DIPONEGORO MEDICAL JOURNAL
(Jurnal Kedokteran Diponegoro)
Online : http://ejournal3.undip.ac.id/index.php/medico
E-ISSN : 2540-8844
Volume 10, Number 3, May 2021

THE CORRELATION BETWEEN MEAN ATERIAL PRESSURE AND BLEEDING VOLUME WITH THE NATIONAL INSTITUTE OF HEALTH STROKE SCALE (NIHSS) SCORE FOR INTRACEREBRAL HEMMORHAGE PATIENTS

Shonia Syvafiftyan Rosaline[1*], Hermina Sukmaningtyas[2], Arinta Puspita Wati[3], Sukma Imawati[2]
[1]Undergraduate Program, Faculty of Medicine, Diponegoro University, Semarang, Indonesia
[2]Department of Radiology, Faculty of Medicine, Diponegoro University, Semarang, Indonesia
[3]Department of Neurology, Faculty of Medicine, Diponegoro University, Semarang, Indonesia
[*]Corresponding Author: E-mail: ssrosaline@gmail.com

ABSTRACT

Introduction: Intracerebral hemorrhage refers to primary, spontaneous, and non-traumatic bleeding that occurs in the brain parenchyma. Intracerebral hemorrhage accounts for approximately 10-20% of all stroke. The most common risk factor for non-traumatic hemorrhagic stroke is hypertension. The increase in Mean Arterial Pressure leads to the incidence of intracerebral hemmorhage. The NIHSS is a systematic assessment tool that quantitatively measures stroke associated with neurologic deficits. Neurological deficits that occur in intracerebral hemorrhage occur because blood enters the brain parenchyma. The incoming blood was measured by the Automatic Volume Method (software volume evaluation), namely the calculation of volume by computer software on the CT Scan tool. **Aim**: To determine the correlation between Mean Arterial Pressure and bleeding volume with NIHSS score in intracerebral hemorrhage patients. **Methods**: The research design used in this study was cross sectional. The sample of this study was 40 research subjects using purposive sampling, this study has independent variables, namely Mean Arterial Pressure and bleeding volume, while the dependent variable is the NIHSS score (National Institute of Health Stroke Scale). This study conducted an analysis using Spearman's. **Results: :** The results of this study indicate that there is no significant relationship between bleeding volume and NIHSS score (p = 0,157, r = 0,228) and there is no significant relationship between MAP and NIHSS score (p = 0,268, r = -0,179) **Conclusion:** There is no statistically significant relationship between Mean Arterial Pressure and bleeding volume with the NIHSS score

Keywords: Mean Arterial Pressure, Bleeding Volume, National Institute of Health Stroke Scale, Intracerebral Hemorrhage

INTRODUCTION

Intracerebral hemorrhage refers to primary, spontaneous, non-traumatic bleeding that occurs in the brain parenchyma.[1] WHO states that worldwide stroke is the second leading cause of death and the third leading cause of disability, Indonesia itself is the country with the highest number of stroke sufferers in Asia.[2] The most common risk factor for non-traumatic hemorrhagic stroke is hypertension. One way to determine hypertension is to measure the Mean Arterial Pressure (MAP). [3] If there is an increase in Mean Arterial Pressure and it leads to the incidence of stroke, especially intracerebral hemorrhage, it can be assessed using certain standards. One of the standards used to measure neurological deficits is the National Institute of Health Stroke Scale (NIHSS). The NIHSS is a systematic assessment tool that quantitatively measures stroke associated with neurologic deficits.[4]

In intracerebral hemorrhage, the clinical presentation also varies based on the volume of bleeding and the location of the intracerebral hemorrhage.[1] Calculation of the volume of intracerebral hemorrhage can use manual methods or automatic methods. The automatic volume evaluation method (software volume evaluation) is a volume calculation by computer software in the CT scan tool. However, none of the symptoms / signs that occur in patients are specific enough to differentiate between intracerebral hemorrhage and ischemic stroke, therefore the diagnosis of intracerebral hemorrhage should always rely on neuroimaging.[1] Neuroimaging that can be used is CT Scan. CT Scan (Computed Tomography Scanner) is a procedure used to obtain images from various small angles of the skull and brain.[5]

METHODS

This study was conducted at Dr. Kariadi Hospital, Semarang. The study was conducted from June to July 2020. This study used a cross sectional study design. The data sampling method will use purposive sampling method. The research subjects were 40 people who met the inclusion and exclusion criteria. The inclusion criteria of this study were patients with acute onset intracerebral hemorrhage as evidenced by non-contrast head CT scan and age more than 60 years. Meanwhile, the exclusion

DIPONEGORO MEDICAL JOURNAL
(Jurnal Kedokteran Diponegoro)
Online : http://ejournal3.undip.ac.id/index.php/medico
E-ISSN : 2540-8844
Volume 10, Number 3, May 2021

criteria of this study were patients with blood clotting factor disorders, patients with a history of head trauma, and patients with intracerebral hemorrhage and found abnormalities such as infratentorial bleeding, or acute ischemia.

The independent variables in this study were the mean arterial pressure and bleeding volume. Mean Arterial Pressure calculated from blood pressure and bleeding volume obtained from the CT scan results. While the dependent variable in this study is the NIHSS score. Data analysis used the Spearman correlation test to measure the level of closeness of the relationship between two independent and dependent variables.

The research protocol was carried out by obtaining approval and ethical clearance from the Health Research Ethics Commission of the Faculty of Medicine, Diponegoro University / Dr. Kariadi Hospital, Semarang no. 116 / EC / KEPK / FK-UNDIP / VI / 2020.

RESULTS

Subject Characteristics

This study was conducted from June to July 2020 with a total of 40 research subjects, consisting of 25 men and 15 women. The average subject was 67.80 years old.

Table 1. Characteristics of Research Subjects

Variable	F	%	Mean ± SD	Median (min – max)
Gender				
Men	25	62,5		
Women	15	37,5		
Age			67,80 ± 7,96	65,5 (60 – 90)
BMI			22,83 ± 3,63	23,1 (16,6 – 30,93)
LDL			120,93 ± 31,97	119 (60 – 176)
Uric acid			5,43 ± 2,76	4,7 (0,7 – 12,5)
Bleeding Volume				
< 30	24	60,0		
> 30	16	40,0		
MAP				
Optimal	13	32,5		
Normal	7	17,5		
High normal	9	22,5		
Grade I hypertension	8	20,0		
Grade II hypertension	0	0		
Grade III hypertension	3	7,5		
NIHSS				
Mild	8	20,0		
Moderate	9	22,5		
Severe	17	42,5		
Profound	6	15,0		

Bleeding volumes less than 30 cc were more common, whereas bleeding volumes less than 30 cc occurred in 24 study subjects and more than 30 cc occurred in 16 study subjects.

Mean Arterial Pressure (MAP) of the research subjects were mostly in the optimal category and the least in the hypertension III category, with 13 research subjects in the optimal category, 7 in the normal category, 9 in the normal high category, 8 in the hypertension I category.

DIPONEGORO MEDICAL JOURNAL
(Jurnal Kedokteran Diponegoro)
Online : http://ejournal3.undip.ac.id/index.php/medico
E-ISSN : 2540-8844
Volume 10, Number 3, May 2021

Research subjects, category II hypertension did not occur in all research subjects, category III hypertension as many as 3 study subjects.

The National Institute of Health Stroke Scale (NIHSS) of the research subjects was the most in the severe category and the least in the profound category with the mild category as many as 8 research subjects, the moderate category as many as 9 research subjects, the severe category as many as 17 research subjects, the profound as many as 6 research subjects.

Table 2. Analysis of the Relationship between Bleeding Volume and NIHSS

Variable	NIHSS				p¥	R
	Mild	Moderate	Severe	Profound		
Bleeding Volume						
< 30	7	5	9	3	0,157	0,228
> 30	1	4	8	3		

Description: ¥ Spearman's

Based on the results of the Spearman test, the p value in the analysis of the correlation between bleeding volume and NIHSS score was 0.157 (p> 0.05), so it can be concluded that there was no significant correlation between bleeding volume and the NIHSS score.

Table 3. Analysis of the Relationship between MAP and NIHS

Variable	NIHSS				p¥	R
	Mild	Moderate	Severe	Profound		
MAP						
Optimal	2	1	6	4	0,268	-0,179
Normal	2	3	2	0		
High normal	1	3	4	1		
Grade I hypertension	2	2	4	0		
Grade II hypertension	0	0	0	0		
Grade III hypertension	1	0	1	1		

Description: ¥ Spearman's

Based on the results of Spearman's test, the p value in the analysis of the correlation between MAP and NIHSS score is 0.268 (p> 0.05) so it can be concluded that there is no correlation and the direction of the correlation is opposite between MAP and NIHSS score.

Table 4. Analysis of Relationship between MAP and NIHSS

Bleeding Volume	MAP					p¥	R
	Optimal	Normal	High Normal	Grade I hyperte-nsion	Grade III hyperte-nsion		
< 30	5	5	7	6	1	0,226	-0,196
> 30	8	2	2	2	2		

Description: ¥ Spearman's

Based on the results of Spearman's test, the p value in the analysis of the correlation between MAP and bleeding volume was 0.226 (p> 0.05), so it can be concluded that there was no correlation and there was no correlation and there was an opposite correlation between the volume of bleeding and the MAP value.

DIPONEGORO MEDICAL JOURNAL
(Jurnal Kedokteran Diponegoro)
Online : http://ejournal3.undip.ac.id/index.php/medico
E-ISSN : 2540-8844
Volume 10, Number 3, May 2021

DISCUSSION

Based on study from August 2017 to May 2020 medical record data that has been conducted, it was found that 40 intracerebral hemorrhage patients could become research subjects because they fit the inclusion criteria. In this study, after testing the hypothesis it was found that there was no significant correlation between the volume of bleeding and the NIHSS score, there was no correlation and the direction of the opposite correlation between the MAP and the NIHSS score, there was no correlation and the direction of the opposite correlation was between the volume of bleeding and the MAP value.

This study is in accordance with several previous studies.[6,7,8] Study conducted by Rahayu, Masruroh Rakhmani, Alidha Raisa, Neila Rahmah, and Kurnia said that there was no significant correlation between Mean Arterial Blood Pressure and NIHSS score. Another thing that is in line is a study conducted by Soleh which explained that there was no correlation between hypertension in intracerebral hemorrhagic stroke and NIHSS at day 30.[7] Study conducted by Agis D, Goggins MB, Oishi K, et al is also in line, namely the study said no there is a significant correlation between volume or NIHSS. [8]

The discrepancy between MAP and NIHSS score and bleeding volume with the existing NIHSS could be caused by several things including not considering the onset of intracerebral hemorrhage experienced by the study subjects. In previous studies, it was stated that blood pressure was higher in acute stroke sufferers which would increase rapidly in the first 1 hour.[9] Furthermore, it did not consider a history of recurrent stroke. In previous studies, it has been discussed that a history of hypertension has a significant effect on the incidence of stroke.[10] The latter does not take a deeper look at other risk factors related to study results such as obesity, smoking, diabetes mellitus, hyperuricemia, heavy alcohol, age, race, gender genetics. It is confirmed in the study that there is no correlation between MAP and bleeding volume. So that there may be other factors that influence this study more than the three variables that are taken into account.

This study also found several limitations. This study did not use the controls in it. In this study also did not consider any possible confounding factors such as age and smoking history. Age and smoking history are associated with worsening clinical outcomes experienced by patients with intracerebral hemorrhage. [11,12] This study also assessed the volume of bleeding from radiographs in the form of CT-scan, where differences in data collection time could affect the severity of intracerebral hemorrhage.

CONCLUSION

Based on the data presentation and discussion in the previous chapter, it can be concluded that this study shows that there is no statistically significant correlation between Mean Arterial Pressure and the NIHSS score and there was no statistically significant correlation between bleeding volume and NIHSS score.

RECOMMENDATION

In further study, other risk factors that can cause intracerebral hemorrhage such as obesity, smoking, diabetes mellitus, hyperuricemia, heavy alcohol, age, race, sex, and genetics are considered. The onset and previous history of the patient should be considered. And also this topic need more study regarding the correlation between bleeding volume and Mean Arterial Pressure with the NIHSS score to see which factors are more influential in increasing the NIHSS score.

REFERENCES

1. Morotti A, Goldstein JN. Diagnosis and Management of Acute Intracerebral Hemorrhage. *Emerg Med Clin North Am*. 2016;34(4):883-899. doi:10.1016/j.emc.2016.06.010
2. Pradesta RR, Sukmaningtyas H, Pudjonarko D. Korelasi Lokasi Perdarahan Intraserebral Dengan Outcome Pasien Stroke Hemoragik. *J Kedokt Diponegoro*. 2017;6(2):1178-1185.
3. Lele A V., Wilson D, Chalise P, Nazzaro J, Krishnamoorthy V, Vavilala MS. Differences in blood pressure by measurement technique in neurocritically ill patients: A technological assessment. *J Clin Neurosci*. 2018;47:97-102. doi:10.1016/j.jocn.2017.10.079
4. Elim C, Tubagus V, Ali RH. Hasil pemeriksaan CT scan pada penderita stroke non hemoragik di Bagian Radiologi FK Unsrat/SMF Radiologi RSUP Prof. Dr. R. D. Kandou Manado periode Agustus 2015 – Agustus 2016. *e-CliniC*. 2016;4(2):4-8. doi:10.35790/ecl.4.2.2016.14398

DIPONEGORO MEDICAL JOURNAL
(Jurnal Kedokteran Diponegoro)
Online : http://ejournal3.undip.ac.id/index.php/medico
E-ISSN : 2540-8844
Volume 10, Number 3, May 2021

5. Putri Permatasari D. Validitas Skor Stroke Siriraj Dibandingkan CT Scan Kepala Pada Diagnosis Jenis Patologi Stroke Di RSUD Dr. Moewardi. 2012;66:37-39.
6. Rahayu M, Rakhmani AN, Raisa N, Ar Rahmah KA. Hubungan Mean Arterial Blood Pressure Dengan Keluaran Pasien Stroke Trombotik Yang Dinilai Dengan Skor Nihss. *Maj Kesehat*. 2018;5(3):160-170. doi:10.21776/ub.majalahkesehatan.005.03.5
7. Soleh. Hubungan antara hipertensi pada penderita stroke perdarahan intraserebral akut dengan keluaran klinis setelah 30 hari perawatan. Published online 2017.
8. Agis D, Goggins MB, Oishi K, et al. Picturing the Size and Site of Stroke with an Expanded National Institutes of Health Stroke Scale. *Stroke*. 2016;47(6):1459-1465. doi:10.1161/STROKEAHA.115.012324
9. Bowry R, Navalkele DD, Gonzales NR. Blood pressure management in stroke: Five new things. Neurol *Clin Pract*. 2014;4(5):419-426. doi:10.1212/CPJ.0000000000000085
10. Erawantini F, Lia Chairina RR. Hipertensi Terhadap Kejadian Stroke. *J Ilm Inov*. 2016;16(2):102-104. doi:10.25047/jii.v16i2.292
11. Yufe R. Stroke prognostication using age and NIH stroke scale: Span-100. *Neurology*. 2013;81(6):603. doi:10.1212/01.wnl.0000433418.06773.33
12. Peters SAE, Huxley RR, Woodward M. Smoking as a risk factor for stroke in women compared with men: A systematic review and meta-analysis of 81 cohorts, including 3 980 359 individuals and 42 401 strokes. *Stroke*. 2013;44(10):2821-2828. doi:10.1161/STROKEAHA.113.002342