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Demographic and clinical predictors of breast cancer among Palestinian women

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ABSTRACT

Breast cancer is one of the most common invasive cancers in women. Factors contributing to breast cancer include demographic, clinical, social and psychological ones. This study was set out to highlight to how much extent the investigated demographic and clinical factors are associated with breast cancer. The study was carried on 200 patients who are suffering from breast cancer. Of the total, 197 patients were females, and the 3 remaining were males. Data was collected from the government hospitals in middle and northern parts of the West Bank, Palestine. For analyzing the data, descriptive stat and binary logistic regression were executed using SPSS 20. The mean age of patients was 48.9 (SD = 10.7). Estrogen receptors (ER) and progesterone receptors (PR), abortion, psychological distress, marital status, and career of patients have been found as predicting factors for breast cancer. In conclusion, breast cancer is a major threat for Palestinian women and healthy living. However, increasing awareness of this disease and its predictors and related risk factors such as abortion, psychological distress and others may limit such a disease. Also, implementation of a breast cancer screening program may also help in curing this disease in its early stages.

Keywords: Breast cancer, invasive, psychological distress, risk factors.

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INTRODUCTION

Breast cancer (BC) is one of the most common cancers in women worldwide, with nearly 1.7 million new cases diagnosed in 2012 (second most common cancer after lung cancer). This represents about 12% of all new cancer cases and 25% of all cancers in women (Ferlay et al., 2012). Latest estimates mention that more than one million new BC cases occur worldwide annually, with approximately 580,000 cases occurring in developed countries and the 420,000 remaining cases in developing countries (Ferlay et al., 2000).

In Palestine, breast cancer amounted to 35.4% of all types of cancers among Palestinian women. The percentage of incidence is 1 out of every 13 women. In 2013, 401 cases were diagnosed with breast cancer compared to 292 cases that were diagnosed with breast cancer in 2012 (Palestinian Ministry of Health (nd)).

However, breast cancer is classified according to its origin in the breast. For example, ductal breast cancer begins in cells of the duct that supply the milk to nipple, lobular breast cancer begins in the lobes of breast, invasive breast cancer that invades other parts than the original site, and inflammatory breast cancer begins in soft tissues of breast and becomes more aggressive (Breast Cancer Collaborative Group (nd)).

Estrogen and progesterone are hormones in women that control the development of secondary sex characteristics, such as breast development, armpit hair, pubic, and regulation of the menstrual cycle. A woman's production of estrogen and progesterone decreases with age, with a sharp decrease around menopause. Long-term exposure to these hormones increases breast cancer risk. Women who began menstruating early in

their life or went through menopause late in their life have a somewhat higher risk of breast cancer because their breast cells will be exposed to estrogen and progesterone for a longer time (Arndt et al., 2008).

In addition, about 1 of 5 breast cancers have too much of a growth-promoting protein called human epidermal growth factor receptor 2 (HER2/neu). The HER2/neu gene induces the cells to make this protein. Tumors with high levels of HER2/neu are referred to as HER2-positive.

Cancers that are HER2-positive have too many copies of the HER2/neu gene, resulting in greater than normal amounts of the HER2/neu protein. Such cancers tend to grow and spread in an aggressive way. All newly diagnosed invasive breast cancers should be tested for HER2/neu and the positive ones may benefit from treatment with drugs that target the HER2/neu protein (Verma et al., 2012).

It has been reported that the late menopause (> 55 year), early menstruation (< 12 year), having first child at an older age, or never having given birth may increase the risk of having breast cancer (Reid et al., 2015). Pregnancy may help in preventing breast cancer because it pushes breast cells into their final phase of maturation (Witkiewicz et al., 2011).

This study was set out to investigate the traditional contributing factors that may influence the risk of breast cancer, including: age at diagnosis, place of residence, career, marital status, lymph node metastasis, estrogen receptor, progesterone receptor, HER2, smoking, oral contraceptive use, abortion, family history, psychological status.

MATERIALS AND METHODS

Study design

A cross sectional survey design was followed to collect secondary data about breast cancer with reference to patient's medical documentaries at their diagnosing and treatment health settings. Medical data were collected using hospital patients' records, while the rest of data were collected by clinical interview or phone calling with patients.

Sample collection

The study was carried out in 2014 with reference to a sample of 200 patients with breast cancer, who are treated at north of the West Bank public hospitals, Palestine (Khalil Suliman Hospital in Jenin Governorate and Al-Watani Hospital in Nablus Governorate). Of the total sample, 197 individuals were female subjects, and the 3 remaining individuals were males.

Inclusion and exclusion criteria

In view of this present study, we have included all patients with breast cancer, and we have excluded all patients who have benign tumor, missing medical data in their files or whom we could not contact and reach to interview.

Data analysis

In this study, descriptive as well a binary logistic regression statistics were performed using SPSS 20 to identify the potential predictors of breast cancer.

RESULTS AND DISCUSSION

Table 1 presents the distribution of the main investigated variables among breast cancer patients, where the means and standard deviations of 200 subjects are depicted. When it comes to age mean for instance, it was found to be 48.94 with SD of 10.63. Also, 93% of the breast cancer patients were married. As far as smoking behavior, only 4% were smokers.

On the basis of encoding breast cancer (that is, the investigated dependent variable) and its related sites as (0 vs.1), (0 for left site and1 for right site) instead of (1 vs. 2), 200 cases were processed via implementing the binary logistic regression technique to determine to how much extent the studied independent variables really predict the binary response of patients on the dependent variable.

Referring to Table 2, where the Hosmer–Lemeshow test calibration results for the set analysis model indicate that the numbers of observed breast cancers are not significantly different from those predicted by the model and that the overall model fit is good.

Further checks were carried out on the fit for individual observations by inspection of various types of residuals (differences between the observed and expected values), where it was found clearly that the observations have a strong influence on the fitted model. For further details, the provided contingency outcomes for Hosmer and Lemeshow test make it more clear (Table 3).

The Hosmer–Lemeshow test indicates that the numbers of observed breast cancers are not significantly different from the predicted ones by the model and that the overall model fit is good. It is clear that the observed cases are not that much different from the expected ones, which means that the overall model fit is good.

R^2 for testing the power size of the logistic regression

The Cox & Snell and the Nagelkerke R^2 are two of such important statistics which were carried out. The calculated values for the provided data found to be as 0.073 and 0.098, respectively. Knowing that the maximum value that the Cox & Snell R^2 attains is less than 1 and the Nagelkerke R^2 as an adjusted version of the Cox & Snell R^2 covers the full range from 0 to 1, though the R^2 statistics do not measure the goodness of fit of the model but indicates how useful the explanatory variables are powerful in predicting the response variable (that is, the breast cancer). From here, they can be referred to as measures of effect size. With the provided

Table 1. Descriptive statistics of the studied breast cancer patients, where means and standard deviations are given for each studied variable.

Parameter	N	Mean	SD
Age	200	48.94	10.673
Residence	200	1.42	0.495
Employment	200	0.10	0.301
Marital status	200	0.93	0.413
Lymph node metastasis	200	0.53	0.500
Estrogen receptor	200	0.59	0.494
Progesterone receptor	200	0.52	0.501
HER-2	200	0.27	0.445
Smoking behavior	200	0.04	0.184
Oral contraceptive use	200	0.26	0.440
Abortion	200	0.60	0.492
Family history	200	0.36	0.481
Psychological distress	200	0.69	0.464
Site of breast cancer	200	1.48	0.501
Valid N (listwise)	200		

SD = Standard deviation.

Table 2. Hosmer and Lemeshow test of overall model fitness.

Step	Chi-square	df	Sig.
1	5.255	8	0.730

Table 3. Contingency outcomes for Hosmer and Lemeshow test of observed and predicted values.

		Site of breast cancer - 1		Site of breast cancer – 2		Total
		Observed	Expected	Observed	Expected	
Step 1	1	15	15.113	5	4.887	20
	2	14	13.775	6	6.225	20
	3	13	12.503	7	7.497	20
	4	11	11.354	9	8.646	20
	5	9	10.538	11	9.462	20
	6	11	9.625	9	10.375	20
	7	11	9.365	10	11.635	21
	8	5	8.408	15	11.592	20
	9	7	7.621	13	12.379	20
	10	8	5.697	11	13.303	19

outcomes with confidence, it might be said that the calculated values indicate that the model is a useful one in predicting breast cancer and related sites (Table 4).

Furthermore, for testing the explanatory parameters at interval of confidence (95%), the Wald statistic test for the coefficients of the residence, career, marital status, lymph node metastasis, estrogen receptor, progesterone receptor, HER2, smoking, oral contraceptive use, abortion, family history, and psychological distress indicates that many of such explanatory factors do contribute significantly in predicting breast cancer. In such cases, particularly, the calculated values of career, marital status, estrogen receptor, progesterone receptor, abortion, and psychological distress found to be superiors to the tabulated p values (Table 5). Such results are consistent with previous studies. Career has shown to be significant risk factor for breast cancer, an outcome that is confirming Pergolottii et al. (2014) findings. Despite

Table 4. Cox & Snell and the Nagelkerke R^2 model summary for the provided data for a logistic regression outcomes.

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	261.695[a]	0.073	0.098

a. Estimation terminated at iteration number 4 because parameter estimates changed by less than .001.

Table 5. Variables contributing to be included in the equation of predicting breast cancer.

		B	S.E.	Wald	df	Sig.	Exp (B)/odds ratios	95% C.I. for EXP(B)	
								Lower	Upper
Step 1[a]	Residence	0.101	0.315	0.103	1	0.748	1.106	0.597	2.051
	Career	0.509	0.529	0.928	1	0.336	1.664	0.590	4.694
	Marital status	0.372	0.419	0.790	1	0.374	1.451	0.638	3.300
	Lymph node metastasis	0.176	0.314	0.312	1	0.576	1.192	0.644	2.208
	Estrogen receptor	-0.556	0.386	2.072	1	0.150	0.574	0.269	1.223
	Progesterone receptor	0.311	0.385	0.652	1	0.419	1.365	0.642	2.903
	HER2	0.185	0.347	0.285	1	0.593	1.203	0.610	2.374
	Smoking	-0.142	0.859	0.027	1	0.869	0.868	0.161	4.675
	Oral contraceptive use	0.238	0.343	0.480	1	0.489	1.268	0.647	2.485
	Abortion	-0.402	0.363	1.226	1	0.268	0.669	0.328	1.363
	Family history	-0.053	0.315	0.028	1	0.867	0.949	0.512	1.757
	Psychological status	0.920	.339	7.345	1	0.007	2.509	1.290	4.881
	Constant	-1.552	0.946	2.695	1	0.101	0.212		

many previous studies such as Kruk (2014) and Izano et al. (2014) who showed that smoking increases the risk for breast cancer, our study displays that smoking is not significant in having breast cancer, for most of the Palestinian women are non-smokers. Married patients have been found to be at higher risk in developing breast cancer. Such result could be due to the fact that the percentage of spinsterhood in Palestine is low, which is in agreement with results reported by Rosner et al. (1994). The results showed that ER and PR are risk factors in breast cancer, confirming results by Moon et al. (2011) and Newman et al. (2014). However, ER and PR are hormonal receptors that regulate growth and differentiation of normal breast tissues.

When it comes to abortion and psychological distress the study shows that they are potential risk factors for breast cancer. Such findings are in agreement with previous studies such as Hosseinzadeh et al. (2014) and O'Neill et al. (2015).

Further analyses were used, where the fitted model included all variables and the tests outcomes as shown in Table 5 indicate that all predictors were retained to be in the equation. Several models may produce equally good statistical fits for a set of data, therefore, it is important when choosing any statistical model to take in account further the biological or the clinical considerations of the investigated case and not merely depend on statistical results.

Finally, the output which is highlighted in Table 5, where the Wald tests of other variables are given, such variables do contribute to the drawn model. This is also seen clearly in the provided

confidence intervals for odds ratios (probability ratios), where none of which include the exact value of 1. Once the Wald value is higher than the significance value then the parameter is considered as a risk factor. The psychological distress is shown to give the highest significance as risk factor for the breast cancer. In contrary, smoking significance was found as very low.

Since there are more than one explanatory variable in our model, odds ratio for any variable no doubt depends on the values of other variables. The higher the odds ratio for a particular variable, the higher the significance will be.

CONCLUSION AND RECOMMENDATIONS

In this study, many factors have been found to play a role in breast cancer among Palestinian women, such as career, marital status, ER, PR, abortion, and psychological distress.

In general, breast cancer occurs in all stages of life, so women, at all stages of their life are highly recommended to increase their awareness about this serious disease. Also, screening programs should be implemented to early detect this disease while it is in its early stages where it will be managed easily. Furthermore, adhering to cancer prevention programs no doubt will help in major reduction of death due to breast cancer (Cloud et al., 2015).

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