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ORIGINAL RESEARCH

Catastrophic Health Expenditure and Associated Factors Among Hospitalized Cancer Patients in Addis Ababa, Ethiopia

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Background: Out-of-pocket (OOP) health expenditures for cancer care expose households to unanticipated economic consequences. When the available health services are mainly dependent on OOP expenditure, the household faces catastrophic health expenditure (CHE). This study aimed to estimate the incidence and intensity of CHE in hospitalized cancer patients and identify coping strategies and associated factors.

Method and Material: Hospital-based cross-sectional study design was conducted on 305 cancer inpatients in Addis Ababa between November 2021 and February 2022. All patients with cancer who were hospitalized during the data collection period were included in the study. The incidence of CHE was estimated at the 40% threshold of households' non-food expenditure and the intensity of CHE was captured based on the amount by which household expenditure exceeded the threshold and mean positive overshoot, the mean level by which CHE exceeds the threshold used. Multivariate logistic regression was used to assess the relationship between CHE levels and the independent variables.

Results: The incidence of CHE at the 40% threshold of households' non-food expenditure was 77.7%, while the O and MPO were 36.2% and 46.6%, respectively. CHE for cancer care was significantly associated with patient residence, increased number of chemotherapy cycles, increased duration of hospital admission, lack of insurance enrolment, and lower-income quintiles. Saving and selling assets were identified as the primary coping mechanisms.

Conclusion: The incidence and intensity of CHE among inpatients with cancer were high and which could lead to impoverishment of households. Improved quality and coverage of health insurance and decentralizing cancer care to regions standards similar to Addis Ababa will save households from incurring CHE.

Keywords: catastrophic out-of-pocket health expenditure, coping mechanisms, cancer, Ethiopia

Introduction

Cancer is a non-communicable disease and the second leading cause of death globally, causing a substantial economic burden on patients and their families.[1] The World Health Organization's (WHO) global cancer report indicates that in 2018, 18.1 million people worldwide were diagnosed with cancer, and 9.6 million died of cancer.[2]

The age-standardized incidence rate of patients with cancer in China in 2015 was estimated to 186.39 per 100,000[3] while in Kenya it was 196 for females and 167 for females and in Sudan 91 for female and 92 for male per 100,000.[4] The Ethiopian age standardized rates of cancer incidence per 100,000 were 136 for females and 70 for males.[5]

Since there is no national cancer registry system in Ethiopia, the Addis Ababa City cancer registry is used to estimate the incidence of cancer in the country.[6] Between September 2011 and August 2014, the registry reported a total of 5701 cases of cancer in Addis Ababa. Based on this report, the Ethiopian national cancer control plan estimated that the annual

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incidence of cancer in 2015 was approximately 60,960 cases and the annual mortality was over 44,000. The 2020 Global Cancer estimates of WHO report indicate that the number of new cancer cases and associated deaths in Ethiopia were 77,352 and 51,865, respectively.[7–9] This indicates that cancer is a growing public health concern in Ethiopia. Increasing populations and changing lifestyles pose a significant risk of cancer. Unfortunately, the country's oncology services are insufficient to handle the growing burden of cancer.[10]

In addition to health effect, cancer causes severe financial burden to households who are not financially protected against health shocks. In most low- and middle-income countries, out-of-pocket (OOP) payments are the primary source of health financing. These payments are made directly by patients to cover the costs of medical services.[11]

The World Bank report on public health expenditure indicated that in Ethiopia the share of OOP payments from general health spending was 33% in 2013/14, while the Ethiopian seventh national health account report indicated that OOP spending decreased from 33% in 2013/14 to 31% in 2016/17.[12] However, the WHO Global Health Database 2018 reported that the share of OOP expenditure in Ethiopia accounted for 35.47%.

OOP healthcare expenditure exposes households to unanticipated economic consequences that absorb a large share of the household budget.[13] Households may incur catastrophic health expenditure (CHE) due to seeking medical services, which represents health spending beyond a specified income threshold or household's capacity to pay for healthcare.[14]

Globally, the number of people incurring CHE at 10% income threshold increased from 588.5 million in 2000 to 808.4 million in 2017. It is also reported that cancer is imposing a significant economic burden on the population in sub-Saharan African countries. For example, using a threshold of 20% of household income, 64% of households experienced catastrophic health expenditure after a diagnosis of advanced cancer in Malawi.[15] Similarly, a study conducted at a tertiary care hospital in Nigeria indicates that 86% of women diagnosed with breast cancer spent over 25% of their annual household income.[16]

In Ethiopia, due to lack of strong financial protection programs such as health insurance schemes, a considerable number of households experience catastrophic health expenditures that expose them to impoverishment every year.[17]

The incidence of CHE is particularly high households with member who have cancer.[18,19] Existing limited studies revealed that more than half of households with members who used medical services for cancer incurred catastrophic health expenditures. For instance, a study conducted in Addis Ababa in 2018 revealed that the incidence of CHE among cancer patients was 74.4%.[20] However, there is a lack of evidence on the level of catastrophic OOP expenditures among cancer inpatients in Ethiopia using both direct and indirect costs at different thresholds.[20–22] Direct costs comprise out-of-pocket health expenditure for health-care providers and related expenses such as transportation to the facility and food. On the other hand, indirect costs are incurred due to absence from work and the resulting loss of productivity.[23] This study aimed to fill this research gap by assessing the incidence and intensity of catastrophic OOP expenditure at different thresholds among cancer inpatients and coping strategies in Addis Ababa, Ethiopia.

Methods and Materials

Study Design and Setting

A hospital-based cross-sectional study was conducted in five cancer care hospitals in Addis Ababa between November 2021 and March 2022. Addis Ababa has 13 public hospitals, 32 private hospitals, and 93 public health centers. Based on the Ethiopian central statistics agency, the total population of Addis Ababa city was estimated to be 3,773,999 in 2021 which covers 3.7% of the total population of the country.[24] About 250–300 new patients with cancer are registered monthly in 10 cancer diagnostic and treatment service-providing hospitals in Addis Ababa. Hallelujah, Bethzatha, and Legehar General Hospitals reported the highest number of patients with cancer among private hospitals.[19] Tikur Anbessa Specialized Hospital (TASH) is the largest cancer treatment public hospital in the country. Additionally, the longest-serving hospital offers radiotherapy services and a population-based cancer registry. The TASH registry reported that more than 7600 new cases were registered in 2019 (TASH cancer registry office). The study was conducted at two public hospitals (TASH and St. Paul's Hospital Millennium Medical College) and three private hospitals (Bethzatha, Hallelujah, and Legehar) which reported the highest patient flow in 2019/2020.

Study Population and Sampling Procedure

The source populations were all cancer patients attending cancer care in the government and privately owned hospitals in Addis Ababa. The study population included all inpatients seeking cancer treatment during the data collection period in the selected hospitals. Hospitalized patients with cancer who were undergoing cancer treatment (chemotherapy, radiotherapy, hormonal therapy, surgery, or supportive treatment) for 12 months preceding the data collection period and who had a history of at least 7 days of admission in the last 3 months preceding the data collection date were included in the study. Cancer patients with a history of co-morbidities including hypertension, diabetes mellitus, asthma, and psychiatric disorders as well as pregnant women were excluded.

The sample size was determined using a single population proportion formula and by taking 95% confidence interval, 5% degrees of freedom, 74.4% catastrophic out-of-pocket expenditure of cancer patients,[20] and 10% non-response rate. The calculated sample size was 322. However, the data were collected from 305 study participants. The sample size was proportionally allocated to each hospital based on the patient load in 2019. Owing to the limited number of admitted patients, all patients who fulfilled the inclusion criteria were included. The data collection period was extended by 3 months to meet the sample size.

Data Collection Tool and Data Collection Technique

A semi-structured questionnaire was developed based on the WHO's Study of Global Ageing and Adult Health (SAGE) survey instrument[25] and other relevant literature.[26] Data were collected through face-to-face interviews, and medical charts were reviewed for each respondent to collect clinical data to estimate patient expenditure. Three Bachelor of Science degree health professionals and one Master of public health professional were employed for data collection and supervision, respectively. The data collection tool consisted of 30 interview questions and 7 chart review questions.

Measurement of the Outcome

However, there is currently no unique threshold for estimating the incidence of catastrophic health expenditures. The most applicable thresholds vary between 5% and 25% of total household expenditure or between 20% and 40% of the capacity to pay or non-food expenditure.[27,28] Therefore, for this study, the share of households' out-of-pocket cancer care expenditure ≥40% of the household's capacity to pay was taken as catastrophic health expenditure. Sensitivity test was conducted at thresholds of 20%, 25%, and 30%.[29]

The WHO defines a household's capacity to pay *(ctp)* as the non-subsistence effective income of the household. However, households may report food expenditure so that non-food expenditure is used as a non-subsistence spending.[11]

In this study, household non-food expenditure was used as a proxy measure for the household's capacity to pay because this more precisely reflects purchasing power in comparison with the stated income.[30] The capacity of household to pay for health is measured using the following equation:

$$\mathrm{Ctp} = \mathrm{exp} - \mathrm{fexp}$$

Where *ctp* = household's capacity to pay, *exp* = total possible expenditure of household, *fexp* = food expenditure of household *Ei* = Catastrophe value, *H* = Head count.

The formula used to calculate the head counts (H) of catastrophic health expenditure among the total number of individuals (N) is:

$$H = \frac{1}{N}\Sigma_{i=1}^{N} E_i$$

In the notation, *Ei* refers to the catastrophic value. However, the above measure of incidence, the headcount of catastrophic health expenditure, cannot measure the intensity of catastrophic expenditure. Hence, catastrophic overshoot

(O) (the amount by which household expenditure exceeds the threshold) and mean positive overshoot (MPO) (the mean level by which catastrophic health expenditure exceeds the threshold used) capture the intensity.[30]

$o_i = E\left(\left(\frac{T}{x}\right) - z\right)$ Where X = *ctp*, T = OOP expenditure, Z = Specified threshold.

So the overshoot is the average: $0 = \frac{1}{N}\Sigma_{i=1}^{N} 0_i$ Then $MP_0 = \frac{0}{H}$

out-of-pocket expenditure for cancer care estimated as all cancer care expenditure of the household for the last 12 months before the interview. The expenditure includes medical costs (for consultation, laboratory, and drug) as well as non-medical costs such as transportation and food costs incurred while visiting the health facilities. The monthly expenditure and income of the household were transformed to an annual basis. Possible probing approaches were applied to avoid recall bias. Direct medical expenditure was estimated by reviewing the medical charts of the participants and asking for receipts.

Indirect cost (income loss) due to cancer care for those who have no known income was calculated using a wage scale of 137birr per day (4127birr per month), which is the non-professional wage scale of the country according to the report of the Central statistics agency of Ethiopia.[21] The exchange rate U.S. dollar 42.4 was applied as it was in the middle year of the study period.

The coping mechanisms of the households reported were classified into two groups as covered by themselves (borrowing, selling assets, and income saving including Equb and Edir) and financial support from others (from relatives, religious organizations, and others). Financial support was deducted from total expenditure to estimate the level of catastrophic health expenditure.

Data Quality Control

To maintain data quality, we took several measures. First, we conducted a pre-test of the survey instrument on 5% of the planned sample size to ensure clarity of the questions and necessary corrections were made according to the pre-test result. Second, the data collectors and supervisors were given 2 days of training on the study aim, data collection procedure, and research ethics. Third, the data collection tool was translated into Amharic and back to the original English language to maintain consistency. Fourth, the data collection procedure was closely supervised. Furthermore, all the collected data were checked for completeness, accuracy, and consistency by the supervisors and principal investigator.

Data Processing and Analysis

The collected data were entered into EPI data version 3.1 and then exported to STATA version 16.0 for further analysis. We summarized health expenditure using means and standard deviations (SDs). Noting the fact that measures of central tendencies are influenced by outlier values, we also reported median costs with interquartile ranges (IQRs). In order to assess predictors of catastrophic health expenditure, we used logistic regressions. In order to do this, a binary logistic regression model was first applied and then variables with p-value of less than 0.1 in the bi-variable logistic regression were entered into multivariable regression analysis. The explanatory factors used for bivariate analysis include gender, age group, religion, marital status, type of cancer, health insurance status, cycles of chemotherapy taken, length of hospital stay, distance from hospital, income quintile, and employment status. These variables were selected based on different literature reviews and scientific plausibility. We used a p-value of less than 0.05, a 95% confidence interval (CI), and an adjusted odds ratio (AOR) to assess the relationship between CHE and the explanatory variables.

Result

Socio-Demographic and Economic Characteristics

A total of 320 cancer patients were approached out of whom 305 responded with a response rate of 95.3%. The majority of the respondents (66.2%) were females. Of the respondents, 61.6 were married. Regarding age, 91.8% of the participants were aged between 19 and 65 years and the mean age was 44.1(±SD 15.5) years. More than half (55.7) of the study participants came from large families (4–6) and more than half (57.7%) were from out of Addis Ababa with an average distance of 181.9km (±SD) 223.8 from the hospital. Regarding occupational status, private business was the highest (49.8%) followed by employment (23.3%) (Table 1)

Table 1 Socio-Demographic Characteristics of Respondents (n=305)

Characteristics		Frequency	Percent %
Gender	Male	103	33.8
	Female	202	66.2
Age group	1–18	12	3.9
	19–65	269	88.2
	≥66	24	7.9
Religion	Orthodox	183	60.0
	Islam	61	20.0
	Protestant	55	18.0
	Others*	6	2.0
Marital status	Married	188	61.6
	Single	117	38.4
Education level	Unable to read and write	42	13.8
	Elementary school (1–8)	94	30.8
	Secondary school (9–12)	72	23.6
	Higher education	97	30.8
Occupation	Employed	71	23.3
	Private business	152	49.8
	Unemployed	40	13.1
	Day laborer /Retired	42	13.8
Household Income quintile	Lowest	65	21.3
	Second	62	20.3
	Third	58	19.0
	Fourth	59	19.3
	Highest	61	20.0
Residence	Addis Ababa	129	42.3
	Out of Addis Ababa	176	57.7
Distance from the hospital (km)	0–300	236	77.4
	301–600	50	16.4
	>600	19	6.2

Notes: *Catholic, Adventist, and Pagan.

Clinical Information

Most study participants were from public hospitals (86.2%) and the remaining 13.8% were from private hospitals. Breast cancer was the most common type of cancer accounting for 29.5% and followed by cervical cancer (21%). All the patients received supportive treatment so far.

The mean and median of the total hospital admission days per year to receive cancer care were 32 days (SD; 40.99) and 22 days (IQR; 22), respectively. Patients reported days absent or minimized working days without payment and the total number of days their attendant was absent from work to provide care was a mean of 59.85 (SD; 75.8) and mean of 36.1 (SD; 39.7), respectively (Table 2).

Expenditure for Cancer Care

The mean annual out-of-pocket expenditure of households for cancer care was estimated to be 60,724.3birr/$1,432.2 (SD; 32,038.3birr) and median 54,860birr/$1294 (IQR; 36,480).

Table 2 Clinical Information of the Respondents (n=305)

Clinical Variables		Frequency	Percent %
Type of cancer	Breast cancer	89	29.2
	Cervical cancer	64	21.0
	Colorectal cancer	47	15.4
	Blood cancer	23	7.5
	Others*	82	27.0
Type of treatment taken so far (multiple answers possible)	Chemotherapy	298	97.7
	Radiotherapy	29	9.5
	Surgical therapy	135	44.3
	Hormonal therapy	13	4.3
	Sportive treatment	305	100
Cycle of chemotherapy	1–4	148	48.5
	5–8	125	41.0
	≥9	32	10.5
Type of facility	Public	263	86.3
	Private	42	13.7

Note: *Oro-pharyngeal, esophageal, gastric, skin, liver, prostate, and lung.

The mean expenditures of patients who came from out of Addis Ababa, further from the treatment hospital, received treatment in a private hospital, did not enroll in any type of health insurance, and received more cycles of chemotherapy were higher than those of their counterparts.

Direct medical expenditure accounted for 63% of the total cancer care expenditure indirect and direct non-medical expenditures accounted for 19.6% and 17.7%, respectively. Medicine expenditure had the highest expenditure on direct medical expenditure.

Blood cancer accounted for the highest expenditure compared to other types of cancer (Table 3).

Incidence and Intensity of CHE

The catastrophic incidence (headcount) of cancer inpatients at a threshold of 40% (direct and indirect expenditures) was 77.7%. When using only direct medical expenditures, it was found to be 65.6% (Table 4).

The mean positive overshoot for the lowest income quintile at the 40% threshold was 78.3%, which means that on average the OOP expenditure for households in the lowest income quintile was 78.3% higher than 40% of the households' capacity to pay (Table 5).

Table 3 Summary of Cancer Care Expenditure and Incidence of CHE by Type of Cancer (n=305)

Type of Cancer	Frequency (%)	Average Annual Cancer care Expenditure in Birr (±SD)	Median and IQR** of Annual Cancer care Expenditure Birr	CHE Headcount (%)
Breast cancer	89(29.2)	48,708.1 (27,446.8)	42,213.3 (31,580.0)	67(75.3)
Cervical cancer	64(21.0)	51,797.8 (27,081.4)	45,499.5 (30,554.5)	44(68.8)
Colorectal cancer	47(15.4)	58,278.2 (33,618.3)	50,866.0 (38,768.0)	37(78.7)
Blood cancer	23(7.5)	64,105.2 (24,003.4)	62,342.0 (28,650.0)	21(91.3)
Others*	82(27.0)	56,939.8 (28,572.6)	53,055.0 (37,025.0)	68(70.1)

Note: *Oro-pharyngeal, esophageal, gastric, skin, liver, prostate, and lung; **Inter-quartile range.

Table 4 The Incidence and Intensity of CHE at Different Thresholds (n=305)

CHE as a Share of the Capacity to Pay	Threshold Level			
	20%	25%	30%	40%
Headcount	94	90.5	88.2	77.7
Overshoot	51.8	47.9	44.0	36.2
Mean positive overshoot	55.1	52.9	49.9	46.6

Table 5 The Intensity of CHE Across Income Quintiles at Different Thresholds (n=305)

Threshold %	Income Quintile														
	Lowest			Second			Third			Fourth			Highest		
	CHE%	O %	MPO %	CHE%	O %	MPO%	CHE%	O %	MPO%	CHE%	O %	MPO%	CHE%	O %	MPO%
20	98.3	89.8	91.4	96.8	69.3	71.6	95	43.8	46	95	29	30	85.5	24.2	28.3
25	96.6	85.3	88	95.2	65	68.2	93.4	40	42.7	88.7	25.8	29	79	21.3	27
30	96.5	80.7	83.6	95	60.6	63.7	93.4	35.8	38.3	83.9	22.5	26.8	72.6	18.8	25.8
40	91.4	71.6	78.3	87	52	59.6	80.3	27.7	34.5	67.7	15.8	23.3	62.9	13.6	21.6

Factors Associated with Catastrophic Health Expenditure

Patients those who came from out of Addis Ababa were 2.4 times (AOR; 2.4, 95% CI: 1.1, 5.4) and who came from more than 300km distance were 12 times (AOR; 12, 95% CI: 1.6, 94.5) more likely to incur CHE. Households of patients who took more than 5 cycles of chemotherapy were 4 times (AOR; 4.0, 95% CI: 1.8, 8.9) more likely to encounter CHE. Moreover, households that were not enrolled in any type of health insurance were almost 6 times (AOR; 5.6, 95% CI: 2.0, 16.2) more likely to encounter CHE than their counterparts. Those who had the lowest income were 10 times more likely (AOR; 9.8, 95% CI: 2.5, 37.9) to encounter CHE than their counterparts. Those who were admitted for more than 42 days were 3.5 times (AOR; 3.5, 95% CI: 1.2, 10.6) more likely to incur CHE as compared to their counterparts (Table 6).

Table 6 Factors Associated with Catastrophic Health Expenditure (n=305)

Independent Variables		CHE		COR (95% CI)	AOR (95% CI)	p-value AOR
		Yes (%)	No (%)			
Type of facility	Public Private	213(81) 24 (57)	50(19) 18(43)	1** 0.3(0.2, 0.6)	– 0.46(0.15, 1.3)	– 0.17
Residence	Addis Ababa Outside A.A[a]	79 (61) 158(89.7)	50(39) 18(10.3)	1 ** 5.6(3.0, 10.2)	– 2.4(1.1, 5.4)	– 0.03*
Cycle of chemo-therapy	1–4 5–8 ≥9	101(68.2) 107(86) 29(90.6)	47(31.2) 18(14) 3(9.4)	1** 2.77(1.5, 5.1) 4.5(1.3, 15.5)	– 4.0(1.8, 8.9) 5.6(1.3, 23.6)	 <0.01* 0.02*
Insurance enrolment	CBHI [b] Private No insurance	131(75.7) 25(58) 81(91)	42(24.3) 18(42) 8(9)	1** 0.4(0.2, 0.9) 3.2(1.5, 7.3)	– 0.7(0.3, 1.8) 5.6(2.0, 16.2)	– 0.50 <0.01*
Length of hospital stay in days	1–21 22–41 ≥42	82(66) 86(82) 69(92)	43(34) 19(18) 6(8)	1** 2.4(1.3, 4.4) 9.0(2.4, 15.1)	– 1.8(0.8, 3.9) 3.5(1.2, 10.6)	– 0.10 0.02*

(*Continued*)

Table 6 (Continued).

Independent Variables		CHE		COR (95% CI)	AOR (95% CI)	p-value AOR
		Yes (%)	No (%)			
Distance from hospital(km)	0–300	170(72)	66(28)	1**	–	
	301–600	49(98)	1(2)	3.9(2, 7.8)	2.2(0.5, 9.4)	0.30
	>600	19(95)	1(5)	19.9(4.7, 84)	12(1.6, 94.5)	0.02*
Educational status	Illiterate	37(88)	5	1**	–	–
	Elementary	78(83)	16(17)	0.7(0.2, 1.9)	2(0.5, 7.4)	0.30
	Secondary	60(83)	12(17)	0.7(0.2, 2)	1.7(0.4, 6.9)	0.5
	Higher education	62(63.9)	35(38)	0.2(0.1, 0.7)	1.3(0.3, 5.2)	0.7
Household income quintile	Highest	39 (63)	23(37)	1**	–	
	Fourth	42 (67.7)	20(32.3)	1.2(0.6, 2.6)	1.2(0.4, 3.4)	0.7
	Third	49 (80)	12(20)	2.4(1.1, 5.4)	2.5(0.8, 7.6)	0.1
	Second	54 (87)	8(13)	4.0(1.6, 9.8)	4.1(1.2, 14.3)	0.03*
	Lowest	53 (91)	5(9)	6.3(2.2, 17.9)	9.8(2.5, 37.9)	0.01*

Notes: *Significant association, **Reference group, [a]Addis Ababa, [b]Community based health insurance.

Table 7 Coping Strategies Used by Households to Alleviate the Financial Burden (n=305)

Coping Strategies	Frequency	Percent%
Saving or any household member's income	300	98.4
Selling assets	118	38.7
Financial support from a friend or relative	97	31.8
By Equb/Edir	20	6.6
Borrowing from usury or financial institution	9	3.0

Coping Strategies for Financial Problem

Most participants reported that they implemented more than one coping strategy to alleviate their financial burden. Almost all (98.4%) of the participants reported that they used their family members' income and savings as coping strategies to overcome their financial burden (Table 7).

Discussion

The study shows that the incidence of out-of-pocket expenditure for cancer care based on a 40% threshold of households' capacity to pay was 77.7%. This percentage is very high compared to Korean cancer patients (39.8%)[31] and Malaysian colorectal cancer patients (48.7%).[29] However, it is slightly lower than that of Indian cancer patients (79%)[32] and Nigerians (86%).[16] Variations in the reported incidence of catastrophic health expenditure could be attributed to differences in the measurement of CHE, types of cancer considered in the analysis, and socio-economic factors in the study countries. Our findings are relatively similar to results from African countries than to those from Asian countries. A similar study conducted on 352 cancer patients in Addis Ababa in 2018 revealed that the level of CHE for cancer care was 74.4% based on a 10% threshold of total household income.[20] However, unlike the current study, this did not consider the indirect costs borne due to seeking medical care.

In this study, the CHE for cancer care was almost three-fold higher than that for cardiovascular disease in Addis Ababa (27%) and households of persons with depression and disability in rural Ethiopia (24%).[27,33] This indicates that cancer expenditure is very high and an uncountable number of patients are dying at home without receiving cancer care or they destruct other needs to invest in cancer care.

When the number of cycles of chemotherapy increases, the chance of households becoming catastrophic increases also increase. The result was supported by the study done in Addis Ababa and northwest Ethiopia.[20,34]

Patients who came from out of Addis Ababa were 2.4 times more at risk of getting CHE than their counterparts. This was similar to a study on cardiovascular disease patients in Addis Ababa.[33] This may happen due to increased direct non-medical expenditures like transport food and bed rent during hospital visits.

Households of patients who were not enrolled in any type of health insurance scheme were almost six times at risk of incurring CHE. A community survey done in Egypt reported that households with no private health insurance are at high risk of CHE[35] and also a study done in northeast Ethiopia revealed that insured households were 81% times less likely to incur catastrophic health expenditure as compared with non-insured.[36]

Households of patients admitted for more than 42 days were 3.5 times more likely to incur CHE as compared to their counterparts. The result is similar with inpatients with cancer in Sudan, which revealed that as the length of stay increases the expenditure significantly increases.[37] This implies that receiving inpatient care for cancer could expose households to further impoverishment.

Households who have the highest income quintile were 90% less likely (AOR; 01, 95% CI: 0.03, 0.4) to encounter CHE as compared to the lowest income quintile. For rural Chinese cancer patients, the chance of getting CHE for those households of the lowest income quintile was 36 times,[38] and a similar report was found in Malaysia.[29] A study done on cardiovascular disease in Addis Ababa reported that households in the lowest income quintile are more likely to get into CHE than those with the highest income quintile.[33] The evidence overall indicates the catastrophic nature of cancer care, particularly for the poorest households that have limited capacity to afford medical services.

Patients and their households may use more than one coping strategy for their financial constraints. In this study saving was the main coping mechanism followed by selling assets and asking for financial support from relatives and friends, which was similar to other studies.[20,33–35] However, studies conducted in Iran and fifteen other African countries revealed that borrowing and selling assets were the main coping mechanisms.[39,40] The difference could be the country's economic status and availability of borrowing setup from financial institutions.

This study provides useful evidence that can inform the decision-making process for healthcare financing and to provide financial protection to households against catastrophic health spending. However, the results need to be taken considering the following limitations. First, some recall biases and are unable to include patients who were treated for some time and resign due to financial constraints. Second, indirect costs are measured by considering the lost income for the patients of those who accompanied the patient during health facility visits but do not include the forgone income of those who provided palliative care at home.

Moreover, data were collected only from Addis Ababa and it would be difficult to make generalization to the study country.

Conclusion

This study revealed a considerable incidence of catastrophic health expenditure among patients attending cancer care at public and private hospitals in Addis Ababa. The economic consequences of cancer care are practically found to be severe for households in the lower socioeconomic status.

The households attempted to cope with the cost of concern care using coping strategies. Such as saving, selling assets, and asking for financial support from relatives were the main coping mechanisms for the financial burden that have impoverishment effects. Therefore, in order to protect the households from the health and economic consequences of cancer, we recommend strengthening efforts by concerned bodies to reduce the risk factors of cancer and its burden in the population.

It is also necessary to decentralize the cancer care given in Addis Ababa to the regions with similar standard. Moreover, reducing out-of-pocket health expenditure by developing strong health insurance program is crucial.

Currently, Ethiopia has implemented community-based health insurance that serves only those who are engaged in the informal sector.[41] Hence, it is necessary to focus on developing stronger health insurance schemes that cater to the population in both the formal and informal sectors. Saving individuals with cancer from CHE is not a pending issue.

Abbreviations

AOR, adjusted odds ratio; CBHI, community-based health insurance; CHE, catastrophic health expenditure; MoH, Ministry of Health; OOP, out-of-pocket expenditure; WHO, World Health Organization; TASH, Tikur Anbesa Specialized Hospital; IQR, interquartile range; SD, standard deviation.

Operational Definitions

Equb; is an Ethiopian cultural association of people to mobilize finance and distribute on a rotating basis for each member. Edir; is a social Ethiopian institution aimed at mutual aid and grants cooperative insurance to specific communities.

Data Sharing Statement

The data are available from the correspondent author upon reasonable request.

Ethical Considerations

Ethical approval was obtained from the School of Public Health's Institutional Research Ethics Review Board (IRB), Addis Ababa University (Ref. No. SPH/025/14). Written informed consent was obtained from all participants. Study participants were assured by data collectors that their data would be kept confidential and that they would not face any harm or disadvantage for taking part in the study. For minor participants, guardians (relatives) signed on behalf of the patient, and this study was conducted in accordance with the Declaration of Helsinki.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis, and interpretation, or all these areas; took part in drafting, revising, or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors have declared that they have no conflicts of interest in this work.

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