

Direct non-medical costs and influencing factors of patients with non-small cell lung cancer treated with targeted therapy: A cross-sectional study in Vietnam

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Abstract:

To estimate the direct non-medical costs and related factors for patients with non-small cell lung cancer (NSCLC) with estimated glomerular filtration rate (EGFR) mutations who received first-line targeted therapy, a cross-sectional study was conducted from October 2022 to December 2023. Interviews were conducted with 310 NSCLC patients at the Vietnam National Cancer Hospital in Tan Trieu. The mean total direct non-medical costs for NSCLC patients were VND 832,989 per month, accounting for 3.6% of the mean total costs and 29.6% of the average income of NSCLC patients. The highest proportion of patients incurred expenses for transportation (98.7%), meals (90.0%), and lodging (39.0%). Costs for transportation (VND 591,525, accounting for 71.0%), meals (VND 155,580, accounting for 18.7%), and lodging (VND 85,884, accounting for 10.3%) were reported. Meal and lodging costs increased with the duration of hospital visits ($p < 0.001$). Factors such as residing in rural areas, frequency of caregivers, and duration of hospital visits were found to affect the direct non-medical costs of patients with EGFR-mutated NSCLC ($p < 0.05$). Organisations and individuals should support NSCLC patients by offering free or discounted meals, lodging, and transportation. This assistance can help reduce the out-of-pocket burden on patients and prevent them from falling into poverty.

Keywords: cost, direct cost, direct non-medical cost, non-small cell lung cancer, targeted therapy.

Classification numbers: 3.2, 3.6

1. Introduction

According to GLOBOCAN 2022, lung cancer is the leading cause of death among cancers, with 1.8 million deaths annually. It is estimated that by 2050, the number of new cases of lung cancer could reach 35 million [1]. Non-small cell lung cancer (NSCLC) accounts for about 85% of all new lung cancer cases [2]. In Vietnam, lung cancer has ranked second in incidence and mortality rates each year since 2012 [3], and up to 89% of non-small cell lung cancer cases are detected at late stages (stage IIIB and IV) [4]. Meanwhile, the cost of treating stage IV lung cancer (8,293 Euros/month) is significantly higher than that of stage IA disease (3,228 Euros/month) [5]. In the United States, the total annual medical costs for lung cancer treatment range

from 0.00248 to 0.1326% of the gross domestic product (GDP) [6]. According to a study that assessed the impact of out-of-pocket cancer treatment costs on household finances in Vietnam, the estimated costs include direct medical costs (inpatient and outpatient treatment costs) that patients must pay after deducting amounts covered by health insurance. Additionally, direct non-medical costs such as meals, lodging, and transportation, which patients pay in full, were also included in these estimates. Consequently, these costs have driven 37.4% of households in Vietnam into poverty [7]. Although the study did not specify the proportion of direct non-medical costs in the total cost of cancer treatment, it is evident that these costs, combined with direct medical costs, have contributed to impoverishing households in

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Vietnam. Therefore, non-medical direct costs also need to be considered and evaluated further in future studies.

However, in most health economic studies, direct non-medical costs are rarely mentioned because they are difficult to estimate, convert clearly and accurately, and are not readily available in terms of data. Direct non-medical costs typically account for only a small proportion of the total cost of lung cancer treatment [8, 9]. According to a study in Nepal, direct non-medical costs accounted for 13% [10], while in Iran, the cost accounted for only 2.7% of the total cost of cancer treatment [11]. However, all direct non-medical costs during the treatment process are paid by the patients and their families out of pocket [9, 12]. In Malaysia, based on out-of-pocket expenditures, direct non-medical costs accounted for the largest proportion (46.1%) of the total cost of cancer treatment [13]. This has a direct impact on patients' finances, increasing the economic burden on patients and their families. Therefore, direct non-medical costs should also be considered and measured in the same way as direct medical costs to comprehensively assess the economic burden that NSCLC patients are facing. Consequently, we conducted this study to estimate the direct non-medical costs and identify factors affecting the total direct non-medical costs of NSCLC patients. Our goal is to propose appropriate policies to reduce the economic burden on patients and their families.

2. Materials and methods

2.1. Study population

Patients with NSCLC who tested positive for an EGFR gene mutation via PCR testing were included in this study. These patients were classified as stage IV and received first-line treatment with targeted therapy at the Department of Medical Oncology 1 and Medical Oncology 2 at the Vietnam National Cancer Hospital in Tan Trieu campus from October 2022 to December 2023.

Inclusion criteria: (1) Patients currently undergoing at least 30 days of treatment in step 1 at the time of the interview; (2) Patients without neurological or psychiatric issues; (3) Patients capable of understanding the research questions in Vietnamese; (4) Patients who provide written consent to participate in the study by signing the consent form, with the option for their caregivers to assist them.

Caregivers were recruited alongside the patients in this study. They had to be over 18 years old, family members of the patients, free of mental illness, and knowledgeable about the patient's condition and treatment costs [9]. Moreover, they needed to be willing to participate in the study and capable of aiding the patients in answering questions or providing written informed consent on their behalf.

Exclusion criteria: (1) Patients receiving treatment in step 2 or step 3; (2) Patients currently being treated for other acute illnesses; (3) Patients suspected of disease progression or already in a progressed state.

2.2. Study setting

The Vietnam National Cancer Hospital is a facility that provides medical examinations, treatments, training, in-depth research, and technology transfer for cancer treatment to lower-level hospitals. Patients with terminal cancer or those requiring intensive treatment nationwide are transferred to the Vietnam National Cancer Hospital for treatment. The hospital has two specialised departments, Medical Oncology 1 and Medical Oncology 2, that focus on lung cancer treatment [14]. Therefore, patients at the hospital exhibit most of the characteristics of NSCLC patients in Vietnam. The research conducted at the hospital will not only benefit the hospital itself but can also be replicated, with the results transferred to lower-level hospitals nationwide. Up until 2022, no research had been conducted at the Vietnam National Cancer Hospital on the direct non-medical costs, outside of treatment for patients with stage 4 EGFR-mutant non-small cell lung cancer who received targeted therapy as a first-line treatment. After receiving ethical approval from Hanoi Medical University, we obtained permission from the leadership of the Vietnam National Cancer Hospital in Tan Trieu to collect data for this research, which was approved. The research began in October 2022, and data collection continued until December 2023 to ensure that enough research samples were collected to meet the research objectives.

Study design: This study utilised a cross-sectional descriptive method.

Sample size: To calculate the sample size required for a mean value, we use the formula:

$$n=(Z^2_{1-\alpha/2}\sigma^2)/\epsilon^2\mu^2$$

where n: the sample size to be collected; α (statistical significance level): $Z_{1-\alpha/2}=1.96$ when $\alpha=0.05$; (acceptable relative error): $\epsilon=0.202$; μ (mean value of reference study)=3667.37 [13]; and σ (standard deviation value from the reference study)=6287.46 [13]. Therefore, the calculated sample size required was 276.7 patients. To account for potential missing data, it is recommended to reserve 10% of the sample, resulting in a required sample size of 304.4 (rounded to 304) patients with NSCLC. For this study, we collected data from 310 patients with NSCLC.

2.3. Estimating non-medical direct costs

Direct non-medical costs are expenses directly related to a patient's examination and treatment process but are not direct medical costs. These costs include meals, transportation, and lodging. Patients and their families were responsible for covering these costs throughout the entire treatment process [9, 15, 16]. The study collected data on the direct non-medical costs incurred by NSCLC patients, such as transportation, lodging, and meals for their medical appointments over a 30-day period. This period spanned from the initial hospital visit in one month to the subsequent month's initial hospital visit. Interviews were conducted on the final day of each hospital visit during this one-month timeframe.

Perspective on estimating direct non-medical costs: The patient's perspective was used.

Types of direct non-medical cost components included [9, 17-19]: The out-of-pocket costs incurred by both the patients and their caregivers.

(1) *Transportation:* This encompasses costs associated with transporting patients and their accompanying individuals, such as fuel costs, mileage, parking fees, road tolls, bus fares and taxi tickets.

(2) *Lodging:* This includes the costs of renting a place to stay, covering expenses for breakfast, lunch and overnight lodgings.

(3) *Meals:* This category includes costs for breakfast, lunch, dinner, and drinking water for patients and their caregivers during medical examinations.

The direct non-medical costs of patients with NSCLC were calculated using the following formula: Total direct non-medical costs=Transportation+Lodging+Meals.

Adjusting costs according to the Consumer Price Index (CPI): All direct non-medical costs have been adjusted for the CPI in 2023 Vietnamese Dong (VND) using the following formula [20, 21]:

$$\text{Cost}^{2023} = \frac{\text{Cost}^{2022} \times \text{CPI}^{2023}}{\text{CPI}^{2022}}$$

2.4. Data analysis and processing

All data on non-medical direct costs and characteristics of NSCLC patients were collected, entered, cleaned, and coded using Excel version 2019. The data were subsequently analysed using SPSS version 26.0 and STATA version 17.0.

Mean, standard deviation (SD), median, minimum (min), and maximum (max) values were used to analyse the descriptive variables of direct non-medical costs, including costs for meals, lodging, transportation, and total direct non-medical costs. Descriptive statistics were used to illustrate the number and percentage of patient characteristic variables such as age group, residence, education level, etc.

In order to evaluate the normal distribution of the direct non-medical cost variables, we used the Kolmogorov-Smirnov test and histograms. These costs were determined not to follow a normal distribution; we performed Mann-Whitney U and Kruskal-Wallis H tests to compare the variations between these costs and categorical variables.

Univariate and multivariate linear regression models were used to analyse the relationship between independent variables (residence, education level, frequency of caregivers, number of examination days in one month) and the dependent variable (total direct non-medical costs of NSCLC patients in a month). It was assumed that the dependent variable followed a normal distribution. Any p-values below 0.05 were considered statistically significant.

2.5. Ethical approval

The study was approved by the leadership of the Vietnam National Cancer Hospital in Tan Trieu, who agreed to access, collect, and use data. The Ethics Council of Hanoi Medical University also approved the study with two certificates: 666/GCN-HDDDDNCYSH-DHYHN, dated August 30, 2022, and 974/GCN-HDDDDNCYSH-DHYHN, dated August 6, 2023.

3. Results

3.1. General characteristics of research subjects

Of the total 310 patients with NSCLC participating in the study, more than half were over 60 years old (51.6%).

The majority of these patients resided in rural areas (71.3%), had a secondary education level (49.0%), had a duration of illness of less than 12 months (65.2%), and up to 50.3% of patients did not have any monthly income. Additionally, 60.3% of patients had caregivers, with 42.9% always having someone with them. The treatment response rate for the patients was quite good, with 93.2% showing stability. However, the rate of patients experiencing side effects was relatively high, at 66.5%. In one month, a total of 172 NSCLC patients visited the hospital at least once, accounting for the highest rate of 55.5% (Table 1).

Table 1. Characteristics and number of examination days in one month of the study populations.

Characteristics		Total n (%)	Length of hospital visits in one month (days) n (%)		
			1 (n=172)	2 (n=95)	≥3 (n=43)
Age groups (years)	≤60	150 (48.4%)	77 (24.8%)	54 (17.4%)	19 (6.1%)
	>60	160 (51.6%)	95 (30.6%)	41 (13.2%)	24 (7.7%)
Residence	Rural	221 (71.3%)	129 (41.6%)	62 (20.0%)	30 (9.7%)
	Urban	89 (28.7%)	43 (13.9%)	33 (10.6%)	13 (4.2%)
Education level	Intermediate or higher	36 (11.6%)	19 (6.1%)	12 (3.9%)	5 (1.6%)
	High school	102 (32.9%)	58 (18.7%)	30 (9.7%)	14 (4.5%)
	Secondary school	152 (49.0%)	84 (27.1%)	46 (14.8%)	22 (7.1%)
	Primary school or lower	20 (6.5%)	11 (3.5%)	7 (2.3%)	2 (0.6%)
Duration of illness (months)	>24	38 (12.3%)	21 (6.8%)	10 (3.2%)	7 (2.3%)
	13-24	70 (22.6%)	38 (12.3%)	22 (7.1%)	10 (3.2%)
	≤12	202 (65.2%)	113 (36.5%)	63 (20.3%)	26 (8.4%)
Patients income	Mean±SD (VND/month)	2,810,852 (5,083,492)	2,988,501 (4,953,802)	2,944,811 (5,916,062)	1,804,302 (3,266,351)
	No	156 (50.3%)	79 (25.5%)	53 (17.1%)	24 (7.7%)
	Yes	154 (49.7%)	93 (30.0%)	42 (13.5%)	19 (6.1%)
Caregivers	Yes	187 (60.3%)	108 (34.8%)	56 (18.1%)	23 (7.4%)
	No	123 (39.7%)	64 (20.6%)	39 (12.6%)	20 (6.5%)
Frequency of caregivers	Always (100%)	133 (42.9%)	83 (26.8%)	36 (11.6%)	14 (4.5%)
	Often (>75-99%)	64 (20.6%)	31 (10.0%)	24 (7.7%)	9 (2.9%)
	Occasionally (25-75%)	77 (24.8%)	41 (13.2%)	24 (7.7%)	12 (3.9%)
	Rarely (25%)	32 (10.3%)	14 (4.5%)	10 (3.2%)	8 (2.6%)
	Never (0%)	4 (1.3%)	3 (1.0%)	1 (0.3%)	0 (0.0%)
Response evaluation	Stable disease	289 (93.2%)	162 (52.3%)	86 (27.7%)	41 (13.2%)
	Partial response	21 (6.8%)	10 (3.2%)	9 (2.9%)	2 (0.6%)
Side effects	Yes	206 (66.5%)	119 (38.4%)	65 (21.0%)	22 (7.1%)
	No	104 (33.5%)	53 (17.1%)	30 (9.7%)	21 (6.8%)

3.2. Direct non-medical costs of patients with non-small cell lung cancer

Among the direct non-medical costs that 310 patients with non-small cell lung cancer had to pay out of pocket, 98.7% of patients had to pay for transportation. This was followed by the rate of patients having to pay for meals (90%), with lodging being the lowest at only 39.0% (Fig. 1).

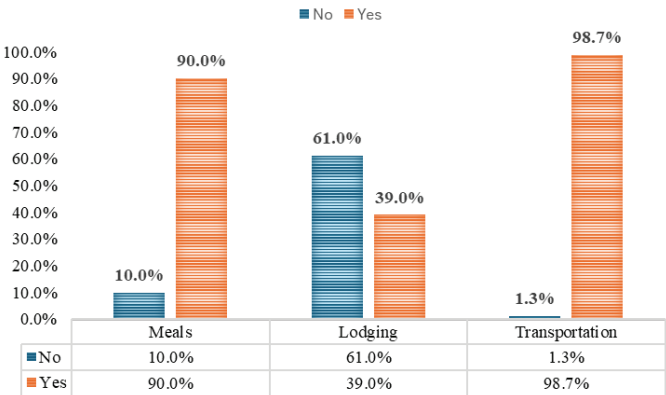


Fig. 1. Characteristics of direct non-medical expenses in one month of non-small cell lung cancer patients.

Table 2. The direct non-medical costs per month for non-small cell lung cancer patients.

Direct non-medical costs (VND/month)	Mean	Standard deviation	Median	Min	Max
Meals	155,580	142,304	120,000	0	867,300
Lodging	85,884	152,307	0	0	929,250
Transportation	591,525	410,695	500,000	0	1,858,500
Total direct non-medical costs	832,989	527,745	720,000	0	2,292,150
Total costs	23,281,977	12,261,802	23,017,872	3,487,475	53,359,312

Total costs included direct non-medical costs, direct medical costs, and indirect costs.

The mean total direct non-medical costs for NSCLC patients were VND 832,989 per month, accounting for 3.6% of the mean total costs and 29.6% of the average income of NSCLC patients. The highest cost was transportation at 591,525 VND, followed by meals at 155,580 VND, and the lowest cost was lodging at 85,884 VND per month (Table 2).

When examining the breakdown of component costs within the total average non-medical direct costs per month for non-small cell lung cancer patients, transportation costs accounted for the highest percentage at 71%, followed by meals at 18.7% and lodging at 10.3% (Fig. 2).

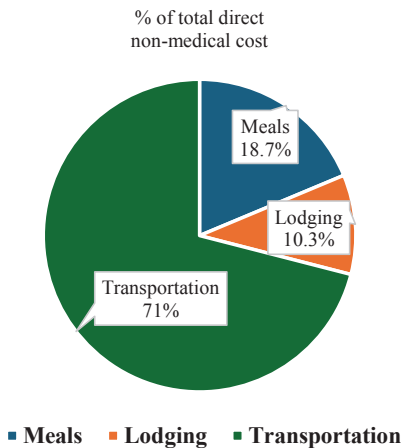


Fig. 2. The percentage of component costs in total direct non-medical costs of non-small cell lung cancer patients.

When examining the relationship between the components of non-medical direct costs and the duration of hospital visits in one month, we found that the average monthly cost of meals and lodging for non-small cell lung cancer patients increased with the length of hospital visits ($p<0.001$ for each group). Similarly, the cost of

Table 3. Component costs of non-medical direct costs and time for hospital visits in one month.

Time for hospital visits in one month (days)		Direct non-medical costs (VND/month)		
		Meals	Lodging	Transportation
≥3	Mean	253,728	216,616	625,702
	SD	221,095	280,108	451,947
2	Mean	170,677	91,856	545,747
	SD	131,838	130,323	401,606
1	Mean	122,704	49,903	608,264
	SD	106,750	87,698	405,242
p-value ^b		<0.001***	<0.001***	0.300

SD: Standard deviation, ^bKruskal-Wallis H test, * $p<0.05$, ** $p<0.01$, *** $p<0.001$.

transportation was highest in patients who visited for 3 days or more (VND 625,702), but this difference was not statistically significant ($p>0.05$) (Table 3).

According to the study results (Table 4), the average monthly non-medical direct costs of non-small cell lung cancer patients living in rural areas (VND 885,815) were higher than those living in urban areas (VND 701,814; $p=0.001$). Patients with primary education or lower had

higher non-medical direct costs (VND 982,294) than those with other education levels ($p=0.004$). Non-medical direct costs were higher in patients with caregivers and more frequent ($p<0.001$). The increased time for hospital visits increased the non-medical direct costs of patients ($p=0.013$). The differences in non-medical direct costs during the course of the disease, the occurrence of side effects and the response evaluation were not statistically significant ($p>0.05$).

Table 4. Direct non-medical costs and non-small cell lung cancer patient characteristics (n=310).

Characteristics	Total direct non-medical costs (VND/month)					p-value
	Mean	Standard deviation	Median	Minimum	Maximum	
Age groups (years)						
≤60	811,403	540,324	685,580	49,560	2,292,150	0.327 ^a
>60	853,225	516,550	800,000	0	2,209,550	
Residence						
Rural	885,815	496,963	800,000	60,000	2,219,875	0.001 ^{a, **}
Urban	701,814	579,761	570,000	0	2,292,150	
Education level						
Primary school or lower	982,294	525,020	956,250	143,000	2,020,000	0.004 ^{b, **}
Secondary school	836,961	519,384	711,050	60,000	2,292,150	
High school	883,983	509,732	782,025	49,560	2,075,000	
Intermediate or higher	588,789	560,283	330,000	0	2,044,350	
Duration of illness (months)						
≤12	847,294	532,302	720,000	40,000	2,219,875	0.412 ^b
13-24	853,790	539,980	800,000	0	2,292,150	
>24	718,628	477,069	650,000	50,000	2,010,000	
Caregivers						
No	631,212	457,401	530,000	0	2,219,875	<0.001 ^{a, ***}
Yes	965,708	529,937	939,575	98,000	2,292,150	
Frequency of caregivers						
Never (0%)	403,153	230,072	454,300	100,000	604,013	<0.001 ^{b, ***}
Rarely (25%)	611,862	505,295	495,000	40,000	2,219,875	
Occasionally (25-75%)	655,474	433,249	600,000	0	1,693,300	
Often (>75-99%)	790,744	550,080	619,750	98,000	2,075,000	
Always (100%)	1,022,219	515,309	1,010,000	104,000	2,292,150	
Time for hospital visits in one month (days)						
1	780,872	480,425	700,000	0	2,044,350	0.013 ^{b, *}
2	808,280	519,551	680,000	50,000	2,209,550	
≥3	1,096,046	649,509	1,200,000	40,000	2,292,150	
Side effects						
No	889,717	553,383	800,000	40,000	2,292,150	0.235 ^a
Yes	804,349	513,312	700,000	0	2,219,875	
Response evaluation						
Partial response	847,952	616,351	620,000	104,000	2,075,000	0.873 ^a
Stable disease	831,901	521,943	720,000	0	2,292,150	

^aMann-Whitney U test, ^bKruskal-Wallis H test, * $p<0.05$, ** $p<0.01$, *** $p<0.001$.

Table 5. Factors influencing the total direct non-medical costs of non-small cell lung cancer patients (Linear regression analyses).

Independent variables	Total direct non-medical costs (Linear regression model)					
	Univariate			Multivariate		
	Beta	S.E	p-value	Beta	S.E	p-value
<i>Residence</i>						
Urban	Reference	-	-	Reference	-	-
Rural	184000.4	65528.24	0.005**	183378.6	64840.13	0.005**
<i>Education level</i>						
Primary school or lower	Reference	-	-	Reference	-	-
Secondary school	-145333.2	124030.9	0.242	-73261.47	115548.4	0.527
High school	-98310.92	127516.8	0.441	4.690.113	118841.5	0.969
Intermediate or higher	-393504.9	145422.1	0.007**	-184296.1	139571	0.188
<i>Frequency of caregivers</i>						
Always (100%)	Reference	-	-	Reference	-	-
Often (>75-99%)	-231475.1	76167.16	0.003**	-260795.1	73443.1	<0.001***
Occasionally (25-75%)	-366745.3	71695.01	<0.001***	-390027.6	69701.84	<0.001***
Rarely (25%)	-410357.7	98580.64	<0.001***	-451378.1	95283.86	<0.001***
Never (0%)	-619066.2	254070.9	0.015*	-503453.8	245143.7	0.041*
<i>Time for hospital visits in one month (days)</i>						
1	Reference	-	-	Reference	-	-
2	27408.45	66289.65	0.680	79715.19	61714.06	0.197
≥3	315174.6	88417.23	<0.001***	389510.4	82330.05	<0.001***
<i>Intercept</i>				700011.4	165067.3	<0.001***

Prob>F =0.0000; R-squared=0.2098 Adj; R-squared =0.1834

S.E: Standard error, Reference: Beta: 1.00, *p<0.05, **p<0.01, ***p<0.001, total direct non-medical costs were assumed to follow a normal distribution.

3.3. Factors influencing the direct non-medical costs of non-small cell lung cancer patients

According to the study results in Table 5, both univariate and multivariate regression models showed that factors influencing the total direct non-medical costs of NSCLC patients include residence (p=0.005), frequency of caregivers (p<0.05 for each group), and time for hospital visits (3 days or more, p<0.001). The factor of education level (intermediate or higher) was not significant in the multivariate regression analysis (p>0.05).

4. Discussion

The average monthly direct non-medical cost for NSCLC patients was VND 832,989, accounting for 29.6% of their average monthly income of VND 2,810,852. It is important to note that over half of NSCLC patients (50.3%) had no income at all. This lack of income can be attributed to the fact that most NSCLC patients were diagnosed at stage IV, requiring them to stay at home for treatment, thus limiting their ability to earn money [22]. When faced with financial burdens, patients may try to reduce treatment costs by cutting down on doses or stopping treatment

altogether [23-27]. However, this can result in worsened symptoms and reduced survival time for the patient [23, 28, 29]. Direct non-medical costs such as meals, lodging, and transportation may seem insignificant compared to the patient's income, but finding ways to reduce these costs can have a significant impact on the economic well-being and treatment effectiveness for patients and their families.

Transportation accounted for the highest proportion at 71.0%, while costs for meals and lodging were 18.7 and 10.3%, respectively. This result is similar to a study conducted in China, where transportation costs also accounted for the highest proportion of non-medical direct costs (78.8%) [30]. Additionally, a study in Malaysia showed that the cost of transportation was a burden for NSCLC patients, acting as a barrier to accessing health care services for those with low socioeconomic status and living far from treatment facilities [13]. In our study, NSCLC patients with EGFR mutations were treated as outpatients, visiting monthly and receiving pills to take at home. They typically visited the hospital and returned home on the same day. The costs of medical examinations mainly included lunch and lodging during the afternoon, so these two types of costs were not significant. The transportation cost was higher than other costs because

most patients (71.3%) lived in rural areas, requiring long-distance travel to and from the hospital. This difference in costs was appropriate given the circumstances.

There was a significant relationship between the time for hospital visits in one month and the total direct non-medical costs, which included meals and lodging costs of NSCLC patients ($p < 0.001$). This finding, not previously documented in some studies conducted in Vietnam, highlights the impact of extended medical examination times on the total direct non-medical costs. However, transportation costs did not show a significant difference between long and short medical examination times ($p > 0.05$). Typically, patients, regardless of the distance, would only travel from home to the hospital and then back home. When medical examination times are prolonged, it is necessary to consider increasing the budget for lodging and meals.

There was a correlation between the place of residence and the total non-medical direct costs of patients with non-small cell lung cancer. Patients living in rural areas had higher non-medical direct costs compared to patients living in urban areas ($p = 0.005$). This finding is consistent with a study conducted in Malaysia [13]. Patients residing in rural areas must travel longer distances to the treatment facility, resulting in longer return times and increased costs for meals and lodging. Ultimately, this leads to higher direct non-medical costs.

Patients with caregivers had higher direct non-medical costs compared to other groups ($p < 0.05$). However, multivariate linear regression analysis showed that only the frequency of caregivers increased total direct non-medical costs for NSCLC patients ($p < 0.05$ for each group). Therefore, the frequency of caregivers was the main factor contributing to increased direct non-medical costs. The research results indicated that longer hospital visits resulted in higher food and lodging costs. More caregivers and increased frequency of caregivers led to additional costs for meals, lodging, and transportation, thereby raising direct non-medical costs accordingly.

Our study on non-medical direct costs based on interviews with patients diagnosed with non-small cell lung cancer is one of the first of its kind in Vietnam. However, there are some limitations to this study. Firstly, there is a lack of available documents for comparison with our study results in Vietnam. Secondly, the collection of direct non-medical costs was limited to a one-month period at a single hospital, which may not fully capture the entire treatment process for the patient and cannot be generalised to the entire country. Therefore, in the future, with improved time and funding conditions, we plan to conduct studies on a larger scale and for a longer duration to provide a more comprehensive understanding of direct non-medical costs associated with NSCLC treatment in Vietnam.

5. Conclusions

The average direct non-medical cost incurred by a patient with non-small cell lung cancer per month was VND 832,989, which accounts for 29.6% of their average monthly income of VND 2,810,852. Among the component costs of non-medical direct costs, transportation costs accounted for the highest proportion at 71.0%. The majority of patients had to cover expenses for transportation and meals (98.7 and 90.0%, respectively), while only 39.0% of all patients had to pay for lodging expenses. Factors such as patients living in rural areas far from hospitals, more frequent caregiver presence, and having time for hospital visits (three or more days) increased the direct non-medical costs of NSCLC patients. Therefore, the hospital needs to implement a policy of prioritising patients who come from a distance to be examined first. This will help reduce the time for hospital visits in one month, ultimately decreasing the costs associated with meals and lodging. The state should actively promote and mobilise individuals and organisations to join forces in supporting these patients. This can be done by offering reduced or free meals, lodging, and transportation for patients and their caregivers, particularly for those with NSCLC who live far from the hospital and may have limited financial resources. Providing this support can help reduce the economic burden of out-of-pocket payments for NSCLC patients, including direct non-medical costs. It also contributes to reducing the risk of pushing patients and their families into poverty due to medical costs. This support can help NSCLC patients have more opportunities to continue targeted therapy treatment and prolong life.

CRedit author statement

Van Chinh Nguyen: Conceptualisation, Funding acquisition, Resources; Thi Thai Hoa Nguyen: Software, Visualisation; Nguyen Nguyet Tram Luu: Investigation, Writing original draft; Khanh Linh Dao: Project administration, Writing, Reviewing & Editing; Thi Thanh Huong Tran: Data curation, Methodology; Huy Tuan Kiet Pham: Supervision, Validation; Formal analysis.

COMPETING INTERESTS

The authors declare that there is no conflict of interest regarding the publication of this article.

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