided by SUS, mammography (MMG) is the most used exam with 8,109,591 in the years 2017 to 2021. Histological examinations of the breast that were performed in the last 5 years were 73,008 in total. On the other hand, the cytological tests, which are fewer in number, were performed 38.945 in the same period.

The peak of exams was in 2019, mammography with about 2,044,253, breast histology with about 19,314 and breast cytology with 10,328. As it was observed that in the years 2020 and 2021 there was a decrease in the performance of exams, considering that one of the reasons was the pandemic caused by the SARS COV-2 virus, a survey was carried out and detected a decrease of 26.3% in hospitalizations in breast outpatients and the number of MMG decreased by 79.8% (koca; Yidirim, 2021).

MMG is indicated for women aged 50 to 69 years and every two years according to the Ministry of Health (MoH), but when changes are observed in the clinical examination, then the age to perform the radiological examination is 40 to 49 years (Melo et al., 2017). Thus, this was the age group of choice in the present study, since the risk group for MC is over 40 years of age.

The collection of information that was only obtained from the public network and excluding the private network, so the number of women who undergo MMG is still below considering the global incidence of MC, in addition to being noticeable that the public network is dependent on the services it has an agreement, results in a decrease in the population's access to the exams. MMG can identify MC in the early stages, but requires complementary tests, as it lacks specificity (Flores; Lorenzo; Araújo, 2018). It is necessary to invest in more specific methods, such as genetic sequencing of the BRCA1 and BRCA2 genes, for the early diagnosis of BC.

Early detection of breast lesions is a priority in primary health care, where the search for primary health care units is crucial. An ecological study analyzed data from DATASUS and demonstrated an increasing rate of family health strategy (FHS) coverage (Ramos et al., 2018). Even with the growing coverage of the FHS, there is still heterogeneity of access to health services in the country. Whereas, there are states with resources and equipment available for the female population, but there are states that do not provide these resources. Pernambuco offers a greater number of mammography machines compared to other states and beyond the minimum amount established by the Ministry of Health. MMG is the gold standard for breast lesions and it would be ideal to access it for all users (Moreno et al., 2019).

One study revealed that most participants between 40 and 59 years of age undergo MMG every two years, and patients aged 50 to 59 years have a higher incidence of performing the test,



but that the method does not reach all women in the target group, thus requiring informative actions reporting the importance of MMG for early detection of BC (Rilza, 2019). Thus, it can be said that the method is not sought by the female population aged 40 to 59 years, considering that it is the age most affected by this neoplasm.

According to Francioli et al., (2018), there is an overvaluation of mammography exams, where they expose women unnecessarily and generate expenses that could be directed to other effective methods for breast lesions in younger women. It is seen in the literature that MMG is considered the gold standard test for the early diagnosis of MC, but there is a need to implement new, more specific methods that could be used in young women for early detection of MC.

Histopathological examination is also used for the diagnosis of BC, as it determines the morphological classification and clinical evolution (Aquino et al., 2016). An epidemiological survey carried out at the Federal University of Paraná between 2008 and 2013 confirmed the diagnosis of ductal and lobular carcinomas of the breast by histopathology, but that there were difficulties in the data because of the local service, resulting in a predominance of late diagnosis, since there are difficulties for the Brazilian population to have access to the test, thus resulting in worsening of BC and consequently deaths (Rocha et al., 2019).

According to Siu (2016), the amount of unnecessary histopathological tests is large compared to the low effectiveness in morbidity and mortality of real populations. Thus, this author considers that the SUS should stop overvaluing this method and invest in more specific tests for MC in young patients. However, in contrast, the author Kuiava et al., (2019) describe that the histopathological examination together with Artificial Intelligence (AI) complement the structural peculiarities of the health system, and a screening method can be used for the diagnosis of BC.

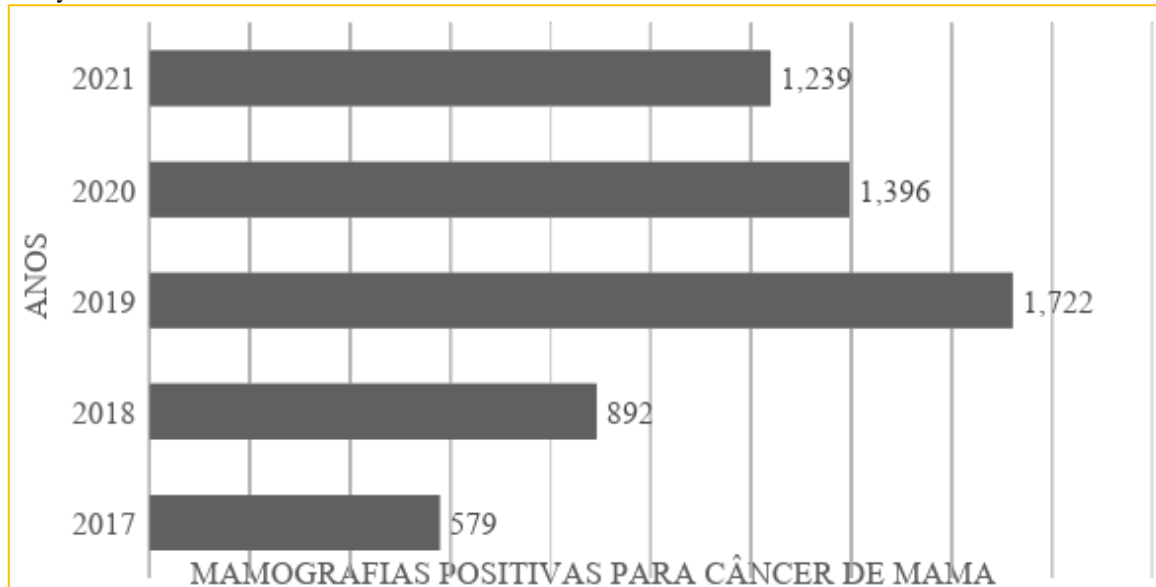
In 1980, breast cytological examination became part of the breast evaluation as a complement to the diagnosis, differentiating between malignant and benign lesions (Bennett; Saboo, 2019) It is one of the most widely used methods in screening for the diagnosis of BC (Saikia et al., 2019) but it does not allow the degree of invasion to be verified as histologically (Silva et al., 2019). According to the literature, this method is performed to aid in the diagnosis of BC, but it does not verify the degree of injury, which is the reason for not being included in the first diagnostic options.

In general, the studies corroborate the results of this research, and what helps the non-performance of these tests by Brazilian women are environmental factors, poor population, lack of education and gender inequality, as they are not determined as important factors in campaigns

aimed at women, giving rise to the scarcity of these methods for these women and enabling an increase in the number of cases of BC and an increasing number of deaths (Vásquez, 2017).

Graph 1 shows the data regarding the number of lesion-positive mammography performed in Brazil.

Graph 1- Results of mammograms positive for malignant lesions for breast cancer from 2017 to 2021 in women aged 40 to 59 years.



Source: Cancer Information System (SISCAN), 2021

According to the information obtained, the year 2019 had the highest number, with 1,722 cases and in the years 2020 and 2021 there was a decrease in positive MMG for breast lesions. One of the factors for delimiting diagnoses was the Covid-19 pandemic, due to situations of social isolation, as a consequence there was a reduction in the search for imaging exams, such as MMG (De Oliveira; From Lima; Lima, 2021).

According to Oliveira et al., (2021), the North, Northeast, and Midwest have higher cases of detection of advanced stages of BC. Also according to this author, the South and Southeast have a better structure for early detection of BC. This socioeconomic inequality in the Brazilian territory contributes to morbidity and mortality due to BC in the country.

The study of Matos; R; Peixoto (2021) showed an increase in BC cases in Brazil from 2015 to 2020. An analysis that was carried out observed that there was an increase in the occurrences and hospitalizations due to BC in the years 2008 and 2013, in the group of patients over 40 years of age in Minas Gerais, which followed the same increase in the country, in addition to the fact that the most frequent hospitalizations were of women between 50 and 59 years of age (Barbosa et al., 2017). Thus, the expansion of BC in Brazil is evident over these

years between the ages of 40 and 59 years, with the most susceptible age being between 50 and 59 years.

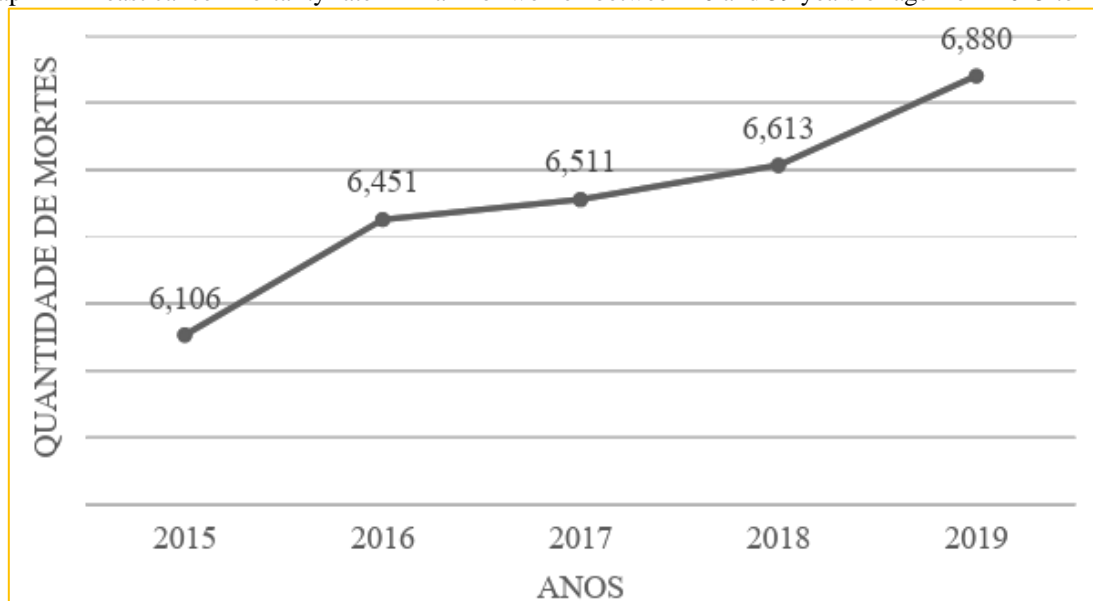
Among the studies observed, those of Assisi; Barreto; Lima (2019) presented a total of 22,711 women diagnosed with positive breast lesions in Bahia from 2013 to 2018. Even with this increase in BC cases observed, the number of notifications is low considering the global incidence, and may be related to the lack of records in the system that should be informed by the municipalities, thus there is no real reflection of the number of women with MC in Brazil.

Diagnostic mammography is used in cases of patients who present characteristic signs and symptoms of breast cancer and in cases of control of benign lesions (Cipriano, 2021). According to Pereira; Viapiana; Silva, (2019) the lack of information about risk factors and the lack of access to specialized health services results in a delay in the diagnosis of several women, thus aiding in the discovery of an advanced stage of neoplasia, resulting in an increase in deaths from BC.

DATASUS does not record positive results for malignant lesions in the histopathological examination, only the results of benign tumors are described, whereas breast cytology describes only the number of tests performed. This study prioritized the results of malignant tumors and, for these reasons, breast histology and cytology methods were not highlighted as mammography.

Data on breast cancer mortality in Brazil are described in **Graph 2**.

Graph 2 - Breast cancer mortality rate in Brazil of women between 40 and 59 years of age from 2015 to 2019.



Source: Mortality Information System (SIM), 2021



This graph shows the MC mortality rate of the female population aged 40 to 59 years, in the years 2015 to 2019, since 32,561 women died of BC in these 5 years. It is observed that the number of deaths grows every year.

Even though the prevalence of neoplasms is large-scale in developed countries, there is an inequality of access to early diagnosis and treatment in developing countries, resulting in a higher level of deaths in these countries, including Brazil (Azevedo et al., 2019; Oak; Breads, 2019; Guerra et al., 2017).

According to the estimate made by INCA, MC is the main cause of death of the female population in Brazil and in the world, as the worldwide mortality rate is 14.23 deaths/100,000 women. In Brazil, the South and Southeast regions had the highest rates of death from BC in 2019. In the South, Southeast and Northeast regions, there is a predominance of breast neoplasms, except in the North region. In the Midwest region, the most frequent cases are of cervical and stomach cancer (INCA, 2021).

The mortality numbers in the South region exceed the national rate, with the state of Rio Grande do Sul having the highest cases of deaths in all ages in the three states of the South (Paula et al., 2019). On the other hand, Barros et al., (2020), observed the predisposition in the increase of BC deaths in the state of Ceará, in the Northeast over the years 2005 to 2015, as well as the same author observed significant reductions in the year 2009, but because these are studies from different periods, this divergence of information may be presented, Since the result of this study showed the case numbers of deaths grow every year.

In addition, another study reported that the dominance of deaths occurs in the states of Rio Grande do Norte, Sergipe, Pernambuco and Ceará. Being one of the most affected age groups, from 40 to 59 years and 50 to 59 years, they have a higher predominance of deaths. This is due to the need of the Northeast region for resources and services for early diagnosis (Gonsalves; Barbosa, 2016; Lôbo et al., 2020; Tortajada et al., 2019).

A study conducted by Oliveira, L (2020), shows a high mortality rate of BC in all regions of Brazil, with the South and Southeast having the highest numbers of deaths in the year 2000 to 2017. It was also seen that other regions, such as the North and Northeast, showed less availability for prevention and care for MC, thus limiting the diagnosis of MC in these regions.

With the difficulties in health services are aggravated by territorial differences, making it a complex issue. Unfortunately, these facts are reflected in the late diagnosis of BC, especially when these diagnoses are in women with low or no level of education (Dos Santos et al., 2019; Oliveira et al., 2021).



The number of BC cases has grown in Brazil over the years, emphasizing that the South and Southeast are regions with better resources for MC detection, while in other regions, especially the poorest ones, such as the North and Northeast, many women die from unidentified causes, precisely because of the lack of records limited the study's research. In addition to the fact that there is no record of the numbers of deaths on the SIM platform for the years 2020 and 2021.

4 CONCLUSION

This study concludes that mammography is the most widely used test by the Brazilian population for the early diagnosis of BC, but there is a need for new methods to aid in its detection. In addition, in 2019 there was a peak in positive mammograms for breast lesions, and in 2020 and 2021 there was a reduction, as well as a decrease in MMG, one of the factors that explains this decline is the pandemic caused by the SARS-COV2 virus.

Another observation identified was the increase in the number of deaths in Brazil over the years. The factors that contribute to late detection are the lack of informational actions, level of education, poor populations, and lack of resources in some regions of the country, resulting in an increase in the number of deaths.



REFERENCE

- Aquino, R. G. F. de, Pinheiro, L. G. P., Cavalcante, D. I. M., Vasques, P. H. D., Oliveira, A. L. de S., & Silva, C. A. B. da. (2016). Carcinoma ductal invasor: comparação dos graus histológicos entre tumor primário e metástase axilar. repositorioufcb [Internet]. Available from: <http://www.repositorio.ufc.br/handle/riufc/18182>
- Azevedo, P. R. M., Rocha, J. B., Fernandes, T. A. A. de M., & Fernandes, J. V. (2019). Analysis of cervical cancer mortality rate trends in Natal-RN, Brazil, between 2000 and 2012. *Revista de Salud Pública*, 21(2), 161–7.
- Bennett, I. C., & Saboo, A. (2019). The Evolving Role of Vacuum Assisted Biopsy of the Breast: A Progression from Fine-Needle Aspiration Biopsy. *World Journal of Surgery*, 43(4), 1054–61.
- Bernardes, N. B. S., A. C. F., de Souza Facioli, L., Ferreira, M. L., de Sá, O. R., & de Moura Costa, R. (2019). Article Title. ID on line. *Revista de psicologia*, 13(44), 877-885.
- Bonacho, T., Rodrigues, F., & Liberal, J. (2019). Immunohistochemistry for diagnosis and prognosis of breast cancer: a review. *Biotechnic & Histochemistry*, 95(2), 71–91.
- Carvalho, J. B., & Paes, N. A. (2019). Corrected cancer mortality rates for the elderly in the states of the Brazilian northeast. *Ciência & Saúde Coletiva* [Internet], 24(10), 3857–67. Available from: <https://link.gale.com/apps/doc/A607063862/IFME?>
- Cipriano, C. D. C. (2021). A importância do exame de mamografia na detecção precoce do câncer de mama. repositórioifapedubr [Internet]. Available from: <http://repositorio.ifap.edu.br/jspui/handle/prefix/427>
- da S Aline Rilza. (2019). O papel da citologia no diagnóstico do câncer de mama. Available from: <https://repositorio.ufsc.br/handle/123456789/202132>
- De Assis, E. A., Barreto, M. da L., & Lima, K. B. E. (2019). PERFIL SOCIODEMOGRÁFICO DO CÂNCER DE MAMA NA BAHIA NOS ANOS DE 2013 A 2018. *Textura*, 13(21), 104–13.
- De Oliveira Barros, L., Barreto Bastos Menezes, V., Jorge, A. C., Fonseca de Moraes, S. S., & Gurgel Carlos da Silva, M. (2020). Mortalidade por Câncer de Mama: uma Análise da Tendência no Ceará, Nordeste e Brasil de 2005 a 2015. *Revista Brasileira de Cancerologia*, 66(1).
- De Souza Lôbo, J. L., Costa Silva, M. L., Barbosa Vieira Tomé, T. K., & Dornels Freire de Souza, C. (2020). Mortalidade por Câncer de Mama Feminino em Alagoas no Período de 2001 a 2016: Análise de Tendência e Distribuição Espacial. *Revista Brasileira de Cancerologia*, 66(1).
- dos-Santos-Silva, I., De Stavola, B. L., Renna, N. L., Nogueira, M. C., Aquino, E. M. L., Bustamante-Teixeira, M. T., et al. (2019). Ethnoracial and social trends in breast cancer staging at diagnosis in Brazil, 2001–14: a case only analysis. *The Lancet Global Health*, 7(6), e784–97.



- Estatísticas de câncer. (2018). INCA - Instituto Nacional de Câncer. Available from: <https://www.inca.gov.br/numeros-de-cancer>
- Flores, C. A. da S., Lorenzo, B. de, & Araújo, N. T. da C. (2018). Prevalência de mamografia, ultrassonografia e biópsia no município de Sinop, norte do Estado de Mato Grosso. *Revista de Epidemiologia e Controle de Infecção* [Internet], 8(2), 01–6. Available from: <https://www.redalyc.org/journal/5704/570463736002/movil/>
- Francioli, A., Barbosa, A., Yamaguchi, M., Silva, T., & Bernuci, M. (2018). REFLEXÕES SOBRE O DIAGNÓSTICO PRECOCE DO CÂNCER DE MAMA: UM ESTUDO DE CASO ACERCA DA FAIXA ETÁRIA ALVO DAS AÇÕES DE RASTREIO. *Enciclopédia Biosfera*, 15(27), 183–94.
- Gonçalves, M., & Alexandar De Brito Barbosa. (1998). Mortalidade e morbidade por câncer de mama feminino na região Sudeste do Brasil (segundo UF's): uma análise para. Available from: <http://www.abep.org.br/publicacoes/index.php/anais/article/download/1552/1515>
- Guerra, M. R., Bustamante-Teixeira, M. T., Corrêa, C. S. L., Abreu, D. M. X. de, Curado, M. P., Mooney, M., et al. (2017). Magnitude e variação da carga da mortalidade por câncer no Brasil e Unidades da Federação, 1990 e 2015. *Revista Brasileira de Epidemiologia* [Internet], 20(suppl 1), 102–15. Available from: https://www.scielo.org/article/ssm/content/raw/?resource_ssm_path=/media/assets/rbepid/v20s1/en_1980-5497-rbepid-20-s1-00102.pdf
- Koca, B., & Yildirim, M. (2021). Delay in breast cancer diagnosis and its clinical consequences during the coronavirus disease pandemic. *Journal of Surgical Oncology*, 124(3), 261–7.
- Kuiava, V. A., Kuiava, E. L., Rodriguez, R., Beck, A. E., Rodriguez, J. P. M., & Chielle, E. O. (2019). Method of histopathological diagnosis of mammary nodules through deep learning algorithm. *Jornal Brasileiro de Patologia e Medicina Laboratorial*, 55(6).
- Liang, Y., Zhang, H., Song, X., & Yang, Q. (2020). Metastatic heterogeneity of breast cancer: Molecular mechanism and potential therapeutic targets. *Seminars in Cancer Biology*, 60, 14–27.
- Mangueira, V. M. (2019). Efeitos antitumoral e antinociceptivo do n'-(6-cloro-2-metoxiacridin-9-il)-2-cianoacetohidrazide (ACS-AZ), um novo derivado acridínico. Available from: <https://repositorio.ufpb.br/jspui/handle/123456789/19187>
- Manual Gerencial do Sismama e Siscolo. (2018). INCA - Instituto Nacional de Câncer. Available from: <https://www.inca.gov.br/publicacoes/manuais/manual-gerencial-do-sismama-e-siscolo>
- Matos, S. E. M., Rabelo, M. R. G., & Peixoto, M. C. (2021). Análise epidemiológica do câncer de mama no Brasil: 2015 a 2020 / Epidemiological analysis of breast cancer in Brazil: 2015 to 2020. *Brazilian Journal of Health Review*, 4(3), 13320–30.



- Melo, F. B. B., Marques, C. A. V., Rosa, A. da S., Figueiredo, E. N. de, & Gutiérrez, M. G. de. (2017). Actions of nurses in early detection of breast cancer. *Revista Brasileira de Enfermagem* [Internet], 70(6), 1119–28. Available from: https://www.scielo.br/pdf/reben/v70n6/pt_0034-7167-reben-70-06-1119.pdf
- Muniz Barbosa, M., Ferraz, E., Oliveira Hott, G., Geraldo, J., Gomes, E., De Paulabonfá, L., et al. (n.d.). CÂNCER DE MAMA, UM LEVANTAMENTO EPIDEMIOLÓGICO DOS ANOS DE 2008 A 2013. Available from: <https://s3.us-east-1.amazonaws.com/assets.unitpac.com.br/arquivos/revista/2017-2/Artigo-6.pdf>
- Moreno, T. E. dos S., Torres, L. V. P., Filomeno, S. B., Filho, P. A. F. S., Pinto, M. B. F., Ramos, J. de A., et al. (2021). Prevalência e fatores associados à realização da mamografia no Estado de Pernambuco durante o período de 2015-2019/ Prevalence and factors associated with the performance of mammography in the State of Pernambuco during the period 2015-2019. *Brazilian Journal of Development*, 7(7), 65796–806.
- Mortalidade. (2021). INCA - Instituto Nacional de Câncer. Available from: <https://www.inca.gov.br/controle-do-cancer-de-mama/dados-e-numeros/mortalidade>
- Oliveira, A. G. de L., Lima, V. de O., & Lima, L. R. de. (2021). DIAGNÓSTICO PRECOCE DO CÂNCER DE MAMA DURANTE A PANDEMIA: UMA REVISAO DE LITERATURA. *Encontro de Extensão, Docência e Iniciação Científica (EEDIC)*, 8(0). Available from: <https://reservas.fcrs.edu.br/index.php/eedic/article/view/4839>
- Oliveira, L. S. de. (2020). Mortalidade feminina por câncer de mama no Brasil nos anos de 2000 a 2017: tendência e perfil sociodemográfico. *www.arca.fiocruz.br* [Internet]. Available from: <https://www.arca.fiocruz.br/handle/icict/44747>
- Oliveira, N. P. D. de, Cancela, M. de C., Martins, L. F. L., & de Souza, D. L. B. (2021). Spatial distribution of advanced stage diagnosis and mortality of breast cancer: Socioeconomic and health service offer inequalities in Brazil. *PLOS ONE*, 16(2), e0246333.
- PAULA, G. F., et al. (2019). Mortalidade por câncer de mama em mulheres da Região Sul do Brasil nos anos de 2007 a 2016. In: *Encontro Internacional de Produção Científica*.
- Pereira, H. F. B. do E. S. A., Viapiana, P. de S., & Silva, K. L. T. (2019). Aspectos Clínicos e Patológicos do Câncer de Mama em Mulheres Jovens Atendidas na FCEcon entre 2003 e 2013. *Revista Brasileira de Cancerologia*, 63(2), 103–9.
- Rakha, E. A., & Pareja, F. G. (2020). *New Advances in Molecular Breast Cancer Pathology. Seminars in Cancer Biology*, Apr.
- Ramos, A. C. V., Alves, L. S., Berra, T. Z., Popolin, M. P., Arcoverde, M. A. M., Campoy, L. T., et al. (2018). Estratégia Saúde da Família, saúde suplementar e desigualdade no acesso à mamografia no Brasil. *Revista Panamericana de Salud Pública*.
- Rocha, H. Z., Manica, G. C. M., Noronha, L. de, Ramos, E. A. S., & Klassen, G. (2019). Comparative analysis of the histopathological and epidemiological profile of ductal and lobular breast carcinomas diagnosed at the Hospital de Clínicas da Universidade Federal



- do Paraná during the period 2008-2013. *Jornal Brasileiro de Patologia e Medicina Laboratorial*.
- Romieu, I., Amadou, A., & Chajes, V. (2017). The Role of Diet, Physical Activity, Body Fatness, and Breastfeeding in Breast Cancer in Young Women: Epidemiological Evidence. *Rev Invest Clin*, 69(4), 193–203.
- Saikia, A. R., Bora, K., Mahanta, L. B., & Das, A. K. (2019). Comparative assessment of CNN architectures for classification of breast FNAC images. *Tissue and Cell*, 57, 8–14.
- Silva, R. de P., Gigante, D. P., Amorim, M. H. C., & Leite, F. M. C. (2019). Fatores associados à realização de mamografia em usuárias da atenção primária à saúde em Vitória, Espírito Santo*. *Epidemiologia e Serviços de Saúde*, 28(1).
- Siu, A. L. (2016). Screening for Breast Cancer: U.S. Preventive Services Task Force Recommendation Statement. *Annals of Internal Medicine*, 164(4), 279–97.
- Tomazelli, J. G., & Silva, G. A. e. (2017). Rastreamento do câncer de mama no Brasil: uma avaliação da oferta e utilização da rede assistencial do Sistema Único de Saúde no período 2010-2012*. *Epidemiologia e Serviços de Saúde*, 26(4), 713–24.
- Tortajada, J. dos S., Oliveira, T. S., Costa, C. K. F., Picinin, M. B., & Massuda, E. M. (2019). DESIGUALDADES SOCIOECONÔMICAS NA MORTALIDADE POR CÂNCER DE MAMA: REVISÃO SISTEMÁTICA. *Nucleus*, 16(2), 441–52.
- Vásquez, C. L. (2017). El Movimiento social del cáncer de mama como dispositivo neoliberal. *Revista Estudos Feministas*, 25(3), 1347–54.
- World Cancer Day: Breast cancer overtakes lung cancer in terms of the number of new cancer cases worldwide. (2023). IARC showcases key research projects to address breast cancer – IARC [Internet]. Available from: <https://www.iarc.who.int/news-events/world-cancer-day-2021/>