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COGNITIVE FUNCTION IMPAIRMENT IN HYPERTENSION PROLANIS PATIENTS AT FAMILY PHYSICIAN CLINIC FACULTY OF MEDICINE UNIVERSITAS MUHAMMADIYAH PALEMBANG

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ABSTRACT

Hypertension is a chronic medical condition characterized by an increase in blood pressure. The incidence of hypertension continues to occur and increase, whereas further complications such as cognitive function impairment which will interfere the quality of life can be prevented by knowing the risk factors. Many factors can affect cognitive function impairment including genetic factors, lifestyle, age, and other diseases such as hypertension. The purpose of this study was to determine factors affecting cognitive function impairment in hypertension prolanis patient at the Family Physician Clinic Faculty of Medicine,Universitas Muhammadiyah Palembang. Type of this research was an analytic observational study with a cross-sectional research design. The population in this study were Prolanis participants at the Family Physician Clinic, Faculty of Medicine, Universitas Muhammadiyah Palembang, totaling 30 respondents obtained by total sampling technique. The instrument for measured cognitive function was a Mini Mental State Examination (MMSE) questionnaire while hypertension and other data were taken based on medical records, blood pressure measurements and direct interviews with respondents. The data was analyzed using the chi-squere test and fisher as an alternative. Based on the results of this study, there was a significant relationship between stage of hypertension (p value 0.006) with impaired cognitive function and there was no significant relationship between age (p value 0.269), gender (p value 1.000), education (p value 1.000), family function (p value 1.000), BMI (p value 0.269), and duration of hypertension (p value 0.269) to impaired cognitive function. Stage hypertension can affect cognitive impairment in hypertensive patients.

Keywords: Impaired Cognitive Function, Hypertension, Prolanis

Introduction

Hypertension is a systolic blood pressure value of 130 mmHg or more and/or a diastolic blood pressure of more than 80 mmHg. Hypertension ranks among the most common chronic medical conditions characterized by a persistent increase in arterial pressure. [1] The World Health Organization (WHO) estimates the current global prevalence of hypertension at 46% of the total world population. The prevalence of hypertension is highest in Africa at 27%. Southeast Asia ranks 3rd highest with a prevalence of 25% of the total population.[2,3] Previous studies have revealed that long-term hypertension can cause a decrease in cognitive function, which will

certainly greatly impair the quality of life of sufferers [4]. Cognitive impairment is a disorder associated with increasing age. This disorder causes a decrease in brain function related to the ability of attention, concentration, calculation, decision making, reasoning and abstract thinking. In elderly people there is a tendency to decrease functional capacity both at the cellular level and at the organ level in line with the aging process. Cognitive function impairment is an important problem in old age although the cause is not yet clear. [5,6]

Hypertension likely contributes to cognitive decline through decreased cerebral perfusion, which may affect multiple brain areas. Hypertension can reduce cerebral fluid and increase the occurrence of ischemic or anoxic lesions in the brain, especially in the hippocampal area. This causes a decrease in memory ability on neuropsychological tests. [7,8] The role of the family in cognitive function problems that are often faced by the elderly here is very important. The family is the smallest unit of society and best understands the conditionality of its family members. In addition, the family has the main role to minimize the problem of mental (cognitive) disorders in their elderly family members and maintain their health. There are several family roles that can be carried out to reduce cognitive problems experienced by the elderly, including maintaining and caring for the elderly, training their mental endurance, maintaining social and economic changes, and continuing to provide motivation.[9] Family social support is considered important for the elderly so that it can prevent cognitive decline. If cognitive function is not addressed immediately, the elderly will experience cognitive damage to the stage of dementia. Dementia is an intellectual disorder that inhibits work and social functions. These cognitive impairments will reduce the ability of the elderly to perform daily activities. Social support needs to be improved because it can reduce the effects of stress and directly improve the mental health of individuals and families. Family social support is an important coping strategy that exists in times of stress for families. Social support can also function as a solution strategy to reduce stress and its negative consequences.[10] There were still few previous studies that discuss about cognitive function in hypertensive patients and their risk factors. This study was conducted to assess cognitive function impairment in prolanis hypertension patients at the Family Doctor Clinic Faculty of Medicine Universitas Muhammadiyah Palembang.

Methods

The type of research used was analytic observational research with a cross-sectional research design. The research sample was taken with total sampling technique with a sample size of 30 respondents. The research sample was prolanis (Program Pengelolaan Penyakit Kronis) participants at the Family Doctor Clinic, Faculty of Medicine Universitas Muhammadiyah Palembang who met the inclusion criteria and were not included in the exclusion criteria. Inclusion Criteria were all Prolanis respondents who are willing to become research subjects and diagnosed

with hypertension. Exclusion Criteria included psychiatric disorders, organic mental disorders such as Alzheimer's or Dementia, history of stroke or other cardiovascular disease, suffering from illiteracy, hearing, and communication impairment. The measurement for cognitive imparment is the Mini mental state examination (MMSE) questionnaire which includes 11 assessment items used to assess attention and orientation, memory, registration, recall, calculation, language skills, and the ability to draw complex polygons. if the total score is 25 points or more is categorized as normal, 21-24 points as mild cognitive impairment, 10-20 points as moderate cognitive impairment, 0-9 points as severe cognitive impairment. Hypertension and other data were taken based on medical records, blood pressure measurements and direct interviews with respondents. Data were analyzed univariately and bivariately using the chi squere test/fisher test.

Results

Data from 30 respondents were obtained on age, gender, education, occupation, alcohol consumption, smoking, BMI, stage of hypertension, duration of hypertension, history of drug, family history, family function and impaired cognitive function as follows:

Based on the table above, the most respondents were at the age of ≥ 60 years, namely 17 people (58.1%) while age 45-59 years were 13 people (41.9%). Most respondents were female, namely 28 people (93.3%) and male as many as 2 people (6.7%). The most respondents with lower education were 23 people (76.7%), followed higher as many as 7 people (23.3%). 29 respondents did not work (96.7%) and only 1 person (3.3%) who worked. Respondents in this study did not consume alcohol (100%), did not have family history of cognitive function impairment (100%) and did not smoke were 29 people (96.7%) and only 1 person (3.3%) smoked. 29 respondents with good family function (96.7%) while 1 person (3.3%) with poor family function. Respondents who were obese were 13 people (43.3%) and those who were not obese were 17 people (56.7%).

Most respondents with stage I hypertension were 23 people (76.7%) while respondents with stage II hypertension were 7 people (23.3%). Respondents with hypertension <5 years were 17 people (56.7%) while respondents with hypertension >5 years were 13 people (43.3%). Respondents routinely control or seek treatment (100%) and respondents with or without cognitive function disorders were 15 people each (50%).

Table 1. Characteristic, lifestyle, Hypertension and Cognitive Function of Respondents

	f (n=30)	%
Age		
45-59 years	13	41.9
≥ 60 years	17	58.1
Gender		
Male	2	6.7
Female	28	93.3
Education		
Lower	23	76.7
Higher	7	23.3
Occupation		
Yes	1	3.3
No	29	96.7
Family History		
Yes	0	0
No	30	100
Family Function		
Poor	1	3.3
Good	29	96.7
Alcohol consumtion		
Yes	0	0
No	30	100
Smoking		
Yes	1	3.3
No	29	96.7
BMI		
Obesity	13	43.3
Normal	17	56.7
Stage of Hypertension		
Stage 1	23	76.7
Stage 2	7	23.3
Duration Hypertension (years)		
>5 tahun	13	43.3
< 5 years	17	56.7
Regular medication		
No	0	0
Yes	30	100
Impairment Cognitive Function		
Yes	15	50
No	15	50

The following is the distribution of MMSE scores obtained from all respondents:

Table 2: Distribution of Cognitive Function Impairment

MMSE	Mean
Orientation	
Time	3.73
Place	4.23
Registration	3.00
Attention and Calculation	4.57
Recall	1.50
Language	
Naming of Objects	1.83
Subtraction of a String of Words	1.00
Performing Commands	1.33
Reading and Performing Commands	1.00
Writing Words	0.93
Imitating pictures	0.80

Based on Table 2 above, it is known that in this study the mean score of time orientation 3.73, place orientation 4.23, registration 3.00, attention and calculation 4.57, recall 1.50, Naming of Objects 1.83, Subtraction of a String of Words 1.00, performing commands 1.33, reading and performing commands 1.00, writing words 0.93 and imitating pictures 0.80.

The following are the results of bivariate tests of factors that affect cognitive function impairment:

Table 3. Factors Affecting Cognitive Function Impairment

	Cognitive Function Impairment				Total		p value
	Yes		No				
	f	%	f	%	f	%	
Age							
60-90 years	10	33.3	7	23.3	17	56.7	0.269
45-59 years	5	16.7	8	26.7	13	43.3	
Gender							
Male	1	3.3	1	3.3	2	6.7	1.000
Female	14	46.7	14	46.7	28	93.9	
Education							
Lower	12	40	11	36.7	23	76.7	1.000
Higher	3	10	4	13.3	7	23.3	
Occupation							
Yes	0	0	1	3.3	1	3.3	1.000
No	15	50	14	46.7	29	96.7	
Family Function							
Poor	1	3.3	0	0	1	3.3	1.000
Good	14	46.7	15	50	29	96.7	
BMI							
Obesity	5	16.7	8	26.7	13	43.3	0.269
Normal	10	33.3	7	23.3	17	56.7	
Stage of Hypertension							
Stage 2	7	23.3	0	0	7	23.3	0.006
Stage 1	8	26.7	15	50	23	76.7	
Duration Hypertension (years)							
>5 tahun	8	26.7	5	16.7	13	43.3	0.269
< 5 years	7	23.3	10	33.3	17	56.7	

Based on the table above, it is known that respondents with stage I hypertension have impaired cognitive function as many as 8 people (26.7%) while there are no cognitive function disorders as many as 15 people (50%). A total of 7 people (23.3%) respondents in stage II hypertension all had impaired cognitive function. From the statistical results of the Fisher test obtained p-value of 0.006 ($p < 0.05$) which indicates that there is a relationship between stage of hypertension and impaired cognitive function. Based on the table above, it is known that none of the variables like age, gender, education, occupation, family function, BMI, duration of hypertension have a relationship with impaired cognitive function (p value < 0.05).

Discussion

Based on age according to the result shows the largest age group of respondents is in the age group ≥ 60 years. Based on the results of the analysis, there is no significant relationship between age and impaired cognitive function (P = 0.296). This is different from the other research which shows there is a positive relationship between age and impaired cognitive function. Based on theory, with increasing age, a person will begin to lose neuron cells and begin to form neurofibrillary tangle and neurite plaque in the brain. This disrupts the impulse delivery system, causing a decrease in cognitive function. [11]

The largest group of respondents' gender was female (93.3%). This happens because the life expectancy of women is higher than men. Increasing life expectancy results in an increase in the number of elderly so that with the high life expectancy of people who are female, the number of elderly who are female is more than the elderly who are male. Based on the analysis, there is no significant relationship between gender and cognitive function impairment (p value=1,00). The results of this study are supported by other research which states that there is no significant difference between men and women in maintaining cognitive function.[12] This is not in line with other research which states that there is a significant relationship between gender and impaired cognitive function, where women experience more cognitive probable than men. Based on theory, women in old age will experience a decrease or even loss of the sex hormone estradiol, which plays an important role as a neuroprotective agent that protects nerve cells. This hormone has receptors in brain regions that play a role in regulating memory function. The difference in the results of this study with previous findings can be related to the unbalanced ratio between female and male samples, as well as other factors such as physical activity, education, cognitive activity, and social involvement which can also influence so that the elderly can better maintain their cognitive function. [13]

Based on the level of education according to this study, the highest was lower education. It was found that there was no significant relationship between education level and cognitive function impairment (p= 1,00). This is in line with other research which states that education level does not affect cognitive impairment. This is different from previous research which states that there is a relationship between education level and cognitive impairment. This relates to the theory of synaptic reserve hypothesis, where highly educated people have more synapses in the brain than people with low education. When the synapse is damaged due to a process of cognitive impairment, then another synapse will replace the damaged place.[14] The difference in the results of this study with previous findings is due to various factors. This is due to the existence of other factors that influence the incidence of cognitive function decline. The presence of intellectual stimulation, social engagement, and socialization. said that intellectual stimulation, social engagement, or adequate physical activity increases neural synaptogenesis, which reduces the risk

of cognitive function impairment. Synaptogenesis is the formation of connections between nerve cells. Synaptogenesis is influenced by synapses which are the link between nerve cells.[15] Based on ccupation according to the table shows more respondents who do not work. Based on the table of sociodemographic characteristics with cognitive decline, there is no relationship between occupation and impaired cognitive function. This can be influenced by various factors, such as physical activity carried out by respondents. Adequate social support from family has a relationship with reduced mortality and can improve cognitive function status mortality and can improve cognitive function status for the better. Elderly people who get adequate family support tend not to experience a decrease in cognitive ability and only experience moderate cognitive function impairment. Cognitive abilities and only experience moderate cognitive function impairment, while the elderly who get less family support tend to experience moderate to severe cognitive decline. Less family support tend to experience moderate to severe cognitive decline.[16]

Based on the BMI table show more respondents who are not obese. This proves that nutritional adequacy in the elderly is quite good. There is no significant relationship between BMI and impaired cognitive function. This is in line with the research which states that there is no relationship between nutritional status and cognitive function in the elderly.[17] This study is different from the other results which says there is a relationship between nutritional status and cognitive function of the elderly. The cause of the absence of a relationship between BMI and cognitive function can be caused by various factors such as possible lack of accuracy when measuring BMI. The physiology that occurs in the elderly is the shrinkage of the invertebral disc which causes a decrease in height. This is closely related to the calculation of the height of the respondent. Another possibility is that there are other variables associated with cognitive function in the elderly such as level of independence, frailty, and hearing loss. [18]

In the results of the study, it was found that most research respondents experienced stage I hypertension as many as 23 people (76.7%). This is in line with Indrayani and Purnawati's research (2020) on the stage of hypertension in the elderly who experience cognitive impairment in Dauh Puri Kelod Village, West Denpasar, the study's elderly experienced the most grade 1 hypertension, as many as 40 people (57.1%). [5] This is also supported by other researche at the Samalantan Health Center, West Kalimantan. stated that the stage of hypertension of the most patients in the study was grade I as many as 17 people (47.2%). It was found that many respondents experienced hypertension <5 years, as many as 17 people (56.7%). This is not in line with the study's elderly had the most hypertension ≥5 years as many as 50 people (71.4%). [5,13] This is also not in line with the research of Suputra that found most patients studied had a length of hypertension ≥5 years as many as 55 people (65.5%). It was found that the majority of research respondents routinely controlled treatment as many as 30 respondents (100%). This is the same as research by Emiliana regarding compliance with control of hypertension patients at the Pisangan Jakarta Health Center

as many as 144 patients (54.5%) routinely control treatment. Respondents routinely control treatment, this shows good compliance, explained that regular control can determine the effectiveness of treatment and the patient's response to therapy. Some things that need to be considered in blood pressure control, among others: evaluation of the possibility of orthostatic hypotension and other side effects of therapy, the possibility of decreasing drug doses, laboratory tests (electrolytes and kidney function), and checking the risk of organ damage. [19–21] In this study, respondents who had a family history of hypertension were 12 people (40%). This is in line with research by Arum, namely a family history of hypertension is related to the incidence of hypertension. This is because genetic factors in certain families will cause the family to have a risk of suffering from hypertension.[22]

Each respondent experiences with or without cognitive impairment. This proves that a chronic increase in blood pressure is thought to increase the effects of aging on brain structure. Based on table 3 shows that there is a significant relationship between hypertension and impaired cognitive function. This is in line with the research which states that there is a correlation between hypertension and cognitive function in the elderly. This is also supported by research which says there is a relationship between hypertension and cognitive function of the elderly. The cause of the absence of a relationship between hypertension and cognitive function can be caused by a decrease in brain function. One of the complications of hypertension in the central nervous system besides stroke can also cause a decrease in cognitive function, one of which is memory function which, if left chronically, can cause dementia (vascular cognitive impairment). [23,24] This is in line with the research found by Rizky that obtained the results of the Chi-square test between the relationship between hypertension and decreased cognitive function with p value of 0.009 ($p < 0.05$). This shows that there is a significant relationship between hypertension and decreased cognitive function. The odd ratio value of 5.762 indicates that the elderly who experience hypertension have a risk of 5.762 times experiencing a decrease in cognitive function than the elderly who do not experience hypertension. Hypertension likely contributes to cognitive decline through decreased cerebral perfusion, which may affect several areas of the brain. Hypertension can reduce CBF and increase the occurrence of lesions due to ischemia or anoxia in the brain, especially in the hippocampal area. This causes a decrease in memory ability on neuropsychological tests. [7]

Chronic increases in blood pressure can increase the effects of aging on brain structures, including reduction of white and gray substance in the prefrontal lobe, decreased hippocampus, increased hyperintensity of white substance in the frontal lobe. Complications of hypertension related to the brain are vascular remodeling resulting in cerebral autoregulation disorders, lesions in the substantia alba, lacunar infarcts, and brain changes like alzheimer's dementia such as amyloid and cerebral atrophy. And the longer if left unchecked, it will further aggravate the lesions in the substantia alba and lacunar infarction, so that cognitive function impairment will also be

more severe.[24] Hypertension is a cardiovascular disease that occurs due to an increase in blood pressure. Chronic hypertension will make cerebral vascular smooth muscle cells proliferate. The proliferation results in a narrower lumen and thicker blood vessel walls so that the nutrients carried by the blood to the brain tissue will be disrupted. Cells in neurons will become ischemic if not treated immediately. When ischemia occurs, the ion pumps needed by ATP will not function so that sodium and calcium ions will be trapped in neuronal cells. Sodium will pull H2O into the cell so that it becomes oedema. Calcium will activate glutamate and become a cytotoxic substance for cells. Sodium and calcium will eventually make neuron cells die and cause impaired cognitive function. [25]

Conclusion

Based on the description above, it can be concluded that stage of hypertension is one of the factors that have a major influence on the incidence of cognitive function impairment in Prolanis patient. Hypertensive patients are expected to control their blood pressure by taking medication regularly, maintaining ideal body weight, diet and routinely checking their health at health facilities.

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Conflict of Interest

This research has no conflict of interest with any party.

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