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# Red Cell Distribution Width as a Predictor for Systeimic Hypertension

**Pulikallu Ranjith Kumar[1], S. Chandrababu[2], Gujjula Sidhartha[3]**

[1]Narayana Medical College and Hospital, Chintareddy Palem, Nellore, Andhra Pradesh, India - 524003
Email: *ranjith323[at]gmail.com*

[2]Professor, Department of General Medicine, Narayana Medical College and Hospital, Chintareddy palem, Nellore, Andhra Pradesh, India – 524003
Email: *babuschandra9[at]gmail.com*

[3]Narayana Medical College and Hospital, Chintareddy palem, Nellore, Andhra Pradesh, India – 524003
Email: *gujtin77[at]gmail.com*

**Abstract:** ***Red cell distribution width (RDW) is a measurement of the variation in the size and volume of red blood cells (RBCs). It's a standard parameter of a complete blood count (CBC) and is calculated by dividing the standard deviation of the mean cell size by the mean corpuscular volume (MCV) of the RBCs and multiplying by 100 to convert to a percentage. The normal range for RDW - Coefficient of Variation is approximately 11.0–15.0%. RDW is raised in several haematological disorders, inflammatory conditions, chronic diseases, altered neurohormonal conditions. Hence RDW levels can be used as marker of investigation and helps in management and future therapeutic approaches.***

**Keywords:** Red cell distribution width (RDW), Mean corpuscular volume (MCV)

## 1. Introduction

A red cell distribution width (RDW) test measures the differences in the volume and size of your red blood cells (erythrocytes). Normally, your red blood cells are all about the same size. A high RDW means that there's a major difference between the size of your smallest and largest red blood cells. RDW is elevated in accordance with variation in red cell size (anisocytosis); that is, when elevated RDW is reported on complete blood count, marked anisocytosis (increased variation in red cell size) is expected on peripheral blood smear review.

Elevated RDW levels can be observed in many clinical conditions, such as haemolysis, after blood transfusions and in response to ineffective

red cell production, which can be caused by deficiencies in iron, vitamin B12 or folate. RDW is also increased in certain clinical states, like pregnancy, thrombotic thrombocytopenic purpura and inflammatory bowel disease. The baseline RDW value has been shown to be associated with long term adverse events in both acute and chronic conditions, such as acute myocardial infarctions (MI), heart failures, stable angina, stroke, and peripheral artery disease. RDW is an important marker for both diagnostic and prognostic purposes in various clinical cardiovascular settings.

**Study Design:** Cross sectional study. Patient's presenting to medicine department OPD in Narayana Medical College & Hospital

**Sample Size**: 100 patients

**Sampling Method:** Convenience sampling.

**Duration of Study:** From May 2023 to May 2024.

**Inclusion Criteria**
Both males and females were included between the age 30 to 60 years who are either Prehypertensive or hypertensive patients

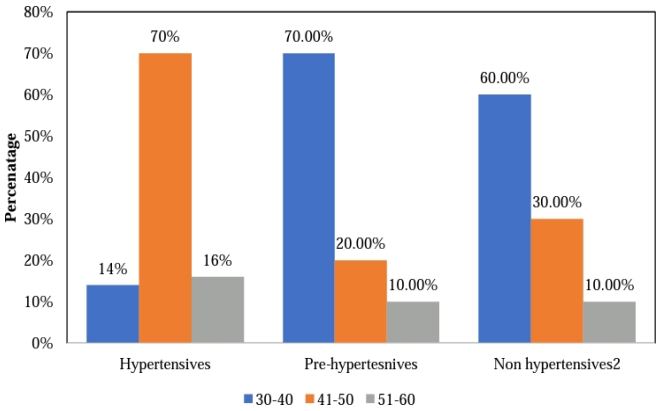
**Exclusion Criteria:**
- Patients with anaemia.
- Patients with dyslipidaemia.
- Patients with K/C/O CKD, CAD, CVA.
- Patients with diabetes mellitus.
- Terminally ill patients.
- Individuals with tobacco & alcohol usage.

**Statistical Analysis**
SPSS (Statistical Package for Social Sciences) version 20. (IBM SPASS statistics [IBM corp. released 2011] was used to perform the statistical analysis. One - way ANOVA test was used to compare the between different clinical features. P value < 0.05 was taken as level of significance.

## 2. Results

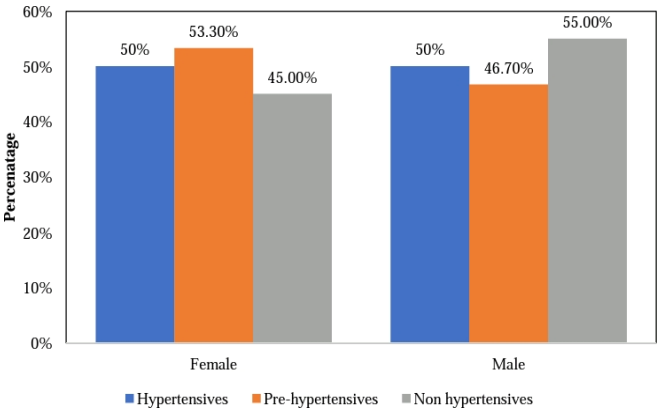
- In the study 100 individuals were divided into three groups: 50 Hypertensive, 30 Pre - hypertensive, 20 Healthy individuals.
- Hypertensives were more in the age group 40 - 50yrs (70%).
- Prehypertensive & non hypertensives were more among age 30 - 40yrs (70% & 60%).
- Hypertensives were equally distributed among males and females
- Pre hypertensives were more among females.
- Non hypertensives were more among males

| S. No. | Age | Hypertensives | Pre-Hypertensives | Non Hypertensives |
|---|---|---|---|---|
| 1 | 30-40 | 7 (14) | 21 (70) | 12 (60) |
| 2 | 41-50 | 35 (70) | 6 (20) | 6 (30) |
| 3 | 51-60 | 8 (16) | 3 (10) | 2 (10) |




**Distribution of Age among Participants**

| S. No. | Gender | Hypertensives | Pre-Hypertensives | Non Hypertensives |
|---|---|---|---|---|
| 1 | Male | 25 (50) | 16 (53.3) | 9 (45) |
| 2 | Female | 25 (50) | 14 (46.7) | 11 (55) |



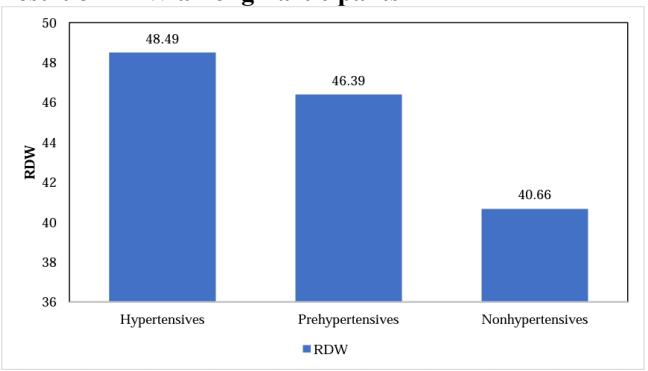

**Distribution of Gender among Participants**

**Distribution of Gender among Participants RDW Results:**

- Average RDW (fl) - SD is 48.49±2.18 among hypertensives, 46.39±3.51 among prehypertensive, 40.66±1.38 among non - hypertensives.
- 76% of hypertensives (38 out of 50) Have increased RDW.
- 66.7% of prehypertensive (20 out of 30) have increased RDW.
- This study demonstrated that RDW was greater in hypertensive and prehypertensive patients when compared to normal controls
- This remained true even after correcting for age, haemoglobin, and RDW, SD, which has a typical range of 39 - 46 femtoliter (FL).

| S. No. | RDW (fl)- SD | Hypertensives | Pre-Hypertensives | Non Hypertensives |
|---|---|---|---|---|
| 1 | Mean ± SD | 48.49 ± 2.18 | 46.39± 3.51 | 40.66± 1.38 |
| 2 | Min | 40 | 39 | 39 |
| 3 | Max | 52 | 52 | 45 |
| 4 | Standard Error Mean | 0.45 | 0.36 | 0.31 |

**Result of RDW among Participants**




**Result of RDW Among Participants**

## 3. Discussion

- Anisocytosis increases RDW
- Abnormal RDW values have been linked to inflammation, neurohumoral activation.
- Inflammation increases RDW by interfering with normal iron metabolism suppressing the response to erythropoietin, and shortening the lifespan of RBC'S
- RDW value independently predicted mortality among Cardiovascular co - morbidities such as hypertension, heart failure, diabetes mellitus (DM), peripheral artery disease and ischemic heart disease.

## 4. Conclusion

- Hypertensives and pre - hypertensives have considerably higher RDW levels than normal controls.
- RDW is a sensitive index of inflammatory status and a potential predictor of hypertension in pre - hypertensive and normal individuals.
- RDW can be utilized to provide primordial prevention in individuals with pre - hypertension.
- RDW is a straightforward metric obtained from routine CBC, therefore can be observed as a surrogate marker for predicting hypertension.

## 5. Future Scope

Ongoing research and interdisciplinary collaboration will be instrumental in improving the RDW as diagnostic factor for several diseases.

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