FACTORS ASSOCIATED WITH IMPAIRED COGNITIVE FUNCTION IN THE ELDERLY PEOPLE

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ABSTRACT

The decline in cognitive function that occurs in the elderly can result in limitations in carrying out daily work, making dependence on others so that it can reduce the quality of life. The purpose of this study was to identify cognitive function disabilities and the factors that influence cognitive function diseases in the elderly in RW 01 Kelurahan Susukan Kecamatan Ciracas, East Jakarta. This study uses a quantitative method through a cross- sectional approach. The population in this study were the elderly aged ≥ 60 years, amount to 386 people. The research sample was 197 people. The independent variables in this study were age, gender, education level, history of degenerative diseases and physical activity and the dependent variable was cognitive function in the elderly. The data was collected using the MMSE (Mini Mental State Examination) and IPAQ (International Physical Activity Questionnaire) questionnaires. Data analysis was carried out by univariate, bivariate with Chi Square test and multivariate with multiple logistic regression test predictive model. The results of the study with variables that had a significant relationship were education level variables (p-value = 0.000), history of degenerative diseases (p-value = 0.019) and physical activity (p-value = 0.000). Variables that did not have a significant relationship with cognitive function were age (p-value=0.190 and gender (p-value=1,000). The results showed that most of the elderly had normal cognitive function and there was a relationship between the level of education, history of degenerative diseases and physical activity with the cognitive function of the elderly. Future research is expected to be able to conduct studies that focus more on a more diverse educational background and develop its relationship with cognitive and dementia incidence.

Keywords: activity physical, cognitive function, elderly, education, history of degenerative diseases

ABSTRAK

Penurunan fungsi kognitif yang terjadi pada lansia bisa menyebabkan keterbatasan dalam menjalankan aktifitas sehari-hari, membuat ketergantungan pada orang lain hingga menyebabkan kualitas hidup menurun. Tujuan dilakukan penelitian adalah untuk mengidentifikasi gangguan fungsi kognitif dan faktor faktor yang mempengaruhi gangguan fungsi kognitif pada lansia di RW 01 Kelurahan Susukan Kecamatan Ciracas, Jakarta Timur. Penelitian yang digunakan dengan metode kuantitatif melalui pendekatan Cross Sectional. Populasi dalam penelitian adalah lansia berusia ≥ 60 tahun berjumlah 386 orang. Sampel penelitian sebanyak 197 orang. Variabel bebas dalam penelitian ini adalah umur, jenis kelamin, tingkat pendidikan, riwayat penyakit degeneratif dan aktivitas fisik dan variabel terikatnya adalah fungsi kognitif pada lansia. Pengumpulan data dilakukan melalui wawancara dengan kuesioner Mini Mental State Examination (MMSE) dan IPAQ (International Physical Activity Questionnaire). Analisis data yang dilakukan secara univariat, bivariat dengan uji *Chi Square* dan multivariat dengan uji regresi logistik ganda model prediksi. Hasil penelitian dengan variabel yang memiliki hubungan signifikan adalah variabel tingkat pendidikan (p-*value*=0.000), riwayat penyakit degeneratif (p-*value* =0.019) dan Aktivitas fisik (p-*value*=0.000). Variabel yang tidak memiliki hubungan signifikan dengan fungsi kognitif adalah variabel umur (p-*value*=0.190 dan Jenis kelamin (p-*value*=1.000). Hasil penelitian didapatkan sebagian besar lansia memiliki fungsi kognitif normal dan ada hubungan antara tingkat pendidikan, riwayat penyakit degeneratif dan aktivitas fisik dengan fungsi kognitif lansia. Penelitian selanjutnya diharapkan bisa melakukan studi yang lebih fokus di latar belakang pendidikan yang lebih beragam dan mengembangkan pada hubungannya dengan kognitif dan kejadian demensia.

Kata Kunci : aktivitas fisik, fungsi kognitif, lansia, pendidikan, riwayat penyakit degeneratif

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Introduction

Population aging or an increase in the ratio number of elderly people from the total population has occurred worldwide. That there are 703 million elderly (elderly) aged 65 years in 2019. It is projected that in 2050 it will be 1.5 billion or an increase of 16% from 1990 so that it is stated that one in six people in the world is 65 years old.[1] The number of elderlies in Indonesia with the criteria of age 60 years is 24,752 million; this means 9.3% of the 265 million Indonesian population. This elderly number will continue to increase until 2050.[2] There is a cognitive function disorder that occurs and the accompanying risk factors cause the quality of the elderly to decrease, as shown in the ability to carry out activities that are increasingly limited and have to ask for help from others. Cognitive ability has an influence on the quality of life, especially with regard to the level of intelligence and memory possessed.[3] The elderly who have normal cognitive function have a tendency to get a better quality of life.[4] The decline in cognitive function is the most serious problem and even causes an increase in the occurrence of dementia so that the elderly will experience disturbances and a decrease in quality of life.[5]

In the elderly, the body experiences changes or decreases in body functions due to degenerative processes and decreases in various systems in the body such as memory loss, muscle weakness, hearing, feelings, and various other biological disorders.[6] Age is the most common risk factor for memory loss and dementia, defined as a decline in cognitive function that can interfere with independent functioning.[7] The decline cognitive function causes the inability of the elderly to carry out normal daily activities and makes them dependent on others to take care of themselves. This dependency ratio continues to increase every year, where data from the National Socio-Economic Survey (SUSENAS) shows that in 2019 The ratio of dependency in the elderly was 15.01. This means that every 100 people of productive age (aged 15-59 years) must bear 15 elderly people. This ratio will continue to increase in line with the increasing number of elderly and automatically increase the burden of dependents on the productive age population.[2] In addition, in 2010-2025, Indonesia will experience a potential demographic bonus, where 100 people who work will cover 44 people who do not work. This will have an impact on increasing income either per capita or national.[8] The impact that occurs due to the aging process is not only about the elderly themselves due to decreased daily activities., it also has an impact on the productive age around them because it becomes a social burden.

The purpose of this study was to identify impaired cognitive function and the factors that influence cognitive function disorders in the elderly in Kelurahan Susukan, Kecamatan Ciracas, East Jakarta.

Method

This research was conducted with a quantitative design with a Cross-Sectional approach. The population is the elderly ≥ aged 60 years who live in RW 01 Kelurahan Susukan, Kecamatan Ciracas, East Jakarta, amounting to 386 people and the sample size is 197 people, which is obtained using the Slovin formula. Researchers then calculated the number of samples proportionally using proportional stratified random sampling techniques. This technique makes it possible to obtain a sample that can represent the entire RW 01 population with 15 RT studied proportionally. The selection of research subjects was carried out by purposive sampling based on the inclusion and exclusion criteria set by the researcher. Inclusion criteria include individuals aged ≥ 60 years and a minimum education of SMP (Junior High School). Meanwhile, the exclusion criteria were the elderly who lived in nursing homes, had health problems that caused communication, hearing and vision problems. Data collection is done by home visits through in-person interviews and questionnaire filling out. The instrument used is a questionnaire that is adjusted to the variables to be measured. IPAQ (International Physical Activity Questionnaire) is used to see physical activity in the last 7 days. We then divided the study results into low activity levels (<3000METs min/week), and high activity levels (≥3000METs min/week). While the measurement of cognitive function used a questionnaire in the Mental Mini State Examination (MMSE) according to Oxford Medical Education 2015. The MMSE is a 30-point test used to measure thinking ability. This measurement uses a maximum score of 30. For each "yes" answer, a score of 1 is given and each "no" answer is given a score of 0. The category of cognitive function by the researcher is divided into two, namely normal cognitive with a score of ≥24 and cognitive impairment with a score of <24. The research conducted has been through ethical review procedures and received approval from the research ethics committee of Universitas Respati Indonesia Number: 132/SK. KEPK/UNR/VI/2021.

Results

Based on Table 1 the characteristics of the study subject, it would appear that most respondents had normal cognitive as many as 164 (83.2%), aged 60-65 years as many as 107 (54.3%) with female sex as much as 109 (55.3%) and low education 100 (50.8%). Most of the respondents did not have a history of degenerative diseases as many as 152 (77.2%), the average respondent had a high activity of 101 (51.3%).

Table 1. Characteristics of the Study Subject in Kelurahan Susukan

Variable	Frequency (n=197)	Percentage
Age (years)		
60-65	107	54.3
>65	90	45.7
Gender		
Male	88	44.7
Female	109	55.3
Education Level		
High (>SMP)	97	49.2
Low (SMP)	100	50.8
History of Degenerative Disease		
No	153	77.7
Yes	44	22.3
Physical Activity		
High (≥3000 MET/Week)	101	51.3
Low (<3000 MET/Week)	96	48.7
Cognitive Function		
No Cognitive Impairment (≥24)	164	83.2
Cognitive Impairment (<24)	33	16.8

Table 2 shows the results of the bivariate analysis using logistic regression. It was obtained if the average of the subjects studied was aged 60-65 years with normal cognitive function (86.9%). The results of the square test showed that there was no significant difference between age and cognitive function. It was also found that gender differences were not related to cognitive function. The next variables studied were education level, history of degenerative disease and physical activity obtained p-value<0.05, which means there is a significant relationship with cognitive function.

Table 2. Relationship of variables of age, gender, education level, history of degenerative diseases and physical activity with cognitive function of the elderly in the Kelurahan Susukan East Jakarta

Variable	Cognitive Function				Total	*P-value*	OR (95% CI)
	No Cognitive Impairment		Cognitive Impairment				
	N	%	n	%			
Age (year)							
60-65 year	93	86.9	14	13.1	107	0.190	1.778 (0.834-3.787)
>65 year	71	78.9	19	21.1	90		
Gender							
Male	73	83.0	15	17.0	88	1.000	0.963 (0.454-2.040)
Female	91	83.5	18	16.5	109		
Education Level							
High (>SMP)	92	94.8	5	5.2	97	0.000	7.156 (2.632-19.457)
Low (SMP)	72	72.0	28	28.0	100		
History of Degenerative Disease							
No	133	86.9	20	13.1	153	0.019	2.789 (1.253-6.208)
Yes	31	70.5	26	29.5	44		
Physical Activity							
High	95	94.1	6	5.9	101	0.000	6.196(2.427-15.819)
Low	69	71.9	27	28.1	96		

Description: significance of p-value <0.05

In multivariate analysis (table 3) it can be concluded that there are 2 variables that are significantly related to cognitive function., namely the level of education and physical activity.

Between the two variables, the most dominant education level variable is related to cognitive function. with an OR = 5.70, this means that elderly people who have a higher level of education will have a chance to have normal cognitive function by 5.70 times higher than the elderly who have a low education. after being controlled by activity variables and history of degenerative disease variables. Elderly who have high physical activity will have the opportunity to get normal cognitive function 4.45 times greater than those with low physical activity, after controlling for variables of education and level of education. The elderly who does not have a history of degenerative diseases will have a 1.73 times greater chance of getting normal cognitive function compared to the elderly who have a history of degenerative diseases.

Table 3. Multivariate Final Modeling

Variabel	P-value	OR (95%CI)
Education Level	0.001	5.706 (2.043-15.934)
Physical Activity	0.003	4.455 (1.662-11.939)
History of Degenerative disease	0.226	1.731 (0.711-4.214)

Description: significance of p-value <0.05

Discussion

Based on the Chi Square test, there is a significant relationship between age and cognitive function. Gamage, (2019),[9] also found the same thing, where the age variable did not have a significant relationship with cognitive function by saying that age is a less powerful factor when compared to other comorbidities related to cognitive function that occur in the elderly. In line with this Surya Rini (2018),[5] also said that age was not proven to be associated with impaired cognitive function in the elderly. However, Small, (2019),[7] stated different results, saying that age is the biggest risk factor for memory loss and dementia which is defined as cognitive decline that interferes with independent functioning. This is because in old age, the body will experience changes or decrease in body functions due to degenerative processes that will affect various systems in the body such as memory loss. However, statistical tests in our study did not find a relationship between age and cognitive function, this could be due to a stronger factor affecting age, as in this study it was found that most of the elderly, having a high level of education, did not have a high level of education. degenerative diseases and high physical activity. That changes that occur related to a history of degenerative diseases can accelerate nerve disfunction and there is evidence that the wrong lifestyle, how regularly the elderly do daily physical activities also help the onset of cognitive symptoms.[10]

The results showed that there was no significant difference between gender and cognitive function (table 2). The research of Surya Rini et al., (2018),[5] state the same thing, if gender is not proven to be associated with cognitive function, it is also supported by the findings of Hutasuhut et al., (2020),[11] That between gender and cognitive function has no relationship. However, this

contradicts the research of Kim & Park (2017),[12] which shows a significant difference even when age is controlled. According to Spar & La Rue (2006) in Permana., et al (2019) the trend of cognitive aging is almost the same between men and women. In women there is generally a decrease in initial spatial tasks and a decrease in verbal tasks in men. Several other studies convey findings that are different from the results of this study and this can be explained that on average women have higher cognitive function disorders than men, this is because the age in women is much longer than the man and the change in the function of oestrogen receptors in the brain plays a role in learning and memory function. Differences in research results can be caused by several things, such as unequal comparison of samples between men and women or the presence of other variables that can affect gender

The test results show a significant relationship between education level and cognitive function, with higher education level (>SMP) having normal cognitive function 7 times higher than low education level (<SMP). A Malaysian study showed only the level of education in sociodemographic factors showed a significant association with impaired cognitive function. The causes that might explain the much lower cognitive decline at higher levels of education are through the following mechanisms; That elderly people with low levels of education have a higher risk of central nervous system damage, while higher levels of education have the ability to produce a better compensation strategy where they have more nervous reserves.[9] Same thing on the discovery Hutasuhut et al., 2020,[11] that respondents with lower education levels have a 4 times bigger chance to occur impaired cognitive function. Ritchie et al., 2018,[13] found evidence that his long education is associated with an increase in intelligence test scores. People who complete longer years of education have a tendency to have higher intelligence.

Along with increasing age, this will be followed by the aging process and a decrease in physical, mental, and functional abilities including the occurrence of degenerative diseases, including hypertension and diabetes mellitus. The two diseases were selected by the researchers as diseases owned by respondents with a span of 5 years, where the disease is chronic, progressive and tends to have a strong influence on the health of the elderly. In this study (Table 2) between a history of degenerative diseases and impaired cognitive function found a significant association (p-value = 0.019). Research results Sari., et al. (2019),[14] describes how degenerative diseases can affect a person's cognitive function, this is related to reduced memory, thinking ability and finally cognitive function. This is also supported through research by Wreksoatmodjo (2014),[15] and E. Fazrina (2020),[16] where factors of hypertension showed an influence on the decline in cognitive function. In Taufik's research, (2014),[17] found findings related to the length of history of hypertension where when measurements or examinations were carried out, in subjects who currently suffered from hypertension the results were not significant, but when measurements were made on subjects who had a history of hypertension more than 5 years obtained a significant value

on cognitive function. In line with Gunawati's research (2018),[18] that in patients with a history of hypertension 5 years, there is an increasing number of patients experiencing *probable* cognitive impairment. Sadock & Sadock, 2011 in Hutasuhut et al., (2020),[11] history of hypertension and Diabetes Mellitus is known to contribute to an increase in the degree of stroke. The disorder affects small and medium-sized cerebral vessels that infarct and produce multiple parenchymal lesions. That the reduction of hypertension has major benefits in reducing the occurrence of morbidity and mortality.[17] Another study gave different results, in Totting, Pinzon and Widiasmoko, (2018),[19] the bivariate analysis they worked on, the results showed that diabetes mellitus and impaired cognitive function post ischemic stroke both had no association. (OR: 1.506 95% CI: 0.654- 3.466 p-*value* = 0.334). The researcher explained that the cause of the absence of a significant relationship between a history of diabetes mellitus and impaired cognitive function could be due to the research subject being studied on antidiabetic medication or the result of antidiabetic medication. Blood sugar levels are also fluctuating and this really depends on the respondent's daily diet, physical activity carried out and the use of antidiabetics and how someone who has diabetes can manage stress well. Widie Nugroho et al, (2016),[20] presented their findings that uncontrolled blood sugar is thought to contribute as a cause of cognitive function disorders. That diabetes mellitus in the elderly has long been associated with an increased incidence of dementia by an unknown mechanism. It is believed that uncontrolled blood sugar is associated with decreased cognitive function with even greater decline.[21]

The mechanism by which diabetes and cognitive decline are connected is not yet fully understood by experts. However, an increase in blood sugar levels can harm the brain in various ways, namely that diabetes increases the risk of heart disease and stroke, it can injure blood vessels. Damaged blood vessels in the brain will result in decreased cognitive function. The condition of diabetes is able to cause insulin levels that are often unbalanced and this can result in a decrease in cognitive function.[22]

In this study, the relationship between physical activity and cognitive function was analysed and found that respondents with high physical activity had normal cognitive function. Statistical test obtained p-*value* = 0.000 so it can be concluded that the level of physical activity with cognitive function has a relationship. The same thing has been reported in many other studies as in (Sauliyusta and Rekawati, 2016),[23] which states the same thing. Weuve (2004),[24] says that high physical activity is associated with cognitive impairment with a 20% lower risk of occurrence and better cognitive work. The physical activity referred to in this study is based on WHO explanation that all movements that require energy expenditure, including movements that are done at leisure or are part of a person's work (WHO., 2020).[25]

Several possible mechanisms have the potential to explain the relationship between physical activity and cognitive function. Physical activity is thought to be able to support the health

of blood vessels in the brain by lowering blood pressure, increasing lipoproteins, ensuring adequate cerebral perfusion. Another thing is related to the emergence of a relationship between insulin and *amyloid* (which is characteristic of Alzheimer's), where in insulin resistance there is aerobic activity and glucose intolerance, and physical activity can prevent and delay cognitive decline. Relation to the brain physical activity can maintain the structure of nerves, synapses and capillaries.[24]

Physical activities that can be done by the elderly are in accordance with the guidelines of the *World Health Organization,* (2011),[26] which are translated by the *Centre for Disease Control and Prevention (CDC), (2014),*[27] including: (1) Elderly can do aerobics for at least 150 minutes /week of moderate physical activity (e.g. short distance walking, house cleaning, leisurely cycling, climbing stairs, gardening) plus muscle-strengthening activities at least two days a week (2) or at least 75 minutes/week in combination with vigorous activity (examples; jogging, running, badminton) plus muscle vigorous exercises at least two days a week (3) or with a combination of moderate and vigorous physical activity equivalent to recommendations numbers 2 and 3 above, plus muscle-strengthening exercises at least twice a week (4) or for greater benefit higher, can do up to 300 minutes/week of moderate physical activity plus muscle strengthening exercises at least twice a week (5) or 150 minutes/week for strenuous physical activity plus muscle strengthening exercises at least twice a week (6) or a combination of moderate and strenuous physical activity equivalent to recommendations numbers 4 and 5 above, plus muscle-strengthening exercises at least twice a week

Al Quran reading activity with a minimum of 15 minutes every day is considered able to make cognitive function last, especially in the elderly who have experienced cognitive decline.[28] Traditional halma games have also been shown to be able to make cognitive function improve, by stimulating the brain like thinking of winning a match.[29] All these activities are carried out regularly will significantly impact a person's cognitive function.[30]

Conclusion

This study concludes that education has an important contribution to its effect on cognitive function, followed by a history of degenerative diseases and how well an elderly person performs regular physical activity as reflected in the IPAQ score in the last 7 days. Educational variable became the dominant variable with function controlled by physical activity variable and history of degenerative disease. It should be considered that future research can conduct studies that focus more on a more diverse educational background and develop its relationship with cognitive function and the incidence of dementia.

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Conflict of Interest

The author declares that there is no conflict of interest in this research

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