Research Article **ISSN 2639-944X**

Journal of Medical - Clinical Research & Reviews

The Cost Implications of Orthodox Breast Cancer Care: The Perspective of Breast Cancer Patients in Port Harcourt, Nigeria

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Received: 25 Feb 2026; **Accepted:** 26 Mar 2026; **Published:** 02 Apr 2026

Citation: Ijah RF, Adeniji FO, Igwe SR, et al. The Cost Implications of Orthodox Breast Cancer Care: The Perspective of Breast Cancer Patients in Port Harcourt, Nigeria. J Med - Clin Res & Rev. 2026; 10(4): 1-11.

ABSTRACT

Background: *Global breast cancer status as reported in 2022 revealed an estimated 2.3 million new cases and 666,000 breast cancer-related deaths, accounting for 23.8 % of all cancer cases and 15.4 % of deaths among women. This study evaluated the orthodox (hospital) cost of breast cancer care among women diagnosed with breast cancer in Port Harcourt, Nigeria, from the healthcare payers' perspective.*

Methods: *A cross-sectional analytical study was carried out among breast cancer patients in two teaching hospitals using questionnaires in Port Harcourt, Nigeria.*

Results: *A total of 276 consenting histologically confirmed patients were used for quantitative study. The study was analysed using descriptive statistics with the aid of SPSS version 21 and Microsoft excel. The mean age of the study participant was 48.2 years. The average monthly income of 211 (76%) respondents was less than 230 USD. The average total direct medical costs for orthodox breast cancer care per patient was equivalent to ₦14,346,501.00 (9,564.36 USD). The average direct non-medical cost for orthodox care was ₦954,380.76 per patient and ₦1,908,761.52 (1272.50 USD) per household. The indirect non-medical cost for orthodox care was ₦962,222.60 (641.48 USD), and ₦1,924,445.21 (1,282.96 USD) per household. The cumulative costs of orthodox medical (hospital) breast cancer care were ₦18,179,707.73 (12,119.8 USD).*

Conclusion: *This study uncovered the orthodox costs of breast cancer per patient and household, as seen through the lenses of the healthcare payers. Catastrophic expenditure was observed, and out-of-pocket expenses was the dominant mode of payment. Concerted efforts are needed to subsidise breast cancer care.*

Keywords

Breast Cancer, Orthodox costs, Economic Impact, Patients, Perspective, Port Harcourt, Nigeria.

Introduction

"Global breast cancer status as reported in 2022 revealed an estimated 2.3 million new cases and 666,000 breast cancer-related deaths, accounting for 23.8 % of all cancer cases and 15.4 % of deaths among women. [1]" Breast cancer care servicers includes chemotherapy, surgery, radiotherapy, hormonal therapy, immunotherapy/targeted therapy, etc., and the economic burden of breast cancer may vary in different countries: Korea from 2007-

2010 [2], in Iran [3], in the European Union [4], in the United States of America [5], in India [6] and in systematic review [7], have been reported. A Swedish study documented a total cost of breast cancer in 2002 as 3.0 billion SEK [8]. The economic impact of breast cancer can be viewed from societal, health care provider's, and the health care payer's perspectives, with the latter comprising direct medical, direct non-medical and indirect non-medical costs [9,10].

The direct medical cost articulates the cost of medical diagnosis and all forms of treatment of breast cancer. The direct non-medical costs refer to other illness-related expenses made other than direct payments made for diagnosis and treatments, and examples include monies spent on transportation, feeding and accommodation of care givers. The indirect non-medical costs accounts for income that would have been earned but was deprived due to diagnosis and treatment for breast cancer.

There are also variations in the costs of breast cancer care in Africa. The annual direct cost of breast cancer care has been reported to be GH¢2,070.83 per patient in Ghana, and the indirect annual cost was reported to be GH¢3,937.16 per patient in Ghana [11]. Yet in another Ghanaian study, the average direct medical expenses was GHS 4,311.90, the direct non-medical cost was reported as GHS 823, while the indirect non-medical cost was reported to be GHS 272.40 [12].

In South Africa, the total direct medical cost was ZAR3 154 877 for 200 patients with ZAR15 774 reported as average per patient [13]. In Addis Ababa the mean direct medical cost was reported as 893.02 USD per patient in 2015/2016 [14].

Healthcare financing for breast cancer is challenging globally [15-17]. Health care financing options are reported to be limited for cancer patients in Nigeria [18], and out-of-pocket expenses is very common as over 70% of breast cancer patients experience catastrophic healthcare expenditure [19,20]. This is similar to what obtains in most low and middle-income countries like India [21,22], Bangladesh [23], Vietnam [24,25], Iran [26], Thailand [27] and others [28,29]. Measures at improving healthcare services at national and sub-national levels through primary healthcare care involvement have been recommended [30,31]. This study evaluated the medical (orthodox) cost (direct medical cost, direct non-medical cost and indirect nonmedical cost) and its impact on women diagnosed with breast cancer in Port Harcourt, Nigeria within a-3year (January 2022-December 2024) from the healthcare payers' perspective.

Materials and Methods

Research Design

A cross-sectional analytical study was carried out.

Study Area

This study was carried out in Port Harcourt, the capital city of Rivers State - being one of the thirty-six States in the Federal Republic of Nigeria. Port Harcourt is the fifth (5th) populous city in Nigeria with a population of 1,148,665, after Lagos, Kano, Kaduna, and Ibadan in descending order [32].

Study Setting

The study settings were the breast clinics and surgical wards at the University of Port Harcourt Teaching Hospital (UPTH) and the Rivers State University Teaching Hospital (RSUTH) – both are tertiary healthcare facility located in Port Harcourt.

Study Population

Consenting histologically confirmed breast cancer patients and their relatives were used for the study. Patients who were between 18 years of age or older and who are on treatment for 3 months to 2 years since diagnosis. Patients with any other cancers, or who were pregnant, failed to attend scheduled medical appointments regularly, or were too ill in intensive or emergency room treatment were excluded.

Sample Size Determination

The minimum sample size was determined using the Cochran's sample size formula for continuous data (for survey), based on estimated population of histologically confirmed breast cancer in the UPTH over three-year period from 2018-2020, estimated to be 56.

$$n_0 = \frac{(t)^2 X (s)^2}{d^2} = \frac{(1.96)^2 X (1,679)^2}{7 X 0.03^2} = 118$$

These calculations are as follows:

$$n_1 = \frac{n_0}{1+n_0 / population} = \frac{118}{1+118 / 1679} = 111.$$

Where population size = 1,679.

Where n_0 = required return sample size according to Cochran's formula= 118. n_1 = required return sample size because sample >5% of population.

Sampling Method

Total population of consenting patients who met the inclusion criteria was used for the questionnaire-based (quantitative) data. Consent was obtained before administration of questionnaire.

Study Instrument

Medical records of patients were used to confirm the disease status. The predesigned, pretested semi-structured interviewer-administered questionnaires, filled by the patients/relatives. Out of 320 questionnaires distributed to the patients (or relatives of patients) who had breast cancer, 276 were returned (gave consent for inclusion in the study), and these gives an overall response rate of 86%.

Validity/Reliability of Instrument

Questionnaire was scrutinized by the author for authenticity or otherwise and pre-tested before use. The Cronbach alpha (in SPSS) was used for the validity of the study instrument, and a

value of was 0.975 was obtained.

Study variables

The variables of interest in the study included: sociodemographic data, income bracket, patient's awareness of breast cancer, cost or expenses made for orthodox breast cancer care (direct medical cost, direct non-medical cost, indirect non-medical cost); modes of payment for breast cancer; and sources of financing of breast cancer care services.

Data Analysis

Descriptive statistics was used in analyzing the research questions posed on this study. The Cronbach's alpha coefficient was used to measure the internal consistency or reliability of a set of survey items. In this study, the Cronbach's alpha was 0.975 showing that the collection of items was consistently measured with the same characteristics, and from the item statistics table, the corrected item-total correlation for ninety (90) questions were above 0.900, and thus, seven questions or items was deleted.

Results

Figure 1 shows a chart of the occupation of breast cancer patients in Port Harcourt. Thirty-one percent were involved in different types of businesses, 26% were traders, 22% were civil servants, 8% were professionals, and 2% were oil company workers.

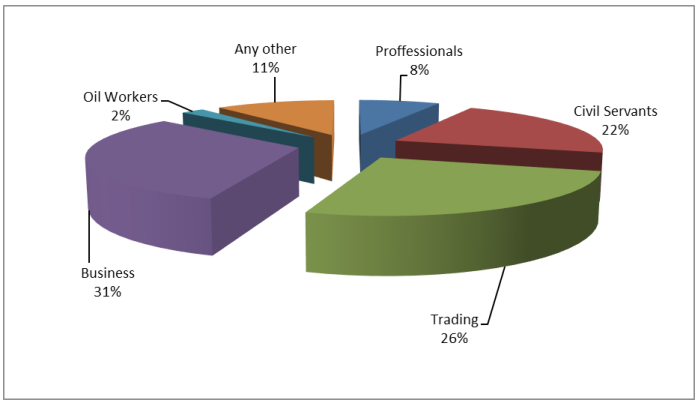

Figure 1: Chart Showing the Occupation of Breast Cancer Patients in Port Harcourt.

The socio-demographic and clinical characteristics of those included in the analysis were presented in Table 1. There were more females with breast cancer in Port Harcourt than the males: females: n = 274, 99.3%; males: n = 2, 0.7%. The mean age of the study participant was 48.2 years with the following age groups in descending order: 45 – 54 years (n = 91; 33%), 35 – 44 years (n = 65; 24%), 55 – 64 years (n = 59; 21%), 25 – 34 years (n = 34; 12%), 65 years and above (n = 24; 9%) and 15 – 24 years (n = 3; 1%). Out of the 276 breast cancer patients 78% (n = 214) were married, 17% (n = 48) single, 2.5% (n = 7) were divorced, 2% separated (n = 6), and 0.5% (n = 1) was widowed. One hundred and forty-eight (54%) respondents had tertiary/post-secondary school education, 102 (37%) had secondary school education, and 26 (9%) had primary level of education. The occupations of respondents in descending order of frequency were: 87 (32%) had business they owned as their occupation, 71 (26%) were traders, 60 (22%) were civil servants, 31 (11%) were engaged in other occupations, 21 (8%) were professionals, and 6 (2%) were oil workers. Majority of the participants were Christians (n = 261; 94%), 8 (3%) respondents were Moslems, while 7 (3%) were practitioners of other religions. Ninety-eight (36%) respondents had family size of 3 – 4 children, 65 (24%) had 1 – 2 children, 63 (23%) had more than 4 children, and 50 (18%) had no children.

Table 1: Socio-Demographic Information on Breast Cancer Patients (n = 276).

Variables		Frequency	Percentage (%)	Mean (Standard Deviation)
Sex	Male	2	0.7	1.99 (0.085)
	Female	274	99.3	
	Total	276	100	
Age (Years)	15 – 24	3	1	48.23 (1.173)
	25 – 34	34	12	
	35 – 44	65	24	
	45 – 54	91	33	
	55 – 64	59	21	
	65+	24	9	
Marital Status	Single	48	17	1.91 (0.568)
	Married	214	78	
	Separated	6	2	
	Divorced	7	2.5	
	Widowed	1	0.5	
Educational Status	Primary	26	9	2.44 (0.661)
	Secondary	102	37	
	Tertiary	148	54	
Occupation	Professionals	21	8	3.33 (1.355)
	Civil Servants	60	22	
	Trading	71	26	
	Business	87	32	
	Oil Worker	6	2	
	Any other	31	11	
	Christianity	261	94	
Religion	Islam	8	3	1.08 (0.353)
	Others	7	3	

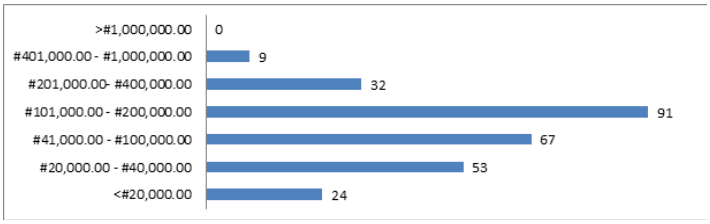

Figure 2: Chart Showing the Income Bracket of Breast Cancer Patients in Port Harcourt. (The symbols "#" represent Naira "₦" sign).

Figure 2 show the income bracket of respondents. The respondents' mean monthly income was ₦131,048.91. Twenty-four (9%) respondents had a monthly income of less than ₦20,000.00, 53

Table 2: Direct medical costs for Orthodox breast cancer care (n = 276).

Average amount spent on laboratory tests for diagnosis and care of Breast Cancer Patients.			Average amount spent on the hospital admission and out-patients 'visits and prescription for treatment of Breast Cancer			Average amount spent on follow-up appointments with health care specialist and cost of specialist care for treatment of Breast Cancer		
No of Months of Care	No of Patients responded	Amount Spent (₦)	No of Months of Care	No of Patients responded	Amount Spent (₦)	No of Months of Care	No of Patients responder	Amount Spent (₦)
1	59	3,122,990	1	12	4,124,900	1	27	2,158,000
2	28	6,100,900	2	10	15,600,000	2	17	2,665,000
3	17	5,213,000	3	9	18,265,000	3	18	4,329,000
4	14	4,591,600	4	4	5,785,000	4	16	4,069,000
5	15	9,748,700	5	12	19,565,000	5	10	5,525,000
6	16	11,628,500	6	17	37,375,000	6	7	3,952,000
7	11	4,416,100	7	10	32,136,000	7	12	8,426,600
8	2	156,000	8	8	6,552,000	8	5	1,924,000
9	5	3,360,500	9	4	6,632,600	9	14	6,760,000
10	3	1.149,200	10	4	10,595,000	10	10	3,893,500
11	6	8,320,000	11	5	16,965,000	11	6	3,503,500
12	19	7,564,700	12	15	14,183,000	12	23	5,772,000
13	14	20,923,500	13	2	7,800,000	13	7	7,735,000
14	12	16.640,000	14	3	10,400,000	14	3	936,000
15	5	9,815,000	15	3	5,265,000	15	1	1,365,000
16	-	-	16	6	24,284,000	16	-	-
17	2	1,404,000	17	5	23,400,000	17	1	2,210,000
18	11	3,263,000	18	26	38,259,000	18	7	1,436,500
19	-	-	19	-	-	19	1	2,600,000
20	7	4,004,000	20	10	29,159,000	20	3	1,755,000
21	-	-	21	-	-	21	-	-
22	4	481,000	22	3	9,750,000	22	-	-
23	-	-	23	-	-	23	-	-
24	6	4,251,000	24	9	2,008,500	24	4	936,000
25	-	-	25	-	-	25	-	-
26	-	-	26	-	-	26	5	650,000
27	-	-	27	-	-	27	-	-
28	1	1,495,000	28	-	-	28	2	5,200,000
29	-	-	29	-	-	29	-	-
30	2	2,808,000	30	2	2,860,000	30	1	1,300,000
31	-	-	31	-	-	31	-	-
32	-	-	32	4	1,079,000	32	-	-
33	-	-	33	-	-	33	1	1,300,000
34	-	-	34	-	-	34	-	-
35	-	-	35	-	-	35	-	-
36	10	36,075,000	36	16	118,105,000	36	10	22,750,000
Total	269	166,531,300	Total	199	460,018,000	Total	211	103,151,000

Table 3: Direct non-medical costs for Orthodox breast cancer care (n = 276).

Average amount spent on travelling to and from health facilities for diagnosis and care			Average amount spent on payment for lodging for the treatment			Average amount spent on payment for meals at place of diagnosis and treatment		
No of Months of Care	No of Patients responded	Amount Spent (₦)	No of Months of Care	No of Patients responded	Amount Spent (₦)	No of Months of Care	No of Patients responded	Amount Spent (₦)
1	43	1,176,500	1	21	5,222,100	1	9	2,158,000
2	48	2,522,000	2	17	5,668,000	2	6	2,665,000
3	28	4,381,000	3	7	1,933,100	3	12	4,329,000
4	7	1,794,000	4	9	507,000	4	2	4,069,000
5	11	2,600,000	5	2	91,000	5	3	5,525,000
6	20	2,424,000	6	5	234,000	6	9	3,952,000
7	5	910,000	7	2	149,500	7	5	8,426,000
8	10	1,298,700	8	7	383,500	8	6	1,924,000
9	6	591,500	9	3	312,000	9	7	6,760,000
10	4	897,000	10	9	754,000	10	2	3,893,500
11	1	130,000	11	9	196,300	11	1	3,503,500
12	12	1,501,500	12	8	1,059,500	12	18	5,772,000
13	7	1,820,000	13	-	-	13	-	-
14	7	422,500	14	-	-	14	4	936,600
15	1	117,000	15	1	650,000	15	-	-

16	-	-	16	-	-	16	-	-
17	-	-	17	-	-	17	1	2,210,000
18	2	182,000	18	1	104,000	18	3	1,436,500
19	-	-	19	-	-	19	-	-
20	-	-	20	-	-	20	-	-
21	-	-	21	-	-	21	-	-
22	-	-	22	-	-	22	2	936,000
23	-	-	23	-	-	23	-	-
24	2	665,600	24	1	156,000	24	2	650,000
25	-	-	25	-	-	25	-	-
26	-	-	26	-	-	26	-	-
27	-	-	27	-	-	27	-	-
28	2	169,000	28	-	-	28	-	-
29	-	-	29	-	-	29	-	-
30	2	331,500	30	-	-	30	-	-
31	-	-	31	-	-	31	-	-
32	-	-	32	-	-	32	1	1,300,000
33	-	-	33	-	-	33	-	-
34	-	-	34	-	-	34	-	-
35	-	-	35	-	-	35	-	-
36	-	-	36	-	-	36	3	2,750,000
Total	191	23,934,300	Total	102	17,420,000	Total	96	63,195,500

Table 4: Indirect non-medical costs for Orthodox breast cancer treatment in Port Harcourt for the three years of study (n = 276).

Average amount (₦) lost following the diagnosis and care of breast cancer patients		
No of Months of Care	**No of Patients responded**	**Amount Lost (₦)**
1	15	2,548,000
2	5	1,339,000
3	5	1,644,500
4	3	2,210,000
5	9	4,173,000
6	11	9,087,000
7	5	6,175,000
8	5	3,770,000
9	4	2,275,000
10	5	3,068,000
11	3	4,680,000
12	32	35,425,000
13	7	10,595,000
14	4	10,140,000
15	5	8,060,000
16	3	2,990,000
17	-	-
18	5	3,640,000
19	-	-
20	3	2,470,000
21	-	-
22	-	-
23	-	-
24	5	5,395,000
25	-	-
26	1	1,300,000
27	-	-
28	-	-
29	-	-
30	7	13,780,000
31	-	-
32	-	-
33	-	-
34	-	-
35	-	-
36	4	9,360,000
Total	146	140,484,500

Table 5: Average cost of orthodox breast cancer services that patients could not afford.

Breast Cancer Services	Category of Cost	Variables	Cost (₦)	Total Cost (₦)
Radiotherapy	Direct Medical Cost	Radiotherapy Fees	2,000,000.00	3,197,000.00
		Laboratory Fees	70,000.00	
		Drugs	100,000.00	
	Direct Non-Medical Cost	Transportation	250,000.00	
		Lodging	525,000.00	
		Feeding	252,000.00	
	Indirect Non-Medical Cost	Amount Not Earned During the Period	200,000.00	
Immunotherapy/Targeted Therapy	Direct Medical Cost	Trastuzumab (Complete Course)	420,000 (x18)	7,560,000.00
Immunohistochemistry (IHC)			150,000.00	150,000.00
Total				10,907,000.00

(19%) earned between ₦20,000.00 and ₦40,000.00, 67 (24%) earned between ₦41,000.00 and ₦100,000.00, 91 (33%) were within ₦101,000.00- and ₦200,000.00-income bracket, 32 (12%) earned between ₦201,000.00 and ₦400,000.00, 9 (3%) earned between ₦401,000.00 and ₦1,000,000.00, and no respondent earned more than ₦1,000,000.00.

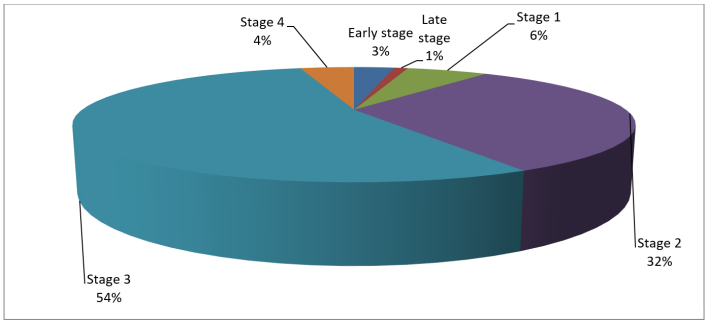

Figure 3: The Stages of Breast Cancer Patients in Port Harcourt for past three Years.

Figure 3 displays the various stages of breast cancer patients in Port Harcourt for the past three years. The patients with stage III disease were more in number (54%) than any other stages, followed by stage II disease (32%).

Table 2 shows the direct medical costs for orthodox breast cancer treatment in Port Harcourt within the three years of study. Out of 276 breast cancer patients that participated in this study, 269 (97%) patients spent an average amount of ₦166,531,300.00 on the laboratory tests needed for the diagnosis and care of breast cancer (i.e. ₦619,075.46 per patient), 199 (72%) patients spent average amount of ₦460,018,000 on the hospital admissions and out-patient's visits and prescription for treatment of breast cancer (i.e. ₦2,331,648.24 per patient), and about 211 (76%) patients spent average amount of ₦103,151,000.00 (i.e. ₦488,867.30) on follow-up appointments with health care specialist and costs of specialist care for treatment of breast cancer. The average total direct medical costs for orthodox breast cancer care per patient is therefore ₦619,075.46 + ₦2,331,648.24 + ₦488,867.30 = ₦3,439,591.00.

Table 3 shows the direct non-medical costs for orthodox breast cancer treatment in Port Harcourt for the three years of the study. One hundred and ninety-one (69%) patients spent an average amount of ₦23,934,300.00 on travelling to and from health facilities for the diagnosis and care of breast cancer (i.e. ₦125,310.00 per patient), 102 (37%) patients spent average amount of ₦17,420,000.00 on the payment for lodging for the treatment of breast cancer (i.e. ₦170,784.31 per patient), and about 96 (35%) spent average amount of ₦63,195,500.00 on payment for meals at place of diagnosis and treatment of breast cancer (i.e. ₦658,286.45 per patient). The total cost is therefore is ₦125,310.00 + ₦170,784.31 + ₦658,286.45 = ₦954,380.76. Breast cancer patients are often accompanied by one or two relatives, who also spend monies on transportation, lodging and feeding. Hence, accounting for at least one relative will bring the direct non-medical costs for orthodox breast cancer to ₦1,908,761.52 (1272.50 USD).

Table 4 shows the indirect non-medical costs for orthodox breast cancer treatment in Port Harcourt for the three years of study. Out of 276 breast cancer patients that participated in this survey, 146 (53%) lost an average amount of ₦140,484,500.00 following the diagnosis and care of breast cancer in Port Harcourt. However, some of the patients could not respond to this inquest. The indirect non-medical cost for individual breast cancer patient is therefore ₦962,222.60 (641.48 USD), and the cost for each household (patient and caregiver) is therefore ₦1,924,445.21 (1,282.96 USD).

Table 5 shows the average cost of radiotherapy, immunotherapy, and immunohistochemistry for orthodox breast cancer services that patients could not afford. The total cost for radiotherapy services was ₦3,197,000.00 (2,131.33 USD), targeted therapy/ immunotherapy was ₦7,560,000.00 (5,040 USD), and immunohistochemistry was ₦150,000.00 (100 USD). Total being ₦10,907,000.00 (7,271.3 USD).

Discussion

Breast cancer is aptly captured under goal 3 of the Sustainable Development Goals (SDGs) with a target to reduce premature mortality by one-third by year 2030. [33-35] The study brings to the fore high out-of-pocket (OOP) expenses and catastrophic healthcare expenditure (CHE) associated with breast cancer care, and the often-neglected indirect costs like lost productivity and care from family members. These were natural consequence of

lack of medical insurance for breast cancer patients. Almost all the breast cancer patients were females and, with a ratio of 137: 1. Out of the 276 breast cancer patients, only 2 were males, giving 99.3% female preponderance and 0.7%. males breast cancer. This finding aligns with the observation of other researchers that acknowledge male breast cancer to account for less than 1% of all breast cancers [36,37]. The mean age was 48.2 years observed in this study share similarity with the findings 45.9years earlier reported in Port Harcourt [38], and less than the median age of 41 years described in another Port Harcourt study [39]. It is also similar to observations breast cancer patients in the West African Sub-region [40-43]. However, the observed mean age in this study differs from the findings observed from the United Kingdom where less than a fifth of the breast cancer patients were less than fifty years of age [44].

Majority of the patients were married and had tertiary/post-secondary school education. This observation is expected as the mean age of the patients in this study is 48.2 years, at which age majority of the respondents would have been married. This was supported by the findings in previous studies [45,46]. Additionally, that majority of the respondents had tertiary/post-secondary education is in-keeping with already published observations in Southern Nigeria [47,48]. It is not surprising that almost all the patients were Christians. This is because this study was conducted in Port Harcourt in Southern Nigeria, known to be dominated by [49-51]. Business women, traders, and civil servants formed the majority of breast cancer patients in the study. More than half of the patients in this study had stage III disease, followed by stage II in about a third of the breast cancer patients. These observations are in agreement with the findings previous studies in Port Harcourt [52-54], Nigeria [55-57], and Africa [58,59].

The stage at diagnosis is the strongest prognostic indicator for survival. When only a fifth of the patients had been with breast cancer for 3-4 years, it therefore corroborates the observations in this study and previous studies that majority of the patients with breast cancer were diagnosed at late stages [39,53,54]. Additionally, the five-year survival was estimated to be 87% for regional stage and 32% for distant stage disease globally [60]. Worse still, breast cancer prognosis is poorer among blacks [60,61] and in the low-and middle-income countries where socioeconomic challenges feature as additional issues [62-64]. The mean monthly income of respondents was ₦131,048.91 (87.3 USD), and only 3% of the respondents earned between ₦401,000.00 (267.3 USD) and ₦1,000,000.00 (666.7USD). The issue of low wages among Nigerian workers has echoed in the works of other researchers [65-67]. The issue of low wage versus the cost of breast cancer care brings to the fore the catastrophic nature of the problem.

Direct Medical Cost

The average total direct medical costs for orthodox breast cancer care per patient was ₦3,439,591.00 (2,293.06 USD). This accounted for the hospital services that breast cancer patients were able to attempt to afford. The direct medical cost of medical care is often what is known and quoted as the cost of care by the lay persons in the society, and for breast cancer just like other illnesses, off-setting the direct medical cost will not solve the economic challenges of the breast cancer patient, although it does go a long way. Bearing in mind that majority of the patients did not have full treatment (e.g. radiotherapy/ immunotherapy) for socioeconomic reasons, it means that this average estimate is an under-reporting. However, there was additional direct medical cost amounting to the sum of ₦10,907,000.00 (7,271.3 USD) for radiotherapy, targeted therapy, immunotherapy, and immunohistochemistry which most of the breast cancer patients needed as part of their treatment but were not able to afford in our practice.

The average total direct medical costs for orthodox breast cancer care per patient therefore would be [₦3,439,591.00 (2,293.06 USD) + ₦10,907,000.00 (7,271.3 USD)] ₦14,346,501.00 (9,564.36 USD).

The average total direct medical costs for orthodox breast cancer care per patient was ₦14,346,501.00. This value is equivalent to 9,564.36 USD, using the conversion rate of 1 USD to 1500 Nigerian Naira. The direct cost of breast cancer care of 9,564.36 USD in this dissertation is higher than value of 8450 USD observed in the Chinese study [68] and the 5,500.2 USD reported in a Ghanian study [69]. The plausible reasons for the difference could be the differences in year of publication of report, prices of goods and service in different countries, and the duration of treatment which was for a year in the Ghanian study, and three years in this dissertation. Additional reason for the difference could also be recall-bias of the questionnaire-based study in this dissertation as against the incidence-based reporting format in study the Ghanian report.

Direct Non-Medical Cost

The direct non-medical cost for orthodox breast cancer was estimated as ₦1,908,761.52 (1,272.50 USD). This finding in this study is within the range of 576.48 - 11,397.48 USD reported in a hospital in Dakar, Senegal [70].

However, the mean value of 1,272.50 USD in this study is less than 4,559.79USD in the Dakar study. The possible reason for this observation could be that the patients and their relatives in our study did not have the luxury of paying for near-by hotel accommodations and feeding during their period of treatment and hence the lower figures. Another explanation could be the type of hospital and location of practice: while the Dakar study was carried out in a national cancer center 95.85 USD/month, this study was done in a section of a country in a single State with a lower income 87.3 USD/month.

Indirect Non-Medical Cost

The indirect non-medical cost for individual breast cancer patient was ₦962,222.60, and ₦1,924,445.21 for each household (patient and one caregiver). This is equivalent to 641.48 USD per patient and 1,282.96 USD for the household as the least amount that would have been earned during the period. This observed non-medical cost is less than the findings in a global systematic review

on indirect cost of breast cancer, reflecting productivity loss, that reported value range of 1,488.61 to 4,518,628.5 USD [71] and the value of 1529 USD observed in a Chinese study [68]. The explanation for this difference could be that our values are not actual but estimates in questionnaire-based study subject to patient recall bias. Another reason for the relatively low values could also be the fact that this study adopted prevalence-based reporting while the quoted systematic review used the incidence-based reporting format. Yet another reason for the difference could be the local factors – where the uninsured patients who were economically challenged with low earning power. This is further buttressed by many research works that echoed low wage paid to Nigerian workers [72,73]. This low indirect non-medical of breast cancer care in this study further highlights the catastrophic expenditure the patients are exposed to if with all they earn a patient could not pay for cost of breast cancer care.

Total cost of Orthodox (hospital) Care

The average total direct medical costs for orthodox breast cancer care per patient was ₦14,346,501.00 (9,564.36 USD); the average direct non-medical cost for orthodox breast cancer per patient was estimated as ₦1,908,761.52 (1,272.50 USD); and the average indirect non-medical cost for orthodox breast cancer care was ₦1,924,445.21 (1,282.96 USD) for each household. From the foregoing, the grand total cost of orthodox medical care for breast cancer was ₦18,179,707.73 (12,119.8 USD). If this amount is related to the average monthly income of less than 230 USD for 76% of the respondents in this dissertation, it is about five times the yearly income of majority of breast cancer patients in the study. It is therefore staggering, and amount to financial strangulation, financial toxicity, or catastrophic health expenditure for a single breast cancer patient and household. Catastrophic health expenditure is often defined as spending that reduces household consumption of basic goods [19,74-76]. The observed total cost in this study is higher than the values quoted in Ile-Ife in a study whose prospective data was collected 2009 – 2019 [19]. The reasons for this difference could be the years of data collection and the attendant differences in the cost of goods and services in different cities in Nigeria. It is also higher than the values reported in Other African studies [77]. It is however, similar to the stated value of 17,992 USD in a study carried out in Lagos Nigeria and published in year 2025 [20].

The sources (and modes) of financing of breast cancer services

The study revealed that individual patient's out-of-pocket expenses/ payments was the main source of financing of breast cancer care derived from personal savings (42%), support from family members (24%), through borrowing (15%), etc. Payment from National Health Insurance Scheme was less than 1%. Our finding share similarity with the results of a scoping review on cancer care financing in Nigeria where limited healthcare financing options was observed, and out of pocket payment was the experience of most cancer patients [18]. Similar observations re-echoed in other studies as financial catastrophe for breast cancer patient in Nigeria [19,20,78]. This observation is similar to findings of study conducted in Mumbai in India where out of pocket payment accounted for 72.2% of the total cost of breast cancer care [22]. Poor breast cancer financing resulting in catastrophic/out of pocket expenditure is a significant health system challenge that could possibly explain some of the late presentations and high morbidity and mortality associated with breast cancer especially in low- and middle-income countries. This thought is shared in the findings of a Nigerian study that chronicled the role of social barriers to breast cancer diagnosis and treatment [79] and also a systematic review on health system barriers in Asia [80].

Study Limitations

The costs of breast cancer care documented in this report were estimates of expenses made by patients while filling study questionnaires, and therefore not actual costs. They are therefore subject to recall bias which is a known limitation of this type of study. All the patients in this study did not have the same duration of treatment, a key factor which also rubs on the cost of care.

Conclusion

This study uncovered the orthodox costs of breast cancer per patient and household, as seen through the lenses of the healthcare payers. The cost of breast cancer was significant, and the economic impact was experienced beyond the coping ability of most breast cancer patients and households. Out-of-pocket expenses was the dominant mode of payment for breast cancer services, and the payments were sourced from self and helps. These findings further added to the existing literature calling for concerted effort towards minimizing the financial strangulation that is often associated with the most common cancer seen among women globally and in our country.

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