

Correlation Between Mean Platelet Volume (MPV) and Clinical Outcome in Patients with Subdural Hemorrhage (SDH) in Prof. I.G.N.G Ngoerah General Hospital Denpasar

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ABSTRACT

Background: Subdural hemorrhage (SDH) occurs due to the accumulation of abnormal blood under the dura mater, a protective layer of brain tissue under the calvarium due to the rupture of the bridging veins. The importance of hematological factors as parameters related to intracranial bleeding, one of which is SDH. Mean Platelet Volume (MPV) is one of the main parameters that reflect the function and activity of platelets. The relationship between MPV values and the incidence and outcome of SDH is not fully known. This study aims to determine the relationship between MPV and SDH outcomes for monitoring and prognostic purposes for SDH.

Methods: This research is cross-sectional. This research was conducted based on data from medical records from inpatient installations at Prof. I.G.N.G Ngoerah General Hospital Denpasar with a total sample of 96 cases. The data included in the inclusion criteria were medical record data which contained information about research variables, which are gender, age, history of previous trauma, and the value of Mean Platelet Volume (MPV). This study included data on 96 patients with SDH who were admitted to the Inpatient Installation of Prof. I.G.N.G Ngoerah General Hospital from July 2018 to August 2021. All patients carried out routine blood tests in the first hours of

hospitalization and the outcome was good (discharged alive) and poor (died) during hospitalization. The MPV value was converted into a nominal variable and its relationship with the outcome was assessed by bivariate analysis.

Results: From data collection, 96 patients with SDH were treated at the inpatient installation of Prof. I.G.N.G Ngoerah General Hospital during that period. Distribution of patients based on the history of trauma most of the patients had a history of previous trauma 57 patients (59.4%) and 39 patients (40.6%) from this study denied any trauma, based on gender, 67 patients were men (69.7%), 40 of whom had traumatic SDH and 27 others had non-traumatic SDH. There were 29 women with subdural hemorrhage (30.2%), with 17 having traumatic SDH and 12 having non-traumatic SDH. From the results, it was found that the age group of SDH patients \leq 60 years, was 32 patients (33.3%), where most (18 patients) had Non-traumatic SDH and 14 patients experienced traumatic SDH. While the age group of 60 years and over was more than 64 patients (66.7%), with 21 of them experiencing non-traumatic SDH and 43 others experiencing traumatic SDH. The overall outcome was that 57 patients were discharged alive and 39 died during hospitalization. A bivariate analysis test with Chi square to find the relationship between abnormal MPV values with good and poor outcomes of SDH showed

no significant relationship between the two variables ($p = 1,000$).

Conclusion: Based on the results of this study, the value of the Mean Platelet Volume was not significantly associated with the outcome in patients with Subdural hemorrhage.

Keywords: Subdural hemorrhage (SDH), Mean Platelet Volume (MPV), Outcome, prognosis

INTRODUCTION

A subdural hemorrhage (SDH) is a collection of blood under the inner layer of the dura but external to the brain parenchyma and arachnoid membrane. Subdural hematoma is the most common type of traumatic intracranial mass lesion. Subdural hematomas result from the accumulation of abnormal blood under the dura mater, a protective layer of brain tissue beneath the calvarium. The brain consists of connective tissue that is at high risk of brain injury without a protective layer (scalp and other elements of the skull). The brain is protected under the skull by the meninges which consist of three layers; The dura mater, which differentiates from the neural crest, attaches to the periosteum and arachnoid mater. The arachnoid mater lies beneath the dura mater (middle meningeal layer) forming many villi through the dura with bridging veins as one-way valves for drainage of neural tissue beneath the deepest meningeal layer called the pia mater. These bridging veins are prone to rupture if faced with a direct force against their thin walls, causing blood to seep under the dura and form a hemorrhage.¹ When there is a larger space between the dura and brain parenchyma, as occurs in the growing adult or the aging brain, the cerebrospinal fluid flowing between the bridging veins has a larger space, in this context, the structure here will stretch and become easily ruptured. Trauma is the most common cause of subdural hemorrhage (SDH). The most common cause is direct trauma to the head. The risk of developing SDH according to a study in South Wales, England, is higher at the age of under 1 year, the incidence reaches 21 per 10,000 children in this age

group, but there is no predisposition to sex. The prognosis of SDH due to trauma is better in men than in women at a young age.² Meanwhile, chronic subdural hemorrhage has an incidence of 1.72 to 20.6 per 100,000 people per year in the elderly population. Risk factors for this disease include older age, male gender, and use of antiplatelet/anticoagulant.^[3]

The importance of hematological factors as parameters related to intracranial hemorrhage such as SDH has not been widely studied. Impaired platelet function has been associated with an increased risk of intracranial hemorrhage, and is thought to be a good predictor of mortality.^[4,5,6] As an important blood component in preventing bleeding, platelet function is associated with spontaneous intracerebral hemorrhage.^[4] Mean Platelet Volume (MPV) is one of the parameters that reflect platelet function and activity. The MPV describing the mean platelet volume/size is a representative indicator of megakaryocyte hyperplasia and metabolism, and platelet production in the bone marrow, which indicates the age of circulating platelets. As one of the main parameters reflecting platelet function, MPV is thought to have an impact on the development of intracranial hemorrhage including SDH. However, the relationship between the two has not been proven. This study aimed to evaluate the relationship between MPV values and prognostic factors in SDH patient's outcomes.

METHODS

This research was conducted by collecting data from medical records and inpatient installations at Prof. I.G.N.G Ngoerah General Hospital Denpasar Bali, and collecting patient data from July 2018 to August 2021 with a total sample of 96 cases. The data included in the inclusion criteria were medical record data which contained information about research variables, gender, age, and history of previous trauma, and which was equipped with the Mean Platelet Volume (MPV) value on routine blood examinations. The

research sample was all cases of subdural hemorrhage patients who had been treated at the inpatient installation of Prof. I.G.N.G Ngoerah General Hospital based on medical record data from July 2018 to August 2021. The research data were analyzed statistically using the 20th version of the SPSS program. The analysis was carried out using a descriptive method to describe the basic characteristics of the research subjects. Bivariate analysis using Chi-Square with statistical significance determined based on the p-value was declared significant if p

<0.05, and the strength measure was known by the Odds Ratio (OR).

RESULT

Research samples meeting the research inclusion criteria were collected. A total of 96 patients with SDH were successfully collected and analyzed. Based on the presence or absence of a history of trauma, the results showed that most of the patients with subdural hemorrhage had a history of previous trauma, 57 patients (59.4%) and 39 patients (40.6%) from this without any previous history of trauma.

Table 1. Characteristics of Subdural Hemorrhage Patients in the Neurology Inpatient Ward of Prof. I.G.N.G Ngoerah General Hospital

History		Frequency (n)	Percentage (%)	Mean±SD
	Trauma	57	59.4	
	Non trauma	39	40.6	
Gender				
	Men	67	69.7	
	Women	29	30.2	
Age				
	≤60 years	32	33.3	64.43±14.9
	>60 years	64	66.7	
Outcome				
	Good	57	59.4	
	Poor	39	40.6	
MPV				
	Normal	47	49	7.66±1.9
	Abnormal	49	51	

SD = Standard Deviation

Based on the results of the study by gender, there were 67 male patients with subdural bleeding (69.7%), 40 of whom had traumatic SDH and 27 others had non-traumatic SDH. There were 29 women patients with subdural hemorrhage (30.2%), with 17 cases having traumatic SDH and 12 cases of non-traumatic SDH.

Distribution of patients by age. In this study, patients were divided into 2 age groups; ≤ 60 years and >60 years. From the results of the study, it was found that the age of SDH patients ≤ 60 years included in the study, 32 patients (33.3%), where most (18 patients) had Non-traumatic SDH and 14 patients had traumatic SDH. While in the age group of

≤60 years, more than 64 patients (66.7%), with 21 of them having non-traumatic SDH and 43 having traumatic SDH. While the overall outcome of SDH cases is that as many as 57 patients were discharged alive, and 39 patients died during hospitalization. The clinical outcome of patients in this study, 57 patients (59.4%) were discharged alive and 39 (40.6%) patients died. A total of 23 patients with poor outcomes (died) were patients with traumatic SDH and 16 patients with non-traumatic SDH. While the survivors were 23 patients from the non-traumatic SDH group and 34 patients from the traumatic SDH group.

Table 2. Relationship of MPV Abnormalities to SDH Outcomes

Variable	Good (%)	Poor (%)	P value	OR(IC 95%)
MPV				
Normal	28 (29.2)	19 (19.8)	1.00*	1.016(0.450-2.296)
Abnormal	29 (30.2)	20 (20.8)		
History				
Traumatic	34(35.4)	23 (24)	1.00*	1.028(0.449-2.356)
Non Traumatic	23 (24)	16 (16.7)		

Age				
≤60 years	19 (19.8)	13 (13.5)	1.00*	1.000(0.421-2.373)
>60 years	38 (39.6)	26 (27.1)		

*=chi square

A bivariate analysis test with Chi square to find the relationship between abnormal MPV values with good and poor outcomes of SDH showed no significant relationship between the two variables ($p = 1,000$).

DISCUSSION

Subdural hemorrhage (SDH) is more common in men than women with a ratio of 3:1. The incidence of chronic SDH appears to be higher in the 5th to 7th decades of life. One retrospective study⁵ reported that 56% of SDH cases occurred in the 5th and 6th decades. The highest prevalence was in men and the highest occurred on average in the 6th decade of life. The most common etiology is trauma, but in younger patients, risk factors such as alcohol consumption, thrombocytopenia, coagulation disorders, and anticoagulant therapy are major risk factors for SDH. In older age, cardiovascular disease and hypertension are comorbid risk factors.^[5] In our study, trauma was the most common etiology reported from the patient's history. Mortality in SDH patients in the previous study has been reported in 36-79% of patients. A good prognosis is found to be higher in young patients under 40 years of age, while the age of 40-80 years is associated with a fairly high mortality rate of 65-80%. The result of this study is not in accordance with the result of the previous study, where both good and poor outcomes are found in the age group of >60 years old. This may be because the age distribution of patients in this study was more in the age group of >60 years, recorded in the ratio of 2:1. There is little literature evaluating the role of MPV in intracranial hemorrhage. At present, the relationship between MPV abnormalities and cerebral hemorrhage remains controversial. No clear association was found between MPV values and the risk of a cerebral hemorrhage in several studies.^[7,8,9]

Our findings suggest that MPV abnormalities do not affect the outcome of patients with SDH. One study showed that a decrease in the MPV value has a higher probability of bleeding than an increase in value, which implies that the MPV can be used to measure the tendency of bleeding and can be used as a parameter to assess the early improvement of hematopoietic function in the spinal cord. MPV is associated with poor prognosis in patients with stroke, but other studies have not shown a correlation.^[9]

Mean Platelet Volume (MPV) is a laboratory parameter used to assess platelet function. This marker has also been reported as a prognostic parameter in ischemic disease.^[10] MPV value indicates platelet activation. Cytokines, chemokines, and coagulation factors are activated and released from platelets, where their volume is increased in neural inflammation. Although this parameter is increased in ischemic events, this value is still uncertain as a prognostic factor for intracranial hemorrhage.^[7,9] These results were also obtained in this study. Although the MPV values in this study showed that abnormal values were more common in patients with poor outcomes, this difference was not significant.

CONCLUSION

Based on the results of this study, the value of the Mean Platelet Volume was not significantly associated with the outcome in patients with intracranial hemorrhage, especially SDH. Intracranial hemorrhage including SDH is still one of the main causes of death and morbidity. Assessment of unknown risk factors from simple parameters such as components of routine blood tests such as MPV is useful for providing clues to the probable prognosis

for assessing mortality. More studies are needed to identify these parameters.

Declaration by Authors

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