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Red Cell Distribution Width (RDW) as Outcome Predictor in Traumatic and Non-Traumatic Subdural Hematoma (SDH) Patients at Prof. Dr. I.G.N.G. Ngoerah Hospital Denpasar for the period July 2018 - August 2021

Chiquita Putri Vania Rau[1], I Wayan Widyantara[1], Anak Agung Ayu Putri Laksmidewi[1], Ida Bagus Kusuma Putra[1], I Komang Arimbawa[1]

[1]Neurology Department, Faculty of Medicine Universitas Udayana/Prof. dr. I.G.N.G Ngoerah General Hospital, Bali, Indonesia

Corresponding Author: Chiquita Putri Vania Rau

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ABSTRACT

Introduction. Subdural Hematoma (SDH) is one of the most common causes of death in neurological emergencies. This occurs because of the mechanism of injury caused by bleeding in the cerebrum. Red cell distribution width (RDW) is one of the erythrocyte profile markers that shows the uniform distribution of circulating erythrocyte sizes. SDH conditions require a fast response so that the treatment carried out becomes more effective and efficient.

Methods. This study is a retrospective observational analytic study with a cross sectional approach. The data obtained in this study is secondary data taken from the medical records of the neurology inpatient installation of Prof. Dr. I.G.N.G Ngoerah Hospital Denpasar which carried out for a complete blood count in the period July 2018 - August 2021. The existing data were then described and analyzed using the SPSS version 24.

Results: There were 96 subjects with SDH in the Neurology Inpatient Installation at Prof. dr. I.G.N.G Ngoerah Hospital Denpasar for the period July 2018 – August 2021. Researchers compared the outcome characteristics of the survivor and non-survivor groups which included gender, etiology, and RDW level status. Comparisons were also made in the trauma and non-trauma groups.

Conclusion: There were no significant differences in the outcome characteristics of the survivor and non-survivor groups which included gender, etiology, and RDW levels in general as well as in the comparison of the traumatic and non-traumatic groups.

Keywords: Red Cell Distribution Width (RDW), prognosis, Subdural hematoma (SDH), trauma, non-trauma

INTRODUCTION

Subdural hematoma (SDH) is one of the most common causes of death in neurological emergencies[1]. This occurs due to the mechanism of injury caused by bleeding in the cerebrum and causing increased intracranial pressure due to hypoxia and cytotoxic edema, seizures triggered by stimulation of the cortex and the occurrence of blood loss[2-4]. Other conditions that make the SDH condition worse are the occurrence of neuroinflammation which stimulates vascular leakage and activation of acute inflammatory cells which results in disruption of the blood-brain barrier[4,5].

Red cell distribution width (RDW) is one of the markers of the erythrocyte profile which shows the distribution of the similarity in

the size of circulating erythrocytes[6]. This function is played through the control regulation of tissue oxygen demand which stimulates the release of erythropoietin. However, the tissue demands in the subacute setting that fail to be adequately managed result in the release of immature erythrocytes and reticulocytes into the intravascular space. The mechanism is the same in anemia resulting from severe blood loss or in the occurrence of hemolysis[7,8].

The condition of SDH requires a quick response so that the management is carried out more effectively and efficiently. This is necessary in assessing the prognosis of patients with SDH. Blood loss in SDH provides a significant feature in RDW[9,10]. Therefore researchers wanted to know the relationship between RDW values as a predictor for outcome in SDH patients.

MATERIALS & METHODS

This research is a retrospective observational analytic study with a cross-sectional approach. This research was conducted on patients who had a complete blood count, traced through data from physical medical records and electronic medical records at the neurology inpatient installation of Prof. dr. I.G.N.G Ngoerah Hospital Denpasar in the period July 2018 – August 2021. Then it is seen whether during the patient's treatment for SDH there is a deterioration to death or the patient can go home from treatment in a living condition. The data obtained was then analyzed using the Statistical Product and Service Solutions (SPSS) application version 24.

STATISTICAL METHODS

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

Characteristics of Research Subjects

In this study, there were 96 study subjects with SDH sufferers with a distribution of subject characteristics of gender, age, etiology, RDW, RDW level status, and outcomes shown in Table 1.

Table 1. Distribution of the characteristics of traumatic and non-traumatic SDH patients at Prof. dr. I.G.N.G Ngoerah Hospital in the period July 2018 – August 2021

Variable	N(%)	Mean ± SD	Min	Max
Gender				
Male	67(69,8%)			
Female	29(30,2%)			
Age (year)		64,4 ± 14,9	16	99
Etiology				
Trauma	57(59,4%)			
Non Trauma	39(40,6%)			
RDW (%)		13 ± 2,3	10,2	30,3
Normal	67(69,8%)			
Abnormal	29(30,2%)			
Outcome				
Survivor	55(57,3%)			
Non survivor	41(42,7%)			

SD: Standard Deviation

The research subjects 67 people (69.8%) were male. The average age of the research subjects was 64.4 ± 14.9 years. The etiology of SDH in most subjects was trauma in 57 people (59.4%). The average RDW of all subjects was 13 ± 2.3% with RDW within normal limits of 67 people (69.8%). The outcome of the SDH case was that 55 people (57.3%) were survivors.

Table 2. Distribution of the characteristics of Traumatic SDH patients at Prof. dr. I.G.N.G Ngoerah Hospital in the period July 2018 – August 2021

Variable	N(%)	Mean±SD	Min	Max
Gender				
Male	41(71,9%)			
Female	16(28,1%)			
Age		67,2 ± 15	16	99
RDW		13,5 ± 1,6	11,3	18,8
Normal	44(77,2%)			
Abnormal	13(22,8%)			
Outcome				
Survivor	33(57,9%)			
Non Survivor	24(42,1%)			

SD: Standard Deviation

The research subjects for the traumatic SDH group, 41 people (71.9%) were male. The average age of the research subjects was 67.2 ± 15 years. The average RDW of subjects with traumatic SDH was 13.5 ± 1.6% with RDW within normal limits of 44 people (77.2%). The outcome of the traumatic SDH case was that 33 people (57.9%) were survivors.

Table 3. Distribution of the characteristics of non-traumatic SDH patients at Prof. dr. I.G.N.G Ngoerah Hospital in the period July 2018 – August 2021

Variable	N(%)	Mean±SD	Min	Max
Gender				
Male	26(66,7%)			
Female	13(33,3%)			
Age		60,4±14	29	80
RDW		12,3±3	10,2	30,3
Normal	23(59%)			
Abnormal	13(41%)			
Outcome				
Survivor	22(56,4%)			
Non Survivor	17(43,6%)			

SD: Standard Deviation

The non-traumatic SDH study subjects 26 people (66.7%) were male. The average age of the research subjects was 60.4 ± 14 years. The average RDW of subjects with non-traumatic SDH was 12.3 ± 3% with RDW within normal limits of 23 people (59%). The outcome of the non-traumatic SDH case was that 17 people (43.6%) were survivors.

Comparison of SDH Patient Characteristics

Comparison of the characteristics of SDH patients was carried out using bivariate analysis to determine the relationship between the characteristics of SDH patients and their overall outcomes in patients with SDH. Bivariate analysis was performed using the chi square method. The results of the bivariate analysis are shown in Table 4.

Table 4. Analysis of the relationship between SDH patient characteristics and outcomes

Variable	Outcome		*p-value*	OR (IK 95%)
	Survivor	***Non Survivor***		
Gender				
Female	17	12	0,863*	1,081 (0,447-2,614)
Male	38	29		
Etiology				
Non Trauma	22	17	0,885*	0,941 (0,413-2,143)
Trauma	33	24		
RDW Level				
Normal	42	25	0,104*	2,068 (0,855-5,003)
Abnormal	13	16		

**** = chi square***

From the results of the bivariate analysis, both gender (p-value = 0.863), etiology (p-value = 0.885) and RDW level status (p-value = 0.104) were not significantly different from the overall outcome of patients with SDH.

Table 5. Analysis of the relationship between the characteristics of Traumatic SDH patients and outcomes

Variable	Outcome		*p-value*	OR (IK 95%)
	Survivor	**Non survivor**		
Gender				
Female	11	5	0,300*	1,900 (0,560-6,451)
Male	22	19		
RDW Level				
Normal	28	16	0,106*	2,800 (0,782-10,021)
Abnormal	5	8		

**** = chi square***

From the results of the bivariate analysis, both gender (p-value = 0.300) and RDW level status (p-value = 0.106) were not significantly different in the outcome of patients with traumatic SDH.

Table 6. Analysis of the relationship between the characteristics of non-traumatic SDH patients and their outcomes

Variable	Outcome		*p-value*	OR (IK 95%)
	Survivor	**Non survivor**		
Gender				
Female	6	7	0,361*	0,536 (0,139-2,059)
Male	16	10		
RDW Level				
Normal	15	8	0,184*	2,411 (0,652-8,920)
Abnormal	7	9		

**** = chi square***

From the results of bivariate analysis, both gender (p-value = 0.361) and RDW level status (p-value = 0.184) were not significantly different in the outcome of patients with non-traumatic SDH.

DISCUSSION

Based on secondary data from medical records, it was found that at Prof. dr. I.G.N.G Ngoerah Hospital in the period July 2018 - August 2021 SDH cases were found more in male. This is consistent with previous studies with a male/female ratio of 2.59, male are associated with risk factors for SDH, both traumatic and non-traumatic[11]. Research conducted by Wang et al (2021) also found that 76.4% were male[12]. However, this is different from a study conducted by Söderholm et al (2015) which found that 61.6% of non-traumatic SDH sufferers were women[13].

Based on secondary data from medical records, it was found that at Prof. dr. I.G.N.G Ngoerah Hospital in the period July 2018 – August 2021, the average age of patients with SDH was 64.4 ± 14.9 years. This is in accordance with previous research conducted by Söderholm et al (2015) which stated that the most vulnerable age to experience SDH is 45-73 years[13]. Slightly different from a study conducted by Hong et al (2020), which found most patients with SDH were aged 73.11 ± 10.80 years[14]. Likewise with research by Chen et al (2019), it was found that the largest age group in non-traumatic SDH cases was 45-64 years[9]. This is because the risk factors for vascular rigidity due to age are associated with worsening and precipitating of SDH[15,16].

The most common etiology of SDH in this study was trauma in 59.4% of all cases. This is in accordance with previous research by Wang et al (2021) SDH occurs in 23.8% of all trauma cases[12]. Meanwhile, SDH in non-traumatic cases occurred in 27.4% of all non-traumatic cases[9]. This is due to the trauma state the mechanism that occurs is acceleration and deceleration which is more destructive[17]. The mechanism that causes non-traumatic SDH is bridging vein rupture[18].

On examination the majority of RDW levels were found to be within normal limits. These results are difficult to interpret because they are different from previous studies. Research conducted by Hong et al (2020) stated that the RDW in femtoliters (fl) was 42.01 ± 2.83 fl in SDH cases. In the study conducted by Sadaka et al, there were no significant differences between RDW survivors and non-survivors[19]. Research conducted by Acar et al (2016) also found no correlation between RDW and the prognosis of SDH patients[11].

Based on all the results of bivariate analysis between the prognostic characteristics of SDH patients according to gender, etiology and RDW and based on trauma and non-traumatic etiology, there were no significant results as predictors of outcome in patients with SDH. This is consistent with studies conducted by Söderholm et al (2015), Chen et al (2019), Acar et al (2016) and Sadaka et al (2018) which stated that there was no relationship between RDW and the outcomes of SDH patients, both trauma and non traumatized.

CONCLUSION

Based on the results of the study, there was no significant difference between the Red Cell Distribution Width (RDW), gender and etiology of Subdural Hematoma (SDH) and the prognosis or outcome of SDH. There was also no significant difference between RDW levels in both traumatic and non-traumatic SDH patients and the patient's prognosis or outcome.

Declaration by Authors

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