

## Review Article

# Epidemiology of Breast Cancer in Europe and Africa

**Ganiy Opeyemi Abdulrahman Jnr.<sup>1</sup> and Ganiyu Adebisi Rahman<sup>2</sup>**

<sup>1</sup>*Institute of Medical Education, Cardiff University School of Medicine, 5th Floor, Cochrane Building, Heath Park, Cardiff CF14 4XW, UK*

<sup>2</sup>*Division of General Surgery, Department of Surgery, University of Ilorin Teaching Hospital, Ilorin 240001, Nigeria*

Correspondence should be addressed to Ganiy Opeyemi Abdulrahman Jnr., [ussheadie@hotmail.co.uk](mailto:ussheadie@hotmail.co.uk)

Received 29 September 2011; Revised 19 February 2012; Accepted 11 March 2012

Academic Editor: P. Vineis

Copyright © 2012 G. O. Abdulrahman Jnr. and G. A. Rahman. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Breast cancer continues to remain the most lethal malignancy in women across the world. This study reviews some of the epidemiological similarities and differences in breast cancer between white European women and black African women with the aim of optimising care for women with breast malignancy across the world. The incidence of breast cancer is lower among African women than their European counterparts. Majority of women in Europe are postmenopausal when they present with breast cancer; however, the peak incidence among African women is in the premenopausal period. Ductal carcinoma is the commonest type of breast cancer among women in Africa and Europe. However, medullary and mucinous carcinomas are more common in Africa than in Europe. While European women usually present at an early stage especially with the advent of screening, African women generally present late for treatment resulting in lower survival rates. There should be more research at the molecular level among African women to identify genetic factors that may contribute to the risk of developing breast cancer. There should also be improvement in the health care system in Africa in order to optimise care for women with breast cancer.

## 1. Introduction

Breast cancer continues to remain the most lethal malignancy in women across the world. In 2008, approximately 1.4 million women were diagnosed with breast cancer worldwide with corresponding 460000 deaths [1]. Of these, approximately 450000 women were diagnosed with the disease in Europe with a corresponding 140000 deaths, while 68000 women were reportedly diagnosed with the disease in Africa with a corresponding 37000 deaths [1]. A number of studies have suggested that there are epidemiological differences between breast cancers among women in Europe and Africa. Risk factors such as menopause, oral contraceptive use, cigarette smoking, and family history of breast cancer have been shown to have different relations to breast cancer among blacks and whites [2]. This paper aims to uncover some of the epidemiological similarities and differences in breast cancers between white European women and black African women.

## 2. Incidence

Breast cancer is a leading cause of death among women in West Africa with an approximately 30000 new cases in 2008 and more than 16000 deaths [1]. The incidence appears to be significantly lower in Eastern Africa with approximately 18000 new cases and a corresponding 10000 deaths during the same year [1]. In Western Europe, the incidence is five times higher than that in West Africa. Furthermore, approximately 40000 deaths from breast cancer were recorded in 2008 [1]. The incidence is similar in Central and Eastern Europe with approximately 115000 new cases and more than 47000 deaths in 2008 [1]. The incidence has also been shown to be significantly higher among women of European origin in the United States of America. Fejerman and colleagues reported that Greater European ancestry is associated with increased risk of breast cancer [3]. They recorded a statistical significance when women

with 51% to 75% and 76% to 100% European ancestry were compared with women with 0% to 25% European ancestry [3].

### 3. Age at Presentation

The mean age at presentation varies between Africa and Europe. It has been reported that the mean age is 48 years in Africa and approximately two-thirds are premenopausal [4, 5]. On the contrary, the majority of women present at postmenopause in Europe [6–8]. In the United Kingdom, the median age at presentation for Black women is similar to African women at 46 years compared to 67 years in white British women [9]. African-American women have also been found to present at a significantly younger age than their Caucasian counterparts [10, 11]. The factors responsible for this are not fully understood, although it could be due to the breast cancer genes (BRCA 1 and 2) and their variants [12].

### 4. Hormones

It is thought that differences in the epidemiology of breast cancer among races could partly be attributed to endogenous hormones. Pinheiro and colleagues analysed the association between race and hormone levels among premenopausal African-American, Asian-American, and Caucasian women in the United States [13]. In comparison to Caucasians, African-American women had 18% higher levels of oestradiol ( $P < 0.01$ ), 17% higher free oestradiol ( $P < 0.01$ ) and 11% higher IGF-1 ( $P < 0.01$ ) [13]. Of significant note is the fact that premenopausal African-American women were found to have 11% lower levels of sex hormone binding globulin (SHBG) [13] as it is well known that SHBG is associated with a decrease in the risk of breast cancer risk [14]. In another study, African-American women had 17.4% and 25% higher levels of follicular and luteal phase oestradiol concentrations, respectively, than Caucasian women [15]. These findings may explain the higher incidence of premenopausal breast cancer among women of African origin. Of particular interest is that postmenopausal African-American women also have higher levels of oestradiol than white women but, in contrast to premenopausal level, they have higher levels of SHBG [16]. Unfortunately, there is paucity of data on hormone levels of premenopausal nonmigrant African women.

### 5. Histopathology of Breast Cancer

Histologically, ductal carcinoma is the commonest type of breast cancer among women in Africa and Europe with similar frequency [5, 17]. However, medullary and mucinous carcinomas are more common in Africa than in Europe. In addition, more women have grade 3 tumours in Africa than in Europe. In Tanzania, for example, 56.4% have tumours with histological grade 3 [5], while, in Nigeria, 45.1% have grade 3 tumour [18]. On the contrary, only 15.8% of Finnish women have a grade 3 tumour. Most women in Europe

present with a grade 1 or 2 tumour [17]. African-American women are also considerably more likely to have high grade nuclear atypia, grade 3 tumours, increased number of positive nodes, and more necrosis than white women [19–21]. Black British women have been shown to have higher rates of grade 3 tumours and lymph-node-positive disease than white British women [9]. This may explain why the progression of breast cancer is more aggressive in African women than in European women.

Gene expression analysis has been used to classify breast cancer into various subtypes. These include luminal A, luminal B, basal-like, HER2+/ER-, and unclassified. Basal-like breast tumours occur at a significantly higher rate among premenopausal African-American patients compared with postmenopausal African-American and non-African-American patients [22].

### 6. Stage at Presentation

There is a significant difference in staging at the time of presentation between European women and their African counterparts. Most women in Africa present when the disease is at an advanced stage. In a study in East Africa, more than 70% of the patients presented at stage III or IV [5]. In studies in Libya and Nigeria, more than half of the patients presented at stage III or IV [17, 18]. However, in Europe, women are more likely to present when the disease is still in its early stage [23]. In a Nigerian study, as high as 39% of the patients had fungating tumours while 13% had clinical evidence of systemic metastasis [4]. The reason for the advanced presentation in Africa could be due to lack of health care coverage especially in remote rural areas and poverty as healthcare is not free in most countries. On the contrary, in most European countries, healthcare is easily accessible and free. In addition, public awareness is high and screening is available in most European countries.

### 7. Breast Cancer Genes (BRCA1 and BRCA2)

Breast cancer susceptibility genes 1 and 2 (BRCA1 and BRCA2) are tumour suppressor genes, and mutation of these genes has been shown to be associated with an increased risk of developing breast cancer. These genes have been demonstrated to contribute to an increased risk of breast cancer among European women. In a study in Sweden, BRCA mutations were more frequent among case subjects with one first- or more than one first- or second-degree relative with breast or ovarian cancer ( $P < 0.001$ ) than among subjects without this degree of family history [24]. In addition, BRCA mutations were statistically significantly more common among women with bilateral breast cancer than among women with unilateral breast cancer ( $P = 0.002$ ) [24]. Research has even suggested that the age of onset of breast cancer tends to be younger in BRCA1 mutation carriers than BRCA2 mutation carriers [25]. Unfortunately, much research has not been done on the possibility of genetic predisposition to breast cancer among native African women in the African continent.

## 8. Management

As many breast cancer cases are detected early in Europe, many of the women could have breast conserving surgery (BCT). In Poland, for example, the number of tumours detected with diameters  $\leq 5$  cm increased from 57% in 1984 to 81% in 2003 [26]. On the contrary, in Africa, only 52% of the patients have tumour size below 6 cm [5]. As a result, most women in Africa have mastectomy and adjuvant hormonal therapy or chemotherapy and many others only receive palliative care because the tumour is advanced and inoperable.

## 9. Discussion

Breast cancer is increasing in regions that until recently had low rates of the disease. However, the incidence of the malignancy is still low in Africa compared to the incidence in Europe. This has largely been attributed to a protective reproductive history including late menarche, early menopause, high parity with prolonged breastfeeding, irregular menses, and fewer ovulatory cycles [27]. However, it has been reported that African women tend to present at an earlier age and the disease appears to be more aggressive than in their European counterparts. This could be due to certain genetic predisposition. Unfortunately, much genetic work has not been done on nonmigrant African women, although some research has been done in their African-American counterparts. In an American study, most African-American patients had mutations in BRCA2 while most mutations in the white cohort were in BRCA1 [28]. The study further stated that almost half of the African-American women had variants of uncertain significance, compared to only 12% of the white cohort [28]. In addition, Black women in Europe exhibit similar pattern of disease to African women than to white European women suggesting that genetics may be playing a more significant role. The higher prevalence of basal-like breast tumours and a lower prevalence of luminal A tumours could also contribute to the poor prognosis in young African-American women with breast cancer. It would be of immense benefit if there could be research into the genetics of breast cancer among African women in various regions of the African continent. Such research might even reveal mutations that are currently unknown.

African-Americans have the highest rates of premenopausal breast cancer, and it has been suggested that this might be linked to hormonal levels such as oestrogen [29]. Oestrogen stimulates cell division, and, therefore, the higher the exposure of a woman to oestrogen, the higher the rates of cell division in the breast. A high rate of cell division predisposes humans to DNA copying error, resulting in higher risk of cancer. Studies have shown that African-American women have higher levels of oestradiol, free oestradiol, and IGF-1, all of which have been attributed to a higher risk of breast cancer. SHBG reduces the risk of breast cancer and the fact that postmenopausal African-American women appear to have a higher level of SHBG may explain why Black women both in and out of Africa are at a lower risk of breast cancer after menopause. However, other

risk factors may combine to increase the risk of breast cancer in postmenopausal Caucasian women.

The high mortality from breast cancer in Africa could be attributed to poverty. In most parts of Africa, health care is not free, and, as a result, women delay before presentation to hospital. It is not uncommon for them to have used unorthodox medicine before eventually visiting the hospital. In many instances, the disease would have reached an advanced stage. This is in contrast to most European countries where health care is not only free, but also regular screening is available to women of certain ages. This increases the probability of detecting breast cancer at a very early stage. In the United Kingdom, for example, women aged 50–70 years are invited for breast screening with mammography every three years [30]. In addition, the National Institute of Clinical Excellence (NICE) has stated that women who are known to have a genetic mutation should be offered annual MRI surveillance if they are BRCA1 and BRCA2 mutation carriers aged 30–49 years and TP53 mutation carriers aged 20 years or older [31]. In France, regional breast cancer screening programmes are being offered to women aged 50–74 years. Unfortunately, this is not the practice in many African countries.

The poor health care system in Africa also affects the management of breast cancer patients. Many women in Africa are unable to undergo breast conserving surgery (BCT) because of lack of radiotherapy facilities. To perform a breast conserving surgery, radiotherapy would be required after surgery [32]. As a result, a significant number of African women with breast cancer have to undergo mastectomy. This is in contrast to Europe where many breast cancer patients are able to have their breast conserved [33] because of the availability of radiotherapy facilities. In Africa, mastectomy rate is more than 85% [4], compared to just 30% in Europe [33, 34]. In fact, in the UK, more than 70% of screen-detected breast cancer patients have BCT [34]. There are only 4 radiotherapy centres in Nigeria, with a population of 160 million, compared to the UK that has a population of 60 million and more than 70 radiotherapy centres.

There must be political will on the part of African leaders to adequately fund the health care system. To optimise the management of breast cancer patients, there must be access to radiotherapy facilities and cytotoxic drugs must be readily available. Imaging facilities such as computerised tomography (CT) and magnetic resonance imaging (MRI) must be readily available at no cost to the patient or at an affordable rate.

As it appears that Black women, both within and outside Africa, have a higher incidence of premenopausal breast cancer, it might be worth considering lowering the age at which Black women are first invited for screening in countries that have a breast cancer screening programme so as to detect malignant changes as early as possible.

## 10. Conclusion

The epidemiological similarities and differences in breast cancer among women in Europe and Africa have been

reviewed. There should be more research at the molecular level among African women to identify genetic factors that may contribute to the risk of developing breast cancer. There should also be improvement in the health care system in Africa in order to optimise care for women with breast cancer.

## References

- [1] J. Ferlay, H. R. Shin, F. Bray, D. Forman, C. Mathers, and D. M. Parkin, "GLOBOCAN 2008 v1.2, Cancer Incidence and Mortality Worldwide. IARC Cancerbase No, 10," International Agency for Research on Cancer, Lyon, France, 2010, <http://globocan.iarc.fr/>.
- [2] R. M. Mayberry and C. Stoddard-Wright, "Breast cancer risk factors among black women and white women: Similarities and differences," *American Journal of Epidemiology*, vol. 136, no. 12, pp. 1445–1456, 1993.
- [3] L. Fejerman, I. Romieu, E. M. John et al., "European ancestry is positively associated with breast cancer risk in Mexican women," *Cancer Epidemiology Biomarkers and Prevention*, vol. 19, no. 4, pp. 1074–1082, 2010.
- [4] A. R. K. Adesunikanmi, O. O. Lawal, K. A. Adelusola, and M. A. Durosimi, "The severity, outcome and challenges of breast cancer in Nigeria," *Breast*, vol. 15, no. 3, pp. 399–409, 2006.
- [5] P. F. Rambau, P. L. Chalya, M. M. Manyama, and K. J. Jackson, "Pathological features of Breast Cancer seen in Northwestern Tanzania: A nine years retrospective study," *BMC Research Notes*, p. 214, 2011.
- [6] Public Health Wales NHS Trust, "WCISU Annual Publication No. SA10/01: Cancer Incidence in Wales 2004–2008," Welsh Cancer Intelligence and Surveillance Unit, Cardiff, UK, 2010, <http://www.wales.nhs.uk/sites3/Documents/242/incpub2010.pdf>.
- [7] Cancer Registry of Norway, *Cancer in Norway: Cancer in Norway 2009 – Cancer incidence, mortality, survival and prevalence in Norway*, Cancer Registry of Norway, Oslo, Norway, 2011.
- [8] Finnish Cancer Registry, *Cancer stat fact sheets*, Institute for Statistical and Epidemiological Cancer Research, Helsinki, Finland, 2011.
- [9] R. L. Bowen, S. W. Duffy, D. A. Ryan, I. R. Hart, and J. L. Jones, "Early onset of breast cancer in a group of British black women," *British Journal of Cancer*, vol. 98, no. 2, pp. 277–281, 2008.
- [10] J. G. Elmore, V. M. Mocerri, D. Carter, and E. B. Larson, "Breast carcinoma tumor characteristics in black and white women," *Cancer*, vol. 83, no. 12, pp. 2509–2515, 1998.
- [11] L. A. G. Reis, C. L. Kosary, B. F. Hankey, B. A. Miller, L. X. Clegg, and B. K. Edwards, *SEER Cancer Statistics Review, 1973–1996*, National Cancer Institute, Bethesda, Md, USA, 1999.
- [12] Q. Gao, S. Neuhausen, S. Cummings, M. Luce, and O. I. Olopade, "Recurrent germ-line BRCA1 mutations in extended african american families with early-onset breast cancer [1]," *American Journal of Human Genetics*, vol. 60, no. 5, pp. 1233–1236, 1997.
- [13] S. P. Pinheiro, M. D. Holmes, M. N. Pollak, R. L. Barbieri, and S. E. Hankinson, "Racial differences in premenopausal endogenous hormones," *Cancer Epidemiology Biomarkers and Prevention*, vol. 14, no. 9, pp. 2147–2153, 2005.
- [14] T. Key, P. Appleby, I. Barnes, G. Reeves, and Endogenous Hormones and Breast Cancer Collaborative Group, "Endogenous sex hormones and breast cancer in postmenopausal women: reanalysis of nine prospective studies," *Journal of the National Cancer Institute*, vol. 94, no. 8, pp. 606–616, 2002.
- [15] C. A. Haiman, M. C. Pike, L. Bernstein et al., "Ethnic differences in ovulatory function in nulliparous women," *British Journal of Cancer*, vol. 86, no. 3, pp. 367–371, 2002.
- [16] V. W. Setiawan, C. A. Haiman, F. Z. Stanczyk, L. Le Marchand, and B. E. Henderson, "Racial/ethnic differences in postmenopausal endogenous hormones: the Multiethnic Cohort Study," *Cancer Epidemiology Biomarkers and Prevention*, vol. 15, no. 10, pp. 1849–1855, 2006.
- [17] J. M. E. Boder, F. B. E. Abdalla, M. A. Elfageih, A. Abusaa, A. Buhmeida, and Y. Collan, "Breast cancer patients in Libya: comparison with European and central African patients," *Oncology Letters*, vol. 2, no. 2, pp. 323–330, 2011.
- [18] O. F. Ikpat, P. Kronqvist, T. Kuopio, R. Ndoma-Egba, and Y. Collan, "Histopathology of breast cancer in different populations: Comparative analysis for Finland and Africa," *Electronic Journal of Pathology and Histology*, vol. 8, no. 4, pp. 24011–24018, 2002.
- [19] V. W. Chen, P. Correa, R. J. Kurman et al., "Histological characteristics of breast carcinoma in blacks and whites," *Cancer Epidemiology Biomarkers and Prevention*, vol. 3, no. 2, pp. 127–135, 1994.
- [20] H. Aziz, F. Hussain, C. Sohn et al., "Early onset of breast carcinoma in African American women with poor prognostic factors," *American Journal of Clinical Oncology*, vol. 22, no. 5, pp. 436–440, 1999.
- [21] L. A. Newman and A. E. Alfonso, "Age-related differences in breast cancer stage at diagnosis between black and white patients in an urban community hospital," *Annals of Surgical Oncology*, vol. 4, no. 8, pp. 655–662, 1997.
- [22] L. A. Carey, C. M. Perou, C. A. Livasy et al., "Race, breast cancer subtypes, and survival in the Carolina Breast Cancer Study," *Journal of the American Medical Association*, vol. 295, no. 21, pp. 2492–2502, 2006.
- [23] P. Grosclaude, M. Colonna, G. Hedelin et al., "Survival of women with breast cancer in France: variation with age, stage and treatment," *Breast Cancer Research and Treatment*, vol. 70, no. 2, pp. 137–143, 2001.
- [24] N. Loman, O. Johannsson, U. Kristoffersson, H. Olsson, and Å. Borg, "Family history of breast and ovarian cancers and BRCA1 and BRCA2 mutations in a population-based series of early-onset breast cancer," *Journal of the National Cancer Institute*, vol. 93, no. 16, pp. 1215–1223, 2001.
- [25] C. M. Steel, "BRCA1 and BRCA2 mutations in Scotland and Northern Ireland," *British Journal of Cancer*, vol. 88, no. 8, pp. 1256–1262, 2003.
- [26] M. Bębenek, M. Pudełko, and J. Błaszczuk, "Breast cancer incidence and mortality in Lower Silesia (Poland) between 1984 and 2003—trends and perspectives," *Central European Journal of Medicine*, vol. 2, no. 2, pp. 208–215, 2007.
- [27] A. Fregene and L. A. Newman, "Breast cancer in sub-Saharan Africa: How does it relate to breast cancer in African-American women?" *Cancer*, vol. 103, no. 8, pp. 1540–1550, 2005.
- [28] B. G. Haffty, A. Silber, E. Matloff, J. Chung, and D. Lannin, "Racial differences in the incidence of BRCA1 and BRCA2 mutations in a cohort of early onset breast cancer patients: African American compared to white women," *Journal of Medical Genetics*, vol. 43, no. 2, pp. 133–137, 2006.
- [29] E. E. Marsh, N. D. Shaw, K. M. Klingman et al., "Estrogen levels are higher across the menstrual cycle in African-American women compared with Caucasian women," *Journal*

*of Clinical Endocrinology & Metabolism*, vol. 96, no. 10, pp. 3199–3206, 2011.

- [30] Cancer Research UK, “Breast cancer screening,” Cancer Research UK, London, UK, 2011 <http://info.cancerresearchuk.org/spotcancerearly/screening/breastcancerscreening/>.
- [31] National Collaborating Centre for Primary Care, “Familial breast cancer: the classification and care of women at risk of familial breast cancer in primary, secondary and tertiary care,” National Institute of Clinical Excellence, London, UK, 2006 <http://www.nice.org.uk/nicemedia/live/10994/30247/30247.pdf>.
- [32] G. A. Rahman, “Breast conserving therapy: a surgical technique where little can mean more,” *Journal of Surgical Technique and Case Report*, vol. 3, no. 1, pp. 1–4, 2011.
- [33] B. Cutuli, C. Lemanski, A. Fourquet et al., “Breast-conserving surgery with or without radiotherapy vs mastectomy for ductal carcinoma in situ: French Survey experience,” *British Journal of Cancer*, vol. 100, no. 7, pp. 1048–1054, 2009.
- [34] D. Dodwell, K. Clements, G. Lawrence et al., “Radiotherapy following breast-conserving surgery for screen-detected ductal carcinoma in situ: Indications and utilisation in the UK. Interim findings from the Sloane Project,” *British Journal of Cancer*, vol. 97, no. 6, pp. 725–729, 2007.