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# Anemia as Predictor of In-Hospital Mortality Among Patients Having Congestive Heart Failure

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**Abstract**
**Background:** Anemia remains an important risk factor which contributes towards the worsening of the outcomes, consisting of cardio-renal anemia syndrome and its impact in heart failure remains to be complex and multifactorial. The current study was done to evaluate the role of anemia on mortality among patients having congestive heart failure. **Material and methods:** This study included a total of 115 patients with congestive heart failure presenting at Chaudhry Pervez Elahi Institute of Cardiology (CPEIC) Multan. After the inclusion of patients in study, 3 ml of venous blood sample was drawn under aseptic conditions and immediately transported to the hospital laboratory in EDTA vial for hemoglobin levels analysis. These patients were followed till discharge to document in-hospital mortality during current hospitalization. All the sociodemographic distribution and other relevant information such as age, gender, area of residence, diabetes, hypertension, obesity, smoking, hyperlipidemia and mortality were noted in the proforma and data was entered and analyzed by SPSS version 22 for descriptive statistics and tests of significance. Anemia was cross-tabulated against in-hospital mortality using two by two table and chi-square test was applied at level of significance of 0.05. **Results:** Among our 115 patients with congestive heart failure, 75 (65.2%) were males and 40 (34.8%) were females. Mean age of our patients with CHF was 57.17 ± 11.65 years ranging from 34 to 80 years. Although males were younger than female patients with congestive heart failure but this difference was not statistically significant (p=0.140). Seventy five (65.2%) were from rural areas, 40 (34.8%) were poor, 70 (60.9%) from middle income families and only 5 (4.3%) belonged to rich families. Forty five (39.1%) had diabetes and 55 (47.8%) had hypertension. Mean body mass index (BMI) of patients with congestive heart failure was 26.12 ± 2.93 kg/m$^2$ and 35 (30.4%) were obese. Twenty five (21.7%) were smokers. Mean hemoglobin level of these patients was 11.36 ± 2.55 d/dl ranging from 6.6 to 14.7 g/dl and anemia was documented in 60 (52.2%) our patients. In-hospital mortality in patients with congestive heart failure was 12 (10.4%) and of these 12 mortalities, severe anemia was noted in 7 (58.33%) patients. **Conclusion:** Our study results have documented high frequency of anemia among patients with congestive heart failure. In-hospital mortality was significantly associated with anemia and its severity. Hemoglobin levels were significantly less among patients with in-hospital mortality compared with those who were alive. Our study results suggest early diagnosis anemia followed by timely management can help to decrease adverse events among patients with congestive heart failure.
**Keywords:** Congestive Heart Failure, anemia, in-hospital mortality.

## Introduction:

Cardiovascular diseases are the leading cause of mortality all over the world [1-3], particularly in developing countries as the mortality rates among developed nations have dropped down significantly due to the availability of the healthcare facilities and advancements in techniques owing to patient care [4-5]. Heart failure is associated with significant medical, financial, psychological and societal burden with high rates of emergency department admissions[6]. In USA, due to the heart failure (as a primary or secondary diagnosis), approximately more than 2.6 million patients get hospitalized every year and increase cost of healthcare budget enormously [7]. Congestive heart failure is a common health issue with high rates of mortality, emergency department/hospital admissions, reduced physical activity, poor productivity, loss of work and poor quality of life of the patients [8-10]. There are other modifiable as well as non-modifiable factors which lead to the worsening of the conditions of the patient and poor prognosis in addition to direct impact of congestive heart failure [11-13]. Anemia is also a major cause of disease morbidity, poor quality of life and productivity, reduced physical activity and is common entity among heart failure patients, hence representing a modifiable risk factor for poor prognosis and adverse clinical outcomes. It is also a strong predictor for the burden of related co-morbidities and for increased severity of the disease.

Anemia remains an important risk factor which contributes towards the worsening of the outcomes,

 

consisting of cardio-renal anemia syndrome and its impact in heart failure remains to be complex and multifactorial [13]. Among patients having heart failure, causes of anemia may include "nutritional deficiencies (malabsorption, impaired metabolism), acute blood loss (gastrointestinal bleeding), decrease in erythropoietin production and response to erythropoietin due to the intrinsic renal disease, hemodilution because of volume expansion, relative iron deficiency, chronic disease anemia, etc. advanced age, the presence of DM and renal failure are associated with anemia".[14] Khan et a l[11] reported 43% anemia in patients with congestive heart failure (CHF), Oster et al[15] reported 55 % anemia in patients with CHF. The mortality rate in patients with the anemia group was 8.6% [16], Kuule et al[17] reported 7.5 ± 3.4 days hospital stay for these patients.

Owing to role of anemia in congestive heart failure in worsening of the condition and poor prognosis of the patients, this study was conducted to evaluate role of anemia in CHF in Southern Punjab. This study was done to determine the role of anemia associated with mortality to generate evidence on this topic as there is limited data on this topic from Pakistan.

**Material and methods:**

This study included a total of 115 patients with congestive heart failure presenting at Chaudhry Pervez Elahi Institute of Cardiology (CPEIC) Multan. Congestive Heart failure patients more than 20 years of age were included and CHF was defined as "patients having shortness of breath having Killip class I-IV (class I=no cracles, class II=JVP, class III=pulmonary edema, class IV=cardiogenic shock) and swelling of legs (assessed on clinical judgment by 2-3 minutes pressing of medial malleolus, if pit develops it was taken as positive) for more than 1 month (presence of all) which is consistent with echocardiographic findings (percentage of blood ejected with each beat – less than 50 – 75%" while patients having any malignancy, chronic obstructive pulmonary disease, poor intake and CABG were excluded. After the inclusion of patients in study, 3 ml of venous blood sample was drawn under aseptic conditions and immediately transported to the hospital laboratory in EDTA vial for hemoglobin levels analysis. Anemia was defined as "if Hb level is less than 13 g/dl for men and 12 g/dl for females", mild anemia was defined as "Hb 10 - 11.9 g/dl for women and 10 - 12.9 g/dl for men", moderate anemia was defined as "Hb levels ranging from 7 - 9.9 g/dl for both genders" and severe anemia was defined as "Hb values <7 g/dl for both genders". These patients were followed till discharge to document in-hospital mortality during current hospitalization. All the sociodemographic distribution and other relevant information such as age, gender, area of residence, diabetes, hypertension, obesity, smoking, hyperlipidemia and mortality were noted in the proforma and data was entered and analyzed by SPSS version 22 for descriptive statistics and tests of significance. Anemia was cross-tabulated against in-hospital mortality using two by two table and chi-square test was applied at level of significance of 0.05.

**Results:**

Among our 115 patients with congestive heart failure, 75 (65.2%) were males and 40 (34.8%) were females. Mean age of our patients with CHF was 57.17 ± 11.65 years ranging from 34 to 80 years. Although males were younger than female patients with congestive heart failure but this difference was not statistically significant (p=0.140). Seventy five (65.2%) were from rural areas, 40 (34.8%) were poor, 70 (60.9%) from middle income families and only 5 (4.3%) belonged to rich families. Forty five (39.1%) had diabetes and 55 (47.8%) had hypertension. Mean body mass index (BMI) of patients with congestive heart failure was 26.12 ± 2.93 kg/m$^2$ and 35 (30.4%) were obese. Twenty five (21.7%) were smokers. Mean hemoglobin level of these patients was 11.36 ± 2.55 d/dl ranging from 6.6 to 14.7 g/dl and anemia was documented in 60 (52.2%) our patients. In-hospital mortality in patients with congestive heart failure was 12 (10.4%) and of these 12 mortalities, severe anemia was noted in 7 (58.33%) patients. The role of anemia on mortality rate in patients with CHF has been presented in Table No. 1.

**Table No. 1**
**Distribution of in-hospital mortality compared with anemia.**
(n=115)

| Anemia | Mortality | | P – value |
|---|---|---|---|
| | Yes (n = 12) | No (n = 103) | |
| **Yes** (n = 60) | 10 | 50 | **0.031** |
| **No** (n = 55) | 02 | 53 | |
| **Total** | **115** | | |

 

**Table No. 2**
**Distribution of mean Hb levels with in-hospital mortality.**

| Hemoglobin level | Mortality | | P – value |
|---|---|---|---|
| | Yes (n = 12) | No (n = 103) | |
| **Mean** | 8.51 | 11.69 | **0.001** |
| **SD** | 3.08 | 2.27 | |

**Table No. 3**
**Distribution of in-hospital mortality with different factors.**
(n=115)

| Characteristic | | Mortality | | P – value |
|---|---|---|---|---|
| | | Yes | No | |
| **Gender** | Male | 07 | 68 | 0.750 |
| | Female | 05 | 35 | |
| **Age groups** | Up to 50 Years | 06 | 39 | 0.534 |
| | > 50 Years | 06 | 64 | |
| **Residential status** | Rural | 10 | 65 | 0.212 |
| | Urban | 02 | 38 | |
| **Diabetes** | Yes | 06 | 39 | 0.534 |
| | No | 06 | 64 | |
| **Socioeconomic status** | Poor | 02 | 38 | 0.228 |
| | Middle Income | 10 | 60 | |
| | High income | 00 | 05 | |
| **Hypertension** | Yes | 11 | 44 | 0.005 |
| | No | 01 | 59 | |
| **Obesity** | Yes | 02 | 33 | 0.340 |
| | No | 10 | 70 | |
| **Smoking** | Yes | 04 | 21 | 0.290 |
| | No | 08 | 82 | |

**Discussion:**

Anemia remains an important risk factor which contributes towards the worsening of the outcomes, consisting of cardio-renal anemia syndrome and its impact in heart failure remains to be complex and multifactorial. Among our 115 patients with congestive heart failure, 75 (65.2%) were males and 40 (34.8%) were females. Silverberg et al [18] documented 79 % male patients having congestive heart failure, in compliance with our study results. Dai et al [19] has also reported similar results. Rasheed et al [20] reported 88% male patients with congestive heart failure showing compliance with our findings. Khan et al [21] reported 60 % male gender predominance in patients with CHF which are close to our study results. Nasir et al [22] reported male gender preponderance with 65 % which is close to our study results.

Mean age of our patients with CHF was 57.17 ± 11.65 years ranging from 34 to 80 years. Although males were younger than female patients with congestive heart failure but this difference was not statistically significant (p=0.140). Rasheed et al [20] reported 50.77 ± 7.53 years mean age which is close to our study results. Nasir et al [22] reported 60 ± 13 years mean age which is similar to that of our study results. Vim et al [23] from Iran also reported 61 years mean age of the patients with congestive heart failure (CHF) which is close to our study results.

Seventy five (65.2%) were from rural areas, 40 (34.8%) were poor, 70 (60.9%) from middle income families and only 5 (4.3%) belonged to rich families. Forty five (39.1%) had diabetes and 55 (47.8%) had hypertension. Mean body mass index (BMI) of patients with congestive heart failure was 26.12 ± 2.93 kg/m$^2$ and 35 (30.4%) were obese. Twenty five (21.7%) were smokers. Silverberg et al [18] reported diabetes in 30 %, hypertension in 64% and smoking in 40 % patients. These findings are close to our study results. Dai et al [19] reported similar results.

Mean hemoglobin level of these patients was 11.36 ± 2.55 d/dl ranging from 6.6 to 14.7 g/dl and anemia was documented in 60 (52.2%) our patients. In-hospital mortality in patients with congestive heart failure was 12 (10.4%) and of these 12 mortalities, severe anemia was noted in 7 (58.33%) patients and there was significant association with severity of anemia.

Silverberg et al [18] reported 79.1 % frequency of anemia which shows high frequency of anemia in compliance with our findings. Usmanov et al [24] reported 10.7 ± 0.4 mg/dl mean Hb level in CHF which is in

 

compliance with our study results. Dai et al [19] reported 62.2 % anemia in CHF which is similar to that of our study results. Khan et al [11] reported 43% anemia in patients with congestive heart failure (CHF), Oster et al [15] reported 55 % anemia in patients with CHF which is close to our results. Kuule et al [17] reported 7.5 ± 3.4 days hospital stay for these patients, these findings are in compliance with our study results. Mortality was noted in 16 (8.5%) of our study cases. Dai et al [19] reported mortality in 6.3 % in CHF with anemia which is close to our study results.

**Conclusion:**

Our study results have documented high frequency of anemia among patients with congestive heart failure. In-hospital mortality was significantly associated with anemia and its severity. Hemoglobin levels were significantly less among patients with in-hospital mortality compared with those who were alive. Our study results suggest early diagnosis anemia followed by timely management can help to decrease adverse events among patients with congestive heart failure.

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