



Impact of Breast Cancer on Marital Status. A Case Control Study in Sudan and Greece

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Abstract

Introduction: Breast cancer is the most common cancer among women in Sudan and Greece. Once diagnosed, the female patient undergoes several medical interventions for diagnosis and treatment such as surgery, chemotherapy, hormonal or radiation therapy and this period is very stressful for the patient, her family, husband or spouse.

Aim of the Study: Our aim was to investigate the impact of breast cancer diagnosis and treatment on the patient's marital status as well as on patient's social life and their career. We included patients from Greece and Sudan, taking into consideration the differences in social and educational status; we explored the possibility of different responses between the two countries.

More specifically, we compared the divorce rates between a group of women diagnosed with breast cancer and those of a control group in both countries. Furthermore, we recorded the impact of breast cancer on the patient's as well as on her husband's career.

Methods: This is a comparative cross sectional case control study. It was conducted at Bashair Teaching hospital of Alneelain university and Elsharif Hospitals in Sudan and Hippokrateion University General Hospital and Alexandra University General Hospital in Athens, Greece. Inclusion criteria were married female patients diagnosed with breast cancer at any stage and treated. 100 patients from Sudan and 94 patients from Greece were included in the study and were compared to a control group of patients diagnosed with benign lesions, consisting of 100 patients from Sudan and 66 patients from Greece.

Results: The survey of participants showed that, in Greece most of control (53 of 65, 94.6%) and patients (65 of 79, 82.3%), were still married at the time of the study, the same result showed in Sudan, (86 of 90, 95.5%) of the control group, and (87 of 98, 89.7%) of the group of patients were still married at the time of the study, the frequency distribution was significant with p-value of Chi-square test (.047). The difference in frequency distribution of partner's occupation after diagnosis and treatment of breast cancer, was not significant among Greeks, where the more affected ones were employees, (29, 58%) for controls, and (32, 53.3%) for patients), and the p-value of Fisher Exact test (.362), also in Sudanese the frequency of employees was (53, 57%) for control and (34, 64.2%), with p-value of Fisher Exact test (.686). The status of partner's work in Greece resulted significant difference in frequency distribution, where the frequency of the group that their work did not affected was increased from controls (24, 48.1%) to among patients (48, 65.8%), and the frequency of group that changed to the best also increased from controls (0, 0%) among patients (2, 2.7%), while the changing to the worst decreased from controls (27, 51.9%) to (23, 31.5%) in patients, these differences between controls and patients were significant with p-value of Fisher Exact test (.032). While no significant differences noticed among Sudanese respondents where the frequency distribution was (70, 79.5%), and (82, 87.2%) for no changes in control and patients respectively, (2, 2.3%), and (5, 5.3%) for changes to the best in control and patients respectively, (16, 18.2%) and (7, 7.4%) for change to the best in control and patients respectively, with p-value of Fisher Exact test (.058).

Conclusion: Divorce is not common among breast cancer survivors in Greece and Sudan in spite of the different cultural and lifestyle modalities of life. Long term survivors diagnosed with breast cancer may return to their career, some of them may have achievements that are not reached by their healthy mates in Greece and Sudan.

Recommendations: It is urgent to have strategic plans to increase awareness for early detection, accurate diagnosis and comprehensive management as well as follow up programs of breast cancer both in Greece and Sudan. It is very important to have psychiatry groups to support the breast cancer patients and their families especially during the first two years. It is essential to support and rehabilitate the breast cancer survivors and their families to return to their previous activities.

Keywords: Breast Cancer; Sudan; Greece

Abbreviation

ER: Estrogen Receptor; HER2: Herceptin; PR: Progesterone; NOS: Non-otherwise Specified; TNBCs: Triple Negative Breast Cancers; SES: Socioeconomic Status; QOL: Quality of Live

Introduction

Breast cancer is the most common cancer among women worldwide including Sudan [1]. In Greece, it is estimated that one in twelve women will be diagnosed with breast cancer during her life. Almost 4500 women are diagnosed with breast cancer every year in Greece [2]. A study carried out in Sudan during 2009-2010 reported 6771 new cancer cases. Of those, 3646 (53.8%) cases corresponded to women and 3125 (46.2%) cases to men. Moreover, in this study, authors reported that the most commonly diagnosed cancer among women was breast cancer followed by leukemia, cervical cancer, and ovarian cancer. Among men, the most common diagnosed cancer was prostate cancer followed by leukemia, lymphoma, oral cancer, colorectal cancer, and liver cancer [3].

As mentioned above, breast cancer is considered the most common cancer diagnosed in women in all European countries [4]. Greece differs from other European countries as does not apply a national screening program, thus leading to diagnosis at a more advanced stage and recording poor outcomes in treating these patients, especially women living in distant Greek regions [5].

Many studies have tried to record the impact of breast cancer on patient's social life, psychological status and prognosis [6]. It is a fact that improvement has been accomplished throughout the years in the diagnosis and treatment of breast cancer resulting in higher survival rates and better quality of life of the patients in Greece and Sudan.

This study focused on the impact of breast cancer on the marital status of the patients and the effect on their social lives. Moreover, it intended to record any possible differences in the attitude of the patient's husbands in two different countries like Greece and Sudan.

The study recorded the age at which women were married, age at diagnosis of breast cancer, the level of education of the patients, the level of education of the spouse, the patient's and spouse's occupation and the effect of the disease on their career. Furthermore, records of the patient's tribe, the type of community in which the patient lives and how do all these factors affect the marital status of each patient.

In the recent literature there were two studies. One study was conducted in Eretria and Sudan and the second one in Italy and Sudan. The first study relied on histopathology reports and concluded that breast cancer was diagnosed at younger age and was characterized by more aggressive clinical and molecular prognostic markers. Younger age and poorly differentiated tumors are strongly associated with ER negative breast cancer. The luminal-A like tumors, which are sensitive to hormone therapy, are less frequent, instead, the most aggressive subtype (TNBCs) are more prevalent in their study group [7]. However, little is known about the molecular subtypes of breast cancer associated with multiple childbirths and lactation in populations who do not use contraceptive means, such as African populations. The molecular structure of breast cancer in African women might be different compared to those of breast cancer in Western ones [8].

In the second study 114 and 138 paraffin blocks were taken from Sudan (the laboratory of the radioisotope center) and Milan, Italy (multimedia laborites). They stated that all differences be-

tween the Sudanese and Italian breast cancer series reflected the stage at diagnosis rather than intrinsic biological characteristics [9]. This may have relevant implications for breast cancer prevention and treatment in Africa. The conclusions of the two researches were contradicting and this is an area for more research in the future.

In parts of the world including sub-Saharan Africa, where life expectancy is shorter, the median age at diagnosis is 10 - 15 years younger than that in the developed world, Europe and the USA [10-13]. Invasive carcinoma of non- otherwise specified (NOS) was the most encountered type (79.5%) of breast cancer in a study done by a group of pathologists in eighteen Pathology departments in Khartoum [1] as previously published in Sudan [9], whereas the corresponding rate elsewhere in Africa was 60% [7]. Most of the Sudanese patients present with hormonal estrogen receptors negative, which entails aggressive disease, poor prognosis, suspicion of distant metastasis and higher rate of recurrent disease.

On the other hand, a study from Greece outlined that hormone therapy in combination with surgical treatment and chemotherapy seemed to be associated with better quality of life regarding pain and vitality [27].

State of the problem

Breast cancer is a disease that affects the whole family especially the husband or spouse there is two different cultures extended family type in Sudan and nucleus family type in Greece. After breast cancer diagnosis, the stress full condition of investigation and treatment modalities from surgery hormonal therapy and to chemotherapy which may lead to patients body disfigurement and psychological stress which may affect the sexual function of the patient and her spouse or husband and the reflection of these events on the marital status and the career of the patient and her husband or spouse

Aim of the Study

To evaluate the impact of breast cancer on the marital status of the patients in both countries Greece and Sudan, taking into consideration social and educational variation, and to study the effect of breast cancer and its treatment on the career of the patient and her husband or spouse.

Specific Objectives

Our aim was to record divorce rates in patients undergoing

breast cancer treatment In Sudan and Greece and compare them with a control group. Moreover, our goal was to record the impact of breast cancer on a patient's career and personal life and to evaluate the armamentarium of therapeutic tools in both countries.

Methodology

Our study is a comparative cross sectional case control study performed at Bashair Teaching of Alneelain university and Elsharif Hospitals in Sudan, Hippokrateion General Hospital of the University of Athens and Alexandra General Hospital of the University of Athens in Greece.

Inclusion criteria included married female patients that were diagnosed with breast cancer underwent appropriate treatment and with more than five years disease free.

Our first group included 100 breast cancer patients from Sudan and 94 breast cancer patients from Greece. These groups of patients were compared with a second control group that included 100 female patients from Sudan and 66 female patients from Greece diagnosed with a benign disease of the breast.

Informed consent was obtained in all cases, either during their hospital follow-up visits or by telephone. The Ethical Committees of each Hospital had approved our study.

Data were retrieved from a questionnaire, transferred to an excel report and analyzed by a specialized Biostatistician with the use of SPSS and Fisher's exact test. Fisher's test is a very statistical significant test used in the analysis of contingency tables and it is employed in small size sample, however it is valid for all size samples. It is named after its inventor, Ronald Fisher, and is one of a class of exact tests, so called because the significance of the deviation from a null hypothesis (e.g., P-value) can be calculated exactly, rather than relying on an approximation that becomes exact in the limit as the sample size grows to infinity, as with many statistical tests this test is known as ANOVA test as well. Patients in Greece were examined in specialized multidisciplinary breast clinics in two University Hospitals. Data were retrieved during their initial interview or by a telephone interview. Both breast clinics in Hippokrateion and Alexandra General Hospitals are Breast Accredited Units, utilizing all up to date means of mammography, sonography and biopsy.

On the other hand, patients in Sudan were examined in both Hospitals by only one specialized breast surgeon in collaboration

with General Surgeons. Mammogram is available only in one public Hospital and in private Hospitals sonography and biopsy were available in both of the previously mentioned hospitals.

Results

The study included 100 patients of diagnosed and treated breast cancer patients from Sudan mainly Bashair University Hospital and Elsharif specialized hospital and 94 patients from National Kapodistrian University Hospital of Athens and Alexandra teaching hospital, according to the biology and nature of the disease (invasive or Noninvasive) the patients received their treatment it varies from lumpectomy(lumpectomy), mastectomy with or without axillary dissection and accompanied with or without chemotherapy, radiotherapy and hormonal therapy . There was no significant difference in patients age at marriage in Greece and Sudan, while there was significant difference in age at diagnosis in Greece and Sudan (49.23 ± 8.23), (46.03 ± 9.47), the p-value of independent samples was (.015) (Figure 1) so the age at diagnosis is younger in Sudanese patients.

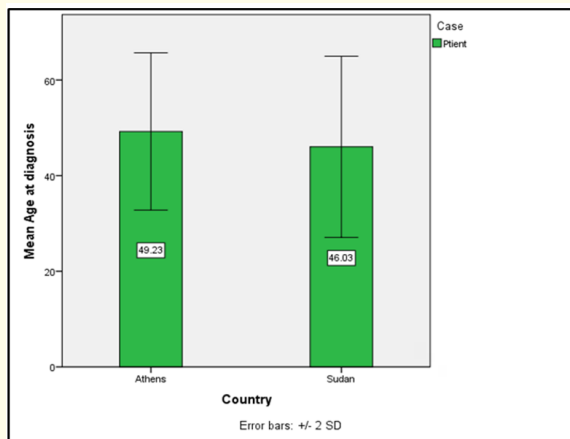


Figure 1: Age of breast cancer diagnosis in both countries.

Age at marriage in Greek and Sudanese patients, the age distribution was as follows the mean age at marriage was (25.47 ± 6.55 and 24.31 ± 7.23) in Greek and Sudanese patients with no statistical difference, the p-value of independent samples was (.000) in this figure we concluded to that there is no difference in age of marriage in the patients groups in Sudan and Greece. There is the significant

difference in age when married between patients (25.47 ± 6.55) and control (23.07 ± 5.09), the p-value of independent samples was (.000) among Greeks, and insignificant difference between patients (24.31 ± 7.23) and control (23.61 ± 5.62), the p-value of independent samples was (.724) among Sudanese (Figure 2) while there is significant difference in the age of marriage between the patients and control the control groups get married at younger age.

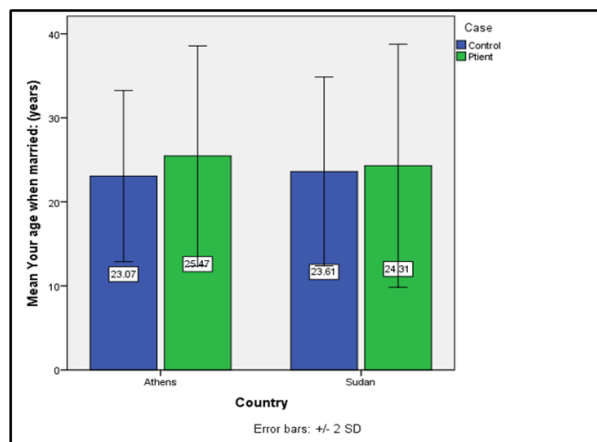


Figure 2: Marital age of patients in both countries.

The frequency distribution of the type of highest level of education was insignificant in Greece (the p-value of Fisher exact test=.535) and significant in Sudan (the p-value of Chi-square test = .000), in Greece the test showed, the increasing of educational level versus decreasing of number of patients, while in Sudan the same relation has broken by graduated patients (27, 39.1% of patients) (Figure 3).

Type of patient’s community in Greece compared to Sudan. The frequency distribution of the type of community was insignificant in Greece (the p-value of Chi-square test=.357) and significant Sudan (the p-value of Chi-square test =.001), in Greece the frequency of patients from urban communities was the highest (61, 64.9%) but the difference between the observed and expected frequencies was very small , while in Sudan the frequency of patients from urban also was the highest (95, 96%), the significance Occurred because the difference between observed and expected frequencies (Figure 4).

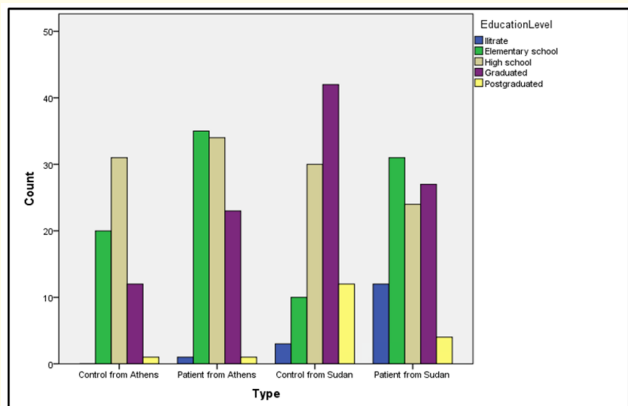


Figure 3: Education level among the two groups.

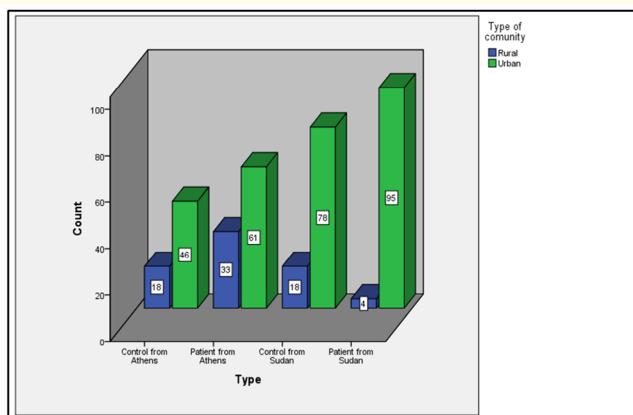


Figure 4: Type of community.

The frequency distribution showed that the most frequent tribe in Greece was Caucasian in the group of controls (63, 98.4%) and the group of patients (92, 98.9%), (the p-value of Fisher Exact test=.651). The most frequent tribe in Sudan was Afro-Asiatic in patient (65, 70.7%) and control (68, 72.3%), (the p-value of Fisher Exact test=.840). The frequency distribution showed that the most frequent tribe in Greece was Caucasian in the group of controls (63, 98.4%) and the group of partners of the patients (92, 98.9%), (the p-value of Fisher Exact test=.651). The most frequent tribe in Sudan was Afro-Asiatic in partners of the patients (65, 70.7%) and

control (68, 72.3%), (the p-value of Fisher Exact test=.840). Different partner’s tribes in Greece and Sudan, The analysis proved that, the Caucasian was the common partner’s ancestry among controls (58, 98.3%) and patients (75, 97.4%) candidates from Greece, the p-value of Fisher Exact test (.327), so the frequency distribution was not significant, such as the result among Sudanese candidates which was not significant also with frequency (68, 73.1%) for Afro-Asiatic among controls and (69, 72.6%) for Afro-Asiatic among patients, and the p-value of Fisher Exact test (.949) this may reflect that most of the Greek populations were Caucasian and most of the Sudanese tribes were Afro-asiatic.

The survey of participants showed that, most of patients and control, whether in Sudan or Greece were married at the time of diagnosis, the frequency distribution was significant with p-value of Chi-square test (.015) (Table 1).

The survey of participants showed that, in Greece most of control (53 of 65, 94.6%) and patients (65 of 79, 82.3%), were still married at the time of the study, the same result showed in Sudan, (86 of 90, 95.5%) of the control group, and (87 of 98, 89.7%) of the group of patients were still married at the time of the study, the frequency distribution was significant with p-value of Chi-square test (.047) (Table 2). This shows there is no great effect of breast cancer disease on the marital status of breast cancer survivors.

Statistics showed that, in Greece there was insignificant frequency distribution for the status of number of persons lived with patient, the frequency distribution showed the frequency and percent of the three categories were (in control 30, 50%), and (in patient 55, 60.4%) for Greek group the number has not changed, (in control 2, 3.3%) and (in patient 8, 8.8%) for the Sudanese group the number was increased, and (in control 28, 46.7%) and (in patient 28, 30.8%) for the group the number was decreased, the p-value of Fisher exact test was(.096), while in Sudan there was significant frequency distribution for the status of number of persons lived with patient, the frequency distribution showed the frequency and percent of the three categories were (in control 73, 75.3%), and (in patient (56, 60.9%) for the group the number has not changed, (in control 16, 16.5%) and (in patient 9, 9.8%) for the group the number was increased, and (in control 8, 8.2%) and (in patient 27, 29.3%) for the group the number was decreased, the p-value of Fisher exact test was (.001), so the final result, in Sudan the

		Type								P-value
		Control from Athens		Control from Sudan		Patient from Athens		Patient from Sudan		
		Count	Column N %	Count	Column N %	Count	Column N %	Count	Column N %	
Were married at the time of first breast biopsy?	No	8	12.5%	6	6.3%	12	13.2%	2	2.0%	.015
	Yes	56	87.5%	90	93.8%	79	86.8%	98	98.0%	

Table 1: Number of married patients during their first biopsy.

			Type								P-value	
			Control from Athens		Control from Sudan		Patient from Athens		Patient from Sudan			
			Count	Column N %	Count	Column N %	Count	Column N %	Count	Column N %		
Were you married at the time of the study?	Yes	Current relationship with this spouse	Divorced	0	0.0%	2	2.2%	8	10.1%	6	6.2%	.047
		Still married	53	94.6%	86	95.6%	65	82.3%	87	89.7%		
		Widowed	3	5.4%	2	2.2%	6	7.6%	4	4.1%		

Table 2: Number of patients still married at the time of study.

number of people whom live with patients after diagnosis changed to the best, but no changes in Greece.

The difference in frequency distribution of partner's occupation after diagnosis and treatment of breast cancer, was not significant among Greeks, where the more affected ones were employees, (29, 58%) for controls, and (32, 53.3%) for patients (Figure 5) and the p-value of Fisher Exact test (.362), also in Sudanese the frequency of employees was (53, 57%) for control and (34, 64.2%), with p-value of Fisher Exact test (.686). The status of partner's work in Greece resulted significant difference in frequency distribution, where the frequency of the group that their work did not affected was increased from controls (24, 48.1%) to among patients (48, 65.8%), and the frequency of group that changed to the best also increased from controls (0, 0%) among patients (2, 2.7%), while the changing to the worst decreased from controls (27, 51.9%) to (23, 31.5%) in patients, these differences between controls and patients were significant with p-value of Fisher Exact test (.032)

.while no significant differences noticed among Sundance respondents where the frequency distribution was (70, 79.5%), and (82, 87.2%) for no changes in control and patients respectively, (2, 2.3%), and (5, 5.3%) for changes to the best in control and patients respectively, (16, 18.2%) and (7, 7.4%) for change to the best in control and patients respectively, with p-value of Fisher Exact test (.058) (Figure 6).

Age at first child birth among Greek and Sudanese ladies before diagnosis of breast cancer; The descriptive statistics showed no significant differences between means of age at the first birth, the ANOVA test p-value (.092). The difference between the mean of age among Greek patients (27.3 ± 5.76), Sudanese patients (26.72 ± 7.37), and the p-value of independent sample t-test (.425), which was not significant (Figure 7).

The frequency of number of child births among Greek and Sudanese patients before diagnosis of breast Cancer, the significant

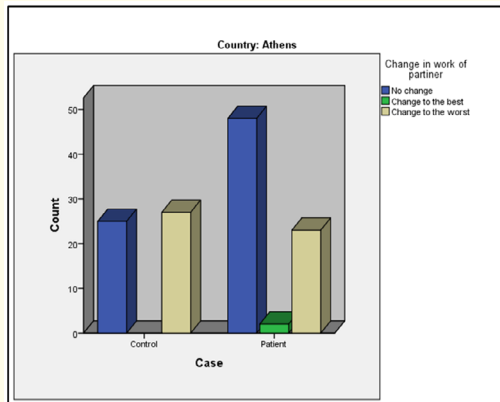


Figure 5: Change of occupation of the patient.

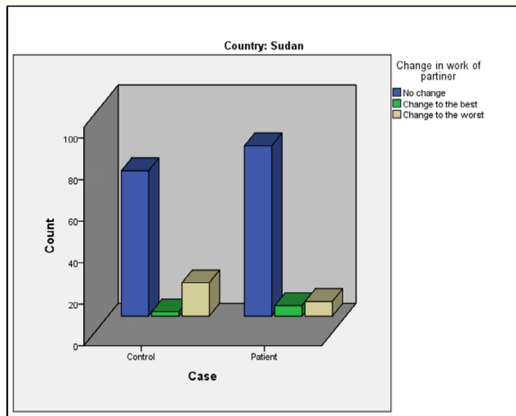


Figure 6: Change of the work of partner of the patient.

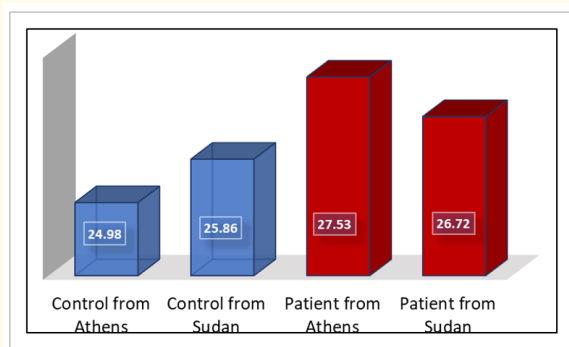


Figure 7: Age of mothers at first childbirth among the 2 populations.

frequency distribution of the number of births before cancer development points to, the number lied within range from 0 to 9 births, the most frequent number among Greek patients was 1 child, while among Sudanese were 2 children P-value of Fisher's Exact Test = .028 (Figure 8).

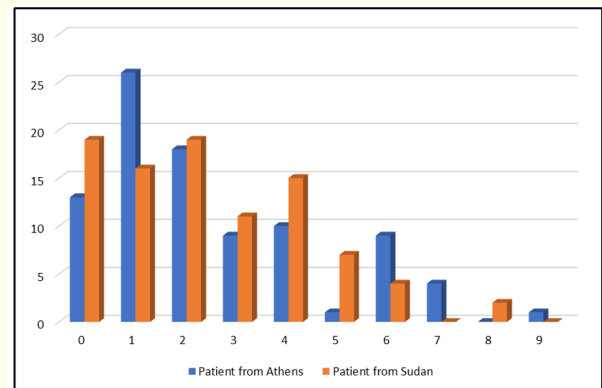


Figure 8: Number of children in both populations before breast cancer diagnosis.

On the other hand the number of childbirths among Greek and Sudanese patients after breast cancer diagnosis. The significant frequency distribution of the number of births after cancer development points to, the number lied within range from 0 to 3 births, the most frequent number among Greek and Sudanese patients was 0, and no (4, 5, 6, 7, 8, 9) births after cancer development. P-value of Fisher's Exact Test=.029.

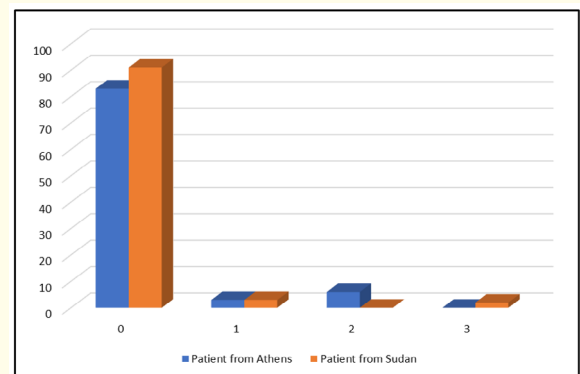


Figure 9: Number of children born after breast cancer diagnosis and treatment.

Discussion

The primary goal of this study was to investigate any potential impact of social factors on breast cancer survivors and their families. In this data it is found that the age of marriage is higher in both groups of patients from Greece and Sudan than the age of marriage in both control groups. Concerning marital age we came across various reports in the literature. The average marital age in our study was 23 years old in the control group and 25.5 years old in the Greek breast cancer group. These findings comply with the findings in the literature that report an average marital age in Greece of 24.4 [14]. On the other hand from old resources, one out of three Sudanese girls were reported to get married before the age of 18 years old in a 2017 report, 10.7% of women aged 15 to 49 were married before the age of 15 years, and 38% were married before the age of 18 years old [15]. Other studies however, have reported that recent social changes are associated with a slight increase in the mean age at 1st marriage for females [16]. This complies with the finding of our study that the age of marriage is equal between the Greek and Sudanese patients, but there was a significant difference in the age of marriage between the patients and the control from Greece, the age of marriage in Greek female patients was higher than the age of the control group at marriage figure 2, in the literature we found different findings in a paper from Saudi Arabia they said The factor of early marriage or early sexual intercourse, that is, for females under 18 years of age (OR = 13.9, 95% CI, 6.0 to 32.3), was the strongest risk factor for breast cancer among women in the eastern region of Saudi Arabia. Early marriage is a potential risk factor for female breast cancer in the Eastern Region of Saudi Arabia [17], these results goes with a study which consider marriage as an independent risk factor for breast cancer this has been conclusion of a meta -analysis study [18]. On the other hand a study from India from Madras found a three-fold risk in both pre- and postmenopausal groups when the interval between age at first birth and menarche was more than 12 years and also in women who attained menopause between the age of 44-49 [19].

Age At breast cancer diagnosis

In this data it is found that the age of diagnosis of breast cancer is younger in Sudan than the patients from Greece This facts has been reported in the literature concerning breast cancer in African women, which is characterized by younger age at onset, advanced stage at diagnosis, and consequently poor prognosis, it was reported that about 70% of the women diagnosed with breast

cancer were younger than 50 years [20] This study showed that in both countries the age of marriage at the time of diagnosis, the frequency distribution was significant with p-value of Chi-square test (Figure 3).

Education and socioeconomic status:

In this study, patients from both countries with a higher level of educational status had better treatment outcomes (27, 39.1% of patients) figure 4. This finding complies with the literature, indicating that low socioeconomic status was associated with late-stage breast cancer at diagnosis and poor type of treatment received [22]. In a study from Sudan, authors found that patients who were married, with higher education, better employment, and with longer duration of survival and higher quality of life (QOL) [21]. The literacy rate is 70.2% of total population, male: 79.6%, female: 60.8 in Sudan, in Greece it has an adult literacy rate of 97.37%. While the male literacy rate is 98.28%, for females is 96.5%. In a study done in China in seven centers during the period 1999-2008 they found that the type of occupation and education level have a significant impact on the stage at diagnosis, clinical and pathological features, implementation of examination, and the selection of treatment patterns and occupation and education level of patient are independent factors for stage at diagnosis. This entails that more effort must be done that lower-income occupation and lower educational attainment group to develop more accurate and effective prevention and treatment strategies for breast cancer [23]. Low socioeconomic status is a risk factor for unfavorable Breast cancer outcomes, regardless of race [24]. There is strong relationship between the socioeconomic status (SES) and determinant of health. This strong relationship has been documented for centuries, dating back to ancient Greece, Egypt, and China [22], one of the fundamental principles of public health is that socioeconomic status (SES) is a strong determinant of health. This strong relationship has been documented for centuries, dating back to ancient Greece, Egypt, and China [25-27].

Type of community

In Greece the frequency of patients from urban communities was the highest (61, 64.9%) but the difference between the observed and expected frequencies was very small, while in Sudan the frequency of patients from urban also was the highest (95, 96%), the significance Occurred because the difference between observed and expected frequencies, figure 5, this can be explained

by the fact in Sudan there is huge movement from the rural areas towards urban areas. Urban population refers to people living in urban areas as defined by national statistical offices. It is calculated using World Bank population estimates and urban ratios from the United Nations World Urbanization Prospects. In study from U.S.A they found that the overall population no evidence of rural disadvantage in either time period, In fact the percentage of breast cancer cases diagnosed late is higher in the highly urbanized city of Chicago than it is in other regions of the state an indication of urban disadvantage [28]. A study from China showed that In that study, they analyzed urban-rural disparity in cancer burden in Shanghai, China in the past 14 years and confirmed that female breast cancer occurred more frequently in urban than in rural populations [29].

Tribes and genetics

The genetics and tribes plays an important role as a risk factor of breast cancer and it had been well established that breast cancer affects the black American and African populations at an earlier age group aggressive disease and poorer prognosis [30,31]. This is not always due to the genetics only, there is the effect of the environment on the genes what is known as epigenetics which results in development of mutations. Over 300 mutations have been identified in BRCA1 and BRCA2 carriers worldwide. Within these populations, founder mutations have been described amongst the Ashkenazi Jews, Swedes, Norwegians, Dutch, Russians, Japanese, African Americans, Finns and French Canadians. In African American women, who have a higher incidence of early onset breast cancer with poor overall survival, three novel BRCA1 mutations have been identified, which are distinct from those identified amongst Caucasians [30]. In our data most of the patients and their partners from Greece are of Caucasian tribes and most of the patients and their partners from Sudan are from Afro-Asian tribes this gives two main groups in which we can make a comparison. A recently reported meta-analysis of 14 studies done in the USA concluded that African-American ethnicity is a significant independent predictor of outcome in breast cancer, even after adjusting for SES. In the aggregate analysis of this study, ratio for African-American patients compared to the Caucasians was 1.22 (95% CI, 1.13-1.30). A mortality odds ratio of 1.35 (95% CI, 1.00 -1.82) was also noted in three studies done in patients who had equal-access systems, further supporting the view that SES and delayed presentation did not account for poorer survival in African-American women [32].

Social relationship and marital status

In this study, most of the patients from Greece were married at the time of the diagnosis of breast cancer, and the same rates were reported in Sudan.

Almost all of the breast cancer survivors documented that their spouses were supportive and even if the patient lost her breast her life is more important.

In Sudan, large population families are common. In one of our cases, one family had fifty members, all living together. On the contrary, this is rare in Greece where the largest family was composed of five members. Moreover, in Sudan the number of family members may increase and their aim was to support the ill family member, where the extended family provided social services. Traditionally, the family was responsible for the old, the sick, and the mentally ill, although many of these responsibilities had been eroded by urbanization. Whether in rural or urban society, however, the burden of these social services fell upon the women [33] on the other hand Most Greeks live as nuclear families in a single household; however, the extended family is kept close and visited often [34].

Regarding the work among breast cancer survivors, since most of the patients are diagnosed before 55 years of age, and due to improvement of survival as a result of strategies of early detection and comprehensive management, the patients became able to return to work [35]. In general work gives sense of security to the patient [36] and it must be part of patient rehabilitation after completion of treatment.

In a previous study done at the Netherland about 80% of the patients were below the age of 55 years it shows that most of the breast cancer survivors will successfully return to work within the first two years after diagnosis [37]. Research on cancer patients in general suggests that the likelihood of returning to work is associated with (a) the severity of the disease at diagnosis, (b) the characteristics of the job, and (c) a variety of socio-demographic factors. In particular, cancer patients diagnosed with advanced disease are more likely to experience problems returning to work than those diagnosed with localized disease. Employment difficulties are also experienced by those working in blue-collar occupations and low-income or seasonal jobs [37].

Breast cancer is a couple's "condition", not a disease of the wife's breast. Significantly elevated levels of distress are known to occur up to three years post diagnosis and in some studies spousal distress exceeds that of the diagnosed woman [38-40], spouses experienced disruptions in their sleep, eating, and ability to work that they attributed to their wife's breast cancer. Couples experiencing high psychological distress reported lower levels of perceived family support than couples in whom both spouses reported normal levels of psychological distress. All of the above mentioned studies reported on the initial period of breast cancer diagnosis, in our study we have a long term effect that the patients and their spouses returned to their usual work and most of our patients were static but few of them (couples) improved on their carrier and some of them they did higher studies and became leaders at their field of work figure 5 and 6.

No patient was divorced because of her disease or mastectomy in this study, most likely because Sudanese and Greek husbands are loyal, supportive and sympathetic especially in such occasions [21]. Most of the married survivors interviewed reported very supportive and helpful responses from their spouses in the initial treatment period the women themselves and their spouses usually recognized that breast loss was a minor issue compared with the threat to life that cancer posed [24].

Breast cancer and parity

Late age at first childbirth (>30 years old) has shown to be a risk factor for breast cancer [41,42], in our results figure 7, it was clear that the age of the patient at the first child birth is higher than the age of the ladies of the control group at the first child birth this goes with the literature the mean age of the patients from Greece was (27.3) it was lower in the Sudanese group of patients (26.3) the difference was not statistically significant, but the difference is statistically significant between the control and patients groups both in Sudan and Greece, that is to say the age of mothers at first child birth is younger in control groups.

The Reproductive risk factors are associated with breast cancer and they are possibly mediated by alterations in sex hormones [43]. Elevated circulating concentration of sex hormones is associated with breast cancer risk [42,43] and high levels are observed in women with a higher body mass index (BMI). Estrogen circulating levels are reported to be higher in women with higher BMI when

compared to women with lower BMI [43]. Long term exposure to estrogen has been shown to elevate risk of breast cancer; however, increased exposure to estrogen during pregnancy has a protective function against breast cancer [45,46]. Of course the endogenous reproductive female hormones are controlled by the pituitary gland started at menarche and till menopause, the proliferation of normal growth of the breast tissues is under the estrogen and progesterone effect, estrogen increases the proliferation of malignant breast cells as well [47]. The levels of natural estrogen are the first mechanism, the carcinogenicity of estrogen is dependent on three mechanisms: 1) the activity of the hormone is mediated by receptors, 2) metabolic activation that is mediated by the P450 cytochrome and 3) aneuploidy induction. These mechanisms stimulate direct genotoxic effects and thereby increases mutation rates [47]. Estrogen is reportedly mutagenic through a genotoxic mechanism-formation of depurating estrogen-DNA adducts. This is performed by the reaction of catechol estrogen quinones with DNA [48,49]. The hormones estrogen and progesterone effect on cell proliferation in the breast tissue via breast tumor stem cells may lead to malignant cell proliferation [50,51], progesterone induces cell proliferation by activation of the progesterone receptor (PR). Excess PR contributes to breast malignancy and promotes development of invasive tumors [52,53].

On the other hand the opportunity to have childbirth among breast cancer survivors after diagnosis and treatment is small [21]. This can be explained by the effect of chemotherapy and hormonal therapy. The maximum number of childbirth after breast cancer treatment is three in Sudanese patients and two in Greek patients figure 9.

Conclusion

- Divorce is not common among breast cancer survivors in Greece and Sudan in spite of the different cultural and life-style modalities of life.
- Long term survivors diagnosed with breast cancer may return to their career, some of them may have achievements that are not reached by their healthy mates in Greece and Sudan.
- Breast cancer patients in Sudan presents at late stage, the patients presents at younger age group with negative estrogen receptors tumors and higher recurrence rate.

Recommendations

- It is urgent to have strategic plans to increase awareness for early detection, accurate diagnosis and comprehensive management as well as follow up programs of breast cancer both in Greece and Sudan.
- It is very important to have psychiatry groups to support the breast cancer patients and their families especially during the first two years.
- It is essential to support and rehabilitate the breast cancer survivors and their families to return to their previous activities.
- National and international efforts are needed to improve management and quality of life for breast cancer patient’s especially in Sudan and to some extent in Greece.

Research Questionnaire

For ‘Impact of Breast Cancer on Marital Status’

Please only complete this questionnaire if you HAVE had a breast biopsy.

NAME: _____

DATE: _____

DATE OF BIRTH: _____

Section I - Breast cancer diagnosis, treatment and detection

Please answer the following questions based on the timing of your first breast biopsy.

Results

1. How many breast biopsies have you had? _____

Please answer the following in regards to your first breast biopsy:

2. When was your first breast biopsy? _____ (MM/YYYY)

a. Name of hospital: _____

b. Name of doctor: _____

3. Which breasts were biopsied?

- Left
- Right
- Both

4. What was the result of your first biopsy? (Check all that apply)

- An invasive cancer
- A non-invasive cancer (early stage breast cancer)
- Was it Ductal Carcinoma *In-situ* (DCIS)? Yes
No

- Was it Lobular Carinoma *In-situ* (LCIS)? Yes
No

- Both an invasive and non-invasive cancer
- Benign breast disease
- Normal
- Other: _____

If you have had a diagnosis of breast cancer, please complete the following section on breast cancer treatment. If you have not had a history of breast cancer, please continue to section II.

- Yes
- Date: ___ / ___ / _____ (mm / dd / yyyy)

Section II -Marital relationship at the time of your first breast biopsy

13. Were you married at the time of your first breast biopsy?

- No ◊ Please go to Section III
- Yes

14. When were you married? : _____ (MM/YYYY), to: _____ (MM/YYYY)

15. Your age when married: _____ (years), Partner’s age

when married: _____(years)

YYYY)

16. What is your current relationship with this spouse?

- Still married
- Widowed
- Separated, Date of separation: _____ (MM/YYYY)
- Divorced, Date of divorce: _____ (MM/YYYY)
- If separated first, date of separation: _____ (MM/YYYY)

21. Place of birth:

City Province/State

22. Current Residence:

City Province/State

Postal Code

17. Did you have any children with this spouse?

- No
- Yes
- Number of children: _____
- List the years of birth of your children: _____

23. What type of community do you live in? (Mark all that apply)

- Rural
- Urban
- Suburban
- Farming
- Other: _____

18. In the first year following your first breast biopsy, how did your relationship with your partner change [compared to your relationship before your breast biopsy]? (Check the most appropriate box)

- It stayed the same
- It got better
- It got slightly worse
- It deteriorated

24. What is your major ancestry?

Ethnic Background: _____

Country of Origin: _____

19. Overall, what was the impact of your first breast biopsy on this relationship?

- Positive
- Negative
- No Impact

25. What was your work status at the time of your first breast biopsy: (Mark all that apply)

- Retired
- Homemaker
- Work Full-time, Occupation: _____
- Work Part-time, Occupation: _____

Section III - Personal information

20. Date of Birth: _____ (MM/DD/

• Unemployed or laid off, Duration of unemployment: _____ (years, months)

• Previous occupation: _____

• Other (please specify): _____

26. What is your current work status? (Mark all that apply)

• Retired

• Homemaker

• Work Full-time, Occupation: _____

• Work Part-time, Occupation: _____

• Unemployed or laid off, Duration of unemployment: _____ (years, months)

• Previous occupation: _____

• Other (please specify): _____

27. What is the highest level of education that you have achieved? (Check the most appropriate box)

• Elementary School

• High School

• College (diploma)

• University (degree)

• Postgraduate Program (Please check: ___ Masters ___ PhD)

• Postgraduate Professional School Program (e.g. Medical school, dental school)

28. What is your current relationship status? (Check the most appropriate box)

• Married

• Engaged/Long Term Relationship

• Common-law

• Divorced, not remarried

• Divorced, remarried

• Widowed, not remarried

• Widowed, remarried

• Single

• Other (please specify): _____

29. How many people were living in your household, including yourself, at the time of your first breast biopsy? _____ (Number of people)

30. Who did you live with at the time of your first breast biopsy? (Check all that apply)

• My own children, number ____

• My relatives' children, number ____

• My husband

• My In-laws

• My mother

• My father

• My sister(s)

• My brother(s)

• Relatives of my spouse

• Other: _____

31. How many people are currently living in your household, including yourself?

• ____ (Number of people)

32. Who do you currently live with? (Check all that apply)

• My own children, number ____

• My relatives' children, number ____

- My husband
- My In-laws
- My mother
- My father
- My sister(s)
- My brother(s)
- Relatives of my spouse
- Other: _____

Section IV - Partner information

Please complete the following questions in regards to the partner you were married to at the time of your first breast biopsy. If you were not married at the time of your first breast cancer diagnosis, please go to CONTACT INFORMATION).

33. Birth date of partner: __ / __ / ____ (month-day-year)
34. What is this partner’s major ancestry?
- Ethnic Background: _____
 -
 - Country of Origin: _____
35. What was your spouse’s occupational status at the time of your first breast biopsy: (Mark all that apply)
- Retired
 - Homemaker
 - Work Full-time, Occupation: _____
 - Work Part-time, Occupation: _____
 - Unemployed or laid off, Duration of unemployment: _____ (years, months)
 - Previous occupation: _____

- Other (please specify): _____
36. What is your partner’s current work status? (Mark all that apply)
- Retired
 - Homemaker
 - Work Full-time, Occupation: _____
 - Work Part-time, Occupation: _____
 - Unemployed or laid off, Duration of unemployment: _____ (years, months)
 - Previous occupation: _____
 - Other (please specify): _____
37. What is the highest level of education that this partner has achieved?
- Elementary School
 - High School
 - College (diploma)
 - University (degree)
 - Postgraduate Program (Please check: __ Masters __ PhD)
 - Postgraduate Professional School Program (e.g. Medical school, dental school)

Contact Information

Thank you for taking the time to complete this questionnaire. Should the need arise, may we call you again?

- No
- Yes
- Telephone number: _____
- Email : _____

In the case that we are unable to reach you at this number, please provide a telephone number of a relative that we can call to obtain your new contact information:

Name: _____ Relation-
ship: _____

Telephone number: _____

Email: _____

If you are changing you contact information, please call us at:+249115848962.

FOR OFFICE USE (to be completed by Study Personnel):

Participating centre: _____, Contact person:

Interviewer (if by phone):

Individual Identification No: _____

Date questionnaire sent: _____
Month - Day - Year

Date questionnaire received: _____
Month - Day - Year

Information received by: mail _____ telephone _____ email
_____ in clinic _____

PATIENT CONSENT

I.....
.....

Agree to be considered a volunteer and to provide information and investigations about my condition to participate in the study research done by Mrs. Ayda Hussein Omer Mustafa, about breast cancer and its effects on marital status .

I have been fully informed beforehand.

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