

Patient Hypertension Modeling Using Decision Tree: Analysis of Age, Symptoms, Fatty Food Intake, Salt Intake, Medication Count, and Blood Pressure Using RapidMiner

Manahan Tua Tinambunan¹, Sipra Barutu²

Program Studi Ners Tahap Akademik STIKes Santa Elisabeth Medan¹, Program Studi Sistem Informasi, Universitas Panca Budi, Medan²

ARTICLE INFO

ABSTRACT

Keywords:

Hypertension, Data Mining, Decision Tree, RapidMiner, Lifestyle Factors, Medication Use

Hypertension is a chronic disease characterized by persistently elevated blood pressure and remains a major global health problem. Various interacting factors, including age, salt and fatty food intake, medication use, and blood pressure, influence the risk and symptoms of hypertension. This study aims to identify patterns and characteristics of hypertension patients and determine the most influential factors using data mining techniques. A quantitative approach with the Decision Tree algorithm was applied using RapidMiner Studio. The analysis involved data preprocessing, model training and validation, and identification of influential variables. The Decision Tree analysis revealed that medication use is the main determinant of symptom patterns in hypertension. In patients not taking medication, symptoms were mainly influenced by salt intake and blood pressure, where low salt intake was associated with nausea and moderate salt intake with varied symptoms, especially headaches. In patients taking medication, symptom patterns were affected by the combination of salt and fatty food intake. High salt and fat consumption were associated with dizziness, while moderate intake was related to fatigue. Hypertension symptoms are determined not only by blood pressure but also by lifestyle factors and medication use. The Decision Tree model effectively identifies hierarchical relationships among these factors, providing valuable insights for healthcare professionals to design more targeted hypertension management and prevention strategies.

Email :
barutusipra@gmail.com

Copyright © 2025 JU-KOMI. All rights reserved are Licensed under a Creative Commons Attribution- NonCommercial 4.0 International License (CCBY-NC 4.0)

INTRODUCTION

Hypertension is a chronic disease characterized by persistently high blood pressure and is one of the leading causes of death worldwide. An individual is diagnosed with hypertension when systolic blood pressure (SBP) is ≥ 140 mmHg and diastolic blood pressure (DBP) is ≥ 90 mmHg after repeated measurements, contributing to approximately 10.4 million deaths annually (WHO, 2018). The global prevalence of hypertension is estimated at 22% of the total population, yet fewer than one-fifth of patients make efforts to control their blood pressure (Ri, 2020). In Indonesia, the prevalence of hypertension is relatively high, especially among the elderly, but the majority of cases (63.2%) remain undiagnosed by healthcare personnel (Risksedas, 2018; Hazwan, 2017).

Various factors influence the risk of hypertension, including both personal and environmental factors. These factors include age, symptoms experienced, consumption of fatty foods, salt intake, number of medications used, and blood pressure itself. These factors often interact with each other, as explained by the mosaic theory of essential hypertension, which states

that hypertension results from several interacting causes, with primary factors including genetic components and environmental factors such as salt intake, stress, and obesity (Yonata, 2018).

Patient characteristics, including age, symptoms, habits of consuming fatty foods, salt intake, number of medications, and blood pressure, play an important role in understanding hypertension patterns and treatment adherence (Purwanto, 2020; Fitriani, 2015). Traditional analysis of these factors is often challenging due to the complexity of their interactions.

With technological advancement, data mining has become an effective method to analyze patient health data, identify patterns and characteristics of hypertension, and determine the most influential factors. One commonly used technique is the Decision Tree, which allows the classification of patients based on variables such as age, symptoms, fatty food consumption, salt intake, number of medications, and blood pressure. This study utilizes RapidMiner, a visual-based data mining platform, to process and analyze hypertension patient data. The main objective of this research is to identify the patterns and characteristics of hypertension patients based on the variables mentioned above and to determine the most influential factors contributing to hypertension. The results are expected to assist healthcare professionals in clinical decision-making and in developing more effective hypertension prevention strategies.

METODE

This study uses a quantitative approach with data mining methods. Hypertension patient data were analyzed to identify patterns and characteristics influencing hypertension using the Decision Tree algorithm.

Analysis Process

1. Preprocessing
Data cleaning, filling in missing values, and converting categorical variables (e.g., symptoms, fatty food consumption, salt intake, number of medications) into numeric format.
2. Algorithm Selection
The Decision Tree algorithm is used to facilitate the interpretation of decision patterns.
3. Model Training and Validation
The data is split into training and testing sets.
4. Influential Factor Analysis
Identifying the variables that have the greatest influence on hypertension based on their priority in the Decision Tree.

Analisis dilakukan menggunakan RapidMiner Studio, software data mining berbasis visual yang mendukung algoritma Decision Tree dan evaluasi model.

RESULTS AND DISCUSSION

Data collection

A	B	C	D	E	F
Usia	Gejala	K.M Berlemak	K.M Garam	N.obat	Tekanan Darah
26–35	Pusing	Tinggi	Tinggi	Ya	Pra-hipertensi
26–35	Nyeri Kepala	Sedang	Sedang	Tidak	Pra-hipertensi
26–35	Kelelahan	Tinggi	Sedang	Ya	Pra-hipertensi
26–35	Mual	Rendah	Rendah	Tidak	Pra-hipertensi
26–35	Pusing	Tinggi	Tinggi	Ya	Pra-hipertensi
26–35	Nyeri Kepala	Sedang	Sedang	Tidak	Pra-hipertensi
26–35	Kelelahan	Tinggi	Sedang	Ya	Pra-hipertensi
26–35	Mual	Rendah	Rendah	Tidak	Pra-hipertensi
36–45	Pusing	Sedang	Tinggi	Ya	Hipertensi I
36–45	Nyeri Kepala	Tinggi	Tinggi	Ya	Hipertensi I
36–45	Kelelahan	Sedang	Sedang	Tidak	Hipertensi I
36–45	Mual	Tinggi	Sedang	Ya	Hipertensi I
36–45	Pusing	Sedang	Tinggi	Ya	Hipertensi I
36–45	Nyeri Kepala	Rendah	Sedang	Tidak	Hipertensi I
36–45	Kelelahan	Tinggi	Tinggi	Ya	Hipertensi I
36–45	Mual	Sedang	Sedang	Tidak	Hipertensi I
36–45	Pusing	Tinggi	Tinggi	Ya	Hipertensi I
36–45	Nyeri Kepala	Sedang	Sedang	Tidak	Hipertensi I
36–45	Kelelahan	Tinggi	Tinggi	Ya	Hipertensi I
36–45	Mual	Sedang	Sedang	Tidak	Hipertensi I

Figure 1. Hypertension data collection

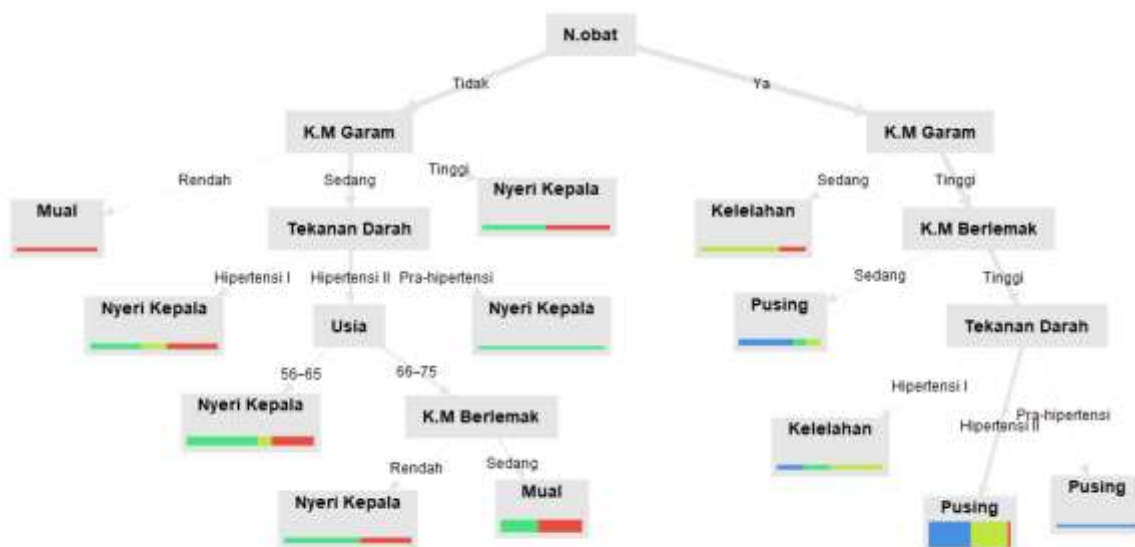


Figure 1. After the data has been preprocessed, the data is modeled using a decision tree. Decision Tree analysis based on hypertension patient data shows that medication use (N.Obat) is the main factor separating symptom patterns. In patients not taking medication, symptom patterns are more influenced by salt intake (K.M Garam) and blood pressure. For

Patient Hypertension Modeling Using Decision Tree: Analysis of Age, Symptoms, Fatty Food Intake, Salt Intake, Medication Count, and Blood Pressure Using RapidMiner. Manahan Tua Tinambunan

example, patients with low salt intake mostly experience nausea, while patients with moderate salt intake show varied symptoms depending on blood pressure. Patients with Hypertension I predominantly experience headaches, while patients with Hypertension II and aged 56–65 years also tend to experience headaches. In patients aged 66–75 years, consumption of fatty foods becomes an additional factor: patients with low-fat intake still predominantly experience headaches, whereas those with moderate-fat intake predominantly experience nausea. Patients with pre-hypertension mostly experience headaches, while patients with high salt intake also tend to experience headaches.

In patients taking medication, symptom patterns are also influenced by salt and fatty food consumption. Patients with moderate salt intake predominantly experience fatigue, whereas patients with high salt intake and moderate-fat food predominantly experience dizziness. For patients with high salt intake and high-fat food, blood pressure determines symptoms: patients with Hypertension I predominantly experience fatigue, patients with Hypertension II predominantly experience dizziness, and patients with pre-hypertension also predominantly experience dizziness.

These results indicate that hypertension patient symptoms are influenced not only by blood pressure but also by a combination of lifestyle factors (salt and fatty food intake) and medication use. The Decision Tree facilitates hierarchical identification of these patterns and helps healthcare professionals understand the interactions among factors affecting symptoms, allowing interventions to be carried out more precisely.

CONCLUSION

Decision Tree analysis of hypertension patient data shows that medication use (N.Obat) is the main factor differentiating symptom patterns. In patients not taking medication, symptoms are more influenced by salt intake (K.M Garam) and blood pressure, while in patients taking medication, symptom patterns are also affected by a combination of salt and fatty food intake. These results indicate that hypertension symptoms are influenced not only by blood pressure but also by lifestyle factors and medication use. The Decision Tree facilitates hierarchical identification of these patterns, enabling healthcare professionals to understand the interactions among factors affecting symptoms and to implement interventions more accurately.

REFERENSI

- Yu, S., Jiang, K., Zhu, X. Y., Ferguson, C. M., Krier, J. D., Lerman, A., & Lerman, L. O. (2021). Endovascular reversal of renovascular hypertension blunts cardiac dysfunction and deformation in swine. *Journal of hypertension*, 39(3), 556-562.
- Hazwan, A. (2017). *Hypertension in Indonesia: Trends, challenges, and prevention strategies*. Indonesian Journal of Public Health, 12(2), 45–54.
- Fitriani, S. (2015). *Karakteristik pasien hipertensi dan kepatuhan terhadap terapi obat*. Jurnal Kesehatan Indonesia, 7(1), 12–20.
- Purwanto, A. (2020). *Faktor risiko hipertensi dan strategi pengendalian di masyarakat*. Jurnal Ilmu Kesehatan, 8(2), 101–110.
- Riskesdas. (2018). *Riset Kesehatan Dasar 2018: Profil kesehatan masyarakat Indonesia*. Kementerian Kesehatan Republik Indonesia. <https://www.kemkes.go.id>
- Ri, H. (2020). *Global burden of hypertension and control strategies*. World Health Journal, 15(3), 78–85.
- Sedayu, A. (2017). *JNC 8 guideline for prevention and management of high blood pressure*. Indonesian Heart Journal, 5(2), 33–41.
- De Ville, B. (2013). Decision trees. *Wiley Interdisciplinary Reviews: Computational Statistics*, 5(6), 448-455.
- Song, Y. Y., & Lu, Y. (2015). Decision tree methods: applications for classification and prediction. *Shanghai archives of psychiatry*.

- Mienye, I. D., & Jere, N. (2024). A survey of decision trees: Concepts, algorithms, and applications. *IEEE access*, *12*, 86716-86727.
- Barutu, S. (2024). Analysis of Malaria Disease Classification Based on Age in the Work Area of Idanogawo Health Center, Idanogawo District, Nias Regency Using the Decision Tree Algorithm. *Jurnal Komputer Indonesia (Ju-Komi)*, *3*(01), 34-38.
- Lee, C. S., Cheang, P. Y. S., & Moslehpour, M. (2022). Predictive analytics in business analytics: decision tree. *Advances in Decision Sciences*, *26*(1), 1-29.