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Original Article

The Significance of Hematologic Indices in Patients with Heart Failure

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ABSTRACT

The leading cause of death worldwide is Coronary Heart Disease (CHD). In patients with chronic heart failure (CHF), hematologic markers have been associated with clinical outcomes. Hemographic indices, or measures of white blood cells, are easy and useful, clear and simple predictors of both subclinical and systemic inflammation. **Objective:** To find out the significance of hematologic markers in patients admitted to the hospital with heart failure. **Methods:** A retrospective study was conducted on the hospitalized patients for HF from April 2019- May 2020. Total of 170 patients were enrolled in the current study. The inclusion criteria of the study was patients above 18 years, hospitalized patient for HF, having an EF< 40% and having two or more symptoms of HF as well as be discharged alive from the hospital. The hematologic indices were taken for each patient at the time of admission. The hemographic indices were defined as WBC count, neutrophil count, RL, NLR, and PLR. The neutrophil-platelet ratio (NLR) and the platelet-lymphocyte ratio (PLR) were derived as the ratios of neutrophil and platelet counts to lymphocyte counts, respectively. The entire test was performed by the hospital biochemistry lab under the standard protocol. Patients were followed till six months. At the time of admission complete medical history and hemographic indices was recorded. Data was entered and analyzed using SPSS 25.0. The quantitative variables were presented by mean and standard deviation and qualitative with frequency/percentages. All the qualitative variables were compared among both by using the Chi-square test and all quantitative variables by independent sample t test. The p-value less than 5% were considered as significant. **Results:** Total 170 patients were enrolled in current study among which 123(72.3%) survived and 47(27.64%) were died during 6 month follow up. The mean age among survived were 57.55±7.5 and dead was 59.96±7.9 (P-value= 0.06). According to gender male have dominance, in survived patients there were 98(79.7%) and in dead 38(80.9%) males (P-value= 0.86). 53(43.1%) patients were smokers in survived patients and 27(57.4%) in dead (P-value= 0.09). Status of comorbidities showed that the diabetes mellitus showed quite common among groups. The neutrophil count, WBC, lymphocyte count and NLR were elevated in deceased patients. The Platelet counts and hemoglobin levels were low in the deceased. **Conclusions:** It was concluded from the current study that the increased neutrophil count, WBC, lymphocyte count, and NLR were associated with the mortality of HF patients

INTRODUCTION

The leading cause of death worldwide is coronary heart disease (CHD), which is most usually caused by atherosclerosis [1]. Severe signs and symptoms of heart failure (HF) that often result in hospitalization or frequent emergency department visits Patients with HF are a heterogeneous group with a significant rate of readmission after discharge [2]. The nature of the underlying heart disease and the rate at which the condition develops influence the development and severity of HF symptoms. The majority of HF patients (70%) are admitted for worsening chronic HF, while up to 15-20% of patients are admitted for the first time, and roughly 5% are admitted for

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advanced or end-stage HF. A small percentage of HF patients have low blood pressure (8%), and a third have a shock (3%) [2,3]. Although progress in treatment and diagnosis of HF is still linked to a high rate of mortality among patients [4]. It is critical to identify high-risk patients for therapy and the development of new therapeutic approaches. Many research has been published on using hemographic indices to predict prognosis in HF patients [5-8]. In patients with CHF, hemographic markers have been associated with clinical outcomes. Hemographic indices, or measures of white blood cells, are easy and useful, clear and simple predictors of both subclinical and systemic inflammation [9]. It was established that the strong and independent predictors of mortality among HF patients were anemia, and red cell distribution width [6,7]. Leukocytosis, particularly neutrocytosis with lymphocytopenia, and thrombocytosis, on the other hand, are signs of active inflammation [10,19,20]. A study conducted in 2011 on HF patients reported that rather than the neutrophil count per se, the neutrophil-to-lymphocyte ratio (NLR) was a significant predictor of clinical outcomes after discharge and hospital mortality [11]. These hemographic indices are considered to link with HF. In patients with heart failure, a number of hematologic parameters are known to be prognostic significance. However, in people with HF, the risks associated with various hemographic indices have not been thoroughly compared. As a result, therefore the current study was conducted to find out the significance of hemographic markers in patients admitted to the hospital with heart failure.

METHODS

A retrospective study was conducted on hospitalized patients for HF from April-May 2020. Total of 170 patients were enrolled in the current study. A left ventricular ejection fraction (LVEF) of less than 40% was identified as systolic HF by transthoracic echocardiography. The inclusion criteria of the study were patients above 18 years, hospitalized patient for HF, having an EF< 40% and having two or more symptoms of HF (e.g., dyspnea, orthopnea, pretibial edema, or jugular venous distension), as well as be discharged alive from the hospital. Patients with severe renal failure, malignant diseases, chronic inflammation, peripartum cardiomyopathy, chronic pulmonary disease or recent heart surgery was excluded from the study. The hemographic indices were taken for each patient at the time of admission. The hemographic indices were defined as WBC count, neutrophil count, NLR, and PLR. The neutrophil-platelet ratio (NLR) and the platelet-lymphocyte ratio (PLR) were derived as the ratios of neutrophil and platelet counts to lymphocyte counts, respectively. The entire test was performed by the hospital biochemistry lab under the standard protocol. Patients were followed till six months either through planned visit in hospital or by telephonically with family members of patients to find out the status of mortality patients were then divided into two groups based on mortality (Alive or Dead). At the time of admission complete medical history (age, gender, hypertension, diabetes mellitus, smoking history, and hyperlipidemia) and hemographic indices (Neutrophil count (/mm3), WBC count (/mm3), Lymphocyte count (/mm3), Platelet count (k/mm3), Neutrophil to Lymphocyte Ratio (NLR), Platelet-to-lymphocyte ratio (k/mm3), Hemoglobin (g/dl)) was recorded. Data was entered and analyzed using SPSS 25.0. The quantitative variables were presented by mean and standard deviation and qualitative with frequency/percentages. All the qualitative variables were compared both by using the Chi-square test and all quantitative variables by independent sample t-test. A p-value of less than 5% was considered as significant.

RESULTS

Total 170 patients were enrolled in current study among which 123(72.3%) survived and 47(27.64%) were died during 6 month follow up. The mean age among survived were 57.55+7.5 years and dead was 59.96+7.9 years (P-value= 0.06). According to gender, males have dominance, in survived patients there were 98(79.7%) and in dead 38(80.9%) males (P-value= 0.86). 53(43.1%) patients were smokers in survived patients and 27(57.4%) in dead (P-value= 0.09). Status of comorbidities showed that the diabetes mellitus showed quite common among groups (Survived= 78(63.4%) Vs. Dead= 13(27.7%), P-value= 0.000), Hypertension (Survived= 112(91.1%) Vs. Dead= 6(12.8%), P-value= 0.000), Hyperlipidemia (Survived= 61(49.6%) Vs. Dead= 14(29.8%) P-value= 0.02) and Coronary Artery disease (Survived= 99(80.5%) Vs. Dead= 33(70.2%) P-value= 0.02).

Variables	Survived(n=123)	Dead (n=47)	P-value
Age (Mean + SD)	57.55±7.5	59.96±7.9	0.06
Gender (Male)	98(79.7%)	38(80.9%)	0.86
Smoking History	53(43.1%)	27(57.4%)	0.09
Diabetes Mellitus	78(63.4%)	13(27.7%)	0.000
Hypertension	112(91.1%)	6(12.8%)	0.000
Hyperlipidemia	61(49.6%)	14(29.8%)	0.02
Coronary Artery disease	99(80.5%)	33(70.2%)	0.150

Table 1: Baseline history of patients

Table 2 shows that hemographic indices among survivors and deceased. The hemographic indices showed that the neutrophil count (Survived= 4231.2±0.57 Vs. Dead= 5321.10±1.23, P-value= 0.000**), WBC (Survived=

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6864.41±2.54Vs. Dead= 7285.89±2.03, P-value= 0.000**), lymphocyte count (Survived= 1540.93±1.34 Vs. Dead= 7285.89±1.01, P-value= 0.03*) and NLR (Survived= 3.99±1.58 Vs. Dead= 5.591±0.81, P-value= 0.00**) were elevated in deceased patients. The Platelet counts (Survived= 207.19±0.75 Vs. Dead= 202.60±0.82, P-value= 0.43) and hemoglobin levels (Survived= 11.13±1.5 Vs. Dead= 10.21±1.81, P-value= 0.43) were low in deceased. The neutrophil count, WBC, lymphocyte count and NLR were elevated in deceased patients. The Platelet counts and hemoglobin levels were low in deceased.

Variables	Survived(n=123)	Dead (n=47)	P-value
Neutrophil count (/mm3)	4231.2±0.57	5321.10±1.23	0.000**
WBC count (/mm3)	6864.41±2.54	7285.89±2.03	0.000**
Lymphocyte count (/mm3)	1540.93±1.34	7285.89±1.01	0.03*
Platelet count (k/mm3)	207.19±0.75	202.60±0.82	0.43
Neutrophil to Lymphocyte Ratio (NLR)	3.99±1.58	5.591±0.81	0.000**
Platelet-to-lymphocyte ratio (k/mm3)	199.32±2.17	217.11±0.51	0.000**
Hemoglobin (g/dl)	11.13±1.5	10.21±1.81	0.107

Table 2: Comparison of Hemographic Indices among Groups Independent sample t-test ** strong significant results

DISCUSSION

Heart failure (HF) is a clinical disorder characterized by hemodynamic abnormalities that can lead to stress organ damage. HF symptoms are severe enough to require hospitalization or repeated visits to the emergency room. Patients with heart failure are a diverse group with a high rate of readmission following discharge [12]. These hemographic indices are considered to link with heart failure. In patients with heart failure, a number of hematologic parameters are known to be prognostic significance. Although laboratory parameter changes are crucial within hours of HF patients, they must also be analyzed within the first few days. Therefore the current study was conducted to find out the significance of hemographic markers in patients admitted to the hospital with heart failure. The results of the current study revealed that total of 170 patients were enrolled in the current study among which 123(72.3%) survived and 47(27.64%) died during a 6-month follow-up. The mean age among survived was 57.55+7.5 and the dead was 59.96+7.9 (P-value= 0.06). According to gender males have dominance, and status of comorbidities showed that the diabetes mellitus showed quite common among groups, Hypertension was also present followed by hyperlipidemia and Coronary Artery disease. The hemographic indices showed that the neutrophil count, WBC, lymphocyte count, and NLR were elevated in deceased patients. The Platelet counts and hemoglobin levels were low in the deceased. A study conducted in 2011 on HF patients reported that rather than the neutrophil count per se, the neutrophil-to-lymphocyte ratio (NLR) was a significant predictor of clinical outcomes after discharge and hospital mortality [11]. Among patients with acute heart failure, a higher WBC count was demonstrated to represent a significant risk of mortality throughout the first 30 days and 6 months after the myocardial infarction Furthermore, a higher WBC level was linked to a more advanced CAD as well as epicardial and myocardial perfusion problems [13]. The neutrophil and lymphocyte combination indices have a stronger prognostic value than the individual measures. NLR has been associated with the progression of coronary atherosclerosis. It is a significant and independent predictor of future coronary events, according to a study [14]. At the time of admission, the NLR was reported as a predictor of in-hospital and 6-month mortality in patients who have PCI in research by Tamhane and colleagues [15]. In literature, reduction in platelet count without thrombocytopenia has been linked to an increased risk of death in some studies, particularly in critically ill patients. It was also reported that the decline in platelet count is an independent predictor of mortality among severe cases. It was also suggested that the decrease in platelet counts can be used to predict prognosis [16,17]. Anemia or low hemoglobin levels are common in people with heart failure for a variety of causes. Anemia was shown to be prevalent in 37.2 % of patients with HF, which was linked to an elevated reported mortality rate [18].

CONCLUSIONS

It was concluded that the increased neutrophil count, WBC, lymphocyte count, and NLR were associated with the mortality of HF patients. Hematological indicators have the main advantage of being reasonably affordable and thus widely and easily available in daily clinical practice. They've also been shown to be diagnostic and prognostic in a variety of cardiovascular diseases.

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