



The Influence of Elderly With Chronic Diseases On Cognitive Function Disorders Using MoCA INA at the Getasan District Elderly Posyandu

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ABSTRACT

Populations at risk of dementia, such as the elderly, people with chronic diseases (hypertension, diabetes mellitus, hypercholesterolemia, and stroke), and a family history of senility, require early detection of dementia. People with chronic diseases need cognitive function screening to determine the future risk of dementia. The purpose of this study was to determine the relationship between the elderly with chronic diseases and cognitive function disorders using the MoCA-INA screening. This type of research used a cross-sectional study design using multivariate analysis with binary logistic regression to determine the correlation between variables. The results of the data analysis showed that there was a significant difference with respect to hypertension, diabetes mellitus, or both, age, gender, and education level (Elementary School and Junior High School). It was concluded that elderly individuals who have chronic diseases can affect cognitive function, resulting in a status of mild

cognitive impairment.

Keywords: Dementia, MoCA-INA, binary logistic regression

INTRODUCTION

Dementia is a syndrome caused by brain disease or disorders that can be chronic or progressive and can slow down a person's cognitive function (thinking ability), including memory, reasoning, orientation, comprehension, calculation, learning capacity, language, and judgment, and can affect daily activities. Changes in cognitive function can include forgetfulness; forgetfulness is the mildest cognitive impairment, 39% of this disorder is estimated to be complained of by the elderly aged 50-59 years, increasing to more than 85% at ages over 80 years. In this phase, a person can still function normally, although it is difficult to recall information that has been learned; it is not infrequently found in middle-aged people. If the population aged over 60 years in Indonesia is 7% of the total population, then 3% of these complaints of forgetfulness are suffered by the population in Indonesia. This forgetfulness can progress to Mild Cognitive Impairment and eventually to dementia as the most severe clinical form. Dementia is a severe and progressive intellectual decline that can interfere with a person's social function, work, and daily activities.

Worldwide, around 55 million people have dementia, with over 60% living in low- and middle-income countries. As the proportion of elderly people increases in almost every country, this number is expected to rise to 78 million by 2030 and 139 million by 2050. According to WHO data, nearly 10 million new cases of dementia occur each year. Dementia is the seventh leading cause of death worldwide and one of the main causes of disability and dependency among the elderly. In Indonesia, in 2016, it was estimated that there were 1.2 million people with dementia (PWD). This figure is projected to increase to 2 million people by 2030 and 4 million people by 2050.

Alzheimer's disease is the most common cause of dementia and contributes to 60-70% of dementia cases. Besides Alzheimer's, other causes of dementia include: vascular dementia (due to complications of chronic diseases such as hypertension, diabetes mellitus, and stroke, or bad habits such as smoking and alcohol consumption), dementia with Lewy bodies (a condition of abnormal alpha-synuclein protein buildup in brain nerve cells), degeneration of the frontal part of the brain

called frontotemporal dementia, head injury or trauma called chronic traumatic encephalopathy, nutritional deficiencies (especially folic acid and vitamin B12), and HIV infection.

Populations at risk of dementia, such as the elderly, people with chronic diseases (hypertension, diabetes mellitus, hypercholesterolemia, and stroke), and a family history of senility, require early detection of dementia. Dementia screening should be conducted at the primary healthcare level, where suspected cases will be referred for diagnostic procedures at the hospital level. The recommended screening tool is the Montreal Cognitive Assessment Indonesian version (MoCA-INA).

Screening with MoCA-INA aims to measure and compare the degree of cognitive impairment quantitatively and serially. The maximum score that can be obtained in the MoCA examination is 30, and a result <26 indicates cognitive function impairment. MoCA is capable of detecting mild cognitive impairment with a sensitivity of 83-90%. This tool assesses various cognitive aspects, such as executive function, orientation, memory, and visuospatial processing. MoCA can also detect cognitive function impairment in post-stroke patients, including vascular dementia, with a sensitivity of 92%. The sensitivity of MoCA in detecting Alzheimer's dementia reaches 94-100%. MoCA-INA can evaluate the level of cognitive decline and the factors that influence it.

This study uses the MoCA-INA questionnaire to determine the influence of the elderly with chronic diseases on cognitive function disorders using MoCA-INA at the Elderly Posyandu in Getasan sub-district. Old age tends to be associated with a decline in cognitive status; if the elderly also have chronic diseases, especially those who do not regularly take medication, is there a relationship with cognitive status? MoCA-INA can be used to see if there is mild cognitive impairment or if dementia is already present in an elderly person. The hope of this research is that there is an influence of elderly individuals who have chronic diseases and do not regularly take medication on the incidence of dementia.

METHODS

This cross-sectional study design involved elderly individuals aged ≥ 60 years with chronic diseases at the Elderly Posyandu in the hamlets of Getasan, Sanggar, and Tawang-Nglelo. A sample of 52 people was selected using the purposive sampling method. Data was collected in August-September 2025 through the MoCA-INA questionnaire, which measures eight cognitive aspects. The data was analyzed using multivariate analysis and binary logistic regression to determine the correlation between variables.

The research sample was taken from the accessible population that met the inclusion and exclusion criteria. The inclusion criteria included: elderly aged ≥ 60 years, a history of hypertension, diabetes mellitus, or both, willingness to be a respondent, ability to read and write, and ability to follow the interview until the questionnaire was completed. The exclusion criteria included: elderly with acute/moderate/severe conditions, unable to communicate, diagnosed with dementia, depressive disorders, and Parkinson's disease. The researchers took 46 elderly subjects for MoCA-INA screening to assess cognitive function.

RESULTS AND DISCUSSION

Respondent age data can be seen in the following table:

Table 1. Descriptive Statistics of Respondent Age

	N	Minimum	Maximum	Mean	Std. Deviation
Age	46	60	81	67.8913	6.30777

Based on the table above, from the 46 respondents studied, the lowest age was 60 years, the highest age was 81 years, with a mean of 67.8913 years, and a standard deviation of 6.3077.

Respondent chronic disease data can be seen in the following table:

Table 2. Respondent Data by Chronic Disease

Chronic Disease	f	%
Hypertension	30	65.2%
Diabetes	11	23.9%
Hypertension and Diabetes	5	10.9%
Total	46	100.0%

Based on the table above, from the 46 respondents studied, 30 people (65.2%) had Hypertension, 11 people (23.9%) had Diabetes, and 5 people (10.9%) had both.

Respondent gender data can be seen in the following table:

Table 3. Respondent Data by Education

Education	f	%
Elementary School	28	60.9%
Junior High School	13	28.3%
Senior High School	5	10.9%
Total	46	100.0%

Based on the table above, from the 46 respondents studied, 28 people (60.9%) had an Elementary School education, 13 people (28.3%) had a Junior High School education, and 5 people (10.9%) had a Senior High School education.

Respondent cognitive status data can be seen in the following table:

Table 4. Respondent Data by Gender

Gender	f	%
Male	12	26.1%

Female	34	73.9%
Total	46	100.0%

Based on the table above, from the 46 respondents studied, 12 people (26.1%) were Male and 34 people (73.9%) were Female.

Respondent education level data can be seen in the following table:

Table 5. Respondent Data by MOCA-INA

MOCA-INA	f	%
Normal	22	47.8%
Mild Cognitive Impairment	24	52.2%
Mild Dementia	0	0.0%
Moderate Dementia	0	0.0%
Severe Dementia	0	0.0%

Total	46	100.0%
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Based on the table above, from the 46 respondents studied, respondents with MOCA-INA scores falling into the Normal category numbered 22 people (47.8%), those in the Mild Cognitive Impairment category numbered 24 people (52.2%), and none fell into the Mild Dementia, Moderate Dementia, or Severe Dementia categories.

Multivariate Binary Regression Analysis

The statistical data analysis used in this study was binary logistic regression analysis. Logistic regression analysis has four model tests: assessing the overall model (Overall Model Test), Testing the Feasibility of the Regression Model (Goodness of Fit Test), Coefficient of Determination, and Classification Matrix. Model testing based on the data to be presented used Microsoft Excel data processing tools and Statistical Package For Social Science (SPSS) Version 26.0. The response variable and the suitability of the formed model used a significance level of 5%.

Logistic Regression Model

The analysis used in this study was logistic regression analysis, which looked at the influence of Chronic Diseases (Hypertension and Diabetes), Age, Education Status, and Gender on Cognitive Impairment.

The codes used are as follows:

- Education (X1): 0 = Elementary School, 1 = Junior High School, 2 = Senior High School
- Age (X2)

- Chronic Disease (X3): 0 = Hypertension, 1 = Diabetes, 2 = Hypertension and Diabetes
- Gender (X4): 0 = Male, 1 = Female

Table 6. Logistic Regression Analysis Results

		Variables in the Equation					
		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1 ^a	Penyakit Kronis			7.994	2	.018	
	Penyakit Kronis(1)	4.143	2.083	3.957	1	.047	63.013
	Penyakit Kronis(2)	8.984	3.256	7.615	1	.006	7972.781
	Usia	-.324	.112	8.335	1	.004	.723
	Pendidikan			8.178	2	.017	
	Pendidikan(1)	-6.435	2.606	6.098	1	.014	.002
	Pendidikan(2)	-2.454	2.044	1.440	1	.230	.086
	Jenis Kelamin(1)	-2.507	1.274	3.869	1	.049	.082
	Constant	22.740	7.991	8.098	1	.004	7516742376

a. Variable(s) entered on step 1: Penyakit Kronis, Usia, Pendidikan, Jenis Kelamin.

The odds ratio is used to facilitate the interpretation of the logistic regression model, where it can be seen from the results of the partial parameter significance test that the independent variable that does not significantly affect the dependent variable is Senior High School Education.

Based on the table above, it can be concluded as follows:

1. The odds ratio or Exp(B) value for the Gender variable is 0.082.

This indicates that respondents with Female Gender are estimated to have a 0.082 times lower chance of experiencing Cognitive Impairment compared to respondents with Male Gender.

2. The odds ratio or Exp(B) value for the education level (1) Junior High School variable is

0.002.

This indicates that respondents with a Junior High School education level are estimated to have a 0.002 times lower chance of experiencing Cognitive Impairment compared to respondents with an Elementary School education level.

The odds ratio or Exp(B) value for the Age variable is 0.723. Because the data is quantitative, this value indicates that if there is a 1-unit (1-year) increase in age, the chance of experiencing Cognitive Impairment is 0.723 times lower compared to Normal.

3. The odds ratio or Exp(B) value for the Chronic Disease (1) Diabetes variable is 63.013.

This indicates that respondents with Chronic Disease (1) Diabetes are estimated to have a 63.013 times greater chance of experiencing Cognitive Impairment compared to respondents with Chronic Disease (0) Hypertension.

4. The odds ratio or Exp(B) value for the Chronic Disease (2) Hypertension and Diabetes variable is 7972.781.

This indicates that respondents with Chronic Disease (2) Hypertension and Diabetes are estimated to have a 7972.781 times greater chance of experiencing Cognitive Impairment compared to respondents with Chronic Disease (0) Hypertension.

Table 7. Omnibus Tests Of Model Coefficients

	Chi-square	df	Sig.
Step	33.678	6	0.000

Block	33.678	6	0.000
Model	33.678	6	0.000

With the number of observations ($n = 46$) and the number of independent and dependent variables ($k = 5$), the degree of freedom ($df1 = k - 1 = 5 - 1 = 4$, and ($df2 = n - k = 46 - 5 = 41$, where the significance level = 0.05.

Then the f-table can be calculated using the Ms Excel formula with the insert function as follows: $f\text{-table} = \text{FINV}(\text{Probability}, \text{deg_freedom1}, \text{deg_freedom2})$ $f\text{-table} = \text{FINV}(0.05;4;41)$ $f\text{-table} = 2.600$

Based on the table above, it can be obtained that the f-value is greater than the f-table ($33.678 > 2.600$) with a significance level ($0.000 < 0.05$), so H_5 is accepted.

Thus, it can be concluded that all independent variables consisting of Chronic Diseases (Hypertension and Diabetes), Age, Education Status, and Gender simultaneously influence the dependent variable, namely Cognitive Impairment.

DISCUSSION

The results of the test of the influence of independent variables on the dependent variable are as follows:

- The significance value for the Chronic Disease (0) Hypertension variable is $0.018 < 0.05$, so H_0 is rejected and H_a is accepted, meaning Chronic Disease (0) Hypertension affects Cognitive Impairment.

- The significance value for the Chronic Disease (1) Diabetes variable is $0.047 < 0.05$, so H_0 is rejected and H_a is accepted, meaning Chronic Disease (1) Diabetes affects Cognitive Impairment.
- The significance value for the Chronic Disease (2) Hypertension and Diabetes variable is $0.006 < 0.05$, so H_0 is rejected and H_a is accepted, meaning Chronic Disease (2) Hypertension and Diabetes affects Cognitive Impairment.
- The significance value for the Age variable is $0.006 < 0.05$, so H_0 is rejected and H_a is accepted, meaning Age affects Cognitive Impairment.
- The significance value for the Elementary School education level variable is $0.017 < 0.05$, so H_0 is rejected and H_a is accepted, meaning Elementary School education level affects Cognitive Impairment.
- The significance value for the Junior High School education level variable is $0.014 < 0.05$, so H_0 is rejected and H_a is accepted, meaning Junior High School education level affects Cognitive Impairment.
- The significance value for the Senior High School education level variable is $0.230 > 0.05$, so H_a is rejected and H_0 is accepted, meaning Senior High School education level does not affect Cognitive Impairment.

The results from the Omnibus Tests of Model Coefficients are used to test simultaneously whether all independent variables, with a significance level ($0.000 < 0.05$), so it can be concluded that all independent variables consisting of Chronic Diseases (Hypertension and Diabetes), Age, Education Status, and Gender simultaneously influence the dependent variable, namely Cognitive Impairment.

Hypertension can affect cognitive function through cerebral hypoperfusion, subsequently

causing cerebral atrophy, microinfarcts, microbleeds, and white matter hyperintensities (WMHI). The combination of these pathological features of hypertension increases the risk of cognitive decline with age and the risk of developing neurodegenerative diseases.

Diabetes Mellitus affects cognitive function in that chronic insulin resistance in peripheral tissues is known to reduce insulin levels in the cerebrospinal fluid due to blood-brain barrier disruption, and insulin resistance can interfere with cholinergic activity and N-methyl-D-aspartate receptors (can trigger metabolic syndrome by promoting fat accumulation and interfering with fatty acid oxidation in the liver).

Age affects cognitive function; several other types of dementia increase significantly with age.

Low levels of knowledge, such as Elementary and Junior High School, can affect cognitive function. Higher education is associated with better cognitive function compared to lower education. Education is a protective factor for cognitive function because it can stimulate the brain in daily activities and reduce dementia in the elderly.

Gender can affect cognitive function. Women are at higher risk than men due to the role of endogenous sex hormones, namely estrogen, in the change of cognitive roles. Women experience a decline in spatial activities at an earlier age than men, whereas men usually experience a decline in verbal activities earlier than women.

CONCLUSION

From the research results and discussion, it can be concluded that:

- Elementary School and Junior High School education levels affect the cognitive impairment of the elderly, while Senior High School education level does not have a significant effect on the cognitive impairment of the elderly.

- Hypertension, Diabetes Mellitus, or both affect the cognitive impairment of the elderly.
- Age affects the cognitive impairment of the elderly.
- Gender, especially female, affects the cognitive impairment of the elderly.

Suggestions

- For future researchers who wish to conduct further research, it is recommended to expand the research object and add other variables.
- Based on the results of this study, it is hoped that future researchers can develop the existing research to improve the quality of the research.
- Future researchers are expected to be cautious during the research process because there are many challenges in data source collection.

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