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Original Research Paper

Medicine

CORRELATION OF RDW WITH HbA1c IN DIABETICS

Dr. Ashmitha Padma* Final year PG *Corresponding Author

Dr. Abhilash Mareguddi Assistant Professor

ABSTRACT

Recently, glycated hemoglobin (HbA1c) was used as a tool for glycemic control but since 2010, it is now accepted for the diagnosis of diabetes too. Besides the glycosylation of hemoglobin, hyperglycemia has several other effects on red blood cells (RBCs) as well as changes in the mechanical properties of RBCs, reduced deformability, increased adhesion, and increased osmotic fragility, consequently leading to changes in erythrocyte structure and hemodynamic characteristics. Hyperglycemia tend to have effect on RBC survival and glycation of haemoglobin Red blood cell distribution width (RDW) is the symbol of red blood cell volume distribution width coefficient of variation. It may be considered as heterogeneity index and is the equivalent of anisocytosis observed in peripheral blood smear.

Methods: This is a prospective case series study conducted at S. Nijalingappa Medical College and Hangal Shri Kumareshwar Hospital and Research center, Bagalkot from January 2020 to January 2021.

Results: Total of 121 patients were included in the study who satisfied the inclusion and exclusion criteria. Among the study population it was found that the P value was < 0.0001 in the correlation between RDW and HbA1c. As the P value was highly significant for the correlation with increase in HbA1c there was raise in RDW.

KEYWORDS :

INTRODUCTION

Red blood cell distribution width (RDW) is not only a measure of the size variation of circulating red blood cells (RBC), but also an indicator of their heterogeneity. Measurements of RDW are provided in routine hematological examinations in clinical practice. In recent years, the diagnostic and prognostic value of a parameter of RBCs, red cell distribution width (RDW), has been studied in various diseases like cardiovascular mortality and peripheral artery disease. RDW is a measure of variability in the size of RBCs and is a component of routine complete blood counts (CBCs). Traditionally, it is used together with the mean corpuscular volume (MCV) in clinical practice to differentiate between the causes of anemia.

Uncontrolled diabetes leading to the consistent elevation of HbA1c may induce functional and structural changes in the hemoglobin molecule and cytoplasmic environment within each red blood cell. Consequently, the RDW and other RBC parameters may be altered. As the microvascular complications of diabetes mellitus are well-proven and linked to increased HbA1c, alteration in RDW might have a role in the diagnosis and monitoring of glycemic status as well as complication assessment in diabetic patients.

OBJECTIVE :

To study the correlation between Red cell distribution width and HbA1c in diabetes melitus patient.

METHODOLOGY

The information for the study was collected from patients admitted to S. Nijalingappa Medical College and Hangal Shri Kumareshwar Hospital and research center, Bagalkot from January 2020 to January 2021. Information was collected through prepared profoma from each patient. Qualifying patients have undergone detailed history taking, clinical examination and laboratory investigations.

Inclusion criteria

- Patients with type 2 diabetes mellitus

Exclusion criteria

- Known chronic liver disease or hemoglobinopathies
- Known chronic renal disease
- Known case of anemia
- Known case of rheumatological disease
- Known case of acute or chronic infection of malaria, tuberculosis or maliganancy

Sample size

This was calculated by using OpenEpi, Version 2.0 open source calculator SS mean software at 95% confidence level.

Sampling

This is a case series study. It was done by sample SD Mean table. Hence 121 case were included

RESULTS

Table no.1, Sociodemographic factors including age and gender distribution

Sociodemographic factors		No of cases (n=121)	Percent
Age	45-54	16	13.2
	55-64	49	40.5
	65-74	39	32.2
	≥ 75	17	14.0
Gender	Male	62	51.2
	Female	59	48.8

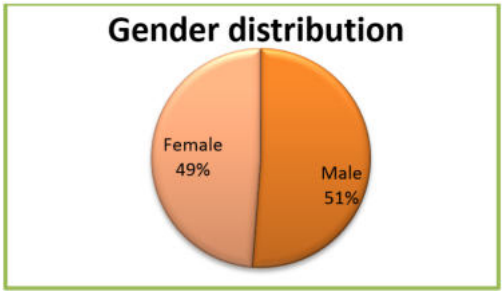

Figure no.1, Pie chart showing gender distribution in the study sample.

Table no.2, showing the percentage of values in the raised HbA1c and RDW among the study sample

Parameters	HbA1c		RDW	
	No of cases	Percent	No of cases	Percent

Normal	2	1.7	22	18.2
Raised	119	98.3	99	81.8
Total	121	100.0	121	100.0

Table no.3 showing the mean and stand deviation among the patients with normal and raised HbA1c and RDW

Parameters	Gender	N	Mean	Std. Deviation	Unpaired t test
HbA1c	Male	62	9.24	1.92	0.532, Not Sig
	Female	59	9.03	1.75	
RDW	Male	62	18.55	3.88	P<0.04, Sig
	Female	59	20.10	4.57	

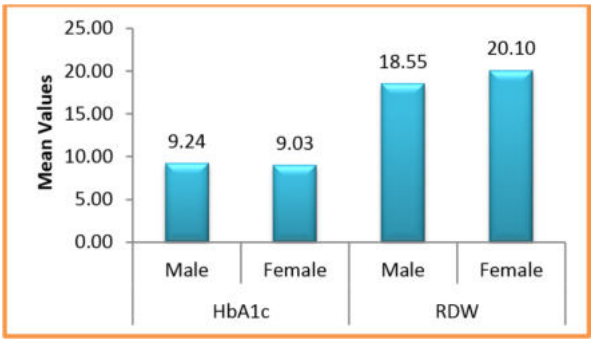

Figure no.2 Bar graph showing the mean values of raised HbA1c and RDW in males and females patients among the study sample.

Table no.4 showing the Correlation between HbA1c and RDW

Correlation between HbA1c & RDW	
r Value	0.725
P Value	P<0.001
Significance	Highly Significant

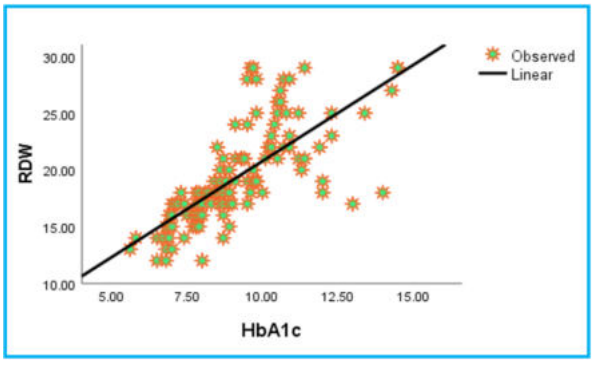

Figure no.3 showing the Correlation between the HbA1c and RDW

DISCUSSION

In this study total of 121 patients were included who satisfied the inclusion and the exclusion criteria. The study sample included was above the age of 45 years. Among the study population, 16 patients were between the age group of 45-54 years, 49 patients were between 55-64 years, 39 patients were between 65-74 years and 17 patients were above the age of 75 years. The mean age group of the study population was between 45-54 years of age. In this study both male and female were included, among which 62 were males and 59 were females.

Among the studied sample, 119 patients were found to have raised HbA1c and which was 98.3% of the study population. Among the 121 patients 99 of them were found to have raised RDW and which was 88.8% of the study population. Among the studied subjects only 22 were found to have normal RDW and only 2 were found to have normal HbA1c.

In this study, 61 male patients were found to have raided RDW and 58 females were found to have raised HbA1c. In this study total of 53 male and 46 females were found to have raised RDW, whereas only 1 male and 1 female patient had normal HbA1c and only 9 male patients and 13 female patients were found to have normal RDW.

In this study, among the male patients having raised HbA1c mean was 9.24 and standard deviation of 1.92 and among female patients a mean of 9.03 and standard deviation of 1.75 were found to jave raised HbA1c. Among the study population, a total mean of 18.55 with standard deviation of 3.88 male patients were found to have raised RDW. Among female patients a total mean of 20.10 with standard deviation of 4.57 were found to have raised RDW.

When the correlation was drawn between the RDW and HbA1c using unpaired t test, the P value was < 0.0001, which shows that correlation between RDW and HbA1c is highly significant. As the duration of diabetes mellitus increases with increase in HbA1c, there is a very high chance of increase in RDW which in turn signifies micro or macrvascular complications.

CONCLUSION

As it is a well-known fact that diabetes mellitus is a life-long metabolic disease, patients with DM keep asking for cost-effective and easily available means of monitoring their glycemic status. In that context, our current study highlighted that RDW has a significant correlation with HbA1c and is an inexpensive and freely available test. Therefore, it may be used as a marker of glycemic status.

However, further studies on a larger scale are required to detect this relation and its glycemic monitoring role in diabetic patients.

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