

Determination of the most common morphological patterns of anemia among Saudi anemic patients attending King Abdul-aziz Medical City-Riyadh

Abstract

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Background: Anemia is a medical condition in which the red blood cells (RBCs) count and hemoglobin (Hb) are less than the normal range. The main causes of anemia are a decrease in RBCs, their destruction and decrease of Hb synthesis. A useful method for diagnosis and classification of anemias is based on the morphological appearance of RBCs on an ideal stained blood smear. The main terms used in such classification are normocytic normochromic, microcytic hypochromic and macrocytic anemia. **Aim:** The aim of this study is to determine the most common morphological pattern of anemia in Saudi anemic patients who were admitted at King Abdul-aziz Medical City-Riyadh. **Materials and Methods:** Retrospectively we evaluated the results of complete blood count (CBC) and peripheral blood picture (PBP) of all anemic patients attending during the year 2013 (from 1st January to 31st December). **Results:** Participants in this study included 150 patients (13 infants, 27 children, 12 youths, 52 adults and 46 old). The gender distribution showed 70 males and 80 females. The results of CBC and PBP showed that 113 (75.3%), 36 (24%) and 1 (0.7%) of the patients had normocytic normochromic, microcytic hypochromic and macrocytic pattern of anemia respectively. **Conclusion:** The normocytic normochromic pattern of anemia is highly frequent among this sample of Saudi patients while the macrocytic pattern of anemia is the lowest. According to gender groups microcytic hypochromic pattern of anemia is more common among females; malnutrition, increase of blood loss due to pregnancy or menstruation, and lack of iron absorption are the main causes, while the normocytic normochromic is highly frequent among males, which are mainly due to blood loss or chronic diseases.

Key words: Anemia, hypochromic, macrocytic, microcytic, morphological patterns, normochromic, normocytic

INTRODUCTION

Anemia is a medical condition in which the hemoglobin (Hb) concentration and red blood cells (RBCs) count are lower than the normal range. The normal range of Hb and RBCs in general vary between males and females, it is defined as a Hb level of <13.5 g/dl and <12.0 g/dl in adult males and females respectively. The main causes of anemia are a decrease in RBCs, insufficient Hb synthesis or increased RBCs destruction, and the primary cause is an iron deficiency.^[1]

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Anemia is the most common health issue in the world, and it affects a large population in almost all countries. The most frequent etiologies of anemia are nutritional deficiencies, malaria, parasitic infections, blood loss, bone marrow replacement, or suppression and hemoglobinopathies.^[2,3] Arbitrarily, anemia may be classified as either moderate (7.0-10.0 g/dl) or severe (<7.0 g/dl).^[4] The signs and symptoms of anemia are generally nonspecific, such as fatigue and weakness; it is often associated with gastrointestinal symptoms such as nausea, constipation, or diarrhea.^[5,6]

Normocytic hypochromic red cells have the central area of polar occupying about a third of the cell diameter and show reduced staining, with an increase in the central area of the pallor.^[7] The morphological classification of anemia is based on morphological criteria of red cells in ideal thin blood film, and also on red cells indices, mean corpuscular volume (MCV), mean cell hemoglobin (MCH) and MCH concentration (MCHC).^[8]

This study is conducted to determine the most common morphological patterns of anemia among the Saudi anemic population, and this will give a good indication about the main cause of anemia among such patients, besides formulating a good protocol for diagnosis.

MATERIALS AND METHODS

Study area

The raw data of this study were collected from hematology laboratory in King Abdul-aziz Medical City (KAMC) at National Guard of Health Affairs hospital (NGHA) complex in Riyadh, Saudi Arabia.

Study subjects

Inclusion criteria

Anemic patients (both the sexes) of all age groups, attending KAMC, Riyadh between 1st January 2013 and 31st December 2013, were included in this study.

Exclusion criteria

Nonanemic patients were excluded.

Study design

This is a retrospective chart review study conducted to determine the morphological patterns of anemia among anemic patients at KAMC, Riyadh in the year 2013. This was compared with the international reference values.

Sample size

A total of 150 anemic patients were enrolled in this study.

Sampling technique

The results of complete blood count (CBC) and peripheral blood picture (PBP) were collected from the medical report center in NGHA hospital using patient's medical record number.

Data collection methods, instruments used, measurements

A computer printout of demographic data and discharge clinical events/outcomes collected from records department for all episodes of hospital discharges that are coded for diagnosis of anemia between January and December 2013.

Data analysis

Study variables were incorporated on the excel sheet. The excel data were uploaded into SPSS software version 20 (The International Business Machines Corporation, New York) to determine the morphological patterns of anemia and their frequencies. A backup soft copy version, as well as a hard copy print, was dated, saved and secured after each data entry update.

RESULTS

The results of CBC and PBP showed that 113 (75.3%), 36 (24%), and 1 (0.7%) of the patients had normocytic normochromic, microcytic hypochromic and macrocytic pattern of anemia respectively [Table 1 and Figure 1]. The gender wise classification of the patterns revealed that 62 (55%) of male patients had normocytic normochromic patterns, while 51 (45%) female patients and 7 (19%) males patients had microcytic hypochromic patterns while in females patients is 29 (81%) and one case of macrocytic pattern showed in males patients [Table 2].

The results of the mean of Hb, hematocrit and RBCs count in anemic patients were (8.6 g/dl), (26.4%) and (3.2×10^{12}) respectively, which were significantly lower than the means of the control group ($P < 0.05$) [Table 3].

RBCs indices MCV, MCH and MCHC in the patients with microcytic hypochromic PBP were significantly lower than the mean of the control group ($P < 0.05$) [Table 3].

DISCUSSION

The classification of anemia is based on three categories, including RBC morphology, pathogenicity of anemia and clinical presentation

Table 1: Frequency of morphological patterns of anemia among study participants

Morphological patterns of anemia	Frequency (%)
Normocytic normochromic	113 (75.3)
Microcytic hypochromic	36 (24.0)
Macrocytic anemia	1 (0.7)
Total	150 (100)

Table 2: The frequency of morphological patterns among study participants to gender groups

Morphological patterns of anemia	Gender		Total
	Male	Female	
Normocytic normochromic	62	51	113
Microcytic hypochromic	7	29	36
Macrocytic anemia	1	0	1
Total	70	80	150

Table 3: The minimum, maximum, mean, standard deviation, and normal range of hematological parameters of study participants

Variables	Minimum	Maximum	Mean	SD	Normal range
Hb g/dl	6.00	10.00	8.6	1.17393	Male: 13.5-17.5 g/dl Female: 12.0-15.5 g/dl
PCV percentage	17.00	32.00	26.4	3.58299	Male: 38.8-50.0% Female: 34.9-44.5%
RBCs count c/cumm	2.00	4.00	3.2	0.59907	Male: 4.32-5.72×10 ³ c/cumm Female: 3.90-5.03×10 ³ c/cumm

$P < 0.05$. RBCs = Red blood cells, PCV = Packed cell volume, SD = Standard deviation

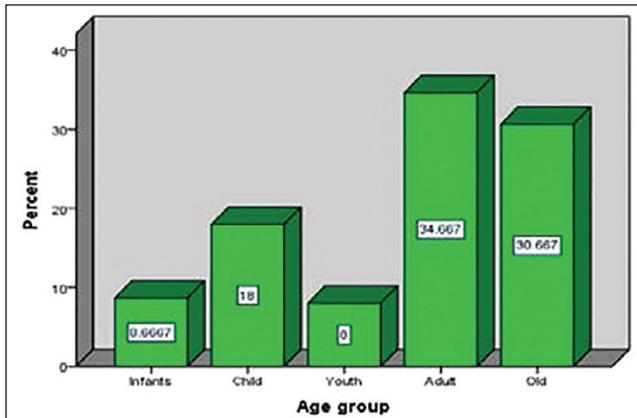


Figure 1: Distribution of age group among study participants

of anemia. These categories are very important in the classification and diagnosis of anemia.^[9]

In clinical practice, the morphological classification of anemia is based on red cell indices; MCV, MCH, and MCHC.^[9]

The age group distribution of participants was 13, 27, 12, 52, and 46 infants, children, youth, adult and old respectively. The study revealed that the mean of Hb, hematocrit and RBCs count in anemic patients were 8.6 g/dl, 26.4% and 3.2×10^{12} respectively, which was significantly lower. These findings are in agreement with those of El Kishawi *et al.*^[10] furthermore, the authors found conducted a research to assess the factors related to anemia and the determination of morphological patterns of anemia among children in association with malnutrition. Furthermore, the authors found significantly lower values of MCV, MCH, and MCHC RBCs indices in the study group of patients with microcytic hypochromic PBP were significantly lower.

The main causes of microcytic hypochromic anemia are shown to be iron deficiency anemia (IDA), thalassemia and anemia of chronic diseases.^[11] The main cause of microcytic hypochromic anemia is an iron deficiency. The confirmation or exclusion of IDA depends on estimation of the level of serum ferritin.^[11] In developed countries, IDA occurs more frequently in adult men and in postmenopausal women.^[12,13]

Our study showed that the normocytic normochromic pattern of anemia was more frequent than the macrocytic pattern. The gender wise classification of the patterns revealed a microcytic hypochromic

pattern of anemia was more common among females. Malnutrition, an increase of blood loss due to pregnancy or menstruation, and lack of iron absorption are the main causes. In male patients, the frequency of the normocytic normochromic pattern of anemia was high, which may be mainly due to blood loss or chronic diseases.^[14] In normocytic anemia, the important issue is to identify the main cause and to prescribe the right treatment. The etiologies of normocytic normochromic anemia are nutritional, renal diseases (e.g., renal failure) and increased red cell destruction.^[14] In macrocytic anemia, the main causes are a low level of Vitamin B12 and a low level of erythrocyte folate. The estimation of both patterns of anemia will guide the proper diagnosis of macrocytic anemia. The most common cause of folate deficiency is either nutritional or malabsorption of this vitamin. In contrast, the deficiency of Vitamin B12 is almost resulting from malabsorption.^[15,16] The normocytic normochromic pattern of anemia is highly frequent among a study sample of the Saudi population while the macrocytic pattern was the lowest. The gender wise classification showed, the microcytic hypochromic pattern of anemia is more common among females while the normocytic normochromic pattern was found to be highly prevalent among males.

RECOMMENDATIONS

1. In order to get more informative data about the types of anemia, iron profile, serum B12 and serum folate should be done as routine hospital diagnostic protocol, in order to obtain the causative factors of microcytic hypochromic, normocytic normochromic, and macrocytic patterns among Saudi populations.
2. Special care should be taken by primary health care provider to detect and prevent anemia, especially among children and women.

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Conflicts of interest

There are no conflicts of interest.

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