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Analysis of the Relationship Between Antihypertension Drug Interactions and Geriatric Patient Blood Pressure Targets at PKU Muhammadiyah Gamping Hospital

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ABSTRACT

Background: Hypertension is a chronic disease characterized by an increase in blood pressure reaching ≥140/90 mmHg, which can increase the risk of stroke, aneurysm, heart failure, and kidney damage. Increasing age is the main trigger factor for increasing a person's blood pressure, due to physiological changes and the tendency to develop complications from comorbidities. Geriatric patients with hypertension who receive combination therapy and have comorbidities have the potential to experience drug interactions that result in the therapeutic effect not being achieved.

Objective: This study aims to determine the relationship between antihypertensive drug interactions and blood pressure targets in geriatric patients in the outpatient installation of PKU Muhammadiyah Gamping Hospital.

Research Methods: This research is observational in nature; data collection is retrospective, using outpatient medical record data for the periods January and December 2022 with a purposive sampling technique. The research sample consisted of 68 outpatients who met the inclusion criteria. The presence of drug interactions was analyzed using the drugs.com instrument, and analysis of the relationship between antihypertensive drug interactions and blood pressure targets used the Chi-square test.

Results: The majority of geriatric patients with hypertension were female, 37 (54.4%); jobs as housewives and retirees were 15 (22.1%) each; 63 (92.6%) had comorbidities and complications; and 44 (64.7%) patients achieved blood pressure targets. The patient's treatment pattern was dominated by a combination of anti-hypertensive therapy; as many as 55 (80.9%) and 62 (91.2%) patients experienced drug interactions with 133 (96%) moderate severity levels. Chi-square test results show a p value > 0.05.

Conclusion: There is no relationship between antihypertensive drug interactions and the achievement of blood pressure targets in geriatric patients.

Keywords: *Blood Pressure, Drug Interactions, Geriatrics, Hypertension*

INTRODUCTION

Hypertension is a non-communicable disease and is accompanied by an increase in blood pressure reaching ≥140/90 mmHg (Trirahmi et al., 2022) with measurements taken twice every five minutes and in a calm state (Glenys, 2017). Hypertension, or high blood pressure, is also known as a silent killer because, in most cases, patients do not know when to have high blood pressure until the physical examination often shows no signs until complications occur (Departemen Kesehatan, 2018).

According to data from the World Health Organization (WHO) in 2015, as many as 1.13 billion people worldwide suffer from hypertension. Hypertension causes 9.4 million people to die, where deaths due to complications are heart disease at as much as 45% and deaths from stroke at as much as 51%. Globally, hypertension is also one of the most common non-communicable diseases in Indonesia, accounting for as much as 57.6%, as evidenced by the increasing number of hypertensive patients who come to health facilities every year (Kementrian Kesehatan RI, 2019). According to Basic Health Research (Riskesdas) data in 2018, the prevalence of hypertension in the Indonesian population aged 18 years and over increased from 2013 by 25.8%; later in the year 2018, it increased to 34.1% (Dinas Kesehatan DIY, 2020). The prevalence of hypertension in the Special Region of Yogyakarta (DIY) is 11.1%, or more than the national figure of 8.8%. Based on this prevalence, DIY is the province with the 4th most hypertension in Indonesia (Kusuma, 2020).

Hypertension disease will increase with age with physiological changes and a tendency to complications from concomitant diseases. This is due to decreased organ function, which increases the risk of complications due to hypertension such as heart disease, diabetes mellitus, dyslipidemia, stroke, and kidney failure (Muntner et al., 2020). Results of previous research by (Peterson, 2014) say that the patient is at an advanced, more dominant risk of increased blood pressure with age.

Therapy recommendations based on the Eighth Joint National Committee (JNC VIII) in 2014 on the first line for antihypertensive therapy for elderly patients (geriatrics), namely the drug class Thiazide diuretics, β-blockers, Angiotensin Converting Enzyme Inhibitor (ACEI), Angiotensin Receptor Blocker (ARB), and Calcium Channel Blocker (CCB), both monotherapy and combination therapy (Indriani & Oktaviani, 2020). As quoted from research (Hartiwan et al., 2018), in hypertension, more than two-thirds of patients cannot be controlled with a single therapy and will receive a combination of antihypertensive drugs from different therapy classes. Hypertensive patients receiving combination therapy and those with comorbidities have the potential to experience drug interactions that result in

therapeutic effects not being achieved. Elderly patients (geriatrics) are more at risk of experiencing drug-related problems (DRPs) (Dinas Kesehatan DIY, 2020). In some cases, people with high blood pressure sometimes require a combination of two or more antihypertensive drugs from various groups to achieve normal blood pressure targets. People with high blood pressure with comorbidities and complications also need more than one drug (polypharmacy) for treatment. Combination therapy that uses two or more drugs at the same time can cause increased drug reactions, such as side effects,toxicity, or a decrease in the effect of the drug used, so as to produce new effects that were not previously known and could not achieve the expected drug reaction (Khairiyah et al., 2022). Polypharmacy puts hypertensive geriatric patients at high risk of experiencing drug interactions, which can result in the patient's blood pressure increasing (Maulidina F et al., 2019).

RESEARCH METHODS

The design of this study is observational, namely research that uses data obtained without any treatment from researchers and includes non-experimental methods. Data acquisition using the retrospective method with past medical record data to see the relationship between antihypertensive drug interaction and blood pressure targets in geriatric patients. The study was carried out by analyzing the medical records of geriatric hypertension patients who came to the outpatient department of PKU Muhammadiyah Gamping Hospital in January–December 2022.

Preparation of Samples

The population in this study was all outpatient geriatric patients with hypertension at PKU Muhammadiyah Gamping Hospital for the January–December 2022 period. The sample of this study was geriatric outpatients with hypertension who used antihypertension drugs at PKU Muhammadiyah Gamping Hospital for the January–December 2022 period, based on inclusion criteria determined by researchers. The sampling technique in this study is a purposive sampling technique calculated using the Slovin formula. In this study, 210 populations and 68 samples were obtained. The following are the inclusion and exclusion criteria in this study:

a. Inclusion criteria

1) Outpatient hypertension patients.

2) Patients diagnosed with hypertension with or without comorbidities and complications.

3) Hypertension patients aged ≥60 years.

4) Hypertension patients who get at least 2 types of drugs, both antihypertension and non-antihypertension combinations.

b. Exclusion Criteria

1) Incomplete medical record data.

2) Hypertension patients who use more than 6 types of drugs this is done to facilitate the analysis of researchers.

3) Types of drugs that are not in Drugs.com.

Data Analizes

The method of processing and analyzing data in this study uses computerized statistical instruments. The analysis carried out was univariate to see the description of patient characteristics, the profile of the use of antihypertension drugs, treatment, and potential drug interactions, then obtained results in the form of number and frequency (%), while bivariate analysis was to analyze the relationship between drug interactions and the achievement of geriatric patients' blood pressure targets using the chi-square test.

RESULTS AND DISCUSSION

Characteristic Features of Geriatric Patients with Hypertension

Tabel1. Description of the Characteristics of Geriatric Patients with Hypertension in the Outpatient Installation of PKU Muhammadiyah Hospital Gamping Period January–December 2022

Characteristic	Sum (n)	Frequency (%)
Gender		
Female	37	54,4
Male	31	45,6
Total	**68**	**100**
Work		
Other	29	42,6
IRT	15	22,1
Retired	15	22,1
Farmer	9	13,2
Does not work	0	0
Total	**68**	**100**
Concomitant Diseases/Complications		
There are comorbidities/complications	63	92,6
No comorbidities/complications	5	7,4
Total	**68**	**100**
Target Pressure		
Blood Reached	44	64,7
Not reached	24	35,3
Total	**68**	**100**

Based on Table 1, it shows that geriatric patients with hypertension who received antihypertension therapy were dominated by women, namely as many as 37 patients (54.4%). This result is in accordance with research conducted by 13 in Bekasi City regarding the relationship between sex and the incidence of hypertension, showing that female respondents (53.7%) experience more hypertension than male respondents (45.9%). This happens because women experience menopause. Women who have experienced menopause

have decreased estrogen levels, where this hormone plays a role in increasing high-density *lipoprotein* (HDL) levels that maintain blood vessel health. If estrogen levels decrease, HDL becomes low. Both low HDL and high LDL affect atherosclerosis and increase blood pressure (Lestari Y. I & Nugroho P. S, 2019).

Based on Table 1, it is seen that other occupations have a higher percentage of 29 patients (42.6%). This other job category consists of civil servants, private employees, laborers, and self-employed, thus causing the percentage of each type of work in this category to be very small. Based on that analysis, it was later determined that the most dominant occupations in this study were IRT and retirees, each with 15 patients (22.1%). Busy lifestyle factors cause stress that increases a person's blood pressure, such as housewives who are busy taking care of the house and children and rarely do activities outside the home. Feelings of pressure cause blood pressure to rise. Lack of exercise is also a factor in increasing blood pressure because fat in the body will accumulate a lot and inhibit blood flow. Stress can also stimulate the kidneys to release the hormone adrenaline, which raises blood pressure and increases blood viscosity (Manik C. M & Ronoatmodjo S, 2019).

Based on Table 1, it shows that *the majority of* patients have comorbidities and complications, amounting to 63 patients (92.6%). In this study, several comorbidities, such as diabetes mellitus, and complications of the disease were CHF *(congestive heart failure)* and stroke. This result is in line with research (16), namely that 73 people (84.9%) with obesity have hypertension. This happens because an increase in body fat in DM patients will have a bad influence on a person's hypertension condition.

The complications of hypertension in this study are CHF *(congestive heart failure)* and stroke. These results are in line with research in Kendal, which showed that compared to people without high blood pressure, people with hypertension had a 7 times higher risk of stroke, a 6 times higher risk of heart failure, and a 3 times higher risk of heart attack. Based on this study, which can be seen in Table 1, it shows that most patients reach blood pressure targets by 44 (64.7%). These results are in accordance with study (Anugera IA, 2020), where geriatric blood pressure targets were achieved after therapy so that the patient's blood pressure was equal to or below 140/90 mmHg. The achievement of blood pressure targets occurs because patients are obedient to taking medication and routine control; this has been proven by research (Farida U & Cahyani P. W, 2018) showing that compliance with hypertensive patients in undergoing antihypertensive treatment has a statistically significant effect on blood pressure control.

Profile of Use of Antihypertensive Drugs

Table 2. Treatment Characteristics of Geriatric Patients with Hypertension in the Outpatient Installation of PKU Muhammadiyah Gamping Hospital for the January-December 2022 Period

Characteristic	Sum (n)	Frequency (%)
Name of Antihypertensive Drug		
Candesartan	38	22,4
Bisoprolol Fumarate	33	19,4
Amlodipine	26	15,3
Furosemid	20	11,8
Ramipril	13	7,6
Spironolakton	12	7,1
Hidroklorotiazid	11	6,5
Nifedipin	10	5,9
Lisinopril	2	1,2
Clonidin	2	1,2
Carvedilol	2	1,2
Captopril	1	0,6
Total	**170**	**100**

Characteristic	Sum (n)	Frequency (%)
Work		
Other	29	42,6
IRT	15	22,1
Retired	15	22,1
Farmer	9	13,2
Does not work	0	0
Total	**68**	**100**
Types of therapy		
Antihypertensive combination	55	80,9
Single antihypertensive	13	19,1
Total	**68**	**100**
Antihypertensive Drug Class		
Diuretik	43	25,3
ARB	38	22,4
CCB	36	21,2
Beta blocker	35	20,5
ACEI	16	9,4
Alfa-blocker	2	1,2
Total	**170**	**100**

Based on Table 2, the most widely used antihypertensive drug is candesartan (22.4%). This study is in accordance with research (Brittany et al., 2017), namely the most widely used antihypertensive drug from the ARB group, namely candesartan. ARBs work by blocking angiotensin II receptors that cause vasodilation and tissue repair (Andriani et al., 2019). Its action is actually similar to that of an ACE *inhibitor;* the difference is that this drug inhibits angiotensin II activation of its receptor, while an ACE *inhibitor* inhibits angiotensin II production. In theory, this drug is more beneficial than ACE *inhibitors* because it does not produce the side effects of dry cough (Nilansari A. F et al., 2020). Based on the results of the study, it is known that of the 68 outpatients at PKU Muhammadiyah Gamping Hospital, as many as 55 patients (80.9%) received a combination of antihypertensive drugs. The results of this study are similar to research conducted by (Marhenta Y. B et al., 2018) that found that the number of patients who received polytherapy or combination therapy was higher than monotherapy or single therapy, where as many as 38 people (71.8%) received combination therapy while only 15 patients (28.2%) received antihypertensive monotherapy at Panembahan Senopati Hospital Bantul. The rational use of a combination of antihypertensive drugs aims to maintain blood pressure and lower blood pressure and has many advantages, including that if only using a single antihypertensive drug with high doses, the synergistic and additive effects of combination therapy will reduce higher side effects such as sudden hypotension (Saseen JJ et al., 2016).

Based on Table 2, it can be seen that diuretic drugs are more widely used than other drug classes. Diuretics will lower plasma volume so that blood pressure and cardiac output drop

(U'un Prastiya et al., 2022). In this study, the diuretics used were furosemide and spironolactone. Spironalactone is not used alone but in combination with other antihypertensions and is mostly used in HHD (*hypertensive heart disease*) patients.

Potential Drug Interactions

Table 3. Potential Drug Interactions of Geriatric Patients with Hypertension in Outpatient Installations of PKU Muhammadiyah Hospital Gamping Period January-December 2022

Characteristic	Sum (n)	Frequency (%)
Drug Interactions		
There is interaction medicine	62	91,2
No drug interactions	6	8,8
Total	**68**	**100**
Severity		
Moderate	133	69
Minor	46	23,5
Major	15	7,5
Total	**200**	**100**

Table 3 showed that 62 (91.2%) of the 68 patients had potential drug interactions. Potential drug interactions occur in as many as 200 events. Of the total 200 interaction events, the most frequent is interaction with moderate severity, with as many as 133 incidences (69%), and the most common is drug interaction with bisoprolol. This is in line with research conducted by (Setyaningsih et al., 2019); there are 276 potential occurrences of drug interactions with bisoprolol. This is in line with research conducted (Setyaningsih et al., 2019) that states that 78.55% of drug interaction events have a severity of close or *moderate*. These results show that the potential action of the drug caused is still declared safe because the most severe is a close monitor, which means that although the effect can damage some internal organs, if the administration is under supervision and with the appropriate dose, it does not cause harmful effects.

Analysis of the Relationship of Antihypertension Drug Interactions with Blood Pressure Target Achievement

Table 4. The Relationship of Drug Interaction with the Achievement of the Blood Pressure Target of Geriatric Patients in the Outpatient Installation of PKU Muhammadiyah Hospital Gamping Period January-December 2022

		Target Pressure Blood		Total (n)	*P Value*
		Achieved n(%)	No Achieved n(%)		
Potential Interaction Medicine	Exist Interaction Medicine	40 (58,8)	22 (32,4)	62 (91,2)	0,916
	No Exist Interaction Medicine	4 (5,9)	2 (2,9)	6 (8,2)	
Total n (%)		**44 (67,7)**	**24 (35,3)**	**68 (100)**	

There were 200 drug interactions among a total of 62 patients who experienced drug interactions. The *Chi-square test* is used to analyze the relationship between antihypertensive drug interactions and the blood pressure targets of geriatric patients. Based

on an analysis of 68 geriatric patients with hypertension in the outpatient installation of PKU Muhammadiyah Gamping Hospital for the period January–December 2022, it was found that *the majority of* patients who had the potential to experience drug interactions had their blood pressure achieved compared to patients who did not experience drug interactions.

The cross-tabulation Chi-square *test* between the interaction of antihypertensive drugs with blood pressure targets showed a p-value of 0.916, which means that there is no meaningful or statistically significant relationship between antihypertensive drug interactions and the achievement of geriatric patients' blood pressure targets. The potential drug interactions documented in this study were found on *drugs.com*. There were 200 drug interactions among a total of 62 patients who experienced drug interactions. The *Chi-square test* is used to analyze the relationship between antihypertensive drug interactions and the blood pressure targets of geriatric patients. Based on an analysis of 68 geriatric patients with hypertension in the outpatient installation of PKU Muhammadiyah Gamping Hospital for the period January–December 2022, it was found that the majority of patients who had the potential to experience drug interactions had their blood pressure achieved compared to patients who did not experience drug interactions. *The Chi-square* cross-tabulation test between antihypertensive drug interactions and blood pressure targets showed a p-value of 0.916, which means no There is a significant or statistically significant relationship between antihypertensive drug interactions and the achievement of geriatric patients' blood pressure targets. The potential drug interactions documented in this study were found on *drugs.com*.

CONCLUSION

The characteristic features of geriatric patients with hypertension are that they are predominantly female, work as housewives, and have comorbidities and complications with the patient's blood pressure target achieved. The patient's treatment pattern is dominated by combination therapy with diuretic drugs. Potential antihypertensive drug interactions in the majority of geriatric patients of moderate severity. There was no significant relationship between the interaction of antihypertensive drugs and the achievement of blood pressure targets in geriatric patients at PKU Muhammadiyah Gamping Hospital.

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