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The Relationship Between Hematoma Volume and Lesion Location with the Level of Consciousness in Hemorrhagic Stroke Patients at Gunung Jati Regional Hospital, Cirebon, in 2024

Tubagus Syahrul Ramdani[1]*, Dasa Sariadi[2], Hendry Gunawan[3]
[1,2,3]Universitas Swadaya Gunung Jati, Cirebon, Indonesia
Email: tubagussyahrulr@gmail.com

KEYWORDS
Hematoma Volume, Hematoma Lesion Location, Level of Consciousness

ABSTRACT
A stroke is defined as an acute clinical manifestation of neurological dysfunction that persists for ≥ 24 hours. WHO states that in 2018, there were an estimated 50 million stroke patients worldwide, and every year, there are an additional 13.7 million stroke cases. Intracerebral Hemorrhage (ICH) is one of the most severe and fatal subtypes of cerebrovascular haemorrhage. The volume of bleeding and the location of the hematoma lesion are two things that can affect patient mortality. To analyze the relationship between the volume and location of hematoma lesions with the level of consciousness of hemorrhagic stroke patients at Gunung Jati Regional Hospital Cirebon in 2024. This study is an analytic observational study with a cross-sectional approach. Data collection using total sampling in accordance with the inclusion criteria of as many as 40 samples. The population in this study consists of hemorrhagic stroke patients at Gunung Jati Regional Hospital Cirebon in 2024. The data that has been collected is processed using univariate and bivariate analysis. Bivariate analysis using the Spearman test. The hematoma volume was ≤ 30 mL and the lesion location was in the parietal lobe. The results of the analysis of the volume of hematoma with the level of consciousness obtained a p-value of 0.000 (≤ 0.05) with an R-value of 0.529, showing a significant relationship with fairly strong strength and positive relationship direction. As for the location of the hematoma lesion with the level of consciousness, the p-value is 0.007 (≤ 0.05) with an R-value of 0.422, indicating a relationship with fairly strong strength and negative relationship direction. There is a significant relationship between the volume and location of hematoma lesions and the level of consciousness of hemorrhagic stroke patients.

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Corresponding Author: Tubagus Syahrul Ramdani*
Email: tubagussyahrulr@gmail.com

INTRODUCTION

Stroke is something that is highly feared by the public because of the long-term effects that can cause significant or irreversible damage (De Wit et al., 2017). Stroke cannot be avoided because it can occur at any time and is caused by many factors, such as lifestyle and diet, regardless of age, gender, ethnicity and other factors. Stroke is defined as a neurological disorder of the brain, spinal cord, and retina, either partially or completely, which persists for≥ 24 hours or causes death due to vascular disorders (Williams & Felix, 2022).

According to the results of the 2019 Global Burden of Disease study, stroke is the leading cause of disability-adjusted life year in those aged 50 years and over (Song et al., 2022). WHO stated that in 2018, there were an estimated 50 million stroke patients worldwide, with around 13.7 million new stroke cases appearing each year. Although the prevalence of hemorrhagic stroke is not as much as

ischemic stroke, according to data from the Ministry of Health of the Republic of Indonesia, intracerebral hemorrhagic stroke is included in the ten non-communicable diseases that cause the most deaths in Indonesia, a mortality rate of 18.49% to 19.69% (Aryastami & Mubasyiroh, 2023).

Indonesia itself is the largest contributor to stroke disease in Asian countries, even according to World Life Expectancy, Indonesia is ranked first with the highest number of stroke diseases in the world, it is estimated that every year Indonesia experiences an increase in new stroke patients with a total of 550,000 people, with the death rate due to this stroke disease reaching 138,264 (Yang & Li, 2023). Pusdatin data in 2018 shows that 10.9% or 2,120,362 people from the population aged ≥ 15 years had a stroke based on a doctor's diagnosis (Safitri et al., 2022).

Intracerebral Hemorrhage (ICH) is one of the most severe and fatal subtypes of cerebrovascular haemorrhage and is associated with a mortality rate of up to 40% (Pinho et al., 2019). Approximately 30% of patients with ICH will experience an expansion of bleeding within 6 hours of the onset of neurologic deficits. Every 1 mL increase in hematoma is estimated to increase the risk of death by 5%. In addition to bleeding volume, the location of the lesion can also affect the mortality of hemorrhagic stroke patients. The most frequent hemorrhagic stroke bleeding sites are the putamen and internal capsule (±50% of all hemorrhagic stroke cases), lobe regions (temporal, parietal, frontal lobes), thalamus, pons, and cerebellum. Bleeding location can be a predictor of hemorrhagic stroke outcome (Yang & Li, 2023). Based on these data, researchers are interested in conducting a study entitled "The Relationship between Volume and Location of Hematoma Lesions with the Level of Consciousness of Hemorrhagic Stroke Patients at Gunung Jati Regional Hospital Cirebon in 2024".

METHOD

This study is an analytic observational research with a cross-sectional approach, conducted at Gunung Jati Cirebon Regional Hospital from May to June 2024. The study aimed to analyze hemorrhagic stroke cases using medical records of patients diagnosed with intracerebral hemorrhage stroke. The population of this study consisted of patients diagnosed with intracerebral hemorrhagic stroke at Gunung Jati Cirebon Regional Hospital from January to June 2024.

The sampling technique used in this study was purposive sampling, where participants were selected based on specific inclusion and exclusion criteria. The inclusion criteria for this study were: (1) patients diagnosed with intracerebral haemorrhage stroke at Gunung Jati Cirebon Regional Hospital between January and June 2024, (2) patients experiencing their first attack of intracerebral haemorrhage stroke, and (3) patients with complete medical records. The exclusion criteria included (1) patients with CT scan results indicating brain ischemia, (2) subarachnoid haemorrhage (SAH) patients, and (3) patients with intracerebral haemorrhage due to trauma.

Data collection was performed by reviewing the medical records of eligible patients. The data gathered included patient demographics, clinical history, imaging results, and other relevant medical information. Data analysis was conducted using descriptive statistics to summarize the characteristics of the sample, as well as inferential statistics to examine relationships and differences between variables. This study has received ethical approval from the Research Ethics Committee of Gunung Jati Cirebon Regional Hospital (No. 021/LAIKETIK/KEPPKRSGJ/V/2024) and adheres to ethical research guidelines.

RESULT AND DISCUSSION

Table 1. Frequency distribution of samples based on bleeding volume

No.	Criteria	Frequency	Percentage (%)
1	Lesion volume ≤ 30 mL	34	85.0

No.	Criteria	Frequency	Percentage (%)
2	Lesion volume > 30 mL	6	15.0
	Total	**40**	**100**

For data on samples with bleeding volume categories, the most samples were samples with lesion volume ≤ 30 mL, as many as 34 samples (85%) more than with lesion volume > 30 mL as many as 6 samples (15%).

Table 2. Frequency distribution of samples based on the location of bleeding lesions

No.	Criteria	Frequency	Percentage (%)
1	Frontis	8	20.0
2	Parietal	20	50.0
3	Temporalis	7	17.5
4	Occipitalis	5	12.5
	Total	**40**	**100**

Sample data with the category of hematoma lesion location is divided into 4 lobes, namely Frontalis, Parietalis, Temporalis, and Occipitalis. The location of the bleeding lesion with the most samples was the Parietal Lobe with 20 samples (50%), followed by the second most in the Frontalis Lobe with 8 samples (20%), then the Temporalis Lobe with 7 samples (17.5%), and the last sample was in the Occipitalis lobe with 5 samples (12.5%).

Table 3. Frequency Distribution of Samples Based on the Glass Glow Coma Scale

No.	Criteria	Frequency	Percentage (%)
1	GCS 15: Compos Mentis	22	55.0
2	GCS 12-14: Somnolent	1	2.50
3	GCS 8-11: Sopor	6	15.0
4	GCS 3-7: Coma	11	27.5
	Total	**40**	**100**

Level of consciousness based on GCS, the most samples were GCS 15 with 22 samples (55%), followed by GCS 3-7 with 11 samples (27.5%), then GCS 8-11 with 6 samples (15%), and the least samples were GCS 12-14 with 1 sample (2.5%).

Table 4. Bivariate Analysis Between Hematoma Volume and Level of Consciousness

Hematoma Volume		Awareness Level				Total	*p-value*	*r*
		GCS 15	GCS 12-14	GCS 8-11	GCS 3-7			
≤30 mL	n	22	1	5	6	34	0.000	0,529
	%	55.0	2.5	12.5	15	85.0		
>30 mL	n	0	0	1	5	6		
	%	0.0	0.0	2.5	12,5	15.0		
Total	n	22	1	6	11	40		
	%	55.0	2.5	15.0	27.5	100.0		

Based on crosstab analysis, the distribution of sample data with Hematoma Volume ≤ 30 mL was 34 samples with details of 22 samples (55%) having a compos mentis level of consciousness, 1 sample (2.5%) had a somnolent level of consciousness, 5 samples (27.5%) had a sopor level of consciousness and 6 samples (15%) had a coma level of consciousness. As for sample data with Hematoma Volume > 30 mL, there were no samples with the category of compos mentis and somnolent level of consciousness, but 1 sample (2.5%) with sopor level of consciousness and 5 samples (12.5%) with coma level of consciousness were obtained.

The results of the Spearman correlation statistical test between hematoma volume and the level of consciousness of hemorrhagic stroke patients at Gunung Jati Regional Hospital obtained a p-value of 0.000 (≤ 0.05) so that H0 was rejected, and H1 was accepted, with a correlation coefficient value of 0.529 with moderate strength and positive relationship direction where the higher the volume of bleeding, the more GCS decrease. Thus, it is concluded that there is a significant relationship between hematoma volume and the level of consciousness of hemorrhagic stroke patients at Gunung Jati Regional Hospital in 2024.

Table 5. Bivariate analysis between hematoma volume and level of consciousness

Hematoma Lesion Location		Awareness Level				Total	*p-value*	*r*
		GCS 15	GCS 12-14	GCS 8-11	GCS 3-7			
Frontal Lobe	n	2	0	3	3	8	0.007	-0,422
	%	5.0	0.0	7.5	7.5	20.0		
Parietal Lobe	n	9	1	3	7	20		
	%	22.5	2.5	7.5	17.5	50.0		
Temporalis lobe	n	7	0	0	0	7		
	%	17.5	0.0	0.0	0.0	17.5		
Occipital Lobe	n	4	0	0	1	5		
	%	10.0	0.0	0.0	2.5	12.5		
Total	n	22	1	6	11	40		
	%	55.0	2.5	15.0	27.5	100.0		

The distribution of sample data on the location of hematoma lesions in the frontal lobe with details of 2 samples (5%) had a compos mentis level of consciousness, 3 samples (7.5%) had a sopor level of consciousness, 3 samples (7.5%) had a coma level of consciousness, and no samples were found with a somnolent level of consciousness category. Sample data with the location of hematoma lesions in the parietal lobe with details of 9 samples (22.5%) had a compos mentis level of consciousness, 1 sample (2.5%) had a somnolent level of consciousness, 3 samples (7.5%) had a sopor level of consciousness, and 7 samples (17.5%) had a coma level of consciousness. Data on samples with hematoma lesions in the temporal lobe with details of 7 samples (17.5%) had a compos mentis level of consciousness, and there were no samples with somnolent, sopor and coma level of consciousness categories. While sample data with the location of hematoma lesions in the occipital lobe with details of 4 samples (10%) had a compos mentis level of consciousness, 1 sample (2.5%) had a coma level of consciousness, and no samples were obtained with the categories of somnolent and sopor levels of consciousness.

The results of the Spearman statistical test between the location of the hematoma lesion and the level of consciousness of hemorrhagic stroke patients at Gunung Jati Regional Hospital obtained a p-value of 0.007 (≤ 0.05) H0 rejected, and H1 accepted, with a correlation coefficient value of 0.422 with

moderate strength and negative relationship direction. Then the conclusion is. Thus, it is concluded that there is a relationship between the location of the hematoma lesion and the level of consciousness of hemorrhagic stroke patients at Gunung Jati Regional Hospital in 2024.

A. Analysis of the Relationship Between Hematoma Volume and Consciousness Level of Hemorrhagic Stroke Patients

The relationship between bleeding volume and the level of consciousness of stroke patients can be seen in Table 4. The results showed that intracerebral haemorrhage patients with a compos mentis level of consciousness had an average volume of ≤ 30 mL, while patients who experienced coma had an average volume of bleeding > 30 mL. These results are in line with research by Arifin et al. (2020), which shows that bleeding volumes ≥ 30 cc are almost six times more at risk of death within 30 days (Putra et al., 2020). In addition, another study according to Lei Song et al. (2023) stated that patients with hematoma expansion had poor GCS scores; in this study, there was a significant relationship between bleeding volume and anatomical location on the outcome of deep intracerebral haemorrhage (Yang & Li, 2023).

This is also in accordance with research conducted by Maria Ulfa et al. (2020). There is a relationship between bleeding in intracerebral stroke patients and the level of consciousness, where there are two predictors, namely increased intracranial pressure and bleeding diameter, so that the greater the volume of bleeding, the heavier the level of consciousness (Putra et al., 2020). Hemorrhage stroke patients are more likely to experience decreased consciousness; this is due to the rupture of cerebral blood vessels due to various factors, resulting in a blood clot (hematoma). The large volume of haemorrhage in bleeding stroke patients can affect patient mortality, along with the larger volume of hematoma, the greater the intracranial pressure, which creates a space pressure effect that will compress the brain parenchyma, which in turn will cause a very rapid decline in consciousness (Kumar et al., 2018).

B. Analysis of the Relationship between Hematoma Lesion Location and Consciousness Level of Hemorrhagic Stroke Patients

The relationship between the location of hematoma lesions and the level of consciousness of hemorrhagic stroke patients can be seen in Table 5. The results showed that intracerebral haemorrhage patients with the most compliments level of consciousness were found in the parietal lobe (Claassen et al., 2016), and the highest coma level of consciousness was found in the parietal lobe, precisely in the Capsula interna and Thalamus areas. This is in line with research conducted, which states that hematoma in the PLIC area correlates with poor prognosis results where in this study, the PLIC area is included in the parietal lobe and the final results of this study show that there is a significant relationship between anatomical location and hematoma expansion in ICH patients (Yang & Li, 2023).

In addition, another study conducted by Kay-Cheong Teo et al. (2023) stated that the prognosis of stroke patients with haemorrhage in the thalamus or internal capsule region has a worse prognosis than similar haemorrhage in the external capsule or lobar region (Teo et al., 2023).

Decreased consciousness or coma is caused by structural or metabolic damage to the brainstem ARAS or damage to bilateral cerebral cortical sections (Oli & Shrestha, 2024). The RAS is a complex polysynaptic pathway consisting of multiple neural pathways that connect the brainstem with the cerebral cortex. The needles start from the brainstem and then continue to the thalamus, where they synapse and project to the cerebral cortex (Bhushan et al., 2022). A lesion will distort the structure of the cerebral hemispheres due to lateral compression of the inner middle structures and tentorial herniation of the temporal lobe, resulting in compression of the mesencephalon and the subthalamic area of the reticular activating system, thus disturbing the centre of consciousness (Teo et al., 2023).

CONCLUSION

The volume and location of hematomas may influence the level of consciousness in patients. This study aims to examine the relationship between hematoma volume, lesion location, and the level of consciousness. The objective of this study is to assess the relationship between hematoma volume and the level of consciousness, as well as to analyze how the location of the hematoma lesion correlates with the level of consciousness in patients. The majority of hematomas are found to have a volume of ≤ 30 mL, with the lesions predominantly located in the parietal lobe. Statistical analysis of the relationship between hematoma volume and the level of consciousness reveals a p-value of 0.000 (≤ 0.05) and an R-value of 0.529, indicating a significant and fairly strong positive correlation. In contrast, the analysis of the relationship between the location of the hematoma lesion and the level of consciousness shows a p-value of 0.007 (≤ 0.05) and an R-value of 0.422, indicating a significant, fairly strong negative correlation.

REFERENCES

Aryastami, N. K., & Mubasyiroh, R. (2023). Optimal utilization of maternal health service in Indonesia: a cross-sectional study of Riskesdas 2018. *BMJ Open*, *13*(9), e067959.

Bhushan, R., Ravichandiran, V., & Kumar, N. (2022). An overview of the anatomy and physiology of the brain. In *Nanocarriers for Drug-Targeting Brain Tumors* (pp. 3–29). Elsevier. https://doi.org/10.1016/B978-0-323-90773-6.00023-3

Claassen, J., Velazquez, A., Meyers, E., Witsch, J., Falo, M. C., Park, S., Agarwal, S., Michael Schmidt, J., Schiff, N. D., & Sitt, J. D. (2016). Bedside quantitative electroencephalography improves assessment of consciousness in comatose subarachnoid hemorrhage patients. *Annals of Neurology*, *80*(4), 541–553.

De Wit, L., Theuns, P., Dejaeger, E., Devos, S., Gantenbein, A. R., Kerckhofs, E., Schuback, B., Schupp, W., & Putman, K. (2017). Long-term impact of stroke on patients' health-related quality of life. *Disability and Rehabilitation*, *39*(14), 1435–1440.

Kumar, G., Mukherjee, S., & Patnaik, R. (2018). Exploring the Neuroprotective Potential of Chlorogenic Acid: An In-vivo and In-silico Approach. *Cerebrovasc Dis*, *46*(1), 1–49.

Oli, K. K., & Shrestha, A. (2024). Coma and Vegetative State. In *Case-based Approach to Common Neurological Disorders* (pp. 287–296). Springer.

Pinho, J., Costa, A. S., Araújo, J. M., Amorim, J. M., & Ferreira, C. (2019). Intracerebral hemorrhage outcome: A comprehensive update. *Journal of the Neurological Sciences*, *398*, 54–66. https://doi.org/10.1016/j.jns.2019.01.013

Putra, M. P. J., Sani, A. F., Lestari, P., & Ardhi, M. S. (2020). Bleeding Volume, Blood Pressure, and Consciousness Level in Association with the Mortality Rate among Patients with Intracerebral Hemorrhage at Dr. Soetomo General Hospital, Surabaya. *Althea Medical Journal*, *7*(2), 51–54.

Safitri, H. O., Fauziningtyas, R., Indarwati, R., Efendi, F., & McKenna, L. (2022). Determinant factors of low birth weight in Indonesia: Findings from the 2017 Indonesian demographic and health survey. *Journal of Pediatric Nursing*, *63*, e102–e106. https://doi.org/10.1016/j.pedn.2021.10.005

Song, L., Qiu, X.-M., Guo, T.-T., Zhou, H., Tang, D.-F., Wang, L.-S., Fu, Y.-F., Chen, H., Mao, H.-Q., & Wang, H.-B. (2022). Association between anatomical location and hematoma expansion in deep intracerebral hemorrhage. *Frontiers in Neurology*, *12*, 749931.

Song, L., Zhou, H., Guo, T., Qiu, X., Tang, D., Zou, L., Ye, Y., Fu, Y., Wang, R., Wang, L., Mao, H., & Yu, Y. (2023). Predicting Hemorrhage Progression in Deep Intracerebral Hemorrhage: A

Multicenter Retrospective Cohort Study. *World Neurosurgery*, *170*, e387–e401. https://doi.org/10.1016/j.wneu.2022.11.022

Teo, K.-C., Fong, S.-M., Leung, W. C. Y., Leung, I. Y. H., Wong, Y.-K., Choi, O. M. Y., Yam, K.-K., Lo, R. C. N., Cheung, R. T. F., & Ho, S.-L. (2023). Location-specific hematoma volume cutoff and clinical outcomes in intracerebral hemorrhage. *Stroke*, *54*(6), 1548–1557.

Ulfa, A. M., & Challen, A. E. (2020). Good Corporate Governance on Integrity of Financial Statements. *Tarumanagara International Conference on the Applications of Social Sciences and Humanities (TICASH 2019)*, 40–46.

Williams, D. M., & Felix, A. C. G. (2022). Prevention, Diagnosis, and Management of Stroke. *Reichel's Care of the Elderly: Clinical Aspects of Aging*, 208.

Yang, J., & Li, M. (2023). Epidemiology of Noncommunicable Diseases. In *Textbook of Clinical Epidemiology: For Medical Students* (pp. 213–226). Springer.