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Types of precancerous and cancerous breast lesions at pathology laboratory of the Buea Regional Hospital-Cameroon

Tassang Andrew[1, 2, 3], David Greenspan[4], Tosin Yinka Akintunde[5, 6], Enow Orock George[1, 7], Walters Ndakason[2]

[1] Faculty of Health Sciences, University of Buea, Cameroon
[2] Buea Regional Hospital, Annex, Cameroon
[3] Atlantic Medical Foundation Hospital, Mutengene, Cameroon
[4] University of Arizona College of Medicine-Phoenix, USA
[5] Department of Sociology, School of Public Administration, Hohai University, Nanjing, China
[6] Department of Demography and Social Statistics, Obafemi Awolowo University, IIe-Ife, Osun State, Nigeria
[7] Regional Hospital Bafoussam, Cameroon

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Abstract
Introduction: Breast cancer is the 1st gynaecological cancer globally, with 2.100.000 cases, among which 627.000 are fatal annually. These figures are projected to get to 14.000.000 cases and 8.200.000 deaths in the next two decades. Breast cancer is a variety of different histological types of cancers. The types of cancers are ductal carcinoma in situ, lobular carcinoma in situ, invasive breast cancer, inflammatory carcinoma, papilloma, medullary carcinoma, phyllode tumours, and Paget disease.
Methodology: A descriptive retrospective study was carried out based on the registry of the pathology laboratory of the Buea regional hospital, Cameroon. The period was from the 04th of March 2016 to the 25th of May 2019.
Results: In terms of frequency, the following types of precancerous lesions and cancers were recorded: invasive breast carcinoma, carcinoma in situ, papilloma, inflammatory carcinoma, phyllode tumours and angiosarcoma. Their respective percentages were; 74.84, 14, 47, 6.92, 1.89, 1.57, and 0.32
Conclusion: Breast cancer is a heterogeneous malignancy made of various histological types. Our study identified the following pathologies in order of frequency: invasive breast carcinoma, ductal carcinoma in situ, papilloma, inflammatory carcinoma, phylloid tumours and angiosarcoma.
Objective: the objective of the study was to find out the frequency of various types of breast cancer and precancerous lesions.

Keywords: types of breast cancer, frequency, invasive breast cancer, ductal carcinoma in situ, papilloma, and inflammatory carcinoma

Introduction

Breast cancer (BC) is the 1st gynaecological cancer in women, with about 2.1 million cases and more than 627. 000 death worldwide. 1 out of 8 women by the age of 80 will develop BC [1, 2, 3, 4, 5, 6, 7]. The projection by the world cancer report in 2012 is a tremendous increase of 14 million new cases and 8.2 million related cancer-related deaths in the next two decades [8]. The breast is a modified sebaceous gland on the anterior aspect of the chest, between the 2nd and the 6th intercostal space. The breast has two types of tissues; the glandular and the stromal tissues. The latter comprises connective tissue, fat, lymphatics, and blood vessels [9, 10]. The glandular tissue is a tree-like structure made of secreting acini, grouped into multiple lobules or glands which open into collecting milk ducts. The breast has 12 to 20 lobules that drain into collecting ducts that merge into larger ducts that drain at the level of the nipple [11].
Some breast cancers can originate from the transformation of benign breast lesions, such as adenofibroma, fibrocystic disease of the breast [12, 13, 14, 15, 16, 17].

Risk Factors

Risk factors of the BC are multiple and vary. Advanced age, any condition which exposes breasts tissues to prolonged unopposed estrogen exposure such as early menarche, late menopause, estrogen-based contraceptives, late first pregnancy (>30 years and above), no full-term pregnancy, absence of breastfeeding. Genetic mutation of 2 breast cancer genes (BRCA 1 and BRCA 2) and other genes mutations, personal history of breast, endometrial, ovarian, and colon cancer, 1st degree relative with breast cancer; mostly at an early age. Alcohol consumption (dose-dependent), obesity, consumption of high dietary fat, high socioeconomic status (western

hemisphere), exposure to radiation, and hormone replacement therapy [18, 19, 20, 21, 22]. Breast cancer is a heterogeneous disease with multiple histological and clinical presentations [11, 23].

Types of Premalignant and Malignant Cancers of The Breast

Ductal carcinoma in situ (DCIS): DCIS is the most common noninvasive type of breast cancer. In DCIS, cancerous cells proliferation inside the ductal system without breaking the basal membrane. So, the cancerous cells are contained within the milk duct without stromal invasion [24]. This is an early stage of cancer that is easily treatable. If left untreated, it can break into the surrounding tissues and becomes invasive.

Invasive ductal carcinoma or infiltrating carcinoma: occurs when the cancerous cells originating from the ductal epithelium break through the ductal basal membrane and invade the neighbouring tissues and other parts of the body [24, 25, 26]

Lobular carcinoma in situ (LCIS): refers to the proliferation of atypical cells inside the lobules. This cancer is highly treatable, and it hardly infiltrates into the neighbouring tissues.

Ductal carcinoma in situ and invasive ductal carcinoma make 80% of breast cancers [24, 25, 26]. Invasive lobular carcinoma occurs when the malignant cells break through the basement line of the lobules' epithelium and invade the stroma. This type of cancer represents 5-10% of breast cancers [25, 26, 27]

Inflammatory breast cancer: is a type of invasive ductal carcinoma. This type of cancer presents all the features of inflammation, so the breast appears swollen and erythematous. It affects the blood system of the skin and or the lymphatic vessels of the breast. It may be detected in ducts and lobules. It does not generally form any distinctive mass.

This cancer is very aggressive and appears to evolve very rapidly. It accounts for about 1-5% of breast cancers. These cancers are present at a younger age and likely to have metastasis at the time of diagnosis. Their survival rate is shorter than in non-inflammatory cancers of the breast [28, 29].

Metastatic carcinoma: is classified as stage 4 breast cancer. This occurs when there is a distant invasion by metastatic cells from the primary breast tumour. The distant organs involved include the lungs, the liver, the bones, and the brain [30]

Medullary carcinoma: this type of breast cancer is rare and represents about 3-5% of breast cancers. It is a soft fleshy tumour well circumscribed. They represent less than 5% of breast infiltrating cancers. Its prognosis is better than the one of DCIS. It generally presents no lump and is detectable at mammography [31, 32].

Paget disease of the breast: it is uncommon cancer that affects the skin, the areolar, and the nipple, which appear eczema-like and scaly. Beneath it, generally, there is another cancer (DCIS). it represents 1-4% of breast cancers [33, 34, 35, 36, 37]. It is common in postmenopausal women from the 5th decade and above. Some cases have been reported in adolescents [38].

Angiosarcoma of the breast: this type of cancer represents only 1-2% of breast cancers. It develops in the epithelium of blood vessels or of the lymphatic system. It usually occurs in the 3rd and 4th decade of life. It proliferates and is not often diagnosed until it has spread in other parts of the body [39, 40, 41, 42].

Phyllode tumours: These tumours develop in the connective tissues of the breast; they are sarcomas. 25% of phyllodes are malignant and very aggressive. They affect women primarily in the 4th decade, although other ages can be affected [43, 44, 45]. The glandular and stromal structures are not evenly distributed into the whole breast tissue; more are found in the upper external quadrant of the breast. This explains why this quadrant is the siege of 50% of all breast cancers. The breast is sensitive to exposure to estrogen and progesterone. With ageing, the stroma is gradually replaced by fatty tissue, the glandular tissue atrophies, and the breasts involute to become loose [46, 47, 48].

Papilloma: papilloma of the breast is an intraductal crest-like growth in the milk ducts close to the nipple. About 17-20% of cases could be malignant, and 20% of patients have atypical cells. It primarily affects women from the 3rd to the 5th decade. Atypical hyperplasia is one of the risk factors for malignant transformation. An intraductal papilloma is a small, benign tumour that forms in a milk duct in the breast. These tumours are made of the gland and fibrous tissue as well as blood vessels. They most commonly occur in women between ages 35 and 55. There are no known risk factors for intraductal papilloma. There is evidence that Human Papilloma Virus (HPV) has a significant role in invasive breast cancer [49, 50, 51, 52]. Some authors have detected the genome of HPV in 48.6% in cases of advanced breast cancer, showing the possible link which can exist between HPV and BC [53, 54, 55, 56] This study aims to review the different types of breast cancer and establish their frequency of occurrence at the Buea regional hospital pathology laboratory, from the 06th of January, 2016, to the 25th of May, 2019.

Methodology

Study design, Population, and Data Collection

A hospital-based retrospective study was conducted to examine the types and prevalence of Breast Cancers in Buea Regional Hospital, South west region (Buea Fako), Cameroon. The data analysed in this descriptive study covered three years based on the records of the histopathology department of the Buea regional hospital from the 04th of March 2016 to the 25th of May 2019.

Ethical Consideration

The ethical board of the Faculty of Health Sciences of the University of Buea approved all procedures and protocols for this study.

Research clearance was received from the Director of the Buea Regional Hospital. The study strictly adhered to the Helsinki Declaration on the procedure for human research in methodology and interpretation of study evidence.

Data Analysis

Basic descriptive statistics were analysed to present the distribution of various breast cancer types reported. The demographic variable "age" was used to appropriate the cancer prevalence and frequency percentage among registered patients in the hospital presented in tables, charts and graphs.

Results

Table 1 and Figure two show the prevalence of different types of breast cancer reported between the 04th of March 2016 and the 25th of May 2019 in the hospital. The distribution of the reported breast cancer cases retrieved data showed that the bulk of the patients were Invasive Ductal Carcinoma (72.33%) and Carcinoma Insitu (14.47%).

Table 1: Distribution of the types of reported Breast Cancer cases N=318

Types	Frequency	%
Carcinoma Insitu	46	14.47
Invasive Ductal Carcinoma	238	74.84
Angiosarcoma	1	0.32
Phylloid	5	1.57
Papilloma	22	6.92
Inflammatory carcinoma	6	1.89

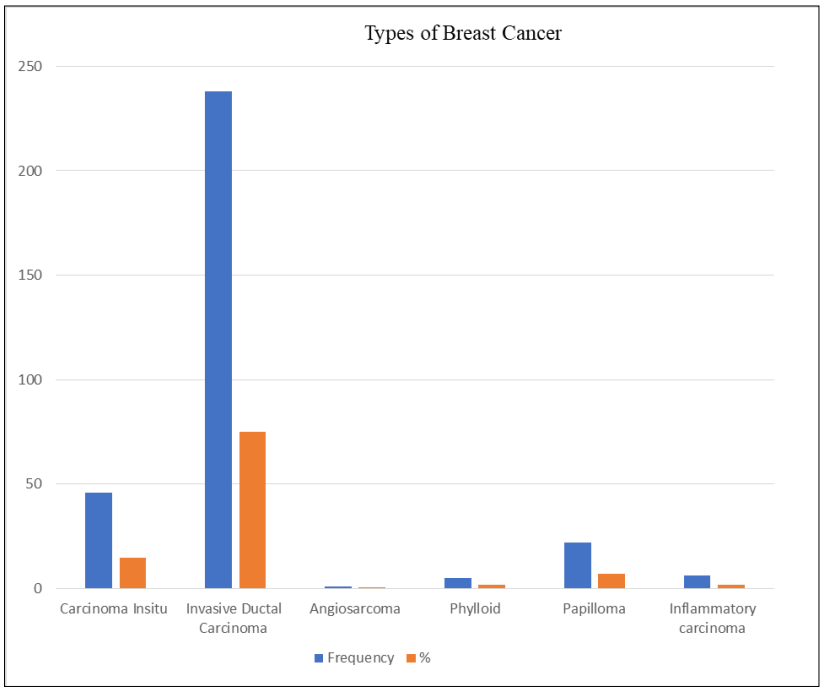

Fig 1: Distribution of the types of reported Breast Cancer cases between the 04th of March 2016 and the 25th of May 2019.

Figure 2 present the age prevalence of Invasive Ductal Carcinoma, the most vulnerable age group. The predominant age group accounts for approximately 38% of the Invasive Ductal Carcinoma cases aged 41-50.

Similarly, 51-60 accounted for about 21% of the patients screened in the hospital within three years. Ages 31-40 were estimated to account for about 20% of the Invasive Ductal Carcinoma cases.

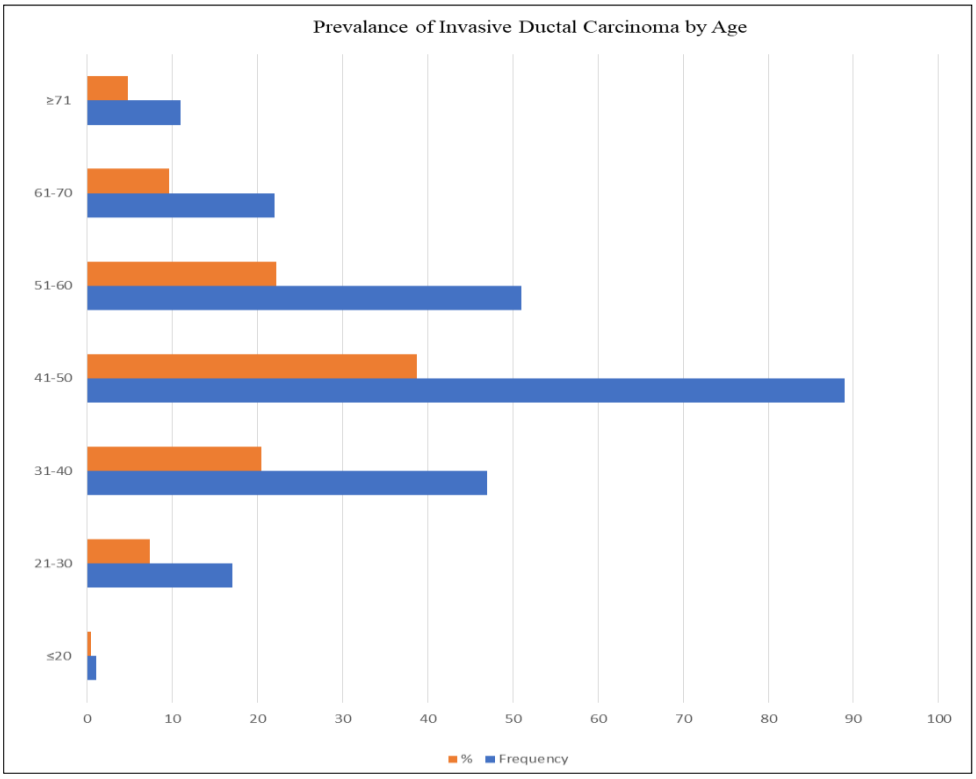

Fig 2: Age distribution of Invasive Ductal Carcinoma reported between the 04th of March, 2016, to the 25th of May 2019

In Figure 3, evidence shows that no report of Carcinoma Insitu was reported in ages 20 and below. However, of the total 46 reported Carcinoma Insitu cases, the majority were aged 31-40 (30.43%) and 41-50 (28.26%). Relatively, there is a high report of breast cancer in age groups 21-30 (13%).

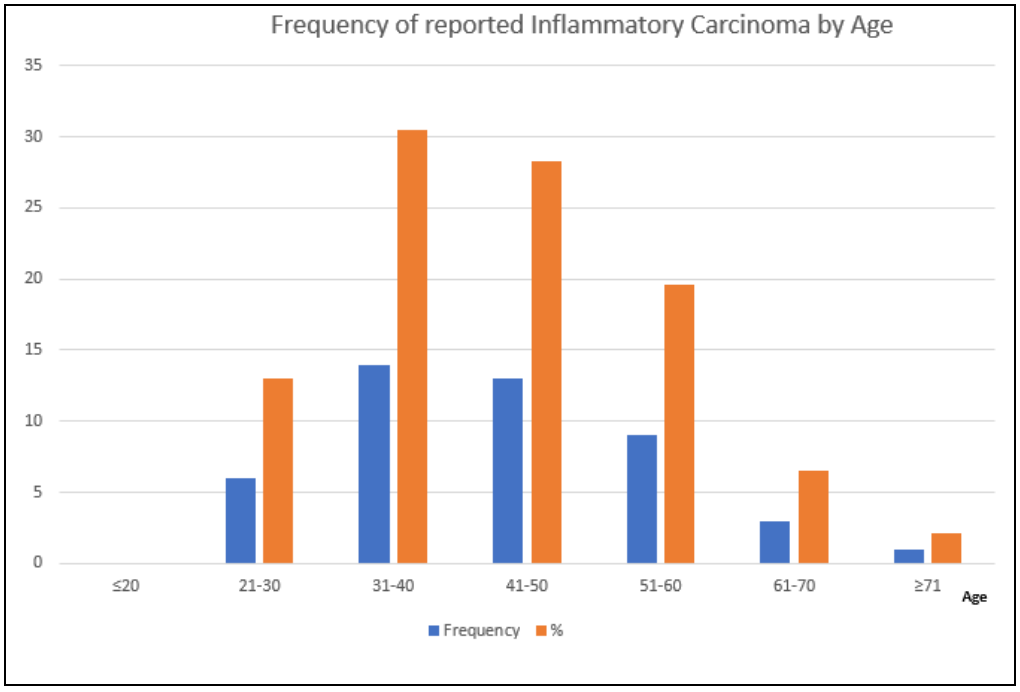

Fig 3: Age distribution of Carcinoma Insitu reported between the 04th of March, 2016, to the 25th of May 2019

Other reported Breast Cancer

Table 2 reported other prevalent breast cancer types: Angiosarcoma, phylloid, papilloma, and inflammatory carcinoma. There is papilloma in ages 20-60, and more reported in the age group 31-40.

Table 2: Distribution of other types of cases of Breast Cancer reported between the 04th of March 2016 and the 25th of May 2019

Age	Angiosarcoma	Phylloid	Papilloma	Inflammatory Carcinoma
≤20	0	4	2	0
21-30	0	1	5	0
31-40	0	0	9	0
41-50	0	0	2	2
51-60	1	0	4	0
61-70	0	0	0	0
≥71	0	0	0	4
Total	1	5	22	6

Discussion

In this study, invasive ductal carcinoma of the breast is the 1st breast cancer in terms of frequency, with a percentage of 74.84%. These findings agree with the results of many studies [24, 25, 26]. One would have expected them to be diagnosed much earlier at the stage of in situ CA. Possible explanations could be found in one of the following. The clinical presentation of ductal carcinoma in situ could be poor, ranging from absence symptoms to non-alarming watery/bloody expectoration from the nipples.

Additionally, the low economic status of our countries, the lack of knowledge and awareness in terms of prevention and treatment of cancer are some of the major impediments in the fight against cancer [57]. The peak of invasive ductal carcinoma occurrence is between 41-50 years, followed by 51-60 years, with respectively 38, 26 % and 21, 3 %, given a total of 59, 56 %. These findings are not very different from those of other authors [3, 4, 58]

The second most common cancer in our study in terms of frequency is carcinoma in situ. It is the most common noninvasive cancer of the breast [24]. Unfortunately, mammography detection, trained medical personnel in oncology, and awareness and knowledge of the general population are all wanting [57]. It represents 14.46% of our sample. Understandably its peak of occurrence is between 31-49 years old, and this is earlier than for invasive carcinoma.

Papilloma represents about 6.92 % of cases seen in this retrospective study. The peculiarity of papilloma tumours is that 20% of them are malignant, and 20% of patients present atypical cells [50, 51, 52]. These atypical cells under the influence of an oncogenic factor such as the Human papillomavirus could become malignant [53, 54, 55, 56]. Literature puts the age occurrence of papilloma tumours between 35 and 55 years [49, 50, 51, 52]. In our study, out of 22 cases, nine occurred between 31-40 years, five between 21-30 years and four between 51 to 60 years, giving respectively 40, 9%, 22.7%, and 18, 2%.

With 1.9 %, inflammatory carcinoma is number 4 in frequency in our study. It is a very aggressive cancer and fulminant in evolution. The breast presents all characteristics of inflammation with no distinctive mass. Affected are the blood vessels of the skin and or the lymphatic tissues of the breast. Our study agrees with the literature, which puts it between 1 to 5% [28, 29]. However, findings differ from what the literature generally reports as a malignancy occurring at a younger age [28, 29]. Out of six cases reported in our study, two occurred between 41 to 50 years, and four occurred in patients about 71 years of age.

Phyllode tumours: they generally develop from the connective tissue, are very aggressive, and have large volumes. Most women in their 4th decade are affected [43, 44, 45]. This type of breast cancer comes 5th in frequency in our study. For the 5 cases reported in this study, four were below 20 years and one between 21 and 30 years, making it a tumour of the very early age contrary to what is generally reported in the literature. Angiosarcoma, in our classification, is the last type of cancer found in this study. It develops from the epithelium of blood and lymphatic tissues. It affects women in their 30s and 40s. It is generally diagnosed late when it has metastasised in other parts of the body [39, 40, 41, 42]. The lone case in this study occurred between 51 and 60 years.

Conclusion

Breast cancer is a heterogeneous malignancy made of various diseases. Each of these has its specificity in terms of age of occurrence, tissue affected and aggressiveness. In our study, invasive breast carcinoma, with a percentage of 74.84 %, came first in terms of frequency, followed by carcinoma in situ, papilloma, inflammatory carcinoma, phyllodes tumours and angiosarcoma, respectively with 14.47, 6.92, 1.89, 1.57 and 0.32%. The lack of human and material resources in our countries and lack of awareness and knowledge about breast cancer is prejudicial for the early detection and treatment of cancer in our countries.

References

1. Momenimovahed Z, Ghoncheh M, Pakzad R, Hasanpour H, Salehiniya H. Incidence and mortality of uterine cancer and relationship with human development index in the world. *Cukurova Med J*,2017:42(2):233-240. doi:10.17826/cutf.322865
2. Earl H. Gynecologic Tumors. Tumour types. In: Carmichael J, Woll JP, Bunch C, editors. Medicine international. 2nd ed.,1995:32:469.

3. Stewart BW, Wild CP. World Cancer Report, 2014. Geneva, Switzerland: WHO Press; 2014. [Google Scholar]
4. WHO: Geneva, Switzerland. Breast cancer. http://www.who.int/cancer/prevention/diagnosis-screening/breast-cancer/en/
5. Bray F, Ferlay J, Soerjomataram I, Siegel RL, Torre LA, Jemal A. Global cancer statistics: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA Cancer J Clin,2018:68(6):394-424.
6. Siegel RL, Miller KD, Jemal A. Cancer statistics, 2019. *CA Cancer J Clin*. 2019;69(1):7–34. doi:10.3322/caac.21551
7. DeSantis CE, Ma J, Gaudet MM, et al. Breast cancer statistics *CA Cancer J Clin*,2019:69(6):438-451. doi:10.3322/caac.21583
8. World Cancer Report, 2014. Available: http://publications.iarc.fr/Non-Series-Publications/World-Cancer-Reports/World-Cancer-Report-2014
9. Breast cancer process India, Breast cancer cost India, Breast cancer, Delhi India. *Breast cancer information and resources*. 2010. [14 April 2010]. http://www.digforthecure.org/breast-cancer-process-india-breast-cancer-cost-india-breast-cancer-delhi-india. html.
10. Ganesh N Sharma et al. Various Types and Management of Breast Cancer: An Overview. J Adv Pharm Technol Res,2010:(2):109-126.
11. What is breast cancer? Imaginis, 2008. [17 Mar 2010]. http://www.imaginis.com/breast-health/what-is-breast-cancer-2.
12. What is breast cancer? American cancer society, 2009. [18 Mar 2010]. http://www.cancer.org/docroot/CRI/content/CRI_2_4_1X_What_is_breast_cancer_5.asp .
13. Breast cancer process India, Breast cancer cost India, Breast cancer, Delhi India. *Breast cancer information and resources*, 2010. [14 April 2010]. http://www.digforthecure.org/breast-cancer-process-india-breast-cancer-cost-india-breast-cancer-delhi-india. html.
14. Maffini MV, Soto AM, Calabro JM. et al. The stroma as a crucial target in rat mammary gland carcinogenesis. J Cell Sci,2004:117:1495-1502. [PubMed] [Google Scholar]
15. Sonnenschein C, Soto AM. Carcinogenesis explained within the context of a theory of organisms. Progress in biophysics and molecular biology,2016:122:70-76. [PMC free article] [PubMed] [Google Scholar]
16. Qian BZ, Pollard JW. Macrophage diversity enhances tumor progression and metastasis. Cell,2010:141:39-51. [PMC free article] [PubMed] [Google Scholar]
17. 10. Dumars C, Ngyuen JM, Gaultier A. et al. Dysregulation of macrophage polarisation is associated with the metastatic process in osteosarcoma. Oncotarget,2016:7:78343-78354. [PMC free article] [PubMed] [Google Scholar]
18. Majeed W, Aslam B, Javed I. et al. Breast cancer: major risk factors and recent developments in treatment. APJCP,2014:15:3353-3358. [PubMed] [Google Scholar]
19. Sgroi DC. Preinvasive breast cancer. Annu Rev Pathol. 2010;5:193–221. [PMC free article] [PubMed] [Google Scholar]
20. Deng CX. BRCA1: cell cycle checkpoint, genetic instability, DNA damage response and cancer evolution. Nucleic Acids Res,2006:34:1416-1426. [PMC free article] [PubMed] [Google Scholar]
21. Dine J, Deng CX. Mouse models of BRCA1 and their application to breast cancer research. Cancer Metastasis Rev,2013:32:25-37.
22. Brewer HR, Jones ME, Schoemaker MJ. et al. Family history and risk of breast cancer: an analysis accounting for family structure. Breast Cancer Res Treat, 2017:165:193-200. [PMC free article] [PubMed] [Google Scholar]
23. Polyak K. Heterogeneity in breast cancer. J Clin Invest,2011:121:3786-8. CAS PubMed PubMed Central Article Google Scholar
24. Breast Cancer. Merck, 2008. [the 18th of March. 2010]. http://www.merck.com/mmhe/sec22/ch251/ch251f.html.
25. Types of breast cancer. Rethink breast cancer, 2003. [the 18th of March. 2010]. http://www.rethinkbreastcancer.com/types_of_breast_cancer.html.
26. Types of breast cancer. Abviva, 2009. [the 18th of March. 2010]. http://abviva.com/1.html .
27. Fayed L. Types of breast cancer. About.com: Cancer, 2009. The 09th of July, [the 20th of March. 2010]. http://cancer.about.com/od/breastcancer/a/cancertypes.htm .
28. Hance KW, Anderson WF, Devesa SS, et al. Trends in inflammatory breast carcinoma incidence and survival: The surveillance, epidemiology, and end results program at the National Cancer Institute. *J Natl Cancer Inst*,2005:97:966-975. [PMC free article] [PubMed] [Google Scholar]
29. Levine PH, Steinhorn SC, Ries LG, Aron JL: Inflammatory breast cancer: the experience of the surveillance, epidemiology, and end results (SEER) program. J Natl Cancer Inst. 1985, 74: 291-297.
30. Carter BA, Jensen RA, Simpson JF, Page DL. Benign transport of breast epithelium into axillary lymph nodes after biopsy. *Am J Clin Pathol*,2000:113(2):259-265. doi:10.1309/7EF8-F1W7-YVNT-H8H5
31. Foulkes WD, Smith IE, Reis-Filho JS. Triple-negative breast cancer. The New England journal of medicine, 2010, 11. [PubMed PMID: 21067385]

32. Chu Z, Lin H, Liang X, Huang R, Zhan Q, Jiang J, et al. Clinicopathologic characteristics of typical medullary breast carcinoma: a retrospective study of 117 cases. PloS one, 2014. [PubMed PMID: 25375803]
33. Paget J. On the disease of the mammary areola preceding cancer of the mammary gland. *St Bartholomews Hosp Rep,*1874:10:87-9. [Google Scholar]
34. Tavassoli FA. Norwalk, Connecticut: Appletonand Lange; Pathology of the breast, 1999, 731-60. [Google Scholar]
35. Sakorafas GH, Blanchard K, Sarr MG, Farley DR. Paget's disease of the breast. *Cancer Treat Rev,*2001:27:9-18. [PubMed] [Google Scholar]
36. Kanitakis J. Mammary and extramammary Paget's disease. *J Eur Acad Dermatol Venereol.* 2007;21:581–90. [PubMed] [Google Scholar]
37. Martin VG, Pellettiere EV, Gress D, Miller AW. Paget's disease in an adolescent arising in a supernumerary nipple. *J Cutan Pathol,*1994:21:283-6. [PubMed] [Google Scholar]
38. Ascensao AC, Marques MS, Capitao-Mor M. Paget's disease of the nipple.Clinical and pathological review of 109 female patients. *Dermatologica,*1985:170:170-9. [PubMed] [Google Scholar
39. Rosen P. "Sarcoma," in Rosen's Breast Pathology, P. P. Rosen, Ed., Lippincott Williams & Wilkins, Philadelphia, Pa, USA, 2001, 813-861.
40. Bardwil JM, Mocega EE, Butler JJ, Russin DJ. "Angiosarcomas of the head and neck region," The American Journal of Surgery,1968:116(4):548-553.
41. Folpe AL, Gowen AM. Malignant Vascular Tumors. Soft Tissue Tumors, Mosby, St. Louis, Miss, USA, 1995.
42. Nascimento AF, Raut CP, Fletcher CDM. "Primary angiosarcoma of the breast: clinicopathologic analysis of 49 cases, suggesting that grade is not prognostic," American Journal of Surgical Pathology,2008:32(12):1896-1904.
43. Ductal breast cancer. Cancer studies. Mar. [the 28th of March. 2010]. http://cancer-studies.com/ductal-breast-cancer.
44. Fayed L. Types of breast cancer. About.com: Cancer, 2009. The 09th of July, [the 20th of March. 2010]. http://cancer.about.com/od/breastcancer/a/cancertypes.htm .
45. Stephan P. Mucinous (Colloid) Carcinoma of the breast. About.com: Cancer, 2008. The 05th of August, [the 20th of March. 2010]. http://breastcancer.about.com/od/types/p/mucinous_ca.htm .
46. Shahoud JS, Burns B, Anatomy, Thorax, Internal Mammary (Internal Thoracic) Arteries 2019 Jan; [PubMed PMID: 30726022]
47. Solari F, Burns B, Anatomy, Thorax, Pectoralis Major Major, 2019. Jan; [PubMed PMID: 30252247]
48. Cuadrado GA, de Andrade MFC, Akamatsu FE, Jacomo AL. Lymph drainage of the upper limb and mammary region to the axilla: anatomical study in stillborns. Breast cancer research and treatment. 2018 Jun; [PubMed PMID: 29380209]
49. Parkin D, Bray F, Ferlay J, Pisani P. Cancer incidence, mortality and prevalence worldwide, GLOBOCAN American Cancer Society. Cancer J Clin,2005:55:74-108.
50. Parkin DM. The global health burden of infection-associated cancers in the year 2002. Int J Cancer,2006:118(12):3030-44.
51. Goldszmid RS, Dzutsev A, Trinchieri G. Host immune response to infection and cancer: unexpected commonalities. Cell Host Microbe,2014:15(3):295-305.
52. Park IH, Ko K, Joo J, Park B, Jung SY, Lee S, et al. High volumetric breast density predicts risk for breast cancer in postmenopausal, but not premenopausal, Korean women. Ann Surg Oncol,2014:21(13):4124-32.
53. Bae JM. Two hypotheses of dense breasts and viral infection for explaining incidence of breast cancer by age group in Korean women. Epidemiology and health,2014:36:e2014020.
54. Petry KU. HPV and cervical cancer. Scand J Clin Lab Invest,2014:74(244):59-62.
55. Schiffman M, Castle PE, Jeronimo J, Rodriguez AC, Wacholder S. Human papillomavirus and cervical cancer. Lancet,2007:370(9590):890-907.
56. Neh Fru C, Tassang Andrew, Frederick Nchang Cho, Tassang Thierry and P. Ngum Fru. Determinants of Awareness and Knowledge on Cervical Cancer among Women in Buea- Cameroon. International Journal of Research and Reports in Gynaecology,2020:3(3):1-14. Article no.IJRRGY.61689
57. Siegel RL, Miller KD, Jemal A. Cancer Statistics, 2017. CA Cancer J Clin,2017:67:7-30. [PubMed] [Google Scholar]