

Overview of Cognitive Dysfunction in Post-Ischemic Stroke Patients at The Neurological Polyclinic of Anutapura Palu Hospital

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ARTICLE INFO	ABSTRACT
Article History: Received: 27 January 2025 Accepted: 09 February 2025 Published online: 10 February 2025	Ischemic stroke, also known as brain damage, is caused by blockage of cerebral blood flow arising from thrombus formation. Ischemic stroke is a type of brain circulation disease where there is a blockage or obstruction that causes brain hypoxia without bleeding. Cognitive function is the entire process by which an individual receives, records, stores and uses information. If left untreated, disturbances in cognitive function will interfere with daily activities. Research purposes to determine impaired cognitive function in post-ischemic stroke patients at the neurology clinic at Anutapura Regional Hospital, Palu based on gender, age, educational history, domain of impairment and results of examinations carried out. Methods Descriptive using cross sectional methods and primary data collection methods or conducting interviews and filling out questionnaires with patients directly. Results and Conclusions Of the 23 Post-Ischemic Stroke Patients who received treatment at the Neurological Polyclinic, Anutapura Regional Hospital, Palu, the gender distribution of the respondents was the highest, namely men (65.2%) who experienced ischemic stroke and cognitive function disorders occurred more quickly with the average damage to cognitive function being - men (17.40) while the average for women (17.50), based on the majority age of 50-55 years was 6 respondents (26.1%) and the average experienced a decline in cognitive function at the age of 66-70, namely 21.33, based on education >12 years as many as 15 respondents (65.3%), the majority domain of impairment based on the MoCA-INA test was visuospatial function as many as 23 respondents (100%), and the number of ischemic post-stroke patients seeking outpatient treatment at the Neurology Polyclinic, Anutapura Hospital, Palu, whose cognitive function was impaired based on the overall function test. in MoCA-INA there were 21 respondents (91.3%).
Keywords: Ischemic Stroke; Cognitive Function; MoCA-INA This is an open access article under  the CC-BY-SA license.	

INTRODUCTION

Stroke is a disease of the blood vessels of the brain. *World Health Organization* (WHO) describes stroke as a medical disease characterized by rapidly developing clinical indications, such as focal and global neurological disorders, due to the lack of other obvious causes other than vascular¹. Ischemic stroke or known as brain damage caused by blockage of cerebral blood flow arises from the formation of thrombus in the cerebrum or embolic artery that supplies blood to the brain and other parts of the body. The ischemic process caused by cerebral embolism and thrombosis is known as ischemic stroke². Ischemic stroke is a type of cerebral circulatory disease in which there is a blockage or obstruction that causes brain hypoxia without bleeding². The second most common cause of death worldwide is stroke³.

According to Riskesdas statistics from 2018, Papua Province has the lowest prevalence of stroke (4.1) and East Kalimantan Province has a high prevalence (14.7). And Central Sulawesi Province is eighteen³.

Cognitive function is the entire process by which an individual receives, records, stores and uses information. Cognitive function can also be defined as all mental processes that include perception, memory, imagination creation, and thinking that form awareness and alertness as well as decision-making processes⁴.

Impairment of cognitive function when left untreated can interfere with daily activities. For example, memory impairment often occurs in post-ischemic stroke patients⁵.

In previous studies, the influence of age on the occurrence of cognitive dysfunction after ischemic stroke will increase with age due to aging and decreasing vascularization. The influence of gender was obtained as a result that most men were more at risk of suffering from stroke than women, but the risk of the severity of cognitive dysfunction was experienced by many women⁶. Based on the theory of anatomical reorganization, which states that continuous stimulation facilitates internal reorganization in the brain, the decline in cognitive function occurs more often <12 years than in those who have more than >12 years⁷.

Damage to small blood vessels (small blood vessel disease) in the brain, especially in limbic, paralimbic, diencephalon, frontal basal brain, frontal lobe and alba substance, is usually a

cognitive function impairment resulting from stroke. This impairment can lead to a decline in cognitive function that can be measured by cognitive examination using *Montreal Cognitive Assesment Instrument* (MoCA-INA) Indonesian version. These disorders can be in the form of momentary memory disorders, attention disorders, visuospatial disorders, language disorders, and executive function disorders⁴.

The purpose of this study is to find out the picture of cognitive dysfunction in post-ischemic stroke patients at the Anutapura Palu Hospital Neurological Polyclinic based on gender, age, educational history, disorder domain and examination results.

MATERIAL AND METHOD

This study is a descriptive research with a *cross sectional study design*. This research was conducted at Anutapura Palu Hospital, Jalan Kangkung, No 1, Palu City, 94226, Central Sulawesi, Indonesia. The study population is all post-ischemic stroke patients who are treated at the Neurological Polyclinic of Anutapura Palu Hospital who meet the inclusion criteria. This study was conducted from November 30 and December 2023 to January 20, 2024 with samples taken from 23 patients.

The data collection method in this study uses *total sampling*. The data analysis used in this study uses SPSS *for windows*.

RESULTS

Based on research that has been conducted at Anutapura Palu Hospital on ischemic post-stroke patients based on the MoCA-INA test and sample distribution based on gender, age, educational history, disorder domain and results based on the test. The results of statistical analysis are displayed with the following systematics:

Sample distribution of Post Stroke Ischemic Patients by Gender

In the results of the study, the distribution of ischemic post stroke patients by gender was divided by gender as many as 15 people (65.2%) with an average (17.40) and 8 women (34.4%) with an average (17.50).

Table 1. Sample distribution of Post Stroke Ischemic Patients by Gender

Gender	Number (N)	Percentage (%)	Average
Man	15	65.2	17.40
Woman	8	34.8	17.50
Total	23	100	17.45

Sample distribution of Post Ischemic Stroke Patients by Age

Table 2. Sample distribution of Post Ischemic Stroke Patients by Age

Age	Number (N)	Percentage (%)	Average
45-49	5	21.7	19.20
50-55	6	26.1	18.33
56-60	4	17.4	13.75
61-65	4	17.4	16.25
66-70	3	13.0	21.33
71-75	1	4.3	11.00
Total	40	100	16.64

In the results of the sample distribution based on the age of distribution, the most is the age group of 50-55 years as many as 6 people (21.6%) and

the average age of cognitive function impairment is in the group of 66-70 years (21.33).

Sample distribution of Post Ischemic Stroke Patients based on Education History

Table 3. Sample distribution of Post Ischemic Stroke Patients based on Education History.

Education	Number (N)	Percentage (%)	Average
Not in school	1	4.3	14.00
SD	3	13.0	14.33
SMP	4	17.4	15.25
SMA	7	30.4	16.43
S1	6	26.1	21.33
S2	2	8.7	20.00
Total	40	100	16.89

In the results of the distribution research based on educational history, some came from the high school group as many as 7 people (30.4%), based on the length of education >12 years as many as 15 people (65.3%). The average education is >12 years in the Bachelor/S-1 group (21.33) then Bachelor/S-2 (20.00) and for the high school group (16.43).

Sample distribution of Post Stroke Patients Ischemic by Disorder Domain

Table 4. Sample distribution of Post Stroke Patients Ischemic by Disorder Domain[illegible]

In the results of the above study, the results of MoCA-INA screening for cognitive function impairment in post-ischemic stroke patients based on the domain of disorder, most of the patients experienced visuospatial disorders as many as 23 people (100%) this was because the patient had difficulty concentrating. In the domain of cognitive function impairment naming, there were 8 respondents (34.8%) who experienced naming disorders, this was because patients had difficulty losing the ability to recognize an object, person or shape. Meanwhile, in the attention and language group, each had 18 respondents (78.3%) who experienced attention and language or language disorders.

The distribution of patient domain disorders in the abstraction and delayed memory groups, each had 22 respondents (97.5%) who experienced disorders in abstract thinking and memory skills. Meanwhile, in the orientation domain disorder group, there were 12 people (52.2%).

Sample distribution of Post Ischemic Stroke Patients based on the results of cognitive function tests (MoCA-INA)

Table 5. Sample distribution of Post Ischemic Stroke Patients based on the results of cognitive function tests (MoCA-INA)

Cognitive functions	Number (N)	Percentage (%)
Annoyed	21	91.3
Normal	2	9.7
Total	23	100

In the results of the study on the distribution of samples of post-ischemic stroke patients based on the results of the cognitive function test (MoCA-INA), most of them experienced impaired cognitive function as many as 21 respondents (91.3%)

DISCUSSION

The results of the study conducted at the Neurological Polyclinic of Anutapura Palu Regional General Hospital on 23 patients with Post Ischemic Stroke showed that the percentage of sex was more suffered by men as many as 15 patients (65.2%) with an average of 17.40 while in women as many as 8 patients (34.8%) with an average of 17.50. This study is in line with Bimo A L in 2019, where more male patients were found to have more cognitive dysfunction and faster than women. This happens because *neurosexism behavioral* where the physiology of the male and female brains is different. Female brains are better at language, long-term memory, and attention than men. The male brain is better at visuospatial tasks. In addition, compared to male brains, female brains are better equipped to adapt to the typical idea of aging, which causes cognitive decline to occur more slowly⁸. In a study conducted at the Islamic Hospital Jakarta Sukapura in 2019, the average results that many cognitive function disorders and their severity occurred in female patients because the hormone estrogen in the premenopause and menopause phases decreased estrogen production where the hormone estrogen plays a role in preventing atherosclerosis plaques in all blood vessels⁶.

The results of subsequent studies based on age showed that the probability of post-ischemic stroke patients experiencing cognitive function impairment was higher in geriatric patients. In the age group of 45-49 as many as 5 patients (21.7%) with an average of 19.20, the age group of 50-55 as many as 6 patients (26.1%) with an average of 18.33 then for the age group of 56-60 with an average of 13.75 and 61-65 with an average of 16.25 got the same number, namely as many as 4 patients (17.4%) with an average of 21.33 and in the age group of 66-70 years there were

3 patients (13.0%) with an average of 21.33 and the age group of 71-75 years got 1 patient (4.3%) with an average of 11.00. The results of this study are in line with Bimo A L in 2019 where cognitive function began to decline from the age of 45, This is because aging causes the brain to lose volume, less vascularization, and lose its ability to think clearly. Attention and memory problems are the first caused by a reduction in brain cells and neurons, which also leads to a decrease in language and speech skills⁸. In the most age group in the age group of 66-70 years with an average of 21.33 where physiologically increasing age, there will be a decrease in the function of the systems in the body. Increasing age also affects the decline in memory ability coupled with the occurrence of stroke. Increasing age also makes blood vessels less elastic so that they become stiff and accelerate the occurrence of atherosclerosis which disrupts the blood supply⁷.

The results of the next study based on educational history were obtained as many as 8 patients (34.7%) who had a low educational history, namely the duration of education was less than 12 years and as many as 15 patients (65.3%) whose education duration was more than 12 years at the average results for high school (16.43), undergraduate (S1) with an average (21.33) and undergraduate (S2) on average (20.00). The results of this study are in line with Salsa S R in 2020 which was taken from the previous study which found that the higher a person's education, the lower the risk of cognitive function decline, which is supported by the role of cognitive reserves, these cognitive reserves can be developed with activities that stimulate cognitively such as undergoing education and work⁹.

The results of the next study on the disorder domain based on the results of MoCA-INA screening for cognitive function types:

1. Visuospatial Function

Visuospatial is a constructive ability such as drawing or imitating an image or object. In this study, there were 23 patients (100%) who experienced disorders. This disorder often arises in post-stroke patients, patients will find it difficult to imitate images because they have difficulty concentrating or disturbances in recognizing the images they see¹⁰.

2. Attention

In the attention test, there were 18 patients (78.3%) who experienced attention or attention disorders. In a study that is in line with Fransiska A in 2020, attention disorders in post-stroke patients often occur in some patients to have difficulty concentrating, especially in patients who have had a stroke on the right side. It is also the domain that is the earliest to experience degradation when cognitive function declines⁸.

3. Language

Language disorders often occur in post-stroke patients where the patient has difficulty or cannot pronounce the sentences or words shown to them. There were 18 patients (78.3%) who had post-stroke problems with communication or what is often called aphasia. Aphasia is a partial or total loss of language skills that is divided into the ability to speak, the ability to understand what people are saying or saying, reading and writing¹⁰.

4. Abstraction

There were 22 patients (95.7%) who experienced poststroke problems with abstraction. It is difficult for the patient to try to understand the equations of the object, fruit or object being shown. Disturbances in the abstract domain are related to the location of the stroke in the left hemisphere¹⁰.

5. Delayed Memory

There were 22 patients (95.7%) who had poststroke impairment in delayed memory or recall. Delayed memory impairment is often the first symptom that arises in patients with impaired cognitive function. In the early stages, the disturbed is the new memory and then the old memory can also be disturbed⁸.

6. Orientation

There were 12 patients (52.2%) who had post-stroke impairment. This happens because the ability to remember short and long term decreases along with difficulty orienting to the surrounding situation, causing confusion in patients⁸.

From the results of the research and the MoCA-INA test conducted at the Neurological Polyclinic of the Anutapura Palu Regional General Hospital, there were more cognitive function disorders than those who did not with a ratio of 21:2 where as many as 21 patients experienced cognitive function impairment while 2 patients showed normal test results. Lack of cerebral blood flow, which provides oxygen and essential nutrients due to blockage of blood vessels, results in cerebral hypoxia and deterioration of function of the brain area that regulates the five domains of cognitive function. This accounts for the high number of ischemic post-stroke patients who have impaired cognitive function⁸.

The results of this study are strengthened by previous research which has the same goal at Sanglah Denpasar Hospital Bali where 26 samples were obtained and 21 patients who were disturbed after ischemic stroke experienced cognitive function impairment⁸.

Evaluation of cognitive function in stroke patients is important because there are disturbances in one or several domains of

cognitive function that can affect the healing and rehabilitation process. Disturbances in the language domain, abstraction ability and delayed memory are related to the location of the stroke in the left hemisphere. Meanwhile, lesions in both hemispheres are related to a decrease in function in several domains, namely visuospatial designation, naming, attention and orientation¹⁰.

The cognitive impairment screening test using MoCA-INA is an appropriate and sensitive procedure to detect whether there is a mild cognitive function impairment or cognitive dysfunction. The test using MoCA has been carried out and validated in Indonesia and based on research previously conducted by Doddy P in 2010, it was concluded that the Indonesian version of the MoCA test has been valid and reliable to be used to detect cognitive impairment⁴.

CONCLUSION AND RECOMMENDATION

From the results of the study on 23 Post Ischemic Stroke Patients who were treated at the Neurological Polyclinic of Anutapura Palu Hospital, it was concluded that the distribution of the most respondents was male (65.2%) who experienced ischemic stroke and cognitive impairment occurred faster with an average of 17.40 damage to male cognitive function while the average level of severe damage to cognitive function was 17.50 for females, based on the majority age of 50-55 years as many as 6 respondents (26.1%) and those who experienced an average decline in cognitive function at the age of 66-70 21.33, based on education >12 years as many as 15 respondents (65.3%), the majority of disorders based on the MoCA-INA test on visuospatial function as many as 23 respondents (100%), and the number of ischemic post-stroke patients who underwent

outpatient treatment at the Neurological Polyclinic of Anutapura Palu Hospital whose cognitive function was impaired based on all functional tests in the MoCA-INA A total of 21 respondents (91.3%).

For medical personnel or health workers, it is very important to conduct an assessment of cognitive function in post-stroke patients by facilitating or providing therapeutic interventions to improve the patient's cognitive function through the MoCA-INA test, then can work together with medical rehabilitation to undergo treatment therapy for patients who have cognitive function disorders, especially in post-ischemic stroke patients.

For the next researcher, we better understand what limitations exist in this study, namely data collection using the primary data method within 3 months in the form of interviews and MoCA-INA questionnaire tests. The research time is short so that the samples obtained are not many. The research sample was limited to patients who had previously come to outpatient care and had been tested before, insufficient inclusion data, crowded neurological polyclinic conditions so that limiting the time to conduct interviews were feared to affect the results of the MoCA-INA test, patients or respondents who were less cooperative in conducting the test so that the test was carried out later than the estimated time specified. And for the next researcher, we can develop this research more deeply related to the influence or relationship of the cause of impairment in the cognitive function of post-ischemic stroke patients.

For educational institutions, through this research, it is hoped that it will be a learning material for both Preclinical students of the Faculty of Medicine, Alkhairaat University and the community.

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AUTHOR CONTRIBUTIONS

Conceptualization, S. N. H., R. R., M. M.; methodology, S. N. H.; validation, R. R. and M. M.; formal analysis, S. N. H.; investigation, R. R.; resources, S. N. H.; data curation, S. N. H.; writing-original draft preparation, S. N. H., and R. R., M. M.; writing-review and editing, R. R., M. M.; visualization, S. N. H. All authors have read and agreed to the published version of the manuscript.

CONFLICTS OF INTEREST

The author declares that there is no conflict of interest.

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