

CHAPTER 1

INTRODUCTION

1.1 Research Background

High blood pressure (hypertension) is a major health issue in many countries, as it can lead to severe heart disease and strokes. Hypertension is often considered a serious health concern because its onset is often unnoticed, progressing silently until it reaches a life-threatening level. According to the World Health Organization (WHO), non-communicable diseases are responsible for approximately 60% of deaths and 43% of diseases globally. Each year, nearly 8 million people die from hypertension, and almost 1.5 million of these deaths occur in East and Southeast Asia¹.

Nearly one billion people worldwide suffer from hypertension, and approximately 7.1 million people die each year due to this condition, according to JNC 7 data. This number is expected to rise by 2025. Hypertension prevalence in Indonesia is also high. Based on data from the 2018 Basic Health Research (Riskesdas), the national prevalence of hypertension in adults over 18 years old is 34.11%, and it is predicted to increase yearly².

Data from the 2015 health profile of districts/cities in Central Java shows that hypertension accounts for the largest proportion of non-communicable diseases (NCDs) at 57.87%, followed by diabetes mellitus at 18.33%³. The prevalence of hypertension in Central Java Province is 37.5%, with a higher rate among women (40.17%) compared to men (34.83%)⁴.

One of the diseases that can arise as a complication of hypertension is heart failure. Chronic high blood pressure leads to heart disease in hypertensive patients, causing structural changes in the myocardium, coronary blood vessels, and the cardiac conduction system. These changes can lead to left ventricular hypertrophy (LVH),

¹ WHO, *Global Report on Hypertension*, Universitas Nusantara PGRI Kediri, vol. 01, 2023.

² Kemenkes RI, "Hasil Riset Kesehatan Dasar Tahun 2018," *Kementerian Kesehatan RI* 53, no. 9 (2018): 1689–1699.

³ Kemenkes RI, "*Profil Kesehatan Provinsi Jawa Tengah*" 2015.

⁴ Kemenkes RI, "Hasil Riset Kesehatan Dasar Tahun 2018."

coronary artery disease (CAD), conduction system disorders, and systolic and diastolic myocardial dysfunction, which manifest clinically as angina or myocardial infarction, cardiac arrhythmias, and congestive heart failure (CHF). Therefore, hypertensive heart disease is a broad term for conditions such as LVH, coronary artery disease, cardiac arrhythmias, and CHF that result from the direct or indirect effects of hypertension⁵.

Combination therapy is recommended when single antihypertensive therapy fails to achieve target blood pressure control. According to the Eighth Joint National Committee (JNC 8), recommended antihypertensive combinations include Thiazide Diuretics, Beta Blockers (BB), Calcium Channel Blockers (CCB), Angiotensin-Converting Enzyme Inhibitors (ACEi), or Angiotensin II Receptor Blockers (ARB). It is recommended to avoid using both ACEi and ARB simultaneously and to combine only one of these with other drug classes⁶.

The JNC 8 recommends that the selection of initial therapy for hypertension with complications or comorbid heart failure in the general non-African population should include thiazide-type or loop diuretics, Calcium Channel Blockers (CCB), Angiotensin Converting Enzyme Inhibitors (ACEi), or Angiotensin II Receptor Blockers (ARB), with a moderate recommendation (Grade B)⁷.

Appropriate medication for hypertensive patients with complications is essential to ensure effective treatment. Inadequate therapy can lead to therapeutic failure and result in high costs borne by society⁸.

Furthermore, hypertension therapy is a long-term treatment, often requiring lifelong administration. This prolonged treatment can lead to increased hospitalizations⁹, raising hypertension-related healthcare costs and requiring

⁵ Upik Pebriyani, Iyang Gumilang, and Kata Kunci, "1 , 1 , 2," no. December (2015).

⁶ Paul A. James et al., "2014 Evidence-Based Guideline for the Management of High Blood Pressure in Adults: Report from the Panel Members Appointed to the Eighth Joint National Committee (JNC 8)," *Jama* 311, no. 5 (2014): 507–520.

⁷ Ibid.

⁸ Ewelina Wierzejska et al., "Systematic Review / Meta-Analysis A Global Perspective on the Costs of Hypertension : A Systematic Review," *Arch Med Sci* 16 (2020): 1078–1091.

⁹ Ni Nyoman Wahyu Udayani, Ni Wayan Riastini, and I Made Agus Sunadi Putra, "Perbedaan Efektivitas Penggunaan Obat Amlodipin Tunggal Dengan Kombinasi Amlodipin Dan Lisinopril Pada Pasien Hipertensi Rawat Inap Di Rs 'X' Tabanan Tahun 2017," *Jurnal Ilmiah Medicamento* 4, no. 2 (2018).

additional resources to support patient care¹⁰. Consequently, long-term patient care demands a significant administrative burden. Between 2011 and 2012, the expenditure for hypertension therapy reached USD 48.6 billion, and it is projected to rise to USD 274 billion by 2030¹¹.

Since antihypertensive drug prices vary, the cost of drugs plays a critical role in determining treatment policies for patients¹². High drug costs can limit patient access to the necessary therapy, especially among populations with limited financial means. Therefore, ensuring cost-efficiency in antihypertensive therapy selection is essential for optimal healthcare resource utilization. Decisions that overlook cost efficiency can lead to resource wastage and service imbalances¹³. Based on these factors, pharmacoeconomic evaluations are crucial in supporting the efficient use of effective antihypertensive medications, one of which is Cost-Effectiveness Analysis (CEA). CEA is an economic evaluation method used to assess and select the best treatment option from multiple therapies with similar therapeutic goals. CEA can compare two or more treatment alternatives¹⁴.

Given these background issues, evaluating cost-effectiveness is deemed important to ensure that hypertensive patients with heart failure complications receive treatment suited to their needs and to prevent the increasing prevalence of hypertension. Appropriate treatment benefits patients by providing effective disease management, reducing costs, and improving treatment adherence, especially for hypertensive patients who require lifelong medication. This serves as motivation for the researcher to conduct a study on the cost-effectiveness of combination

¹⁰ WHO, "Global Status Report on Noncommunicable Diseases 2014 ([Http://Apps.Who.Int/Medicinedocs/Es/m/Abstract/Js21756en/](http://apps.who.int/medicinedocs/es/m/abstract/js21756en/))," Geneva: World Health Organization (2014).

¹¹ Dariush Mozaffarian, "Dietary and Policy Priorities for CVD, Diabetes and Obesity - a Comprehensive Review," *Circulation* 133, no. 2 (2016): 187–225.

¹² Torbjørn Wisløff et al., "Choice of Generic Antihypertensive Drugs for the Primary Prevention of Cardiovascular Disease - A Cost-Effectiveness Analysis," *BMC Cardiovascular Disorders* 12 (2012).

¹³ Akram Ahmad et al., "The Role of Pharmacoeconomics in Current Indian Healthcare System," *Journal of Research in Pharmacy Practice* 2, no. 1 (2013): 3.

¹⁴ Heejung Bang and Hongwei Zhao, "Cost-Effectiveness Analysis: A Proposal of New Reporting Standards in Statistical Analysis," *Journal of Biopharmaceutical Statistics* 24, no. 2 (2014): 443–460.

antihypertensive therapies for heart failure complications in hypertensive patients at Dr. Moewardi Hospital Surakarta.

1.2 Research Problems

Based on the background, the research problems can be formulated as follows:

1. How is the profile of blood pressure reduction in the antihypertensive combination therapy of Valsartan-Furosemide and Amlodipine-Furosemide for hypertensive patients with heart failure complications at Dr. Moewardi Hospital Surakarta?
2. How is the profile of total direct medical cost between the antihypertensive combination therapies of Amlodipine-Furosemide and Valsartan-Furosemide for hypertensive patients with heart failure complications at Dr. Moewardi Hospital Surakarta?
3. How is the cost-effectiveness of using the combination therapies of Amlodipine-Furosemide and Valsartan-Furosemide for inpatient hypertensive patients with heart failure complications at Dr. Moewardi Hospital Surakarta, from January 2022 to August 2024, based on the Average Cost Effectiveness Ratio (ACER) and Incremental Cost Effectiveness Ratio (ICER)?

1.3 Research Objectives

The objectives of this research are:

1. Knowing the blood pressure reduction in antihypertensive combination therapy of Amlodipine-Furosemide and Valsartan-Furosemide in hypertensive patients with heart failure complications at Dr. Moewardi Hospital Surakarta.
2. Knowing the average total direct medical costs of using combination therapy of antihypertensive Amlodipine-Furosemide and Valsartan-Furosemide in hypertensive patients with complications at Dr. Moewardi Hospital Surakarta.
3. Knowing the cost-effectiveness value of the use of Amlodipine-Furosemide and Valsartan-Furosemide combination therapy in hypertensive patients with complications of heart failure hospitalized at Dr. Moewardi Hospital Surakarta

January 2022-August 2024 based on Average Cost Effectiveness Ratio (ACER) and Incremental Cost Effectiveness Ratio (ICER).

1.4 Research Benefits

1. Theoretical Benefits

The results of this study are expected to provide benefits in the form of new data and information that can be used as a basis for further research.

2. Practical Benefits

The results of this study are expected to provide information on the most effective combination of antihypertensive drugs so that it can help reduce waste and increase the efficiency of drug use.

1.5 Authenticity Research

There have been many studies on the cost-effectiveness of antihypertensive combination therapy with complications, as shown in Table 1 below.

Table 1 Authenticity Research

Research Title	Type of Research	Variable	Result	Research Differences
<i>Cost-Effectiveness Analysis of Antihypertensive in Hypertension Patients with Complications of Diabetes Mellitus Type 2 Hospitalized at Dr. Moewardi Hospital in 2017¹⁵.</i>	Non-experimental	-	Of the 41 samples that met the inclusion and exclusion criteria, the most widely used antihypertensive drug was amlodipine (37%). Based on the ACER method, the combination of Amlodipine 10 mg and Captopril 25 mg is the most <i>cost-effective</i> drug combination,	Differences in heart failure complications. Did not use variables in the study, and conducted research on patients in inpatient installations.

¹⁵ Bintang Anjani, "Analisis Efektivitas Biaya (Cost- Effectiveness) Antihipertensi Pada Pasien Hipertensi Komplikasi Diabetes Melitus Tipe 2 Rawat Inap Di Rsud Dr. Moewardi Tahun 2017," *Publikasi Ilmiah* (2019).

Research Title	Type of Research	Variable	Result	Research Differences
Comparative Clinical and Cost Effectiveness of Candesartan and Losartan in the Management of Hypertension and Heart Failure: A Systematic Review, Meta-Analysis, and Cost Utility Analysis ¹⁶ .	Descriptive Analytic with Systematic Review and Meta-Analysis Methods.	-	with a value of Rp. 15,605.06. Candesartan reduces blood pressure to a slightly greater extent compared to Losartan. There is no strong evidence to support the superiority of Candesartan over Losartan in the treatment of heart failure.	The difference in the cost analysis used is Cost Effectiveness Analysis, the combination of antihypertensive therapy used is Amlodipine-Furosemide and Valsartan-Furosemide.
Cost Effectiveness Analysis of Amlodipine-Furosemide Combination Treatment Compared with Amlodipine Bisoprolol Combination in Outpatient Hypertension Patients at Undata Hospital Palu, August-October Period 2014 ¹⁷ .	Descriptive analytical prospective data collection.	-	Amlodipine-Bisoprolol combination is the most effective treatment than Amlodipine-Furosemide combination, while for cost effectiveness, Amlodipine-Furosemide combination has the most effective cost than Amlodipine-Bisoprolol combination.	Differences in the combinations used, namely Amlodipine-Furosemide and Valsartan-Furosemide, variables used, and retrospective data collection methods.

¹⁶ A. M. Grosso et al., "Comparative Clinical- and Cost-Effectiveness of Candesartan and Losartan in the Management of Hypertension and Heart Failure: A Systematic Review, Meta- and Cost-Utility Analysis," *International Journal of Clinical Practice* 65, no. 3 (2011): 253–263.

¹⁷ Niken Wike Wijayanti, Alwiyah Mukaddas, and Muhamad Rinaldhi Tandah, "Analisis Efektivitas Biaya Pengobatan Kombinasi Amlodipin Furosemid Dibandingkan Dengan Kombinasi Amlodipin Bisoprolol Pada Pasien Hipertensi Rawat Jalan Di Rsud Undata Palu Periode Agustus-Oktober Tahun 2014," *Jurnal of Natural Science* 5, no. 1 (2016): 101–110.