ANALYSIS OF ANEMIA AND BLOOD INDICES IN MEN AND PREMENOPAUSAL WOMEN

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ABSTRACT

Objective: To compare general characteristics, laboratory indices, etiologies and underlying causes in men and pre-menopausal women with anemia.

Methodology: A total of 105 patients with anemia presenting to Internal Medicine clinic of Abant Izzet Baysal University Hospital were enrolled in the study. Characteristics of the participants, etiology, underlying cause of anemia, hematological parameters and findings on gastroscopy with colonoscopy were recorded. Pregnant, post-menopausal women and patients with history of blood transfusion were excluded. SPSS v.15.0 was used to analyze the data.

Results: Median ages of male and female participants were 62 (25) and 36 (20) years respectively. Mean corpuscular volume was 84 ±15fL and 74 ±10fL in men and women respectively. Serum ferritin level of the men (27 mcg/L) was significantly higher than those of the women (4.6 mcg/L). Pearson's correlation analysis revealed that the best correlatives of hemoglobin in anemic female and male was mean corpuscular volume and red blood cell count respectively. The most common etiology was iron deficiency anemia in both women (75%) and men (63%).

Conclusion: Mean corpuscular volume in women and red blood cell mass in men are best indicators of hemoglobin in anemia.

Key Words: Anemia, Erythrocyte indices, Erythrocyte count, Hemoglobin

INTRODUCTION

Reduction in erythrocyte or red blood cell mass is the definite description of anemia[1,2]. Since, evaluation of anemia in this manner is not a practical way, hemogram parameters; hemoglobin (Hb) and hematocrit (Hct) are commonly used to establish the diagnosis of anemia. An Hb value lower than 13 g/dL in men and lower than 12 g/dL in women without pregnancy and lower than 11g/dL in women during pregnancy is referred to as anemia according to the WHO guidelines[3,4]. Despite cut off values of anemia described according to gender, it was shown that population over 60 years of age tend to have lower Hb levels compared to those in younger[5,6]. The rate of anemia among premenopausal women is not low. Severe anemia is reported in 2.2%, moderate in 14% and mild anemia in 32% of women in a study from India[7]. There is limited data about types and frequency of anemia in men. For instance, iron deficiency anemia is about 7 times more prevalent in women compared to men[8].

Etiology and indices of anemia in men and women can be different from each other. For instance, iron deficiency anemia is more common in fertile women and in pediatric patients compared to adult men and post-menopausal women. On the other hand, vitamin B12 deficiency anemia is more prevalent in elderly since the incidence of atrophic gastritis increase in elderly population. It is highly probable that causes and etiology of the anemia differ in premenopausal women and men. However, there is no data about the anemia etiologies in men and postmenopausal women in our institution, which we intended to obtain data. Moreover, laboratory indices of the anemia in premenopausal women and men could be different from each other. Information about these characteristics among anemic premenopausal women and men can improve diagnosis and management in this population.

In the present study, we aimed to compare general features, laboratory parameters, etiologies of anemia in men and premenopausal women. We also aimed to find out best correlative indices with Hb in anemic subjects.

METHODOLOGY

This descriptive study was conducted on anemic patients on the patients referred to tertiary care hospital.

Following approval of the study by institutional board, the study enrolled the patients with anemia that presented in institutional outpatient Internal Medicine clinics between December 2017 and August 2018. Sample size of 105 was calculated using power analysis. Pregnant women, women in puerperium, postmenopausal women and patients younger than 18 years were excluded. We also excluded the patients who received erythrocytes transfusion prior to the admission to our clinic. General characteristics of the study population, such as age, daily medications used, accompanied comorbidities, characteristics of menstrual cycles in women, endoscopic diagnoses (if any) were recorded after obtaining this data from institutional database and patients' files. Type of anemia and underlying cause of the anemia was also noted.

Laboratory parameters in hemogram such as, white blood cell count (WBC), erythrocyte count (RBC), mean corpuscular volume (MCV), red cell distribution width (RDW), and platelet count were recorded. In hemogram test analyzer, LH 780 model of Beckman Coulter analyzer (Beckman Coulter In.; Bre CA) was used. Architect c8000 analyzer (Abbott Inc. Lake Forest, IL, USA) was used in serum biochemical analyses. Test results from serum biochemistry including, ferritin, iron binding capacity, folate, vitamin B12, serum iron, c-reactive protein (CRP), erythrocyte sedimentation rate (ESR), lactate dehydrogenase (LDH) and creatinine levels were also recorded. The ratio of serum iron to serum iron + iron binding capacity was used to calculate transferrin saturation.

Data was analyzed with SPSS software (SPSS 15.0 for Windows, IBM Co, Chicago, IL, USA). Categorical variables were expressed as numbers (percentage) and analyzed with chi-square test. The normality data was assessed with Kolmogorov- Smirnov test. While, variables with normal distribution were expressed as mean and standard deviation; furthermore, compared with independent samples t test, variables without normal distribution were expressed as median (interquartile range [IQR]) and compared with Mann Whitney U test.

Correlation among study parameters were observed by conduction of Pearson's correlation analyze test. Statistical significance was considered when p-value was lower than 0.05.

RESULTS

Median ages of the men and women were 62 (25) and 36 (20) years, respectively. Anemic men were significantly older than anemic women (p<0.001). MCV of men and women was 84 ±15 fL and 74±10 fL, respectively (p<0.001). Men's and women's PLT were 194 (208) k/mm^3 and 310 (113) k/mm^3, respectively. The difference was statistically significant (p=0.01). Women's ferritin (5.6 (4.6) mcg/L) was significantly lower than the men's ferritin level (14 (27) mcg/L), (p<0.001). The LDH of women was significantly lower than the LDH of the men. The ESR of women was significantly lower than the ESR of the men with anemia. The CRP of women was significantly lower than the CRP of the men.

Thirty six (44%) women had their menstruation regular and remaining 45 (56%) had irregular with menorrhagia. Only 16 (19.8%) of women had concurrent diseases while 18 (75%) of men had comorbidities (p<0.001). Anti-aggregant or anti-coagulant drug usage was significantly more common in anemic men (11 of 24, (45.8%)) compared to anemic women (1 of 81, (1.2%)) in study population (p<0.001).

Etiologies Anemia are given in table 1.

Upper endoscopic findings are given in table 2 which were not significantly different between study groups (p=0.16). Colonoscopy was required and performed in 4 (4.9%) of women and 10 (41.7%) of men with anemia. Colonoscopic findings were not significantly different among study population (p=0.67).
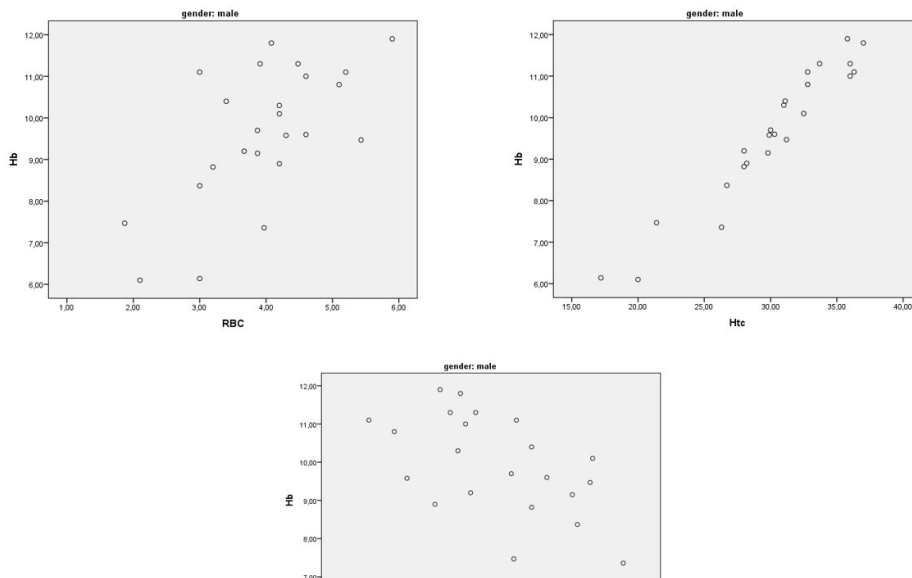
The Hb level was significantly and positively correlated with Hct (r=0.92, p<0.001), MCV (r=0.67, p<0.001), serum iron (r=0.40, p<0.001), transferrin saturation (r=0.38, p<0.001), and negatively correlated with RDW (r=-0.49, p<0.001) levels. Neither serum ferritin, nor vi-

Table 1: Differences of anemia etiologies

Anemia etiologies	Men	Women
Iron deficiency	15 (62.5%)	61 (75.3%)
B12 deficiency	5 (20.8%)	2 (2.5%)
Folic acid deficiency	0	1 (1.2%)
Thalassemia	0	3 (3.7%)
Iron deficiency and anemia of chronic disease	1 (4.2%)	1 (1.2%)
B12 deficiency and anemia of chronic disease	1(4.2%)	1 (1.2%)
Iron and B12 deficiency	2 (8.3%)	12 (14.8%)

Table 2: Gastrointestinal causes

Endoscopic diagnosis	Men	Women	P
Number	15	17	
Gastritis	9 (60%)	13 (74.5%)	
Peptic ulcer	2 (13.3%)	2 (11.8%)	
Normal finding	0	2 (11.8%)	p<0.001
Gastritis and polyp	2 (13.3%)	0	
Esophageal varices	2 (13.3%)	0	
Colonoscopy	10 (41.7%)	4 (4.9%	p=0.67

Figure 1: Correlation between Hb and anemia parameters in anemic women

tamin B12 and folic acid levels were correlated with Hb in women with anemia. Figure 1 shows the correlation between Hb and anemia parameters in anemic women. Hb was significantly and positively correlated with RBC (r=0.65, p=0.001), Hct (r=0.96, p<0.001), and negatively correlated with RDW (r=-0.62, p=0.001) in anemic men. Serum ferritin, vitamin B12 and folic acid levels were not correlated with Hb in anemic men, either. Figure 2 shows the correlation between Hb and anemia parameters in anemic men (Figure 1 and 2).

DISCUSSION

Main findings of present study were following; anemic women were significantly younger than men and women had significantly lower levels of ferritin, MCV, PLT, LDH, ESR and CRP levels compared to those in men. Co morbid diseases were less common in women compared to men while use of medications was less common in women compared to men,. Iron deficiency anemia was less common in men compared to women while anemia of chronic disease and vitamin B12 deficiency anemia were more frequent in men. Gastrosco-

py and colonoscopy were required more commonly in men compared to women subjects. Hematocrit and Hb level was best correlated with MCV in anemic women and with RBC in anemic men.

Iron deficiency is the most common cause of anemia worldwide[9]. Pediatric population and young women are more vulnerable to the anemia than other age groups. Besides, in general population, iron deficiency anemia is more common in women compared to men[10]. This is due to the fact that women have only 500 mg of iron store as compared to 1000 mg iron store in men. Therefore, depletion of iron in nutrition causes anemia earlier in women[11]. Nearly three quarters of the study population in present study was female, which was also in accordance to previous literature[12].

In present study, men were older than women. There could be several explanations for the age difference between men and women. Initially, we selected premenopausal women to compare men without age limitation and premenopausal women tend to be younger. In addition, the most common form of anemia, iron defi-

Figure 2: Correlation between Hb and anemia parameters in anemic men
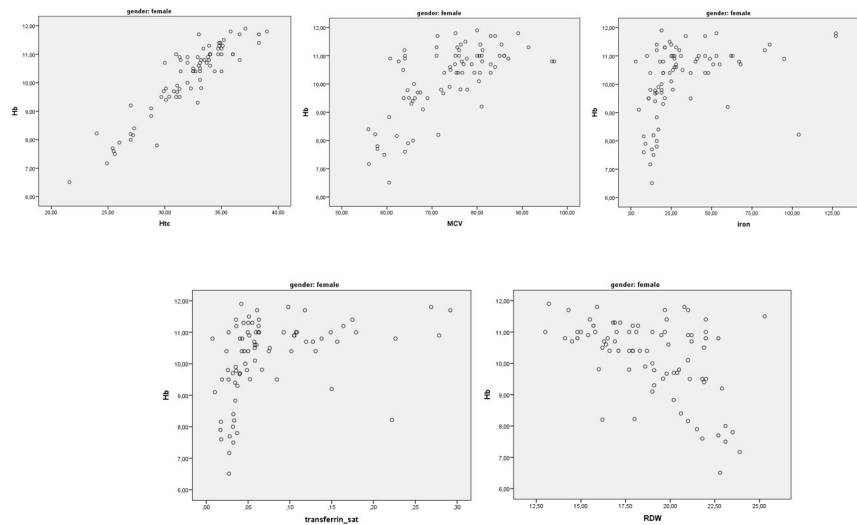
ciency, is more common in women of childbearing age. Indeed, iron deficiency anemia was the most common etiology of anemia in our study population.

Low ferritin and MCV values are indicative of iron deficiency anemia, which is more common in women as the cause of anemia. Therefore, women had decreased MCV and ferritin compared to men. On the other hand, levels of serum iron and transferrin saturation, other indices of iron deficiency, were not different in women compared to anemic men. Thrombocytopenia is reported to be associated with iron deficiency[13]. In present study, since iron deficiency anemia was less common in men, platelet count was also higher in men compared to the women.

Accompanied diseases, such as hypertension, atherosclerotic heart disease, and diabetes mellitus were more common in men than women. It is suposed that this difference was mainly due to the age and gender difference between men and women. Incidences of both chronic diseases mentioned above were raised with age. Moreover, age difference between anemic women and men in present study should also be responsible for the difference in drug usage between men and women. Since the comorbidities were more common in men than women, drug usage associated with these comorbidities was also more common in anemic men than women.

Severity of anemia is dependent on the level of Hb[14]. MCV is referred to as the most important erythrocyte indices in iron deficiency anemia[15]. Indeed, MCV had the best correlation with Hb level in anemic women in present study. The most common anemia type in women was iron deficiency anemia and this type of anemia is associated with microcytosis of the erythrocytes, which refers to as reduction in MCV. Therefore, MCV best correlates with Hb in women anemic subjects. Similar results have been reported in literature. A study by Beard et al. reported both MCV and Hb best correlated with stress scale of anemic mothers[16]. On the other hand, Hb was best correlated with RBC in anemic men. Vitamin B12 deficiency anemia, which is characterized by a defect in the production of rapidly growing cells, was less common in women compared to men in present study. Vitamin B12 stimulates both the maturation and proliferation of the cells[17]. So, treatment with cobalamin causes an increase in RBC in megaloblastic anemia[18]. That could be an explanation of significant correlation between Hb and RBC in anemic men in present study.

The upper gastrointestinal endoscopy and colonoscopy are recommended for the evaluation of anemia, especially due to iron deficiency[19-20]. Therefore, gastroscopy was performed in 21% of anemic women and in 62.5% of anemic men, while colonoscopy was performed in 4.9% of women and 41.7% of anemic men in our study. Since the most common cause of anemia in premenopausal women was iron deficiency caused by menstrual problems, need for gastroscopy and colonoscopy in women were significantly lower than that in anemic men.

Endoscopic procedures have been reported to be failing to reveal the cause of anemia in every one of 3 - 6 cases[21-22]. In present study, the rates of normal findings in gastroscopy were 11.8% in women and 0% in men. On the other hand, the rates of normal colonoscopy were 75% in women and 50% in men. These results

suggest that, both upper and lower endoscopic procedures are more productive in anemic men than women. High unremarkable colonoscopy rates in both men and women may indicate that endoscopic interventions were overused in determination of anemia cause in our clinic. However, a long term follow up with greater study population is needed to confirm this conclusion.

Two important limitations of the present study are relatively small study population and retrospective design of the work. However, results are important in evaluation of anemic population.

CONCLUSION

The study concludes that MCV in women and RBC mass in men are best correlates of Hb in anemia. Therefore, these values in routine hemogram tests require more attention by physicians. Physicians should also be aware of comorbidities and drug use especially in anemic men. Finally, gastroscopy and colonoscopy would be needed in anemic men more than women.

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CONTRIBUTORS