Correlation between Red Cell Distribution Width and Glycemic Control in Diabetic Patients

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Abstract: *Background: Diabetes is one of the most life style related disorders in the world. Red cell distribution width is a marker of Red cell volume variability. Methods and results: retrospective study of 100 diabetic patients. Correlation between RDW, HbA1c are assessed among males and females. In the study, the relationship between RDW and HBA1C, RDW and mean glucose were found to be proportional with a significant p value. RDW value was more in females compared to males. But the relationship between RDW and creatinine, RDW and WBC counts, RDW and duration of diabetes were not statistically insignificant. Conclusion: RDW is associated with glycemic control of the patient. Also RDW was found to be more in female population.*

Keywords: Glycemic control; Red Cell Distribution Width; HbA1c

1. Introduction

Diabetes is one of the most common metabolic disorders in the world. Urbanisation and modern life style changes increases the incidence of diabetes. As the number increases the morbidity and mortality also increases. The prevalence of diabetes will be increasing to 592 millon by 2035. In diabetic patients the primary cause of mortality is cardiovascular diseases, whereas the major cause of morbidity is microvascular complications. [1]

The red blood cell distribution width (RDW) is calculated by dividing the standard deviation of erythrocyte volume by the mean corpuscular volume (MCV) and multiplying by 100 to express the result as a percentage. Red blood cell distribution width (RDW) is an index of red blood cell volume variability. It indicates the degree of anisocytosis. As a surrogate for ineffective erythropoiesis, elevated RDW has been traditionally used in the investigation of the etiology of anemia. [2] Recent studies shown that the associations between high RDW increased cardiovascular mortality [2]

HBA1C is a marker of long term glycemic control. HbA1c can increase with age, chronic subclinical inflammation, and oxidative stress, and also in conditions that can adversely affect red blood cell survival, for example hemolytic anemia, blood transfusion, chronic malaria, or major blood loss. There are studies that shows relationship of RDW and sepsis3 and RDW and diabetes [4,5,6]

The present study was undertaken to study the correlation of RDW and Hba1c in diabetic individuals presented to The Department Of General Medicine, SSIMS&RC, Davangere, Karnataka, India. This include measurement of Hba1c by HPLC (High Performance Liquid Chromatography) and RDW to be calculated from Hemogram

2. Aims and Objectives

1. To find RDW and HbA1c in diabetic patients
2. To find the correlation between RDW and HbA1c in diabetic patients.

3. Method of Study

We conducted a retrospective study among the patients who were treated in the department of General Medicine, SSIMS& RC, Davangere, Karnataka . A total of 100 patients who are diabetic were selected.

Inclusion criteria
- Diabetic patients
- Age between 18-80.

Exclusion criteria
- history of smoking,
- anemia with Hemoglobin <12gm in females and <14gm in males.,
- chronic liver disease,
- Patients on dialysis,
- thyroid disease,
- pregnancy,
- heart failure,
- inflammatory conditions
- those receiving anticoagulants
- malignancy,
- coronary artery disease

Out of 100 diabetes patients from the patients came to SS Institute of medical sciences and research centre, FBS, HBA1C, complete blood count and urea and creatinine were sent. From Complete blood count, Hemoglobin, WBC count, platelets, Hematocrit and Red Cell distribution width were analysed. Patients with liver diseases and who ever on dialysis and anemia were excluded from the study.

RDW 11-15 were considered normal. HBA1C <5.6 normal, 5.6-6.5 Prediabetic state. >6.5 as diabetic state.

Results were evaluated using IBM SPSS statistical analysing software. Fischer test and chi square test were applied. And the results were obtained. Relationship between RDW and HBA1C, RDW and serum Creatinine, RDW and mean glucose level, RDW and total WBC counts were analysed.

4. Results

Out of 100 patients analysed, 42 were females and 58 were males. Out of them females were having more raised RDW compared to males. Patients age varies from 20 years to 80 years.

Table 1: RDW and Gender

GENDER	RDW		
	<11	11-15	>15
F	1	16	25
M	8	31	19

Given table has probability 6.7E-04
The sum of the probabilities, p =0.014

Table 2: RDW and duration of diabetes

RDW	YEARS OF DM		
	<5	5-10	>10
<11	3	1	4
11-15	8	29	10
>15	10	20	15

Given table has probability 8.5E-05
Sum of the probabilities, p=0.071

Table 3: RDW AND HBA1C

RDW	HBA1C		
	<5.6	5.6-6.5	>6.5
<11	2	1	5
11-15	6	18	23
>15	1	6	38

Probability of 3.8E-06
Sum of probabilities p=0.002

Table 4: RDW AND MEAN GLUCOSE

RDW	MEAN GLUCOSE			
	<100	100-126	126-200	>200
<11	2	1	2	4
11-15	3	6	26	10
>15	0	3	13	28

Probability 6.7E-04

Sum of the probabilities p<0.001
1.P=3.8E-04

Table 5: RDW and Creatinine

| RDW	CREATININE		
	<0.7	0.7 TO 1.1	>1.1
<11	1	2	3
11-15	2	22	18
>15	2	14	25

Probability 1.5E-03
Sum of probabilities p=0.272

Mean RDW in females: 15.54146 +/- 1.93015
Mean HBA1C in females 8.0975+/- 2.3162
Mean glucose in females 183.0703+/-66.540774
Mean RDW in males : 14.33
Mean HBA1C in males is 8.23
Mean glucose for males is 189.78

In the study, the relationship between RDW and HBA1C, RDW and mean glucose were found to be proportional with a significant p value. RDW value was more in females compared to males. But the relationship between RDW and creatinine, RDW and WBC counts, RDW and duration of diabetes were not statistically insignificant.

5. Conclusion

Our study was to find the correlation between RDW and glycemic control. We found the association of RDW with HBA1C, RDW with Mean Glucose Levels independent of factors like anemia, acute inflammation, and liver diseases and cardiac failure etc. The relationship was statistically significant. Among males and females, females were found to have more raised RDW in the study. But the relationship of RDW with other parameters like creatinine and duration of diabetes were not statistically significant
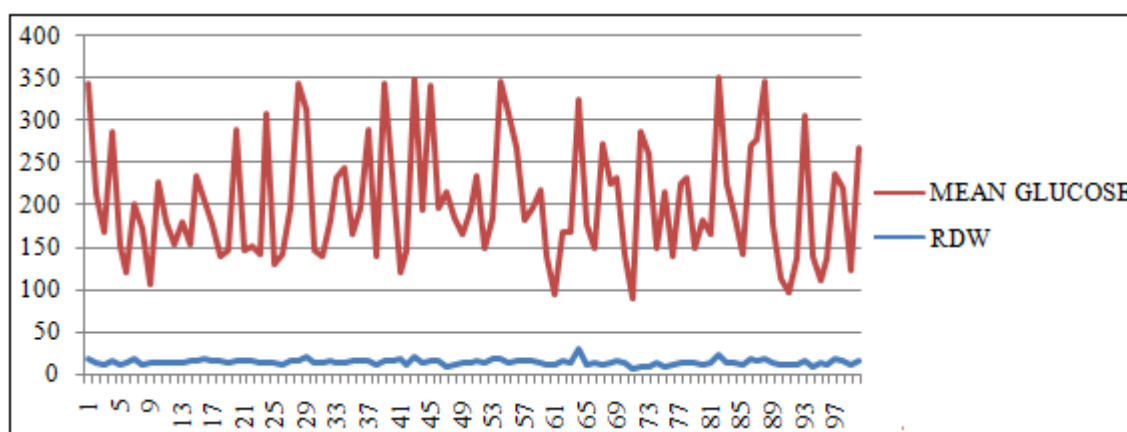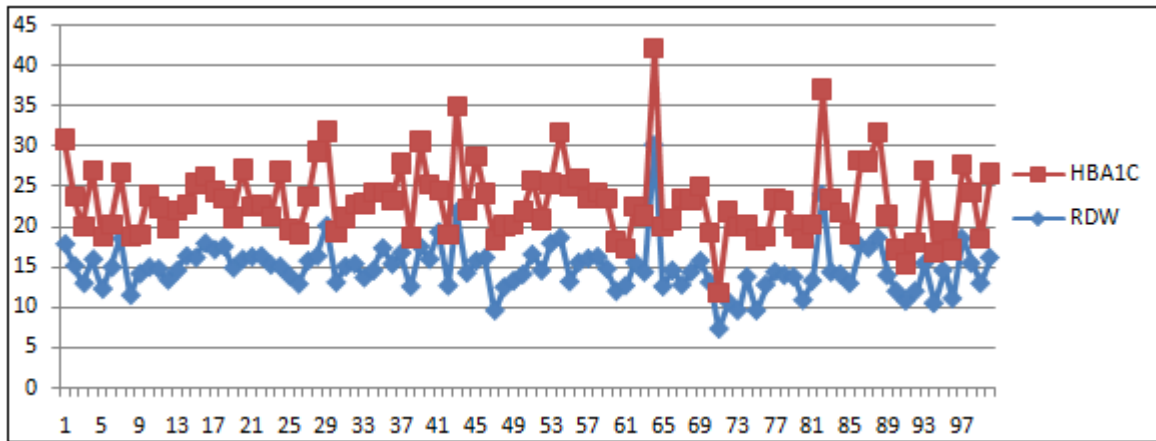
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