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Research article

Prevalence of Breast Cancer in Delta State, Nigeria

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ABSTRACT

Prevalence of Breast Cancer in Delta State, Nigeria was discussed in this paper. Secondary data sourced from the records units of five hospitals in delta state was used. Cross tabulation, Chi-square test for independence, Regression Analysis, Correlation Analysis and Odds Ratio were applied on the three year study, from which it was found that breast cancer cases are independent on environmental factor and dependent on educational factor. A strong linear relationship exists between Breast Cancer and death from such disease, implying that increase in the number of breast cancer cases has very high positive effect on the occurrence of death ($r = 0.968$), 93.7% of the variation in death occurrence is explained by breast cancer. The probability of dying from breast cancer is higher in women 50 years and above than in younger women (age < 50 yrs).

Keywords: Breast Cancer, Odds Ratio, Relative Risk, Breast Self-Examination, Delta State.

1. INTRODUCTION

Breast cancer is cancer that develops from breast tissue.[1] Signs of breast cancer may include a lump in the breast, a change in breast shape, dimpling of the skin, fluid coming from the nipple, or a red scaly patch of skin.[2] In those with distant spread of the disease, there may be bone pain, swollen lymph nodes, shortness of breath, or yellow skin.[3] Risk factors for developing breast cancer include: female sex, obesity, lack of physical exercise, drinking alcohol, hormone replacement therapy during menopause, ionizing radiation, early age at first menstruation, having children late or not at all, older age, and family history.[2][4] About 5–10% of cases are due

to genes inherited from a person's parents, including BRCA1 (Breast Cancer 1) and BRCA2 (Breast Cancer 2) among others. Breast cancer most commonly develops in cells from the lining of milk ducts and the lobules that supply the ducts with milk. Cancers developing from the ducts are known as ductal carcinomas, while those developing from lobules are known as lobular carcinomas.[2] In addition, there are more than 18 other sub-types of breast cancer. Some cancers develop from pre-invasive lesions such as ductal carcinoma in situ.[4] The diagnosis of breast cancer is confirmed by taking a biopsy of the concerning lump. Once the diagnosis is made, further tests are done to determine if the cancer has spread beyond the breast and which treatments it may respond to.[2] The balance of benefits versus harms of breast cancer screening is controversial. A 2013 Cochrane review stated that it is unclear if mammographic screening does more good or harm.[5] A 2009 review for the US Preventive Services Task Force found evidence of benefit in those 40 to 70 years of age,[6] and the organization recommends screening every two years in women 50 to 74 years old.[7] The medications tamoxifen or raloxifene may be used in an effort to prevent breast cancer in those who are at high risk of developing it.[4]Surgical removal of both breasts is another useful preventative measure in some high risk women.[4] In those who have been diagnosed with cancer, a number of treatments may be used, including surgery, radiation therapy, chemotherapy, hormonal therapy and targeted therapy.[2] Types of surgery vary from breast-conserving surgery to mastectomy.[8][9]Breast reconstruction may take place at the time of surgery or at a later date. In those in whom the cancer has spread to other parts of the body, treatments are mostly aimed at improving quality of life and comfort.[9] Outcomes for breast cancer vary depending on the cancer type, extent of disease, and person's age.[9] Survival rates in the developed world are high,[10] with between 80% and 90% of those in England and the United Statesalive for at least 5 years.[11][12] In developing countries survival rates are poorer.[4] Worldwide, breast cancer is the leading type of cancer in women, accounting for 25% of all cases.[13] In 2012 it resulted in 1.68 million cases and 522,000 deaths.[13] It is more common in developed countries[4] and is more than 100 times more common in women than in men.[10][14Risk factors can be divided into two categories: modifiable risk factors (things that people can change themselves, such as consumption of alcoholic beverages), and fixed risk factors (things that cannot be changed, such as age and biological sex).[15]The primary risk factors for breast cancer are female sex and older age.[16] Other potential risk factors include: genetics,[17] lack of childbearing or lack of breastfeeding,[18] higher levels of certain hormones,[19][20] certain dietary patterns, and obesity. Recent studies have indicated that exposure to light pollution is a risk factor for the development of breast cancer.[21] Therefore in this paper, we intend to;

i. Investigate the number of patients and deaths affected with breast cancer
ii. Test the effect of Educational level, and environment on breast cancer incidence
iii. Examine the trend in breast cancer.
iv. Measure the relative risk associated with breast cancer.

2. METHODOLOGY

To achieve the set objectives, data pertaining the subject matter was obtained from the records unit of five hospitals in different local government areas of delta state, these hospitals include; Federal Medical Centre Asaba, Federal Medical Centre Agbor, Ekpan Government Hospital Warri, Baptist Medical Centre Eku, and Mariere Memorial Central Hospital Ughelli. The following models were applied on the data;

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2.1 CHI-SQUARE TEST FOR INDEPENDENCE

This test was applied to investigate the agreement between the observed and expected frequencies;

$$\chi^2 = \sum_{i=1}^{r}\sum_{j=1}^{c}\frac{(o_{ij} - e_{ij})^2}{e_{ij}}$$

and to test the hypothesis of independence

H_o: The Classification are independent

H_1: The Classification are independent

2.2 REGRESSION MODEL

Here we shall make use of the estimated model given by;

$$\hat{Y} = a + bX$$

to determine the relationship between the number of breast cancer patients and their death cases
Where,

$$\hat{b} = \frac{(n\sum xy - (\sum x)(\sum y))}{n\sum x^2 - (\sum x)^2}$$

$$\hat{a} = \frac{(\sum y - b(\sum x))}{n}$$

2.3 CORRELATION COEFFICIENT 'r' AND COEFFICIENT OF DETERMINATION 'R^2'

$$r = \frac{n\sum xy - \sum x\sum y}{\{(\sum x^2 - (\sum x)^2) - (n\sum y^2 - (\sum y)^2\}^{1/2}}$$

$$R^2 = \frac{SS_{YY} - SS_E}{SS_{YY}} = 1 - \frac{SS_E}{SS_{YY}} \qquad 0 < R^2 < 1$$

2.4 ODDS RATIO

We employed this ratio to measure the risk of experiencing the outcome under study when the antecedent factor is present.

	B	$\bar{B}$	TOTAL
A	P_{11}	P_{12}	$P_{1.}$
$\bar{A}$	P_{21}	P_{22}	$P_{2.}$
TOTAL	$P_{.1}$	$P_{.2}$	$P_{..}$

Therefore,

$$O_A = \frac{P_{11}}{P_{12}}$$

$$O_{\bar{A}} = \frac{P_{21}}{P_{22}}$$

Thus, the estimated odds ratio is;

$$O = \frac{O_A}{O_{\bar{A}}} = \frac{P_{11}\,P_{22}}{P_{12}\,P_{21}}$$

$$S.E\,(O) = \frac{O}{(n)^{1/2}} = \left\{ \frac{1}{P_{11}} + \frac{1}{P_{12}} + \frac{1}{P_{21}} + \frac{1}{P_{22}} \right\}^{1/2}$$

$$RR = \frac{P\,(B/A)}{P\,(\bar{B}/A)}$$

3. DATA ANALYSIS AND RESULTS

3.1 CHI-SQUARE TEST FOR INDEPENDENCE OF ENVIRONMENT ON BREAST CANCER CASES

Table 1: Data Showing Age and Environment on Breast Cancer

Age	Environment		Total
	Urban	Rural	
< 50	54	25	79
≥ 50	37	21	58
Total	91	46	137

Ho: Breast Cancer cases are independent on Environmental factor

H_1 : Breast Cancer cases are dependent on Environmental factor

Table 2: Age * Environment Cross tabulation

			Environment		
			Urban	Rural	Total
Age	< 50	Count	54	25	79
		Expected Count	52.5	26.5	79.0
	≥ 50	Count	37	21	58
		Expected Count	38.5	19.5	58.0
Total		Count	91	46	137
		Expected Count	91.0	46.0	137.0

Table 3: Chi-Square Test

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.312[a]	1	.576		
Continuity Correction	.141	1	.707		
Likelihood Ratio	.311	1	.577		
Fisher's Exact Test				.588	.353
Linear-by-Linear Association	.310	1	.578		
N of Valid Cases	137				

From Table 3, we see that "$\chi^2_{cal} = 0.312$", this χ^2 value is less than the "$\chi^2_{0.05,\ 1} = 3.841$" thus, we do not reject the null hypothesis and therefore conclude that breast cancer cases are independent on environmental factor/place of residence.

3.2 CHI-SQUARE TEST FOR INDEPENDENCE OF EDUCATIONAL LEVEL ON BREAST CANCER CASES

Table 4: Data Showing Age and Educational Level on Breast Cancer

Age	Educational Level			Total
	Tertiary	Secondary	Primary	
< 50	24	33	22	79
≥ 50	9	22	27	58
Total	33	55	49	137

Ho : Breast Cancer cases are independent on Educational Level

H_1 : Breast Cancer cases are dependent on Educational Level

Table 5: Age * Educational Level Cross tabulation

			Educational Level			Total
			Tertiary	Secondary	Primary	
Age	< 50	Count	24	33	22	79
		Expected Count	19.0	31.7	28.3	79.0
	≥ 50	Count	9	22	27	58
		Expected Count	14.0	23.3	20.7	58.0
Total		Count	33	55	49	137
		Expected Count	33.0	55.0	49.0	137.0

Table 6: Chi-Square Test

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.461[a]	2	.040
Likelihood Ratio	6.569	2	.037
Linear-by-Linear Association	6.395	1	.011
N of Valid Cases	137		

From Table6, we see that "$\chi^2_{cal} = 6.461$" , this χ^2 value is greater than the "$\chi^2_{0.05,\,2} = 5.991$" thus, we reject the null hypothesis and therefore conclude that breast cancer cases are dependent on educational level.

3.3 REGRESSION ANALYSIS ON THE TOTAL NUMBER OF BREAST CANCER CASES AND DEATH FROM SUCH CASES

Table 7: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.968[a]	.937	.925	3.046

Table 8: Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.02	1.766		-.807	.041
	Breast Cancer Cases	.591	.068	.968	8.638	.000

Table 7clearly shows a strong linear relationship exists between Breast Cancer and death from such disease, implying that increase in the number of breast cancer cases has very high positive effect on the occurrence of death (r = 0.968). Also, 93.7% of the variation in death occurrence is explained by breast cancer cases while 6.3% of the variation is due to other factors other than breast cancer. Table 8 shows that a unit increase in breast cancer cases results in an increase in the number of death occurrence (b = 0.591), implying that there is a direct relationship between the number of breast cancer cases and the number of death occurrence from the disease.

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3.4 CALCULATION OF ODDS RATIO FOR BREAST CANCER CASES.

Table 9: Age * State of Patient

Age		State of Patients		Total
		Death	Alive	
A	< 50	36	43	79
$\bar{A}$	≥ 50	28	30	58
Total		71	66	137

Table 10 : Proportions; Age * State of Patient

Age		State of Patients		Total
		Death	Alive	
A	< 50	0.26	0.32	0.58
$\bar{A}$	≥ 50	0.20	0.22	0.42
Total		0.52	0.48	1

$$P(B/A) = \frac{P_{11}}{P_{1.}} = \frac{0.26}{0.58} = \frac{13}{29} = 0.45 \quad \text{----------(1)}$$

$$P(\bar{B}/A) = \frac{P_{11}}{P_{1.}} = \frac{0.32}{0.58} = \frac{16}{29} = 0.55 \quad \text{----------(2)}$$

$$O_A = \frac{P_{11}}{P_{12}} = \frac{0.26}{0.32} = \frac{13}{16} = 0.81 \quad \text{----------(3)}$$

$$O_{\bar{A}} = \frac{P_{21}}{P_{22}} = \frac{0.20}{0.22} = \frac{10}{11} = 0.91 \quad \text{----------(4)}$$

$$O = \frac{O_A}{O_{\bar{A}}} = \frac{P_{11}P_{22}}{P_{12}P_{21}} = \frac{0.26 * 0.22}{0.32 * 0.20} = \frac{0.05842}{0.064} = 0.91 \quad \text{--------(5)}$$

$$RR = \frac{P(B/A)}{P(\bar{B}/A)} = \frac{9}{11}$$

From the equations above, O_A is 13/16 implying that 13 out of every 16 breast cancer patients aged less than 50 years is expected to die. Similarly, $O_{\bar{A}}$ is 10/11 implying that 10 out of every 11 breast cancer patient aged more than 50 years is expected to die. Equation 5 revealed an odds ratio of 0.91 indicating that the odds of breast cancer patient aged less than 50 years dying is 9% lesser than those aged 50 years and above. Relative Risk of breast cancer patient dying is $^{9}/_{11}$ times higher for patients aged 50 years and above when compared with those aged below 50 years of age.

4. CONCLUSION AND RECOMMENDATION

Based on the findings so far, we hereby conclude that in Delta State Nigeria, breast cancer claims more life in Older women (age≥ 50 yrs) than in younger women (age < 50 yrs). Therefore, the government should by the use of health professionals educate women on Breast Self - Examination (BSE), women should be told about the benefit and limitation of BSE and also how to do it right. Also, medical managements should advice patients and the general public about currently available means of effective cancer prevention. Finally, women should report any changes in their breast look or feel to their health professionals.

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