The Effect of Length of Illness on The Achievement of Systolic and Diastolic Blood Pressure Therapy Targets for Grade 1 Hypertension

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ABSTRACT

Blood pressure >140 mmHg is at high risk for cardiovascular diseases. The aim of the study was to determine the effect of length of illness on the achievement of the target of systolic blood pressure (SBP) and diastolic blood pressure (DBP) in grade 1 hypertension patients without comorbidities. The study design was cross sectional, with a sample size of 34 respondents who met the sample criteria taken from 93 grade 1 hypertension patients without comorbidities. Blood pressure data for the last 3 months based on medical records at the puskesmas and direct blood pressure measurements in the 4th month. The duration of hypertension illness was calculated from the time the doctor diagnosed it until the time of data collection, by means of interviews. Data analysis using chi square. The results of the research on the effect of length of illness on the achievement of SBP and DBP were obtained: p value 0.018, V -0.407, OR (CI) 0.134 (0.023-0.799) and p value 0.019, V -0.402, OR (CI) 0.083 (0.007-0.950). Conclusion: The more chronic you suffer from grade 1 hypertension, the lower the chances of achieving SBP and DBP therapeutic targets. Length of illness needs to be considered in the management of grade 1 hypertension patients.

Kata kunci

1. INTRODUCTION

The prevalence of essential hypertension is greater than secondary hypertension, which is around 95%.(Fuchs, 2018) Hypertension is a systolic blood pressure ≥ 140 mmHg and or diastolic pressure ≥ 90 mmHg.(Association of Hypertension Physicians, 2019; Unger et al., 2020; Williams, Mancia, De Backer, et al., 2018a) In low or middle income countries, such as Indonesia, the prevalence of hypertension has increased, (Department of Health of the Republic of Indonesia, 2018a; Mills et al., 2020) from 25.8% in 2013 to 34.1% in 2018.(Department of Health of the Republic of Indonesia, 2018b) The prevalence of hypertension in Banyumas Regency in 2017 was 8.53% to 26% in 2019.(Department of Health of Central Java Province, 2017, 2019).

Hypertension is declared as the highest burden disease (218 million out of 1.21 billion) (Roth et al., 2018) and is the first risk factor for death (10.4 million out of 34.1 million deaths) and cardiovascular disease (Kjeldsen, 2018; Maharani et al., 2019a; Whelton, Carey, Aronow, Casey, Collins, Himmelfarb, DePalma, et al., 2018; Williams, Mancia, Spiering, et al., 2018).

Uncontrolled blood pressure (≥ 140 mmHg) will further increase the risk of cardiovascular disease. A series of evidence shows that the

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more uncontrolled the blood pressure of hypertensive patients increases the risk of cardiovascular disease (Borghi et al., 2016; Shi et al., 2020; Zhou et al., 2018).

Blood pressure in patients with hypertension can change at any time. Blood pressure that tends to be high or uncontrolled has an impact on endothelial damage. The results showed that in grade 1 essential hypertension patients, endothelial damage had already occurred and if blood pressure was not controlled, endothelial damage would increase and in approximately 10 years it could develop into grade 2 or 3, 2009; Maharani et al., 2019b) Interestingly, grade 1 hypertension still has a risk for cardiovascular disease, (He et al., 2000; Huang et al., 2014; Kjeldsen, 2018; Lee et al., 2011; Maharani et al., 2019a) as well as a significant cause of death. (He et al., 2000).

Research conducted in Murantara, South Sumatra shows that the longer hypertension suffers, the more adherence to taking medication and checking blood pressure regularly increases. (Listiana et al., 2020) Pan, et al's research shows that there is a correlation between length of illness and adherence to taking antihypertensive medication. (Pan et al., 2019) However, other results such as the research of Wahyudi, Ratnawati and Made, Sanati, Vaezi and Jambarsang, and Care et al, show no correlation between length of illness and adherence to taking medication. (Choudhry et al., 2022; Gebremichael et al., 2019; Khayyat et al., 2017; Wu et al., 2010). Several studies in Indonesia, such as research in Lampung, (Artini et al., 2022) and in Samarinda (Lestari et al., 2022) also show that adherence to taking anti-hypertensive drugs is related to controlled blood pressure. Interestingly, Qu, et al's research shows that the length of time suffering from hypertension is correlated with controlled blood pressure (Qu et al., 2019) But in contrast to Abdisa, et al's research that the length of time suffering from hypertension is not related to controlled blood pressure (Abdisa et al., 2022).

The hypertension therapy target is said to be achieved essentially if within 3 months the blood pressure decreases by at least 20/10 mmHg or ideally <140/90 mmHg, or is said to be achieved optimally if within 3 months at the age of <65 years the blood pressure is >120/70-130/80 mmHg and at the age of >65 years the blood pressure is <140/90 mmHg if tolerable. (Indonesian Hypertension Doctor Association, 2021)

The inconsistency in the results of research on the effect of length of illness on blood pressure control, the authors are interested in re-examining using indicators of achievement of hypertension therapy targets. Thus, the purpose of this study is to determine the effect of length of illness on the achievement of systolic (TDS) and diastolic (TDD) blood pressure therapy targets in grade 1 hypertensive patients without comorbidities.

2. METHODS

The research design used an observational study with a cross sectional approach. The research was conducted in the working area of Puskesmas Kembaran I Purwokerto, Banyumas Regency, Central Java, from January 1 to May 25, 2022. The population in this study were grade 1 hypertensive patients without comorbid diseases registered at the health center, which were 93 patients. From the population of 93 patients, there were 34 who met the sample criteria. The sample inclusion criteria include age <80 years, the results of blood pressure measurements in the last 4 months are clearly documented, get antihypertensive drug therapy, no comorbid diseases (such as heart disease, kidney damage, stroke, and Diabetes Mellitus) and live according to the address recorded at the Puskesmas. Exclusion criteria included alcohol consumption and impaired physical activity.

The independent variable in this study is length of illness. The length of illness was based on the length of time experienced by respondents from the time they were first diagnosed with hypertension by a doctor until the time of data collection, which was calculated in months. The dependent variable is the achievement of hypertension therapy targets, namely the comparison of the average systolic and diastolic blood pressure values for the last 3 months with the blood pressure value in the fourth month. If the average blood pressure value for the last 3 months (blood pressure data at the time of data collection and blood pressure data for 2 consecutive months before data collection) there is a decrease in

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blood pressure of at least 20/10 mmHg compared to the blood pressure value for the last 4 months (blood pressure data 3 months ago before research data collection), it is said that the target therapy is achieved and if the decrease in blood pressure <20/10 mmHg, it is said that the target therapy is not achieved.(Indonesian Society of Hypertension Physicians, 2021).

Achievement of therapeutic targets for systolic blood pressure (TDS) is said to be achieved if the average TDS value for the last 3 months has decreased by at least 20 mmHg compared to the blood pressure value of the last 4 months and vice versa if not achieved. Achievement of therapeutic targets for diastolic blood pressure (TDD) is said to be achieved if the average TDS value during the last 3 months has decreased by at least 10 mmHg compared to the blood pressure value of the last 4 months and vice versa if not achieved. The technique of collecting blood pressure data for the last 3 months using a documentation study of medical record data from the health center (secondary data) while blood pressure data in the 4th month when taking research data was carried out by direct measurement of blood pressure (primary data). Blood pressure measurements using a digital spignomanometer that has been previously calibrated. While drug compliance uses the Morisky Medication Adherence Scale (MMAS) questionnaire -8 Indonesian version which has been tested for validity and reliability and declared valid and reliable (Riani et al., 2017).

Proof of correlation between variables with a nominal measuring scale using Chi Square analysis with a 95% confidence level. Data processing and data analysis used the help of the SPSS program. Ethical principles such as anonymity, justice, malefficiency and beneficiency have been applied to this study. This research has received ethical approval with No. B. LPPM-UHB/870/04/2022.

3. RESULTS AND DISCUSSION

3.1 Respondent Characteristics

Respondents in this study had the most characteristics of late elderly (55.9%), female gender (61.8%), who had a family history of hypertension and not equally, each 50% and most respondents had experienced hypertension in the chronic category (≥ 6 months) (73.3%). Most had low medication compliance (70.59%) and more than half of the respondents had blood pressure control compliance in the compliant category (52.94%) (table 1).

Increasing age has a higher chance of experiencing hypertension. This is related to the increasing age of a person, the elasticity of blood vessels and the pumping ability of the heart decreases. Decreased elasticity of blood vessels and heart pumps will increase blood pressure. This result is in line with Ulfah's study that with age there will be a degenerative process of the body's organs (Ulfa et al., 2018).

Women have the opportunity to experience blood pressure, along with increasing age where there will be a decrease in the hormone estrogen. Estrogen is a hormone that plays a role in protecting blood vessels from damage. Previous research shows that manepouse correlates with an increase in the incidence of hypertension (Kusumawaty, 2018).

Table 1. Characteristics of Respondents of Grade 1 Hypertension Patients in Banyumas, Central Java (n=34)

Variable	Frekuency(f)	Percentage (%)
Age		
1. Late Teens	1	2.9
2. Early Adulthood	0	0
3. Late Adulthood	4	11.8
4. Early Elderly	10	29.4
5. Late Elderly	19	55.9
Gender		
1. Female	21	61.8
2. Male	13	38.2
Family History		
1. Yes	17	50
2. No	17	50
Duration of Illness		
1. Acute	9	26,47
2. Chronic (≥6 months)	25	73,53
Medication Adherence		

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1.	Low	24	70,59
2.	Middle	8	23,53
3.	High	2	5,88
Blood Pressure Check Compliance			
1.	Compliant	18	52,94
2.	No Compliant	16	47,06

Tables 2 and 3 show no correlation between age, gender, medication compliance, compliance with blood pressure checks and length of illness with the achievement of therapeutic targets in grade 1 hypertension patients, both for the achievement of systolic and diastolic blood pressure. Table 2 shows that there is a negative relationship between the length of illness and the achievement of therapeutic targets on systolic blood pressure statistically significant, with a p value <0.05 with moderate relationship closeness (V = -0.407) and OR and CI respectively 0.313 and 0.061-1.611.

Thus, the results of this study indicate that the more chronic hypertension is, the less the achievement of therapeutic targets on systolic blood pressure (TDS). Based on the OR value, it can be predicted that the longer the illness of a grade 1 hypertensive patient without comorbidities, the 86.6% chance of achieving TDS decreases.

Table 3 also provides information that there is a negative relationship between length of illness and achievement of therapeutic targets on diastolic blood pressure (TDD) statistically significant with p value <0.05 with moderate relationship closeness (V = -0.402) with OR and CI 0.083 and 0.007-0.950 respectively. Thus, it can be concluded that the more chronic the illness of a patient with hypertension, the less the target therapy on TDD is achieved. Based on the OR value, it can be predicted that the longer the illness of a grade 1 hypertensive patient without comorbidities, the 91.7% chance of achieving TDD decreases.

Hypertension is one of the non-communicable diseases. Grade 1 hypertension is an increase in TDS 140-149 mmHg and or TDD 90-99 mmHg (Whelton, Carey, Aronow, Casey, Collins, Himmelfarb, Depalma, et al., 2018). Grade 1 hypertension within 10 years progresses to stage 2 hypertension. If no treatment is taken, there is a risk of 1.92 to 2.34 times to experience CVD (Luo et al., 2020).

The consensus on hypertension management agreed that blood pressure values are the target of hypertension therapy. The essential hypertension therapy target is said to be achieved if within 3 months there is a decrease in blood pressure of at least 20/10 mmHg. (Indonesian Society of Hypertension Physicians, 2021) In this study, the variable of blood pressure achievement was developed into the achievement of cytolic blood pressure and diastolic blood pressure. The achievement of therapeutic targets in systolic blood pressure is declared achieved if within 3 months of observation there is a decrease in systolic blood pressure of at least 20 mmHg. While the achievement of therapeutic targets in diastolic blood pressure is declared achieved if within 3 months of observation there is a decrease in diastolic blood pressure of at least 10 mmHg. In general, the variable achievement of target therapy is used to determine blood pressure control, such as in the studies of Qu et al, (Qu et al., 2019) Tesfaye et al, (Tesfaye et al., 2017) Li et al (R. Li et al., 2020) and Aberhe et al. (Aberhe et al., 2020).

The results showed that most of the respondents, namely 60% had therapeutic target parameters in the form of TDS that were achieved (decreased <20 mmHg) and 40% were not achieved. The achievement of therapeutic targets in reducing TDD <10 mmHg showed that almost all respondents in this study, namely 88% had TDD that was not achieved and only 12% were achieved. These results are in line with the research of Qu et al, which showed the results of most (67.1%) blood pressure was not controlled. In Qu's research, et a is said to be controlled if the average blood pressure from the results of 2 measurements has decreased <140/90mmHg, using a sample of hypertensive patients with comorbidities (Qu et al., 2019).

Table 2. Correlation of factors associated with the achievement of systolic blood pressure therapy targets (n=34)

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Variable	Achievement of Systolic Blood Pressure Therapy Target (TDS)				
	Achieved (%)	Not Achieved (%)	P value	Phi (V)	OR (CI)
Age					
1. Late Teens	2,9	0	0,556	0,244	
2. Early Adulthood					
3. Late Adulthood	2,9	8,8			
4. Early Elderly	14,7	14,7			
5. Late Elderly	23,5	32,4			
Gender					
1. Female	26,5	35,3	0,851	-0,032	0,875(0,218-3,518)
2. Male	17,6	20,6			
Duration of Illness					
1. Acute	20,6	5,9	0,018	-0,407**	0,134(0,023-0,799)
2. Chronic (≥6 month)	23,5	50			
Medication Adherence					
1. Low	26,5	44,1	0,461	0,214	
2. Middle	14,7	8,8			
3. High	2,9	2,9			
TD Check Compliance					
1. Compliant	26,5	26,5	0,464	0,126	1,667(0,423-6,562)
2. No Compliant	17,6	29,4			

OR: Odds Rasio; CI: Confident Interval

Table 3. Correlation of factors associated with achievement of diastolic therapeutic targets (n=34)

Variable	Achievement of Diastolic Blood Pressure (TDD) Target Therapy				
	Achieved (%)	Not Achieved (%)	P value	Phi (V)	OR (CI)
Age					
1. Late Teens	0	2,9	0,718	0,199	
2. Early Adulthood					
3. Late Adulthood	0	11,8			
4. Early Elderly	5,9	23,5			
5. Late Elderly	5,9	50			
Gender					
1. Female	5,9	55,9	0,627	-0,088	0,579(0,71-4,709)
2. Male	5,9	32,4			
Duration of Illness					
1. Acute	8,8	17,6	0,019	-0,402**	0,083(0,007-0,950)
2. Chronic (≥6 month)	2,9	70,6			

Medication Adherence					
1. Low	5,9	64,7	0,389	0,236	
2. Middle	5,9	17,6			
3. High	0	5,9			
TD Check Compliance					
1. Compliant	11,8	41,2	0,105	0,344	1,286(1,004-1,646)
2. No Compliant	0	47,1			

OR: Odds Rasio; CI: Confident Interval

Several factors that can contribute to the achievement of hypertension therapy targets in this study show that only the length of hypertension illness is negatively correlated with the achievement of therapy targets both in TDS and TDD. The more chronic the hypertension, the lower the chance of achieving the TDS and TDD targets. These results are in line with the research of Qu, et al which shows that the length of time suffering from hypertension correlates with controlled blood pressure (Qu et al., 2019) In contrast to Abdisa's research, et al that the length of time suffering from hypertension is not related to controlled blood pressure (Abdisa et al., 2022) Likewise, the research of Solomon and Sheleme et al shows no correlation between length of illness and controlled blood pressure. The difference in these results is likely due to differences in the parameters of the length of illness. In this study, the length of illness was categorized as acute and chronic, while in previous studies it was categorized into <5 years, 5-10 years and > 10 years.

Blood pressure that continues to increase more than 140/90 mmHg and stays more than 1 year allows changes in the structure of blood vessels and the heart to worsen so that it can also cause blood pressure to increase. Respondents in this study were grade 1 essential hypertension and without comorbidities. Along with the development of time where blood pressure can change at any time uncontrolled so that endothelial damage can increase and without realizing grade 1 hypertension can develop into grade 2. This opinion is based on the results of research showing that in grade 1 hypertension there is already damage to endothelial dysfunction and if hypertension is not controlled, endothelial damage will increase

and increase the grade of hypertension (He et al., 2009; Maharani et al., 2019b).

In the mosaic theory, it is stated that the pathophysiology of hypertension involves the interaction of many mechanisms, including renal mechanisms, vascular autoregulation or endothelial dysfunction, oxidative stress, the immune system (both innate and adaptive), genetics, sodium intake, sympathetic activity and the microbiome (dysbiosis) (Harrison et al., 2021a) Vascular autoregulation is a process to maintain relatively constant tissue perfusion in the body. There are 4 vascular disorders that contribute to hypertension, including: 1) increased vasoconstrictor hormones, such as Ang II, catecholamines and vasopressin, and impaired vasodilation, reduced Nitric Oxide (NO); 2) disturbances in microvascular and vascular structure; 3) hardening of the aorta; 4) as a source and target of immune activation.(Harrison et al., 2021b) Ang II release leads to increased oxidative stress, which can impact inflammation and decreased NO biavaibility (endothelial dysfunction). Inflammation itself can also lead to endothelial dysfunction and increased hypertension. (Adams et al., 2008; Harrison et al., 2021b).

Endothelial dysfunction results in increased BP, which can maintain and worsen hypertension. Hypertension itself also causes endothelial dysfunction (Brandes, 2014; Konukoglu & Uzun, 2016; Y. P. Li et al., 2020; van der Heijden et al., 2017). Therefore, it is important to carry out appropriate management along with the increasing duration of hypertension experienced because it is possible that the longer the blood vessel endothelium is exposed to high blood pressure, the incidence of endothelial dysfunction will increase and the

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more damaged the blood vessel endothelium is, the blood pressure becomes difficult to control.

This study has limitations including blood pressure data for the last 3 months using secondary data. Blood pressure is based on monthly measurements and other factors that can contribute are not all controlled.

CONCLUSION

Length of illness is negatively correlated with the achievement of hypertension therapy targets in both systolic blood pressure and diastolic blood pressure. The more chronic a patient with grade 1 hypertension is, the lower the chance of having therapeutic targets in the form of systolic and diastolic blood pressure achieved. Length of illness needs to be considered in the management of grade 1 hypertension even without comorbidities.

ADVICE

For health workers, especially nurses, it is necessary to pay attention to the management of grade 1 hypertension even without comorbidities.

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