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EVALUATION OF ANTIHYPERTENSIVE DRUG USE ON THERAPY OUTCOMES IN CHRONIC KIDNEY DISEASE (CKD) PATIENTS AT RSUD BENDAN PEKALONGAN

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Abstract

Chronic Kidney Disease (CKD) is a progressive and irreversible condition with hypertension as a major contributing factor. Proper management of blood pressure is essential to prevent worsening renal function and improve patient outcomes. This study aimed to evaluate the use of antihypertensive drugs and their impact on therapy outcomes (Blood pressure, GFR, and QoL) in CKD patients at RSUD Bendan Pekalongan. This research employed a prospective observational method and involved 50 CKD outpatients receiving antihypertensive therapy. Data were collected over a two-month period through clinical measurements and patient-reported outcomes. Blood pressure, GFR and QoL were assessed before and after treatment. QoL was measured using the KDQOL-36 questionnaire. Data were analyzed using univariate and bivariate methods, including paired t-tests. The results showed that 96% of patients received combination therapy, most commonly involving diuretics, calcium channel blockers (CCB), and angiotensin receptor blockers (ARB). Average blood pressure decreased from 146/92 mmHg to 128/83 mmHg, GFR increased from 5.96 to 6.70 mL/min, and QoL scores improved from 288 to 348. These changes were statistically significant. In conclusion, antihypertensive therapy in CKD patients was effective in improving clinical outcomes, including blood pressure control, kidney function, and quality of life. The findings support the implementation of combination therapy as a standard approach in managing hypertension among CKD patients.
Keywords: Chronic Kidney Disease, antihypertensive therapy, blood pressure, glomerular filtration rate, quality of life

INTRODUCTION

Chronic Kidney Disease (CKD) is a progressive and irreversible decline in kidney function that has become a significant global health concern. The disease continues to increase in prevalence, posing a substantial public health burden. Globally, CKD affects approximately 13.4% of the adult population, and in Indonesia, the number of cases has been rising due to the aging population and a high prevalence of comorbidities such as diabetes mellitus and hypertension. According to the Ministry of Health of the Republic of Indonesia (Kemenkes RI, 2019), and data from the Indonesia Renal Registry (2015), 36% of CKD cases were caused by hypertension, totaling 8,472 individuals. Furthermore, the national prevalence of CKD among individuals aged over 15 years reached 0.18% (equivalent to 636,178 individuals), and in Central Java alone, the rate was 0.19%, affecting approximately 88,180 people (Kemenkes RI, 2023).

CKD originates from the progressive damage of nephrons, the functional units of the kidney, resulting in a reduction in glomerular filtration rate (GFR), which serves as a critical marker for kidney function. A normal GFR ranges between 90 mL/min/1.73 m^2, while a value below 15 mL/min/1.73 m^2 indicates End-Stage Renal Disease (ESRD). One of the major contributing factors to the development and progression of CKD is hypertension. Chronic elevation in blood pressure leads to salt and water retention, increased vascular resistance, and glomerular hypertension, ultimately causing further nephron damage. The relationship between hypertension and CKD is thus both causal and reciprocal: while hypertension contributes to kidney damage, CKD also exacerbates blood pressure control problems.

To manage hypertension in CKD patients, several classes of antihypertensive drugs are commonly prescribed, including Angiotensin-Converting Enzyme Inhibitors (ACEIs), Angiotensin II Receptor Blockers (ARBs), and Calcium Channel Blockers (CCBs). ACEIs lower blood pressure by inhibiting the enzyme that converts angiotensin I to angiotensin II. ARBs act by blocking

angiotensin II receptors, which helps promote sodium excretion, while CCBs inhibit calcium influx into vascular smooth muscle cells, leading to vasodilation and blood pressure reduction (Anastasia G, 2016; Auliafendri, 2022).

The effectiveness of these therapies has been supported by various studies. For instance, Kusumawati and Anggun (2017) found that the use of a two-drug antihypertensive combination achieved the most significant reduction in systolic and diastolic blood pressures. Similarly, Auliafendri (2022) reported that antihypertensive therapy not only reduced blood pressure but also improved GFR values in CKD patients. According to the study, ACEIs are the first-line treatment option for reducing the rate of kidney function decline and preventing progression to ESRD, while ARBs serve as an alternative for those who cannot tolerate ACEIs. CCBs are also favored for their renoprotective effects.

This study was motivated by the need to evaluate the clinical profile and effectiveness of antihypertensive drugs in CKD patients using a prospective approach. While previous studies had applied retrospective methods, a forward-looking design can provide more accurate and dynamic observations. The research was conducted at RSUD Bendan Pekalongan, chosen due to the hospital's high patient volume. Based on a 2018 study by Rahman, Kaunang, and Elim (2016), the hospital had 181 CKD patients, 54 of whom were undergoing hemodialysis, making it a suitable environment for this investigation.

The research aimed to analyze the patterns of antihypertensive drug use and to assess their effectiveness in improving therapeutic outcomes among CKD patients, focusing on three clinical parameters: blood pressure, GFR, and quality of life (QoL). Understanding the correlation between pharmacological treatment and these clinical outcomes is crucial to achieving optimal care and slowing disease progression.

The findings of this study are expected to benefit several parties. For the hospital, the results may serve as a basis for evaluating and optimizing antihypertensive therapy for CKD patients. From an academic perspective, the study contributes to the growing body of literature on the management of CKD with antihypertensive drugs. Finally, for the researcher, this project serves as a valuable learning experience in evaluating real-world pharmacotherapy outcomes and advancing understanding of clinical practices in nephrology and cardiology care.

METHOD

This research applied a prospective observational design to evaluate the use and effectiveness of antihypertensive medications in patients diagnosed with Chronic Kidney Disease (CKD). The study was conducted at the outpatient installation of RSUD Bendan, Pekalongan, during the period of February to March 2025. By using a prospective approach, the researchers were able to observe the progression of therapy outcomes in real time, starting from the initial treatment until the clinical responses were recorded.

The total population in this study consisted of 96 CKD patients recorded during the study period. A total sampling technique was employed to select participants, and 50 patients who met the inclusion and exclusion criteria were enrolled in the study. The inclusion criteria required patients to be 18 years or older, to have a blood pressure reading greater than 120/90 mmHg, and to be undergoing outpatient antihypertensive therapy. The antihypertensive medications included drugs from the ACEI, ARB, CCB, or diuretic classes. In addition, participants were required to provide informed consent and be willing to complete the Kidney Disease Quality of Life (KDQOL-36) questionnaire. Patients were excluded if they experienced communication disorders, passed away during the study period, or refused to participate and complete the questionnaire.

The variable observed in this study was the use of antihypertensive drugs, which served as the independent variable, while the dependent variables were the therapy outcomes consisting of changes in blood pressure, glomerular filtration rate (GFR), and quality of life. Blood pressure was measured clinically using a sphygmomanometer. GFR values were calculated using the Cockcroft-Gault formula based on serum creatinine levels. Quality of life was assessed using the KDQOL-36 instrument, which measures four domains: physical health, mental health, kidney disease impact, and treatment satisfaction.

Data collection was carried out by monitoring and documenting the clinical condition of patients throughout the research period. This included recording patient identity, history of hypertension treatment, duration of CKD, and clinical data such as blood pressure and serum creatinine values at both the beginning and end of the study. The KDQOL-36 questionnaire was distributed at three

stages: before, during, and after the administration of antihypertensive therapy to evaluate any improvements in patient-perceived quality of life.
In order to measure patients' quality of life (QoL) the KDQOL-36 was employed. The research instrument used in this study had previously undergone validation and reliability testing. The KDQOL-36 questionnaire had been validated using content validity methods, and its internal consistency had been measured using Cronbach's alpha, resulting in a value of 0.708, which indicates strong reliability (Hudoyo, 2021). This ensured that the quality of life measurements were both accurate and dependable.
Data were analyzed using the IBM SPSS version 20 software. A univariate analysis was conducted to identify the distribution of antihypertensive drug usage, while a bivariate analysis was used to assess the significance of differences in clinical outcomes before and after the administration of therapy. The paired sample t-test was used to determine whether there were statistically significant changes in blood pressure, GFR, and quality of life scores as a result of the treatment.
Throughout the research process, ethical principles were strictly upheld. Informed consent was obtained from each participant, and confidentiality was maintained by anonymizing personal information. Patient data were used exclusively for academic purposes. The research followed the principles of benefit, fairness, and confidentiality as outlined in standard biomedical ethics guidelines (Kusumawaty, 2022).

RESULT AND DISCUSSION

Characteristics of CKD Patients at RSUD Bendan Pekalongan

This study involved 50 patients diagnosed with Chronic Kidney Disease (CKD) who received antihypertensive treatment at RSUD Bendan Pekalongan during the research period. The demographic characteristics of these patients were assessed based on gender and age to understand the population distribution.

Table 2. Karakteristik of Antihypertensive Drug Use in CKD Patients at RSUD Bendan

No	Characteristics	Frequency	Percentage (%)
1	**Gender** Male	22	45,2
	Female	28	54,8
2	**Age**	0	0
	15-24	6	12
	25-34	13	26
	35-44 45-54	15	28
	55-64	17	30
	65-74	2	4
	>75	0	0

In terms of gender, 54.8% of the patients were female, while 45.2% were male. This finding indicates that female patients slightly outnumbered male patients in the CKD population at the study location. The higher prevalence among women is in line with national data from the Indonesian Ministry of Health, which reported a higher incidence of hypertension among women (36.85%) compared to men (31.34%) (Kemenkes RI, 2018b). The difference in prevalence may be related to hormonal factors, particularly the decline in estrogen levels after menopause, which is known to reduce high-density lipoprotein (HDL) levels and increase the risk of hypertension in women (Wasilah, 2022).
With respect to age, the majority of patients were in the productive adult group. Approximately 84% of the participants were between the ages of 15 and 59 years, while only 16% were over 60 years of age. These findings are consistent with epidemiological data indicating that CKD is more prevalent in older adults, particularly those aged 40 and above. According to Ariyanto (2018), individuals over the age of 50 are at increased risk for a significant decline in kidney function, especially when accompanied by comorbidities such as hypertension. Degenerative changes in kidney tissue, including reduced nephron count and impaired regeneration, contribute to the accelerated progression of CKD in this age group (Anita D, 2016).

Patterns of Antihypertensive Drug Use

Table 1. Distribution of Antihypertensive Drug Use in CKD Patients at RSUD Bendan

No	Therapy Type	Drug Combination	Frequency	Percentage (%)
1	Monotherapy	Amlodipine (CCB)	1	2
		Furosemide (Diuretic)	1	2
2	Two-Drug Combination	Candesartan (ARB) + Amlodipine (CCB)	6	12
		Furosemide (Diuretic) + Amlodipine (CCB)	4	8
3	Three-Drug Combination	Furosemide + Amlodipine + Candesartan	29	58
		Furosemide + Amlodipine + Candesartan + Bisoprolol	5	10
		Furosemide + Bisoprolol + Candesartan	1	2
		Furosemide + Amlodipine + Candesartan	2	4
		Furosemide + Bisoprolol + Candesartan	1	2

The antihypertensive therapy patterns observed in this study included both monotherapy and combination therapy, with a predominant use of combination regimens. Among the 50 CKD patients observed, only 4% were treated with monotherapy, while the remaining 96% received a combination of two or more antihypertensive drugs.

The monotherapy group consisted of patients who were prescribed a single antihypertensive agent. In this category, two patients received monotherapy: one was treated with amlodipine, a calcium channel blocker (CCB), and the other with furosemide, a diuretic. This limited use of monotherapy suggests that single-drug regimens may be insufficient for achieving target blood pressure levels in CKD patients, particularly those with advanced disease or undergoing hemodialysis.

Combination therapy was far more common and involved both two-drug and three-drug regimens. The most frequently observed two-drug combination was candesartan (ARB) with amlodipine (CCB), followed by furosemide combined with amlodipine. Among the three-drug regimens, the most dominant combination was furosemide, amlodipine, and candesartan. Several patients were also prescribed four-drug combinations, including bisoprolol, a beta-blocker, added to the three-drug regimen. These findings reflect clinical efforts to achieve optimal blood pressure control through multi-drug strategies tailored to individual patient conditions. The distribution of antihypertensive drug use is shown in the following table:

The use of combination therapy in this study aligns with the recommendations of the *Seventh Report of the Joint National Commite* (JNC 7) wich advocates for multi-drug antihypertensive regimens in patients with CKD. According to JNC 7, most CKD patients require at least three antihypertensive agents to achieve a target blood pressure below 130/80 mmHg (JNC 7, 2003). The frequent use of ARB and CCB combinations in this study is also supported by previous research indicating that these classes offer renoprotective effects while effectively lowering blood pressure (Supadmi, 2015).

In advanced CKD cases, particularly in patients undergoing hemodialysis, fluid overload and increased peripheral resistance necessitate more intensive therapy. Diuretics are commonly included to manage volume status, while ARBs and CCBs are chosen for their favorable effects on vascular resistance and kidney perfusion. Additionally, the use of beta-blockers such as bisoprolol in combination with other antihypertensive agents provides cardiovascular protection and helps stabilize blood pressure in patients with hemodynamic instability (Hundemer, 2021).

Effectiveness of Antihypertensive Therapy on Clinical Outcomes

The effectiveness of antihypertensive therapy in CKD patients at RSUD Bendan Pekalongan was evaluated by measuring changes in three main clinical outcomes: blood pressure, glomerular filtration rate (GFR), and quality of life (QoL). These parameters were assessed before and after the administration of antihypertensive drugs during the research period. Data collection was

conducted prospectively, and the results showed measurable improvements in each outcome. The average values for each parameter are summarized in the following table:

Table 2. Average Clinical Outcomes Before and After Antihypertensive Therapy

No	Variable	Sample Size	Before Treatment	After Treatment
1	Blood Pressure	50	146/92 mmHg	128/83 mmHg
2	GFR	50	5.96	6.70
3	Quality of Life	50	288	348

a. Blood Pressure

A significant reduction in both systolic and diastolic blood pressure was observed after antihypertensive treatment. The average blood pressure prior to therapy was 146/92 mmHg. After therapy, it decreased to 128/83 mmHg. This decline suggests that the antihypertensive regimen was effective in achieving better blood pressure control in CKD patients. Effective blood pressure management is critical in slowing the progression of kidney damage for preserving kidney function. These findings support the clinical importance of combining different antihypertensive classes to achieve targeted outcomes in complex cases such as CKD.

b. Glomerular Filtration Rate (GFR)

The average GFR of patients also improved after treatment, from 5.96 to 6.70 mL/min. While the increase was modest, it still reflects a positive trend in kidney function preservation. GFR is a key indicator in evaluating renal performance, and its improvement is essential in delaying the progression to end-stage renal disease. Previous studies have emphasized the importance of controlling blood pressure in CKD patients to help stabilize or improve GFR values (Auliafendri, 2022). The increase in GFR in this study suggests that the antihypertensive drugs used, particularly ARBs and CCBs, may contribute to maintaining residual kidney function.

c. Quality of Life (QoL)

Quality of life was measured using the Kidney Disease Quality of Life (KDQOL-36) questionnaire. Before treatment, the average QoL score was 288. After treatment, the score increased to 348. This improvement indicates a positive patient-reported outcome following antihypertensive therapy. The KDQOL-36 instrument evaluates multiple dimensions of health, including physical and mental well-being, symptom burden, and satisfaction with care. Improvements in QoL may result from better blood pressure control, reduced symptoms, and increased functional capacity. These findings align with the understanding that successful CKD management not only depends on clinical markers but also on how patients perceive their overall health status (Hudoyo, 2021).

Discussion of Findings

The results of this study demonstrate that antihypertensive therapy in CKD patients at RSUD Bendan Pekalongan was effective in improving key clinical outcomes, including blood pressure, GFR, and quality of life. These findings are consistent with previous studies that have examined similar therapeutic interventions in patients with chronic kidney disease.

A study by Auliafendri (2022) found that the use of antihypertensive drugs such as ACE inhibitors and ARBs not only contributed to better blood pressure control but also led to improvements in GFR. This supports the findings in the present study, where patients experienced a reduction in average blood pressure from 146/92 mmHg to 128/83 mmHg and an increase in GFR from 5.96 to 6.70 mL/min. The improved renal function observed after therapy indicates that proper selection and combination of antihypertensive agents can help slow the progression of kidney damage, particularly in patients undergoing hemodialysis.

In addition to physiological improvements, this study also found a significant increase in quality of life scores, as measured by the KDQOL-36 questionnaire. The score increased from 288 to 348, reflecting better patient well-being after treatment. These results are in line with the findings of Robles (2017), who reported that appropriate antihypertensive therapy not only stabilized renal function but also enhanced the overall quality of life in CKD patients. Effective blood pressure control reduces symptom burden and can lead to improvements in both physical and emotional health domains.

Furthermore, the use of combination therapy involving CCBs, ARBs, diuretics, and in some cases beta-blockers, aligns with clinical guidelines and international recommendations. Xie Liu (2016) emphasized that ARBs are often better tolerated than ACE inhibitors and are preferred in many patients due to fewer side effects, especially in advanced CKD. This matches the prescribing

pattern observed in this study, where candesartan (an ARB) was frequently used in combination with amlodipine (a CCB) and furosemide (a diuretic).

The clinical relevance of these findings lies in the validation of a therapeutic approach that addresses not only the immediate goal of lowering blood pressure but also the long-term preservation of kidney function and enhancement of patient quality of life. By showing that combination antihypertensive therapy can produce significant clinical benefits, this study supports the need for individualized treatment plans that consider both drug efficacy and patient tolerance.

In terms of therapeutic strategy, the results underscore the importance of initiating combination therapy early in patients with poorly controlled blood pressure or declining GFR. The high percentage of patients in this study who received three or more antihypertensive drugs suggests that multi-drug regimens may be essential in advanced CKD. This reinforces the recommendation that CKD patients, particularly those undergoing hemodialysis, require comprehensive pharmacologic management to reduce disease progression and improve life expectancy (Xie Liu, 2016; Auliafendri, 2022).

CONCLUSION

This study concluded that the use of antihypertensive drugs in patients CKD RSUD Bendan Pekalongan was effective in improving clinical outcomes. The majority of patients received combination therapy, most commonly involving three types of drugs such as calcium channel blockers, angiotensin receptor blockers, and diuretics. This combination was found to be the most frequently used and clinically appropriate based on patient conditions and disease stage.

There was a significant different in BP before and after the administration of antihypertensive theraphy, with a p value 0.00. there was no significant different in GFR before and after antihypertensive therapy, and there was a significant difference in QoL before and after antihypertensive therapy.

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