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The Relationship Between Stroke Classification And Motor Function Impairment

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ABSTRACT
Stroke is a sudden abnormality in brain function caused by problems with cerebral blood circulation. In the world, stroke is the second leading cause of death. There are two types of stroke: hemorrhagic and ischemic. Hemiplegia and hemiparesis are the most common motor disorders in patients who have had a stroke. This study investigates whether there is a relationship between stroke classification and impaired motor function experienced by patients who have had a stroke. This research used a literature review method by tracing the results of scientific publications in the time period between 2017 and 2024. From the results it was found that there was a significant relationship between motor function disorders and stroke classification.

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INTRODUCTION

According to the World Stroke Organization , there are 13.7 new cases of stroke and around 5.5 million deaths due to stroke every year, this makes stroke the second most deadly disease in the world after heart disease and the third cause of disability (1) . According to 2013 Riskesdas data , the prevalence of stroke in Indonesia is 12.1 per mile, the highest in East Kalimantan Province (14.7 per mile), the lowest in Papua Province (4.1 per mile), and around 70% of the incidence and 87% of disability and deaths from stroke occur in low- and middle-income countries. Incidence rates in developed countries have fallen in recent years. However, this figure tends to increase in developing countries such as Indonesia. This happens because the implementation of risk factors is not good enough (2) .

Stroke is a condition that occurs when some brain cells die due to disruption of blood flow due to blockage or rupture of blood vessels in the brain. When blood flow stops, the supply of oxygen and food to the brain also stops, so that parts of the brain cannot function as they should. Stroke is a disease of the cerebral blood vessels (cerebrovascular) which is characterized by the death of brain tissue (cerebral infarction) caused by reduced blood flow and oxygen in the brain. This reduced blood and oxygen flow can be caused by blockages, narrowing, or rupture of blood vessels, resulting in a series of biochemical reactions that can damage or kill brain cells. The death of brain tissue can cause loss of

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functions controlled by that brain tissue. If not treated properly, this disease can be fatal and lead to death. Even though they can be saved, sometimes sufferers experience paralysis of their limbs, loss of some memories, or loss of the ability to speak. The forms can include paralysis on one side (hemiplegia), reduced strength in one limb (hemiparesis), speech disorders, and sensation disorders in the skin of the face, arms or legs (3) .

Stroke according to World Health Organization (WHO) is defined as clinical signs that occur quickly or suddenly in the form of focal (or global) deficits in brain function, with symptoms lasting 24 hours or more or causing death, with no clear cause other than vascular causes. According to the 2019 National Guidelines for Medical Services (PNPK) for Stroke Management, stroke is defined as an acute clinical manifestation resulting from neurological dysfunction in the brain, spinal cord and retina, whether partial or complete, that persists for 224 hours or causes death due to blood vessel disorders. There is also a definition of stroke based on the American Heart Association / American Stroke Association (AHA/ASA), where stroke is defined as an acute neurological deficit syndrome resulting from injury to the brain, spinal cord and retina which can be explained by a vascular etiology. The latest definition of stroke includes all of the following components:

1. Central nervous system (CNS) infarction , namely death of brain cells, spinal cord or retina based on:
    a. Pathologic, imaging, or other objective evidence of focal ischemic injury to the brain, spinal cord , or retina according to the associated vascular distribution, or
    b. Clinical evidence of focal ischemic injury to the brain, spinal cord , or retina that persisted for at least 24 hours or caused death by other etiologies was excluded.
2. Ischemic stroke, namely an episode of neurological dysfunction due to cerebral, spinal or retinal infarction .
3. Infarction silent CNS, that is, the presence of imaging or neuropathological evidence suggestive of CNS infarction without findings of acute neurological dysfunction associated with the lesion.
4. Intracerebral hemorrhage , which is a focal collection of blood in the brain parenchyma or ventricular system that is not caused by trauma. Parenchymal bleeding types I and II post CNS infarction are included in this classification.
5. Stroke due to intracerebral hemorrhage , which is a rapidly developing neurological dysfunction due to a focal collection of blood in the brain parenchyma or ventricular system that is not caused by trauma.
6. Silent cerebral hemorrhage , namely a chronic collection of blood products in the parenchyma of the subarachnoid cavity , or ventricular system detected imagingly or neuropathologically that is not caused by trauma and does not manifest into acute neurological dysfunction related to the lesion.
7. Subarachnoid hemorrhage , namely bleeding in the subarachnoid cavity .
8. Stroke due to subarachnoid hemorrhage , namely neurological dysfunction and/or rapidly developing headache due to subarachnoid hemorrhage that is not in the cavity caused by trauma.

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9. Stroke due to cerebral vein thrombosis, namely infarction or bleeding in the brain, spinal cord or retina due to thrombosis in the cerebral vein structures. Clinical manifestations of reversible edema without infarction or hemorrhage are not included in this definition.
10. Unclassified stroke, namely an episode of acute neurological deficit thought to be due to ischemia or bleeding, lasting more than 24 hours or causing death, but without strong evidence to be classified into one of the above groups.

There are also vascular events in the brain but they are different from strokes, namely infarction attacks transient (SIT) or transient ischemic attack (TIA) which is defined as a transient symptom arterial ischemic follicles lasting less than 24 hours without evidence of infarction on pathologist or imaging evidence.

Stroke is classified into 2, namely ischemic stroke and hemorrhagic stroke . Ischemic stroke is a blockage of blood vessels that causes blood flow to the brain to partially or completely stop. Ischemic strokes are generally caused by atherothrombosis of cerebral blood vessels, both large and small. In an ischemic stroke, blockages can occur along the arteries leading to the brain. Blood to the brain is supplied by two internal carotid arteries and two vertebral arteries . These arteries are branches of the heart's aortic arch. An atheroma (fatty deposit) can form in the carotid artery, causing reduced blood flow. This situation is very serious because each carotid artery normally provides blood to most of the brain. Fat deposits can also be released from the artery walls and flow in the blood and then block smaller arteries.

Hemorrhagic stroke is caused by bleeding within the brain tissue (called hemorrhage intracerebrum or hematon intracerebrum) or bleeding into the subarachnoid space , which is the narrow space between the surface of the brain and the layer of tissue covering the brain (called hemorrhage subarachnoid). Hemorrhagic stroke is the most deadly type of stroke, accounting for a small portion of all strokes, namely 10-15% for intracerebral hemorrhage and around 5% for subarachnoid hemorrhage . Hemorrhagic stroke can occur if an intracerebral vascular lesion ruptures , resulting in bleeding into the subarachnoid space or directly into brain tissue. Some of the vascular lesions that can cause subarachnoid hemorrhage are aneurysms saccular and malformation arteriovenous .

METHOD

The study uses a literature review method by searching the results of scientific publications in the time period between 2017 and 2024 using 3 databases , namely: Google Scholar , PubMed , and ScienceDirect . Search strategy based on PICO.

Table 1. PICO Summary

Component	Information
Population/problem	Strokes
Intervention	Ischemic stroke
Comparison	Hemorrhagic stroke
Outcomes	Impaired motor function

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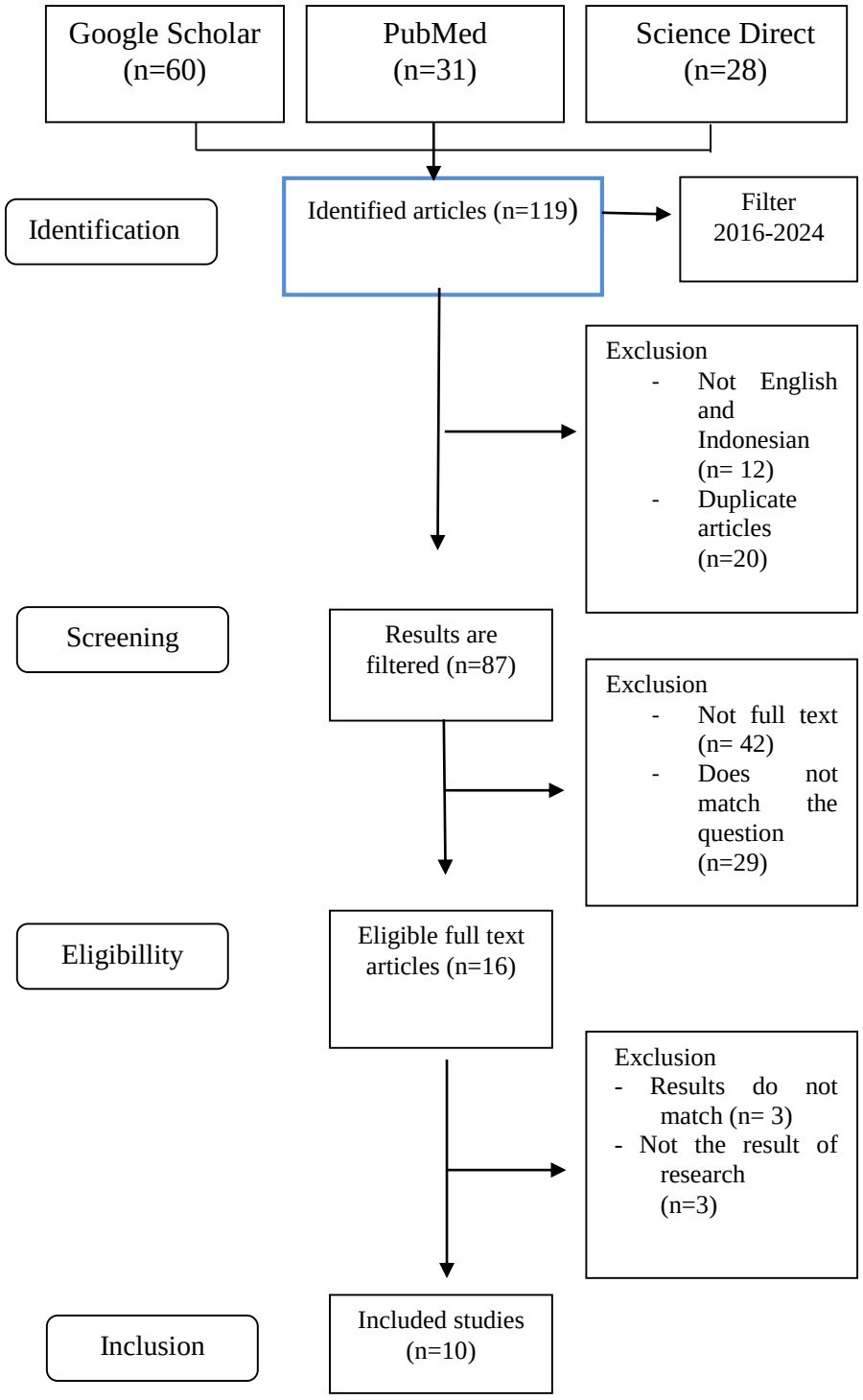
To assess eligibility, these articles were screened using the Critical Appraisal Skills Program (CASP) and the Center for Evidence-Based Medicine (CEBM). In addition, the quality of articles was effectively screened and assessed using the Cochrane risk of bias tool recommended by Cochrane Handbook for Systematic Reviews of Interventions. The prism flow diagram is shown in figure 1.



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RESULTS AND DISCUSSION

Table 2. Journal review literature

No	Journal Name	Title	Method	Writer	Conclusion
1.	digest (2022)	The relationship between motor function and degree of muscle strength with the incidence *of fatigue* post-stroke	observational study with the Pearson correlation test carried out with a questionnaire	Pramana Y et al	There is a significant relationship between motor function and the degree of muscle strength and *fatigue* post-stroke.
2.	Sandi Husada Journal of Health Sciences (2020)	hemorrhagic stroke with motor disorders in patients with risk factors for diabetes mellitus and hypertension	Descriptive analytics with a cross approach sections	Nia Permatasari	There is no comparison of hypertension in nonhemorrhagic stroke with mild and moderate motor impairment
3.	Indonesian Journal of Health Science (2022)	Description of Cognitive Function in Post-Stroke Patients at the Neurology Polyclinic at Dr. Otak Hospital. Drs. M. Hatta Bukittinggi in 2022	This is descriptive research with techniques *Consecutive* sampling	Zaffarsyah et al	The frequency distribution of levels of cognitive function impairment in ischemic stroke patients is highest in no disturbance and mild impairment, whereas in hemorrhagic stroke patients the frequency distribution is even.
4.	Journal of Homeostasis (2020)	Correlation between the location of the lesion and the degree of	observational research and cross-sectional approach . The samples used	Sandy et al	Analysis uses *the Kormogorov-Smirnoff correlation test* shows an

No	Journal Name	Title	Method	Writer	Conclusion
		spasticity in ischemic stroke patients at Ulin Hospital , Banjarmasin	were 30 samples obtained by *purposive sampling*		insignificant value of $p = 0.841$. The conclusion is that there is no relationship between the location of the lesion and the degree of spasticity in ischemic stroke patients at Ulin Regional Hospital, Banjarmasin
5.	Medical Student Scientific Journal (2017)	The Relationship between Stroke Degree and Cognitive Status in Ischemic Stroke Patients at the Neurology Clinic at Dr. Regional General Hospital. Zainoel Abidin Banda Aceh	It is research observational analytics with *cross* design *sectional*	Putri et al	The results of the study showed that 22 people (55.0%) had moderate stroke and 19 people (47.5%) had mild cognitive impairment. There is a strong relationship between the degree of stroke and cognitive status (p = 0.000, r = 0.603). In conclusion, there is a strong relationship between the degree of stroke and cognitive status in ischemic stroke patients at the Neurology Polyclinic, RSUD dr. Zainoel Abidin Banda Aceh.
6.	BMC	Associations	This research is	Einstad et	Of the 567 patients

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No	Journal Name	Title	Method	Writer	Conclusion
	Geriatrics Journal (2021)	between post - stroke motor and cognitive function : a cross-sectional study	a cohort study prospective multicentral	al	consisting of 242 female patients and 325 male patients. The prevalence of concurrent motor and cognitive disorders ranges from 9.5% to 22.9%
7.	Journal of Nursing Invention (2021)	The relationship between stroke classification and impaired motor function in stroke patients	This research design uses a cross design sectional with a sample of 36 respondents	Dody & Huzaifah Zaqyyah	Correlation analysis uses the chi test square with α=0.05 with the results that there is a relationship between stroke classification and impaired motor function in stroke patients with a p value: 0.000
8.	Psychological Zone Scientific Journal (2019)	The relationship between stroke and concentration in patients seeking treatment at the Neurology Clinic at Graha Hermine Hospital Batam city	It is research quantitative with observational design	Isramilda & Lahagu PN	It was found that there was a significant relationship with a value of p=0.001 (p<0.05). There was a relationship between stroke and concentration in patients seeking treatment at the neurology clinic at Graha Hermine Hospital Batam 2017.
9.	Journal Clinical and Population Sciences	Multimodal Assessment of the Motor System in	Patients were divided into 3 groups, depending on	Nazarova et al	IC FA ratio in both corticospinal tract FA profiles contralesional and

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No	Journal Name	Title	Method	Writer	Conclusion
	(2021)	Patients With Chronic Ischemic Stroke	upper extremity motor recovery: good, moderate, and poor. Nonparametric statistical tests and regression analysis		ipsilesional and the ratio of IC FA in the absence of IC and MEP both led to poor motor outcomes (96% accuracy). No other metrics can be used to determine patient classification. For the two investigated muscles, there are different MEPs.
10.	Diponegoro Medical Journal (2018)	Differences in Motor Output in Ischemic Stroke Patients During Asleep and Awake Attacks	This research design uses a cross design sectional with a sample of 36 respondents	Enggarela et al	The difference in MAS scores between stroke patients who occurred while asleep and awake was not much different. Stroke patients who suffer attacks while asleep tend to have higher blood pressure and total cholesterol levels, and have poorer motor output

Based on the literature search that had been carried out, literature was found that specifically discussed the relationship between stroke classification and motor function disorders in stroke patients and several pieces of literature were found that discussed motor function disorders in ischemic stroke and hemorrhagic stroke patients .

In the first journal by Pramana et al (2022), it was stated that there was a significant relationship between motor function and the degree of muscle strength and post-stroke fatigue . However, no relationship was found between the characteristics of gender, age, type of hemiparesis , stroke onset , stroke type and comorbidity factors. vascular such as hypertension, diabetes mellitus and dyslipidaemia with post-stroke fatigue .

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The second journal was by Nia Permatasari (2020), In this study, Non- Hemorrhagic Stroke in motor disorders with blockage and no blockage, the results were that seniors aged >65 years with Non- Hemorrhagic Stroke had moderate motor impairment (2-3) while seniors aged > 65 year old with non- hemorrhagic stroke had mild motor impairment (4-5). The statistical test results using the Kolmogorov-Smirnov Z test have a significant value of 0.00, because the p value = 0.00> α = 0.05. Measurements using motor impairment showed hypertension (≥140/90 mmHg) in non- hemorrhagic stroke with moderate motor impairment (2-3). Measurements using motor impairment showed high levels of diabetes mellitus (≥200 g/ dL) in non- hemorrhagic strokes . Measurements using motor disorders showed high hypertension & diabetes mellitus (≥140/90 mmHg and ≥200 g/ dL) with non-hemorrhagic stroke and blockage. Measurements using motor impairment showed moderate motor impairment (2-3) with blockage. The statistical test results using the Chi-Square test have a significance value of 0.280, because the p value = 0.280> α = 0.05. Mild, moderate or severe motor disorders can occur if the location of the infarction is at a distance or the homonculus affects the motor skills.

The third journal by Zaffarsyah et al (2022), this study states that there is no significant relationship between impaired cognitive function and the type of stroke experienced by the patient. From the results of this study and several previous studies, variations were found in the frequency of cognitive dysfunction based on the type of stroke. This variation could be caused by differences in characteristics of post-stroke patients. Factors such as age, gender, education and occupation greatly influence cognitive health. 27 Other factors that can cause this are variations in severity , location and size of lesions, as well as underlying risk factors for stroke.

The fourth journal by Sandy et al (2020), in this study stated that there was no significant difference between the relationship between the location of the lesion and the degree of spasticity in the Seruni room and stroke center in the Ulin Banjarmasin Regional Hospital area, it was obtained at p=0.841 (p<0.05). In the fifth journal by Putri et al (2020), this research states that there is a strong relationship between the degree of stroke and cognitive status in ischemic stroke patients at the Neurology Polyclinic RSUDZA Banda Aceh, namely that 47.5% of ischemic stroke sufferers experience mild cognitive impairment and ischemic stroke sufferers as many as 55% with moderate degrees of stroke.

Sixth journal by Einstad et al (2021), stated that cognitive and fine motor impairments and a combination of these have become relatively common among stroke survivors despite high premorbid functioning and small strokes. Motor performance is associated with memory, executive function and global cognition. The seventh journal by Dody & Zaqyyah (2021), stated that the results of the analysis of the classification of strokes with impaired motor function were mostly in the category of non- hemorrhagic strokes with hemiparesis disorders with 25 respondents. The statistical test results show a p value: 0.000, this shows that there is a relationship between stroke classification and impaired motor function in stroke patients.

The eighth journal by Isramilda (2019), stated that the results of statistical tests using Chi Square obtained a value of p= 0.00 1(p<0.05) which means it can be concluded that

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there is a relationship between stroke and concentration in patients seeking treatment at the Home Neurology Polyclinic. Graha Hermine Hospital in 2017. The ninth journal by Nazarova (2021), states that the IC FA ratio in both corticospinal tract FA profiles contralesional and ipsilesional and the ratio of IC FA in the absence of IC and MEP both led to poor motor outcomes (96% accuracy). No other metrics can be used to determine patient classification. For the two investigated muscles, there are different MEPs.

The tenth journal by Enggarela stated that there was a statistically significant difference in MAS scores (p= 0.0045) between ischemic stroke patients who were attacked while asleep and awake. However, clinically this difference is not significant (< 10). There was a significant relationship (p= 0.037; r= 0.339) between GDS levels and MAS scores and a significant difference in diastolic blood pressure (p= 0.033) was found between the ischemic stroke groups during sleep and wake attacks.

CONCLUSION

Based on several literatures discussing the relationship between stroke classification and motor function disorders, it can be concluded that there is a significant relationship between motor function disorders and stroke classification. However, there is literature which states that there is no significant relationship between impaired motor function and stroke classification.

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