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A cross sectional observational study on red cell distribution width (RDW) in stroke patients

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Abstract---Red Cell Distribution Width in past was used to differentiate between different types of anemia. In last few years, several studies have revealed that RDW is an independent risk factor for many critical clinical cases, especially for cardiovascular and cerebrovascular diseases. a cross sectional study designed to observe the RDW among the patient with stroke and among patient who are admitted in intensive care unit because of other reason.present study was conducted over a period of 1 years in a tertiary care hospital in the city of central India. A total 300intensive care unit patient were recruited in the study whom are aged above 18 years and patient/relative ready to give consent. Among them 150 were admitted with stroke which are allocated in group A (cases)and other 150 with other diseases in group B (control). Observation of the present study a total 300 participant were there 148 male and 152 female , the mean age of participants is 61.8 ±2.963 (±4.79%). 104 patient were having ischemic stroke, 46 patient were having haemorrhagic stroke . the mean of RDW among stroke patient 14.4184 ±0.35 (±2.42%) [male patients 14.3916 ±0.482 (±3.35%) , female patients 14.4561 ±0.498 (±3.44%)] , among control 13.8095 ±0.293 [male 13.9095 ±0.416 (±2.99%) , female 13.7398 ±0.402 (±2.93%)] Based on the findings of

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this study,we conclude RDW index has statistically significant correlation in Stroke.

Keywords---stroke, comorbidity, RDW.

Introduction

A stroke is the sudden onset of a vascular-related neurological deficit (1). According to the Global Burden of Diseases, Injuries, and Risk Factors Study, it's one of the leading causes of death and DALYs (2). Ischemic and hemorrhagic strokes are common. 85% of strokes are ischemic, and 15% are hemorrhagic (3). Ischemic strokes result from brain blood supply interruption, while hemorrhagic strokes result from blood vessel rupture or abnormal vascular structure. The Glasgow Coma Scale (GCS) and the National Institutes of Health Stroke Scale (NIHSS) can predict the severity of acute ischemic stroke (AIS). GCS is a neurological scale used to record a stroke patient's consciousness during initial and subsequent assessments (4). The NIHSS evaluates patients on 11 parameters and is a good predictor of patient outcomes. A baseline NIHSS score of over 16 indicates a high risk of death, while a score of under 6 indicates a good chance of recovery (5). Red cell distribution width (RDW) measures the variation in red blood cell (RBC) sizes based on the mean corpuscular volume (MCV). It is easily and inexpensively determined by an automated flow cytometer as part of a complete blood count. High RDW levels are linked to high CRP, ESR, and IL levels (6). High RDW levels are linked to a poor prognosis in AMI and PAD.

RDW predicts mortality in patients with cardiovascular disease, cancer, chronic lung disease, symptomatic chronic congestive cardiac insufficiency, and acute cardiac insufficiency (7, 8). We are still evaluating RDW's ability to predict stroke severity. In this study, we tried to correlate RDW with acute ischemic stroke severity and mortality. Initial and subsequent stroke patient consciousness (4). The NIHSS evaluates patients on 11 parameters and is a good predictor of patient outcomes. A baseline NIHSS score of over 16 indicates a high risk of death, while a score of under 6 indicates a good chance of recovery (5). Red cell distribution width (RDW) measures the variation in red blood cell (RBC) sizes based on the mean corpuscular volume (MCV). It is easily and inexpensively determined by an automated flow cytometer as part of a complete blood count. High RDW levels are linked to high CRP, ESR, and IL levels (6). High RDW levels are linked to a poor prognosis in AMI and PAD. RDW predicts mortality in patients with cardiovascular disease, cancer, chronic lung disease, symptomatic chronic congestive cardiac insufficiency, and acute cardiac insufficiency (7, 8). We are still evaluating RDW's ability to predict stroke severity. In this study, we tried to correlate RDW with acute ischemic stroke severity and mortality.

Materials and Methods

This was a cross-sectional observational study that took place in a tertiary care hospital. All study participants gave their informed consent. A thorough medical history was taken, as well as a clinical examination. Following that, a biochemical evaluation was performed, which included a complete blood count, including

RDW, S uric acid, and a lipid profile. A total of 150 stroke cases and 150 controls were studied. Patients admitted for reasons other than stroke served as controls.Only patients admitted with symptoms suggestive of acute stroke within 24 hours of the onset of stroke as evidenced by CT scan or MRI were included in the study. Exclusion criteria include: age 18, gouty arthritis complaints or clinical evidence of gout, and haematological abnormalities such as leukaemia or another myeloproliferative disorder. Hematological conditions linked to increased RDW in patients with CKD due to any cause. The following tests were performed on the participants: Complete Blood Count, RBS / F&PP, Lipid Profile, S uric acid, CT Scan, or MRI. Patients were chosen after meeting the inclusion and exclusion criteria and underwent a medical history, clinical examination, and biochemical testing. The information gathered was entered into a pre-designed questionnaire.Data was entered into a Microsoft Excel worksheet for statistical analysis. For the parameters under investigation, mean values were calculated. The independent sample T test was used to compare mean values. Significant was defined as a P value of less than 0.01. GraphPad Prism 8 was used to conduct the statistical analysis.

Result

Table 1 summarises the studied individuals' fundamental characteristics. Participants included 300 patients. About 150 patients were hospitalised in the intensive care unit after suffering from a stroke or another ailment. Of the 150 patients, 104 had an ischemic stroke and 46 had a hemorrhagic stroke. Cases have a mean age of 65.397.3 years, while controls have a slightly higher mean age of 67.704.8 years. There were 152 female participants and 148 male participants. The male gender predominated among the cases, with 86 males and 64 females, while the female gender predominated among the controls, with 88 females and 62 females. Among all participants, 139 had no risk factors, whereas 161 had one or more risk factor/s, with the majority of them suffering from hypertension (HTN) in both the case and control groups, 66 and 51, respectively. Diabetes was present in 19 cases and 9 controls, with heart disease occurring in 19 cases and 9 controls. The smoking habit is found in 29 cases and 6 controls.

Table 1

Particulars	Sub-Particulars	Types			
		Case		Control	
		N	%	N	%
Sex	Female	64	42.70%	88	58.70%
	Male	86	57.30%	62	41.30%
Mean Age (years)		65.39 ±7.3		67.70 ±4.8	
Risk Factors	DM	19	20.40%	15	22.10%
	Heart disease	19	20.40%	9	13.20%
	Smoking	29	31.20%	6	8.80%
	HTN	66	71.00%	51	75.00%

DM=Diabetes Mellitus, HTN= Hypertension

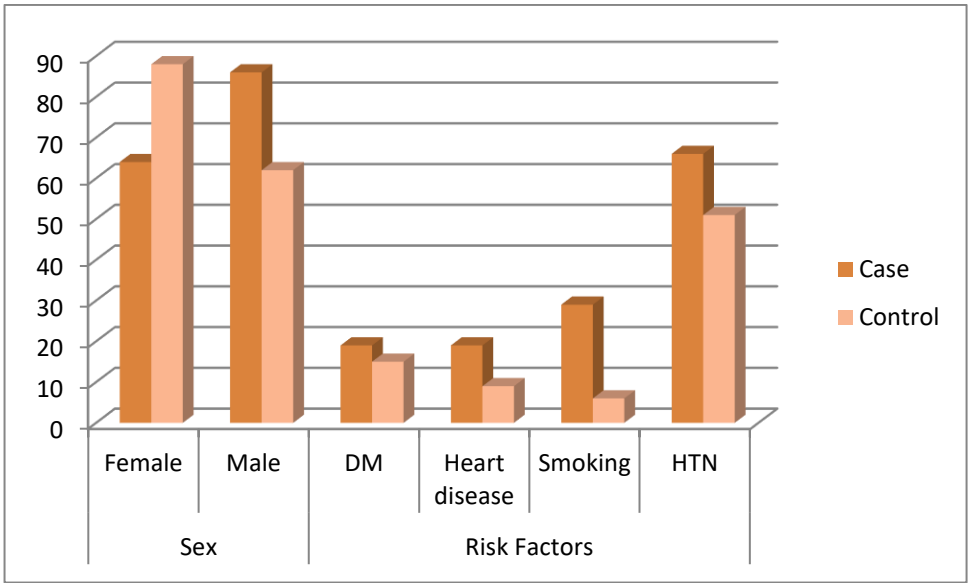

Fig 1.

Table 2 shows the mean and standard deviation of different parameters, the mean value of the red cell distribution width 14.10± 1.55 %, uric acid 5.42 ±1.65 mg/dl, HDL 41.37±11.00 mg/dl, LDL 113.21±35.91 mg/dl , cholesterol 177.27±53.48 mg/dl and Triglycerides 168.78±36.86 mg/dl

Table 2
Mean distribution of parameters

Parameters	N	Mean	SD
RDW(red cell distribution width)	300	14.10	1.55
Uric Acid	300	5.42	1.65
HDL(high-density lipoprotein)	300	41.37	11.00
LDL(low-density lipoprotein)	300	113.21	35.91
Cholesterol	300	177.27	53.48
Triglycerides	300	168.78	36.86

N: Number of samples; SD: Standard Deviation

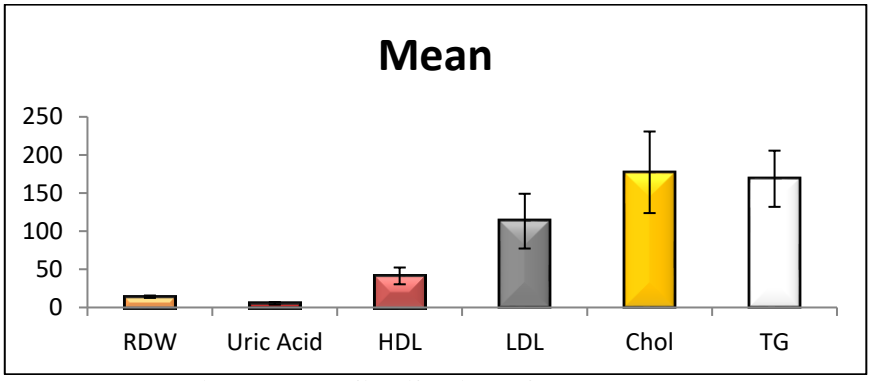

Fig 2. Mean distribution of parameters

Table 3An assessment of the normality of data is a prerequisite for many statistical tests because normal data is an underlying assumption in parametric testing. The above table presents the results from two well-known tests of normality, namely the Kolmogorov-Smirnova and Shapiro-Wilk Test. The Shapiro-Wilk Test is more appropriate for small sample sizes (< 50 samples), but can also handle sample sizes as large as 2000. As the Sig. value under the Kolmogorov-Smirnovaand Shapiro-Wilk column are more than 0.05, we can conclude that the data are normally distributed. Hence, a parametric test will be used for the analysis.

Table 3
Test of Normality

Tests of Normality							
	Types	Kolmogorov-Smirnova			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
RDW	Case	0.039	150	.200*	0.995	150	0.852
	Control	0.048	150	.200*	0.997	150	0.988

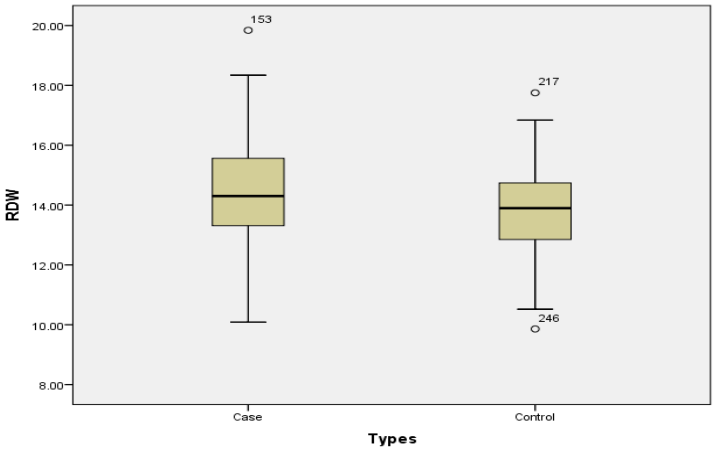

Fig 3. Test of Normality

Table 4 shows (the Independent Samples *t* Test compares the means of two independent groups in order to determine whether there is statistical evidence that the associated population means are significantly different. The Independent Samples *t* Test is a parametric test) Independent sample t test displays a statistically significant higher levels of RDW among Case Group (14.42±1.64) when compared to Control group (13.78±1.38) (t=3.685; P=0.001).

Table 4
Comparison of RDW levels between Case and Control groups

	Types	N	Mean	SD	t	P Value	95% Confidence Interval of the Difference	
							Lower	Upper
RDW	Case	150	14.42	1.64	3.685	0.001*	0.30	0.99
	Control	150	13.78	1.38				

*Statistical significance set at 0.05; N: Number of samples; SD: Standard Deviation

Independent sample t test displays a statistically significant higher levels of RDW among Case Group (14.42±1.64) when compared to Control group (13.78±1.38)(t=3.685; P=0.001).

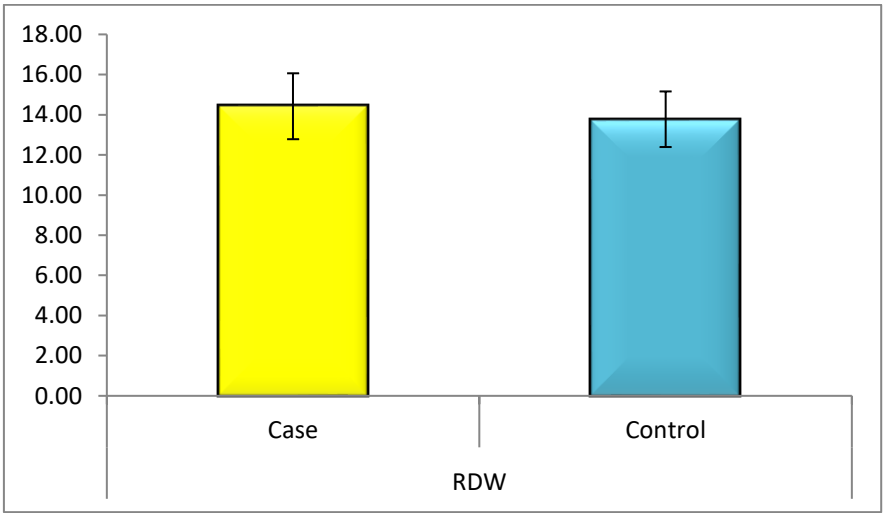

Fig 4. Comparison of RDW levels between Case and Control groups

Discussion

In our study, the most common risk factor was hypertension, which was present in 44.7 percent of patients, followed by smoking (20.7 percent), heart diseases such as RHD, CAD, AF, and so on (14.7 percent), and diabetes (13.3 percent). In a study by Ali et al(2009) [9] , hypertension was found in 75 percent of patients, followed by smoking (51 percent) and diabetes (49 percent). According to Naik et al. (2006)[10] , smoking is the most common risk factor (40.66 percent), followed by hypertension (40 percent) Red Cell Distribution Width The study found that

the mean RDW in stroke patients was higher (14.421.64%) than in controls (13.781.38%). This variation was statistically significant. Ani et al. (2009)[11]discovered that mean RDW was significantly higher in people with stroke than in people without stroke (13.7 percent vs 13.2 percent, p0.001). This was consistent with our findings. A metaanalysis of six studies conducted by Li et al(2020) [12] concluded that RDW levels in stroke patients were significantly higher than in those without stroke (p 0.001), particularly in ischemic stroke.

Conclusion

Stroke is one of the leading causes of death and disability throughout the world. Stroke is associated with a variety of markers such as RDW, uric acid, and lipid components. These tests are widely available in most hospitals and can aid in the screening of patients for stroke when imaging tests are unavailable. These markers can aid in the prediction of strokes. As a result, they can be used as tools to identify people who are at high risk of having a stroke. These people can be offered lifestyle changes and other interventions to help with stroke prevention.

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