Male breast cancer patients: a retrospective study of patients characteristics and treatment outcome at the National Cancer Institute (NCI-UG) - Central Sudan

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Authorship

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Summary

Male breast cancer (MBC) incidence is higher in Africa. Cancer patients treated during 1999-2010 at National cancer Institute (NCI-UG), Central Sudan, were analyzed with regard to MBC. MBC accounted for 2.3% (34/1,505) with mean age of 56.5±15.8 years. The mean period between complain awareness and MBC diagnosis was 25.3±46 months. Most patients presented with large lump (mean size, 6.8±3.0 cm) or metastatic disease (stages III/IV; 21/34, 61.8%). Seventeen patients (50%) were lost during follow-up. Almost all patients lost during follow-up were of late stage (stages III/IV, 16/17 patients). Relapse rate was 71.4% (15/21). The median disease free survival period was 20 months, one-year disease free survival was 58% and the five-year disease free survival was 21.1%. Although the existence of NCI-UG has facilitated MBC patients treatment, but the general impact of healthcare crisis in Sudan is evident by the advanced stage at disease presentation and the short disease free survival.

Introduction

Male breast cancer (MBC) is a rare disease accounted for about 1% of breast cancer patients [1-4]. However its incidence is reportedly higher in populations of African origin [4-7]. The established risk factors for MBC were as follows: old age (common in males of old age, range: 60 – 70 years), excessive use of alcohol, exposure to estrogen, family history of breast cancer, klinefilter syndrome, liver diseases, obesity and radiation exposure [2, 4, 8].

Due to its rarity there is worldwide lack of studies dealing specifically with MBC [3, 9-11]. In fact randomized controlled studies in MBC patients are almost not existed and management guidelines were extrapolated from studies conducted in females [2, 3, 7, 10-12]. Of note population-based cohort study from Sweden, which is one of the largest studies, failed to find evidence to support the proposed association between sex of breast cancer patients and survival [9]. Another current study from Chemnitz/Zwickau region, Saxony, Germany found no survival differences between male and female breast cancer patients and gives more evidence that gender is not a predictor for survival in breast cancer [13].

In Sudan there are only two cancer centers, both located in Central Sudan, *i.e.* the Radiation and Isotopes Center, Khartoum (RICK) and the National Cancer Institute (NCI-UG) of Gezira University in Wad Medani, Gezira State, Central Sudan.

Breast cancer accounted for about one-fifth of all cancer patients treated in Sudan and is the most frequent site-specific malignancy seen at both RICK (20%, *i.e.* 2,084/10,410 recorded cancer patients during the period 1967 - 1984) and NCI-UG (19%, *i.e.* 1,009/5,236 recorded cancer patients during the period 1999 - 2008) [14-22]. Similar frequencies were observed across different studies during the period 1935 - 2006 (16%, 4,005/25,064) as reviewed by Awadelkarim *et al.* (2010) [23]. This may partly reflect awareness bias, as breast masses or ulcerated lesions are readily evident to the patients themselves, as well as hospitalization bias, given the presence of radiotherapy facilities at RICK and NCI-UG [23].

According to data from Sudanese Federal Ministry of Health, 78% of Sudanese breast cancer patients have stage III or stage IV at disease presentation, indicating that most patients remain undiagnosed for long periods [17, 21]. In these late stages treatment often involves multiple modalities, including surgery, radiotherapy, chemotherapy and hormone therapy, but has very low chances of success [24, 25].

Published data on male breast cancer from Sudan is lacking. The current study was thought to investigate the current status of MBC in Sudan by focusing on individual and clinical/pathological characteristics, treatment and follow-up, and treatment outcome parameters of MBC patients attending NCI-UG in the period from April 1999 through December 2010.

Patients and Methods

Medical records of all cancer patients treated at the Department of Oncology, National cancer Institute (NCI-UG), Gezira University, Wad Medani, Gezira State, Sudan, in the period from April 1999 through December 2010, were reviewed with regard to male breast cancer (MBC). Variables assessed were individual and clinical/pathological characteristics, treatment and follow-up, and treatment outcome parameters.

Statistical analysis

The frequencies of various variables were calculated. Survival distribution was estimated by Kaplan Meier method. Disease free survival was determined as interval between diagnosis and detection of first relapse (local and/or regional recurrences, and/or metastases). Statistical analyses were done using SPSS software (SPSS for Windows version 17.0, Release. August 23, 2008. Chicago, IL). Patients with follow-up data less than one month (range: 2 – 7 days) were excluded from survival analyses.

Results

There were 1,505 (19.2%, 1,505/7,836) Sudanese breast cancer patients treated at the NCI-UG from April 1999 through December 2010. The MBC frequency was 2.3% (34/1,505); all were included in the current study.

Individual characteristics

The mean age at MBC diagnosis was 56.5 ± 15.8 years (age range: 22 - 85 years). Most MBC patients were farmers (47.1%) and manual labors (35.3%). The mean body mass index (BMI) was 23 ± 4.5 (range: 17.4 - 36.2). MBC patients at the NCI-UG derived from 20 Sudanese tribes, including Kawahla (9 patients, 26.5%), Ja-alia (3 patients, 8.8%), Kinana (2 patients, 5.9%), Hawsa (2 patients, 5.9%), Rikabia (2 patients, 5.9%), Tama (2 patients, 5.9%) and other 14 tribes with one (2.9%) patient each. Most studied MBC patients were married (91.2%, 31/34). Eleven MBC patients (32.2%) were reported to be alcoholic consumers, one of them consume alcohol for more than 40 years. Only one (2.9%) patient reported to have family history of breast cancer. However, in different study another MBC patient was positive for *BRCA2* mutation status (*i.e.* novel *BRCA2* c.6406_6407delTT) [15]. Of note, none of the MBC patients reported any past individual history of previous malignancy. Tobacco smoking and/or dipping (tombak) was reported by 14/34 (41.1%), one of them was tobacco dipper (tombak) for 40 years and another was smoker for 5 years, whereas, tobacco smoking and/or dipping periods were not available for the rest.

Disease presentation and complain

The mean period between complain awareness and MBC diagnosis was 25.3 ± 46 months (median, 8 months; range: 1 - 240 months). Most patients presented with large breast lump (mean lump size, 6.8 ± 3.0 cm; range: 2 - 12 cm). Breast lump was the presenting symptom in 21 patients (61.8%). Breast lump and ulceration were seen in 8 patients (23.6%). Other 3 (8.8%) patients presented with symptoms indicating metastatic disease and one (2.9%) was a recurrence (initial complain was not available). Disease presentation data was not available for one patient (2.9%). The disease was affecting the left breast in 19/34 (55.9%) and only one (2.9%) patient was presented with bilateral disease. Two (5.2%) MBC patients reported past history of trauma. Nipple discharge was reported in 7/34 (20.6%) patients and nipple retraction in one (2.9%) patient.

Pathological characteristics

Infiltrative ductal carcinoma was histologically confirmed in 21 patients (61.8%), ductal carcinoma *in situ* (DCIS) in one patient (2.9%), rhabdomyosarcoma in one (2.9%) patient, unknown histopathology for 11 patients (32.4%), 9 (26.5%) of them had only cytology confirmation of malignancy, and one (2.9%) was suspicious of malignancy. Histological variants such as papillary, apocrine or other variants have not been reported in the current MBC series. The status of axillary lymph nodes was known for 12 patients (35.3%), of them 6 (17.6%, 6/34) patients had a total number of involved lymph nodes ranged from 1 to 11, which were detailed as follows: 4 (11.8%) were detected with only one axillary lymph node; 1 (2.9%) with two axillary lymph nodes and 1 (2.9%) with eleven axillary lymph nodes. Negative lymph node status was documented for 6 (17.6%, 6/34) patients. Tumor grade 1 was detected in 2 patients (5.9%), grade 2 in 6 patients (17.6%), grade 3 in 11 patients (32.4%), and the rest had unknown grade. ER/PR status was available only for 6 patients, 4 of them were positive and 2 were negative.

Clinical characteristics and treatment outcome

Stage I was documented in 1 (2.9%) patient, stage II in 6 (17.6%) patients, stage III in 12 (35.3%) patients, stage IV in 9 (26.5%) patients and 5 (14.7%) patients were with unknown stage. Mastectomy and axillary clearance was performed for 11 (32.4%) patients, mastectomy without axillary clearance for 7 (20.6%) patients, lumpectomy only for 3 patients (8.8%), lumpectomy and axillary clearance in one (2.9%) patient, 5 (14.7%) patients underwent no surgery, and data for 7 (20.6%) patients was not available. Neoadjuvant chemotherapy was given to 10 (29.4%) patients, adjuvant chemotherapy to 17 (50%) patients, and primary chemotherapy in 4 (11.8%) patients. The rest receive no chemotherapy. Radiotherapy was given to 26 (76.5%) patients; only 2 (5.9%) patients receive no radiotherapy, while the status of radiation therapy of 6 (17.6%) patients was unknown. Most MBC patients (70.6%, 24/34) receive tamoxifen, 5 (14.7%) patients receive no hormonal therapy; and the status of hormonal therapy of 5 (14.7%) patients was unknown. The mean follow-up period of the studied MBC patients was 45.4 ± 41 months (range: 1 – 138 months). Of these, 17 patients (50%) were lost during follow-up (mean follow-up period 26 ± 38 months, range: 1 – 138 months), 4/34 (11.8%) of them were attended the NCI-UG clinic for days (range: 2 – 7 days) and subsequently were excluded from survival analysis. Almost all patients lost during follow-up were presented with late stage (stage IV, 7/34 patients, 20.6%; stage III, 9/34 patients, 26.5%; unknown stage, 1 patient, 2.9%).

During follow-up period 9 patients were confirmed to be dead (52.9%, 9/17 of the subset with complete follow-up data; 26.5%, 9/34 of the total studied MBC patients), 8 patients were alive (47.1%, 8/17 of the subset with complete follow-up data; 23.5%, 9/34 of the total studied MBC patients). Although the analyzed data preclude proper estimation of the overall survival due to its obvious limitations, the median overall survival period was 87 months (95% confidence interval, 55.7 – 118.3; standard error of median, 16), and the mean overall survival was estimated to 95.3 months (95% confidence interval, 75.4 – 115.3; standard error of median, 10.2) (Figure 1). The overall survival was 47.1% (8/17). One-year overall survival was estimated to be 95.2% (standard error, 4.6%), and the five-year overall survival was 72.7% (standard error, 12%). Patients with regular follow-up data that were included in analysis of disease free survival were 61.8% (21/34). The mean follow-up period of this subset of MBC patients was 52.1 ± 37.6 months (range: 4 – 138 months; median, 44

months). Replace rate was 71.4% (15/21), of these only 14.3% (3/21) were local recurrences, whereas 51.1% (12/21) were metastases either to axillary lymph nodes (19%, 4/21), supraclavicular lymph nodes (4.8%, 1/21), both axillary and supraclavicular lymph nodes (4.8%, 1/21) or distant metastasis (33.3%, 7/21) to other organs including liver, lung and bone. In this subset of MBC patients the median disease free survival period was 20 months (95% confidence interval, 3.9 – 36.1; standard error of median, 8.2), and the mean disease free survival was estimated to 34.1 months (95% confidence interval, 19.6 – 48.6; standard error of median, 7.4) (Figure 2). 0ne-year disease free survival was estimated to be 58% (standard error, 11.3%) and the five-year disease free survival was estimated to be 21.1% (standard error, 10.2%).

Discussion

In general, data regarding cancer in Sudan is lacking [23]. Although there were few published studies on breast cancer, none of them were specifically designed to investigate the status of MBC [23]. We reviewed data of cancer patients at the NCI-UG for the last ten years focusing on individual and clinical/pathological characteristics, treatment and follow-up, and treatment outcome parameters of MBC. Gezira region is the main drainage area for the NCI-UG. Gezira region (Gezira State) population is about four millions, which constitutes about 12% of the total Sudanese population [26].

First of all, data insufficiency had been noted, since many important parameters were not available for evaluation. Similar situation had been documented for Sudan and also for other African countries due to the well-known healthcare crisis [23, 27-29]. Nonetheless, the reported frequency of MBC in the current study (2.3%) is in range to that reported previously for patients either African or of African origin but is higher than the frequencies reported in Western countries [1-7, 15].

The mean age of the studied MBC case series was a little younger than the mean age of MBC patients in the developed countries in which MBC is continuously associated with old age (range between 60 – 70 years, peak at 71 years) [2, 4, 8]. This could be due to shorter life expectancy for males in Sudan [23], but other discriminating factors could not be ruled out.

The finding that the majority of patients treated at the NCI-UG were farmers was expected due to the fact that Gezira region is an agriculture area and most of Gezira population work as farmers or its related professions.

Hereditary factors seems to play a role as relevant risk factor for MBC in Sudan, since one patients was positive for *BRCA2* mutation status (*i.e.* novel *BRCA2* c.6406_6407delTT) as reported previously [15], and another patient has a family history of breast cancer while a third one had bilateral breast disease. No other obvious risk factor could be linked directly to the causation of MBC in the current study. Alcohol consumption (32.2%) and tobacco smoking and/or dipping (tombak) (41.1%), maybe implicated in the disease. However, this need more detailed prospective epidemiological studies tailored to assess the association between alcohol consumption and tobacco smoking and/or dipping (tombak) and MBC in Sudan.

The prolonged period between appearance of first symptoms and first consultation (the mean was exceeding two years) was expected due to the well-known African healthcare crisis where routine health check is not practiced and usually patients seek medical care in the events of pain or severe illness that prevent them from practicing their activities [17, 23, 30]. Furthermore, the African healthcare crisis is evident by the fact that most patients in the current study presented with advanced or metastatic disease (stages III/IV; 21/34, 61.8%) as their female counterpart from Sudan [17, 23].

This complex situation could be explained by lack of awareness about the disease, scarcity of health facilities, the widespread of poverty and other traditional medicines and believes [14, 17, 23, 31]. In our view, a combination of all these factors could play prominent role in explaining this deterioration.

Infiltrative ductal carcinoma was the main histpathological pattern among the study group as reported elsewhere [32-34]. Most studied MBC tumors were either of high grade (grade 3) or intermediate grade (grade 2), while low grade (grade 1) tumors were almost lacking. Similar finding were previously reported for Sudanese females with breast cancer [14]. However, since the pathobiological pathways leading to high- and low-grade breast cancer may differ [35], this might suggest that more detailed studies should be conducted before definitive conclusions could be made [35]. Cytological examination was the only mode of diagnosis in 9 patients, while two patients had no any confirmed pathological test. This could partly reflect that fine needle aspiration cytology (FNAC) is considered a way for pathological confirmation of breast cancer in Gezira region and Sudan, maybe due to its easiness and quickness. But may also indicate that the provided pathology services in Sudan have some limitations due to subjective and objective issues as reviewed by Awadelarim *et al.* [36]. Based on this fact, hormone receptor status was not available for the majority of the studied MBC patients, but when available it tend to be positive (4/6, 66.7%) as documented for MBC patients elsewhere [3, 33, 37, 38].

Eighteen patients underwent mastectomy, only eleven patients underwent also axillary clearance. The practice of not including axillary clearance in the management of breast cancer in females is usually encountered in other African countries [5, 39, 40]. Contrary to what had been documented in the developed world where surgery is usually mastectomy with axillary clearance or sentinel node biopsy [3, 8]. This may be explained by the fact that there are no guidelines to direct the management of breast cancer in many local African contexts [31, 41-43], but generally there is worldwide lack of specific management guidelines for MBC [11, 44].

Chemotherapy administration as adjuvant, neoadjuvant or as primary therapy has been well practiced in management of this group of patients as well as using radiotherapy or tamoxifen. Apparently the existence of the oncology centre (NCI-UG) in this region has facilitated the application of these important treatment modalities [14, 17, 23].

Assessment of management outcome in this group of patients turned to be a difficult task due to unavailability of complete disease status for 17 patients who disappeared from follow-up clinic, while all attempts (mainly with phone calls) to recover their related follow-up information were unsuccessful, as elsewhere in Africa [31].

Surprisingly, despite to the well-known African healthcare crisis, the overall survival parameters reported in the current study are high, which were similar to those reported in developed counties [44]. Contrary, to the estimated disease free survival parameters for the 21 patients who attended the follow-up regularly were considerably shorter when compared to MBC patients from other countries [13, 32, 34, 45-50].

This dilemma of high overall survival and shorter disease free survival could be an artifact due to the previously described limitations of the analyzed data, which may increase the overall survival when censoring patients who were lost during follow up, when those patients are more likely be dead due to their late stage at disease diagnosis (stages III - IV, 16/17 patients). However, this data also might suggest that MBC in Sudanese is not an aggressive disease, which needs to be investigated more.

Conclusion

In conclusion the analyzed data suggested that the hereditary factor(s) seem to play a relevant role in the causation of MBC in Sudan. Although the existence of NCI-UG has facilitated the treatment modalities of MBC, but the general impact of the healthcare crisis in Sudan is evident by the advanced stage at disease presentation and the very short disease free survival, which need more coordinated efforts in different but complimentary fields. Moreover, the highlighted MBC situation in Sudan may be a reflection of other relevant African contexts.

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Conflict of interest

The authors declare no conflict of interest

Figures

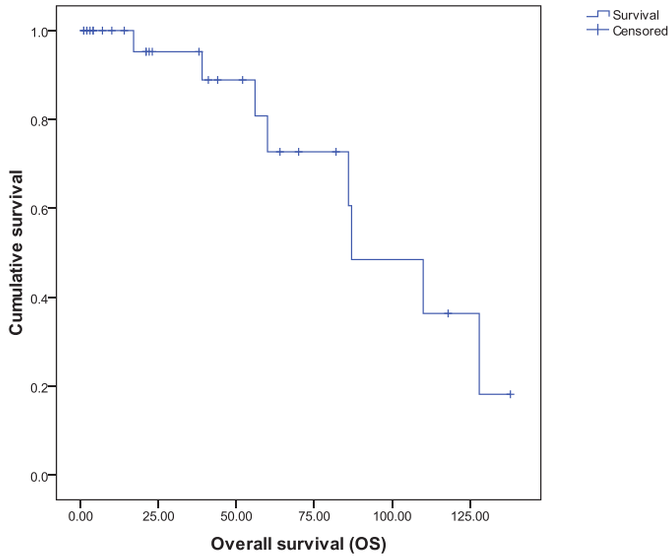

Fig 1: Overall survival of the studied MBC patients attending NCI-UG in the period from April 1999 through December 2010

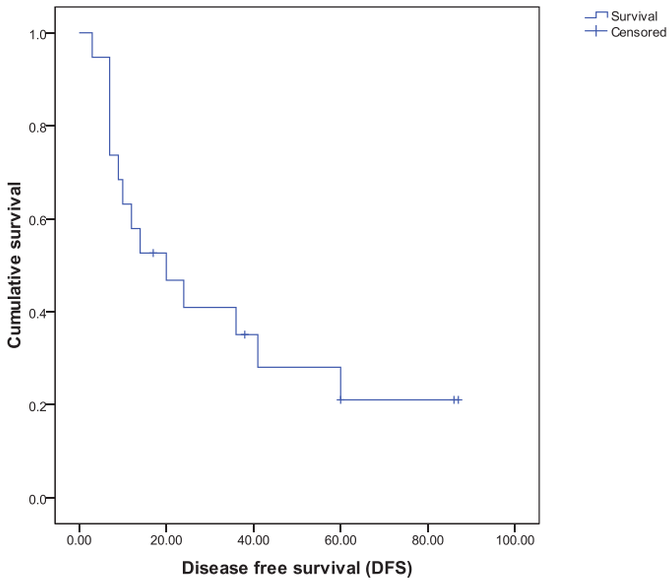

Fig 2: Disease free survival of the studied MBC patients attending NCI-UG in the period from April 1999 through December 2010

References

1. Comet B, Cutuli B, Penault-Llorca F, Bonneterre J, Belkacemi Y. [Male breast cancer: a review]. Bull Cancer 2009;96:181-9.
2. Agrawal A, Ayantunde AA, Rampaul R, Robertson JF. Male breast cancer: a review of clinical management. Breast Cancer Res Treat 2007;103:11-21.
3. Gomez-Raposo C, Zambrana Tevar F, Sereno Moyano M, Lopez Gomez M, Casado E. Male breast cancer. Cancer Treat Rev 2010;36:451-7.
4. Sasco AJ, Lowenfels AB, Pasker-de Jong P. Review article: epidemiology of male breast cancer. A meta-analysis of published case-control studies and discussion of selected aetiological factors. Int J Cancer 1993;53:538-49.
5. Rachid S, Yacouba H, Hassane N. Male breast cancer: 22 case reports at the National Hospital of Niamey-Niger (West Africa). Pan Afr Med J 2009;3:15.
6. O'Malley C, Shema S, White E, Glaser S. Incidence of male breast cancer in california, 1988-2000: racial/ethnic variation in 1759 men. Breast Cancer Res Treat 2005;93:145-50.
7. Ravandi-Kashani F, Hayes TG. Male breast cancer: a review of the literature. Eur J Cancer 1998;34:1341-7.
8. Fentiman IS, Fourquet A, Hortobagyi GN. Male breast cancer. Lancet 2006;367:595-604.
9. Thalib L, Hall P. Survival of male breast cancer patients: population-based cohort study. Cancer Sci 2009;100:292-5.
10. Barh D. Biomarkers, critical disease pathways, drug targets, and alternative medicine in male breast cancer. Curr Drug Targets 2009;10:1-8.
11. Korde LA, Zujewski JA, Kamin L, Giordano S, Domchek S, Anderson WF, Bartlett JM, Gelmon K, Nahleh Z, Bergh J, Cutuli B, Pruneri G, et al. Multidisciplinary meeting on male breast cancer: summary and research recommendations. J Clin Oncol 2010;28:2114-22.
12. Rudlowski C. Male Breast Cancer. Breast Care (Basel) 2008;3:183-9.
13. Foerster R, Foerster FG, Wulff V, Schubotz B, Baaske D, Wolfgarten M, Kuhn WC, Rudlowski C. Matched-pair analysis of patients with female and

male breast cancer: a comparative analysis. BMC Cancer 2011;11:335.
14. Awadelkarim KD, Arizzi C, Elamin EO, Hamad HM, De Blasio P, Mekki SO, Osman I, Biunno I, Elwali NE, Mariani-Costantini R, Barberis MC. Pathological, clinical and prognostic characteristics of breast cancer in Central Sudan versus Northern Italy: implications for breast cancer in Africa. Histopathology 2008;52:445-56.
15. Awadelkarim KD, Aceto G, Veschi S, Elhaj A, Morgano A, Mohamedani AA, Eltayeb EA, Abuidris D, Di Gioacchino M, Battista P, Verginelli F, Cama A, et al. BRCA1 and BRCA2 status in a Central Sudanese series of breast cancer patients: interactions with genetic, ethnic and reproductive factors. Breast Cancer Res Treat 2007;102:189-99.
16. Parkin DM, Bray F, Ferlay J, Pisani P. Global cancer statistics, 2002. CA Cancer J Clin 2005;55:74-108.
17. Hamad HM. Cancer initiatives in Sudan. Ann Oncol 2006;17 Suppl 8:viii32-viii6.
18. INMO Annual Report, INMO Annual Report. Information and Research Center, Statistic Unit, Department of Oncology, Institute of Nuclear Medicine Molecular Biology & Oncology (INMO), Wad Medani, Sudan, 2006.
19. INMO Annual Report, INMO Annual Report. Information and Research Center, Statistic Unit, Department of Oncology, Institute of Nuclear Medicine Molecular Biology & Oncology (INMO), Wad Medani, Sudan, 2001.
20. Ferlay J, Bray F, Pisani P, Parkin DM, GLOBOCAN 2002: Cancer Incidence, Mortality and Prevalence Worldwide. IARC Press, 2004.
21. Ahmed HG, Ali AS, Almobarak A. Frequency of breast cancer among sudanese patients with breast palpable lumps. Indian Journal of Cancer 2010;47:23-6.
22. Hidayatalla A, Rahman EA. The Radiation and Isotope Centre, Khartoum, 1967-1984. In: Parkin DM. Cancer Occurrence in Developing Countries ed. Lyon: IARC, 1986:82-7.
23. Awadelkarim KD, Mariani-Costantini R, Elwali NE. Cancer in the Sudan: An overview of the current status of knowledge on tumor patterns and risk factors. Sci Total Environ 2010;(DOI: 10.1016/j.scitotenv.2010.09.010).
24. Greenberg PA, Hortobagyi GN, Smith TL, Ziegler LD, Frye DK, Buzdar AU. Long-term follow-up of patients with complete remission following combination chemotherapy for metastatic breast cancer. J Clin Oncol 1996;14:2197-205.
25. Honig SF. Hormonal therapy and chemotherapy. In: Harris JR, Morrow, M., Lippman, M. E., Hellman, S. Diseases of the Breast.ed. Philadelphia, Pa: Lippincott-Raven Publishers, 1996:669-734.
26. 5th Population and Housing Census -2008 Priority Results. Central Bureau of Statistics (CBS), 2008.
27. Malik MO, Zaki El Din Z, Elmasri SH. Cancer of the alimentary tract in the Sudan: a study of 546 cases. Cancer 1976;37:2533-42.
28. Dafallah SE, Yousif E, Idris AA. Analysis of documents used in referral system in Wad Medani, Sudan. Saudi Med J 2005;1:148-50.
29. Parkin DM, Ferlay J, Hamdi-Cherif M, Sistas F, Thomas J, Wabinga H, Whelan SL. Cancer in Africa: Epidemiology and preventioned. Lyon: IARC Press, 2003.
30. Oguntola AS, Aderonmu AO, Adeoti ML, Olatoke SA, Akanbi O, Agodirin SO. Male breast cancer in LAUTECH Teaching Hospital Osogbo, South Western Nigeria. Niger Postgrad Med J 2009;16:166-70.
31. Gondos A, Brenner H, Wabinga H, Parkin DM. Cancer survival in Kampala, Uganda. Br J Cancer 2005;92:1808-12.
32. Yoney A, Kucuk A, Unsal M. Male breast cancer: a retrospective analysis. Cancer Radiother 2009;13:103-7.
33. El-Habbash MM, Alwindi AA. Male breast cancer in Tripoli, Libya. Saudi Med J 2009;30:1060-2.
34. Yoney A, Kucuk A, Alan O, Unsal M. A retrospective study of treatment and outcome in 39 cases of male breast cancer. Hematol Oncol Stem Cell Ther 2008;1:98-105.
35. Menard S, Casalini P, Tomasic G, Pilotti S, Cascinelli N, Bufalino R, Perrone F, Longhi C, Rilke F, Colnaghi MI. Pathobiologic identification of two distinct breast carcinoma subsets with diverging clinical behaviors. Breast Cancer Res Treat 1999;55:169-77.
36. Awadelkarim KD, Mohamedani AA, Barberis M. Role of pathology in sub-Saharan Africa: An example from Sudan. Pathology and Laboratory Medicine International 2010;2:49–57.
37. Tunon de Lara C, Goudy G, Macgrogan G, Durand M, Dilhuydy JM, Avril A, Stoeckle E, Bussieres JE, Debled M, de Mascarel I, Mauriac L. [Male breast cancer: a review of 52 cases collected at the Institute Bergonie (Bordeaux, France) from 1980 to 2004]. Gynecol Obstet Fertil 2008;36:386-94.
38. Lanitis S, Rice AJ, Vaughan A, Cathcart P, Filippakis G, Al Mufti R, Hadjiminas DJ. Diagnosis and management of male breast cancer. World J Surg 2008;32:2471-6.
39. Hassan I, Mabogunje O. Cancer of the male breast in Zaria, Nigeria. East Afr Med J 1995;72:457-8.
40. Olu-Eddo AN, Momoh MI. Clinicopathological study of male breast cancer in Nigerians and a review of the literature. Nig Q J Hosp Med 2010;20:121-4.
41. Alsheikh AA, Mohammed AA, Eltayeb EA, Ali MEA, Abuidris DO, Musa HA, Idris M, Gezira Guidelines for Management of Breast Cancer. Institute of Nuclear Medicine, Molecular Biology & Oncology "Now, the National Cancer Institute (NC-UG)", University of Gezira, Wad Medani, Sudan, 2006.
42. Breast cancer guidelines for Uganda. Afr Health Sci 2003;3:47-50.
43. Abulkhair O, Saghir N, Sedky L, Saadedin A, Elzahwary H, Siddiqui N, Al Saleh M, Geara F, Birido N, Al-Eissa N, Sukhun SA, Abdulkareem H, et al. Modification and implementation of NCCN guidelines on breast cancer in the Middle East and North Africa region. J Natl Compr Canc Netw 2011;8 Suppl 3:S8-S15.
44. Kiluk JV, Lee MC, Park CK, Meade T, Minton S, Harris E, Kim J, Laronga C. Male Breast Cancer: Management and Follow-up Recommendations. Breast J 2011;17:503-9.
45. Ngoo KS, Rohaizak M, Naqiyah I, Shahrun Niza AS. Male breast cancer: experience from a Malaysian tertiary centre. Singapore Med J 2009;50:519-21.
46. Benchellal Z, Wagner A, Harchaoui Y, Huten N, Body G. [Male breast cancer: 19 case reports]. Ann Chir 2002;127:619-23.
47. Stranzl H, Mayer R, Quehenberger F, Prettenhofer U, Willfurth P, Stoger H, Hackl A. Adjuvant radiotherapy in male breast cancer. Radiother Oncol 1999;53:29-35.
48. Yu E, Suzuki H, Younus J, Elfiki T, Stitt L, Yau G, Vujovic O, Perera F, Lock M, Tai P. The Impact of Post-Mastectomy Radiation Therapy on Male Breast Cancer Patients-A Case Series. Int J Radiat Oncol Biol Phys 2011.
49. Fogh S, Hirsch AE, Langmead JP, Goldberg SI, Rosenberg CL, Taghian AG, Powell SN, Kachnic LA. Use of tamoxifen with postsurgical irradiation may improve survival in estrogen and progesterone receptor-positive male breast cancer. Clin Breast Cancer 2011;11:39-45.
50. Arslan UY, Oksuzoglu B, Ozdemir N, Aksoy S, Alkis N, Gok A, Kaplan MA, Gumus M, Berk V, Uncu D, Baykara M, Colak D, et al. Outcome of non-metastatic male breast cancer: 118 patients. Med Oncol 2011.