Evaluation of Frequency and Type of Severe Anemia in Patients Referred to the Baqiyatallah Hospital in Tehran in Six Months; A Descriptive Cross-Sectional Study

Hamid Reza Jalalian[1], Meysam Shasti[2], Sadrollah Mahmoudi[3] and Hassan Goodarzi[4,*]

[1]*Department of Hematology and Oncology, Baqiyatallah University of Medical Sciences, Tehran, Iran*

[2]*Internal Medicine Specialist (Internist), Baqiyatallah University of Medical Sciences, Tehran, Iran*

[3]*Emergency Medicine Specialist, Associated Professor of Baqiyatallah University of Medical Sciences, Tehran, Iran*

[4]*Trauma Research Center, Faculty of Medicine, Baqiyatallah University of Medical sciences, Tehran, Iran*

Abstract: Purpose: To investigate the frequency and types of severe unknown anemia in patients referred to the Baqiyatallah Hospital (Tehran) for six months.

Methods: In this descriptive cross-sectional study, the patients with severe unknown anemia referred to the Baqiyatallah Hospital (Tehran, Iran) were selected over six months. Following consideration of inclusion and exclusion criteria, 230 patients with severe anemia (hemoglobin (Hb) > 8gr/dl) were included. Complete medical history was obtained from the patients and additional biochemical blood analyses were applied to determine the frequency and type of anemia. SPSS (v.19) software was used to analyze the findings and the significance level was defined as a p-value <0.05.

Results: In chronic disease anemia (47.5%), gastrointestinal bleeding-associated anemia (29%), bleeding malignancies anemia (21.5%), and aplastic anemia (2%). There were significant differences (p<0.05) in the frequency of different types of normocytic anemia. The highest frequency was detected in folate deficiency anemia (46%), hypothyroidism anemia (34%), and B12 deficiency anemia (20%), respectively. The hemolytic anemia represented a significant difference (p<0.05) in comparison with sickle cell anemia (95%). Also, sickle cell anemia showed a significant difference (p<0.05) between thalacemia-associated anemia (95%) and malignancy-related anemia (95%)

Conclusion: Respectively, the highest frequency of anemia in patients was found in chronic diseases and gastrointestinal bleeding. It is suggested that more attention should be paid to the type of anemia of patients referred to the urgency of hospitals.

Keywords: Anemia, Frequency, Iran, chronic disease.

1. INTRODUCTION

Anemia (erythrocytopenia) is a pathologic condition in which the blood has a lower than a normal number of red blood cells (RBS) or Hb, or a lowered ability of the RBCs to carry and supply the blood oxygen. Anemia is the most common blood disorder, affecting about one-third of the global population. This condition is more common in women than men, during pregnancy, and in children and elderly individuals. Anemia can be caused by bleeding (following trauma and gastrointestinal bleeding), decreased RBC production (following iron deficiency, vitamin B12 deficiency, thalassemia, and several neoplasms), and increased RBC breakdown (following sickle cell). This condition can also be classified based on the size of the RBC and the amount of Hb in each cell [1]. Factors affecting the Hb levels include age, sex, race, pregnancy, genetics, environment, and lifestyle. Thus, the causes of anemia can vary among different societies [2]. Anemia is typically diagnosed on a complete blood count. Apart from reporting the number of red blood cells and the hemoglobin level. A moderate degree of iron-deficiency anemia affected approximately 610 million people worldwide or 8.8% of the population. It is slightly more common in females (9.9%) than males (7.8%). Mild iron deficiency anemia affects another 375 million [3]. Severe anemia is prevalent globally, especially in sub-Saharan Africa [4] where it is associated with infections including malaria and invasive bacterial infections [5].

Based on the biological aspect, anemia is caused by an imbalance in the loss and production of RBC [6]. Possible causes of anemia include nutritional deficiencies, inflammation, genetic disorders, or excessive RBC loss (due to hemolysis or blood loss) [7]. Four indices of RBC, Hb, MCV, and RDW are routinely measured to detect the presence or absence of anemia [8]. Other biochemical analyses such as Hematocrit (MCH) and MCHC can also be obtained [9]. For adult men, the Hb < 14 gr/dl is a sign of anemia, and for adult women, it is < 12 gr/dl [10].

*Address correspondence to this author at the Trauma Research Center, Faculty of Medicine, Baqiyatallah University of Medical Sciences, Tehran, Iran; Tel: +98-9123405912; E-mail: dr_hg145@yahoo.co.uk

Morphologically, anemia is also defined based on the size of the RBC [11]. If the RBCs are < 80 μm, it is called microcytic anemia, 100 > RBC > 80 μm it is called normocytic anemia and RBC > 100 μm it is called macrocytic anemia [12].

Since anemia is associated with the increased mortality rate in women and children, fatal consequences at birth, decreased productivity in adults, and cognitive or behavioral developmental disorders in children, besides as children and women are severely affected by this disease, it is important to determine the rates of anemia and appropriate Hb levels for the population of Iran. Thus, we conducted this descriptive cross-sectional study with the aim of investigating the frequency, type, cause, mean age and sexual distribution in patients with severe unknown anemia referred to the Baqiyatallah Hospital in Tehran over six months.

2. MATERIALS AND METHODS

2.1. Study Design

In a descriptive cross-sectional study, the patients with severe anemia (Hb < 8 gr/dl) with an unknown cause of disease were admitted to the Baqiyatallah Hospital (Tehran, Iran) over six months. Then, additional biochemical tests were conducted to determine the type and frequency of anemia.

2.2. Inclusion Criteria

Whole referred patients with severe anemia (Hb < 8 gr/dl) with a primary unknown cause were included in the present study. Various age groups of males and females were included.

2.3. Exclusion Criteria

All dissatisfied patients participated in the study, and patients with known anemia following diagnostic laboratory analysis or the patients with treated anemia were excluded from the study.

2.4. Data Collection

To collect data, a predesigned checklist was used with various items including patient demographic information (age and sex) and Hb levels.

2.5. Statistical Data Analysis

SPSS statistical software (v. 18) was used for data analysis. Numerical data were shown as mean ± standard deviation and qualitative data as frequency and percentage and variables were compared using relevant tests. In all tests, $p < 0.05$ was considered statistically significant.

3. RESULTS

3.1. Frequency of Normocytic Anemia

Following the assessment of types of normocytic anemia, respectively the highest frequencies were detected in chronic disease anemia (47.5%), gastrointestinal bleeding-associated anemia (29%), bleeding malignancies anemia (21.5%), and aplastic anemia (2%). There were significant differences ($p<0.05$) in the frequency of different types of normocytic anemia (Table **1**).

3.2. Prevalence of Microcytic Anemia

According to the findings of types of microcytic anemia, the highest frequency was found in iron

Table 1: Frequency, Percentage, and the Level of Significance in Different Individuals Referred to Baqiyatallah Hospital during a Period of 6 Months

Types of anemia	Subgroups	Frequency (n)	Percentage (%)	*p-value*
Normochromic normocytic anemia	Chronic disease anemia	57	47.5	P<0.05
	Gastrointestinal bleeding anemia	35	29	
	Bleeding malignances anemia	25	21.5	
	Aplastic anemia	3	2	
Normochromic microcytic anemia	Iron deficiency anemia	35	50	
	Thalassemia associated iron deficiency	27	38	
	Sickle cell anemia	8	12	
Macrocytic anemia	Folate deficiency	14	46	
	Hypothyroidism anemia	10	34	
	B12 deficiency	6	20	

Table 2:   Mean Hb Levels in Different Groups of Severe Anemia

Types of anemia	Mean Hb (mg/dl)	p-value
Folate and B12 deficiencies	7.8	0.002
Hypothyroidism anemia	7.7	
Hemolytic anemia	6.9	
Bleeding malignancies anemia	6.3	
Apelastic anemia	6.3	
Gastrointestinal bleeding anemia	6.3	
Chronic disease anemia	6.1	
Thalassemia associated iron deficiency	6.1	
Iron deficiency anemia	5.8	
Sickle cell anemia	5.8	

deficiency anemia, thalassemia-associated iron deficiency, and sickle cell anemia, respectively. Also, there was a significant (p<0.05) difference in the frequency of microcytic anemia (Table **1**).

3.3. Prevalence of Macrocytic and Megaloblastic Anemia

As the results showed, the highest frequency was detected in folate deficiency anemia (46%), hypothyroidism anemia (34%), and B12 deficiency anemia (20%), respectively. Also, significant differences (p<0.05) were found among the types of macrocytic anemias (Table **1**).

3.4. Prevalence of Hemolytic Anemia

In the study population of 230 patients with severe anemia, 10 patients (4.3% of the population) represented hemolytic anemia.

3.5. Mean Level of Hb in Patients with Severe Anemia

The lowest and highest Hb levels of individuals were found at 3.9 and 7.9 mg/dL. The lowest mean Hb level was detected at 5.8 mg/dl (in iron deficiency anemia and sickle cell anemia) and the highest mean Hb level was found at 7.8 (related to folate and B12 deficiency anemia). Besides, the mean Hb level in a total population of patients with severe anemia was 6.24±0.9 mg/dL. A significant difference (p<0.05) was found among macrocytic-associated anemia for folate and B12 deficiency in comparison with sickle cell, thalassemia, iron deficiency, gastrointestinal bleeding, and chronic disease anemias (Table **2**).

3.6. Mean Age of Patients with Severe Anemia

The lowest and highest age of patients 18 and 92 years and the total mean age of patients was

Table 3:   Mean Age of Patients with Severe Anemia

Types of anemia	Mean age (year)	p-value
Hemolytic anemia	64.3	0.000
Bleeding malignancies anemia	63.7	
Apelastic anemia	61.3	
Hypothyroidism anemia	61.2	
Gastrointestinal bleeding anemia	57.3	
Chronic disease anemia	57	
Folate and B12 deficiencies	53.8	
Iron deficiency anemia	51.9	
Sickle cell anemia	39	
Thalassemia associated with iron deficiency	31.1	

54.56±15.6 years. The lowest mean age was 31.1 years for thalassemia anemia with iron deficiency and the highest mean age was 64.3 years for hemolytic anemia. From the point of view of age, hemolytic anemia represented a significant difference ($p < 0.05$) in comparison with sickle cell anemia (95%). Also, sickle cell anemia showed a significant difference ($p < 0.05$) between thalacemia-associated anemia (95%) and malignancy-related anemia (95%) (Table **3**).

3.7. Sexual Distribution of Patients with Severe Anemia

No significant ($p > 0.05$) differences were found in patients with severe anemia according to the genders (Figure **1**).
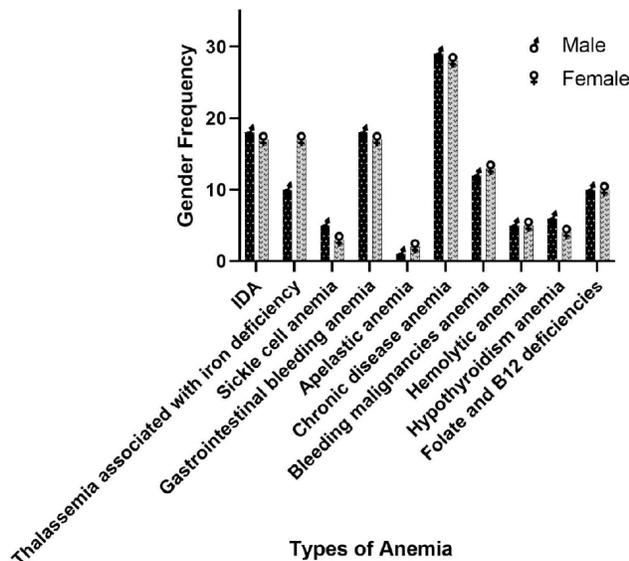
Figure 1: Gender frequencies in various types of anemia in patients reffered to the Baqiyatallah hospital.

4. DISCUSSION

Anemia is a condition in which the Hb concentration or RBC count is less than the normal level. This pathologic condition affects approximately one-third of the world's population [13]. Anemia is associated with the increased mortality rate in women and children, devastating consequences at birth, decreased productivity in adults, and cognitive and behavioral developmental disorders in children. Various factors such as age, sex, race, pregnancy, genetics, and environment can affect Hb levels. Possible causes of anemia are nutritional deficiencies, inflammation, genetic disorders of Hb, or excessive RBC loss following hemolysis. This study was designed to determine the frequency, type, and cause of anemia in 320 patients with severe unknown anemia (Hb < 8

mg/dl) referred to the Baqiyatallah Hospital (Tehran, Iran) over six months.

Seydagmet Akin assessed the prevalence of anemia in Turkish patients with severe anemia (Hb < 7 mg/dl). 112 patients participated in this study and various types of anemia were evaluated in this study. Finally, the most common type of anemia was reported as IDA anemia. But in our study represent the prevalence in the Iranian population, the highest prevalence was related to chronic disease anemia. In 2014, Lawrence Tim Goodnough evaluated the prevalence of anemia in people with Hb < 9 mg/dl in the United States. In this study, 232 patients participated and IDA was reported as the most common type of anemia among the patients. Also, the anemia associated with chronic diseases, hemolytic diseases, and blood malignancies in the next level. Besides, in our study, the highest prevalence of anemia was reported as chronic disease-associated anemia. Mahmoudi *et al*. evaluated the frequency of IDA in 866 Iranian pregnant women in 2014. The prevalence of anemia was detected at 4.13% and the rate of anemia was higher considerably in pregnant women in urban areas than in rural regions. The results of regression analysis showed that the maternal age, fertility number, pre-pregnancy care, unwanted pregnancy, iron pill consumption, tea consumption, and mother's education level had a significant effect on anemia. In our study, the causes of anemia were not studied, but in terms of the similar prevalence of this study, iron deficiency anemia was the most common. In 2017, an important study conducted by Min Li *et al*., entitled "Prevalence of anemia among Chinese rural residents anemia prevalence" (Beijing, China) showed that the prevalence of anemia in individuals < 11 years was 5.5%; 17 years was 8.1%, 18-44 years was 10%, 45-59 years was 9.6% and people > 60 years was 12.6%. According to the findings, the prevalence of anemia showed incremental trend compared to the last decade. In our study, anemia also has a significant relationship with age [14]. A 2017 study by Bison Karaka Sidam on the prevalence of anemia and its associated factors in women of reproductive age in the Turkish city of Izmir at Ege Hospital found that the prevalence in women of reproductive age Anemia was 27.8%, of which 56% had iron deficiency, 37% had iron deficiency anemia and 6.7% had severe anemia. In our study, iron deficiency anemia is also the most common [15]. Ashfikour *et al*. (2021) conducted a comprehensive study on the prevalence of anemia in the women population of reproductive age in

Bangladesh, Maldives, and Nepal. They concluded that the highest prevalence of anemia was associated with iron deficiency; 41% in Bangladesh, 58% in the Maldives, and 40% in Nepal. The prevalence of moderate to severe levels of anemia was higher in uneducated women and pregnant women. In our study, in people with severe anemia, the most common type of anemia was also iron deficiency anemia [16]. Carvalho Malta and coworkers evaluated the anemia prevalence in the adult Brazilian population in 2020. They found that 9.9% of Brazilian adults suffer from anemia. This condition was found at a higher rate in elderly women with low education, black, and residents of the northern and northeastern regions. Also, they found that normocytic normochromic anemia was the most common type of anemia at 56.0% of total population. Goodnough *et al*. assessed the frequency of anemia in patients with Hb < 9 mg/dl in the United States (2014). In their study, 232 patients were participated and following biochemical analysis and they found that the IDA, chronic diseases-associated anemia, hemolytic-associated anemia diseases and malignancy-associated anemia were the most common types of anemia respecicely.

5. CONCLUSIONS

According to the results of this study, the highest frequency of anemia in patients referred to the Baqiyatallah hospital was chronic diseases-associated anemia, and gastrointestinal bleeding-associated anemia, respectively. Thus, emergency medicine specialists and physicians present in this ward are recommended to make the best decision for therapeutic intervention by considering the prevalence of anemia in Iranian patients referred to the hospital.

ETHICAL CONSIDERATIONS

Admission of all patients was conducted based on personal consent and all individuals were allowed to leave the investigation at personal discretion. All interventions were supervised by the Ethics Committee of Baqiyatallah University of Medical Sciences (Ethic code: IR.BMSU.REC.1397.011).

CONFLICTS OF INTEREST

There are no conflicts of interest.

FINANCIAL SUPPORT

No financial support was received from any person or institution for the study.

RESEARCH ETHICS AND CONSENT

Participants were informed about the study and their consent was obtained. The research was carried out by the rules and ethical codes specified in the Declaration of Helsinki.

REFERENCES

[1]   Machado ÍE, Malta DC, Bacal NS, Rosenfeld LGM. Prevalence of anemia in Brazilian adults and elderly. Rev Bras Epidemiol 2019; (Suppl 02): E190008.SUPL.2.

[2]   Veng-Pedersen P, Chapel S, Schmidt RL, Al-Huniti NH, Cook RT, Widness JA. An integrated pharmacodynamic analysis of erythropoietin, reticulocyte, and hemoglobin responses in acute anemia. Pharm Res 2002; 19(11): 1630-5.
https://doi.org/10.1023/A:1020797110836

[3]   Vos T, Flaxman AD, Naghavi M, *et al*. Years lived with disability (YLDs) for 1160 sequelae of 289 diseases and injuries 1990-2010: a systematic analysis for the Global Burden of Disease Study 2010. Lancet 2012; 380(9859): 2163-96.
https://doi.org/10.1016/S0140-6736(12)61729-2

[4]   van Hensbroek MB, Jonker F, Bates I. Severe acquired anaemia in Africa: new concepts. Br J Haematol 2011; 154(6): 690-5.
https://doi.org/10.1111/j.1365-2141.2011.08761.x

[5]   Abuga KM, Muriuki JM, Williams TN, Atkinson SH. How Severe Anaemia Might Influence the Risk of Invasive Bacterial Infections in African Children. Int J Mol Sci 2020; 21(18): 6976.
https://doi.org/10.3390/ijms21186976

[6]   Servilla KS, Singh AK, Hunt WC, *et al*. Anemia management and association of race with mortality and hospitalization in a large not-for-profit dialysis organization. Am J Kidney Dis 2009; 54(3): 498-510.
https://doi.org/10.1053/j.ajkd.2009.05.007

[7]   Adebisi OY, Strayhorn G. Anemia in pregnancy and race in the United States: blacks at risk. Fam Med 2005; 37(9): 655-62.

[8]   Dhar R, Zazulia AR, Videen TO, Zipfel GJ, Derdeyn CP, Diringer MN. Red blood cell transfusion increases cerebral oxygen delivery in anemic patients with subarachnoid hemorrhage. Stroke 2009; 40(9): 3039-44.
https://doi.org/10.1161/STROKEAHA.109.556159

[9]   Jahangiri M, Rahim F, Malehi AS, *et al*. Differential diagnosis of microcytic anemia, thalassemia or iron deficiency anemia: a diagnostic test accuracy meta-analysis. Modern Medical Laboratory Journal 2020; 3(1): 16-29.
https://doi.org/10.30699/mmlj17.3.1.16

[10]   Mozaffari-Khosravi H, Noori-Shadkam M, Fatehi F, Naghiaee Y. Once weekly low-dose iron supplementation effectively improved iron status in adolescent girls. Biol Trace Elem Res 2010; 135(1-3): 22-30.
https://doi.org/10.1007/s12011-009-8480-0

[11]   Krishnasivam D, Trentino KM, Burrows S, Farmer SL, Picardo S, Leahy MF, Halder A, Chamberlain J, Swain S, Muthucumarana K, Waterer G. Anemia in hospitalized patients: an overlooked risk in medical care. Transfusion 2018; 58(11): 2522-2528.
https://doi.org/10.1111/trf.14877

[12]   Babushok DV, Li Y, Roth JJ, *et al*. Common polymorphic deletion of glutathione S-transferase theta predisposes to acquired aplastic anemia: Independent cohort and meta-analysis of 609 patients. Am J Hematol 2013; 88(10): 862-7.
https://doi.org/10.1002/ajh.23521

[13]　Guralnik JM, Eisenstaedt RS, Ferrucci L, Klein HG, Woodman RC. Prevalence of anemia in persons 65 years and older in the United States: evidence for a high rate of unexplained anemia. Blood 2004; 104(8): 2263-8.
https://doi.org/10.1182/blood-2004-05-1812

[14]　Li M, Hu Y, Mao D, Wang R, Chen J, Li W, Yang X, Piao J, Yang L. Prevalence of Anemia among Chinese Rural Residents. Nutrients 2017; 9(3): 192.
https://doi.org/10.3390/nu9030192

[15]　Saydam BK, Genc RE, Sarac F, Turfan EC. Prevalence of anemia and related factors among women in Turkey. Pak J Med Sci 2017; 33(2): 433-438.
https://doi.org/10.12669/pjms.332.11771

[16]　Rahman MA, Rahman MS, Aziz Rahman M, Szymlek-Gay EA, Uddin R, Islam SMS. Prevalence of and factors associated with anaemia in women of reproductive age in Bangladesh, Maldives and Nepal: Evidence from nationally-representative survey data. PLoS One 2021; 16(1): e0245335.
https://doi.org/10.1371/journal.pone.0245335