

## Effectiveness of Use of Antihypertensive Drug In Inpatient Stroke Patients In Hospital Tabanan Regency

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### ABSTRACT

Cardiovascular disease is a disease of the heart and blood vessels. Because the cardiovascular system is very vital, cardiovascular disease is very dangerous for health. One of the cardiovascular diseases is a stroke. The prevalence of stroke in Indonesia reaches 8.3 out of 1000 populations. This prevalence rate increases with increasing age. Indonesian National Data shows that stroke is the highest cause of death, which is 15.4%. Blood pressure management is a strategy to prevent stroke and reduce the risk of recurrence in ischemic stroke and hemorrhagic stroke. The purpose of this study was to determine the effectiveness of the use of antihypertensive drugs in patients with ischemic and hemorrhagic stroke inpatient care at hospital Tabanan seen from the patient's blood pressure. This research is a type of descriptive research with data collection carried out retrospectively. This study was conducted on 53 patients with ischemic stroke and hemorrhagic stroke using antihypertensive drugs. The results of the study on the effectiveness of the use of blood pressure-based antihypertensive drugs in ischemic stroke decreased systolic blood pressure by  $\leq 5$  mmHg by 8 patients (15.09%), decreased systolic blood pressure  $> 5$  mmHg by 1 patient (1.89%). In hemorrhagic stroke decreased systolic blood pressure  $\leq 5$  mmHg as many as 25 patients (47.17%), decreased systolic blood pressure  $> 5$  mmHg as many as 11 patients (20.76%) and in patients who experienced an increase in blood pressure occurred as many as 8 patients (15,09%).

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## 1. Introduction

Stroke is one of the leading causes of death and disability worldwide (American Heart Association/American Stroke Association, 2006). The incidence of hypertension can damage the walls of blood vessels which can easily cause blockage and even rupture of blood vessels in the brain. According to WHO, every year 15 million people in the world suffer a stroke. About 87% of stroke is ischemic, with a high prevalence (Kuriakose D and Xiao Z., 2020). As many as five million of them died and five million other stroke sufferers experienced permanent disability. Stroke is an especially serious problem in Asia, which has more than 60% of the world's population, and many of its countries are "developing" economies. Stroke mortality is higher in Asia than in Western Europe, the Americas or Australasia, except in the case of some countries such as Japan (Feigin VL, Forouzanfar MH, Krishnamurthi R, Mensah GA, Connor M, Bennett DA, 2014). The prevalence of stroke in Indonesia reaches 8.3 out of 1000 population. This prevalence rate increases with increasing age. Indonesia's national data shows that stroke is the highest cause of death, which is 15.4%. There are around 750,000 stroke incidents per year in Indonesia. Data in many hospitals shows that in 2030 it is estimated that 23.6 million people will die from stroke (Ministry of Health, 2013).

According to the National Stroke Association-USA (NSA) stroke is divided into two, namely ischemic stroke and hemorrhagic stroke. The commoner type is an ischemic stroke, caused by interruption of blood flow to a certain area of the brain. Ischemic stroke accounts for 85% of all acute strokes. Acute ischemic stroke caused by blockage or occlusion of a cerebellar artery caused by blood clot (thrombus) that results from excessive clumping of platelets (Fedin AI and Badalyan KR., 2019). From these data it can be seen that the incidence of ischemic stroke has a greater proportion than hemorrhagic stroke (Zafar F, Tariq W, Shoaib RF, Shah A, Siddique M, Zaki A, 2018). In a study conducted by Naito et al, 2020 showed that diastolic blood pressure is a predictor used to see poor functional outcome compared to other blood pressures. Previous reports have shown that an increase in diastolic blood pressure than systolic blood pressure during the acute phase of stroke was independently associated with worse functional outcome at 3 months (Naito H, Hasomi N, Kuzume D, Nezu T, Aoki S, Marimoto Y, 2020). The prevalence of smokers in Indonesia in 2013 amounted to 29.3%, with a total of smokers in men as much as 47.5% and 1.1% female (GATS., 2011). Patients who have strokes with complications will undergo a longer hospital stay compared to patients who have strokes without complications because patients who have strokes with complications have other risk factors that must be cured besides the stroke itself (Herminawati, A., Suryani, 2013).

Management of blood pressure is one strategy to prevent stroke and reduce the risk of recurrence in ischemic stroke and hemorrhagic stroke. Handling hypertension can reduce damage around the ischemic area until the patient's clinical condition is stable (Fagan, C.S. and Hess, 2005). A meta-analysis of antihypertensive treatment reported that a 5-6mmHg reduction in blood pressure resulted in a 42% reduction in stroke and the SHEP study showed a 37% reduction in stroke in patients who had ischemic stroke and were treated with antihypertensives (Kirshner, H.S., 2003). Based on the description above, it is necessary to have a study to determine the effectiveness of the use of antihypertensive drugs in patients with ischemic stroke and hemorrhagic stroke in one of the Tabanan district hospitals.

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## **2. Methods**

This study was conducted in the Medical Record section of a hospital in Tabanan Regency, by taking medical record data on patients with ischemic stroke and hemorrhagic stroke. This research is a descriptive type of research with data collection carried out retrospectively. The study population was all medical records of patients with ischemic and hemorrhagic stroke hospitalized using antihypertensive drugs in a hospital in Tabanan Regency. The research sample includes inclusion criteria and exclusion criteria. The inclusion criteria were ischemic and hemorrhagic stroke patients who were hospitalized at a Tabanan district hospital with blood pressure >120/80 mmHg, aged 26 years. While the exclusion criteria were ischemic and hemorrhagic stroke patients with incomplete or missing data.

The sampling technique used in this research is purposive sampling. Purposive sampling can be done by selecting subjects based on specific criteria set by the researcher. Data was collected using patient medical record data. Collected the number of cases from ischemic and hemorrhagic stroke patients. Followed by selecting samples by grouping all patient data that meet the inclusion criteria

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and exclusion criteria. Then data was collected from each sample, while the data taken included the patient's name, gender, age, blood pressure, length of hospitalization, disease based on complications and antihypertensive drugs given during treatment.

The data obtained will be analyzed descriptively and presented in a table, in order to obtain the effectiveness of the use of antihypertensive drugs in patients with ischemic stroke and hemorrhagic stroke as seen from the decrease in the patient's blood pressure. The data used were patient's name, gender, age, blood pressure, length of hospitalization, disease based on complications and antihypertensive drugs given during treatment. Then calculated the number and percentage of each data.

### 3. Result and Discussion

#### 3.1 Respiratory Disorders in Nervous Disease

TABLE 1.  
CHARACTERISTICS OF RESEARCH SUBJECTS BASED ON GENDER

Stroke Type	Gender	Number Of Patients	Percentage (%)
Ischemic	Male	4	7,55
	Female	5	9,43
Hemorrhagic	Male	22	41,51
	Female	22	41,51
<b>Total</b>		<b>53</b>	<b>100,00</b>

TABLE 2.  
CHARACTERISTICS OF RESEARCH SUBJECTS BASED ON AGE

Stroke Type	Category	Age Range	Age Range	Age Range
Ischemic	Early adulthood	26-35	0	0
	Late adulthood	36-45	0	0
	Early old age	46-55	3	5,67
	Late old age	56-65	1	1,89
	Old age	≥65	5	9,43
Hemorrhagic	Early adulthood	26-35	2	3,77
	Late adulthood	36-45	2	3,77
	Early old age	46-55	8	15,09
	Late old age	56-65	17	32,08
	old age	≥65	15	28,30
<b>Total</b>	<b>53</b>			<b>100,00</b>

TABLE 3.  
CHARACTERISTICS OF RESEARCH SUBJECTS BY TYPE OF STROKE

Type of Stroke	Number of Patients	Percentage (%)
Hemorrhagic	9	17,00
Ischemic	44	83,00
<b>Total</b>	<b>53</b>	<b>100,00</b>

TABLE 4.  
CHARACTERISTICS OF RESEARCH SUBJECTS BASED ON DISEASE COMPLICATIONS

Type of Stroke	Disease Complications	Total	Percentage (%)
Uncomplicated Ischemia	Uncomplicated Ischemia	2	3,77
	With Complications	7	13,21
Hemorrhagic without complications	Hemorrhagic without complications	2	3,77
	With Complications	42	79,25
<b>Total</b>		<b>53</b>	<b>100,00</b>

TABLE 5.  
CHARACTERISTICS OF RESEARCH SUBJECTS BASED ON BLOOD PRESSURE

Type of Stroke	Distribution	Total	Percentage (%)
Ischemic	Pre Hypertension	4	7,55
	Stage 1 hypertension	4	7,55
	Stage 2 hypertension	1	1,88
	Pre Hypertension	3	5,66
Hemorrhagic	Stage 1 hypertension	9	16,98

Stage 2 hypertension	32	60,37
<b>Total</b>	<b>53</b>	<b>100,00</b>

TABLE 6  
CHARACTERISTICS OF RESEARCH SUBJECTS BASED ON LENGTH OF HOSPITALIZATION

Type of Stroke	Length of stay (days)	Total	Percentage (%)
Ischemic	5	2	3,77
	6	1	1,89
	7	3	5,66
	8	1	1,89
	9	1	1,89
	15	1	1,89
	7	1	1,89
Hemorrhagic	9	1	1,89
	10	2	3,77
	11	4	7,54
	12	7	13,20
	13	6	11,32
	14	18	33,96
	15	3	5,66
	16	1	1,89
<b>Total</b>	<b>17</b>	<b>1</b>	<b>1,89</b>
<b>Total</b>		<b>53</b>	<b>100,00</b>

TABLE 7  
CHARACTERISTICS OF RESEARCH SUBJECTS BASED ON ANTIHYPERTENSIVE DRUG US

Type Stroke	Drug Class	Drug	Number of Users	Percent age (%)
Ischemic	<i>β-blocker</i>	Bisoprolol	1	11,11
	Antagonis Kalsium + <i>β-blocker</i>	Amlodipin + Bisoprolol	1	11,11
	Antagonis Kalsium + <i>Acel</i>	Amlodipin + Lisinopril	1	11,11
	<i>β-blocker</i> + Diuretik	Bisoprolol + Furosemid	1	11,11
	<i>Acel</i> + Diuretik	Captopril +Furosemid	2	22,22
	<i>Acel</i> +Antagonis Kalsium	Captopril + Nipedipin	1	11,11
	Diuretik + Antagonis Kalsium	Furosemid + Lisinopril	1	11,11
	Antagonis Kalsium	Amlodipin	15	34,10
	<i>β-blocker</i>	Bisoprolol	1	2,27
	<i>Ace Inhibitor</i>	Captopril	1	2,27
	Diuretik	Furosemid	1	2,27
	<i>Ace Inhibitor</i>	Lisinopril	5	11,38
	Antagonis Kalsium + <i>Ace Inhibitor</i>	Amlodipin + Captopril	2	4,55
	Antagonis Kalsium + <i>Angiotensin Reseptor Blocker</i>	Amlodipin + Candesartan	7	15,91
	Antagonis Kalsium + <i>Ace Inhibitor</i>	Amlodipin + Lisinopril	3	6,82
<i>β-blocker</i> + <i>Ace Inhibitor</i>	Bisoprolol + Ramipril	1	2,27	
Antagonis Kalsium + <i>β-blocker</i> + <i>Angiotensin Reseptor Blocker</i>	Amlodipin + Bisoprolol + Candesartan	1	2,27	
Antagonis Kalsium + <i>β-blocker</i> + Diuretik	Amlodipin + Bisoprolol + Furosemid	1	2,27	
Antagonis Kalsium + Diuretik + <i>Angiotensin Reseptor Blocker</i>	Amlodipin + Furosemid + Valsartan	1	2,27	
Antagonis Kalsium + <i>Ace Inhibitor</i>	Nicardipin and Amlodipin + Captopril	1	2,27	
Antagonis Kalsium + <i>Ace Inhibitor</i>	Nicardipin and Amlodipin + Imidapril	1	2,27	
Antagonis Kalsium + <i>Angiotensin Reseptor Blocker</i> + <i>β-blocker</i>	Nicardipin and Amlodipin + Candesartan + Bisoprolol	1	2,27	
Antagonis Kalsium + <i>Angiotensin Reseptor Blocker</i> + <i>β-blocker</i>	Diltiazem dan Amlodipin + Candesartan + Bisoprolol	1	2,27	
Antagonis Kalsium + <i>β-blocker</i> + <i>Ace Inhibitor</i>	Nicardipin dan Amlodipin + Bisoprolol + Lisinopril	1	2,27	
<b>Total</b>		<b>53</b>	<b>100,00</b>	

TABLE 8  
DATA ON AVERAGE DECREASE IN BLOOD PRESSURE IN PATIENTS WHO RECEIVED  
ANTIHYPERTENSIVE DRUGS

Type of Stroke	Medication	Average Blood Pressure
Ischemic	Bisoprolol	-1,25
	Amlodipin + Bisoprolol	-3,00
	Amlodipin + Lisinopril	-5,66
	Bisoprolol + Furosemid	-3,33
	Captopril + Furosemid	-3,16
	Captopril + Nipedipin	-2,00
	Furosemid + Lisinopril	-3,72
	Amlodipin	-2,47
	Bisoprolol	-4,18
	Captopril	-4,80
Hemorrhagic	Furosemid	-1,00
	Lisinopril	-2,99
	Amlodipin + Captopril	-1,70
	Amlodipin + Candesartan	-3,37
	Amlodipin + Lisinopril	-5,59
	Bisoprolol + Ramipril	+1,71
	Amlodipin + Bisoprolol + Candesartan	-2,90
	Amlodipin + Bisoprolol + Furosemid	+0,33
	Amlodipin + Furosemid + Valsartan	-4,20
	Nicardipin dan amlodipin + Captopril	+0,07
	Nicardipin dan Amlodipin + Imidapril	+1,90
	Nicardipin dan Amlodipin + Candesartan	-6,30
	Diltiazem dan Amlodipin + Candesartan + Bisoprolol	-10,75
Nicardipin dan Amlodipin + Bisoprolol + Lisinopril	-7,27	

TABLE 9  
CHARACTERISTICS OF RESEARCH SUBJECTS BASED ON THE PATIENT'S BLOOD PRESSURE STATUS

Type of Stroke	Condition of Patients	Total (People)	Percentage (%)
Ischemic	Decrease		
	≤ 5 mmHg	8	15,09
	>5 mmHg	1	1,89
Hemorrhagic	Increased	0	
	Decrease		
	≤ 5 mmHg	25	47,17
	>5 mmHg	11	20,76
	Increased	8	15,09
<b>Total</b>		<b>53</b>	<b>100,00</b>

### 3.2 Discussion

The data in table 1. shows that there are more female ischemic stroke patients compared to men, while the number of male and female patients is the same in hemorrhagic stroke. The risk of stroke is 20% higher for men than for women. The prevalence of smokers in Indonesia in 2013 amounted to 29.3%, with a total of smokers in men as much as 47.5% and 1.1% female. However, after a woman turns 55 when estrogen levels decline due to menopause, women have a higher risk than men. The hormone estrogen in women is known to be protective, so after entering menopause women are more susceptible to stroke than men.

Age is one of the factors that influence the occurrence of stroke. In general, older people are more prone to stroke than younger people. This is a natural condition that must be accepted. As you get older, your body's tissues become less flexible and stiffer, including the blood vessels. This is related to the process of degeneration (aging) that occurs naturally. In elderly people, blood vessels are stiffer due to plaque.

In this study, there is one interesting thing where based on the data obtained, the incidence of ischemic stroke is much less than the incidence of hemorrhagic stroke. This is contrary to the statement of (Fagan, C.S. and Hess, 2005), Dinata (2012), and the National Stroke Association-USA (NSA), which state that ischemic stroke is more common than hemorrhagic stroke. Ischemic stroke has the largest percentage, which is about 80% of the total incidence of stroke. Then this is also triggered by a severe stress factor which causes a drastic spike in blood pressure resulting in a hemorrhagic stroke. Another possibility is that many stroke patients are not aware of the main risk

factors that have the potential to cause stroke such as hypertension so that they have never been treated and patients only know about it after experiencing a hemorrhagic stroke. Patients who have strokes with complications will undergo a longer hospital stay compared to patients who have strokes without complications because patients who have strokes with complications have other risk factors that must be cured besides the stroke itself. Patients who have strokes with complications will undergo a longer hospital stay compared to patients who have strokes without complications because patients who have strokes with complications have other risk factors that must be cured besides the stroke itself.

The length of stay for ischemic stroke and hemorrhagic stroke patients in this study was calculated in days. The long length of stay in hemorrhagic stroke patients occurs because the majority of patients who experience hemorrhagic stroke enter the hospital with a decreased state of consciousness. This kind of situation is necessary intensive care and treatment, especially in the area of ruptured blood vessels. The results of this study where in general, ischemic stroke patients will be treated for approximately 7-10 days, while hemorrhagic stroke patients are usually treated longer, namely 14-21 days, the longer treatment is 14-21 days.

Based on Table 7. and Table 8. in ischemic stroke patients, the highest reduction in blood pressure (5.66 mmHg) was obtained in patients receiving the combination of amlodipine and lisinopril and the smallest decrease in blood pressure (1.25 mmHg) in patients receiving received a single antihypertensive drug, bisoprolol. This shows that the administration of a combination of antihypertensive drugs is more effective than a single antihypertensive drug. Based on the therapeutic pharmacology book, amlodipine is one of the most widely used calcium antagonists because the use of calcium antagonist drugs has become one of the first-stage antihypertensive classes as monotherapy. in hypertension with low renin levels such as in the elderly, use will be very effective when combined with calcium antagonists with ACE-inhibitors, methyl dopa, or  $\beta$ -blockers. Calcium antagonists work by inhibiting calcium influx in smooth muscle cells of blood vessels and heart muscle resulting in relaxation. In hemorrhagic stroke, the average decrease in blood pressure was the most (10.75 mmHg) in patients receiving diltiazem and the combination of amlodipine, candesartan and bisoprolol. This may be influenced by the administration of the injection drug, namely diltiazem, thus providing a rapid onset of drug because directly injected into the circulatory system, but this is inversely proportional to the administration of nicardipine injection drugs and the combination of amlodipine and imidapril where there is an average increase in blood pressure of 1.90 mmHg this can be influenced by several factors in patients such as stress because each individual have different physiological and psychological states and the presence of recurrent stroke. Another thing that can affect is the interaction of antihypertensive drugs and other drugs such as NSAIDs. NSAIDs work by inhibiting vasodilators with prostaglandin synthesis in the kidney which causes urinary retention and vasoconstriction (Baxter K., 2010). This causes a decrease in the effectiveness of the antihypertensives given. In this study, the average systolic blood pressure was used because systolic blood pressure is blood pressure when the heart contracts, while diastolic blood pressure is blood pressure when the heart relaxes. Systolic blood pressure occurs when the heart muscle beats to pump blood so that blood is pushed out of the heart to the rest of the body. This shows that systolic blood pressure is more influential in stroke patients.

The data obtained based on an assessment of the patient's condition, in ischemic stroke a decrease in systolic blood pressure of 5 mmHg as many as 8 patients (15.09%), a decrease in systolic blood pressure of > 5 mmHg in 1 patient (1.89%) and there was no in patients with increased blood pressure. In hemorrhagic stroke, a decrease in systolic blood pressure of 5 mmHg in 25 patients (47.17%), a decrease in systolic blood pressure by >5 mmHg in 11 patients (20.76%) and in patients experiencing an increase in blood pressure occurred in 8 patients (15.09%). A meta-analysis study on antihypertensive treatment reported that a reduction in blood pressure of 5-6 mmHg resulted in a 42% reduction in stroke attacks. Lowering blood pressure in stroke patients is necessary to prevent further organ damage, but on the other hand, giving antihypertensive drugs also carries the risk of a rapid drop in blood pressure, which is very dangerous for perfusion (blood flow) to the brain. Therefore, antihypertensive drugs are not given to normalize blood pressure, but only reduce blood pressure to a certain extent according to the treatment protocol.

#### **4. Conclusion**

Based on the research that has been done regarding it, it can be concluded that the most use of antihypertensive drugs in hemorrhagic stroke is 25 patients (47.17%) with a decrease in blood pressure of 5 mmHg.

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