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[Original Research]

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Risk Analysis of Heart Failure in Hypertensive Patients at the Emergency Department Jember Klinik Hospital

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Abstract

Background: Hypertensive patients experience an increase in systemic blood pressure, which places additional strain on the heart. This condition can increase the risk of heart failure. **Objective:** To assess the risk of heart failure in hypertensive patients treated at the Emergency Department of Jember Klinik Hospital. **Method:** This study employed a descriptive design using a cross-sectional approach. The study population consists of hypertensive patients at the Emergency Department of Jember Klinik Hospital. A total of 57 hypertensive patients who underwent examination at the Emergency Department of Jember Klinik Hospital between April and June 2024. The criteria of respondents were patients aged 30 to 74 years, composmentis, and able to communicate. The research instrument used the Framingham score to assess heart failure risk. Analysis statistic used analysis descriptive. **Results:** This study show that 6 respondents (10.5%) have a low risk, 17 respondents (29.8%) have a moderate risk, and 34 respondents (59.7%) have a high risk. **Conclusion:** The findings indicate that the majority of respondents are in the high-risk category for heart failure. Some risk factors need to be considered, including age, sex, systolic pressure, hypertension therapy, smoking, diabetes, and IMT so that respondents are able to control these.

Keywords: Framingham score; heart failure; hypertension

Introduction

Hypertension is one of the primary risk factors that significantly contribute to the development of heart failure. This condition increases the workload of the heart as it pumps blood. When the burden on the heart exceeds its compensatory threshold, it leads to cardiac fatigue. This state subsequently triggers the onset of heart failure (Masenga & Kirabo, 2023; Sartik et al., 2017).

The World Health Organization (WHO) estimates that around 1.13 billion people worldwide have hypertension, meaning one in three individuals globally experiences high blood pressure (Zhou et al., 2021). Each year, the number of individuals with high blood pressure continues to rise, and by 2025, it is estimated that 1.5 billion people will be affected by this condition. Based on the 2019 risk assessment by the Ministry of Health, high blood pressure is more prevalent in the following age groups: 31–44 years (31.6%), 45–54 years (45.3%), and 55–64 years (55.2%).

According to the 2018 Basic Health Research report, 34.11% of Indonesian adults suffer from hypertension, indicating a relatively high prevalence of this condition. Additionally, 1.5% of the Indonesian population is estimated to have cardiovascular diseases overall, with a prevalence rate of 36.32%. East Java Province ranks as the fourth-highest region in Indonesia for hypertension cases, with 190,979 hypertension cases out of 741,735 reported in 2020 (Kementerian Kesehatan RI, 2018). A preliminary study found 53 cases of hypertension in the Emergency Department of Jember Klinik Hospital, 14 of whom experienced heart failure, based on a survey conducted by the researcher from November 2023 to January 2024.

The available data indicate that the prevalence of hypertension is relatively high, necessitating the implementation of preventive measures to protect

patients from complications and adverse prognoses. Hypertension, or elevated blood pressure, forces the heart to work harder during the warming phase. Cardiac fatigue occurs when the strain on the heart exceeds its natural recovery threshold. This condition subsequently leads to heart failure. (Lawson et al., 2020; Pranata & Prabowo, 2017).

Individuals with heart failure must understand how to sustain their lives. The risk of complications is significant for these patients. However, half of those with severe heart failure will not recover (Anies, 2021). Several risk factors, including age, gender, smoking habits, a history of hypertension, and blood glucose levels, are linked to the onset of heart failure (Messerli et al., 2017). Understanding the variables that may increase the risk of heart failure in hypertensive patients is a crucial preventive strategy. Hypertensive patients need to comprehend the primary risk factors of hypertension for early detection in high-risk individuals and prompt treatment for those already affected. This approach will help avoid complications and issues that may arise due to delayed hypertension diagnosis (Sartik et al., 2017). Previous study Duttagupta, S., et al., (2022) shows that framingham risk score are effective and sensitive in predictic cardiovascular disease. This study aimed to assess the risk of heart failure in hypertensive patients treated at the Emergency Department of Jember Klinik Hospital.

Methods

This study is a descriptive-analytic using cross-sectional approach. The study population consisted of all hypertensive patients who underwent examinations in the Emergency Department of Jember Klinik Hospital from April to June 2024, totaling 64 patients. Based on sample size calculation using Slovin's formula, the study sample comprised 57 participants. The sampling technique utilized in this study was purposive sampling.

The inclusion criteria for the study were hypertensive patients treated in the Emergency Department of Jember Clinic Hospital, capable of effective communication, willing to sign an informed consent form, and aged between 30 and 74 years. The exclusion criteria included hypertensive patients with decreased level of conciousness that can interfere with the data collection process, patient with severe complication. The instrument used was the Framingham Risk Score to assess the risk of heart failure. Research instruments Framingham Score analyzes each parameter and acting it into low risk if Fscore < 10%, moderate risk if score 10-19%, and high risk if score > 20%. The analysis employed was descriptive analysis.

Results

The research was conducted from the proposal preparation stage until the completion of the research report, spanning from April to June 2024.

Table 1. Frequency distribution of respondents by age and gender in the Emergency Department of Jember Klinik Hospital 2024

Respondent Characteristics	N (frequency)	Percentage (%)
Age		
30-45 years	17	29.8
46-74 years	40	70.2
Sex		
Male	24	42.1
Female	33	57.9
Total	57	100.0

(Source: Primary data, 2024)

Table 1 shows that the majority of respondents were aged 46-74 years, totaling 40 respondents (70.2%), and the majority were female, with 33 respondents (57.9%).

Table 2. Risk of heart failure in hypertensive patients in Emergency Department Jember Klinik Hospital 2024

Variable	N (frequency)	Percentage (%)
Low risk	6	10.5
Moderate risk	17	29.8
High risk	34	59.7
Total	57	100.0

(Source: Primary data, 2024)

Table 2 shows that the majority of respondents have a high risk of experiencing heart failure, with 34 respondents (59.7%). Framingham Score is calculated based on several major risk factors, such as: age (getting older, the higher the risk), gender (men tend to have a higher risk), blood pressure (hypertension increases score), total cholesterol and HDL (high cholesterol and low HDL increase risk), history of smoking (smokers has a higher score), diabetes (diabetics have a higher risk).

Discussion

The findings revealed that 6 respondents (10.5%) had a low risk, 17 respondents (29.8%) had a moderate risk, and 34 respondents (59.7%) had a high risk. These results indicate that the majority of respondents fall into the high-risk category for heart failure based on the instrument's parameters. A high-risk classification corresponds to a Framingham score greater than 20%, meaning these respondents have a more than 20% likelihood of developing cardiovascular disease within the next 10 years.

Hypertension is a major risk factor that plays a significant role in the development of heart failure. Unmanaged high blood pressure can cause structural and functional abnormalities in the heart. Individuals with hypertension face an increased risk of heart failure, especially when the condition remains uncontrolled for an extended period. Persistent hypertension places excessive strain on the heart, requiring it to work harder to circulate blood, which can eventually lead to structural damage and impaired heart function (Masenga & Kirabo, 2023; Pranata & Prabowo, 2017).

One of the main mechanisms is left ventricular hypertrophy, where the ventricular walls thicken in response to increased cardiac workload. Although initially compensatory, this hypertrophy can eventually lead to both diastolic and systolic dysfunction, which are characteristic features of heart failure (Drazner, 2011). The study by Hamo et al., (2022) found that hypertension is a key factor to the development of left ventricular hypertrophy, a condition characterized by the thickening of the heart muscle due to elevated blood pressure. This condition plays a significant role in the progression of heart failure, as it decreases the heart's elasticity and impairs its pumping ability, eventually resulting in overall cardiac dysfunction.

In addition to left ventricular hypertrophy, hypertension can also cause damage to the small blood vessels in the heart, known as microvascular coronary artery disease. This damage reduces blood flow to the heart muscle, leading to ischemia and ultimately contributing to the development of heart failure. Several studies have identified that hypertensive patients have a higher risk of experiencing myocardial infarction, which can worsen cardiac conditions and accelerate the progression of heart failure (Rodriguez et al., 2014).

Hypertension can also trigger a chronic inflammatory response that contributes to myocardial fibrosis. This fibrosis reduces the elasticity of the heart and disrupts its normal function, ultimately leading to heart failure. Additionally, hypertension can affect the neurohormonal system, such as the renin-angiotensin-aldosterone system, which plays a role in regulating blood pressure and blood volume. Excessive activation of this system can exacerbate cardiac conditions and increase the risk of heart failure (Garcia et al., 2022).

Furthermore, coexisting risk factors like diabetes and elevated cholesterol levels contribute significantly to the deterioration of hypertensive patients' health and heighten the risk of developing heart failure. The study by Wang, (2021) found that hypertensive patients with diabetes or high cholesterol have a higher risk of heart failure compared to those with hypertension alone. The buildup of plaque in the arteries due to high cholesterol levels, along with metabolic imbalances in diabetic patients, further increases the workload on the heart and heightens the risk of heart failure (Hamo et al., 2022).

In this study, the Framingham Score was used to identify patients with high, moderate, and low risk. The Framingham Score is a tool used to evaluate cardiac risk by considering factors such as blood pressure, cholesterol levels, age, smoking habits, and diabetes history. This method is effective in assessing the likelihood of heart failure in hypertensive patients and aids in identifying individuals who need intensive intervention. Proper blood pressure management, cholesterol control, smoking cessation, and diabetes management are crucial in reducing the risk of heart failure (Duttagupta et al., 2022).

By monitoring the Framingham Score periodically, healthcare professionals can evaluate the progression of a patient's risk and implement more comprehensive prevention plans, ultimately helping to reduce the incidence of heart failure in hypertensive patients. Research has shown that the

use of the Framingham Score is an effective approach in identifying hypertensive patients at high risk of heart failure. Targeted interventions, such as strict blood pressure control, dietary adjustments to lower cholesterol, and close monitoring of blood sugar levels, have proven to significantly reduce this risk. By comprehensively monitoring and managing risks, as suggested in the study by Silverman et al. (2022), the hypertensive patient population can achieve better outcomes in preventing heart failure, thereby improving quality of life and reducing cardiovascular disease-related mortality (Hermida et al., 2021; Lidgard et al., 2022). Describe the discussion by comparing the data obtained at this time with the data obtained in the previous study. No more statistical or other mathematical symbols in the discussion. The discussion is directed at an answer to the research hypothesis. Emphasis was placed on similarities, differences, or the uniqueness of the findings obtained. It is need to discuss the reason of the findings. The implications of the results are written to clarify the impact of the results and the advancement of science are studied. The discussion ended with the various limitations of the study.

Conclusion

The conclusion of this study is that the majority of hypertensive patients in the Emergency Department of Jember Clinic Hospital are at high risk of developing heart failure. Hypertensive patients are expected to implement appropriate management strategies to prevent the progression of heart failure. Effective use of antihypertensive medications, lifestyle modifications, and regular blood pressure monitoring are among the strategies that can help reduce the risk of heart failure in hypertensive patients. Additionally, a multidisciplinary approach is essential in the management of hypertension to prevent serious cardiac complications.

Declaration of Conflicting Interest

No conflict of interest to declare.

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Author's Contribution

RA contributed to the study's conception and design, data acquisition, and data analysis
FE contributed to wrote the first draft of the manuscript
RAP contributed revised the final draft, and gave final approval of the version to be published.

Ethical Consideration

The study approval was obtained from Health Research Ethics Committee of Universitas dr. Soebandi (Approval number: 344/KEPK/UDS/V/2024 on 15 May 2024).

Data Availability Statement

The dataset generated during and analyzed during the current study is available from the corresponding author upon reasonable request.

Declaration of Use of AI in Academic Writing

The author used ChatGPT/Gemini in the writing process to improve readability and remove grammatical errors. However, he took full responsibility for the content.

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