
The Correlation between Hypertension and Cognitive Function

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ABSTRACT

Background: Rapid increase in Indonesia health development lead to increase in life expectancy. This demographical shift implicated in altering disease pattern to dominate be degenerative diseases, such as hypertension. Hypertension affected morbidity and mortality rate significantly. Hypertension also known to correlated with increasing risk in cerebrovascular diseases that continue to cognitive function disorders such as vascular dementia.

Objective: To know the relationship between hypertension and cognitive function.

Methodology: Using cross-sectional design with comparative study. Blood pressure measured by using sphygmomanometer and stethoscope, while cognitive function measured by using Mini Mental State Examination (MMSE) and Raven Progressive Matrices (RPM). This research was held in M. Djamil Hospital, Puskesmas Nanggalo Siteba, Puskesmas Padang Pasir, Puskesmas Alai, Puskesmas Andalas, Puskesmas Seberang Padang dan Puskesmas Pauh with consecutive sampling technique

Result: There is no significant differentiation based on age and gender in hypertension and normotensive sample. There is significant differentiation in cognitive function in hypertension and norm tension sample ($p\text{-value} < 0,05$). Hypertension sample will have 7,8 times risk to had cognitive function disorders than normotensive sample (measured using MMSE; OR: 7,8). Hypertension sample will have 3,3 times risk to had cognitive function disorders than normotensive sample (measured using RPM; OR: 3,3).

Conclusion: There is significant differentiation in cognitive function in hypertension and normotensive sample. Hypertension subject will have 3,3 to 7,8 times risk to had cognitive function disorders than normotensive

Keywords: *Cognitive Function, Dementia, Hypertension, MMSE, RPM*

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1. INTRODUCTION

Comprehensive and sustainable development brought many improvements in various fields, one of which is the health that has encouraged the increase of life expectancy (UHH=Usia Harapan Hidup) of Indonesian society. Ministry of Health Republic of Indonesia (MOH) in 2007 predicts UHH in 2025 will reach age 73,7 years. According to the World Health Organization (WHO) report from 1985 to 2025 there are some countries that will experience an increase in the parent population¹

The demographic shift in Indonesian society has serious implications of changing the pattern of diseases among people from infectious and contagious diseases replaced by degenerative diseases¹. One of the degenerative diseases that many suffered by the old person population is hypertension whose incidence rates tend to increase over time. According to WHO, at present, hypertension is not only a health problem in developed countries, but it is a pandemic health problem that significantly affects the high rate of morbidity, as well as mortality. In Asia Pacific and Southeast Asia, the prevalence of hypertension varies from 5 to 47% in males and 7 - 38% in women. The incidence of hypertension is actually even higher because of the increased obesity and metabolic syndrome²

In Indonesia, the incidence of hypertension also increases from time to time. Descriptive epidemiological studies have been conducted to report that there are varied numbers in various places. The lowest figure was in the valley of Baliem Valley, Papua (0.65%), while the highest number was found in Sukabumi which reached 28.6% and then for West Sumatera province in 1974, hypertension prevalence varied from 7.30% to 19.40% prevalence in Jakarta amounted to 14.9%³.

The recent data indicate that nationwide approximately 35 million Indonesians suffer from hypertension, even the incidence of hypertension has been found since adolescence¹.

Hypertension significantly affect the health condition of a person in which the various functions begin to decline, the increased risk of memory loss, the ability to take care of themselves that is very important in daily life. Hendaya is important and fundamental to those who suffer from hypertension in adulthood to old age is the disruption of cognitive function. One of the cognitive dysfunction disorders associated with hypertension is the occurrence of dementia⁴

Dementia is a cognitive decline syndrome that manifests as a memory disorder that interferes with its work, social activities or relationships with others by two or more other cognitive modality disorders: orientation, attention, abstract thinking, language function, visuospatial function, executive function and praxis¹

The association of hypertension and impaired cognitive function has long been studied. Hypertension is known to be associated with an increased risk of cerebrovascular disease that continued with impaired cognitive function as occurred in vascular dementia. Based on the results of the study it is suspected that a combination of brain vascular lesions and substrate damage Alba is often found in patients with hypertension who have cognitive dysfunction without previous stroke¹. Another study described that the occurrence of cognitive dysfunction in hypertensive patients may increase the risk of Alzheimer's disease, due to micro blood vessel disorders, ischemia, oxidative stress and inflammation¹.

The association of hypertension with impaired cognitive function is not known clearly. A study that examined cognitive function for 378 hypertensive patients and compared with 366 subjects of normotensive and was associated with hyperinsulinemia⁸. The results showed that cognitive function of hypertensive sufferers was more disturbed in almost all items of cognitive function examined, although only 5 of the 19 items differ but these are statistically significant. In the hypertensive group with hyperinsulinism (fasting insulin levels > 17.9 ml / L) had a lower score than the group without insulin and normotensive. This difference is significant and is seen in 11 items of cognitive function examined such as numeracy, calculation, language, semantic memory and problem solving. It was concluded that hypertensive patients with hyperinsulinemia showed poorer neuropsychological examination results from the control group, as it required more complex thinking skills⁹.

Based on the background that has been described the problem to be studied is: Is there a relationship of cognitive function disorder with hypertension?

2. MATERIALS AND RESEARCH METHOD

The design used in this study is cross-sectional with comparative study where the dependent and independent variables are examined in the same time. The data on blood pressure (hypertension) as an independent variable will be obtained from measurements using tensimeter (spigmomanometer) and later stethoscope for data on cognitive function impairment as dependent variable which will be obtained by using Mini Mental State Examination (MMSE) and Raven Progressive Matrices (RPM) by a neurologist. Prior to the implementation of the research, ethical approval was requested to the Research Ethics Committee of the Faculty of Medicine, Andalas University and the Research Ethics Committee of RS DR. M. Djamil, Padang. The research was conducted at several places, namely M. Djamil Hospital Polyclinic, Nanggalo Siteba Community Health Center, Padang Pasir Puskesmas, Alai Community Health Center, Andalas Health Center, Puskesmas Seberang Padang and Pauh Puskesmas.

At first time, all patients who visited the polyclinic and puskesmas with hypertension measured blood pressure and then identified as prospective research subjects. Then, the researcher interviewed the candidate subject of research to explained the purpose of the study. After the subjects received an explanation and declared their consent to participate in the study, they signed an 'informed consent' form. Further tests are performed to rule out central nervous system disorders affecting cognitive function, excluding possible complications of renal hypertension by examination of urea and creatinine (renal function), EKG examination for cardiac examination, and examining the physical function to identify strokes and other neurological disorders that interfere with cognitive function. Further examination of cognitive function by specialist neurologist (neurologist) used MMSE and REM, so that the researcher got 2 groups of participant that is case and control.

Two members of the research team (accompanying researchers) conducted a review of the completeness and value of the data included, and besides the companion researcher had the responsibility of coding the data. Their efforts are to check any deficiencies or incomplete records before the data form is submitted for data entry. The form that has been reviewed and received then stored in the computer (temporary data files). The last step is to describe the data and do the coding, which then the data is ready to be analyzed.

The data that has been obtained from blood pressure, MMSE and RPM checks done manually by using quantitative data processing and computer program SPSS 12.00 for window and presented in tabular form and followed by t-test. The result of statistical analysis is significant if $p < 0,05$ is obtained.

3. RESEARCH RESULT

The study was conducted in March - August 2010 involving 152 subjects who were divided into groups of study subjects ($n = 76$) and control ($n = 76$). Sample selection was done consecutively with blood pressure checks, and samples were taken according to inclusion and exclusion criteria.

Tabel 1.1 Characteristics of Research Subjects

Characteristic	Hipertensi (n = 76)	Normotensive (n = 76)	p value
Age, year	54,22 ± 7,51	54,16 ± 6,94	0,95
Gender			
Male	21 (27,6%)	17 (22,4%)	0,454
Female	55 (72,4%)	59 (77,6%)	
Duration of education (yr)			
0-4	17 (22,4%)	18 (23,7%)	0,252
5-8	12 (15,8%)	16 (21,1%)	
9-12	30 (39,5%)	34 (44,7%)	
>12	17 (22,4%)	8 (10,5%)	
MMSE	25,8 ± 2,81	27,62 ± 1,77	0,001
RPM	25,07 ± 11,13	30,28 ± 10,03	0,003

In this study it can be seen that the mean age in the hypertension group was 54.22 ± 7.51 years and the normotency group was 54.16 ± 6.94 years. There was no significant difference between the two groups where from the statistical analysis of independent test t-test obtained $p > 0,05$. Distribution of gender and length of education in hypertension and normotency group with statistical analysis of chi-square test also no significant difference ($p > 0,05$). The mean values of MMSE and RPM between the two new groups showed a significant difference with $p < 0.05$.

Tabel 1.2 Hypertension Relation with MMSE Value

RPM	Blood Pressure				P value	OR	95% CI
	Hipertensi		Normotensive				
	F	%	F	%			
Sub Normal	50	65,8	15	19,7			
Normal	26	34,2	61	80,3	0,001	7,8	3,7-16,3
Total	76	100	76	100			

OR: *odds ratio*, CI: *confidence interval*

Table 1.2 showed that the relationship of hypertension with MMSE values. In the hypertension group, MMSE score under normal was 50 subjects (65.8%) whereas in the normotensive group the MMSE score was below normal for 15 subjects (19.7%). Statistically, there was a significant correlation between hypertension and MMSE value under normal with $p < 0,05$ and OR = 7,8 (95% CI; 3,7-16,3), where hypertension patient risked experiencing MMSE under normal 7.8 times than normotensive.

Tabel 1.3 Hypertension Relation with RPM Value

RPM	Blood Pressure				p	OR	95% CI
	Hipertensi		Normotensive				
	F	%	F	%			
Sub Normal	53	69,7	31	40,8			
Normal	23	30,3	45	59,2	0,001	3,3	1,7-6,5
Total	76	100	76	100			

OR: *odds ratio*, CI: *confidence interval*

In table 1.3 showed that the relationship of hypertension with RPM value. Obtained in hypertension group whose RPM value was below normal, as many as 53 subjects (69,7%) while normotensive group got the value of RPM under normal counted 31 subjects (40,8%). The result of statistic test also showed a significant relationship between hypertension and RPM value under normal with significance $p < 0,05$ and OR = 3,3 (95% CI: 1,7-6,5), which means that hypertension patient at risk of malfunction cognitive with RPM examination 3.3 times compared to normotensive group.

4. DISCUSSION

This study found a significant association between hypertension and cognitive function assessed with MMSE and RPM instruments. The previous studies conducted with cross-sectional methods linked hypertension and mild cognitive impairment, performed on subjects of 918, of which 292 were normotensive and 626 hypertensive (mean age 76 years)¹. A neuropsychological examination was performed with MMSE, a Boston Naming test for the language, and the Wechsler Adult Intelligence Scale-Revised for abstract thinking. The study concluded that a history of hypertension was associated with a risk of mild cognitive impairment. The stronger associations were seen in mild nonamnestic cognitive impairment than amnestics in advanced age¹⁰. From the results of the study showed that the prevention and treatment of hypertension can have a strong influence in reducing the risk of cognitive impairment.

The similar research had also been conducted on 529 participants by dividing it into two groups¹ At range age 18 - 46 years old is the first age group, and age 47 - 83 years of age is second age group. The cognitive function is rated by the Wechsler Adult Intelligence Scale test. The results obtained, in which high systolic blood pressure, diastolic blood pressure, and mean arterial pressure were significantly associated with decreased cognitive function in both groups. In young adult groups blood pressure is susceptible to decreased cognitive function as it did in older age.

In another study that assessed the association between cognitive function and hypertension found that attention and memory were inversely related to blood pressure and duration of hypertension. The study conducted on 1,373 men and women with an average age of 65 years and systolic blood pressure ≥ 160 mmHg and diastolic blood pressure ≥ 95 mmHg, it found an association between blood pressure to decreased cognitive function in MMSE. Individual with untreated hypertension have a 4.3-fold risk for decreased cognitive function³.

The other researchers linked systolic blood pressure in middle age with impaired cognitive function. This cross-sectional study also found that systolic blood pressure is at risk for Alzheimer's disease, but not at diastolic blood pressure³.

In a cross sectional study of hypertensive patients (2252 subjects), the mean value of MMSE 29 and concluded blood pressure with weak cognitive function was associated with age and education level²

5. CONCLUSIONS AND RECOMMENDATIONS

This study concluded that there is a relationship between cognitive function disorder with hypertension. Patients suffering from hypertension have a risk of 7.8 times to have an under normal MMSE score and 3.3 times more likely to have a RPM below normal.

Some informations that can be suggested by the researcher were: 1) Need to do further research about relationship of cognitive function disorder with other pro-inflammatory cytokines in hypertension 2) Need to do further research about type of cognitive dysfunction that happened in hypertension patient.

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