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Positive correlation of Hypertension and Cognitive Function of Elderly

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Abstract

Biological changes in the elderly are one of the triggers for the emergence of hypertension which can cause changes in cognitive function. The purpose was to analyze the correlation between hypertension and cognitive function in the elderly. The design was correlation descriptive research design with the cross-sectional approach. The sampling technique was purposive sampling, the number of samples of respondents was 56 people. The research was conducted at Integrated Healthcare Center Elderly, Malang City. The instrument used to while the cognitive function in the elderly uses the MMSE. Analysis used the Spearman rank test with an alpha value of 0.05 (95% CI). The results showed that there was a significant correlation between hypertension and cognitive function in the elderly (r=0.532 and p=0.000). The direction of the correlation is positive, meaning that the more severe hypertension suffered by the elderly, the more severe they will tend to experience more severe cognitive function impairments. Based on the results of this study, it is recommended for people with hypertension do blood pressure screening and undergo hypertension treatment regularly. This is very important so that prevention and treatment can be carried out earlier to prevent more severe cognitive impairment.

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INTRODUCTION

Hypertension is characterized by an increase in systolic blood pressure 140 mmHg and/or diastolic blood pressure 90 mmHg which persists at a certain time. Symptoms that usually appear in people with hypertension are headache/heaviness in the neck, vertigo, heart palpitations, fatigue, blurred vision, ringing in the ears, and nosebleeds.(Ismaya, Kusumawati and Murti, 2017). The development of lifestyle causes an increase in the incidence of hypertension in the community. Fifty percent of the elderly (aged 60 years) suffer from hypertension, which contributes to an increase in the mortality rate of the elderly per year. One of the complications of hypertension in the central nervous system besides stroke can also cause a decrease in cognitive function(Sari et al., 2019).

Cognitive function is a human mental process that includes attention, perception, thought processes, knowledge, and memory. Approximately 75% of the human brain is a cognitive area. Changes in cognitive function that occur in the elderly are reduced intellectual function abilities, reduced efficiency of nerve transmission in the brain which results in slowing down of information processing and a lot of information is lost during transmission, reduced ability to absorb new information and retrieve information from existing memories, and the ability to remember events. the past is better than the ability to remember recent events.(Ismaya, Kusumawati and Murti, 2017)

Chronic hypertension will make the smooth muscle cells of the brain's blood vessels proliferate. This proliferation causes the lumen to become narrower and the walls of the blood vessels to become thicker so that the nutrients carried by the blood to the brain tissue are also disrupted. Neuron cells in the brain will experience ischemia if not treated immediately. When ischemia occurs, the ion pump that requires ATP will not function so sodium and calcium ions will be trapped in neuronal cells. Sodium will attract H2O into the cell so that it becomes edema. Calcium will activate glutamate and become a cytotoxic substance for cells. The sodium and calcium will eventually make the neuron cells die and cause impaired cognitive function.(Ismaya, Kusumawati and Murti, 2017)

Impaired cognitive function is a serious health problem that can cause psychological, and socio-economic impacts in the form of social isolation and financial difficulties, motor retardation, aggravating other symptoms and can reduce the quality of life. Mathur and Moschis explain that a person's cognitive changes are due to the biological changes they experience and are generally associated with the aging process (Full Moon, 2018).

Several previous studies have revealed that long-term hypertension can cause a decrease in cognitive function that interferes with the patient's quality of life. Preliminary studies in the research area show that screening for cognitive function in the elderly with hypertension has never been carried out. Based on the above background, the researchers are interested in researching the topic of the correlation between hypertension and cognitive function in the elderly.

METHODS

This study used a correlation descriptive research design with a cross-sectional approach, which was a type of research that emphasizes the timing of measurement or observation of free and bound variable data carried out at the same time. This research was conducted on the elderly at the Posyandu for the Elderly of Gadingkasri Village, Puskesmas Working Area with Malang City from May to July 2022. The population in this study was all elderly people who were registered in the Posyandu (integrated health service) for the elderly of Gadingkasri Village, Puskesmas Working Area with Malang City, totaling 96 people.

The samples in this study were elderly people who had hypertension who were taken using purposive sampling techniques of 56 people. The independent (free) variable in this study is a hypertensive disease while the dependent (bound) variable is the cognitive function of the elderly. The instrument in this study used a questionnaire to obtain general data on respondents and an MMSE (Mini Mental Status Exam) questionnaire with modifications in Indonesian to identify cognitive aspects and mental functions of respondents and take respondents' blood pressure measurements using a tension meter device.

Data collection techniques go through the preparation and sample determination stages. Data processing is carried out by editing, coding, scoring, and tabulating. Data analysis is carried out by entering data into the SPSS program. Data analysis includes a univariate analysis where all variables are analyzed using software-assisted descriptive analysis and bivariate analysis to see the correlation between hypertension disease and the cognitive function of the elderly. The statistical test used is the

Spearman rank test, with an alpha value of 0.05 (CI 95%).

RESULTS

The results of the frequency distribution recapitulation collected from the questionnaire on the demographic characteristics of the respondents can be seen in the following table.

Table 1: Respondent's Demographic Frequency Distribution

Demographic Data		Frequency	Percentage (%)
Gender	Man	10	17.9
	Woman	46	82
Age	60-69 yrs	42	75
	70-79 yrs	11	19.6
	80-89 yrs	3	5.4
Education	SD	33	58.9
	JUNIOR HIGH SCHOOL	17	30.4
	SENIOR HIGH SCHOOL	6	10.7
Work	Housewives	42	75.0
	Retired	7	12.5
	Self-employed	7	12.5
Marital Status	Not married	1	1.8
	Marry	50	89.3
	Widow	5	8.9
Religion	Islam	50	89.3
	Christian	6	10.7
Long Suffering	less than 1 year	1	1.8
	1 to 5 years	46	82.1
	6 to 10 years	8	14.3
	More than 10 years	1	1.8
Medication History	Not yet	1	1.8
	Seldom	1	1.8
	Routine	54	96.4
Other Diseases (Comorbid)	None	40	71.4
	Diabetes	8	14.3
	joint pain	3	5.4
	Heart	3	5.4
	stomach	2	3.6

Table 2: Frequency distribution of degrees of hypertension

Systolic Pressure (mmHg)	Diastolic Pressure (mmHg)	Hypertension	Frequency	Percentage (%)
140 – 159	90 – 99	Mild	30	53.6%
160 – 179	100 – 109	Moderate	23	41.1%
>180	110	Severe	3	5.3%
		Amount	56	100.0%

Source: Processed primary data (2022)

Based on the results of a study of 56 elderly people in the elderly posyandu of Gadingkasri Village, Puskesmas Working Area with Malang City, data was obtained that as many as 30 people (53.6%) had mild hypertension. This sentence should be in the method.

Table 3: Frequency Distribution of Elderly Cognitive Functions

Elderly Cognitive Functions	Frequency	Percentage (%)
No cognitive impairment	5	8.9%
There is moderate cognitive impairment	41	73.2%
There is severe cognitive impairment	10	17.9%
Total	56	100%

Source: Processed primary data (2022)

Based on the results of research on 56 elderly people at the Posyandu for the elderly, Gadingkasri Village, the Working Area of the Bareng Health Center, Malang City, it is known that the most elderly (73.2%) elderly experience moderate cognitive impairment.

Cross-Tabulation of the Correlation of Hypertensive Disease with the Cognitive Function of the Elderly

		Cognitive function			Total
		No cognitive impairment	There is moderate cognitive impairment	There is severe cognitive impairment	
Hypertension	Mild	4 80.0%	26 63.4%	0 .0%	30 53.6%
	Moderate	1 20.0%	15 36.6%	7 70.0%	23 41.1%
	Severe	0 .0%	0 .0%	3 30.0%	3 5.4%
Total		5 100.0%	41 100.0%	10 100.0%	56 100.0%

In the results of the crosstabs above, it can be seen that there is a clear tendency where the more severe hypertension suffered by the elderly, the more likely they are to experience more severe cognitive function disorders, and vice versa.

Spearman Correlation Test Results Table

	Spearman correlation coefficient	p-value
The correlation between hypertension and cognitive function in the elderly	0.532	0.000

Based on the results of statistical tests to determine the correlation between hypertension and the cognitive function of the elderly, the Spearman correlation coefficient value is 0.532 with a p-value or significance of 0.000 which is smaller than alpha 0.05 (reject Ho), so it can be concluded that there is a significant correlation between hypertension and the cognitive function of the elderly in the Elderly Posyandu, Gadingkasri Village, Working Area of the Bareng Health Center, Malang City. The direction of the correlation is positive, meaning that the more severe hypertension suffered by the elderly, will cause them to tend to experience more severe cognitive function disorders. And vice versa, the milder hypertension suffered by the elderly.

DISCUSSION

This study found 10 respondents (17.9%) elderly men and 46 respondents (82.1%) elderly women. The results of this study are in line with research conducted by Wahyuniarti, et al., (2017) which examined the correlation between hypertension and cognitive decline in the elderly, with a case-control study that used a sample of 63 hypertension and non-hypertension elderly people aged 60-74 years the Elderly Posyandu, Gadingkasri Village, Working Area of the Bareng Health Center, Malang City, found that as many as 76% of the sample who experienced decreased cognitive function were female, where this number was more than the male elderly sample. Based on data from the 2014 National Socio-Economic Survey (Susenas), the number of elderly women is greater than that of men, namely 10.77 million elderly

women compared to 9.47 million elderly men. The results of the 2014 population census that the proportion of elderly women is higher than the proportion of elderly men, both in urban and rural areas (BPS, 2015). Therefore, the risk of hypertension in women increases after the decrease in the hormone estrogen during menopause. Decreased estrogen will reduce high-density lipoprotein levels and increase low-density lipoprotein levels affecting the process of atherosclerosis formation and causing hypertension.

The results of this study found that 75.0% of the elderly who became the research sample were aged between 60-69 years, which included the category of young elderly. The results of this study are also in line with the research conducted by Wahyuniarti, et al., (2017) which found that 62% of the elderly with hypertension were aged between 60-69 years. In addition, it is also in line with the research results of Akbar, et al. (2020) who examined the characteristics of hypertension in the elderly in Buku village, and found that out of 50 samples of elderly people, there were 92% aged between 60-74 years (elderly). Based on research (Novitaningtyas 2014) confirms that the older you get, the riskier someone has of hypertension. Hypertension will increase with age more than 60 years according to data from the Research and Development Agency, The Ministry of Health of the Republic of Indonesia (2019) which reached 63.8%. At the age of 60-64 years, there is an increase in the risk of hypertension by 2.18 times, aged 65-69 years by 2.45 times, and age >70 years by 2.97 times. This happens because at that age the large arteries lose their flexibility and become stiff because of that blood at each heartbeat is forced to pass through narrower blood vessels than usual and causes blood pressure to rise (Novitaningtyas 2014).

Then for the education level of the respondents, it can be seen that there are 33 elderly people (58.9%) with elementary education, 30.4% of seniors with junior high school education, and 10.7% of the elderly with high school education. The results of this study are in line with research conducted by Taraghi et al., (2016) at the Mazandaran University Teaching Hospital, Iran where the highest level of subject education is in elementary school. This study is not in line with the research conducted by Taufik (2014) which examined the effect of hypertension on cognitive function disorders and divided the level of education into basic education level of 5 (10.29%) subjects, secondary education level of 24 (49%) subjects and higher education level as many as 20 (40.8%) subjects, with the most subjects coming from higher education level. These results are in line with the research of Vadilokias et.al. (2012) which states that higher education (>12 years) makes the subjects in their study have good cognitive performance in the verbal and non-verbal fields during repeated tests for one year compared to the lower education level group (< 12 years old). The results of this study indicate that cognitive impairment occurs in individuals with an education level of more than 12 years. The higher the education, it will increase the density of synapses in the brain and reduce complaints of cognitive impairment. Dementia rarely occurs in people with a high level of education, because of this (Kazman, 2013). 12 years) made the subjects in his study have better cognitive performance in verbal and non-verbal areas during repeated tests for one year compared to the lower educational level group (<12 years).

The results of this study indicate that there is a slowing of cognitive impairment in individuals with an education level of more than 12 years. The higher the education, it will increase the density of synapses in the brain and reduce complaints of cognitive impairment. Dementia rarely occurs in people with a high level of education, because of this (Kazman, 2013). 12 years) made the subjects in his study have better cognitive performance in verbal and non-verbal areas during repeated tests for one year compared to the lower educational level group (<12 years). The results of this study indicate that cognitive impairment occurs in individuals with an education level of more than 12 years. The higher the education, it will increase the density of synapses in the brain and reduce complaints of cognitive impairment. Dementia rarely occurs in people with a high level of education, because of this (Kazman, 2013). The results of this study indicate that cognitive impairment occurs in individuals with an education level of more than 12 years. The higher the education, it will increase the density of synapses in the brain and reduce complaints of cognitive impairment. Dementia rarely occurs in people with a high level of education, because of this (Kazman, 2013). The results of this study indicate that cognitive

impairment occurs in individuals with an education level of more than 12 years. The higher the education, it will increase the density of synapses in the brain and reduce complaints of cognitive impairment. Dementia rarely occurs in people with a high level of education, because of this (Kazman, 2013).

Hypertension is a condition where there is an increase in blood pressure that gives symptoms to a target organ such as stroke for the brain, coronary heart disease for the heart blood vessels, and right ventricular hypertrophy for the heart muscle. (Candra, 2018). Hypertension can occur when blood pressure is greater than the walls of the arteries and blood vessels themselves (WHO, 2019). An uncontrolled increase in hypertension will cause serious liver and heart problems (Mayo Clinic, 2018).

In this study, it was found that 53.6% of the elderly had mild hypertension, 41.1% of the elderly had moderate hypertension, and 5.4% of the elderly had severe hypertension. This is explained by Handayani (2020) that the risk of high blood pressure (hypertension) will increase with age. Approximately 2 out of 3 people over the age of 75 years are estimated to have hypertension. Blood pressure is measured based on the ability of blood to press against the walls of the heart, namely systolic blood pressure (when the heart pumps blood) and diastolic blood pressure (when the heart relaxes).

The elderly are generally considered to have normal blood pressure if the systolic is below 120 and the diastolic is less than 80, or the numbers are stated as 120/80, while a person is said to have hypertension if they have a systolic/diastolic above 130/80. However, please note that blood pressure tends to vary over time, depending on age, activities undertaken, food and drink consumed, and the time of measurement. activities undertaken, food and beverages consumed, and measurement time.

Generally in the elderly, blood pressure is classified as high if it is more than 140/90 mmHg. Things that happen to the body if hypertension occurs in the elderly are severe headaches, dizziness, blurred vision, nausea, ringing in the ears, irregular heartbeat, confusion, fatigue, chest pain, difficulty breathing, blood in the urine, and a pounding sensation in the chest. neck, or ears. Hypertension in the elderly is associated with the aging process that occurs in the body. As a person gets older, blood pressure also increases. Although the aging process is something natural, the elderly with hypertension are still at risk of developing more serious disease complications. Such as stroke, kidney damage, heart disease, blindness, diabetes, and other dangerous diseases.

Impaired cognitive function is a serious problem for the elderly because it causes a decrease in performance on cognitive tasks, especially when making decisions due to delays in processing, working memory, and executive cognitive function. According to Strub et al, cognitive function is a conscious mental activity such as thinking, learning, remembering, and using language. Cognitive function is also the ability of attention, memory, problem-solving, judgment, and executive abilities (planning, assessing, monitoring, and evaluating). (Sibarani RMH, 2014). Measurement of cognitive function in this study using the Mini-Mental State Examination (MMSE) was originally developed for dementia screening but is now widely used for measuring cognitive function in general.

In this study, it was found that 73.2% of the elderly had moderate cognitive impairment. This is explained by Sabarini (2015) that old age is vulnerable to many changes, both physically and psychologically. These changes can be slow or fast. Changes that occur can affect some activities that are routinely carried out. An example of one is the activity of body organs such as the performance of muscles, the brain, and so on. Mental changes experienced by the elderly include changes in personality, memory, and intelligence changes. These changes can occur due to changes in intelligence, as well as decreased memory, such as memory in everyday life, where long-term memory does not change too much, but short-term memory has decreased. That's why old age is synonymous with senility or forgetting everything. In addition, the role of the right brain declines faster than the left brain. This results in impaired alertness function as well as attention from the elderly. Cognitive decline in the elderly also depends on age and gender, especially in women, because in women there is a role for endogenous sex hormones in changes in cognitive function and the function of estrogen receptors in the brain that play a role in learning and memory functions. This results in impaired alertness function as well as attention from the elderly. Cognitive decline in the elderly also depends on age and gender, especially in women, because in women there is a role for endogenous sex hormones in changes in cognitive function and the function of estrogen receptors in the brain that play a role in

learning and memory functions. This results in impaired alertness function as well as attention from the elderly. Cognitive decline in the elderly also depends on age and gender, especially in women, because in women there is a role for endogenous sex hormones in changes in cognitive function and the function of estrogen receptors in the brain that play a role in learning and memory functions.

Some examples of cognitive changes in the elderly include the aging process due to brain performance, where there are changes in the brain associated with age. Every year there is a decrease in volume in each area of the frontal lobe as well as the temporal lobe. This is the volume of the brain accompanied by a decline in cognitive function. Then the influence of the age factor, where with increasing age a person becomes more and more changes in body systems and organs, one of which is a decrease in function. In this case, the influence on cognitive function is decreased intellectual ability, the ability of the brain's nerve transmission to be slow, and loss of memory as well as existing information. Next is memory or memory, namely the decline in memory which is one of the cognitive functions. Long-term memory did not change much, but short-term memory decreased. Followed by a decrease in intellectual function, where IQ is one of the intellectual functions that can decrease in terms of remembering, solving problems, and response speed is also not focused. Changes in other cognitive functions, namely the ability to learn can also decrease, due to a decrease in the function of several organs of the body. This is why it is recommended that the elderly do a lot of practice and therapy in improving learning abilities even though it takes time. Understanding ability in the elderly can also decrease, this is one of the cognitive changes in the elderly who are starting to decline. Like focus and memory that begin to slacken. Difficult to solve problems, terms of solving problems, the elderly also have rather difficult doing that. This is because the organ system function declines with age. Decision-making is also very slow because cognitively the role is starting to decline and decrease. Changes in self-motivation, both cognitive and affective motivation in obtaining something large enough. However, this motivation often lacks support due to physical and psychological conditions.

Based on the results of the cross table shows that the more severe hypertension is suffered by the elderly, then it will cause they tend to experience more severe cognitive function disorders as well. On the other hand, mild hypertension suffered by the elderly will cause them to tend not to experience significant cognitive function disorders. Where this is also supported by the results of the Spearman correlation test which shows that there is a significant correlation between hypertension and cognitive function of the elderly in the Elderly Posyandu, Gadingkasri Village, Bareng Health Center, Malang City, with a positive correlation coefficient of 0.532 with a p-value of 0.000 ($p<0.05$).

The results of this study are in line with the research of Matthew et al. (2017) based on data analysis using the chi-square test, p-value = 0.007, and found significant results between hypertension and impaired cognitive function in the elderly. Decreased cognitive function is an important problem in the elderly, where hypertension will increase the risk of cognitive dysfunction by 7.59 times compared to those without hypertension. Brain microvascular disorders are thought to play a role in the incidence of vascular cognitive impairment. Microvascular disorders such as hypertension, diabetes mellitus, and inflammation. One of the complications of hypertension in the central nervous system is a decrease in cognitive function, which functions as a memory if allowed to cause dementia (vascular cognitive impairment).

Hypertensive patients with moderate to severe cognitive impairment have problems with attention and calculations found in the MMSE, such as subtracting the number 100 by 7 or asking the word "world" to be spelled backward. This is also related to the factor of low education. In the elderly who received higher education early in life, more synapses were formed and increased vascularization in the brain, so their cognitive abilities were better. Higher education tends to seek information on the understanding of the treatment and complications of hypertension. The results of this study are also in line with research conducted by Taraghi et al., (2016) which found a significant correlation between cognitive function and hypertension ($p = 0.039$) (Taraghi et al., 2016). Several sources state that hypertension has a significant effect on cardiovascular function, and cerebral structural

integrity and is associated with cognitive decline. The main explanation for how hypertension has a detrimental effect on cognitive function is that hypertension increases cardiovascular disease. Several longitudinal studies have shown a positive correlation between hypertension and impaired cognitive function. This effect is associated with stroke and is strongly correlated with individuals who do not take antihypertensive drugs (Taraghi et al., 2016). The difference in risk could be because high systolic blood pressure in middle age increases the risk of atherosclerosis, increases the number of white matter ischemic lesions, and increases the risk of atherosclerosis.

CONCLUSION

Based on the results of the study, it can be seen that most of the elderly in the Posyandu for the elderly, Gadingkasri Village, Working Area of the Bareng Health Center, Malang City have blood pressure or hypertension which is classified as mild, namely systolic between 140-159 mmHg and Diastolic between 90-99 mmHg (53.6%). Based on the results of the study, it can be seen that most of the elderly in the Posyandu for the elderly, Gadingkasri Village, Working Area of the Bareng Health Center, Malang City have moderate cognitive impairment (73.2%%).

The results of the Spearman correlation test showed that there was a significant correlation between hypertension and the cognitive function of the elderly at the Elderly Posyandu, Gadingkasri Village, Working Area of the Bareng Health Center, Malang City (r=0.532 and p=0.000). The direction of the correlation is positive, meaning that the more severe hypertension suffered by the elderly, will cause them to tend to experience more severe cognitive function disorders and vice versa.

SUGGESTION

Based on the results of this study, it is recommended for people with hypertension do blood pressure screening and undergo hypertension treatment regularly. This is very important so that prevention and treatment can be carried out earlier to prevent more severe cognitive impairment. In addition, it is also necessary to pay more attention to lifestyle, food intake, and also physical activity to reduce the risk of increased blood pressure which will result in the risk of developing complications such as coronary heart disease, and heart failure.

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CONFLICTS OF INTEREST

Contains the statement of all possible conflicts of interest in the manuscript, including financial, consultant, institutional, and other correlations that might lead to bias or a conflict of interest. If there is no conflict of interest, this should also be explicitly stated. All sources of funding should be acknowledged in the manuscript. All relevant conflicts of interest and sources of funding should be included in the manuscript with the heading "Conflicts of Interest". We guarantee that the article is the original work of the Author. We guarantee that the article has not received prior publication and is not to be published elsewhere.

On behalf of all Co-Authors, the appropriate Author shall be solely responsible for such submissions. The study has not been submitted for publication nor has it been published in whole or in part elsewhere. All the Authors listed on the title page have contributed significantly to the work, have read the manuscript, proved the validity and legitimacy of the data and its interpretation, and approved its submission to the journal Ners and Midwifery Patria Husada. All authors agree that the

list of authors is correct in its content and order and there is no modification.

AUTHORS CONTRIBUTION

The contribution of the chief researcher in this study is to divide the tasks in the implementation of the research, coordinate with members in the collection and analysis of research data, coordinate data processing and analysis, coordinate the implementation of ethical tests, seminars and publication of research results. Meanwhile, research members contribute to collecting and recapitulating research data, analyzing data and compiling research reports and assisting in the publication of research results through journals.

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