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Assessment of red cell distribution width in heart failure: A prognostic significance

[1]Dr. Saurin Kapadia, Resident General Medicine, Department of General Medicine, Bharati Vidyapeeth Medical College, Pune.

[2]Dr. Rishi Patel, Professor, Department of General Medicine, Bharati Vidyapeeth Medical College, Pune.

Corresponding Author: Dr. Saurin Kapadia, Resident General Medicine, Department of General Medicine, Bharati Vidyapeeth Medical College, Pune.

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Abstract

Heart failure is associated with increased burden on patients both physically and financially, currently the natriuretic peptides are most widely used laboratory parameters for detecting the heart failure. Recent studies have suggested that the raised values of Red cell distribution width is associated with poor clinical outcome. In this prospective study we have studied 104 patients of heart failure with reduced ejection fraction and compared their red cell distribution width with NYHA classification, prognosis at the end of 1 month in terms of need for hospitalization or escalation of their treatment for heart failure.

Keywords: Heart Failure with Reduced Ejection Fraction, New York Heart Association Class, Natriuretic Peptides, Red Cell Distribution Width.

Introduction

Heart failure is defined as a clinical entity resulting from impaired ventricular functioning or ejection of blood leading to clinical manifestation of heart failure in the form of dyspnoea, fatigue and signs of Heart Failure, namely peripheral oedema and rales. In India heart failure. The prevalence ranges from 1.3 to 4.6 million, with an annual incidence of 491600–1.8 million . According to the current scenario natriuretic peptides are used in day to day clinical practice for assessing heart failure against which other biomarkers are used in conjugation. Studies done in the Recent past shows co-relation of increased RDW with poor cardiovascular outcome . This parameter is routinely been reported as part of the complete blood count, but in day to day practice the use is mostly restricted for the differential diagnosis of anaemia and other haematological disorders many Recent studies, Red Cell Distribution Width (RDW) was found to be raised in many heart failure patients cohorts[4].

Materials and Methods-

It was a single arm prospective observational study done in a tertiary care centre in western Maharashtra. All patients with age >18 years admitted in medicine ward and ICU fulfilling the definition of heart failure based on 2D echo findings and clinical features were included in the study.All patients with recent blood transfusion (within 3 months), patients on chemotherapy were excluded from study.

Detailed history, clinical examination, laboratory investigation like complete blood count, ECG were done for all patients.

All the patients were subjected to echocardiography to assess 1)Left ventricular ejection fraction(LVEF), 2) Regional wall motion abnormalities, 3) LV systolic and diastolic dysfunction. All the patients were followed up after 1 month to look for prognosis in terms of change in treatment, hospitalized and survival.

All the statistical analysis were done using the SPSS software ver. 28.0. Independent - t test were used to test the significant mean difference of RDW among different co-morbidities, One-way ANNOVA test was used to test significant mean difference of RDW score among the different NYHA class.

Observation and results

There was a total of 104 patients diagnosed as a heart failure (Reduced ejection fraction confirmed by 2 D Echo).Out of total 104 patients, 80 (76.9%) were males and 24 (23.1%) were females.Mean age of the patients were 58.70 ± 13.19 years with maximum age of 90 years and minimum of 23 years. Mean haemoglobin level were 13.75 ± 1.49 gm/ dl. Mean RDW values were 15. 038 ± 1.50. Mean percentage of left ventricular ejection fraction were 34.4 % ± 7.5%. Based on the clinical findings 55.8% patient experienced the symptoms of PND, 20.2 % patient had orthopnoea while on clinical examination 40.4% patient had bilateral rales and 8.7% patient had pedal edema. On observing the co-morbidities Ischemic heart disease(62.5%), hypertension (69.2) % and (59.6%) Diabetes were among the most prevalent conditions among the Heart failure patients. 48.1% had past history of heart failure where as 51.9% patient had past history of myocardial infarction. 51% of the patient were smokers whereas 34.6% were alcoholics. Out of the 104 patients 42 patient had NYHA-II, 20 patient had NYHA III and 12 patient had NYHA IV symptoms. Rest had NYHA-I symptoms. Maximum no of patient i.e. 72(69.2%) had higher RDW values (>14) while 32(30.8) patients had normal RDW values.(Figure-2)

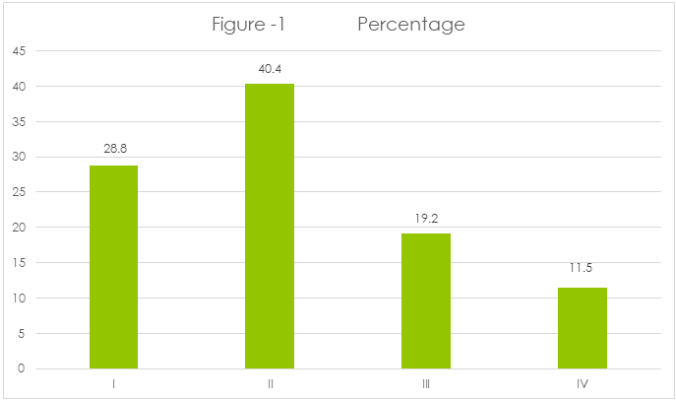


Figure 1

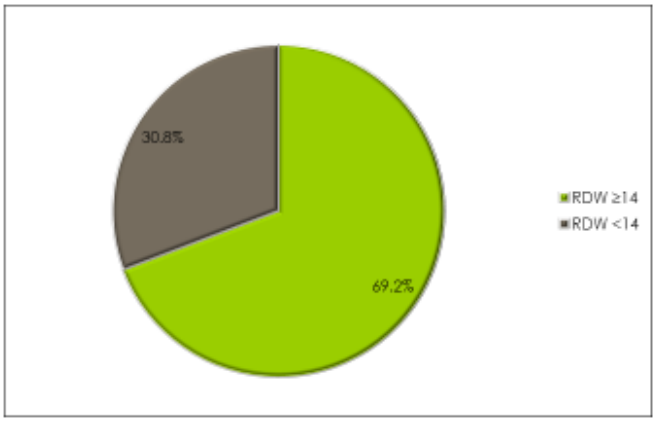
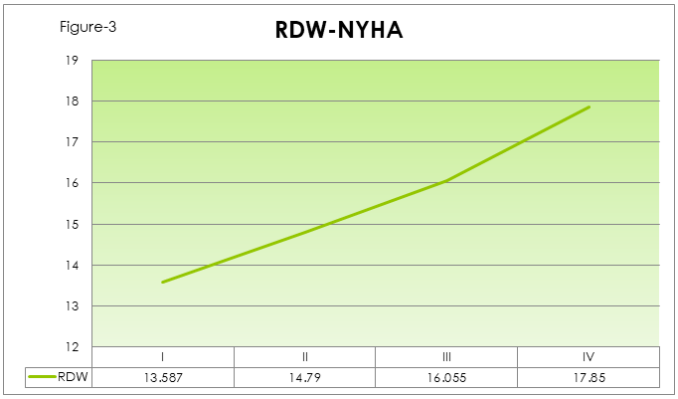


Figure 2

On follow up after 1 month 81.7 % with high RDW had change in treatment, 75% were hospitalized and 1.9% had unfortunate death. More number of patients with diabetes mellitus and hypertension had high RDW (p-value <0.001). Patient with history of ischemic heart disease also had high RDW values however is not statistically significant. (p-value 0.67). patient with NYHA class 1 had normal RDW values whereas with NYHA class 2,3 and 4 shows increasing trend of RDW values (p-value <0.001) (Figure-3). More number of patients in the hospitalized (68 out of 78) and change in treatment group (70 out of 85) had high RDW values (p value <0.001).



Discussion

The results of the present study add to the available data regarding the relevance of elevated RDW in acute Heart Failure. Recently, RDW has been shown to be a novel marker for predicting outcomes in the heart failure population . There was a total of 104 patients diagnosed as a heart failure (Reduced ejection fraction confirmed by 2 D Echo) either utilizing OPD services or IPD services were part of the study. Rudresh M G et al. study was conducted in the medical wards of Srimati Sucheta Kriplani Hospital & Lady Hardinge Medical College and Ram Manohar Lohia Hospital. A total of 70 patients of heart failure and 30 healthy subjects aged above 18 years were included. Of the 70 patients of heart failure, 44 (62.86%) had reduced ejection fraction and 26 (37.14%) had preserved ejection fraction. In our study, mean haemoglobin level were 13.75 ± 1.49 gm/ dl. Mean RDW values were 15. 038 ± 1.50. Mean percentage of left ventricular ejection fraction were 34.4 % ± 7.5%. In our study, mean age of the patients were 58.70 ± 13.19 years with maximum age of 90 years and minimum of 23 years. Rudresh M G et al. showed that the mean age was 52.03 ± 13.21 in controls and 54.86 ± 11.75 in the cases. There was no significant difference between the age cases and controls (p= 0.291) . The prevalence of HF in developed countries is considered to be around 1%-2% of the adult general population . The incidence increases with age, up to ≥ 10% among people > 70 years of age . In India coronary artery disease, diabetes, hypertension, valvular heart diseases and primary muscle diseases are the leading causes for heart failure. Rheumatic heart disease is still a common cause of heart failure in India . Our study finding showed that according to past history, 54 (51.9%) patients had a past history of myocardial infraction and similar number of patients were negative for past history of heart failure and out of total 104 patients, majority of the patients 72 (69.2%) had hypertension and 65 (62.5%) of the patients had ischemic heart diseases. Most common conditions found was hypertension, ischemic heart disease and diabetes mellitus. Rudresh M G et al. found that of the total 70 patients, 42 had ischemic heart disease; 19 had hypertensive heart disease; 7 had rheumatic heart disease and 2 had nonischemic cardiomyopathy . As per above data in our result, 72 (69.2%) of the patients had red cell distribution width more than 14 (High). 32 (30.8%) of the patients had normal red cell distribution width. Rudra M G et al . study found out that the mean RDW in patients was 15.763 ± 2.609 and in controls was 13.17±

0.75 respectively. The red cell distribution width was higher in the cases compared to controls with p value of <0.001. Red cell distribution was > 13.6 in 52 of the 70 cases and ≤ 13.6 in 18 of the 70 cases. But it was >13.6 in only 4 of the 30 controls and ≤ 13.6 in 26 of the 30 controls. This difference is significant with a p value of < 0.0014. Ferreira et al. carried out a retrospective study based on 2 independent cohorts of patients admitted to the emergency department with acute decompensation of HF, the first (i.e., the derivation cohort) consisting of 170 patients and the second (i.e., the validation cohort) consisting of 332 patients. RDW was measured at admission and at hospital discharge, with calculation of the ratio between these two values (i.e., ΔRDW). In the final model, a RDW value >15% at admission was independently associated with a 29% higher risk [odds ratio (OR), 1.29; 95%CI: 0.71-2.33] of composite outcome (hospitalization for acute decompensated HF), whilst such risk was found to be substantially higher for patients with ΔRDW > 0 (OR = 2.47; 95%CI: 1.35-4.51). Even more importantly, the combination of RDW value > 15% at admission and ΔRDW > 0 yielded a substantially higher risk of composite outcome than the two measures alone (OR = 3.40; 95%CI: 1.63-7.08).

Conclusion

The RDW is a simple, rapid, inexpensive and straightforward haematological parameter, which is now automatically generated by all commercially available haematological analyzers together with the complete blood cells count (CBC). Increased RDW values in venous blood samples truly mirror the degree of anisocytosis *in vivo*, and can hence be used for diagnostic, prognostic and even therapeutic decisions in many acute and chronic pathological conditions.The currently available scientific evidence convincingly suggests that RDW measurement predicts the risk of adverse outcomes (cardiovascular and all-cause mortality, hospitalization for acute decompensation or cardiac dysfunction) in patients with Heart Failure.

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