

## A STUDY OF ASSESSMENT OF STROKE SEVERITY USING PLATELET COUNT AND PLATELET DISTRIBUTION WIDTH IN CORRELATION WITH CLINICAL SCORE AND CT FINDINGS

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### Abstract

**Background:** Increased platelet (PLT) count and size also affects the PDW (Platelet Distribution Width), contributing to vascular and thromboembolic phenomena. Thus, platelets count and PDW serve as determinants of platelet function. Hence our study aims to assess the stroke severity using PLT count and PDW in correlation with the clinical score. **Materials and Methods:** A cross-sectional observational study was done among 334 patients admitted to general medicine wards of Govt. Kilpauk Medical College, for six months. Patients whose ages were above 20yrs of age and whose CT showed ischemic stroke and all socioeconomic groups were included in this study. The National Institute of Health Stroke Scale (NIHSS) assessed each case and stroke severity. In addition, a blood sample was collected and analyzed to measure the PLT count and PDW. **Result:** In our study, a maximum number of patients were reported in the age group of 51 to 60 years 135 (40.5%), with male predominance 243 (73%). Hypertension (HTN) was reported as a major risk factor 159 (47.7%). The mean PDW value in a mild, moderate, and severe NIHSS score group, when determined separately, was  $15.57 \pm 1.16$  fL,  $15.80 \pm 1.3$  fL, and  $15.14 \pm 0.93$  fL, respectively 53 ( $P < 0.05$ ) and the mean PLT count (105 /mm<sup>3</sup>) in each NIHSS group was  $2.82 \pm 0.47$  lacs,  $2.62 \pm 0.35$  lacs, and  $2.054 \pm 0.27$  lacs respectively ( $P < 0.05$ ). **Conclusion:** This study did find a statistically significant correlation between the clinical severity of stroke with PDW and PLT count.

## INTRODUCTION

A stroke, also known as a cerebrovascular accident (CVA), is the sudden development of a localised neurological dysfunction that is vascular in origin.<sup>[1]</sup> Between 80% and 85% of all cerebrovascular diseases are caused by it.<sup>[2]</sup> Stroke is the third most prevalent cause of disability-adjusted life years globally and the second biggest cause of mortality, accounting for 6.2 million fatalities in 2011. The prevalence rate of stroke in India has been reported to be 1.27-2.20/1000 persons. The consumption of a carbohydrate-rich diet and a sedentary lifestyle may be significant contributing factors to the rise in the incidence of atherosclerotic illnesses like CVA in India.<sup>[3]</sup>

By increasing atherosclerosis, platelet activation and aggregation contribute significantly to the pathophysiology of acute ischemic stroke. Due to blood artery obstruction in stroke, which causes ischemia, endothelial damage, and newer platelet production, platelet activity is enhanced. Due to an increase in alpha granules and platelet factors, these more recent platelets are greater in size. Additionally, larger platelets produce more prothrombotic substances due to increased metabolic and enzymatic activity.<sup>[4-5]</sup> Mean Platelet Volume is a good indicator of the size of the platelet and its function (MPV).<sup>[6]</sup> To create fresh platelets that help in coagulation, PDW (platelet distribution width) also shows the diversity in platelet size. Increased platelet size and count also alter PDW (Platelet Distribution Width), contributing to thromboembolic and vascular

abnormalities. So, platelet function is determined by MPV and PDW.<sup>[7]</sup>

Numerous studies have shown how platelet indices may be used to predict outcomes in conditions including acute myocardial infarction and malignancy. Because platelet activation and ischemic stroke are directly related.<sup>[8-9]</sup> Hence the present study was carried out to assess stroke severity using platelet count and platelet distribution width in correlation with a clinical score.

## MATERIALS AND METHODS

Hospital-based prospective observational research was carried out in the general medicine wards of Govt. Kilpauk Medical College, Chennai, from March to August 2021, after receiving consent from the institutional ethics committee. Three hundred thirty-four individuals with stroke verified by CT or MRI who came to see us within 48 hours after the beginning of symptoms were included in the research. Patients with hemorrhagic stroke, venous sinus thrombosis, hepatic or renal illness, connective tissue disorders, autoimmune diseases, infections, or sepsis, those taking steroids to suppress their immune systems, hematologic disorders, and cancer were excluded from the study. Demographic and clinical information was recorded using a standardized proforma. At the time of admission, a clinical examination and a brain CT scan were performed to identify the stroke subtype. The NIHSS score table

was then used to determine the stroke severity at the time of admission.

Patients were divided into three categories: mild (1-4), moderate (5-15), and severe stroke (21- 42). Before beginning treatment, a 2 ml venous blood sample was obtained using all aseptic techniques. Our central laboratory's five-part fully automated analyzer [SYSMES] was used to get the CBC. The CBC report was used to obtain the platelet indices (PDW and total PLT count). The mean value of the AIS group's platelet indices (PDW and PLT count) was compared to that of the control group's healthy individuals. To determine whether the values of PDW and PLT count correspond with those of NIHSS score in predicting the severity of disease, the value of platelet indices of the AIS group was also compared with the NIHSS score of the patients.

## RESULTS

The present study was performed on 334 patients, but one patient was lost; hence all parameters were evaluated on 333 patients.

In our study, a maximum number of patients was reported in the age group of 51 to 60 years 135 (40.5%), with male predominance 243 (73%). In addition, the diabetes mellitus (DM), hypertension (HTN), smoking, Dyslipidemia, and alcoholism among the patients were reported in 110 (33%), 159 (47.7%), 40 (12%), 25 (7.5%) and 26 (7.8%) respectively [Table 1].

**Table 1: Demographic variable of patients**

Particulars		Observations N (%)
Gender	Male	243 (73%)
	Female	90 (27%)
Age Group (years)	<30	12 (3.6%)
	31 - 40	27 (8.1%)
	41 - 50	41 (12.3%)
	51 - 60	135 (40.5%)
	61 - 70	94 (28.2%)
	71 - 80	15 (4.5%)
	Above 80	9 (2.7%)
Mean age $\pm$ SD		56.468 $\pm$ 11.81
Risk Factors	DM	110(33%)
	HTN	159 (47.7%)
	Smoking	40 (12%)
	Dyslipidemia	25 (7.5%)
	Alcohol	26 (7.8%)
	Lacunar Syndrome	193 (58%)
Distribution of Stroke	Partial Anterior Circulations Syndrome	35 (10.5%)
	Posterior Circulations Syndrome	98 (29.4%)
	Total Anterior Circulations Syndrome	7 (2.1%)
NIHSS Grades	Mild	44 (13.2%)
	Moderate	113 (33.9%)
	Severe	176 (52.9%)

The distribution of stroke was also studied, and it was found that Lacunar Syndrome was reported a maximum of 193 (58%), followed by Posterior Circulation Syndrome with 98 (29.4%) patients. The distribution of NIHSS grading in our study showed maximum patients 176 (52.9%) in severe grade, followed by moderate grade in 113 (33.9%) patients [Table 1].

The mean PL count in stroke patients was 2.35  $\pm$  0.45 lacs/mm<sup>3</sup> (p=0.101), whereas the mean PDW reported was 15.424 $\pm$  1.14 fL.

The mean PDW value in mild, moderate, and severe NIHSS score groups, when determined separately, was  $15.57 \pm 1.16$  fL,  $15.80 \pm 1.3$  fL, and  $15.14 \pm 0.93$  fL, respectively ( $p < 0.05$ ), and the mean PLT count ( $10^5 /\text{mm}^3$ ) in each NIHSS group was  $2.82 \pm 0.47$  lacs,  $2.62 \pm 0.35$  lacs, and  $2.054 \pm 0.27$  lacs respectively ( $p < 0.05$ ) [Table 2].

**Table 2: Comparison of PLT count and PDW with Groups Stroke**

Variable	Groups	Mean and STD	P-value
PLT count	Mild	$282909.1 \pm 47137.5$	0.0005
	Moderate	$262061.9 \pm 35331.9$	
	Severe	$205823.9 \pm 26947.9$	
PDW	Mild	$15.557 \pm 1.1681$	0.0005
	Moderate	$15.802 \pm 1.3053$	
	Severe	$15.148 \pm 0.9320$	

## DISCUSSION

Our study included 334 patients with stroke, and one subject was lost during the study. This study had more males than females, with male to female ratio of 2.7:1. The mean age of our study group was  $56.46 \pm 11.81$  years, with the maximum cases in the age range of 51 to 60 years. In patients of our study, lacunar syndrome (58%) was the most common neurological deficit, followed by posterior circulation syndrome (29.4%). In our study, hypertension (47.7%) was the most commonly observed risk factor, followed by DM (33%). Maximum patients, i.e. 176 patients, were in the mild NIHSS score group, followed by moderate NIHSS grade with 113 (33.9%) patients.

When determined separately, the mean PDW value in mild, moderate, and severe NIHSS score groups was  $15.57 \pm 1.16$  fL,  $15.80 \pm 1.3$  fL, and  $15.14 \pm 0.93$  fL, respectively ( $P < 0.05$ ) and the mean PLT count ( $10^5 /\text{mm}^3$ ) in each NIHSS group was  $2.82 \pm 0.47$  lacs,  $2.62 \pm 0.35$  lacs, and  $2.054 \pm 0.27$  lacs, respectively ( $P < 0.05$ ). Increased platelet activation predisposes to the development of arterial thrombus, which results in stroke, which might explain our data. This result contradicts the findings of O'Brien et al. and Butterworth et al., who found no differences in Platelet count between stroke and healthy patients.<sup>[10-11]</sup> This result is similar to the study conducted by Numminen et al. and others, who also found increased platelet counts in patients with stroke.<sup>[12]</sup> In our study, the mean values of PDW and PLT Count also decreased proportionately with an increase in the severity of the NIHSS score. Our findings align with those of other research, which show that individuals who have suffered severe strokes and poor clinical outcomes have higher PDW and PLT count levels. The application of these indicators in regular neurological diagnostics for early prediction of severity and potential outcomes should thus be given attention in light of these findings.<sup>[13-14]</sup>

## CONCLUSION

It is clear from the current study that stroke patients had increased PDW values and mean PLT counts. These values rise proportionately as the NIHSS score increases. These indicators provide information regarding the first platelet activation, which plays a

key role in the pathogenesis of stroke. Therefore, PDW and PLT count are simple to measure and reasonably priced haematological markers that may aid in predicting the severity of illness and outcome in stroke patients.

### Limitation of the study

We cannot comment on whether these indices (PDW and mean PLT count) are good predictors of long-term prognostic outcomes in patients with stroke due to a lack of long-term follow-up for our patients. In addition, our investigation was conducted in a tertiary facility where patients are either serious or referred. Thus, our research may favour more difficult situations.

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