A Study of Red Cell Distribution Width in Patients of Heart Failure in Tertiary Care Hospital of South Gujarat

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ABSTRACT

INTRODUCTION: Heart Failure is a condition when there is acquired/inherited abnormality in the function and/or structure of heart leading to signs and symptoms that require frequent admissions and lead to decreased life span and poor quality of life.(1) Recently Red Cell Distribution Width (RDW) was found to be elevated in many heart failure patients.(2) An elevated RDW can predict mortality and morbidity in heart failure. RDW carries more prognostic information in addition to NT-pro BNP in acute heart failure. Few other studies also demonstrated that RDW is markedly elevated in severe heart failure independent of anemia and is a marker of worst prognosis. This study is to compare the parameter RDW in cases of cardiac failure and analyses RDW with severity of heart failure based on NYHA class and LV ejection fraction.

Method: This is a randomized cross-sectional study of 100 Known cases of heart failure and newly detected cases of heart failure who is admitted in tertiary care hospital of south Gujarat. Pretested Performa was used to collect data after taking informed consent Investigations including CBC, LFT, RFT, ECG, Urine routine micro, RBS, Lipid profile, Chest X-Ray, 2D-ECHO and USG abdomen . As mentioned in the proforma was carried out. Final analysis has been done with the help of Open EPI and SPSS software.

Results : Red Cell Distribution Width (RDW) levels are increased in heart failure patients. Heart failure patients with elevated RDW levels correlate with higher NYHA class and low LV ejection fraction

Conclusion : Red Cell Distribution Width (RDW) levels are increased in heart failure patients. Heart failure patients with elevated RDW levels correlate with higher NYHA class and low LV ejection fraction. RDW can be not just a marker but a strong predictor of mortality in heart failure patients. Combining RDW with other biomarkers and NYHA functional class can indeed be a very good predictor of morbidity and mortality.

KEY WORDS : Red Cell Distribution width , Heart Failure, NYHA functional class, LV ejection fraction

I. INTRODUCTION :

Heart Failure is a condition when there is acquired/inherited abnormality in the function and/or structure of heart leading to signs and symptoms that require frequent admissions and lead to decreased life span and poor quality of life1. Ischemia remains the chief etiology for heart failure worldwide. Heart failure is the final common outcome in all pathologies of heart disease. It is associated with a lot of co morbidities and lethality across the globe.

Over the last decade, several biomarkers have emerged in heart medicine like uric acid, neurohormones , hs-CRP, BNP and many other pro inflammatory cytokines which help in the diagnosis as well as prognosis of heart failure. Recently Red Cell Distribution Width (RDW) was found to be elevated in many heart failure cohorts. It is considered as a measure of variability in RBC size2. It is represented in 2 forms- RDW-CV (coefficient of variation) or RDW-SD (standard deviation). It is an easily available investigation as most of the hematology instruments measure RBC

volume and give RDW. An elevated RDW can predict mortality and morbidity in heart failure. Various postulates and theories have been put forth by many researchers for the cause for elevated RDW in the context of heart failure.

Few other studies also demonstrated that RDW is markedly elevated in severe heart failure independent of anemia and is a marker of worst prognosis.

Hence RDW is clearly emerging as a new and promising biomarker in heart failure assessment, and candidacy for ventricular assist devices, IABPs, CRTs and transplantation.

II. AIM AND OBJECTIVE:

Aim of study comprises measurement of red cell distribution width in patients presenting with heart failure and to correlate RDW with severity of heart failure (NYHA functional class and LV ejection fraction). To correlate RDW with morbidity and mortality in patients of Heart Failure.

III. MATERIAL AND METHODS :

The study was done at Surat Municipal Institute of Medical Education and Research (SMIMER) Hospital, Surat, Gujarat, from year January 2019 to August 2020. It was randomized cross sectional study enrolling total 100 OPD and indoor patients of heart failure. Patients with age more than 18 years and known cases of heart failure and newly detected cases of heart failure who is admitted in tertiary care hospital of south gujarat.

Patients having age less than 18 years or anemia with hemoglobin <12 gm/dl or history of blood transfusion within past 3 months or hematological malignancy or sepsis and patient not willing to participate in the study were excluded. Approval for this study was taken in institutional ethical committee. Informed written consent of all the participants were taken. All necessary confidentiality of participants were maintained.

Detail history, examination and investigations like CBC, LFT, RFT, ECG, Urine routine micro, RBS, Lipid profile, Chest X-Ray, 2D-ECHO and USG abdomen as per proforma were done for each participants. Data was entered in MS EXCEL spread sheet and was analyzed with the help of Open EPI and SPSS software. Statistical analysis was done by appropriate statistical method.

IV. RESULTS

This study, conducted in a tertiary care hospital of South Gujarat, had enrolled 100 heart failure subjects

Table 1. Age and Sex Distribution of heart failure patients (n=100) :

Age group	Case %	Sex	Case %
Less than 20 years	2	**Male**	64
20-29 years	5	**Female**	36
30 -39 years	15		
40-49 years	34		
50-59 years	27		
60-69 years	15		
More than 70 years	2		
Total	100		

Among the 100 cases of heart failure selected in our study group, 64% were males and 36% were female participants. Among the 100 cases of heart failure selected in our study group, majority of participants falls in group between age group 41-50. Study participants between age group less than 20 and more than 70 were very less which is of 3, 5 of study participants were in the age group 20 to 29, 15 were in the age group 30 to 39, 34 were in the age group of 40 to 49 years, 27 in the age group of 50 to 59 years, 15 in the age group of 60 to 69 and 2 in age group more than 70.

Table 2: Etiological distribution of Heart failure in study participants

ETIOLOGY	MALE	FEMALE
IHD	31	16
RHD	6	8
Cor pulmonale	8	4
DCM idiopathic	7	2
Alcoholic cardiomyoathy	3	0
Calcific AS/AR	3	1
Peripartum	0	2
RVD	3	1
Eisenmenger's	1	1
Myocarditis	2	1
TOTAL	64	36

Most common etiologic factor in study participants were Ischemic heart disease with second common cause being Rheumatic heart diseases. Almost half of study population had ischemic heart disease (47%). Least common cause was Peripartum and Eisenmenger's diseases.

Table 3: Distribution of risk factors in heart failure patients

RISK FACTORS	MALE	FEMALE
HTN	28	12
DM	23	15
Dyslipidemia	20	9
Smoking	44	0
Alcohol	34	0
BMI>30kg/m2	18	15
Previous h/o HF	13	7
Previous h/o MI	9	5

Smoking and hypertension were the most common risk factor which comprises of 44 and 40 study population respectively. 37 of the study population has diabetes mellitus.

34 of the study population has alcohol addiction. 33 of the study population has BMI>30 kg/m2. 29 of the study population has dyslipidemia. 20 and 14 of the study population has previous history of heart failure and previous history of myocardial infarction respectively.

Table 4: Distribution of major signs and symptoms

SIGNS AND SYMPTOMS	MALE	FEMALE
PND	19	11
Orthopnea	30	19
JVP	28	13
Rales	20	12
S3	19	12
Edema	27	14

Orthopnea is the most common sign in heart failure patients in our study participants.

Table 5: Distribution of cases according to NYHA Functional Class

NYHA CLASS	MALE	FEMALE	TOTAL
1	4	3	7
2	10	5	15
3	36	23	59
4	14	5	19
TOTAL	64	36	100

Majority of study participants falls under NYHA class 3 group which is 59. NYHA Class 4, class 2 and class 1 comprises of 19, 15 and 7 of the total study participants respectively.

Table 6: Distribution of Participants according to LVEF%

LVEF %	MALE	FEMALE	TOTAL
<30 Severe	15	11	26
30-44 Moderate	18	8	26
45-54 Mild	8	6	14
>54 Normal	23	11	14
Total	64	36	100

34% of the study participants have normal ejection fraction.
26% of the study participants have less than 30 LVEF which is severe stage of LVEF %.
While 26% of study participants have moderate stage of LVEF %. and 14% of participants have mild stage of LVEF %.

Table 7: Association between RDW SD and Outcome of study participants

Outcome	RDW SD Value		Total	Chhi (X2) Value	P value
	40-55	>55			
Death	1	14	15	54.55	<0.05
Survived	71	14	85		
Total	72	28	100		

Association was seen between red cell distribution width SD (RDW SD) and outcome of study participants with chi (X2) value being 37.36. It is statistically highly significant (p-value: <0.05). It is said that participants who had died have RDW SD level more than 56. So, we can say that high level of RDW SD have poor prognosis. Chances of survival are increased with RDW SD value between 40 and 55.

V. DISCUSSION :
Elevated red cell distribution width has been found to be associated for a long time with increased risk of adverse cardiovascular event in heart failure patients.

Pro-inflammatory cytokines like IL-6, TNFα and IL-1β erythropoietin mediated RBC maturation leading to increase in RDW. Bone marrow resistance to erythropoietin, deranged iron metabolism, hemodilution and anemia of chronic disease have been proposed as mechanism for anemia and increased mortality in heart failure

patients. Although many studies have successfully elucidated the prognostic role of RDW in heart failure, no clear insights into the mechanisms behind the same have been arrived till date. CHARM data and Duke Databank were used to study the role of RDW as a prognostic marker in heart failure. In our study, the mean age group of patients with heart failure as well as control was 48.22 years. Out of the patients 64% were males and 36% were females. Ratio of male to females was 1.78:1. According to another studies, CHARM(6) Program by Felker mean age of study participants was 64.1. Out of them 65% were males and 35% were females. Ratio of male to females was 1.85:1. Porto cohort done by Ferreira mean age of study participants was 76.2 years. Out of them, 50% were males and 50% were females. Ratio of male to females was 1:1. In our study IHD accounted for the majority of the cases (47%), followed by RHD with DCM and cor-pulmonale. In Felker's study, IHD accounted for the majority of the cases (51.1%) In Ferreira's study, IHD accounted for the majority of the cases (56.5%)

In our study the most common risk factors were smoking(44%), hypertension(40%) and diabetes mellitus(37%) respectively. In Felker's study the most common risk factors were hypertension(65.8%) and diabetes mellitus(30.8%) In Ferreira's study the most common risk factors were hypertension(87.1%) and diabetes mellitus(52.9%) In our study majority of study participants falls under NYHA class 3 group which is 59%. NYHA Class 4, class 2 and class 1 comprises of 19%, 15% and 7% of the total study participants respectively. In Felker study majority of study participants falls under NYHA class 3 group which is 56.1%. NYHA Class 4 and class 2 comprises of 1.3% and 42.7% of the total study participants respectively. In Ferreira study majority of study participants falls under NYHA class 3 group which is 62.4%. NYHA Class 4 and class 2 comprises of 29.4% and 8.2% of the total study participants respectively. All our observations revealed that RDW can be used as a cheaper and easily available prognostic marker in heart failure patients.

VI. CONCLUSION :

Red Cell Distribution Width (RDW) levels are increased in heart failure patients. Heart failure patients with elevated RDW levels correlate with higher NYHA class and low LV ejection fraction. RDW can be not just a marker but a strong predictor of mortality in heart failure patients. Combining RDW with other biomarkers and NYHA functional class can indeed be a very good predictor of morbidity and mortality.

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