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EVALUATION OF SOME FACTORS INFLUENCING BREAST CANCER IN ILORIN METROPOLIS, NIGERIA

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ABSTRACT: *This study examined the trends in the prevalence of breast cancer in Ilorin, Kwara State, Nigeria.* ***Breast cancer is an uncontrolled growth of breast cells,*** *Cancer occurs as a result of mutations, or abnormal changes, in the genes responsible for regulating the growth of cells and keeping them healthy. The focus of this research work was to evaluate the factors affect analyze some factors responsible for the survival of Breast cancer patient in Nigeria. Furthermore, this study used a total number of two hundred and six (206) dataset collected from the records of women between the ages of ≤15 and >45 years in the University of Ilorin Teaching Hospital (UITH), Kwara State. The methodology employed are non-parametric Kaplan-Meier method as well as Log-Rank statistic and the semi-parametric such as Cox proportional hazards regression model to analyze the data in order to determine the hazard ratios of the various covariates. The result obtained by the PHreg procedure indicated that stages of breast cancer, year of admission, and age of patients as factors influencing the outcome of breast cancer patient in Nigeria.*

KEYWORDS: *Survival Analysis, Breast Cancer, Kaplan-Meier Estimator, Log-Rank statistic, Cox proportional Regression, Nigeria*

1. INTRODUCTION

Breast cancer refers to a malignant tumor that has developed from cells in the breast. In other word, breast cancer is a disease in which cells in the breast grow out of control. There are different kinds of breast cancer, and the kind of breast cancer depends on which cells in the breast turn into cancer. Breast cancer can begin in different parts of the breast namely: lobules, ducts, and connective tissue. The lobules are the glands that produce milk. The ducts are tubes that carry milk to the nipple. The connective tissue (which consists of fibrous and fatty tissue) surrounds and holds everything together. However, most breast cancers begin in the ducts or lobules. Breast cancer starts when cells in the breast begin to grow out of control. These cells usually form a tumor that can often be seen on an x-ray or felt as a lump. The tumor is malignant (cancer) if the cells can grow into (invade) surrounding tissues or spread (metastasize) to distant areas of the body. Breast cancer occurs almost entirely in women, but also present in men too [12].

Statistics shown that more than one million new cases of female breast cancer are diagnosed each year [2]. This makes it to be the most frequently disease in women, accounting for over 1/3 of the estimated annual 4.7million cancer diagnosis in females and the second most common tumor after lung cancer in both sexes. Breast cancer is the most frequent disease associated with female in developed as well as developing countries with 55% of it occurrence in the developing countries such as Nigeria. Furthermore, it was shown since 1975 that the annual worldwide breast cancer incidences had almost doubled which means that the prevalence and incidences increased with increasing age [1].

Moreover, WHO [13] documented that since 1987, breast cancer rates increased by 0.5% each year and between 85% and 90% of the cases cannot be attributed to inherited genetic predisposition. However, breast cancer in developed countries is a major public health problem claiming over one million lives annually especially in industrialized nations. Statistics shown that countries like United States of America, Italy, Australia, Germany, Netherlands, Canada and France have the highest overall breast cancer rates while developing countries with lower breast cancer rates are Northern Africa and Eastern Asia [14].

Death rates of 76/100,000 females was estimated to occur in 2020 [9].

Statistics shown that 883,000 cases are in less developed countries and 794,000 in most developed countries [5]. According to the data released by Cancer Research UK, the occurrence of breast cancer among 100,000 women amounts to 145.2 in Belgium and 66.3 in Poland [6].

In the same vein, incidence of breast cancer in the United States is one out of eight women and In Asia one woman suffers from breast cancer out of 35. In Iran, there are 10 cases in 100,000 populations and

7000 new cases have been reported annually [7]. More so, Breast cancer is found mostly in highly populated areas of South Asian developing counties and new cases of breast cancer in China were 168,013 in 2005 and 121,269 in 2000. [8] and [10]. About 75% of women with breast cancer in developing countries are diagnosed in clinical stages III and IV, whereas approximately 70% of newly diagnosed women with breast cancer in North America are in stages 0 and 1 [11].

2. MATERIALS AND METHODS

2.1 Data Description

This study used a secondary data obtained from the records of 206 breast cancer patients registered at University of Ilorin Teaching Hospital (UITH), Ilorin, Kwara state. The information collected were based on the year of admission (2014, 2015, 2016, 2017 and 2018), outcome, length of stay at the hospital, age, gender as well as categories of breast cancer (stage I, stage II, stage IV, and advance stage).

2.2 Summary of data presentation

Table 1: Frequency table showing Age of patients

Age	Freqency	Events	Censored		Valid (%)	Cum. (%)
			N	%		
≤15 years	5	2	3	60%	2.4%	2.4%
15-30 years	9	2	7	78%	4.4%	6.8%
31-45 years	69	7	62	90%	33.5%	40.3%
>45 years	123	23	100	81%	59.7%	100.0%
Total	**206**	**34**	**172**	**83%**	**100.0%**	

Table 1 shows the age distribution of the patients and it was observed within the age bracket that thirty-four (34) patients got the event (i.e dead) out of the records of two hundred and six (206) patients collected.

Table 1.1: Frequency table showing Categories of Breast Cancer

Stages	Frequency	Events	Censored		Valid (%)	Cum. (%)
			N	%		
I	19	5	14	73.7%	9.2%	9.2%
II	25	3	22	88.0%	12.2%	21.4%
IV	52	7	45	86.5%	25.2%	46.6%
Advance	110	19	91	82.7%	53.4%	100.0%
Total	**206**	**34**	**172**	**83.5%**	**100.0%**	

Table 1.1 indicates the categories of breast cancer which reveals that thirty-four (34) event (i.e dead) occurred among the stages of breast cancer recorded from the records of two hundred and six (206) patients collected.

Table 1.2: Frequency table showing Year of Admission of patients

Admission Year	Frequency	Events	Censored		Valid (%)	Cum. (%)
			N	%		
2014	42	11	31	73.8%	20.4%	20.4%
2015	46	6	40	87.0%	22.3%	42.7%
2016	7	1	6	85.7%	3.4%	46.1%
2017	28	2	26	92.9%	13.6%	59.7%
2018	83	14	69	83.1%	40.3%	100%
Total	**206**	**34**	**172**	**83.5%**	**100.0%**	

Table 1.2 shows different admission years of the patients and it was shown that thirty-four (34) patients got the event (i.e dead) out of the records of two hundred and six (206) patients collected within the year interval.

3. DATA ANALYSIS AND RESULT

3.1 DESCRIPTIVE STATISTICS

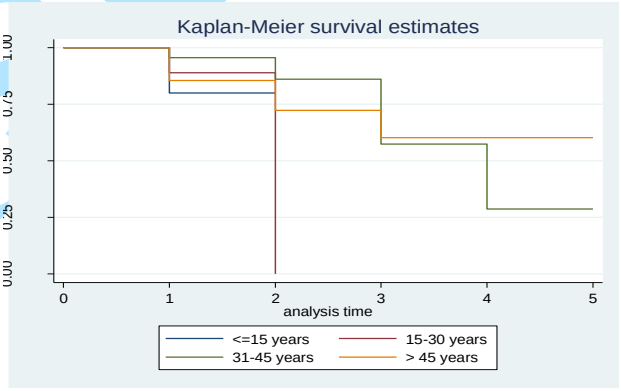

Fig 1: Survival curve on Age Distribution of Breast Cancer patients with log-rank p-value = 0.0421

Figure 1 shows the survivorship function based on the age distribution of breast cancer patients with the number at risk at several time points.

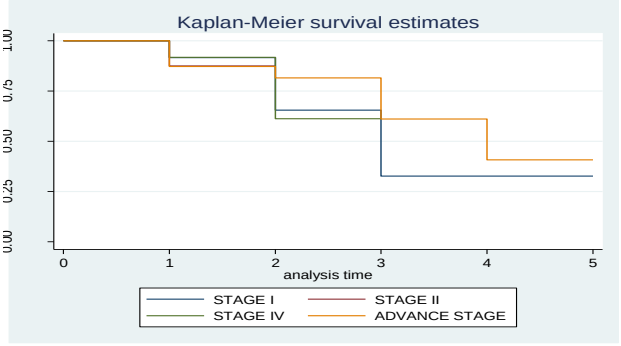

Fig 2: Survival curve on stages of Breast Cancer with log-rank p-value = 0.0253

Figure 2 reveals the survivorship function on stages of breast cancer which include the number at risk at several time points.

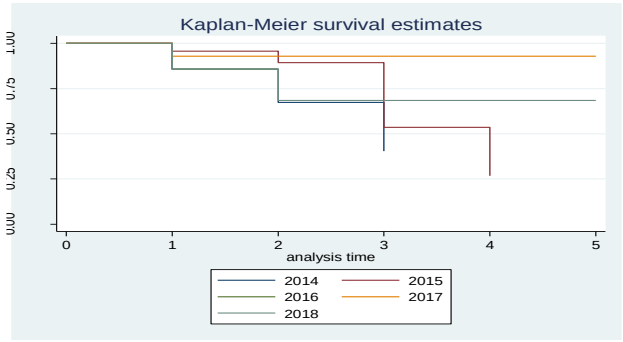

Fig 3: Survival curve on the year of admission of Breast Cancer patients with log-rank p-value = 0.4282

Figure 3 reveals the survivorship function on the year of admission of breast cancer patients which include the number at risk at several time points.

3.2 Log rank test

Test statistic:

$$\Sigma \frac{(Oi-Ei)}{var(Oi-Ei)} \text{ , i=1, 2, 3... } \sim \chi^2_{(df),i=1,2,3\ldots n}$$

H_o: All survival curves are not the same.

Vs

H_1: All survival curves are the same.

Decision rule: Reject H_o if P-Value <α, otherwise do not reject H_o.

Table 2: Log-Rank Test Comparing Age Distribution of Patients

Age	N	Event Observed	Event Expected
<15 years	5	1	0.84
16-30 years	9	2	1.15
31-45 years	69	8	12.75
> 45 years	123	23	19.26
Total	206	34	34.00

X^2 = 3.67 **p-value= 0.0421**

Table 2 shows that the survival functions for the age distribution of breast cancer patients are different from each other.

Table 3: Log-Rank Test Comparing Categories of Breast Cancer

Categories of Breast Cancer	N	Event Observed	Event Expected
Stage I	19	5	4.33
Stage II	25	3	2.97
Stage IV	52	7	6.96
Advance Stage	110	19	19.75
Total	206	34	34.00

X^2 = 0.15 **p-value = 0.0253**

Table 3 indicates that the survival functions for the stages of breast cancer patients are not the same.

Table 4: Log-Rank Test Comparing Admission Year of Patients

Year Of Admission	N	Event Observed	Event Expected
2014	42	10	7.69
2015	46	6	8.78
2016	7	1	1.07
2017	28	2	4.20
2018	83	15	12.26
Total	206	34	34.00

X^2 = 3.84 **p-value = 0.4282**

Table 4 indicates that the survival functions based on year of admission of breast cancer patients are similar.

Table 5: Cox Proportional Hazards Model Results.

Covariates	Reg. Coeff.	Haz. Ratio	Std. Err.	Z	P(Z)	5[95% C.I]	
Age							
16-30 years	0.31	1.36	1.73	0.04	0.81	0.11	16.41
31-45 years	-0.76	0.47	0.54	0.01	0.51	0.05	4.44
>45 years	0.02	1.02	1.12	0.02	0.99	0.12	8.77
2015	-0.68	0.51	0.28	-1.24	0.21	0.17	1.48
2016	-0.30	0.74	0.79	-0.28	0.78	0.09	5.99
2017	-1.21	0.30	0.24	-1.52	0.13	0.06	1.42
2018	-0.18	0.83	0.41	-0.37	0.71	0.32	2.18
Categories							
Stage II	-0.33	0.72	0.57	0.01	0.68	0.16	3.35
Stage IV	-0.15	0.86	0.52	0.04	0.81	0.26	2.83
Advance Stage	-0.29	0.75	0.42	0.02	0.61	0.25	2.25

The model fitted for the data on Diabetes Patients is given below

$h(t,X)=h_o(t)\exp(\sum_{i=1}^{p}\beta_i X_i) = h_o(t)e^{(\beta_1X_1+\beta_2X_2+\beta_3X_3+\cdots+\beta_pX_p)}$

$h_o(t)e^{(0.3086X_1 - 0.7642X_2 - 0.0165X_3 - 0.6798X_4 - 0.3011X_5 - 1.2076X_6 - 0.1835X_7 - 0.3257X_8 - 0.1451X_9 - 0.2909X_{10})}$

The hazard ratio for different Breast Cancer categories were obtained, this means that the estimated regression coefficients, (coef), and the hazard ratio (exp (coef)) between the groups of covariates were obtained. Meanwhile, the hazard ratio which will be used to interpret the Cox proportional hazards model is compared based on its closeness to 1. The hazard ratio of age distribution

of patients was analyzed and showed that patients within the age range 16-30 years, 31-45 years, and > 45 years were suffering more from breast cancer as compared to the baseline hazard age range (that is patients within age ≤ 15 years). To test whether the covariates have any significant effect in the model, their p- values were compared to the significance level (0.05) and it was observed that covariates such as age as well as the stages of breast cancer having their p-value less than the significant level (α=0.05) were statistically significantly contributed to the model.

CONCLUSION AND RECOMMENDATION

Based on the analysis of the data, it can be established that:
Patients within age bracket ≤ 15 years survive better from breast cancer than the other age brackets.
Stage I breast cancer has a better survival prognosis (i.e., maintenance) than patients with stage II, stage IV, and the advance stage breast cancer respectively.
The survival of breast cancer patients with respect to age and categories of breast cancer were different, while the years of admission of breast cancer patients were not.
It was observed that age distribution of breast cancer patients and the stages of breast cancer was significant factor, i.e both covariates contributed to the model significantly.
The further researcher should try other methods to know which other covariates contributes significantly to the model different from the age and the stages of breast cancer.

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