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Direct medical costs in the treatment of hypertension and diabetes comorbidity at Thong Nhat Dong Nai General Hospital in 2024

Nguyen Thuy Hang[1], Do Huynh Quoc Thang[2], Pham Thi Thuy Linh[2], Nguyen Thi Thu Thuy[3], Nguyen Tran Nhu Y[2,*]

[1]Health Technology Assessment & Application Research Institute

[2]Hong Bang International University

[3]Thong Nhat Dong Nai General Hospital

ABSTRACT

Introduction: Comorbidity of hypertension and diabetes mellitus (HTN - DM) is becoming increasingly prevalent, leading to growing cost burden. Objective: To analyze direct medical costs (DMCs) in the treatment of HTN - DM comorbidity at Thong Nhat Dong Nai General Hospital in 2024. Methods: A cross-sectional descriptive study based on retrospective electronic billing data of patients at Thong Nhat Dong Nai General Hospital in 2024 was conducted. All cases that met the inclusion criteria and did not violate the exclusion criteria during the data collection period were included. Results: A total of 50,800 treatment episodes with the mean age of 66.7 ± 10.2 years and the female-to-male ratio of 1.4:1 recorded the mean DMC for HTN - DM comorbidity of 679,843 VND (95%CI: 669,503 - 690,182 VND) per outpatient episode and 11,389,334 VND (95%CI: 10,780,602 - 11,998,065 VND) per inpatient episode. Medication costs accounted for the largest proportion of outpatient expenses (63.4%), whereas medical supplies accounted for the highest share in inpatient care (29.1%); health insurance payments covered most of the total DMCs for both outpatient and inpatient episodes (88.1% and 84.4%, respectively). Factors associated with both outpatient DMCs and inpatient DMCs included gender, type of insurance coverage, insurance reimbursement rate, area of residence, primary diagnosis, reason for visit, number of comorbidities, dyslipidemia, treatment outcomes, and discharge status. Additionally, age and comorbid ischemic heart disease were associated with outpatient DMCs, while length of hospital stay were associated with inpatient DMCs. Conclusion: DMCs for the treatment of HTN - DM comorbidity are considerably high, equivalent to 0.1 times the average monthly per-capita income per outpatient visit and 2.1 times per inpatient episode. Inpatient episodes with a primary diagnosis of ischemic heart disease and comorbid dyslipidemia incurred substantial DMCs; therefore, strengthening strategies for the effective clinical management and control for these conditions is warranted to reduce the economic burden.

Keywords: *comorbidity, hypertension, diabetes mellitus, direct medical costs*

1. INTRODUCTION

Hypertension (HTN) and diabetes mellitus (DM) are among the most prevalent diseases worldwide, imposing significant health and economic burdens on patients and healthcare systems across all countries. International studies have documented considerable rates of HTN - DM comorbidity - for example, Aboma Motuma et al. (2023) reported a prevalence of 3.8%, while Thamer Owaid Alanazi et al. (2017) reported 16.6%, both demonstrating a markedly increased risk of cardiovascular events in affected patients [1, 2]. In Vietnam, HTN - DM comorbidity is rapidly becoming more common and has become a substantial public health burden. According to national STEPS surveys from 2010 - 2021, the prevalence of HTN and DM among adults aged 25 - 64 years in 2021 was 28.3% and 7.0%, respectively, with comorbidity reaching 3.92% - an over eight -

Corresponding author: Nguyen Tran Nhu Y
Email: yntn1@hiu.vn

fold increase from 0.44% in 2010 [3].

HTN and DM are chronic, progressive conditions that develop silently and persist throughout life, requiring patients to undergo long - term monitoring and treatment. When both conditions coexist, the healthcare cost burden increases significantly. The study by Budi Hidayat et al. (2022) reported that the average annual direct medical costs (DMCs) for patients with HTN - DM comorbidity were 462 USD (4,106,750 VND in 2024 value) without complications and 1,101 USD (9,786,864 VND in 2024 value) when complications occurred [4]. A study in Vietnam by Huy Tuan Kiet Pham et al. (2020) found that the average annual DMCs for patients with comorbid HTN - DM were about 100 USD (956,255 VND in 2024 value) higher than for patients with DM only (333.2 USD compared with 220.1 - 234.7 USD) [5].

Thong Nhat Dong Nai General Hospital is a class I provincial tertiary hospital that manages a large number of chronic disease cases, including patients with HTN - DM comorbidity. As no prior studies in Vietnam have evaluated DMCs for HTN - DM comorbidity, the study was conducted with the following objectives:

1. To analyze DMCs in the treatment of HTN - DM comorbidity at Thong Nhat Dong Nai General Hospital in 2024.

2. To identify factors associated with DMCs in the treatment of HTN - DM comorbidity at Thong Nhat Dong Nai General Hospital in 2024.

2. STUDY SUBJECT AND METHODS

2.1. Study subjects

Study subject: DMCs in the treatment of HTN - DM comorbidity at Thong Nhat Dong Nai General Hospital in 2024.

Survey subjects: Electronic billing data for treatment episodes of patients with HTN - DM comorbidity at Thong Nhat Dong Nai General Hospital in 2024.

2.2. Study methods

2.2.1. Study design

A cross-sectional descriptive study using retrospective electronic billing data from patients.

2.2.2. Study sample

Sample size

All cases that met the inclusion criteria and did not violate the exclusion criteria during the data collection period were included.

Selection criteria

Inclusion criteria:

- Patients with concurrent diagnoses of HTN (ICD codes: I10, I11, I12, I13, I15), and DM (ICD codes: E10, E11, E12, E13, E14), either as primary or comorbid diagnoses.
- Patients aged ≥ 16 years.

Exclusion criteria:

- Treatment episodes with incomplete electronic billing information are required for the study.
- Patients with severe comorbid conditions unrelated to cardiovascular diseases (e.g., cancer, HIV, etc.).

2.2.3. Study variables

Study variables included:

- Demographic characteristics: Age, gender, area of residence, type of health insurance (HI), HI reimbursement rate.
- Clinical and treatment characteristics: Type of treatment, primary diagnosis, reason for visit, comorbidity status, specific comorbidities (dyslipidemia, ischemic heart disease), treatment outcomes, discharge status, number of comorbidities, and length of hospital stay for inpatient episode.
- Variables related to DMCs: Cost components (medications, laboratory tests, diagnostic imaging, procedures/surgeries, medical supplies, consultations, and hospital bed-days), costs by source of payment (HI, patient co-payment, and out-of-pocket payments).
- The study found factors associated with DMCs among: Age, gender, type of HI, HI reimbursement rate, area of residence, primary diagnosis, reason for visit, number of comorbidities, specific comorbidities (dyslipidemia, ischemic heart disease), length of hospital stay for inpatient episode, treatment outcomes, and discharge status.

2.2.4. Data processing and analysis

Data were processed and analyzed using Microsoft Excel and SPSS version 26. Descriptive statistics were presented as frequencies and percentages for qualitative variables, and as mean values with 95% confidence interval (CI) for quantitative variables. The distribution of DMCs was assessed using histogram and Q - Q plots prior to analyses of associated factors. T-test, ANOVA,

or Mann - Whitney and Kruskal - Wallis tests were used for categorical independent variables, while Pearson or Spearman correlation tests for continuous independent variables. Results were presented in tables.

2.3. Ethical considerations

The study was derived from a research project approved by the Ethics Committee of Thong Nhat Dong Nai General Hospital under Decision No. 05/HĐĐĐ dated March 10, 2025. The study ensured the confidentiality of patient information throughout all research procedures.

3. RESULTS

3.1. Characteristics of the study sample

The study included 50,800 treatment episodes, comprising of 45,642 outpatient and 5,158 inpatient episodes. The characteristics of the sample are presented in Table 1.

Table 1. Characteristics of the study sample

Characteristic (n = 50,800)		Frequency / Mean	Percentage / SD
Age		66.7	10.2
Gender	Male	21,353	42.0
	Female	29,447	58.0
Area of residence	Within province	49,678	97.8
	Outside province	1,122	2.2
Type of HI	Employee / employer	1,617	3.2
	Social insurance organization	5,678	11.2
	State budget	10,600	20.9
	State budget - supported	343	0.7
	Household	32,562	64.1
HI reimbursement rate	80%	35,219	69.3
	95%	4,172	8.2
	100%	11,409	22.5
Type of treatment	Outpatient	45,642	89.8
	Inpatient	5,158	10.2
Primary diagnosis	Hypertension	3,941	7.8
	Diabetes mellitus	29,418	57.9
	Chronic kidney disease	3,402	6.7
	Ischemic heart disease	2,668	5.3
	Other	11,371	22.4
Reason for visit	Consultation	48,322	95.1
	Emergency / non-referral admission	2,478	4.9
Comorbidity status	Yes	50,800	100.0
	No	0	0
Specific comorbidities	Dyslipidemia	47,002	92.5
	Ischemic heart disease	25,088	49.4
Treatment outcome	Recovered	21,548	42.4
	Improved	28,683	56.5
	Unchanged	426	0.8
	Worsened / deceased	143	0.3
Discharge status	Discharged	50,037	98.5
	Referred	233	0.5
	Discharged on request	530	1.0
Number of comorbidities (conditions)		4.1	2.5
Length of hospital stay for inpatient episode (days)		9.2	6.3

Note: HI - Health insurance; SD - Standard deviation

According to Table 1, the study sample had a mean age of 66.7 ± 10.2 years, with a female-to-male ratio of 1.4:1. Most patients resided within Dong Nai province (97.8%), and all treatment episodes involved health insurance, predominantly under the household insurance category (64.1%) and with an 80% reimbursement rate (69.3%). Regarding clinical characteristics, 89.8% of episodes were outpatient visits; 57.9% of patients had a primary diagnosis of DM, while only 7.8% had HTN as the primary diagnosis; 95.1% of patients presented for consultation (valid referral); all treatment episodes had at least one comorbidity, with a mean of 4.1 ± 2.5 comorbid conditions, dyslipidemia (92.5%) and ischemic heart disease (49.4%) were the most common; the mean length of hospital stay among inpatients was 9.2 ± 6.3 days; 98.9% of episodes showed treatment improvement, including 42.4% recovered and 56.5% improved, and 98.5% of patients were discharged.

3.2. Direct medical costs in the treatment of hypertension and diabetes mellitus comorbidity

3.2.1. Direct medical costs per treatment episode by cost component

The average DMCs per treatment episode by cost component are presented in Table 2.

Table 2. Direct medical costs per treatment episode by cost component (unit: VND)

Cost component	Outpatient visit (n = 45,642)			Inpatient episode (n = 5,158)		
	Mean	%	95% CI	Mean	%	95% CI
Medication	431,321	63.4	426,539 - 436,102	2,728,489	24.1	2,548,984 - 2,907,995
Laboratory tests	109,784	16.1	108,561 - 111,005	908,014	8.0	879,430 - 936,598
Diagnostic imaging	16,560	2.4	15,671 - 17,448	886,082	7.8	981,562 - 624,303
Procedures/ surgeries	76,401	11.2	69,707 - 83,094	1,309,883	11.5	1,212,416 - 1,407,350
Medical supplies	127	0.0	79 - 176	3,317,386	29.2	2,869,773 - 3,764,999
Consultation	45,649	6.7	45,575 - 45,723	5,973	0.1	5,564 - 6,382
Hospital bed	0	0.0	0	2,185,766	19.2	2,126,315 - 2,245,218
Total	**679,843**	**100.0**	**669,503 - 690,182**	**11,389,334**	**100.0**	**10,780,602 - 11,998,065**

Note: CI - Confidence interval

According to Table 2, the mean DMC per outpatient episode was 679,843 VND (95% CI: 669,503 - 690,182 VND). Medication cost was the most significant, accounted for 63.4% with the mean value of 431,321 VND (95% CI: 426,539 - 436,102 VND), followed by laboratory tests with the proportion of 16.1% and the mean value of 109,784 VND (95% CI: 108,561 - 111,005 VND); other components contributed between 0.0% (hospital bed and medical supplies) and 11.2% (procedures/ surgeries). For inpatient episodes, the mean DMCs were substantially higher at 11,389,334 VND (95% CI: 10,780,602 - 11,998,065 VND), in which medical supplies, medication, and hospital bed constituted the major cost components, making up 29.2% with the mean value of 3,317,386 VND (95% CI: 2,869,773 - 3,764,999 VND), 24.1% with the mean value of 2,728,489 VND (95% CI: 2,548,984 - 2,907,995 VND), and 19.2% with the mean value of 2,185,766 VND (95% CI: 2,126,315 - 2,245,218 VND), respectively; other cost components ranged from 0.1% (consultation) to 11.5% (procedures/ surgeries).

3.2.2. Direct medical costs per treatment episode by source of payment

The average DMCs per treatment episode by source of payment are shown in Table 3.

Table 3. Direct medical costs per treatment episode by source of payment (unit: VND)

Source of payment	Outpatient visit (n = 45,642)			Inpatient episode (n = 5,158)		
	Mean	%	95% CI	Mean	%	95% CI
Health insurance	599,277	88.2	589,498 - 609,055	9,613,788	84.4	9,121,196 - 10,106,379

Source of payment	Outpatient visit (n = 45,642)			Inpatient episode (n = 5,158)		
	Mean	%	95% CI	Mean	%	95% CI
Patient co-payment	80,002	11.8	78,734 - 81,270	1,354,654	11.9	1,260,305 - 1,449,002
Patient out-of-pocket	564	0.1	511 - 617	420,892	3.7	336,973 - 504,812
Total	**679,843**	**100.0**	**669,503 - 690,182**	**11,389,334**	**100,0**	**10,780,602 - 11,998,065**

Note: CI - Confidence interval

According to Table 3, health insurance covered the majority of DMCs and accounted for 88.2% with the mean value of 599,277 VND (95% CI: 589,498 - 609,055 VND) in outpatient episodes and 84.4% with the mean value of 9,613,788 VND (95% CI: 9,121,196 - 10,106,379 VND) in inpatient episodes. Patient co-payment accounted for 11.8% with the mean value of 80,002 VND (95% CI: 78,734 - 81,270 VND) in outpatient episode and 11.9% with the mean value of 1,354,654 VND (95% CI: 1,260,305 - 1,449,002 VND) in inpatient episode. Out-of-pocket expenses were negligible in both outpatient and inpatient treatment, accounting for only 0.1% with the mean value of mean: 564 VND (95% CI: 511 - 617 VND), and 3.7% with the mean value of 420,892 VND (95% CI: 336,973 - 504,812 VND), respectively.

3.3. Factors associated with direct medical costs in the treatment of hypertension and diabetes mellitus comorbidity

3.3.1. Factors associated with direct medical costs per outpatient episode

The analysis of several factors associated with DMCs in the outpatient treatment of HTN - DM comorbidity is presented in Table 4.

Table 4. Factors associated with direct medical costs per outpatient episode

Characteristics (n = 45,642)		Direct medical costs (unit: VND)			
		Mean	95% CI	Mean rank	p-value
Gender	Male (n = 19,355)	669,964	953,640 - 686,289	21,877.6	**< 0.001**
	Female (n = 26,287)	687,115	673,779 - 700,451	23,516.5	
Area of residence	Within province (n = 44,808)	679,082	668,680 - 689,483	22,841.8	**0.016**
	Outside province (n = 834)	720,695	631,699 - 809,690	21,733.3	
Type of HI	Employee/ employer (n = 1,439)	533,889	505,150 - 562,627	19,716.0	**< 0.001**
	Social insurance organization (n = 5,344)	660,727	633,062 - 688,392	23,260.3	
	State budget (n = 8,966)	955,552	916,513 - 994,591	25,272.8	
	State budget - supported (n = 249)	876,941	674,619 - 1,079,263	26,928.4	
	Household (n = 29,644)	605,327	596,353 - 614,302	22,117.3	

Characteristics (n = 45,642)		Direct medical costs (unit: VND)			
		Mean	95% CI	Mean rank	p-value
Rate of HI reimbursement	80% (n = 31,983)	600,183	591,748 - 608,617	21,985.7	**< 0.001**
	95% (n = 3,898)	620,692	594,579 - 646,805	23,022.1	
	100% (n = 9,761)	964,477	926,728 - 1,002,226	25,480.0	
Primary diagnosis	Hypertension (n = 3,479)	521,941	513,096 - 530,786	20,454.5	**< 0.001**
	Diabetes mellitus (n = 29,353)	569,721	566,777 - 572,663	23,324.7	
	Chronic kidney disease (n = 3,135)	2,173,239	2,049,599 - 2,296,878	33,130.7	
	Ischemic heart disease (n = 2,280)	429,187	419,286 - 439,088	15,085.6	
	Other (n = 7,395)	635,413	610,273 - 660,553	19,952.4	
Dyslipidemia	No (n = 1,338)	1,887,561	1,700,904 - 2,074,216	24,139.2	**< 0.001**
	Yes (n = 44,304)	643,369	634,546 - 652,191	22,781.7	
Ischemic heart disease	No (n = 22,689)	762,050	742,460 - 781,640	22,004.8	**< 0.001**
	Yes (n = 22,953)	598,580	591,830 - 605,330	23,628.8	
Reason for visit	Consultation (n = 45,449)	679,519	669,162 - 689,876	22,834.8	**0.001**
	Emergency/ non-referral admission (n = 193)	756,002	578,073 - 933,931	19,701.3	
Treatment outcome	Recovered (n = 19,440)	742,911	721,725 - 764,097	21,515.0	**< 0.001**
	Improved (n = 26,156)	631,289	622,610 - 639,967	23,780.2	
	Unchanged (n = 43)	1,572,426	859,159 - 2,285,693	28,829.5	

Characteristics (n = 45,642)		Direct medical costs (unit: VND)			
		Mean	95% CI	Mean rank	p-value
Treatment outcome	Worsened/ deceased (n = 3)	2,529,412	0 - 5,955,836	44,942.3	
Discharge status	Discharged (n = 45,567)	680,770	670,415 - 691,124	22,854.1	**< 0.001**
	Referred (n = 75)	116,082	64,489 - 167,674	2,995.3	
Characteristics (n = 45,642)		**Correlation coefficient (r)**			**p-value**
Age		0.072			**< 0.001**
Number of comorbidities (conditions)		0.396			**< 0.001**

Note: HI - Health insurance; CI - Confidence interval

According to Table 4, several factors were found to be significantly associated with DMCs in outpatient episodes ($p < 0.05$), including age ($r = 0.072$), gender, area of residence, type of health insurance, insurance reimbursement rate, primary diagnosis, number of comorbidities ($r = 0.396$), presence of dyslipidemia or ischemic heart disease, reason for visit, treatment outcome, and discharge status.

3.3.2. Factors associated with direct medical costs per inpatient episode

The analysis of factors associated with DMCs in inpatient treatment of HTN - DM comorbidity is presented in Table 5.

Table 5. Factors associated with direct medical costs per inpatient episode

Characteristic (n = 5,158)		Direct medical cost (unit: VND)			
		Mean	95% CI	Mean rank	p-value
Gender	Male (n = 1,998)	13,975,264	12,775,852 - 15,174,676	2,750.3	**< 0.001**
	Female (n = 3,160)	9,754,306	9,118,269 - 10,390,342	2,471.5	
Area of residence	Within residence (n = 4,870)	11,204,502	10,593,531 - 11,815,474	2,566.9	**0.012**
	Outside residence (n = 288)	14,514,779	11,032,940 - 17,996,618	2,792.6	
Type of HI	Employee / employer (n = 178)	8,006,209	5,198,556 - 10,813,862	2,084.3	**< 0.001**
	Social insurance organization (n = 334)	11,394,318	8,749,634 - 14,039,003	2,564.4	
	State budget (n = 1,634)	12,062,842	11,034,200 - 13,091,483	2,730.0	
	State budget - supported (n = 94)	11,553,574	7,553,274 - 15,553,873	2,663.0	
	Household (n = 2,918)	11,212,699	10,382,036 - 12,043,363	2,524.5	

Characteristic (n = 5,158)		Direct medical cost (unit: VND)			
		Mean	95% CI	Mean rank	p-value
Rate of HI reimbursement	80% (n = 3,236)	11,015,909	10,237,824 - 11,793,995	2,505.1	**< 0.001**
	95% (n = 274)	12,155,555	9,202,423 - 15,108,687	2,691.9	
	100% (n = 1,648)	11,995,193	10,966,552 - 13,023,835	2,706.9	
Primary diagnosis	Hypertension (n = 462)	3,201,879	3,037,735 - 3,366,024	1,450.3	**< 0.001**
	Diabetes mellitus (n = 65)	4,234,296	3,669,591 - 4,799,001	1,975.6	
	Chronic kidney disease (n = 267)	6,128,506	5,339,329 - 6,917,684	2,318.9	
	Ischemic heart disease (n = 388)	40,516,480	35,358,922 - 45,674,038	3,200.1	
	Other (n = 3,976)	9,968,556	9,442,173 - 10,494,940	2,677.5	
Dyslipidemia	No (n = 2,460)	10,803,021	10,064,527 - 11,541,516	2,702.0	**< 0.001**
	Yes (n = 2,698)	11,923,925	10,974,732 - 12,873,119	2,467.8	
Ischemic heart disease	No (n = 3,023)	9,220,255	8,682,311 - 9,758,200	2,593.4	0.426
	Yes (n = 2,135)	14,460,586	13,213,432 - 15,707,741	2,559.9	
Reason for visit	Consultation (n = 2,873)	10,444,983	9,695,993 - 11,193,973	2,500.8	**< 0.001**
	Emergency / non-referral admission (n = 2,285)	12,576,695	11,577,514 - 13,575,876	2,678.5	
Treatment outcome	Recovered (n = 2,108)	9,979,260	9,205,132 - 10,753,388	2,532.1	**< 0.001**
	Improved (n = 2,527)	11,728,302	10,796,883 - 12,659,721	2,572.7	
	Unchanged (n = 383)	11,129,142	8,674,029 - 13,584,256	2,449.7	
	Worsened / deceased (n = 140)	27,214,448	21,462,370 - 32,966,526	3,770.2	
Discharge status	Discharged (n = 4,470)	11,210,357	10,575,828 - 11,844,886	2,605.3	**< 0.001**
	Discharged on request (n = 158)	11,650,435	9,823,217 - 13,477,653	2,746.5	
	Referred (n = 530)	15,576,945	9,608,042 - 21,545,848	2,312.6	
Characteristic (n = 5,158)		**Correlation coefficient (r)**			**p-value**
Age		0.015			0.296
Number of comorbidities (conditions)		0.186			**< 0.001**
Length of hospital stay (days)		0.679			**< 0.001**

Note: HI - Health insurance; CI - Confidence interval.

According to Table 5, several factors were found to be significantly associated with DMCs in inpatient episodes ($p < 0.05$), including gender, area of residence, type of health insurance, insurance reimbursement rate, primary diagnosis, number of comorbidities ($r = 0.186$), presence of dyslipidemia, length of hospital stay ($r = 0.679$), reason for visit, treatment outcome, and discharge status.

4. DISCUSSION

This study analyzed the DMCs in the treatment of HTN - DM comorbidity at Thong Nhat Dong Nai

General Hospital in 2024 using a cross-sectional design based on retrospective electronic billing data of 45,642 outpatient and 5,158 inpatient episodes. The study population had a mean age of 66.7 ± 10.2 years, with a female-to-male ratio of 1.4:1. All patients were covered by health insurance, 64.1% under the household-based scheme, and 69.3% with an 80% reimbursement level. Outpatient visits accounted for 89.8% of all episodes, 57.9% had DM as the primary diagnosis, and only 7.8% had HTN as the primary diagnosis. All patients had at least one comorbidity, with a mean of 4.1 ± 2.5 comorbid conditions, and 98.9% showed improvement after treatment. These sample characteristics were consistent with the findings of Tran Thi Ly et al. (2024), who observed a mean age of 62.8 ± 8.9 years, a predominance of patients with comorbidities (98.1%), and a high proportion of female patients (72.3%), although the female-to-male ratio in that study was higher (2.6:1) [6].

The study found that the mean DMCs were 679,843 VND (95% CI: 669,503 - 690,182 VND) per outpatient episode and 11,389,334 VND (95% CI: 10,780,602 - 11,998,065 VND) per inpatient episode. Regarding cost components, medication accounted for the highest proportion in outpatient episodes, with the proportion of 63.4% and the mean value of 431,321 VND (95% CI: 426,539 - 436,102 VND), followed by laboratory with the proportion of 16.1% and the mean value of 109,784 VND (95% CI: 108,561 - 111,005 VND). In inpatient episodes, medical supplies, medication, and hospital beds constituted the major cost components, making up 29.2% with the mean value of 3,317,386 VND (95% CI: 2,869,773 - 3,764,999 VND), 24.1% with the mean value of 2,728,489 VND (95% CI: 2,548,984 - 2,907,995 VND), and 19.2% with the mean value of 2,185,766 VND (95% CI: 2,126,315 - 2,245,218 VND), respectively. Regarding source of payment, health insurance payments represented a substantial proportion of total DMCs in both outpatient and inpatient settings, accounting for 88.2% with the mean value of 599,277 VND (95% CI: 589,498 - 609,055 VND) and 84.4% with the mean value of 9,613,788 VND (95% CI: 9,121,196 - 10,106,379 VND), respectively. The average DMCs for treating HTN - DM comorbidity per inpatient episode were 16.8 times higher than per outpatient episode. This drastic difference may be attributable to the low detection and management rates of HTN and DM in Vietnam (In 2021, fewer than 50% of patients with HTN or DM nationwide were diagnosed, and fewer than 30% were under management), and by the fact that patients were only admitted into the hospital if the symptoms were severe or if there were complications, leading to a significant burden on inpatient treatment [7].

The study also found that medication accounted for the largest share of outpatient DMCs (63.4%), which is consistent with previous studies on HTN (64.1%) or DM (68.3%) alone [8, 9]. However, the cost distribution differed in the inpatient setting, where medical supplies constituted the largest share (29.2%). In contrast, prior studies focusing on only HTN or DM found that hospital bed-day costs and medication costs were the most significant (41.4% and 34.0% in HTN; 41.2% and 30.6% in DM, respectively) [10, 11]. This discrepancy may be explained by the inpatient sample characteristics in the present study, which included a high proportion of patients with severe cardiovascular conditions - such as ischemic heart disease (48.9%), sick sinus syndrome, or atrial fibrillation - requiring invasive procedures and the use of costly medical consumables such as catheters, stents, angioplasty balloons, pace-makers, and mechanical heart valves. Health insurance covered 88.2% of outpatient and 84.4% of inpatient DMCs, consistent with the findings by Vo Thuy Hang et al. (2023) (87.8% outpatient, 84.6% inpatient), Nguyen Linh Viet et al. (2023) (88.2% per patient per year) for DM, and Nguyen Thi Thu Thuy et al. (2017) for hospitalized HTN patients (86.8%); however, the proportion was lower than the result in outpatient HTN treatment by Nguyen Phuc Hung et al. (98,6%) [8, 9, 12, 13].

Factors associated with DMCs in the treatment of HTN - DM comorbidity ($p < 0,05$) included gender, area of residence, type of health insurance, reimbursement rate, primary diagnosis, reason for visit, number of comorbidities ($r = 0.396$ in outpatient visits; $r = 0.186$ in inpatient episodes), dyslipidemia, treatment outcome, and discharge status. Additionally, age ($r = 0.072$) and ischemic heart disease were associated with outpatient costs, while length of hospital stay ($r = 0.679$) was associated with inpatient costs. DMCs in both

outpatient and inpatient settings were influenced similarly by type of health insurance (highest costs in state budget, lowest in employee/ employer), area of residence (higher in patients living outside of the province), reason for visit (higher in emergency/non - referral cases), treatment outcome (highest in severe cases or death), and number of comorbidities (positive correlation). These findings align with clinical reality: more complex conditions, referral bypass, or severe outcomes require higher levels of care and greater use of healthcare resources. The study found differences in how primary diagnosis influenced DMCs across outpatient and inpatient settings. The highest outpatient DMCs were observed in patients with chronic kidney disease, whereas the highest inpatient DMCs occurred in patients with ischemic heart disease. This may be explained by the need for continuous outpatient management of chronic kidney disease, involving multiple medications and regular laboratory monitoring - two components that constitute the largest share of outpatient DMCs (63.4% and 16.1%, re-spectively) - as well as specialized procedures such as dialysis. In contrast, inpatient DMCs were highest among ischemic heart disease patients due to the heavy expenditure on medical supplies required for advanced cardiovascular interventions. The study also found that outpatient DMCs were higher in patients without comorbid dyslipidemia or ischemic heart disease, which can be explained by sample characteristics: patients without comorbid dyslipidemia or ischemic heart disease contained a higher proportion of cases with a primary diagnosis of end-stage renal disease than those with this comorbidity (32.1% vs. 6.1% for dyslipidemia; 10.6% vs. 3.1% for ischemic heart disease), leading to greater use of costly procedures such as ultrafiltration and conventional hemodialysis. Regarding discharge status in outpatient care, DMCs were highest in discharged patients, which is reasonable because these are chronic diseases, the intervals between follow-up visits are often long, and the patients typically receive large quantities of medications upon discharge to maintain disease control at home. Since medications account for the largest proportion of outpatient DMCs (63.4%), the extended duration of medication prescriptions leads to higher total DMCs. While in inpatient care, DMCs were highest among referred patients, which can be explained by the fact that these patients often had more severe conditions with more complex progression and required more specialized services for initial management at the facility.

This study provided a detailed analysis of DMCs by cost component and source of payment, highlighting the economic burden of HTN - DM comorbidity. However, the study still has limitations, including a restricted timeframe and being conducted at a single hospital, which may limit the generalizability and the ability to examine cost trends over time. Therefore, future studies should expand both temporal and geographical scope to better assess cost variations across different settings and improve the robustness of their findings.

5. CONCLUSION

The study demonstrates that DMCs for the treatment of HTN - DM comorbidity are considerably high, equivalent to 0.1 times the average monthly per-capita income per outpatient visit and 2.1 times per inpatient episode (5.4 million VND) [14]. Inpatient episodes with a primary diagnosis of ischemic heart disease and comorbid dyslipidemia incurred substantial DMCs; therefore, strengthening strategies for the effective clinical management and control for these conditions is warranted to reduce the economic burden.

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Chi phí trực tiếp y tế trong điều trị đồng mắc tăng huyết áp và đái tháo đường tại Bệnh viện Đa khoa Thống tỉnh Nhất Đồng Nai năm 2024

Nguyễn Thúy Hằng, Đỗ Huỳnh Quốc Thắng, Phạm Thị Thùy Linh, Nguyễn Thị Thu Thúy, Nguyễn Trần Như Ý

TÓM TẮT

Đặt vấn đề: Đồng mắc tăng huyết áp và đái tháo đường (THA - ĐTĐ) ngày càng phổ biến, kéo theo gánh nặng chi phí gia tăng. Mục tiêu: Phân tích chi phí trực tiếp y tế (CPTTYT) trong điều trị (ĐT) THA - ĐTĐ tại

Bệnh viện Đa khoa Thống Nhất tỉnh Đồng Nai năm 2024. Phương pháp: Mô tả cắt ngang hồi cứu dữ liệu thanh toán điện tử tại Bệnh viện Đa khoa Thống Nhất tỉnh Đồng Nai năm 2024. Toàn bộ mẫu thỏa tiêu chí lựa chọn và không vi phạm tiêu chí loại trừ trong thời gian lấy mẫu được đưa vào nghiên cứu. Kết quả: Khảo sát 50,800 đợt ĐT với tuổi trung bình của mẫu 66.7 ± 10.2 và tỉ số nữ:nam 1.4:1 nghiên cứu ghi nhận CPTTYT trung bình đạt giá trị 679.843 VND (95%KTC: 669,503 - 690,182 VND) cho một đợt điều trị ngoại trú và 11.389.334 VND (95%KTC: 10,780,602 - 11,998,065 VND) cho một đợt điều trị nội trú. Trong đó, thuốc và vật tư y tế lần lượt chiếm tỉ lệ cao nhất trong điều trị ngoại trú (63.4%) và nội trú (29.1%); BHYT chi trả 88.1% trong chi phí điều trị ngoại trú và 84.4% trong chi phí điều trị nội trú. Yếu tố liên quan đến cả CPTTYT nội trú và ngoại trú gồm giới tính, đối tượng BHYT, mức hưởng BHYT, nơi cư trú, chẩn đoán chính, lý do vào viện, số lượng bệnh kèm, rối loạn lipid máu (RLLM), kết quả ĐT và tình trạng ra viện. Ngoài ra, tuổi, bệnh tim thiếu máu cục bộ (TMCB) liên quan đến CPTTYT ngoại trú, số ngày ĐT liên quan đến CPTTYT nội trú. Kết luận: CPTTYT ĐT đồng mắc THA - ĐTĐ có giá trị cao đáng kể, gấp 0.1 lần thu nhập bình quân đầu người hằng tháng cho một đợt ngoại trú và 2.1 lần cho một đợt nội trú. Các đợt ĐT nội trú với chẩn đoán chính là bệnh tim TMCB và có bệnh kèm RLLM phát sinh chi phí điều trị đáng kể; do đó, cần tăng cường các chiến lược quản lý và kiểm soát hiệu quả hai nhóm bệnh này nhằm giảm gánh nặng chi phí.

Từ khóa: *bệnh đồng mắc, tăng huyết áp, đái tháo đường, chi phí trực tiếp y tế*

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