

Anemia Prevalence and Sociodemographic Factors among Patient with Cardiovascular Disease in Gaza-Palestine

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Abstract Chronic anemia is a risk factor for cardiovascular diseases outcome in patients with heart failure, dilated cardiomyopathy and uncontrolled hypertension. This study was performed to analyze the prevalence of anemia among cardiac patients and to determine the relationship between anemia and socio demographic characteristics. The study design is a cross sectional based on 300 cardiac patients (≥ 19 years) who were hospitalized in ALShifa hospital (Gaza) for 3 months period during the year 2012. The analysis includes socio demographic data, traditional risk factors for cardiovascular diseases (CVD), and Laboratory test included (hemoglobin and clearance creatinine measurement). Collected data was analyzed by using statistical package for social science version 20.0. Anemia was defined as Hemoglobin less than < 12 g/dl in female and less than 13 g/dl in male based on World health organization criteria. Among 300 patients, 181 patients (60.3%) were anemic and 119 (39.7%) were non-anemic. The mean age for all population was 61.4 years. Mean age of patients with anemia tends to be higher (63.9 years) than non-anemic (57.7 years) and the differences between the two means reached statistical significant level (P value < 0.001). Anemia was more common in female (71.4%), older age (71.1%), diabetics (70%), impaired clearance creatinine (70%), hypertensive's (65%) and low education level (64.5%). The highest proportion belonged to valvular heart disease (77.8%), congestive heart failure (74.6%) followed by hypertension (54%), and the lowest is coronary artery disease (46%). Logistic regression reveals that low education, low clearance creatinine level, smoking and diabetes are independently associated with anemia. We conclude that Anemia is common among cardiovascular disease patients, and worsens the prognosis of their clinical condition. Intervention policies to minimize anemia risk factors are needed.

Keywords: anemia, cardiovascular diseases, socio demographic factors, Gaza, Palestine

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1. Introduction

One of the major health challenges to global development in this century is the rapid rise of Non-Communicable Diseases (NCDs) in both developed and developing countries. This growing challenge threatens economic and social development as well as the lives and health of millions of people [1].

The Eastern Mediterranean Region is facing a growing epidemic of CVDs provoked by ageing population and socioeconomic changes. Risk factors for CVDs among Palestinians are demonstrated in a combined observational and analytical cross sectional study conducted by UNRWA in NCD clinics. The study revealed that, most of the identified CVD risk factors were obesity (61.5%), hypercholesterolemia (37.8%), hypertension (30.7%), diabetes (46.7%), physical inactivity (46.8%) and smoking 16.3% [2].

In westernized countries, CVD accounts for the majority of deaths each year. It is reported that anemia may present a special risk in these patients [3]. Considering high prevalence of anemia in general population and direct impact on patient health, anemia causes important physiologic effect on the cardiovascular system, however studies measuring anemia prevalence in population is rare. CVDs, are the most common cause of death worldwide, including (40%) in high-income countries, and (28%) in low and middle-income countries [4]. Mark et al, explained that Anemia, is an independent risk factor for CVD outcomes in the ARIC cohort, a community cohort of subjects between the ages of 45 and 64 years [5]. Paulo suggest that mild anemia was independent modifiable risk factor, for older adults and it was synergistically modified by the presence of CVD [6]. Our study was performed to analyze the prevalence of anemia in patients with cardiovascular disease and explore

main associated health morbidity and the socio demographic factors.

2. Patients and Methods

This is a cross sectional study included 300 adults patient (≥ 19 years) who were hospitalized with a diagnosis of cardiovascular disease in AL Shifa hospital (Gaza strip) for 3 months period during the year 2012. The patients were evaluated regarding their demographic data, cardiovascular risk factors, main clinical diagnosis and laboratory data.

In our study, the definition of anemia is Hemoglobin less than 13 g/dl for men and 12 g/dl for women based on World Health Organization (WHO) criteria. Chronic kidney disease is defined by calculation of creatinine clearance according to Cockcroft-Gault equation ($140 - \text{age} \times \text{weight (kg)} / 72 \times \text{serum creatinine (mg/dl)}$) multiply by 0.85 for women, (less than 85 ml/min impaired and equal or more than 85 ml/min normal clearance creatinine).

Cardiologist made the clinical diagnosis of hospitalized cardiovascular patients. Socio demographic variables were patient's age, gender, level of education, citizenship (citizen or refugee), family size and place of residence (city, camp). In addition, traditional cardiovascular risk factors were determined, hypertension, diabetes, cigarette smoking, body mass index ($\geq 30 \text{ kg/m}^2$ is obese). Laboratory test included hemoglobin and clearance creatinine level. Helsinki committee for ethical issues in Gaza strip approved this study. Collected data was analyzed by using statistical package for social science version 20.0, Numbers and percentage were used to describe the baseline characteristics. In this study, relative frequency of anemia in various CVDs and different age group was assessed. Chi square test was used to examine the statistical significance differences between groups.

The odds ratio and confidence interval of each risk factor was calculated. The differences between means were tested by t-test. In the end, logistic analysis was used to reveal the predictors that can be associated independently with anemia. The P value less than 0.05 was considered statistically significant.

3. Results

Out of 300 cardiac patients, 181 patients (60.3%) were anemic and 119 (39.7%) were non-anemic. Table 1 shows the characteristics of study population by anemia status. Among the patients, there were 153 (51%) men vs. 147 (49%) women. The prevalence of anemia among female patients 105 (71.4%) is higher than male patients 76 (49.7%). The difference between the two groups reached statistical significant level (P value < 0.001). The mean age for all study population was 61.4 years. Mean age in anemic patients tends to be higher (63.9 years) than non-anemic (57.7 years) and the difference between the two means reached statistical significant level (P value < 0.001). Analysis of age group showed that the prevalence of anemia increased by the age increase which is progressive and statically significant. The higher rate of anemia prevalence in our population belongs to the age group older than 70 years (71.1%), the difference between age groups is statistically significant (P value < 0.001). Our findings revealed a relationship between education level and anemia. The prevalence of anemia among low educated patients is two times higher than the patients with high education level (64.5% vs. 35.5%) and the difference reached statistical significant level (P value < 0.001). A minor difference did not reach statistical significant level is observed between patients classified by citizenship, residency and family size.

Table 1. Socio demographic characteristic of study population stratified, By presence or absence of anemia

| Demographic characteristics | Anemic | | Not Anemic | | Total | | OR (95%CI) | P value |
|-----------------------------|--------|------|------------|------|-------|------|------------------|---------|
| | NO | % | NO | % | NO | % | | |
| | 181 | 60.3 | 119 | 39.7 | 300 | 100 | | |
| Gender | | | | | | | | |
| Male | 76 | 49.7 | 77 | 50.3 | 153 | 51 | 0.39 (0.3-0.6) | 0.00 |
| Female | 105 | 71.4 | 42 | 28.6 | 147 | 49 | | |
| Age | | | | | | | | |
| Mean age | | 63.9 | | 57.7 | | 61.4 | | |
| Less than 55 years | 35 | 41.2 | 50 | 58.8 | 85 | 28.3 | 1 | 0.00 |
| 56-69 years | 87 | 65.9 | 45 | 34.1 | 132 | 44 | 2.76 (1.5 – 5.0) | |
| more than 70 years | 59 | 71.1 | 24 | 28.9 | 83 | 27.7 | 3.50 (1.8 – 7.0) | |
| Education | | | | | | | | |
| Low | 169 | 64.5 | 93 | 35.5 | 262 | 87.3 | 3.9 (1.9-8.2) | 0.00 |
| High | 12 | 31.6 | 26 | 68.4 | 38 | 12.7 | | |
| Citizenship | | | | | | | | |
| Refugee | 115 | 61.8 | 71 | 38.2 | 186 | 62 | 0.80 (0.5-1.4) | 0.499 |
| Citizen | 66 | 57.9 | 48 | 42.1 | 114 | 38 | | |
| Residence | | | | | | | | |
| Camp | 71 | 61.2 | 45 | 38.8 | 116 | 38.7 | 1.0 (0.66-1.7) | 0.806 |
| City | 110 | 59.8 | 74 | 40.2 | 184 | 61.3 | | |
| Family size | | | | | | | | |
| 0-8 | 100 | 60.6 | 65 | 39.4 | 135 | 45 | 1.0 (0.6-1.6) | 0.915 |
| More than 8 | 81 | 60 | 54 | 40 | 262 | 87.3 | | |

The reported cardiovascular diseases in our study include valvular heart disease (VHD), congestive heart failure (CHF), hypertension (HTN) and coronary artery disease (CAD) were demonstrate in Table 2. According to our findings the highest prevalence of anemia is reported

in VHD, with the prevalence of (77.8%), patients with CHF are at the second place with a prevalence of (74.9%), followed by patients with HTN (54%), while patients with CAD reported the lowest prevalence rate (46.10%).

Table 2. Frequency of anemia in different cardiovascular disease

| Diagnostic | Anemic | | Non Anemic | | Total | | P value |
|--------------------------|--------|------|------------|------|-------|------|---------|
| | No | % | No | % | No | % | |
| Valvular heart disease | 7 | 77.8 | 2 | 22.2 | 9 | 3 | 0.001 |
| Congestive heart failure | 94 | 74.6 | 32 | 25.4 | 126 | 42 | 0.001 |
| Hypertension | 27 | 54 | 23 | 46 | 50 | 16.7 | 0.001 |
| Coronary artery disease | 53 | 46.1 | 62 | 53.9 | 115 | 38.3 | 0.001 |

To continue the summary of our estimations [Table 3](#) shows that Anemia is more prevalent among hypertensive patients (65% vs. 47.5%) and the difference between hypertensive and normotensive is statistically significant (P value < 0.006). The same difference was observed among diabetics (70%) than non-diabetics (49.3%). Chance of anemia is less among smokers (38%) than

among non-smokers (67.2%) with statistical significant difference (P value < 0.001). Our findings also demonstrate that chances of anemia is 3.5 folds higher among patients with impaired creatinine clearance (P value < 0.001). Anemic patients have larger body mass index (31.4 vs. 30.1), this difference was statistically significant (P value 0.035).

Table 3. Clinical and laboratory characteristics of study population stratified, By presence or absence of anemia

| Characteristic of patients | Anemic | | Not Anemic | | Total | | OR(95%CI) | Pvalue |
|----------------------------|--------|------|------------|------|-------|------|--------------|--------|
| | NO | % | NO | % | NO | % | | |
| Hypertension | | | | | | | | |
| Yes | 143 | 65 | 77 | 35 | 220 | 73.3 | 2 (1.2-3.4) | 0.006 |
| No | 83 | 47.5 | 42 | 52.5 | 80 | 26.7 | | |
| Diabetes | | | | | | | | |
| Yes | 112 | 70 | 48 | 30 | 160 | 53.3 | 2.4(1.5-3.9) | 0.001 |
| No | 69 | 49.3 | 71 | 50.7 | 140 | 46.7 | | |
| Smoking | | | | | | | | |
| Yes | 27 | 38 | 44 | 62 | 71 | 23.7 | 0.2(0.2-0.5) | 0.001 |
| No | 154 | 67.2 | 75 | 32.8 | 229 | 76.3 | | |
| CL Creatinine | | | | | | | | |
| Normal<85ml/min | 39 | 40.2 | 58 | 59.8 | 97 | 32.3 | 3.5 (2-5.7) | 0.000 |
| impaired≥85ml/min | 142 | 70 | 61 | 30 | 203 | 67.7 | | |
| Mean Body mass index | 31.4 | | 30.1 | | 30.9 | | | 0.035 |
| Mean Haemoglobine | 10.9 | | 13.8 | | 12.1 | | | 0.001 |
| Mean clearance Creatinine | 65.4 | | 92.6 | | 76.6 | | | 0.001 |

To control for the confounding effects of the different risk factors we constructed multivariate analysis by the use of the logistic regression analysis. The dependent variable is anemia status and the covariates included clearance creatinine level, smoking, low education,

diabetes Mellitus, hypertension, body mass index and age as demonstrated in [Table 4](#). The significant predictors that can affect anemia independently are clearance creatinine level, smoking, low education and diabetes Mellitus.

Table 4. Logistic Regression for the risk factors for anemia

| | B | S.E. | Sig. | OR (95% C.I.) |
|----------------------|-------|------|-------|--------------------|
| Clearance Creatinine | 0.99 | 0.29 | 0.007 | 2.69 (1.51 – 4.79) |
| Smoking | -0.98 | 0.32 | 0.00 | 0.38 (0.20 – 0.70) |
| Education | 1.15 | 0.40 | 0.00 | 3.16 |
| Diabetes | 0.69 | 0.26 | 0.01 | 1.99 (1.16 – 3.42) |

4. Discussion

In the Palestinian community, neither the prevalence nor the prognosis of anemia has been well defined in patients with CVDs. In our study, it is clear that prevalence of anemia among cardiac patients is higher than the prevalence among the general population, and the risk is higher among women, poor and less educated people.

Most practical definition of anemia is the one given by the World Health Organization (WHO), hemoglobin concentration less than 13 g/dl for men and 12 g/dl for women [2,7]. Based on this definition, our findings revealed high prevalence of anemia among cardiac patients (60.3%), more in female than male (71.4%, 49.7% respectively). De Maria founds that the combination of heart disease and anemia is present in females and it was associated with 3.5 times greater risk of mortality than for nursing home resident without these dual co morbidity [8]. Prior studies have suggested that

lower hemoglobin may be a risk factor for CVD outcome, in high-risk patients who already have CVD or have many risk factors for CVD, where Sarnak et al, found in a large study for 14,410 patients that (9%) of adults (men 5% and women 13%) of a normal USA population ages 45-64 years, have anemia [5]. Anemia predisposed patients to a risk of developing CVD and it is a risk factor in cardiovascular survival rate [9]. Our present study revealed significant increase in the prevalence of anemia by increasing age, (71.1%) in-patient older than 70 years and (41.2%) in patients less than 55 years. However, our study pointed out anemia is not limited to aged people but also targeting younger patients. This findings supports previous reports presented by a recent review of epidemiological studies, explicate that anemia prevalence rate, spreads a wide range, from (3% to 61%) among elderly men and from (3% to 41%) among elderly female [10]. Also Guralink et al, found a rapid rise in anemia prevalence after the age of 50 years, to a rate greater than (20%) in person more than 85 years [11]. Salive et al, found that getting older was significantly and independently related with both hemoglobin level and

anemia [12]. In a study of northwest Iran 2011 shows the highest rate of anemia age group older than 70 years and patients younger than 40 years [13].

Also in our study we observed that cardiac patients with anemia were less educated (64.5%), hypertensive (65%), diabetics (70%), obese (BMI 30 kg/m² and more) and with impaired clearance creatinine (70%). Our data came in agreement with a study In Saudi Arabia completed, in the Cardiovascular Disease Management Program (CVDMP), showed that (27%) of patients were anemic, higher prevalence in females (33.4%), (63%) were 60 years, (74.7%) were hypertensive, (77.4%) had diabetes and (28.6%) had renal disease. The anemia prevalence rate (27%) is lower than our reported prevalence where anemia among general population is lower than the Palestinians percentage due to variation in socioeconomic status [14].

The presence of anemia if extended for a long period may result in ventricular remodeling and cardiac dysfunction [15,16]. It causes important physiologic effect on the cardiovascular system. Metabolic effect induced by anemia can result in direct myocardial toxicity, myocyte dysfunction, water retention which could be harmful in patients with heart failure [17,18,19]. As know Anemia is a common co morbidity and predictor of mortality in patients with chronic heart failure (HF). In recent years, the prevalence rate of anemia in patients with HF has received increasing attention; the rate of HF is 20% in developed countries. Chronic HF, affects 1-2% of the European population, is an important cause of mortality and disability [20,21]. Groenveld et al found that prevalence of anemia was 37.2% in a meta analysis of 34 studies on 150, 180 patients with HF between 2001 and 2007 and concluded that, during management of these patients, it is quite helpful to be aware of the factors that are associated with mortality and morbidity [22].

Over the past years, clinical surveys and trial, showed that the prevalence rate of anemia in HF patients have resulted in range from 9.9% in Valsatran HF trial (Val-Heft), to (55.6%) in the study by Silverberg, despite medical therapies, the annual mortality rate was 20% [23,24]. In addition 30-40% of patients with HF, die within the first year, and 60-70% of these patients die within five years following diagnosis [25]. OPTIME CHF trials showed that every 1 g/dl fall in hemoglobin level is independent risk factors for death and readmission [26].

The presence of anemia with other risk factors including chronic kidney disease, diabetes mellitus is associated with increased mortality, hospitalization and morbidity [27]. Different studies suggest that anemic patients with CHF are more likely to be older, female with more clinical symptom of HF, higher hospitalization rate, history of diabetes and renal insufficiency [20,28]. Our findings is coming in accordance with the data of all these studies, anemia was present in (74.9%) of study population with CHF, most of patients were females with high risk of co morbidity.

Considering profile and clinical implications of anemia in-patient with (CAD), several studies believe that presence of anemia has increased ischemic symptoms, and contributes to the occurrence of myocardial ischemia, associated with a worse prognosis [11,29]. In hospitals, anemia in patients presenting with acute coronary syndrome (ACS), varies between (15%) and (43%) [30,31,32]. The prevalence of anemia in patient presenting

with ACS in a study found in Barcelona Spain during the period (2009-2010) was (25%), and it is a predictor of mortality and cardiovascular complication [33].

For the explanation of the anemia causes Salisbury et al, suggest that up to (57.5%) of patient admitted with normal hemoglobin value acquires anemia during hospital admission [34]. Patients with so-called nosocomial anemia have higher morbidity and mortality during first year of follow up than those who maintain normal hemoglobin value [35]. Bleeding in patients with acute coronary syndrome is not negligible and is due to anti platelets and anticoagulants therapy, and may influence the prognosis. Only a small number of authors have suggested that repeated blood sample, and an inflammatory state in ACS has been described as possible causes [36,37,38,39,40]. In northwest Iran, Azin et al, found that the prevalence of anemia in ischemic heart disease was less than other CVDs (22%), and the study did not discuss the various range of hemoglobin concentration affect the risk of hospitalization and mortality [13]. In our study we found that anemia in CAD was (46.10%).

There are scarce available data concerning the prevalence of anemia in patient suffering from VHD. Available data concerning the subject has been reported by Fyeza Hassan in case report study of Aortic stenosis and gastrointestinal bleeding [41]. In our analysis, the highest proportion belonged to VHD with prevalence rate of (77.8%). This could be explained by the use of dual anti platelet or warfarine therapy that increases the risk of gastrointestinal bleeding in cardiac patients.

Additionally, anemia in hypertension is characterized by pro atherosclerotic condition, with impaired endothelial function, which is an independent predictor of mortality [42]. In our study the percent is (54%) probably due to uncontrolled hypertension associated with others risk factors mainly diabetes, impaired kidney function and low education level. In a study in Australia about 187 hypertensive patients, the prevalence of anemia was (16%) and was higher in patients with uncontrolled hypertension [43]. Moreover, a study in Iran reported the prevalence of hypertension in anemic patients as (20.5%) [13].

5. Conclusion

Clinician should be aware that anemia is common among in-patients with cardiovascular disease and that it is associated risk of morbidity and mortality, and treatment of anemia may be helpful to reduce the risk.

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