



SYSTEMATIC REVIEW

Breast Cancer in Men: A Systematic Review of the Literature from the Arab World

Pierre El Sett* , Georges Jammal, Antoine El Sett, Ronaldo Elkaddoum, Hampig Raphael Kourie



Department of Hematology-Oncology, Hotel Dieu De France Hospital, Saint Joseph University of Beirut, Lebanon

*Corresponding author: Department of Hematology-Oncology, Hotel Dieu De France Hospital, Saint Joseph University of Beirut, Lebanon Riad El Solh, 11-5076, Lebanon, ORCID ID : <https://orcid.org/0000-0001-7525-9234>

Abstract

Introduction: Breast Cancer (BC) is the most frequent cancer worldwide accounting for 11.7% of all cancers but only for 1% of men's cancers; therefore, men's breast cancer is rarely discussed, especially in the Arab World. This review, the first of its kind in the region, aims at reporting current trends in the epidemiology of BC in men, based on studies from the Arab region.

Material and methods: An electronic search of the MEDLINE-PubMed database was conducted until February 2022. Original articles on the epidemiological characteristics and outcomes of men's BC were found and only 25 met the selection criteria.

Results: Male BC varies in the Arab world from less than 1% in some countries, to 4% in others. The mean age at diagnosis is 59.4 years and the majority of the tumors were located in the left breast (57%). The most common type of BC was the invasive ductal carcinoma (89%) associated in 61% of the cases with lymph nodes involvement. Furthermore, the estrogen receptor (ER) positivity was seen in 81% of cases and the Progesterone Receptor (PR) positivity in 71%.

Discussion: The prevalence of BC varies in the Arab world from less than 1% in some countries, similar to western countries, to 4% in others. Genetic mutations such as the BRCA 2 mutation were rarely studied or mentioned. Moreover, the treatment-predicting hormonal receptors such as ER and PR are routinely tested in Arab countries while the Her2NEU receptor is frequently neglected depriving many cancer patients from targeted therapies.

Keywords

Breast cancer; Arab World; Men cancers

Introduction

Breast Cancer (BC) is the most frequent cancer worldwide with over 2.3 million new cases, accounting for 11.7% of all cancers incidences in 2020 [1]. In terms of mortality, BC ranks fifth with one BC death among every six cancer deaths [1]. Most of the time, this malignancy grows from the epithelial cells in the milk-producing glands and breaches the basal membrane to form an invasive carcinoma with a high risk of metastasis [2]. Worldwide, approximately one in eight women will develop BC during their life [3,4], in contrast with men where the probability falls to only one in one thousand [3].

There are multiple risk factors incriminated in the pathogenesis of BC. The first category includes genetic risk factors, with *BRCA1* and *2* mutations being the most frequent genetic alterations causing BC [5,6]. In male carriers, the risk at 70 years of developing BC is 1.2% and 6.8% respectively for *BRCA1* and *2* [7]. The risk raises to 8.4% for over 80 years old male *BRCA2* carriers [8]. In addition, environmental factors that elevate Estrogen to Androgen ratio are also believed to play a role in the tumor genesis of male BC [9].

While the proportion of BC among other cancers varies in different populations, it is estimated that 13 to 35% of women's cancers in the Arab World are BC [10]. The Arab World consists of 22 countries that adhere to the Arab League with a total population of 450 million citizens. Egypt, Sudan and Algeria are the most inhabited

Arab countries with respectively 106, 46 and 45 million inhabitants [11].

Moreover, diagnosing BC at an early stage is linked to better oncological outcomes [12]. In order to fight the most frequent cancer in the region, some Arab countries have set guidelines for systematic screening of BC in women. Although, in line with worldwide recommendations, these guidelines have been adapted to BC in the Arab World, like in Lebanon where mammography screening starts at 40 for women at average risk [13], which, in other terms, is ten years earlier than European recommendations [14]. For a maximum compliance to screening efforts, large-scale awareness campaigns on female BC were organized. However, since men with BC accounts for less than 1 % of all patients with BC [15], it has received, so far, little importance in awareness campaigns and medical literature.

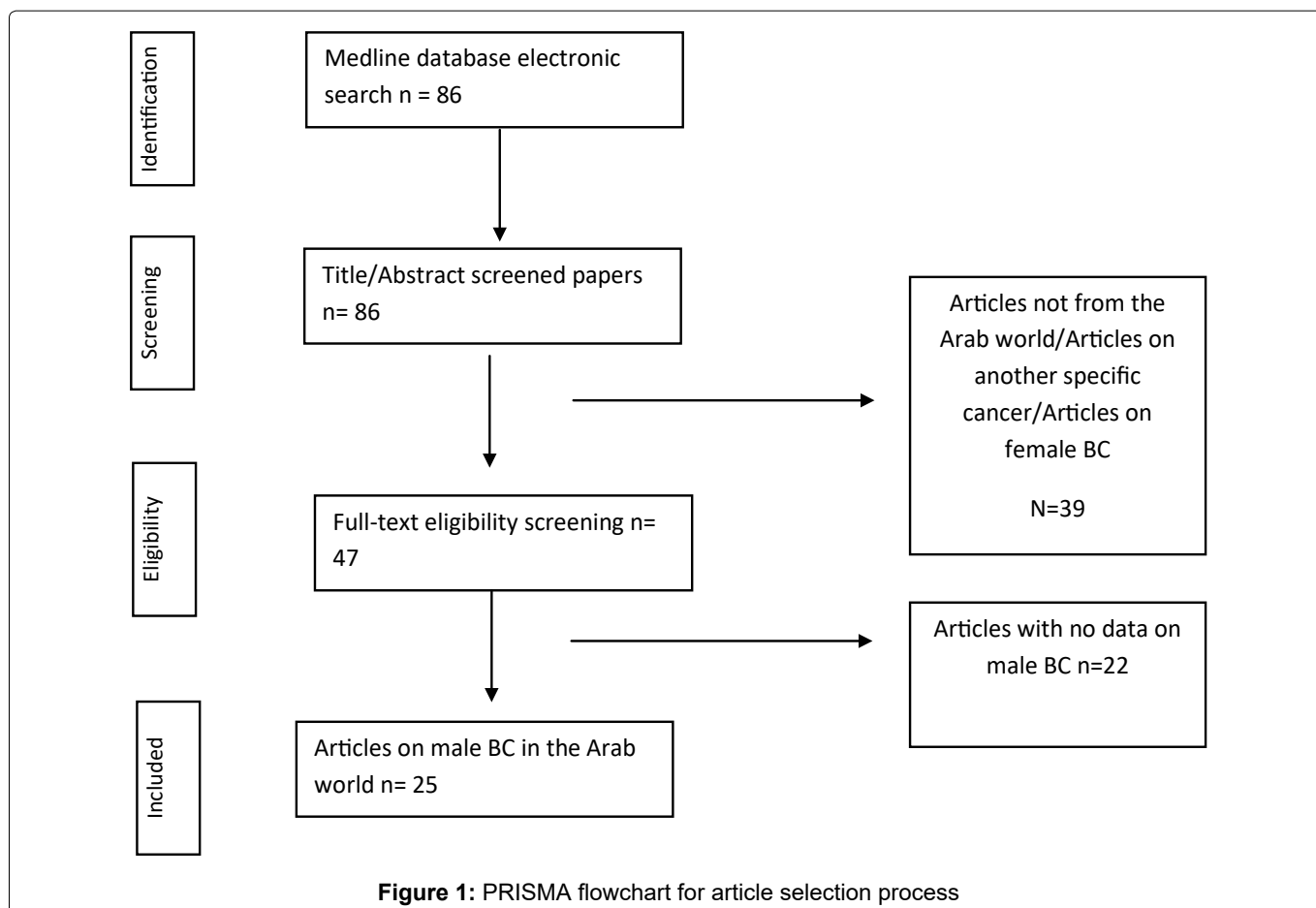
This review, the first of its kind in the Arab World, aims to regroup current data on BC in men in terms of proportion among other cancers, molecular and genetic testing, treatments, and survival rates. These figures are compared with international findings on the subject.

Materials and Methods

In order to extract a maximum of data on BC in men (tumor characteristics, genetics, treatments and outcomes in the Arab World), an extensive electronic search of the PubMed-Medline database until the

13th of February 2022, was conducted. Using Boolean operators, the following keywords in titles and abstracts were searched for: 'Male' and 'Men' excluding 'Female' and 'Women', in combination with 'Breast', 'Cancer', and 'Lebanon', 'Tunisia', 'Algeria', 'Egypt', 'Libya', 'Saudi Arabia', 'Bahrain', 'Kuwait', 'Syria', 'Somalia', 'Djibouti', 'Comoros', 'Oman', 'Emirates', 'Palestine', 'Jordan', 'Qatar', 'Morocco', 'Iraq', 'Mauritania', 'Sudan', 'Yemen', 'East Mediterranean', 'Middle East and North Africa', or 'Arab'. The MeSH terms used were the following: Breast Neoplasms, Male.

In parallel, a search of the Cochrane Library was done, using the MeSH terms "Breast Neoplasms, Male". The search retrieved 59 results, and none of them contained data relevant to the subject of this paper. In the PubMed-Medline database, a total of 86 studies were retrieved. We screened them, aiming to include original articles (both retrospective and prospective studies as well as case and series reports) from the Arab World, in English or French, that contain data on BC in men. Therefore, articles on other men cancers, solely BC in women or articles from countries other than the aforementioned were excluded. At the end, data has been extracted from only 25 articles. Figure 1 is the PRISMA flowchart that recapitulates the process. Furthermore, data was collected from the Lebanese National Cancer Registry (LNCR) from 2005 until 2016. The LNCR is a virtual location with counts of cancers reported by physicians or histopathological



laboratories on the Lebanese territory [16]. Case count of BC in men and women was grouped in a table, and then the proportion of men's BC among all BC has been calculated alongside the proportion of BC in men among other cancers in men.

Results

Overall, only 25 articles in the Arab countries included epidemiological characteristics of BC in men. The country with most articles on the subject was Morocco with 8 publications including a comparative study between Moroccan and Egyptian men's BC.

Starting with Egypt, four studies go in depth in men's BC. In the first one, a 1963 study, El-Ghazayerli et al [17] reported 14 cases of BC in men, counting for 6.3 % of BC at the institute. The average age at diagnosis was 41 years and 7 out of 8 tested patients were affected by Bilharziasis. Half a century later, El-Beshbeshi et al, reported 37 cases, accounting for 0.8 % of all BC cases. The mean OS was 49.9 months with a 5-years OS of 60.5 %. This rate was not significantly correlated to any of the tumor characteristics, however the authors report that the disease-free survival (DFS) of 52.6 % at 5 years, was influenced by T stage ($p=0.05$), lymph nodes ($p=0.043$), metastasis at presentation ($p=0.004$) and chemotherapy administration ($p=0.046$). In the 2014 retrospective study by Soliman et al, the average age at diagnosis is 58 with lymph node involvement in 56 cases (81.2%), 29 hormonal receptor positive tumors (42%) and a 5 years-OS of 46.4 % [18]. In the last retrieved Egyptian study, Gilbert et al sequenced the polyglutamine tract in 44 men with BC and 43 controls, emitting the hypothesis that very short sequences of this region of the androgen receptor, absent in cases, can have a protective role against male BC [19].

However, in a comparative study of Male BC between Egypt and Morocco [20], Gilbert et al found that Egyptian men have a younger mean age at diagnosis of 57.5 years, whereas the mean age at diagnosis of Moroccan men was 63.9 years ($p=0.0002$). Another highlight lays in the underlying liver damages that were noticed in 28 % of Egyptian patients vs only 0.8 % in the Moroccan patients ($p<0.0001$).

Jumping to Morocco, a 2002 study by Hali et al [21] reported that the mean age of diagnosis is 60 years with a delay of 18 months before diagnosis; Seven metastatic BC were documented (5 pulmonary, 1 vertebral and 1 hepatic). In addition, El Omari-Alaoui presented 71 cases with a mean age at diagnosis of 60 years; diagnosis was delayed in average 35 months. Although only 5 were tested for hormonal receptors, 53 patients benefited from a hormonal therapy. 24% of the cases had a metastasis with a median delay of 1 year. Moreover, out of 21 patients by Sellal et al [22], 12 patients had T2 tumors, no patient was metastatic at the time of diagnosis, 17 tumors were positive for

Estrogen Receptors (ER), 17 tumors were positive for Progesterone Receptors (PR) and one was negative for both. 15 (71 %) underwent a mastectomy, 17 (80%) received radiation and 8 (38%) benefited from an endocrine therapy. In a more recent study Hali et al [23], discussed again their dermatological findings in Male BC patients. The most frequent skin symptom reported was ulcerated vegetating lesions in 12 cases. One of the largest single-center Male BC in the Arab world studies by Bourhafour et al described the tumor characteristics of 127 patients [24]; Median age at diagnosis was 62 years with a median delay of 28 months till diagnosis. Half of the patients were diagnosed at stage III and 37 had metastasis at diagnosis. 57 patients received hormonal therapy and 105 were operated. At the end, the authors reported 63 % 5-years OS and 55 % 10-years OS. Another series of 40 patients reported by ElBachiri et al [25] showed that 29 out of 40 patients had T3 or T4 tumors, 75 % had lymph nodes involvement and 15 out of 40 had a metastatic malignancy at the time of diagnosis. In terms of hormonal receptor positivity, 26 patients had positive tumors for either ER or PR and 7 had positive HER2 receptors. At the end, the 5 years-OS was 62 % and 10-years OS 51 % ($p<0.05$). Finally, Laabadi et al reported a series of 6 patients with a mean age of 65.3 years. In this series, the hormonal study retrieved positive receptors to Estrogen in 6 cases and to Progesterone in 5 cases [26].

The only retrieved series documenting Male BC in Tunisia was published in 2003 [27]. In this paper, Beyrouti et al discuss findings from 23 patients with a mean age at diagnosis of 68 years and the majority at an advanced stage.

Moving to Kuwait, a paper published by Temmim et al in 2001 [28] reports 41 cases with a mean age at diagnosis of 55 years and more than half the tumors in the left breast. Invasive ductal carcinoma is the most frequent type with 37 cases and the majorities were lymph node positive. The reported 5 years overall survival is 67 %, which is affected by advanced age at diagnosis, bigger tumor size, more advanced stages, distant metastasis, a higher grade and lymph node involvement, the latter two being independent factors for relapse free survival with respective p-values of 0.01 and 0.045.

In Lebanon, a study of 47 patients by Tawil et al showed a median age at diagnosis of 62 years, a median tumor size of 2.2 cm, a higher age at diagnosis compared to Female BC, a lower HER2+ rate and a rate of 6.4 % of lobular pleomorphic carcinoma [29].

Furthermore, data collected from the LNCR showed an increase in the number of cases reported over the years in both men and women. The highest reported proportion of men's BC among all BC (3.52 %) and of men's BC among all men's cancers (1.67 %) was in 2011 (Table 2).

Table 2: BC in men in the Lebanese National Cancer registry: In comparison with BC in women, among other BC and among cancers in men

Year	BC in Women	BC in men	BC in men among all BC (%)	Cancers in men	BC in men among all men cancers (%)
2005	1451	15	1.02	3622	0.41
2006	1617	23	1.40	3965	0.58
2007	1747	28	1.58	4471	0.63
2008	1717	41	2.33	4135	0.99
2009	1603	38	2.32	4328	0.88
2010	1993	59	2.88	4580	1.29
2011	2000	73	3.52	4365	1.67
2012	2252	82	3.51	5081	1.61
2013	2435	62	2.48	5182	1.20
2014	2528	53	2.05	5552	0.95
2015	2473	53	2.10	5720	0.93
2016	2264	45	1.95	5457	0.82

Two case reports were found: the first one describing a 35 years-old male from Jordan receiving a modified radical mastectomy [30] and the second reporting an inflammatory breast cancer in a 56 years old Lebanese man who died 8 months after the diagnosis [31].

Overall, characteristics from 915 patients were reported in the aforementioned studies, with a mean age at diagnosis of 59.4 years (n=643). The tumor concerned the left breast in 53 % (n=385) and in 3 % of the cases the tumor was bilateral. The mean tumor size is 3.8 cm (n=438) and 61 % had lymph node involvement. All of the studies reported a majority of infiltrating ductal carcinoma (IDC) with a prevalence of 89 % (n=708), followed by the papillary type with 4 %. In terms of Hormonal Receptors positivity, 81% had ER+ tumors (n=214) and 71% had PR+ tumors (n=265) (Table 1).

Discussion

This article is the first of its kind in the Arab countries. To this moment, there were no reviews on BC in men with barely few original articles on the subject. The current work summarizes BC in men tumor characteristics, with an overview of changes that occurred during the years and endemic risk factors.

However, the main problem faced was the lack of data on some important characteristics of male BC such as HER2 receptor analysis or the BRCA2 genetic testing.

Demographics

The prevalence of BC in men among BC in the Arab world varies in different series passing from less than 1 % in some series [32,33], thus consistent with findings from most of western countries [15], to almost 2 % in other series [34-36]. This discrepancy might be explained by a lower rate of women's BC in these countries or other local factors such as tropical infections. However, the numbers remain lower than in sub-Saharan African

countries where BC in men accounts for more than 4 % of BC [37]. Nevertheless, it is interesting to note that one Egyptian study from more than 50 years ago incriminated Bilharzias in a high prevalence of male BC of 6.8 % in addition to a very low age at diagnosis of 41 years [17]. Although controlled in almost all of Egypt, Bilharzias infection is still prevalent in the Nile's valley with over 3 % of prevalence in some villages [38]. Endemic in these regions, this infection causes liver disturbances that reduce the degradation of Estrogen and therefore favor the tumor genesis of BC. From another side, it is also remarkable that the analysis of the Lebanese NCR showed a high prevalence of BC in men among all BC, with an average of 2.32 % reaching 3.5% in 2011 and 2012 as shown in Table 2, which is surprising since Lebanon is known among other Arab countries for a more westernized trend of cancers. Moreover, the mean age at diagnosis of 643 patients from reviewed series was 59.4 years, with nearly 10 years of difference than in women's BC in the Arab world (48 years) [39].

Genetics

The mutation of the BRCA2 gene puts men in a higher risk of BC [40]. The prevalence of the mutation in men's BC cohorts from studies in the Arab world is 28.35 %, which seem to agree with the numbers in Portugal (29.5 %) [41] and in Italy (28.6 %) [42]. Since these mutations predispose to multiple cancers, a systematic testing for the mutation should be considered in every men diagnosed with BC, in order to regularly screen for other possible malignancies [43]. Therefore, more studies from the Arab world should emerge on the subject.

Hormone Receptors

Hormone Receptors are important prognostic and treatment predicting indicators in BC. There are 3 tested hormonal receptors: Estrogen receptor, Progesterone

receptor and Her2/neu. BC that are negative for all of them are named Triple Negative and have the worst prognosis. However, the positivity of ER or PR is predictive for the response to some treatments such as Tamoxifen in ER+ BC [44]. Despite the fact that Her2/neu is an indicator to the response to Trastuzumab, in some Arab countries such as Egypt, testing for HER2 is not routinely indicated [18] and therefore the lack of HER2 testing explains the lack of Herceptin based treatment in the series aforementioned.

In comparison with neighboring Iran [45], Arab countries have almost the same ER positivity rate (85 % vs 82.3%) and a slightly higher PR positivity rate (73 % vs 59%). These numbers also match with the data from Western countries [46-48]. However, the ER positivity rate reported from Ghana is lower (44 %) [49].

Treatment

When it comes to treating BC in men, guidelines are very similar to those in women. Indeed, treatment regimen decision is most often based on results from women trials for specific hormonal expression and patients' characteristics. The European Society of Medical Oncology recommends modified radical mastectomy followed by a hormonal therapy for HR positive tumors or otherwise chemotherapy [50].

Since the HR positivity rate in the Arab world is comparable to the number in the US, the percentage of patients that benefited from hormonal therapy should be similar to that reported in the US. However, only 48 % of the patients in the Arab World Series benefited from this kind of treatments 80.9 % in the US [51] and 82.6 % in Portugal [52]. In contrast, there are more patients treated with radiations in the Arab world and Portugal with 66 % and 87 % respectively, than in the US where only 32.6 % benefited from radiations.

This pattern shows that Arab patients could be benefiting more from endocrine therapies instead of traditional radiation and chemotherapy.

Outcomes

In terms of 5-years survival, numbers reported from series from the Arab world show worse outcome than series in the US [53] with a respective 5-years survival of 62.5 % vs 75 %. This discrepancy is lower for 10-years survival with 53 % vs 56 % respectively.

Psychosocial Aspects

Arab societies share a very particular vision of masculinity, with virility being the heart of the definition of what a man is. This vision affects the perception of many medical problems such as infertility among others [54]. Since BC is much more frequent in women, it is often regarded as a women's disease. While there are no psycho-social studies on this subject in the targeted region, an editorial from Morocco discusses how

emasculating a diagnosis of BC is for Arab males [55]. From another perspective, a German article reports that men might perceive male BC as a threat to their masculinity. Moreover, some participants in this same study considered that BC protocols are originally intended for women and therefore raise concerns over the quality of the treatment they received [56]. The lack of awareness on male BC alongside the taboo that arises from the subject might explain why so little data is available on male BC in the Arab countries.

Conclusion

In conclusion, this review shows that male BC in the Arab world has similar characteristics than most of the Caucasian western countries. However, the number of studies in this subject is still very limited and genetic testing is lacking, in addition to the little consideration given to endocrine therapies. Finally, in order to insure the best possible care for male patients with BC living in this region of the world, more studies are needed, focusing on epidemiological, genetic (*BRCA2* and *HER2NEU* mutations), clinical and psychosocial aspects. Therefore, an urgent need of a unified male BC database is to be considered in our region.

Author's Contribution

PS contributed in designing the study, the graphs and writing the manuscript. RK contributed in screening eligible articles, extracting data and writing the manuscript. AS contributed in screening eligible articles, extracting data and designing the graphs. GJ contributed in screening eligible articles, extracting data and writing the manuscript. HRK is the senior author; he contributed in designing the study and reviewing the manuscript.

Disclosures and Conflict of Interest

The authors report no conflict of interests, writing assistance nor funding for this paper.

References

1. Sung H, Ferlay J, Siegel RL, Laversanne M, Soerjomataram I, et al. (2021) Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA Cancer J Clin* 71: 209-249.
2. Fentiman IS, D'Arrigo C (2004) Pathogenesis of breast carcinoma. *Int J Clin Pract* 58: 35-40.
3. Alkabban FM, Ferguson T. Breast Cancer. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2020 [cited 2021 Feb 13].
4. Libson S, Lippman M (2014) A review of clinical aspects of breast cancer. *Int Rev Psychiatry Abingdon Engl* 26: 4-15.
5. Mehrgou A, Akouchekian M (2016) The importance of *BRCA1* and *BRCA2* genes mutations in breast cancer development. *Med J Islam Repub Iran* 30: 369.
6. Baretta Z, Mocellin S, Goldin E, Olopade OI, Huo D (2016) Effect of *BRCA* germline mutations on breast cancer prognosis: A systematic review and meta-analysis. *Medicine (Baltimore)* 95: e4975.

7. Tai YC, Domchek S, Parmigiani G, Chen S (2007) Breast cancer risk among male BRCA1 and BRCA2 mutation carriers. *J Natl Cancer Inst* 99: 1811-1814.
8. Evans DGR, Susnerwala I, Dawson J, Woodward E, Maher ER, et al. (2010) Risk of breast cancer in male BRCA2 carriers. *J Med Genet* 47: 710-711.
9. Khattab A, Kashyap S, Monga DK (2020) Male Breast Cancer. In: *StatPearls* [Internet]. Treasure Island (FL): StatPearls.
10. El Saghir NS, Khalil MK, Eid T, El Kinge AR, Charafeddine M, et al. (2007) Trends in epidemiology and management of breast cancer in developing Arab countries: a literature and registry analysis. *Int J Surg Lond Engl* 5: 225-233.
11. Arab Countries 2022 [Internet]. [cited 2022 Feb 22].
12. Wang L (2017) Early Diagnosis of Breast Cancer. *Sensors* 17: 1572.
13. Adib SM, El Saghir NS, Ammar W (2009) Guidelines for breast cancer screening in Lebanon Public Health Communication. *J Med Liban* 57: 72-74.
14. Senkus E, Kyriakides S, Ohno S, Penault-Llorca F, Poortmans P, et al. (2015) Primary breast cancer: ESMO Clinical Practice Guidelines for diagnosis, treatment and follow-up. *Ann Oncol* 26: v8-30.
15. Yalaza M, Inan A, Bozer M (2016) Male Breast Cancer. *J Breast Health* 12: 1-8.
16. NCR.Bm.2016 [Internet]. [cited 2021 Mar 6].
17. El-Gazayerli MM, Abdel-Aziz AS (1963) ON BILHARZIASIS AND MALE BREAST CANCER IN EGYPT: A PRELIMINARY REPORT AND REVIEW OF THE LITERATURE. *Br J Cancer* 17: 566-571.
18. Soliman AA, Denewer AT, El-Sadda W, Abdel-Aty AH, Refky B (2014) A retrospective analysis of survival and prognostic factors of male breast cancer from a single center. *BMC Cancer* 14: 227.
19. Gilbert SF, Soliman AS, Iniesta M, Eissa M, Hablas A, et al. (2011) Androgen receptor polyglutamine tract length in Egyptian male breast cancer patients. *Breast Cancer Res Treat* 129: 575-581.
20. Gilbert SF, Soliman AS, Karkouri M, Quinlan-Davidson M, Strahley A, et al. (2011) Clinical profile, BRCA2 expression, and the androgen receptor CAG repeat region in Egyptian and Moroccan male breast cancer patients. *Breast Dis* 33: 17-26.
21. Hali F, Chiheb S, El Ouazzani T, Lakhdar H (2002) [Male breast cancer in Morocco]. *Ann Dermatol Venereol* 129: 699-702.
22. Sellal N, Haddad H, Bouchbika Z, Benchakroun N, Jouhadi H, et al. (2011) Cancer du sein: l'homme est aussi concerné. Étude de 21 cas. *Basic Clin Androl* 21: 45-51.
23. Hali F, Khadir K, Idhammou W, Bensardi FZ, Lefriyekh MR, et al. (2011) [Cutaneous manifestations of male breast cancer]. *Presse Medicale Paris Fr* 141: e483-488.
24. Bourhafour M, Belbaraka R, Souadka A, M'rabti H, Tijami F, et al. (2011) Male breast cancer: a report of 127 cases at a Moroccan institution. *BMC Res Notes* 4: 219.
25. Elbachiri M, Fatima S, Bouchbika Z, Benchekroun N, Jouhadi H, et al. (2017) [Breast cancer in men: about 40 cases and literature review]. *Pan Afr Med J* 28: 287.
26. Laabadi K, Jayi S, Alaoui FF, Bouguern H, Chaara H, et al. (2013) [Breast cancer in men: about 6 cases]. *Pan Afr Med J* 16: 70.
27. Beyrouti MI, Kharrat Koubaa M, Affes N, Ben Ali I, Abbes I, et al. (2003) [Male breast cancer]. *Tunis Med* 81: 48-54.
28. Temmim L, Luqmani YA, Jarallah M, Juma I, Mathew M (2001) Evaluation of prognostic factors in male breast cancer. *Breast Edinb Scotl* 10: 166-175.
29. Tawil AN, Boulos FI, Chakhachiro ZI, Otrrock ZK, Kandaharian L, et al. (2012) Clinicopathologic and Immunohistochemical Characteristics of Male Breast Cancer: A Single Center Experience: Pathology of Male Breast Cancer. *Breast J* 18: 65-68.
30. Awayshih MMA, Nofal MN, Yousef AJ (2019) Modified Radical Mastectomy for Male Breast Cancer. *Am J Case Rep* 20: 1336-1339.
31. Choueiri MB, Otrrock ZK, Tawil AN, El-Hajj II, El Saghir NS (2005) Inflammatory breast cancer in a male. *N Z Med J* 118: U1566.
32. Zekri J, Saadeddin A, Alharbi H (2021) Frequency and clinical characteristics of HER2 over-expressed breast cancer in Saudi Arabia: a retrospective study. *BMC Womens Health* 21: 10.
33. Fouhi ME, Benider A, Gaëtan KZA, Mesfioui A. Profil épidémiologique et anatomopathologique du cancer de sein au CHU Ibn Rochd, Casablanca. *Pan Afr Med J* [Internet]. 2020 Sep 9 [cited 2021 Feb 13]; 37.
34. Corbex M, Bouzbid S, Boffetta P (2014) Features of breast cancer in developing countries, examples from North-Africa. *Eur J Cancer Oxf Engl* 50: 1808-1818.
35. Alotaibi RM, Rezk HR, Juliana CI, Guure C (2018) Breast cancer mortality in Saudi Arabia: Modelling observed and unobserved factors. *PLoS One* 13: e0206148.
36. Salem AAS, Salem MAE, Abbass H (2010) Breast Cancer: Surgery at the South Egypt Cancer Institute. *Cancers* 2: 1771-1778.
37. Ndom P, Um G, Bell EMD, Eloundou A, Hossain NM, et al. (2012) A meta-analysis of male breast cancer in Africa. *The Breast* 21: 237-241.
38. Barakat RMR (2013) Epidemiology of Schistosomiasis in Egypt: Travel through Time: Review. *J Adv Res* 4: 425-432.
39. Hashim MJ, Al-Shamsi FA, Al-Marzooqi NA, Al-Qasemi SS, Mokdad AH, et al. (2018) Burden of Breast Cancer in the Arab World: Findings from Global Burden of Disease, 2016. *J Epidemiol Glob Health* 8(1-2): 54-55.
40. Narod SA, Salmena L (2011) BRCA1 and BRCA2 Mutations and Breast Cancer. *Discov Med* 12: 445-453.
41. André S, Pereira T, Silva F, Machado P, Vaz F, et al. (2019) Male breast cancer: Specific biological characteristics and survival in a Portuguese cohort. *Mol Clin Oncol* 10: 644-654.
42. Vietri MT, Caliendo G, D'Elia G, Resse M, Casamassimi A, et al. (2020) BRCA and PALB2 mutations in a cohort of male breast cancer with one bilateral case. *Eur J Med Genet* 63: 103883.
43. Ibrahim M, Yadav S, Ogunleye F, Zakalik D. Male BRCA mutation carriers: clinical characteristics and cancer spectrum. *BMC Cancer* [Internet]. 2018 Feb 13 [cited 2021 Feb 25]; 18.
44. Puhalla S, Bhattacharya S, Davidson NE (2012) Hormonal therapy in breast cancer: A model disease for the personalization of cancer care. *Mol Oncol* 6: 222-236.
45. Shandiz FH, Tavassoli A, Sharifi N, Khaled SA, Kadkhodayan S, et al. (2015) Hormone receptor expression

- and clinicopathologic features in male and female breast cancer. *Asian Pac J Cancer Prev APJCP* 16: 471-474.
46. Friedman MA, Hoffman PG, Dandolos EM, Lagios MD, Johnston WH, et al. (1981) Estrogen receptors in male breast cancer: clinical and pathologic correlations. *Cancer* 47: 134-137.
47. Olsson H (2000) Estrogen receptor content in malignant breast tumors in men--a review. *J Mammary Gland Biol Neoplasia* 5: 283-287.
48. Korde LA, Zujewski JA, Kamin L, Giordano S, Domchek S, et al. (2010) Multidisciplinary meeting on male breast cancer: summary and research recommendations. *J Clin Oncol* 28: 2114-2122.
49. Akosa A, Van Norden S, Tettey Y (2005) Hormone Receptor Expression in Male Breast Cancers. *Ghana Med J* 39: 14-18.
50. ESMO (2022) ESMO [Internet].
51. Srour MK, Amersi F, Mirocha J, Giuliano AE, Chung A (2020) Male Breast Cancer: 13-Year Single Institution Experience. *Am Surg* 86: 1345-1350.
52. Henriques Abreu M, Henriques Abreu P, Afonso N, Pereira D, Henrique R, et al. (2016) Patterns of recurrence and treatment in male breast cancer: A clue to prognosis? *Int J Cancer* 139: 1715-1720.
53. Konduri S, Singh M, Bobustuc G, Rovin R, Kassam A (2020) Epidemiology of male breast cancer. *Breast Edinb Scotl* 54: 8-14.
54. Inhorn MC (2004) Middle Eastern Masculinities in the Age of New Reproductive Technologies: Male Infertility and Stigma in Egypt and Lebanon. *Med Anthropol Q* 18: 162-182.
55. El Youbi MBA, Bourhafour M, Errihani H. Le cancer du sein chez l'homme au Maroc: quels impacts psycho-sociaux? *Pan Afr Med J* 14.
56. Nguyen TS, Bauer M, Maass N, Kaduszkiewicz H (2020) Living with Male Breast Cancer: A Qualitative Study of Men's Experiences and Care Needs. *Breast Care* 15: 6-13.