Study Of The Cost Effectiveness Of Therapy In Hypertension Patients In Hospital

[K]Richa Yuswantina[1], Niken Dyahariesti[2], Diastri Dwi Ambarwati[3], Aisah Nur Saniah[4]
[1,2,3,4] Program Studi Farmasi, Fakultas Kesehatan, Universitas Ngudi Waluyo
Email Penulis Korespondensi ([K]): richayuswantina@gmail.com

ABSTRACT

Hypertension is where the blood pressure is > 140 mmHg and > 90 mmHg. Combination therapy is needed if a single antihypertensive has not been able to control the desired blood pressure target while the cost of treatment is increasing from time to time. The purpose of this study was to determine the cost-effective combination therapy for antihypertensive drugs in hypertensive patients in an inpatient setting. This study is a descriptive study with a pharmacoeconomic analysis approach using the Cost Effectiveness Analysis (CEA) method which was carried out retrospectively. Data were collected using the Total Sampling technique with 93 patients which were then analyzed to determine the cost-effective therapy based on ACER and ICER. The results showed that hypertension was mostly experienced by patients aged 50-60 years, male sex was more than female. HT stage 2 is often experienced by patients. Type II DM is the most common comorbidity. The lowest ACER value is Rp. 65.195.77. The lowest ICER value is Rp. 7.047.2551 when compared with standard therapy, namely CCB + ACEI. The combinations used in the inpatient unit include two combinations of 42 patients (45.16%) three combinations of 37 patients (39.78%), four combinations 6 (6.45%) five combinations of 8 patients (8.6%). The lowest average direct medical cost is the combination of ACEI antihypertensive + Diuretic + -Blocker Rp. 2.765.262. The cost effective therapy based on ACER and ICER values is a combination of Diuretics + CCB + ACEI + Blockers with an ACER value of Rp. 65,195.77 and also dominant.

Keywords: Colostrum, Breast Milk, Third Trimester Pregnant Women

INTRODUCTION

Hypertension is a condition where there is an increase in systolic blood pressure of more than 140 mmHg while diastolic blood pressure is more than 90 mmHg. Increased blood pressure that lasts for a long time can cause damage to the kidneys (kidney failure), heart (coronary heart disease) and brain (causing stroke) [1].

World Health Organization (WHO) in 2019 estimates that there are 1.13 billion people with hypertension worldwide, two-thirds of cases are in low-middle income countries. This number will continue to increase every year and by 2025 it is estimated to reach 1.5 billion cases, and the death rate due to hypertension and its complications is estimated to reach 9.4 million people annually[2]. Pharmacological therapy that will be obtained by the patient can be in the form of a single antihypertensive drug or can also be a combination of antihypertensive drugs. This combination therapy is needed if the administration of a single antihypertensive drug has not been able to control the desired blood pressure target. The main goal of treating hypertension is to achieve and maintain blood pressure targets. If the target blood pressure has not reached the target within one month of treatment, it can be done by increasing the initial drug dose or by adding a second antihypertensive drug from one of the classes (thiazide diuretic, CCB, ACEI, or ARB)[3].

The high cost of antihypertensive treatment from time to time is increasing, so the price of drugs is an important factor in making policies to determine therapy for patients. Given these factors, it is necessary to apply pharmacoeconomics to assist in the efficient use of antihypertensive drugs that are effective in terms of cost and pharmacology[4]. One method of pharmacoeconomic analysis is cost-effectiveness analysis, cost-effectiveness analysis is an evaluation method used in making decisions in choosing the best alternative from several existing alternatives. The criteria to be selected are based on the total cost of each alternative, so the alternative with the lowest total value will be selected[5].

METHOD

The tools and materials used are data collection sheets, medical records and details of the payment costs of patients undergoing hospitalization at the Semarang Regional Hospital in 2021[6].

1. Research Method

   This research is a non-experimental study, with a descriptive approach to pharmacoeconomic analysis using the Cost Effectiveness Analysis (CEA) method which is reviewed from a hospital perspective, and data collection is carried out retrospectively by means of Total Sampling. ost analysis is done by calculating the total cost of the average of each component of direct medical costs, then classified according to the pattern of therapy7.

2. Analysis of the effectiveness of therapy is carried out by calculating the percentage of therapeutic effectiveness using the following formula: % Effectiveness = a/b x 100%

Information :

a : Number of patients reaching the target BP

b : Number of patients

RESULTS

1. Overview of Patient Characteristics

Table 1. Patient Characteristics

Patient Characteristics	N	%
Age (years)		
18 – 49	14	15,06%
50 - 60	47	50,54%
> 60	32	34,40%
Total	**93**	**100%**
Gender		
Man	58	62,37%
Woman	35	37,63%
Total	**93**	**100%**
Hypertension Classification		
Hypertension Stage II	44	47,31%
Hypertension Urgensi	38	40,86%
Hypertension Emergensi	11	11,83%
Total	**93**	**100%**

In Table 1. Characteristics of patients in this study were grouped by age, gender, classification of hypertension, comorbidities and also space. Based on age, patients were grouped into 3, namely 18-49, 50-60 and >60 years.

Table 2. Overview of the Use of Antihypertensive Combinations In Inpatients

Combination Type	N	%
Combination of 2 Antihypertensive		
CCB[a] + β-Blocker[a,b]	14	15,05%
CCB[a,b,c] + ACEI[b,c,e]	16	17,21%
CCB[a] + ARB[a,b]	12	12,90%
Combination of 3 Antihypertensive		
CCB[a] + ARB[a] + Diuretic[a]	8	8,60%
ACEI[d] + Diuretic[b] + β-Blocker[a]	8	8,60%
ACEI[c] + Diuretic[a] + Agonis α2 Sentral	9	9,68%
CCB[c] + ACEI[b] + Agonis α2 Sentral	7	7,53%
ACEI[a] + ARB[a] + β-Blocker[a]	5	5,38%
Combination of 4 Antihypertensive		
Diuretic[a] + CCB[c] + ACEI[a] + β-Blocker [a]	6	6,45%
Combination of 5 Antihypertensive		
CCB[b] + Agonis α2 Sentral + Diuretic[c] + ARB[c] + β-Blocker[b]	2	2,15%
Diuretic[a] + Diuretic[b] + CCB[c] + ARB[d] + β-Bloker[b]	6	6,45%
Total	**93**	**100%**

Tabel 3. Perhitungan ACER Kombinasi Obat Antihipertensi Pada Pasien Rawat Inap

Combination Type	Average Medical Cost (Rp)	Average Effectiveness (%)	ACER
Combination of 2 Antihypertensive			
CCB[a] + β-Blocker[a,b]	7.619.256	100	73.193
CCB[a,b,c] + ACEI[b,c,e]	6.665.693	56,25	118.450
CCB[a] + ARB[a,b]	6.953.574	33,33	207.471
Combination of 3 Antihypertensive			
CCB[a] + ARB[a] + Diuretic[a]	14.219.283	100	142.192,8
ACEI[d] + Diuretic[b] + β-Blocker[a]	2.765.262	12,5	221.220,9
ACEI[c] + Diuretic[a] + Agonis α2 Sentral	8.295.979	100	82.959.79
CCB[c] + ACEI[b] + Agonis α2 Sentral	3.073.100	14,29	215.052,5
ACEI[a] + ARB[a] + β-Blocker[a]	6.921.156	20	346.057,8
Combination of 4 Antihypertensive			
Diuretic[a] + CCB[c] + ACEI[a] + β-Blocker [a]	6.519.577	100	65.195,77
Combination of 5 Antihypertensive			
Diuretic[a] + Diuretic[b] + CCB[c] + ARB[d] + β-Blocker[b]	4.743.805	0	0
CCB[b] + Agonis α2 Sentral + Diuretic[c] + ARB[c] + β-Blocker[b]	3.913.133	33,33	117.405,7

Note: ACEIa,b,c,d,e= Captropil, Imidapril, Lisinopril, Perindopril, Ramipril; ARBa,b,c,d= Candesartan, Irbesartan, Telmisartan, Valsartan;β-Blokera,b= Bisoprolol, Karvedilol; CCBa,b,c= Amlodipine, Diltiazem, Nifedipine; Diuretics, b, c= Spironolactone, Furosemide, HCT

From the results of the study, it can be seen in table 3 that the total value of direct medical costs was the highest for the use of 3 combinations of antihypertensive drugs, namely CCBa + ARBa + Diuretics, with a total medical cost of Rp. 14,219,283 with a standard deviation of 2,474,230. In table 3, it can also be seen that the lowest total medical costs used by patients are a combination of 3 antihypertensive groups ACEI[d] + Diuretic[b] + -Blocker[a] the costs incurred are Rp. 14,219,283 ± 2,474,230.

Table 4. Calculation of ICER Antihypertensive Combination Therapy in Inpatients

No	Combination Type	Cost Total [C] (Rp)	Effectiveness [E] (%)	Δ C (Rp)	Δ E (Rp)	ICER = ($\frac{\Delta C}{\Delta E}$)
1	ACEI[d] + Diuretic[c,b] + β-Blocker[a]	2.765.262	12,5	-3.900.431	-43,75	89.152,71
	(CCB + ACEI)	6.665.693	56,25			
2	CCB[c] + ACEI[b] + Agonis α2 Sentral	3.073.100	14,29	-3.592.593	-41,96	85.619,47
	(CCB + ACEI)	6.665.693	56,25			
3	ACEI[a] + ARB[a] + β-Blocker[a]	6.921.156	20	-255.463	-36,25	7.047,255
	(CCB + ACEI)	6.665.693	56,25			
4	Diuretic[a] + Diuretic[b] + CCB[c] + ARB[d] + β-Blocker[b]	4.743.805	0	-1.921,89	-56,25	34.166,898
	(CCB + ACEI)	6.665.693	56,25			
5	CCB[b] + Agonis α2 Sentral + Diuretic[c] + ARB[c] + β-Blocker[b]	3.913.133	33,33	-2.752.560	-22,92	120.094,24
	(CCB + ACEI)	6.665.693	56,25			
6	CCB[a] + β-Blocker[a,b]	7.619.256	100	953.563	43,75	21.795,73
	(CCB + ACEI)	6.665.693	56,25			
7	CCB[a] + ARB[a] + Diuretic[a]	14.219.283	100	7.553.590	43,75	172.653,49
	(CCB + ACEI)	6.665.693	56,25			
8	ACEI[c] + Diuretic[a] + Agonis α2 Sentral	8.295.979	100	1.630.286	43,75	37.263,68
	(CCB + ACEI)	6.665.693	56,25			

Note: ACEIa,b,c,d,e= Captropil, Imidapril, Lisinopril, Perindopril, Ramipril; ARBa,b,c,d= Candesartan, Irbesartan, Telmisartan, Valsartan;β-Blokera,b= Bisoprolol, Karvedilol; CCBa,b,c= Amlodipine, Diltiazem, Nifedipine; Diuretics, b, c= Spironolactone, Furosemide, HCT

Based on table 5, the smallest ICER value obtained from the combination of CCBa + -Blockera,b, and CCB + ACEI combination therapy was Rp 21,795,73.

DISCUSSION

Table 1 describes the characteristics of patients in this study grouped by age, gender, diagnosis of hypertension, classification of hypertension, comorbidities and also treatment rooms presented in table 1. Based on age, patients were grouped into 3 namely 18-49, 50-60 and >60 years. It can be seen that the lowest percentage of hypertension is found in the group between the ages of 18-49 years with 14

patients, with a percentage of 15.05%, while the highest incidence of hypertension occurs in the age group between 50-60 years, which is around 47 patients with a percentage of 50,54%. According to Maulidina et.al (2019) and Alifariki (2019) the age factor is very influential on the incidence of hypertension because with increasing age, the risk of hypertension increases. With increasing age a person's blood pressure will also increase, things like this could be due to several factors such as natural changes in the heart and blood vessels and hormones in a person, where the arteries will lose their elasticity or flexibility so that it can cause blood pressure to increase along with increasing age and can also experience a decrease in body resistance, because with increasing age a person is susceptible to disease8.

The most widely used drug combinations based on table 2 are the two combinations of antihypertensive drugs, in order to lower blood pressure optimally, it is necessary to consider the selection of drugs properly. This can be done by selecting treatment with single or combination therapy, low-dose combination therapy of 2 drugs is given for initial therapy in stage 2 hypertension with high or very high risk factors. Lowering blood pressure with the use of a combination of two antihypertensive drugs can reduce the risk of cardiovascular events9.

From the results of the study, it can be seen in table 3 which shows that direct medical costs for inpatients with a combination of antihypertensive drugs have different costs. The cost for each patient can vary because it is influenced by such conditions as the patient's condition, the length of day the patient is treated, and the patient care classroom. It can be seen in table 4.3 that the total value of direct medical costs was highest for the use of 3 combinations of antihypertensive drugs, namely CCB[a] + ARB[a] + Diuretics, with a total medical cost of Rp. 14,219,283 with a standard deviation of 2,474,230. In table 3, it can also be seen that the lowest total medical costs used by patients are a combination of 3 antihypertensive groups ACEId + Diuretic[b] + -Blokera the costs incurred are Rp. 14,219,283 ± 2,474,230. It can also be seen in table 3 which shows the total direct medical costs for other drug combinations, in patients using 2 combinations of antihypertensive drugs it is known to have a higher rupiah value compared to 5 combinations of antihypertensive drugs. From the research that has been done, this is in accordance with the research conducted by Zulfah, Ikaditya and Kosasih (2019) which stated that the more drugs used in a combination therapy did not always increase the cost of therapy. This can also happen because of differences in direct medical costs for each patient due to the length of time the patient is hospitalized, because the longer the patient is hospitalized, the greater the costs that must be incurred by the patient8.

The results of the cost-effectiveness analysis are presented in the form of a ratio. One form of the C/E ratio is the average cost-effectiveness ratio (ACER) which is calculated for each alternative therapy10. Cost effectiveness is obtained by calculating the ACER and ICER values. The interpretation of the results of the ACER calculation shows the costs incurred for every 1% of the effectiveness of

therapy. Based on table 5, the most cost-effective combination antihypertensive therapy was in the combination therapy group patient with Diuretics + CCBc + ACEIa + -Blocker a with the lowest ACER value of IDR 65,195.77 so that the patient required a cost of IDR 65,195.77 for every 1% increase in effectiveness. This shows that the combination therapy of Diuretics + CCBc + ACEIa + -Blocker a is more cost-effective or has a lower cost compared to other combination therapy groups.

CONCLUSIONS

The combinations used in the inpatient unit include two combinations of 14 patients (61%) three combinations of 5 patients (22%), four combinations of 1 (4%) five combinations of 3 patients (13%). The lowest average direct medical cost is the combination of ACEI antihypertensive + Diuretic + -Blocker Rp. 2,695,531. Cost effective therapy based on ACER and ICER Diuretics + CCB + ACEI + -Blockers with an ACER value of Rp. 60,232 and is also dominant.

REFERENCES

1. Indonesia M of H of the R of. Technical Guidelines for Finding and Management of Hypertension. 2013.
2. Durojaiye OC, Bell H, Andrews D, Ntziora F, Cartwright K. Clinical efficacy, cost analysis and patient acceptability of outpatient parenteral antibiotic therapy (OPAT): a decade of Sheffield (UK) OPAT service. Int J Antimicrob Agents. 2018 Jan;51(1):26–32.
3. Mpila, D. A., & Lolo WA. The relationship between the rationale of the use of antihypertensive drugs on the clinical outcome of hypertensive patients at the Manado Clinic. J Pharmacon. 2022;
4. Ostermann JK, Witt CM, Reinhold T. A retrospective cost-analysis of additional homeopathic treatment in Germany: Long-term economic outcomes. PLoS One. 2017;12(9):e0182897.
5. Maulidina, F., Harmani, N. & SI. Factors Associated with the Incidence of Hypertension in the Working Area of the Jati Luhur Health Center Bekasi in 2018. 2019.
6. Page TF, Pelham WE 3rd, Fabiano GA, Greiner AR, Gnagy EM, Hart KC, et al. Comparative Cost Analysis of Sequential, Adaptive, Behavioral, Pharmacological, and Combined Treatments for Childhood ADHD. J Clin Child Adolesc Psychol. 2016;45(4):416–27.
7. Andayani TM. Pharmacoeconomics, Principles and Methodology. Yogyakarta: Bursa Ilmu; 2013.
8. Zulfah M. Cost Effectiveness Analysis of Combination Antihypertensive Drugs in Inpatients at Dr. Hospital. Soekardjo Tasikmalaya. J Pharmacopolium. 2019;
9. Lutfiyati, H., Yuliastuti, F., & Khotimah A. Pattern of Hypertension Treatment in Elderly Patients at the Windusari Health Center, Magelang Regency. J Farm Sains dan Prakt. 2017;
10. Hubner C, Hubner NO, Muhr M, Claus F, Leesch H, Kramer A, et al. Cost analysis of hospitalized Clostridium difficile-associated diarrhea (CDAD). GMS Hyg Infect Control. 2015;10:Doc13.