

Antihypertensive Therapy Patterns in Prolanis Patients at North Gorontalo City Health Centre, Indonesia

Teti Sutriyati Tuloli^{1*}, Mohamad Reski Manno², Robert Tungadi³, Endah Nurrohinta Djuwarno⁴

^{1,2} Department Pharmacy, Community and Clinical Division, Faculty of Sports and Health, Gorontalo State University, Jl. Jenderal Sudirman No. 06, Gorontalo City 96128, Indonesia

³ Department Pharmacy, Pharmacy Technology Division, Faculty of Sports and Health, Gorontalo State University, Jl. Jenderal Sudirman No. 06, Gorontalo City 96128, Indonesia

⁴ Department Pharmacy, Pharmacology Division, Faculty of Sports and Health, Gorontalo State University, Jl. Jenderal Sudirman No. 06, Gorontalo City 96128, Indonesia

* Corresponding author. Email: teti@ung.ac.id

ABSTRACT

Hypertension is a chronic condition characterized by persistent elevation of blood pressure above normal limits, which increases morbidity and mortality risk. A systolic blood pressure ≥ 140 mmHg reflects pressure during cardiac contraction, while a diastolic blood pressure ≥ 90 mmHg reflects pressure during cardiac relaxation. This study aimed to evaluate the use of antihypertensive drugs in Prolanis patients with persistent hypertension at the North Gorontalo City Health Centre. An observational design was applied using secondary data from medical records of 42 patients who received antihypertensive therapy between January and June 2025. Amlodipine was the most commonly prescribed agent in monotherapy, while combinations of two to five drugs were frequently used. The evaluation revealed that drug selection was appropriate (100%), dosage accuracy was 86%, and adherence to usage rules reached 98%, although some inappropriate dosages and usage instructions were still identified. These findings underscore the need for systematic monitoring, regular prescription audits, strengthened verification processes, laboratory monitoring, and patient education to enhance the safety and effectiveness of hypertension management in primary care.



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Keywords

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1. Introduction

According to the World Health Organization (WHO), in 2024 an estimated 972 million people (26.4% of the global population) were living with hypertension, and this figure is projected to rise to 29.2% in 2025. Of these, 333 million cases are in developed countries and 639 million in developing countries, including Indonesia [1]. In Indonesia, the prevalence of hypertension in adults (≥ 18 years) reached 34.1% in 2018 [2].

In Gorontalo City, the prevalence of hypertension based on the 2018 Riskesdas data was 29.2%. By 2022, the estimated number of individuals aged ≥ 15 years with hypertension had reached 50,716 cases. However, only 2,325 patients (4.6%) received standard hypertension services at primary health facilities. At the provincial level, Gorontalo ranks among the five provinces with the highest prevalence of hypertension in

Indonesia. Earlier health records in 2013 reported a prevalence of 29.0% among 1.14 million residents, equivalent to approximately 33,500 cases [2].

Rational drug use in hypertension management requires therapy to be patient-specific, drug-specific, and dose-specific. Patient-specific means that treatment is tailored to the patient's pathophysiological and physiological condition without contraindications. Drug-specific refers to prescribing an agent that provides therapeutic benefit according to the diagnosis. Dose-specific refers to the accuracy of dosage, frequency, and duration of administration to ensure therapeutic effectiveness [3]. Previous studies support this approach. For example, Salwa (2013) reported correct indication (100%), correct dosage (84%), correct patient (100%), but inappropriate dosage in 42% of cases [4]. Similarly, Wulandari et al. (2023) showed rational antihypertensive drug use with 94% correct patient, 100% correct indication, 90% correct drug, and 96% correct dosage [5].

Preliminary observations at the North Gorontalo City Health Centre showed that some patients with stage 2 hypertension (e.g., 170/100 mmHg) were treated with only one type of antihypertensive drug. According to international guidelines, patients with stage 2 hypertension should generally receive a combination of at least two agents [6]. In addition, clinic records indicated 63 Prolanis patients with hypertension between July and August 2023, making hypertension one of the most frequent conditions treated at the health centre. Therefore, this study aims to evaluate the patterns and appropriateness of antihypertensive therapy among Prolanis patients at the North Gorontalo City Health Centre.

2. Methods

This study is an observational study with secondary data collection from the medical records of hypertensive patients who were given antihypertensive drugs at the North Gorontalo City Health Centre.

This study employed an observational design with secondary data collection from the medical records of Prolanis patients diagnosed with hypertension at the North Gorontalo City Health Centre.

Study Setting and Period

The research was conducted at the North Gorontalo City Health Centre in Gorontalo, Indonesia. Data were collected from January to June 2025.

Population and Sample

The study population included all outpatients with hypertension who received antihypertensive therapy during the study period. A total sampling technique was applied, resulting in 42 eligible patients. Inclusion criteria were: (1) Prolanis patients with a confirmed diagnosis of hypertension, (2) complete medical records containing demographic and therapeutic information, and (3) patients who consistently received care at the health centre during the study period. Exclusion criteria were incomplete or missing medical records.

Data Sources

Data were obtained from patient medical records, which included demographic variables (name, age, gender), clinical conditions (comorbidities), and therapeutic details (drug type, dosage, and usage instructions).

Data Analysis

Data were processed using univariate analysis and presented in descriptive statistics, including frequency distributions and percentages. The analysis focused on three aspects: patient characteristics, patterns of antihypertensive therapy, and evaluation of therapy appropriateness in relation to national and international hypertension management guidelines [6]-[9].

Ethical Considerations

This study obtained ethical clearance from the Health Research Ethics Committee of Universitas Negeri Gorontalo (No. 00902275711111320240728272), ensuring compliance with ethical principles for research involving human data.

3. Results and Discussion

Patient Characteristics

The characteristics of Prolanis patients with hypertension at the North Gorontalo City Health Centre are summarized in **Table 1** and **Figures 1-3**. The majority of patients were female (62%) compared to male (38%). This finding is consistent with national data, which show that women, particularly postmenopausal women, are more prone to hypertension due to hormonal changes that affect vascular function [2],[16]. Studies in Indonesia also highlight that female patients tend to report more frequently to health facilities, thereby contributing to a higher documented prevalence among women [13].

Table 1. Characteristics of Prolanis Patients with Hypertension (n = 42)

Characteristics	Category	n	%
Gender	Male	16	38
	Female	26	62
	Total	42	100
Age (years)	25-39	3	7
	40-54	8	19
	55-69	21	50
	70-85	10	24
	Total	42	100
Comorbidity status	Hypertension only	23	55
	Hypertension + 1 comorbidity	16	38
	Hypertension + 2 comorbidities	3	7
	Total	42	100

In terms of age distribution, the largest proportion of patients was in the 55-69 years group (50%), followed by the 70-85 years group (24%). This pattern reflects the degenerative nature of hypertension, which becomes more prevalent with advancing age [2],[18]. Epidemiological studies indicate that the risk of hypertension increases two- to three-fold after the age of 55, often coinciding with the onset of other chronic conditions [13].

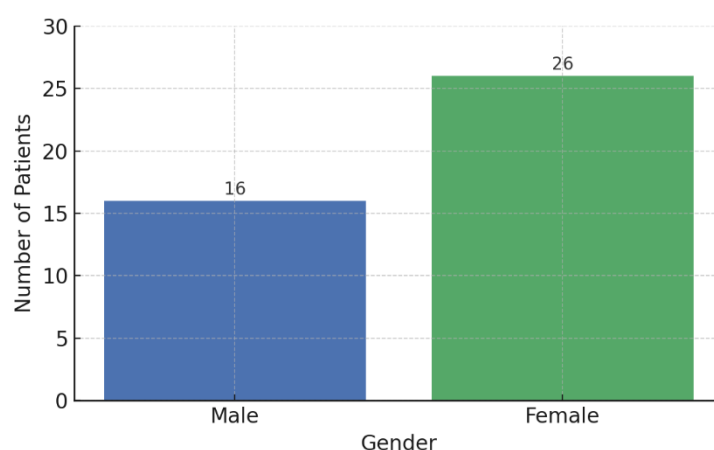


Figure 1. Gender Distribution of Prolanis Hypertension Patients

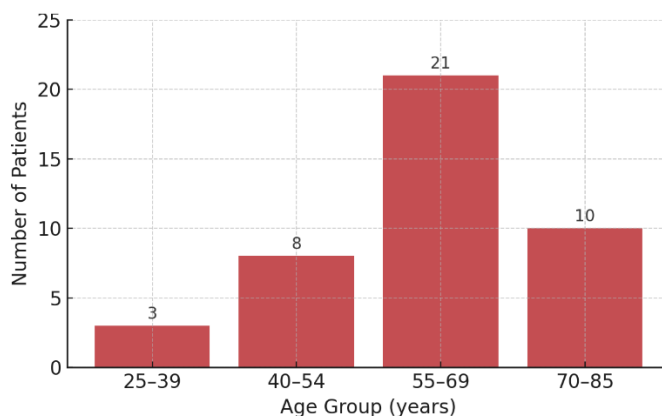


Figure 2. Age Distribution of Prolanis Hypertension Patients

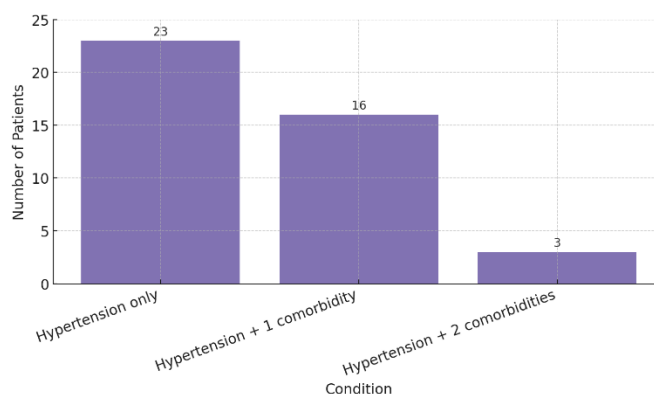


Figure 3. Comorbidity Status of Prolanis Hypertension Patients

Comorbidity was also common in this cohort, with 45% of patients presenting with at least one additional chronic disease such as diabetes mellitus or cardiovascular disorders. This aligns with the “double burden” observed in the Indonesian elderly population, where multimorbidity complicates disease management and increases the risk of poor clinical outcomes [18]. The presence of comorbidities has direct implications for therapy selection, as physicians must consider both blood pressure control and protection against organ damage in high-risk patients.

Patterns of Antihypertensive Therapy

The distribution of antihypertensive therapy among Prolanis patients is presented in **Table 2 and Table 3**. Out of 42 patients, 17 (40%) received single-drug therapy (monotherapy), while 25 (60%) were prescribed combination therapy involving two to five agents. This finding indicates that combination therapy was more commonly used than monotherapy, reflecting an effort to intensify treatment in patients with higher cardiovascular risk or multiple comorbidities.

Table 2. Hypertension Therapy among Prolanis Patients (n = 42)

Therapy Type	n	%
Single	17	40
Combination	25	60
Total	42	100

Within the monotherapy group, amlodipine was the predominant drug prescribed (82%), followed by candesartan (12%) and valsartan (6%). The frequent use of amlodipine demonstrates the preference for calcium channel blockers (CCBs) in primary care, particularly for older patients with isolated systolic hypertension. This is consistent with clinical guidelines that recommend CCBs and thiazide-like diuretics as first-line options in elderly patients [8],[9].

Table 3. Details of Antihypertensive Therapy among Prolanis Patients

	Therapy	Drug Name	Quantity	Percentage
Single	Single	Amlodipine	14	82
		Candesartan	2	12
		Valsartan	1	6
		Total	17	100
Combination	Two-drug combinations	Bisoprolol + Candesartan	5	20
		Amlodipine + Bisoprolol	1	4
		Bisoprolol + Valsartan	1	4
		Amlodipine + Candesartan	3	12
		Amlodipine + Valsartan	2	8
		Amlodipine + Lisinopril	1	4
		Amlodipine + Telmisartan	2	8
	Three-drug combinations	Bisoprolol + Candesartan + Spironolactone	2	8
		Bisoprolol + Candesartan + Amlodipine	3	12
		Bisoprolol + Captopril + Furosemide	1	4
		Bisoprolol + Amlodipine + Valsartan	1	4
	Four-drug combinations	Bisoprolol + Amlodipine + Spironolactone + Lisinopril	1	4
		Bisoprolol + Amlodipine + Spironolactone + Candesartan	1	4
		Five-drug combinations	Bisoprolol + Amlodipine + Spironolactone + Furosemide + Losartan	1
	Total		25	100

Combination therapy regimens varied considerably. The most common two-drug regimen was bisoprolol + candesartan (20% of all combinations), while amlodipine frequently appeared in multiple regimens (e.g., with candesartan, valsartan, lisinopril, and telmisartan). Three-drug combinations often included bisoprolol and candesartan along with either amlodipine or spironolactone. In rare cases, four- and five-drug combinations were prescribed, involving agents such as furosemide and spironolactone, which are typically reserved for resistant hypertension or patients with fluid overload and heart failure [19].

The preference for amlodipine monotherapy and its recurrent role in combination regimens suggests that prescribers at the health centre rely heavily on CCBs due to their effectiveness, tolerability, and availability. However, international guidelines including the

JNC 8 [6], WHO 2021 [8], ISH 2020 [9], and ACC/AHA 2017 [14] emphasize the early use of combination therapy with two low-dose agents, preferably in single-pill combinations, to enhance treatment effectiveness and adherence. Meta-analysis evidence further supports that intensive blood pressure lowering reduces cardiovascular events across diverse populations [15].

The frequent use of beta-blockers, particularly bisoprolol, in various regimens reflects their role in patients with concomitant cardiac conditions such as ischemic heart disease or heart failure. While beta-blockers are no longer considered first-line therapy for uncomplicated hypertension, their utility in specific indications explains their presence in this cohort. The inclusion of spironolactone in several multi-drug regimens also suggests the presence of resistant hypertension in some patients, which requires more aggressive management strategies [19].

Overall, the therapy patterns observed in this study align partly with international guidelines but also highlight the practical limitations of primary care, where drug availability and patient comorbidities strongly influence prescribing decisions.

Evaluation of Therapy Appropriateness

The appropriateness of antihypertensive therapy was evaluated using the *National Clinical Practice Guidelines (PNPK) for Hypertension Management in Adults* issued by the Ministry of Health (2021). The results are presented in **Table 4**.

Table 4. Evaluation of the Appropriateness of Antihypertensive Therapy (n = 42)

Accuracy Parameter	Appropriate (n, %)	Inappropriate (n, %)	Total (n, %)
Drug selection	42 (100)	0 (0)	42 (100)
Dosage	36 (86)	6 (14)	42 (100)
Usage instructions	41 (98)	1 (2)	42 (100)

All prescriptions (100%) were categorized as appropriate in terms of drug class selection. This finding indicates that prescribers generally adhered to clinical guidelines or formularies available at the health centre. However, this figure should be interpreted with caution, as drug appropriateness may also reflect the limited range of antihypertensive agents stocked in the facility rather than universally optimal prescribing practices [8], [9].

Accuracy in dosage was recorded in 86% of cases, while 14% of patients received inappropriate doses. Such discrepancies may have significant clinical consequences: sub-therapeutic doses can result in uncontrolled blood pressure and increased cardiovascular risk, whereas excessive doses may cause adverse effects such as hypotension, electrolyte imbalance, or renal dysfunction [6],[15]. Evidence from local studies also highlights similar challenges, where dosage inaccuracy is a frequent contributor to inadequate hypertension control in Indonesian primary care [10],[17].

Usage instructions were accurate in 98% of cases, but one patient (2%) received incorrect instructions. Although numerically small, such errors are clinically relevant because inappropriate timing, frequency, or relation to meals can reduce adherence and therapeutic effectiveness. Previous studies emphasize that patient understanding of medication instructions is a key determinant of blood pressure control [11],[20].

These findings underscore the importance of continuous medical record audits, strengthening prescription verification systems, and enhancing patient education strategies to improve hypertension management outcomes.

Clinical and Public Health Implications

The therapy patterns and appropriateness evaluation observed in this study have important implications for both clinical practice and public health management. The high

proportion of amlodipine use as monotherapy and its frequent appearance in combination regimens reflects the reliance on calcium channel blockers (CCBs) in primary care. While this is consistent with their effectiveness in elderly patients, international guidelines recommend the use of low-dose two-drug combinations as initial therapy in many cases to enhance efficacy and improve patient adherence [8],[9],[14]. This gap indicates the need for better alignment of prescribing practices with updated international standards.

The finding that 14% of patients received inappropriate dosages highlights a significant area for clinical improvement. Dosage errors can compromise blood pressure control and increase the risk of complications such as stroke, heart failure, and renal impairment [6],[15]. Routine prescription audits, standardized verification protocols, and laboratory monitoring for high-risk patients should be institutionalized in primary care to ensure patient safety and treatment effectiveness [7],[21].

From a public health perspective, the Prolanis program plays a pivotal role in sustaining long-term hypertension management. Prolanis not only facilitates access to regular medication but also provides health education, lifestyle modification counseling, and follow-up monitoring [11],[12]. Strengthening these components through structured patient education sessions, reminder systems, and community engagement can substantially improve adherence rates and clinical outcomes. Evidence also shows that interventions targeting patient understanding and medication adherence are strongly associated with better hypertension control in primary care settings [20],[22].

Furthermore, continuous training for healthcare providers, particularly in dose titration, drug interaction management, and identification of resistant hypertension, is essential to reduce prescribing errors and optimize therapeutic outcomes. Policy interventions should integrate these clinical measures with public health strategies, such as national campaigns on lifestyle modification, early detection, and the provision of affordable combination therapy options.

Overall, the implications of this study underscore the necessity of combining evidence-based clinical management with health system strengthening to achieve sustainable hypertension control in Indonesia.

This study has several limitations. The use of secondary data from medical records restricted the availability of important variables such as baseline and follow-up blood pressure, as well as direct measures of patient adherence. Consequently, the effectiveness of therapy could not be fully assessed [10],[20]. In addition, the study was conducted at a single health centre with a relatively small sample size, which may limit the generalizability of the findings to other settings [17]. Despite these limitations, the study provides useful insights into antihypertensive therapy patterns in Prolanis patients and highlights the need for broader and more comprehensive future research.

4. Conclusion

The majority of Prolanis hypertension patients at the North Gorontalo City Health Centre were elderly women, with nearly half presenting comorbidities, reflecting the growing burden of multimorbidity in this population. Amlodipine was the most frequently prescribed drug in monotherapy, while combination therapy often involving two or more agents was more common overall, consistent with treatment intensification in high-risk patients. The evaluation of prescribing practices showed that drug selection was appropriate in all cases (100%), dosage accuracy reached 86%, and usage instructions were correct in 98%. Nevertheless, the presence of dosage errors highlights the need for closer monitoring, dose titration, and verification procedures. These findings emphasize the importance of routine audits, strengthened prescription verification, laboratory monitoring, patient education, and continuous training of healthcare workers to improve the safety and effectiveness of hypertension management in primary care. Integration of

these measures into the Prolanis program may enhance long-term blood pressure control and reduce the risk of complications.

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Conflicts of Interest:

The authors declare no conflicts of interest related to this research.

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