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# A COMPARATIVE STUDY OF CHANGES IN RED CELL DISTRIBUTION WIDTH AND PLATELET INDICES IN RECENTLY DIAGNOSED TMT POSITIVE CORONARY ARTERY DISEASE PATIENTS AND TMT NEGATIVE INDIVIDUALS

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## ABSTRACT

**Background:** Coronary artery disease (CAD) is a leading cause of morbidity and mortality, and the treadmill test (TMT) has limited diagnostic accuracy. Objective: To evaluate the role of red cell distribution width (RDW) and platelet indices in improving diagnosis and risk stratification of CAD.**Methods:** This observational case-control study included 150 participants divided into TMT-positive and TMT-negative groups. Hematological parameters including RDW and platelet indices were analyzed.**Results:** RDW, MPV, PDW, and P-LCR were significantly higher in TMT-positive patients ($p<0.001$), with positive correlation between RDW and platelet indices, while platelet count was not significant. **Conclusion:** RDW and platelet indices are simple, cost-effective markers that may enhance diagnostic accuracy and risk assessment in CAD

## KEYWORDS

Coronary Artery Disease, Red Cell Distribution Width, Mean Platelet Volume, Platelet Indices, Treadmill Test

## INTRODUCTION

Cardiovascular diseases (CVDs) remain a leading global health challenge, accounting for a significant proportion of morbidity and mortality worldwide. Coronary artery disease (CAD), primarily caused by atherosclerosis, is the most common contributor to CVD-related deaths. The disease process is chronic and often asymptomatic in early stages, eventually presenting as acute coronary syndrome (ACS), including ST-elevation myocardial infarction (STEMI) and non-ST elevation ACS. India bears a disproportionately high burden of CAD, with earlier onset and greater disease severity compared to Western populations, attributed to a combination of genetic, metabolic, and lifestyle factors.

The treadmill test (TMT) is a widely used, cost-effective, and accessible diagnostic tool for CAD, particularly in patients with intermediate pre-test probability. However, its diagnostic accuracy is limited, with moderate sensitivity and specificity, especially in cases of single- or double-vessel disease. Therefore, there is a need for additional markers to enhance diagnostic precision and risk stratification.

Red cell distribution width (RDW), a measure of variability in erythrocyte size, has traditionally been used in the evaluation of anemia but has recently emerged as a potential marker of inflammation and adverse cardiovascular outcomes. Similarly, mean platelet volume (MPV), an indicator of platelet activation, plays a key role in atherothrombosis and has been associated with increased risk of acute coronary events.

This study aims to evaluate the role of RDW and platelet indices in patients undergoing TMT for suspected CAD and to assess whether their addition improves diagnostic accuracy and risk stratification in comparison to TMT alone.

### Materials and Methods

This observational case-control study was conducted in the Department of General Medicine at RKDF Medical College Hospital & Research Centre, Bhopal, over a period of 18 months (April 2023–September 2024). A total of 150 participants aged >18 years attending OPD/IPD were enrolled and divided into two groups: TMT-positive (cases) and TMT-negative (controls). Written informed consent was obtained from all participants, and ethical clearance was taken from the institutional ethics committee.

Baseline demographic and clinical details were recorded using a structured proforma. All subjects underwent treadmill testing (TMT) under standard protocols with continuous ECG monitoring. Venous blood samples (2.5 ml) were collected in EDTA tubes and analyzed using an automated hematology analyzer.

The parameters studied included red cell distribution width (RDW), hemoglobin (Hb), mean corpuscular volume (MCV), HbA1c, lipid profile, and platelet indices such as platelet count, mean platelet volume (MPV), platelet distribution width (PDW), and plateletcrit (PCT).

Statistical analysis was performed using SPSS version 26.0. Data were expressed as mean ± standard deviation or percentages. Intergroup comparisons were done using t-test and ANOVA. A p-value <0.05 was considered statistically significant

### Inclusion Criteria

- Patients attending OPD/IPD who were TMT positive or TMT negative
- Age >18 years
- Willing to participate and provided informed consent

### Exclusion Criteria

- Previously diagnosed cases of coronary artery disease
- Patients with diabetes mellitus or chronic kidney disease
- Conditions affecting RDW (e.g., anemia, chronic liver disease)
- Patients on drugs affecting platelet function
- Cases with acute coronary complications
- Pregnant females

### Data Collection and Procedures

After obtaining informed consent, baseline demographic and clinical data were recorded using a structured proforma. All participants underwent treadmill testing under standard protocols. Venous blood samples were collected in EDTA tubes and analyzed using an automated hematology analyzer for RDW and platelet indices. Data obtained were compiled and statistically analyzed.

## RESULTS:

**TABLE – 1** Baseline Characteristics of Study Participants

| Parameter | TMT Positive (n=75) | TMT Negative (n=75) | p-value |
|---|---|---|---|
| Age (years) | 54.2 ± 9.8 | 51.6 ± 10.2 | >0.05 |
| Age Group | | | |
| 18–40 | 12 (16.0%) | 18 (24.0%) | |
| 41–60 | 46 (61.3%) | 42 (56.0%) | |

| | | | |
|---|---|---|---|
| >60 | 17 (22.7%) | 15 (20.0%) | |
| Gender | | | |
| Male | 52 (69.3%) | 48 (64.0%) | >0.05 |
| Female | 23 (30.7%) | 27 (36.0%) | |
| Hemoglobin (g/dL) | 13.4 ± 1.1 | 13.6 ± 1.0 | 0.28 |

**TABLE-2** Comparison of Hematological Parameters and Correlation Analysis

| Parameter | TMT Positive (Mean ± SD) | TMT Negative (Mean ± SD) | p-value |
|---|---|---|---|
| RDW (%) | 14.8 ± 1.2 | 13.4 ± 0.9 | <0.001* |
| Platelet Count (×10⁹/L) | 236 ± 48 | 248 ± 52 | 0.18 |
| MPV (fL) | 11.2 ± 0.9 | 10.1 ± 0.8 | <0.001* |
| PDW (%) | 14.6 ± 1.5 | 13.2 ± 1.1 | <0.001* |
| P-LCR (%) | 32.4 ± 5.6 | 27.8 ± 4.9 | <0.001* |

**TABLE-3** Correlation in TMT Positive Group

| Correlation Pair | Pearson's r | p-value |
|---|---|---|
| RDW vs MPV | +0.46 | <0.001 |
| RDW vs PDW | +0.42 | <0.001 |
| RDW vs P-LCR | +0.39 | 0.002 |

The study demonstrated that baseline characteristics, including age, gender, and hemoglobin levels, were comparable between TMT positive and TMT negative groups, indicating appropriate matching. A statistically significant increase in RDW, MPV, PDW, and P-LCR was observed in TMT positive patients, suggesting enhanced erythrocyte anisocytosis and platelet activation in coronary artery disease. Platelet count did not differ significantly, highlighting that qualitative rather than quantitative platelet changes are important in CAD. Furthermore, RDW showed a moderate positive correlation with platelet indices, indicating a possible link between inflammation, oxidative stress, and thrombogenesis. These findings support the role of RDW and platelet indices as useful adjunctive markers in CAD

## DISCUSSION

Elevated RDW and platelet indices (MPV, PDW, P-LCR) in TMT-positive patients reflect increased inflammation, oxidative stress, and platelet activation in CAD [1–3]. The positive correlation between RDW and platelet indices suggests an interplay between erythrocyte dysfunction and thrombogenesis [4]. These findings are consistent with previous studies highlighting RDW and MPV as independent predictors of adverse cardiovascular outcomes [2,5]. The lack of significant difference in platelet count emphasizes the importance of functional rather than quantitative platelet changes in CAD.

## CONCLUSIONS

Elevated RDW and platelet indices such as MPV, PDW, and P-LCR in TMT-positive patients highlight their potential role as simple, cost-effective markers for the diagnosis and risk stratification of coronary artery disease [6–8]. Their significant association with CAD, along with the observed correlation between RDW and platelet indices, suggests an underlying link with inflammation and thrombogenesis. Incorporating these parameters with TMT may improve diagnostic accuracy and help in early identification of high-risk patients.

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