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A Descriptive Prospective Cohort Study At Ocean Road Cancer Institute, Tanzania to Estimate the Total Cost of Cervical Cancer Management

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Abstract

Background: Cervical cancer is the leading cancer in developing countries including Tanzania. In Tanzania, it is estimated that about 6,241 new cases of cervical cancer develop each year. Ocean Road Cancer Institute (ORCI) is the only specialized centre for cancer treatment in Tanzania (at the time of the study), and it receives cancer patients from all over the country. The economic burden is important for policy formulation especially in Tanzania where cancer patients receive free treatment. The purpose of this study was to determine the actual cost of cancer treatment in Tanzania, with special emphasis on cervical cancer.

Methods: The study was a descriptive prospective cohort design whereby both direct cost as well as indirect cost were determined using a standardized questionnaire for each patient of all new cervical cancer patients that were recruited in October, 2013 and followed up for a period of two months. The findings of the study will assist management of Ocean Road Cancer Institute and the Government in understanding the direct and indirect cost of cancer treatment, which will lead to better planning for cancer care in the country.

Results: The overall cost per patient for cervical cancer ranged from TZS 2,036,732 (USD 1,257.24) to TZS 5,982,168 (USD 3,692.70) with the mean cost of TZS 3,972,972.74 (USD 2,452.45) [Median = TZS 4,140,426 (USD 2,555.82)]. Median direct cost was TZS 3,503,000 (USD 2,162.34) takes the largest share compared with the median indirect counterpart of TZS 643,480 (USD 397.21). The mean direct cost for outpatients and inpatients was TZS 1,684,000 (USD 1,039.50) [66.73% due to radiotherapy cost] and TZS 3,728,836.36 (USD 2,301.75) [52.42% due to admission cost], respectively. The mean indirect cost for outpatients and hospitalized patients was TZS 1,340,497 (USD 827.47) [55% due to food] and TZS 606,291.44 (USD 374.25) [47.38% due to food followed by 43% due to cost of working days lost], respectively.

Conclusion: Cancer of the cervix poses an immense financial burden on the patients and their families as well as the Tanzanian health sector at large.

Abbreviations

ORCI: Ocean Road Cancer Institute; HPV: Human Papilloma Virus; FIGO: International Federation of Gynaecology and Obstetrics; CIS: Carcinoma in *Situ*; NHIF: National Health Insurance Fund; NHS: National Health Services; ACS: American Cancer Society; GDP: Domestic Produce; WHO: World Health Organisation; MUHAS: Muhimbili University of Health and Allied Sciences; IRB: Institution Review Board; Euro: European Union Currency; TZS: Tanzanian Shillings; USD: United States of America Dollars; SUMATRA : Surface and Marine Transport Regulatory Authority

Background

Cervical cancer is the most common gynaecological malignancy and the third most frequent cancer in women worldwide, with an estimated 530,000 incident cases of cervical cancer of which 85% occur in developing countries 2. In Tanzania, it is the top female malignancy and it is estimated that 6,241 new cases of cervical cancer occur each year, representing an age-standardised-rate of 50.9/100,0002. The data from Ocean Road Cancer Institute (ORCI) shows that about 36% of the cancer patient that attend the institute for treatment are patient with cervical cancer3. Moreover, majority of these patients, attend when the disease is in advanced stages 3. Patient with cervical cancer in Tanzania, may be treated with one of the three treatment modalities depending on the stage of the disease6. The treatment modalities available include surgery, radiation therapy, chemotherapy or a combination of two or three of the modalities7. At any stage of the disease, the patients may require treatment to relieve pain and other symptoms i.e. supportive/palliative care8. Despite the variety of treatment modalities, cervical cancer in developing countries is still associated with significant morbidity and low survival. Cervical cancer remains a public health problem among women of the developing world, especially in Tanzania [1].

The total cost of managing cancer is about USD 263.3 billion, of which USD 78.2 billion is for direct medical costs and USD 185.1 billion is for indirect costs12 as reported in USA. The health expenditure as percentage of Gross Domestic Product (GDP) is highest in the US which was about 17.9% in 201113. In Tanzania, the health expenditure as percentage of GDP is 7.3% in 201113. Overall, about 56% of health expenditure goes towards inpatient care, 24% towards outpatient care and 20% towards prevention services14. Regarding costs of managing cancer in Tanzania, most of the information on cancer care relates to the direct medical expenditure for cancer institute, rather than for overall care for cancer patients and thus it is difficult to compare with other studies [2].

In Tanzania, very little is known about the societal value of resources used as a result managing cervical cancer, including both the direct medical costs for supportive care and indirect costs of care. The indirect costs include the value of lost time from work as a result of the illness, decrease productivity while at work, time or money spent by patient or people looking after

the patient, and premature retirement or death15. The direct costs are by such items as hospital room costs, laboratory costs, operating room costs, physician consultation costs, and chemotherapy as well as radiotherapy costs. The economic definition of cost of an intervention is calculated as the value of the consumed resources, if those resources had been put to use for an alternative service. Using this definition it is true that hospital charges do not necessarily represent true hospital costs 16. Therefore, it has been proposed that it is the use of resource rather than the monetary exchange that defines the direct cost, emphasizing that a valid analysis needs to capture true costs rather than charges. This study is aimed to estimate the total costs for management of cervical cancer at ORCI for a period of two months so as to assist the government in resource allocation [3].

Methods

Aim

The study aimed to estimate the total costs (i.e. direct and indirect) for management of cervical cancer at ORCI for a period of two months on patients' perspective.

Design

It was a descriptive prospective cohort study.

Setting

The study was conducted at ORCI, Dar es Salaam, which at the time of the study was the only cancer treatment centre in Tanzania.

Characteristics of participants

Histologically confirmed cervical cancer patients that were referred to ORCI for treatment in the month of October, 2013.

Data collection

Data was collected using well-structured closed-ended and partially open ended questionnaires. The questionnaires incorporated socio-demographic characteristics, direct cost, and indirect cost. The questionnaires were administered using face-to-face interview. Each participant was subjected to three interviews. The first interview was at 1st visit, second interview was one month post recruitment and the third interview was at two months post recruitment. Ethical clearance was sought from Ethical Clearance Board (IRB) of the Muhimbili University of Health and Allied Sciences (MUHAS). Permission to conduct the study was sought from ORCI. Patients were recruited after consenting to participate in the study and confidentiality was observed even after the study period [4-8].

Method of cost estimation

This cost study was conducted from the perspectives of the patients to estimate the direct and indirect cost of cervical cancer. The direct costs were estimated per patient and completely cycle-set using costs for each admission, investigation, consultation, radiotherapy, chemotherapy and treatment of other conditions as indicated by the National Health Insurance Fund (NHIF) pricelist 22. The medical records of the patients were reviewed to assess the direct costs incurred by the patients at the end of one month to the follow-up period. The unit cost of each service was multiplied with the total frequency or quantity utilized by the patient to get the direct cost in Tanzanian shillings (TZS). (i.e. unit cost X frequency/quantity). The indirect costs that were estimated include costs of transportation, phone call, working days lost and food [9-12].

A close relative was recruited, where necessary, to assist the recall of the indirect cost. Transportation cost was estimated using the Maximum (Capped) Economic Bus Fares between Regional Centres of 2013 issued byUnited Republic of Tanzania through the Surface and Marine Transport Regulatory Authority (SUMATRA) 23. Phone calls were calculated by assuming each call lasted for 5 minutes and the cost was Estimated using the mobile operator, Tigo24, voice tariffs. The economic cost associated with working days lost due to illness was calculated using the current GDP per capita of the country25. The cost of meals (food, drinks, snacks, etc.) was estimated from the perspectives of the patient or recruited close relative.Individual cost items were summed up to the categories of direct cost and indirect income. All costs were measured in TZS and were converted into US Dollar using the prevailing exchange rate during the time of the study (1 US Dollar = TZS1,620)26 [13].

Data analysis

The data were analyzed using SPSS Version 21 for Windows. Data analysis was performed using scores, frequencies and percentages. Various descriptive statistics such as mean, medians, standard deviations, lower and upper ranges were calculated using the SPSS software. Multiple linear regressions using a forward stepwise selection procedure, was employed to identify the predictors of cost variability.

The cervical cancer patients in the study were categorized as early and late stage during analysis28. The early stage included FIGO stage I to IIA whereas late stage included FIGO stage IIB to IVB [14].

Results

Between 1st October and 31st October 2013, a total of 80 new patients with cervical carcinoma were recruited into the study. Of the recruited subjects, 3 of them passed away during treatment and 1 absconded treatment. Thus, only 76 patients were included into the subsequent analysis. Socio-demographic characteristics and disease profile for patients with cervical cancer are presented below:

Table 1: Socio-demographic characteristics.

Category	No. cases (N = 76)	Percentage (%)
Age group		
25-34	6	7.9
35-44	12	15.8
45-54	29	38.2
55-64	20	26.3
≥ 65	9	11.8
Marital status		
Single	0	0
Married	53	69.7
Widowed	12	15.8
Divorced	11	14.5
Occupation		
Peasant	58	76.3
Petty trader	10	13.2
House-wife	5	6.6
Employed	3	3.9
Education		
Illiterate	37	48.7
Primary	35	46.1
≥ Secondary	4	5.2

Characteristics of the study participants

As presented in Table 1, the mean (SD) age was 52.68 (12.545) years, participants age ranging from 28–90 years. The largest proportion of the participants (76.3%) was aged above 45years. The majority of the participants were married (69.7%), peasants (76.3%), illiterate (48.7%), and Muslim (55.3%) [15] (Table 2).

Direct costs

Table 3 reveals the mean of the total direct costs for outpatients was TZS 1,627,809.52 (USD 1,004.82). The mean cost for consultation, investigations, radiotherapy, chemotherapy and treatment of other conditions were estimated to be TZS 154,285.71 (USD 95.24), TZS 231,380.95 (USD 142.83), TZS 1,123,809.52 (USD

693.71), TZS 114,761.90 (USD 70.84), and TZS 3,571.43 (USD 2.20) respectively. Table 4 shows the mean of the total direct costs for inpatients was TZS 3,584,109.09 (USD 2,212.41). The mean costs for admission, consultation, investigations, radiotherapy, chemotherapy and treatment of other conditions were estimated to be TZS 1,954,545.45 (USD 1,206.51), TZS 209,454.55 (USD 129.29), TZS 223,200 (USD 137.78), TZS 1,090,909.09 (USD 673.40), TZS 99,272.73 (USD 61.28), and TZS 6,727.27 (USD 4.15), respectively for the direct costs for inpatients. From table 5, the total direct cost, the cost of radiotherapy represents the largest share (69.0%), followed by investigations cost (14.2%) for the outpatients while cost of admission represents the largest share (54.5%), followed by cost of radiotherapy (30.4%) for inpatients [16].

Indirect cost

Table 2: Mean cost for both direct, indirect and total costs (n=76).

Cost Category	Mean	Median	SD	Minimum - Maximum	
Direct	TZS (USD)	TZS (USD))	TZS (USD)		TZS (USD)
	30,43,552.63	34,13,000.00	10,80,026.38	11,23,000	– 4,881,000
	-1,878.74	-2,106.79	-666.68	(693.21	– 3,012.96)
Indirect	8,31,453.59	7,11,824.00	4,24,501.04	3,40,508	– 2,566,332
	-513.24	-439.4	-262.04	(210.19	– 1,584.16)
Total cost	38,75,005.22	40,85,848.00	9,20,931.78	20,36,732	– 5,691,680
	-2,391.98	-2,522.12	-568.48	(1,257.24	– 3,513.38)

Table 3: Direct costs incurred by Outpatient participants for two months at ORCI (n=21).

Cost Category	Mean	Median	SD	Minimum-Maximum
Consultation fee	TZS (USD)	TZS (USD)	TZS (USD)	TZS (USD)
	1,54,285.71	1,50,000.00	83,400.93	30,000 – 270,000
Investigations	-95.24	-92.6	-51.48	(18.52 – 166.67)
	2,31,380.95	2,33,000.00	38,386.82	118,000 – 287,000
Radiotherapy	-142.83	-143.83	-23.7	(72.84 – 177.16)
	11,23,809.52	12,00,000.00	1,60,949.56	800,000 – 1,200,000
Chemotherapy	-693.71	-740.74	-99.35	(493.83 – 740.74)
	1,14,761.90	65,000.00	1,45,571.94	0 – 390,000
Other treatments	-70.84	-40.12	-89.86	(0 – 240.74)
	3,571.43	0	6,546.54	0 – 15,000
Total direct cost	-2.2	0	-4.04	(0-9.26)
	16,27,809.52	15,53,000.00	3,30,856.11	1,123,000 – 2,125,000
	-1,004.82	-958.64	-204.23	(693.21 – 1,311.73)

Table 4: Direct costs incurred by Inpatient participants for two months at ORCI (n=55).

Category	Cost (%)	Cost (%)
	Outpatients (n=21)	**Inpatients (n=55)**
	TZS [USD]	TZS [USD]
Admission	0	107,500,000 (54.5)
	[0.00]	[66,358.02]
Consultation fee	3,240,000 (9.5)	11,520,000 (5.9)
	[2,000]	[7,111.11]
Investigations	4,859,000 (14.2)	12,276,000 (6.2)
	[2,999.38]	[7,577.78]
Radiotherapy	23,600,000 (69.0)	60,000,000 (30.4)
	[14,567.90]	[37,037.04]
Chemotherapy	2,410,000 (7.1)	5,460,000 (2.8)
	[1,487.65]	[3,370.04]
Other treatments	75,000 (0.2)	370,000 (0.2)
	[46.30]	[228.40]
Total cost	3,41,84,000	19,71,26,000
	[21,101.23]	[121,682.716]

Table 5: Proportion of costs contributing the direct cost for two months at ORCI.

Cost Category	Mean	Median	SD	Minimum-Maximum
	TZS (USD)	TZS (USD)	TZS (USD)	TZS (USD)
Transportation	3,56,266.67	2,36,300.00	2,86,498.58	74,500 – 960,000
	-219.92	-145.86	-176.85	(45.99 – 592.59)
Phone calls	15,000.00	15,000.00	10,889.22	0 – 45,000
	-9.26	-9.26	-6.72	(0 – 27.78)
Cost of working days	2,31,984.00	2,34,132.00	48,427.75	92,364 – 287,832
Lost	-143.2	-144.53	-29.89	(57.01 – 177.67)
Cost of food	7,37,246.67	7,44,000.00	2,73,984.62	300,000 – 1,350,000
	-455.09	-459.26	-169.13	(185.19 – 833.33)
Total indirect cost	13,40,497.33	12,28,988.00	4,82,146.84	815,160 – 2,566,332
	-827.47	-758.63	-297.62	(503.19 – 1,584.16)

Table 6: Indirect costs incurred by Outpatient participants for two months at ORCI (n=21).

Cost Category	Mean	Median	SD	Minimum-Maximum
	TZS (USD)	TZS (USD)	TZS (USD)	TZS (USD)
Transportation	70,983.64	61,800.00	81,016.16	3,500 – 484,100
	-43.82	-38.15	-50.01	(2.16
Phone calls	11,029.09	12,000.00	9,098.35	0 – 36,000
	-6.81	-7.41	-5.62	(0 – 22.22)
Cost of working days	2,60,610.98	2,62,056.00	51,781.96	152,508 – 384,492
lost	-160.87	-161.76	-31.96	(94.14
Cost of food	2,90,294.18	2,49,000.00	1,33,853.50	42,500 – 656,000
	-179.19	-153.7	-82.63	(26.23
Total indirect cost	6,37,091.44	6,06,892.00	1,57,904.21	340,508 – 1,051,400
	-393.27	-374.62	-97.47	(210.19

From table 6, each of the outpatient cervical cancer cases spent TZS 1,340,497.33 (USD 827.47) on average. The mean costs for transportation, phone calls, working days lost due to illness, and food while on treatment were TZS 356,266.67 (USD 219.92), TZS 15,000.00 (USD 9.26), TZS 231,984.00 (USD 143.20), and 737,246.67 (455.09), respectively. Table 7 shows the mean overall indirect costs for the inpatient participants was TZS 637,091.44 (USD 393.27). The mean costs for transportation, phone calls, days lost due to illness, and food while on treatment were TZS70,983.64 (43.82), TZS 11,029.09 (USD 6.81), TZS 260,610.98 (USD 160.87), and TZS 290,294.18 (USD 179.19), respectively. From table 8, the cost of food contributes the most for both outpatients and inpatients, 55% and 46%, respectively followed by transportation cost (26.58%) for the outpatients and cost of working days lost due to illness (41.1%) for inpatients [17].

Predictors for variation in patient related cost

As provided in Table 8, the cost incurred by patients were computed across two broad distinct categories; direct and indirect cost for both outpatients and inpatients. To determine which disease profile characteristics influenced cost, Independent-Samples T Test was fitted to the cost data for both care status, stage of disease and histology. The dependent variable was the total direct and indirect cost incurred by the study participants. As shown in Table 9, care status and stage of the disease demonstrated significant association with the total direct and indirect cost incurred by the study participants at ORCI in two months with p values of 0.000 and 0.02, respectively. A multiple linear regression model was fitted to the cost data. The final model includes two variables, care status and stage of the disease. Table 10 shows that both care status and stage of the disease

were significantly associated with total direct and indirect cost of cervical cancer with p-values of 0.000 and 0.000, respectively [18].

Discussion

This study, in addition to confirming the costliness of cervical cancer as disclosed by other studies, has produced some important key findings related to the economics of cervical cancer that can be used as inputs for further economic evaluation. The large discrepancies between mean and median values of the various cost items indicated in this study could be due to the skewedness of the cost data. The standard deviations presented in this study are large, sometimes exceeding the means. Such a pattern is commonly observed when there is wide variation in treatment patterns among patients, even amongst those apparently exhibiting the same pattern of disease [19].

The mean age of the respondents was 52.68 years and majorities (76.3%) were aged above 45 years, which is an early menopausal period. Most (48.7%) of the respondents were illiterate followed by 46.1% of the respondents that had attended primary schooling. The vast majorities (76.3%) were peasants and 69.7% were housewives. These findings show that the poor, marginalized and uneducated segments of the population are most affected by the disease. This may be useful information for policy actions aimed at addressing issues of inequity. These characteristics of the study participants were also consistent with other studies conducted in Tanzania, and some other developing countries [19-21].

The study shows that mean total cost for cervical cancer management for two months at ORCI was TZS 3,875,005.22 (USD 2,391.98) whereby the mean direct and indirect cost were TZS 3,043,552.63 (USD 1,878.74) and TZS 831,453.59 (USD 513.24). This is a very important finding in Tanzanian context considering cancer treatment is free of charge. However, in the literature, the majority of the studies on the cost of cervical cancer collected information for duration of one year after diagnosis [19-21].

Nevertheless, the findings of this study are consistent with these other studies in terms of the costliness of cervical cancer management. A Spanish study reported that the mean cost of hospitalization by cervical cancer was EUR 3,098 (USD 4,177.96)17. A study conducted in Italy showed the mean cost of cervical cancer ranged from EUR 6,024 (USD 8,123.96) to EUR 11,367 (USD 15,329)18. Another study conducted in Morocco revealed the average cost of invasive cervical cancer management ranged from USD 2,952 to USD 7,82720. A Tunisian study reported the mean direct medical care cost of cervical cancer ranged from EUR 431 (USD 581.25) to EUR 4,140 (USD 5,583.20)19 while an Ethiopian study showed the mean outpatient and inpatient cost for cervical cancer management were USD 407.2 and USD 404.4, respectively 21 [22].

In terms of stages of illness, the study found, the cost for early stage was lower compared with late stage. This finding was consistent with the findings from other studies on cervical cancer [18,20]. Although it is difficult to compare the aforementioned findings with other studies done elsewhere it is quite clear that these cost estimates were big enough to be huge economic burden for the patients and their family members [23-26].

Study Limitations

Being a cost study, some of the costs may be underestimated, some costs may be overestimated and some costs may be totally omitted. The use of the NHIF price-list do not reflect the actual market price of the direct cost [27]. This study is limited to the patient's perceptive cost, excluding a more comprehensive cost analysis which would include other costs to the health system, health care provider, the family and to society at large. Intangible costs (pain, suffering, stigma and discrimination) were not also included due to difficulties in measurement [28]. The limitations of self-reported data must also be recognized in interpreting the findings of this study.

Conclusion

Cancer of the cervix poses an immense financial burden on the patients and their families. Care status and stage of the disease were predictors of cost. Prolonged hospital stay and late stage of cervical cancer are associated with higher cost.

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