ORIGINAL RESEARCH

THE RELATIONSHIP BETWEEN STROKE SUBTYPES AND COGNITIVE FUNCTION IN ISCHEMIC STROKE PATIENTS AT SILOAM HOSPITAL LIPPO VILLAGE

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Abstract

Introduction: Stroke is the second leading cause of death and a major cause of disability worldwide, including in Indonesia, and has an impact on cognitive function. Stroke can be classified based on the Bamford system into: Lacunar Infarct (LACI), Partial Anterior Circulation Infarct (PACI), Posterior Circulation Infarct (POCI), and Total Anterior Circulation Infarct (TACI), each with distinct clinical characteristics and lesion locations. This study aims to analyze the relationship between stroke subtypes and cognitive function in ischemic stroke patients using the MoCA- Ina questionnaire, to understand the clinical symptom differences and predict anatomical lesion sites in ischemic stroke subtypes based on the Bamford classification.

Methods: This was a cross-sectional analytical study involving 40 ischemic stroke patients. Data were collected using the MoCA-Ina questionnaire to assess the cognitive function of ischemic stroke patients.

Results: There was a significant relationship between stroke subtypes (anterior vs. posterior circulation) and cognitive function in ischemic stroke patients (P-value = 0.000), where patients with anterior circulation involvement showed greater cognitive impairment than those with posterior involvement.

Conclusions: There is an association between stroke subtype and cognitive function in ischemic stroke patients at Siloam Hospital Lippo Village, particularly affecting the cognitive domains of language, delayed recall, abstraction, and attention.

Keywords: stroke subtype, cognitive function, ischemic stroke

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Introduction

Stroke is one of the leading causes of death and disability worldwide. The World Stroke Organization reports that approximately 13.7 million new cases of stroke occur each year, with 5.5 million resulting in death. Stroke can be categorized into ischemic and hemorrhagic types, with ischemic stroke accounting for approximately 80% of all cases. Ischemic stroke occurs due to obstruction of blood flow to the brain caused by an embolus,

thrombus, or hypoxia, leading to neurological dysfunction. The prevalence of stroke in Indonesia remains high, with regions such as North Sulawesi (10.8%), Yogyakarta Special Region (10.3%), and Jakarta (9.7%) reporting significant incidence rates. Stroke not only causes motor impairment but also cognitive deficits that impact patients' quality of life. Cognitive function encompasses various aspects such as memory, attention, language, and orientation, all of which may be affected depending on the location of the brain infarct.

Bamford classifies ischemic stroke into four subtypes based on lesion location and clinical symptoms: Lacunar Infarct (LACI), Partial Anterior Circulation Infarct (PACI), Posterior Circulation Infarct (POCI), and Total Anterior Circulation Infarct (TACI). Several studies have indicated that different stroke subtypes may affect cognitive function differently. Research by Malik and Maulina found that patients with LACI, PACI, and TACI experienced cognitive impairment, while POCI showed no significant association. However, another study by Bozdoğan et al. reported a correlation between POCI and cognitive dysfunction.

To date, research findings on the relationship between ischemic stroke subtypes and cognitive function remain inconsistent. In Indonesia, studies using the Indonesian version of the Montreal Cognitive Assessment (MoCA-Ina) are still limited. Therefore, this study aims to analyze the relationship between ischemic stroke subtypes based on Bamford's classification and cognitive function using MoCA-Ina, in order to provide further insight into clinical manifestations and predict the anatomical site of stroke lesions.

Materials and Methods

This study is a numerical comparative analytical study with a cross-sectional design aimed at analyzing the relationship between ischemic stroke subtypes and cognitive function using the MoCA-Ina assessment tool. Samples were selected through purposive sampling from outpatient ischemic stroke patients at Siloam Hospital Karawaci. Inclusion criteria included patients aged 18–65 years with a history of ischemic stroke for more than one month. Exclusion criteria consisted of a history of severe head injury, brain tumor or inflammation, dementia, depression, education level of ≤12 years, and aphasia. Data were collected through interviews and MoCA-Ina assessments. Statistical analysis was conducted using IBM SPSS version 27.0. The Kolmogorov- Smirnov test showed that the data were normally distributed ($p = 0.129$), and the independent samples t-test was subsequently applied, with p-values < 0.05 considered statistically significant. This study was approved by the Ethics Committee of the Faculty of Medicine, Pelita Harapan University (040/K-LKJ/ETIK/I/2023), and written informed consent was obtained from all participants.

Results

This study aims to analyze the relationship between ischemic stroke subtypes and patients' cognitive function using the MoCA-Ina. The results are presented objectively in the form of tables and statistical analyses.

Subject Characteristics

This study involved 60 ischemic stroke patients, of whom 40 met the

inclusion criteria, while 20 were excluded due to dementia, depression, or having an education level of ≤12 years.

Table 1. Subject Characteristic (N=40)

Characteristic	N (%)
Gender	
Female	6 (15)
Male	34 (85)
Age	
Minimum	43
Maximum	65
Mean	58,28
BMI (Body Mass Index)	
Normal	13 (32,5)
Overweight	10 (25)
Obesity	17 (42,5)
Comorbidities	
Hypertension	26 (65)
Cholesterol	24 (60)
Heart disease	16 (40)
Diabetic	20 (50)
Stroke Subtypes	
Anterior system	32 (80)
- LACI (lacunar stroke)	9
- TACI (Total Anterior Cerebral Infarction)	0
- PACI (Partial Anterior Circulation Infarct)	23
Posterior System	8 (20)
- POCI (Posterior Cerebral Infarction)	
MoCA-Ina Score	
- Minimal	14
- Maximal	29
- Median	20,5
- Mean	20
Cognitive Function	
- Affected <26	33(82,5)
- Not affected ≥26	7(17,5)

Of the 40 respondents, the majority were male (85.0%), with an age range of 43–65 years (mean age 58.28 years). Based on the Body Mass Index (BMI), 32.5% had normal weight, 25% were overweight, and 42.5% were obese. Hypertension (65%) was the most common comorbidity, followed by high cholesterol (60%), diabetes (50%), and heart disease (40%).

The Relationship Between Stroke Subtypes and Cognitive Function

Table 2. The mean MoCA-Ina score based on stroke subtypes (N = 40)

Stroke Subtype	N	Mean	Std. Deviation	Std. Mean
Anterior	32	18,625	3,03	0,536
Posterior	8	26,125	4,61	1,63

Table 3. Statistical test results of stroke subtypes and cognitive function.

No	Variabel	MoCA-Ina		
		Mean ± SD	Min/Max	*P-value*
1.	Anterior	18,625 ± 3,03	14/25	0,000
2.	Posterior	26,125 ± 4,6	15/29	

Table 4. Bivariate analysis results between stroke subtypes and cognitive function.

	Anterior		Posterior		*P value*
	Mean ± SD	Min/max	Mean ± SD	Min/max	
Visuospatial	3,37 ± 1,62	0/5	4,5 ± 0,756	3/5	0,067
Naming	2,4 ± 0,665	1/3	2,8 ± 0,35	2/3	0,056
Orientation	5,25 ± 0,84	3/6	5,75 ± 0,7	4/6	0,077
Language	1,75 ± 0,718	0/3	2,76 ± 0,7	1/3	0,001
Delayed Recall	0,8 ± 1,28	0/4	2,37 ± 1,06	0/3	0,003
Abstraction	1,37 ± 0,6	0/3	2,37 ± 0,74	1/3	0,002
Attention	3,68 ± 1,53	1/6	5,5 ± 1,06	3/6	0,003

Statistical Analysis

The Kolmogorov-Smirnov test showed that the data were normally distributed (p = 0.129). Levene's test indicated a p-value of 0.813 (>0.05), suggesting homogeneity of the data. The independent samples t-test revealed a significant difference in MoCA-Ina scores between the anterior and posterior stroke subtypes (p = 0.000). These results indicate that patients with posterior system stroke have better cognitive function compared to patients with anterior system stroke.

Discussion

The results of this study show a significant difference in cognitive function between anterior and posterior ischemic stroke subtypes. Patients with posterior stroke had higher MoCA-Ina scores compared to those with anterior stroke (p = 0.000), indicating better-preserved cognitive function in this group. This study is consistent with the findings of Malik and Maulina (2005), who reported cognitive impairment in patients with LACI, PACI, and TACI subtypes, but not in POCI. However, these results contradict the study by Bozdoğan et al., which found that POCI can also lead to cognitive decline. This discrepancy may be due to variations in measurement methods and sample characteristics. The majority of patients in this study had hypertension (65%), which is a major risk factor for stroke. Additionally, obesity (42.5%) is also associated with cognitive impairment, as shown in the study by Zolla Natallian (2022). These findings highlight the importance of early detection of risk factors to prevent post-stroke cognitive impairment. The clinical implication of this study is the importance of classifying stroke subtypes to determine the appropriate rehabilitation approach. MoCA-Ina has been shown to have higher sensitivity than MMSE in detecting cognitive impairments in stroke patients. This study has limitations in the sample size, which is not fully homogeneous, and did not control for sociodemographic and lifestyle factors. Future research is recommended to increase the sample size, consider confounding factors, and conduct longitudinal studies to understand long-term changes in cognitive function.

Conclusion

This study shows a significant difference in cognitive function between anterior and posterior ischemic stroke subtypes. Patients with posterior stroke have better cognitive function compared to those with anterior stroke, as evidenced by higher MoCA-Ina scores (p = 0.000). These results emphasize that the classification of ischemic stroke subtypes plays a role in determining the level of cognitive impairment.The implication of this finding is the importance of cognitive screening in stroke patients based on subtypes, which can help in planning more optimal rehabilitation. Further research with a longitudinal design and larger sample size is needed to strengthen these findings and explore other factors contributing to cognitive decline in ischemic stroke patients.

Conflict of Interest

The authors declared no conflict of interest.

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