Objective financial toxicity in patients with cancer: a cross-sectional study

Nguyen Thanh Xuan[1], Nguyen Hoang Lan[2], Nguyen Thanh Gia[2], Le Dinh Duong[2], Tran Binh Thang[2]*
(1) Hue Central Hospital
(2) Hue University of Medicine and Pharmacy, Hue University

Abstract

Introduction: We conducted this study to estimate the objective financial toxicity and identify the associated factors that contribute to the objective financial toxicity among patients with cancer. **Methods**: A cross-sectional study that included 300 patients was carried out at Hue Central Hospital, Vietnam from 09/2022 to 03/2023. Data was collected using a structured questionnaire through face-to-face interviews and review of medical records. Objective financial toxicity was measured by catastrophic health expenditure (CHE), threshold of 25% of average household income. A multivariable logistic model was used to determine the factors that contribute to CHE in patients with cancer. **Results:** The prevalence of CHE at cutoff points 25% was 85.7%. The higher risk of CHE was significantly associated with age under 60 (OR = 1.93, 95% CI: 1.05 - 3.52); female (OR = 3.34, 95% CI: 1.74 - 6.40); no income (OR = 4.03, 95% CI: 1.40 - 11.6); stage III (OR = 6.94, 95% CI: 1.01 - 47.56), respectively. In contrast, no significant association was found between health insurance, residential areas, education level, or cancer type and CHE. **Conclusions** Our study and existing research highlight the significant financial burden borne by cancer patients (CHE, 85.7%), particularly those with lower socioeconomic status and in later stage of the disease.

***Keywords**: Objective financial toxicity; Catastrophic Health Expenditure; cancer.*

1. INTRODUCTION

In 2020, the world had 19,292,789 new cancer cases, of which 9,958,133 patients died [1]. In Vietnam, in 2020, 182,563 newly discovered cancer patients were recorded, of which 122,690 died [2]. Cancer is truly a burden on society in Vietnam. 74.3% of diseases in Vietnam are noncommunicable diseases, of which cancer ranks second among the 10 leading causes of disease. The economics budence for breast, cervical, liver, colorectal, stomach, and oral cavity cancers were estimated to account for 0.22% of Vietnam's total GDP in 2019 [3].

Cancer poses a financial burden on patients due to the high cost of treatment. This burden must be considered in the patient's personal circumstances and experience with diagnosis and treatment. The cost of cancer treatment negatively affects patients' mental health [4], directly affects the treatment process, increases the risk of stopping treatment and affects quality of life [5], even reducing the patient's ability to survive [6]. Financial toxicity (FT) is a term that describes psychological distress, negative coping behaviors, and material conditions that patients experience due to the high out-of-pocket (OOP) costs of treatment, increased cost sharing, and decreased household income as a result of cancer and its treatment [7]. Objective FT as a part of the FT measuring costs of treatment, like out-of-pocket healthcare expenses [8, 9]. FT affects 40 - 50% of cancer survivors [10] and is associated with worse quality of life, greater nonadherence to cancer care and general medical care, and the use of lifestyle-altering behaviors such as increased home sale or refinance, decreased basic spending, and increased use of savings or retirement accounts [6, 11].

Studies show that there are numerous factors that can contribute to FT in patients with cancer. Patients who declared personal bankruptcy from cancer treatment costs had nearly twice the mortality risk as those who did not declare bankruptcy [6]. Patients with inadequate insurance coverage, low income, unemployment, long travel times to a healthcare facility, lower education, younger age, non-white race, and female sex are at increased risk for FT [7, 10]. In the current study, our objectives were to estimate the objective FT and to identify associated factors among patients with cancer.

2. SUBJECTS AND METHODS

Subjects: Patients who received cancer treatment during the study period.

Inclusion Criteria: Primary diagnosis of cancer with at least 12 months of treatment.

Exclusion: those patients with any mental problem and no ability to answer the question.

Corresponding author: Tran Binh Thang; Email: tbthang@huemed-univ.edu.vn
DOI: 10.34071/jmp.2024.4.10
Received: 7/3/2024; Accepted: 18/6/2024; Published: 25/6/2024

2. METHODS

Study design: A cross-sectional observational study was conducted from 09/2022 to 03/2023 at Hue Central Hospital of Vietnam. A total of 300 patients diagnosed with primary cancer were included in this analysis.

Variables and measurements

Dependent variable: Objective FT was defined by catastrophic health expenditure (CHE) resulting from healthcare costs associated with their treatment. We employed the budget share approach (also known as the basic approach), a method popularized by the World Bank [8, 12, 13]. CHE was defined as occurring when OOP payments exceeded a defined proportion of an average household's income, specifically greater than 25% [13, 14]. OOP costs were estimated as the total direct costs, including both medical and non-medical expenses, incurred for cancer treatment during the past year. The analysis considered only patient-borne costs, excluding any expenses covered by health insurance or third-party payers. Income was assessed the amount of income per capita of households or the minimum income as the government suggested for the poverty level (2000000 Vietnam Dong per capita).

Independent variables: Data encompassing demographics and cancer information was collected through a questionnaire. Demographic and socioeconomic factors included: age (categorized as under 60 or 60 and over), sex (male or female), residence (rural or urban), occupation status, and health insurance coverage level (100%, 95%, or 80%). Additionally, cancer type (limited to a selection of convenient cancers) and stage (I, II, III, or IV) were also included.

Data Collection

Demographic and socioeconomic information: data on demographics, socioeconomic factors, and direct non-medical costs were collected through a structured questionnaire administered by nurses and students during face-to-face interviews. Direct medical costs were based on the previous 12 months' medical bills in the hospital electronic system. Cancer data was collected by reviewing medical records with the assistance of oncologists.

Statistical analysis

To identify the factors that predict exceeding a specific catastrophic health expenditure (CHE) threshold (25%), a multivariable logistic regression was utilized. The model's goodness-of-fit was assessed using the Hosmer-Lemeshow test statistic (χ^2 value) and its associated degrees of freedom (DF). The results of the Hosmer-Lemeshow test ($p > 0.05$) indicate that the model fits the data well. A significance level of $\alpha = 0.05$ was chosen to determine statistical significance (p-value ≤ 0.05). The data was prepared and cleaned in Microsoft Excel before being analyzed with Stata 15.0.

Ethics and Fundings

The participants were allowed to collect additional data from the medical record for research purposes. The study was approved by the Institutional Ethics Committee for Biomedical Research of the University of Medicine and Pharmacy, Hue University (H2022/485). This work was supported by research funds from Hue University (DHH 2022 – 04–175).

3. RESULTS

Table 1. Information of sociodemographic and clinical-related cancer

Characteristics (all)		Patients (n)	Percent (%)
All samples			
Age	< 60	152	50.7
	≥ 60	148	49.3
Sex	Male	208	69.3
	Female	92	30.7
Education	Primary school/Below primary school	95	31.7
	≥ Secondary school - High school	205	68.3
Residential areas	Rural	74	24.7
	Urban	226	75.3
Occupation status	Stable income	66	22.0
	Unstable income	163	54.3
	No income	71	23.7

Health insurance	100%	153	51.0
	95%	36	12.0
	80%	111	37.0
Type of cancers	Oesophagus cancer	39	13.0
	Stomach cancer	15	5.0
	Colorectal cancer	30	10.0
	Liver cancer	32	10.7
	Biliary/pancreatic cancer	112	37.3
	Breast cancer	72	24.0
Cancer Stages	I	6	2.0
	II	54	18.0
	III	110	36.7
	IV	130	43.3

Table 1 presented Information of sociodemographic and clinical-related cancer. The majority of participants were male (69.3%). Most participants had at least a secondary school education (68.3%). Approximately three-quarters of the participants resided in urban areas (75.3%). A significant proportion of participants reported unstable or no income (78%). Biliary/pancreatic cancer was the most common cancer type among participants, accounting for 37.3% of cases. The majority of patients were diagnosed at late stages (III & IV) of the disease (80%).

Table 2. OOP by sociodemographic and clinical-related cancer

Characteristics (all)		**n (%)**	**Out of pocket (1,000 VND)**	
			Mean ± SD	**Median**
All samples			44504 (32810.7)	39867.1
Age	< 60	152	48417.1 (36822.9)	42036.7
	≥ 60	148	40485.1 (27654.8)	33996.8
Sex	Male	208	42600.7 (30918)	35616.9
	Female	92	48806.9 (36548)	42418.7
Education	Primary school/Below primary school	95	49792.83 (38430.31)	45032.8
	≥ Secondary school - High school	205	42053.03 (29635.82)	36000.0
Residential areas	Rural	74	45771.6 (31152.1)	42020.4
	Urban	226	44088.9 (33392.3)	39152.2
Occupation status	Stable income	66	46363.5 (31891.4)	41742.7
	Unstable income	163	42571.9 (34364.1)	35233.7
	No income	71	47211 (30027.5)	45588.0
Health insurance	100%	153	47676.3 (37575.5)	40000.2
	95%	36	44335.8 (23357.8)	45761.2
	80%	111	40185.8 (27727.3)	34354.6

Type of cancers	Oesophagus cancer	39	50882.1 (24910.4)	45801.2
	Stomach cancer	15	38708.3 (21530.5)	47032.8
	Colorectal cancer	30	50452.3 (25226.7)	51554.9
	Liver cancer	32	37376.7 (27971.4)	25284.8
	Biliary/pancreatic cancer	112	45552.6 (36830.8)	36967.1
	Breast cancer	72	41314.7 (36172.8)	30250.1
Cancer Stages	I	6	28288.9 (15758.2)	31996.8
	II	54	40677.8 (25135.4)	37926.4
	III	110	45795.7 (41076.1)	36700.2
	IV	130	45748.7 (27911.3)	44176.8

Table 2 explored how these costs vary depending on sociodemographic and clinical-related cancer factors. On average, the mean and median direct cost per patient for one-year treatment were 44,504,000 Vietnamese Dong (VND) and 39,867,100 VND, respectively.

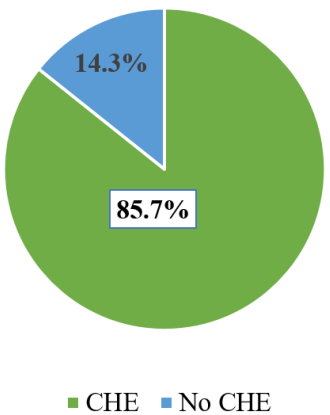

Figure 1. Prevalence of CHE in patients with cancer

Figure 1 shows the prevalence of Catastrophic Health Expenditure (CHE) at a 25% cutoff point. 85.7% of patients experienced CHE.

Table 3. Multivariable logistic regression evaluating factors associated with CHE in cancer patients

Characteristics		**CHE *(> 25% of income)***		
		OR	**95% CI**	**p**
Age	≥ 60	Reference		
	< 60	**1.93**	**1.05 - 3.52**	**0.036**
Gender	Male	Reference		
	Female	**3.34**	**1.74 - 6.40**	**0.012**
Education	Primary school/Below primary school	Reference		
	≥ Secondary school - High school	0.50	0.23 - 1.11	0.090
Residential areas	Urban	Reference		
	Rural	0.82	0.40 - 1.66	0.575
Occupation status	Stable income	Reference		
	Unstable income	1.84	0.87 - 3.92	0.112
	No income	**4.03**	**1.40 - 11.6**	**0.010**

Health insurance	100%	Reference		
	95%	2.14	0.75 - 6.11	0.157
	80%	1.50	0.76 - 2.95	0.244
Type of cancers	Oesophagus cancer	Reference		
	Stomach cancer	0.76	0.09 - 6.51	0.800
	Colorectal cancer	1.98	0.31 - 12.63	0.470
	Liver cancer	0.27	0.06 - 1.19	0.084
	Biliary/pancreatic cancer	0.68	0.16 - 2.8	0.592
	Breast cancer	0.60	0.13 - 2.81	0.515
Cancer Stages	I	Reference		
	II	2.61	0.38 - 18.11	0.333
	III	**6.94**	**1.01 - 47.56**	**0.049**
	IV	3.47	0.52 - 23.24	0.199

Goodness-of-fit test for logistic model: Pearson chi2(208) = 11.76, Prob > chi2 = 0.162

The multivariable logistic regression analysis identified several factors that were significantly associated with an increased risk of CHE among patients with cancer (**Table 3**). Compared to individuals over 60 years old, those under 60 were more likely to experience CHE (OR = 1.93, 95% CI: 1.05 - 3.52). Females had a higher risk of CHE compared to males (OR = 3.34, 95% CI: 1.74 - 6.40). Individuals with no income had a substantially higher likelihood of CHE compared to those with stable income (OR = 4.03, 95% CI: 1.40 - 11.6). Patients with stage III cancer had a significantly higher risk of CHE compared to those with stage I (OR = 6.94, 95% CI: 1.01 - 47.56). In contrast, no significant association was found between health insurance, residential areas, education level, or cancer type and CHE. The Hosmer-Lemeshow test results (χ^2 = *11.76)* suggest an acceptable model fit (p-value > 0.05).

4. DISCUSSION

This study investigated objective FT and contributing factors among patients with cancer in a tertiary hospital. The findings highlight a concerning burden of financial hardship associated with cancer treatment. Specifically, our study indicated that the cost per patient in the last 12 months for cancer treatment was 44,504,000 Vietnam Dong. In addition, the findings also reveal that a large proportion of people experience catastrophic health expenditure with cut-off point of 25% of household income, corresponding to 85.7%. Factors associated with a higher risk of CE, including younger age, female, no income, and late stage.

Our findings on total out-of-pocket costs, deficits, and financial catastrophe are similar to those reported in other studies on cancer patients. The results of the study by Hoang Van Minh et al. (2017) on patients with cancer (n = 1,916) showed a mean OOP cost of 43.9 million VND, a median of 33.4 million VND and a standard deviation of 51.3 million VND. Catastrophic health spending rates based on thresholds of 20%, 30%, 40%, and 50% of household income were 82.6%, 73.7%, 64.7% and 56.9%, respectively [15]. A regional study conducted during this period in eight Southeast Asian nations, including Vietnam, found that nearly half (48%) of patients faced catastrophic healthcare expenses (defined as more than 30% of household income) [16]. Similarly, a recent 2020 study focusing on lung cancer patients at the National Oncology Hospital (K Hospital) revealed an even higher rate of 62.7% incurring catastrophic expenses [17]. These findings highlight a worrying trend: the increasing burden of out-of-pocket medical costs relative to household income among cancer patients. This financial strain forces patients and their families into difficult choices, including borrowing money from medical professionals, selling assets, taking on bank loans or using credit, or even abandoning treatment altogether [18]. The consequences can be devastating, potentially leading to premature death for patients and financial hardship for families, impacting children's education, and potentially forcing them to drop out of school [16].

Compared to neighboring China, where studies report CHE rates ranging from 43% to 78% among

cancer patients, depending on the methods of CHE estimation [19, 20]. Furthermore, a recent study by Ngan et al. (2021) on breast cancer patients found a higher average deficit ratio (out-of-pocket expenses to income) of 2.6 times. This disparity could be attributed to differences in the types of cancer studied and the stage of diagnosis at inclusion [18]. These findings highlight the significant financial burden on cancer patients and their families. The financial burden associated with treatment can lead to extreme exhaustion, not only financially but also financial psychologically [21]. Our study focused primarily on objective FT, which is the measurable cost burden on patients and their families. More research is needed to explore subjective FT, which includes the emotional and psychological impact of these costs on patients.

Our study also identified several factors associated with higher levels of financial hardship due to healthcare costs: younger age, female, no income, and late-stage diagnosis. These findings align with previous research conducted within Vietnam [15, 17, 18] and in low- and middle-income countries [22, 23]. These results suggest the need for targeted interventions to address the financial burden experienced by these vulnerable groups. Moving beyond traditional hospital-based approaches, exploring alternative methods is crucial to reduce disparities in access to cancer care and treatment [24]. Furthermore, factors such as the proportion covered by health insurance were not significantly related in our study, which raises the possibility for future research to explore the role of insurance in the association with financial difficulties in cancer patients more deeply [25].

This study has several limitations. First, it only estimates the average per capita cost within households, which does not fully reflect the cost burden across all family members. This limitation is consistent with those identified by Nguyen et al. in their review article [13]. However, due to data constraints, we were only able to employ a specific cost estimation method. Second, the OOP cost estimation method utilizes a prevalence-based approach, which only reflects the costs for the most recent year of treatment. It does not capture the cumulative costs incurred from the time of diagnosis. Future studies should consider this aspect in their cost estimations. Although our study effectively captured objective FT through indicators such as CHE, it did not explore the psychological impact of these burdens, the coping strategies used by patients, and the downstream consequences of such psychological distress. Future research should consider investigating these crucial aspects to gain a more comprehensive understanding of the challenges faced by cancer patients.

5. CONCLUSIONS

Our study and existing research highlight the significant financial burden borne by cancer patients (CHE, 85.7%), particularly those with lower socioeconomic status and in later stage of the disease. Addressing this challenge requires multifaceted strategies. Furthermore, it is crucial to investigate effective interventions to reduce financial hardships and improve access to care for vulnerable groups.

REFERENCES

1. World Health Organization. The Global Cancer Observatory. 2020.

2. World Health Organization. The Global Cancer Observatory - Vietnam. 2020.

3. National Cancer Institute. Financial burden of cancer care. 2020.

4. Kahn J. R., Earlin L. I. Financial strain over the life course and health among older adults. J Health Soc Behav. 2006;47:17-31.

5. Lathan C. S. Association of Financial Strain With Symptom Burden and Quality of Life for Patients With Lung or Colorectal Cancer. J Clin Oncol. 2016;34:1732-40.

6. Ramsey S. D. BA, Fedorenko C. R., Blough D. K., Overstreet K. A., Shankaran V.,. Financial Insolvency as a Risk Factor for Early Mortality Among Patients With Cancer. J Clin Oncol. 2016;34:980-6.

7. Sadigh G, Switchenko J. Correlates of financial toxicity in adult cancer patients and their informal caregivers. Supportive Care in Cancer. 2021;30:217-25.

8. Park J, Look KA. Relationship between objective financial burden and the health-related quality of life and mental health of patients with cancer. Journal of oncology practice. 2018;14(2):e113-e21.

9. Tran Thu Ngan, Hoang Van Minh, Michael Donnelly. Financial toxicity due to breast cancer treatment in lowand middle-income countries: evidence from Vietnam. Support Care Cancer. 2021;2021:6325-33.

10. Smith GL L-OM, Advani PG, . Financial burdens of cancer treatment: A systematic review of risk factors and outcomes. . J Natl Compr Canc Netw. 2019;17:1184-92.

11. Jonas A. de Souza, Bonnie J. Yap. Measuring

financial toxicity as a clinically relevant patient-reported outcome: The validation of the COmprehensive Score for financial Toxicity (COST). Cancer. 2017;123:476-84.

12. Wagstaff A, Doorslaer Ev. Catastrophe and impoverishment in paying for health care: with applications to Vietnam 1993–1998. Health economics. 2003;12(11):921-33.

13. Nguyen HA, Ahmed S, Turner HC. Overview of the main methods used for estimating catastrophic health expenditure. Cost Eff Resour Alloc. 2023;21(1):50.

14. Wagstaff A, Flores G, Hsu J, Smitz MF, Chepynoga K, Buisman LR, et al. Progress on catastrophic health spending in 133 countries: a retrospective observational study. Lancet Glob Health. 2018;6(2):e169-e79.

15. Hoang VM, Pham CP, Vu QM, Ngo TT, Tran DH, Bui D, et al. Household Financial Burden and Poverty Impacts of Cancer Treatment in Vietnam. BioMed Research International. 2017;2017:9350147.

16. The ACTION study. Catastrophic health expenditure and 12-month mortality associated with cancer in Southeast Asia: results from a longitudinal study in eight countries. BMC Medicine. 2015;13(1):190.

17. Phan Ngọc Sơn NTQ, Nguyễn Quỳnh Anh. Chi phí thảm họa mà hộ gia đình và người bệnh có thẻ Bảo hiểm y tế phải gánh chịu do điều trị ung thư phổi tại Bệnh viện K năm 2020. Tạp chí Khoa học Nghiên cứu Sức khỏe và Phát triển. 2022;06(03-2022):40-9.

18. Ngan TT, Van Minh H, Donnelly M, O'Neill C. Financial toxicity due to breast cancer treatment in low- and middle-income countries: evidence from Vietnam. Support Care Cancer. 2021;29(11):6325-33.

19. Zheng A, Duan W, Zhang L, Bao X, Mao X, Luo Z, et al. How great is current curative expenditure and catastrophic health expenditure among patients with cancer in China? A research based on "System of Health Account 2011". Cancer Med. 2018;7(8):4036-43.

20. Chen JE, Lou VW, Jian H, Zhou Z, Yan M, Zhu J, et al. Objective and subjective financial burden and its associations with health-related quality of life among lung cancer patients. Support Care Cancer. 2018;26(4):1265-72.

21. Witte J, Mehlis K, Surmann B, Lingnau R, Damm O, Greiner W, et al. Methods for measuring financial toxicity after cancer diagnosis and treatment: a systematic review and its implications. Ann Oncol. 2019;30(7):1061-70.

22. Xu B, Hu L, Cheng Q, W KWS. A systematic review of financial toxicity among cancer patients in China. Asia Pac J Oncol Nurs. 2022;9(8):100071.

23. Prinja S, Dixit J, Gupta N, Dhankhar A, Kataki AC, Roy PS, et al. Financial toxicity of cancer treatment in India: towards closing the cancer care gap. Front Public Health. 2023;11:1065737.

24. Shah K, Zafar SY, Chino F. Role of financial toxicity in perpetuating health disparities. Trends Cancer. 2022;8(4):266-8.

25. Giang NH, Oanh TTM, Anh Tuan K, Hong Van P, Jayasuriya R. Is Health Insurance Associated with Health Service Utilization and Economic Burden of Non-Communicable Diseases on Households in Vietnam? Health Syst Reform. 2020;6(1):1-15.