

Prevalence of Anemia in Heart Failure Patients and Its Relation With Kidney Dysfunction



Medical Science

KEYWORDS : Heart Failure, Anemia, Kidney Dysfunction.

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ABSTRACT

To find the prevalence of anemia in patients with heart failure (HF) and to correlate it with kidney dysfunction 417 patients were observed within 20 weeks. Out of which 265 patients were diagnosed for heart failure. Their blood test report analysis was used for the assessment of anemia and creatinine level among them. On analyzing, 32.08% patients diagnosed with HF were anemic, out of which severe anemia is responsible for 1.89%, moderate and mild anemia contributes 3.40% and 26.79% respectively. Pearson's correlation test was used to see the relation between the anemia and kidney dysfunction which gave a non-significant result at N=85, p<0.05.

INTRODUCTION:

Heart failure occurs when the heart pumps insufficiently and is unable to maintain blood flow to meet the needs of the body. Heart failure accompanied with anemia can increase the level of morbidity and mortality. Anemia is defined as the decrease in the amount of red blood cells or the amount of hemoglobin in the blood. Diagnosis is based on the amount of hemoglobin in blood, as in men anemia is based on a hemoglobin of less than 13 to 14 g/dL while in women it must be less 12 to 13 g/dL [2,4]. In studies related to heart failure, anemia was considered to develop due to a complex interaction of iron deficiency, kidney disease and cytokine production, although micronutrient insufficiency and blood loss might also contribute. Such studies also concluded anemia of chronic disease and iron deficiency might co-exist in patients with HF[11]. One such chronic condition that can cause anemia is renal dysfunction. Renal dysfunction is defined by a reduced glomerular filtration rate which is calculated from serum creatinine levels. The normal serum creatinine level is 0.5-1.3mg/dl. Elevation from this normal range leads to kidney dysfunction and severity depends on the degree of elevation. As healthy kidneys produce the hormone erythropoietin that stimulates the bone marrow to make oxygen-carrying red blood cells. Thus when the kidneys fail, they produce less erythropoietin, resulting in decreased production of red blood cells to replace the natural breakdown of old red blood cells. As a result, the blood carries less hemoglobin, a condition known as anemia[8].

In this study, we have tried to examine the prevalence of anemia in the heart failure patients and to know its relation with kidney dysfunction. This study is my sincere effort for generating awareness regarding the harmful consequences of anemia in HF patients so as to reduce the chances of worsening the condition and chances of increased level of morbidity and mortality.

MATERIAL and METHODS:

417 patients were observed within 20 weeks who were admitted to the Cardiology Department of an esteemed Multispecialty Hospital, New Delhi. Out of which 265 patients were diagnosed for heart failure. The inclusion criteria used were- age >= 35, both males and females present in admitted. Information regarding their history, general lifestyle as well as current health diagnosis reports was collected with the help of questionnaire-interview. Blood test report analysis was used for the assessment of anemia and creatinine level among them. The samples were then categorized under anemic and non-anemic using WHO criteria for anemia and the severity of anemia was analyzed with the help of Indian standards. Then the correlation between hemoglobin concentration and creatinine level among

the anemic heart failure patients was also analyzed using Pearson's correlation test.

OBSERVATIONS and RESULTS:

PREVALENCE OF HEART FAILURE IN DIFFERENT AGE GROUPS:

In fig. 1 below, it can be observed that the prevalence of heart failure is more prevalent in the age group 55-65 years i.e. 38.86%. This may be interpreted as the outcome of severe risk factors of cardiac disease witnessed in the increasing ages of one's life.

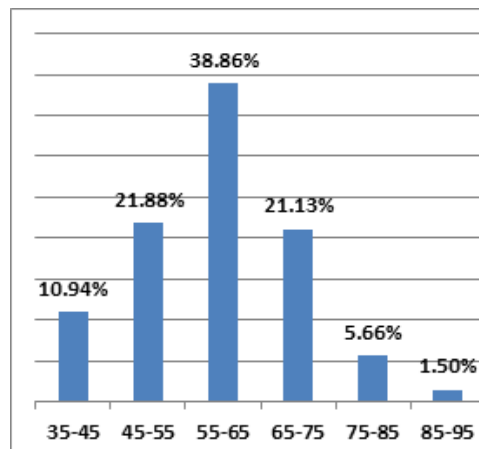


Figure1. PERCENTAGE OF HF PATIENTS IN DIFFERENT AGE GROUPS

PREVALENCE OF ANEMIA IN HF PATIENTS:

In the sample size of 265 HF patients, there were 85 anemic patients. Thus the prevalence of anemia came out to be 32.08% from the total sample size which is depicted in Fig.2.

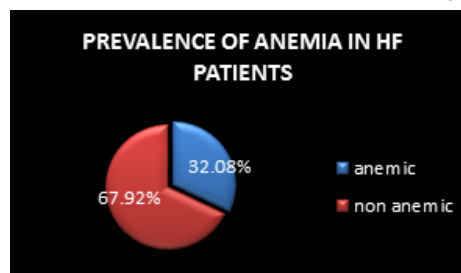


Figure 2: PREVALENCE OF ANEMIA IN HF PATIENTS

STATUS OF ANEMIC HF PATIENTS:

Out of 85 anemic HF patients, Fig. 3 below shows the fraction of each category i.e. mild, moderate and severe anemic from the total sample size.

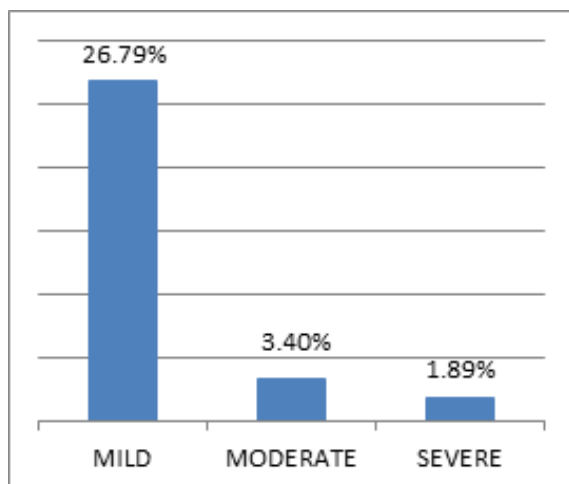


Figure 3: PERCENTAGE OF ANEMIC STATUS

PEARSON CORRELATION TEST:

Fig.4 below depicts the Pearson Correlation chart between Hb content and Creatinine level of the HF patients, resembling a negative correlation chart.

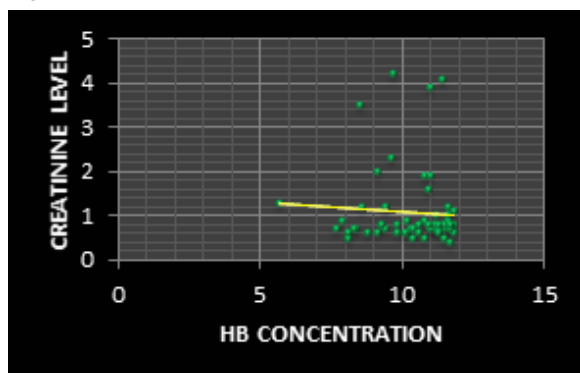


Figure 4: PEARSON CORRELATION CHART BETWEEN HB AND CREATININE LEVEL IN ANEMIC HF PATIENTS

DISCUSSION:

Anemia is a major public health problem associated with many risk factors. This study was conducted at a multispecialty hospital to see the prevalence of anemia in heart failure patients. The findings of this study indicate that anemia is less prevalent in HF patients of the age group 35-90 years as the prevalence of anemia is found to be 32.08% with mild, moderate and severe anemia being 26.79%, 3.40% and 1.89% respectively. The overall prevalence of anemia in this study is almost similar to those found by other researchers where the prevalence of anemia was 15%^[13]. *Witte KK et al 2004*, reported an analysis of patients with LVSD and LVDD which revealed that patients with symptoms and signs of CHF have a high prevalence of anemia (34%) despite whether they have a LV dysfunction or diastolic dysfunction. Our study found much similar prevalence of anemia because the subjects had an additional characteristic which includes heart failure, CKD, Renal artery stenosis and hypertension, etc. The other fact is that the source was a multispecialty hospital where there is a best cardiac facility available due to which a greater number of sample was easy to collect.

Several studies have reported that iron deficiency was the most

common cause of anemia to be found^[6]. And in patients with HF, untreated iron deficiency may result in anemia^[10]. In many studies of heart failure, anemia was considered to develop due to a complex interaction of iron deficiency, kidney disease and cytokine production, although micronutrient insufficiency and blood loss might also contribute. It was also concluded that anemia of chronic disease and iron deficiency might co-exist in patients with HF. In such cases one might need to measure soluble transferrin receptors and ferritin levels for further explanation^[11]. But in this study due to absence of funds, serum ferritin levels is not performed in patients with moderate and severe anemia as serum ferritin indirectly measures the serum iron. Kidney dysfunction or chronic kidney disease is also an important risk factor for the development of severe anemia. As healthy kidneys produce the hormone erythropoietin that stimulates the bone marrow to make oxygen-carrying red blood cells. Thus as the kidneys fail, they produce less erythropoietin, resulting in decreased production of red blood cells to replace the natural breakdown of old red blood cells. As a result, the blood carries less hemoglobin, a condition known as anemia^[1,7,8,9]. Erythropoietin is produced not only in kidneys but also it is produced in several other extra renal tissues in response to metabolic and oxidative stress or in cases of injuries. Myocardium is one of these tissues that produce specific erythropoietin receptors and response to this hormone. Hypoxic myocardium produces HIF-1 that increases the transcription of erythropoietin^[3]. Renal dysfunction is defined by a reduced glomerular filtration rate which is calculated from serum creatinine levels. Changes in serum creatinine related to treatment with diuretics or angiotensin-converting enzyme inhibitors are not necessarily associated with worse outcomes. The normal serum creatinine level is 0.5-1.3mg/dl. Elevation from this normal range leads to kidney dysfunction and severity depends on the degree of elevation^[8].

Jean-Christophe Luthi et al, 2006 stated that HF associated with anemia and CKD revealed that hemoglobin was associated with an increased risk of death - 20% and 6.1% of individuals with and without CKD, respectively and hemoglobin was related to early readmission; which concluded that both CKD and anemia were frequent among older patients with heart failure and were the predictors of adverse outcomes, independent of other known risk factors for heart failure^[5]. In this study kidney dysfunction is not strongly associated with anemia as the Pearson's correlation test between Hb level and Creatinine concentration, calculated the correlation coefficient ($r = -0.045$ and at $N=85$, $p<0.05$). Where the negative sign of r denotes that there is a negative relation between Hb and Creatinine concentration and the absolute value of r i.e. 0.045 depicts that there is no or negligible relation between the above two. Moreover, the correlation graph of our study shows that both Hb and creatinine are slightly inversely proportional to each other as the deviation from the no correlation graph is minute; showing negligible relationship between Hb and creatinine concentration depicting that prevalence of anemia in this study is not due to kidney dysfunction and thus giving a non-significant result. As anemia and renal disease can be seen in a large number of patients with heart failure, as a dysfunctional heart can promote the dysfunction of the kidneys through a variety of pathophysiological mechanism, whereas the reciprocal is also true as well. Renal dysfunction is very much common in patients with heart failure and is also associated with high morbidity and mortality. These two conditions may worsen each other through multiple mechanisms such as fluid overload and increased venous pressure, hypo-perfusion, neurohormonal and inflammatory activation, and associated treatment^[12]. *Westenbrink BD et al, 2007* conducted study with CHF patients, which revealed that the anemia in CHF was not only independently associated with impaired renal perfusion and blunted EPO production, but to fluid retention as well. *Ravish Shah et al, 2013* conducted a study over elderly population, which concluded that prevalence of anemia increases with age

when accompanied by heart failure conditions despite of the causative factors. Similar result is obtained in this study also, which came out to be as 10.94%, 21.88%, 38.86%, 21.13%, 5.66% and 1.50% in the age group 35-45yrs, 45-55yrs, 55-65yrs, 65-75yrs, 75-85yrs and 85-95yrs, respectively. According to this study the prevalence of anemia increased from the age 35yrs to 65yrs then started to decline. Such findings reflect that better treatment of the underlying causes of anemia and regular checkup of elderly people could mean access to better health care and consequently lower prevalence of anemia. Unawareness and low level of education along with low socio-economic status may lead to increased chances of morbidity and mortality in anemic HF patients. This is also likely to increase the prevalence of anemia.

CONCLUSION:

Prevalence of anemia in HF patients admitted is 32.08%; and out of which, severe anemia is responsible for 1.89%, moderate and mild anemia contributes 3.40% and 26.79% respectively. Even though the characteristics most strongly associated with severe anemia included CKD and hypertension, but in this sample group the relation between anemia and kidney dysfunction is found less; thus giving a non-significant result.

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