Anemia and Nutrition Inter Relation

Tadlaoui DA Tcha*

Hemobiology Unit, Central Biology Laboratory, Hammoud Hospital University Medical Center, Lebanon

*Corresponding Author: Tadlaoui DA Tcha, Hemobiology Unit, Central Biology Laboratory, Hammoud Hospital University Medical Center, Lebanon.

Abstract

Anemia is defined by decreased hemoglobin levels, depending on the patient's age and sex:

- 13 g/dL in humans,
- 12 g/dL in women
- 14 g/dL in newborns.

Hemoglobin is a protein containing iron, it is the main constituent of red blood cells, giving its red color to the blood. It fixes oxygen at the pulmonary level, transports it and delivers it to organisms cells to ensure their proper functioning.

Keywords: *Anemia; Nutrition; Hemoglobin*

Introduction

Anemia continues to be a major public health problem worldwide despite improved living conditions, classified by the World Health Organization (WHO) as one of the major problem. Our goal is to clarify the logical patio-profiles of anemia cases to introduce and classify them [1,2].

Reminders about the structure and properties of hemoglobin

The red blood cell (GR) or hematium or erythrocyte is an anucleated cell containing hemoglobin and several enzymes that protect hemoglobin and membrane proteins from any oxidative agent, its membrane is very flexible and gives GR all its elasticity and deformability.

The hemoglobin molecule was the first protein whose three-dimensional structure was elucidated and whose sequence was obtained in amino acids. The hemoglobin molecule is composed of 4 protein subunits, formed by the association of four identical polypeptide chains: two alpha chains (or alpha globins) each composed of 141 amino acids and two beta chains (or beta globins) of 146 amino acids. which each contain a nucleus (heme) in which is an iron atom that can ionize itself in its free form and fix an oxygen molecule. Oxygen attaches reversibly to the ferric part of the hemoglobin molecule.

The amount of oxygen molecules associated with heme is proportional to the concentration of these molecules in the blood and the partial pressure of oxygen. The affinity of hemoglobin for oxygen is expressed by P50, a partial oxygen pressure for which 50% of the hemoglobin is oxygenated, varying according to temperature, Ph, concentration in O_2. The body of an adult man contains 3 to 4g of iron, of which 2 to 3g in hemoglobin. Other iron-rich tissues are the liver and spleen. Iron reserves are built in a specialized cell, macrophage and

iron is stored using a ferritin protein. In blood plasma, there is little iron associated with another protein, transferrin.

Iron metabolism is essentially a continuous recycling of iron within the body. GRs have a lifespan of 120 days, their destruction is mainly in the spleen; the released iron is immediately recycled by macrophages. The source of iron needed for the synthesis of hemoglobin is the production of GR by the bone marrow. Iron loss is minimal, stirring at 1 to 2 mg/day, due to peeling of skin surfaces and mucous membranes, especially during menstruation. A food rich in meat or fish, will bring sufficient amounts of iron. On the other hand, an exclusively vegan food can lead to significant iron deficiencies and severe anaemia [3-5].

Diagnostic criteria for anemia

Anemia can be observed in all areas of medicine. The blood formula count (N.F.S) is one of the most prescribed biological tests, whether or not anemia is suspected. It is an examination of quantitatively and qualitatively studying the figurative elements of the blood: red blood cells, white blood cells and platelets.

This examination detects the presence of various pathologies or disorders, such as:

- Anemia
- Infection
- Inflammation
- A malfunction of the bone marrow, which ensures the production of blood cells.

Before confirming the diagnosis of anemia, False decreases in hemoglobin levels:

- Pregnancy in the 3rd trimester by hemodilution;
- Hypersplenism: Pre-analytical dilution (little blood sample is taken from the anticoagulant contained in the tube, non-compliance with the pre-analytical phase);
- Hypergammaglobulinemia.

The classic symptoms of anemia are characterized by fatigue, asthenia, stress dyspnoea, polypnoea and tachycardia (palpitations) pale skin and mucous membranes (skin-mucous pallor), headache, jaundice.

The history and questioning of the patient are very important to label his anemia: like knowing the eating habits (consumption of meat, vegetables. in women the number of pregnancies, breastfeeding whether it is insured or not.

The anemia so strong, it is therefore necessary to determine its etiology, to make the diagnosis and decide on a suitable treatment regimen. The discovery of anemia should lead to an accurate etiological assessment and guided by clinical and positive data. Anemias are the result of varied and complex pathophysiological causes and mechanisms that make certain diagnoses very difficult.

Once anemia is confirmed by low hemoglobin levels, the results of the NFS should be well interpreted and the 3 hematimetric constants analyzed: GVM - average blood volume; TCMH - Average corpuscular hemoglobin content and average hemoglobin corpuscular concentration - CCMH as well as reticulocyte levels that are highly informative on the regenerative, or not, aspect of anemia. Reticulocytes are the precursors of hematites, the last nucleus stage in the circulating blood.

Depending on the rate of reticulocytes, anemia is said to be: Regenerative if the rate is greater than 120 Giga/l and is regenerative if the value is less than 120 Giga/l.

Variation in VGM (80 - 100 fl) qualifies anemia as:

- Microcytic: If VGM less than 80 fl (femtoliter or3)

- Microcytic: If VGM exceeds 100 fl,

- Normocytic: If VGM between 80 - 100 fl.

TCMH: 27 - 32 pg (picogramme)

- Anemia is called normochromic if TCMH between 27 and 32 pg.

- Anemia is hypochromic: if TCMH less than 27 pg.

CCMH: 32 - 36%

- Anemia is normochromic if CCMH between 32 and 36%.

- Anemia is hypochromic if CCMH inferior eat 32%.

CCMH may be exceptionally higher than 36% in large burns or during hereditary micro spherocytosis, otherwise the measuring device drifts.

Some biological examinations are necessary to confirm the etiological diagnosis of anemia such as:

- The martial check-up (dose of ferritin, its deficit makes it possible to make the diagnosis of iron deficiency);

- Blood smear sometimes directs or diagnoses sickle (Appearance in favor of pinocytosis), in uremic hemolytic syndrome (HUS) red blood cells in the shape of Schistocytes are observed;

- Electrophoresis of hemoglobin, electrophoresis of membrane proteins;

- The inflammatory balance sheet to know if the anemia is inflammatory (sedimentation velocity, C-reactive protein or CRP, fibrinogen dosage, electrophoresis of serum proteins with the increase of 2 globulins);

- Hemolysis balance sheet (Bilirubin, Haptoglobin);

- Enzymatic disasters (such as plates of pyruvate kinase PK, and G6PDH-Glucose 6 Phosphate Dehydrogenase)

- Vitaminomations: Vitamin B 12, Folic Acid;

- Bone marrow punctures also where anemia is regenerator and associated with other cytopenias.
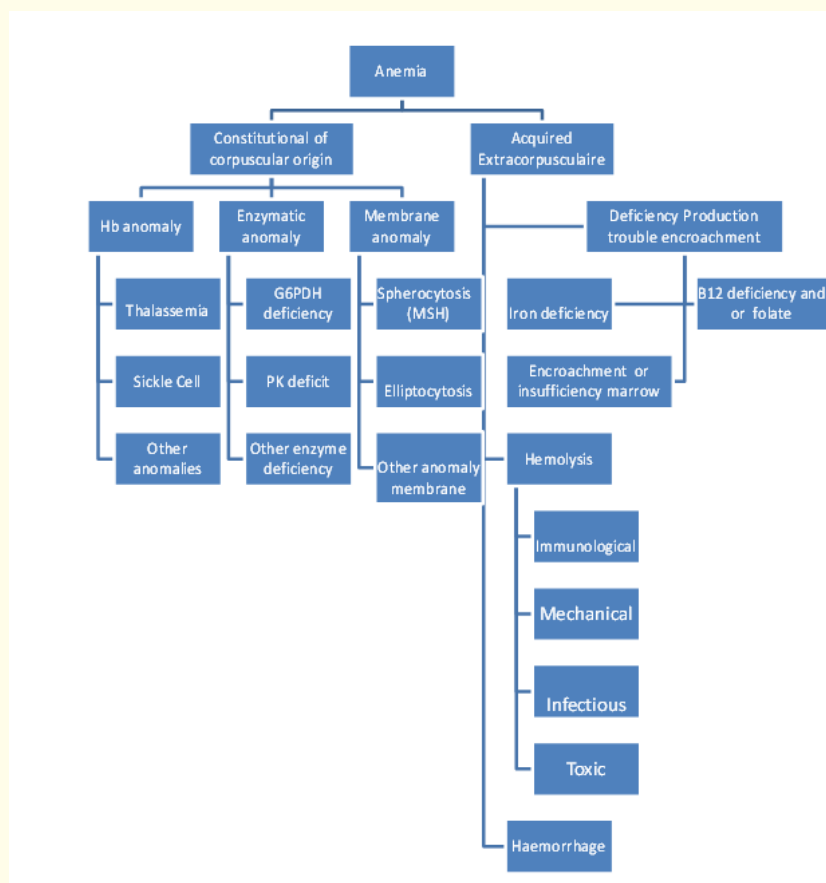
Etiologic classification of anemia

All clinical and symptomatic information acini that the results first of the NFS and then of the other biological tests will allow us to label and classify the confirmed anemia (Algorithms 1 and 2).

Anemia can be the result of three main mechanisms:

- Blood loss: Acute or chronic bleeding;

- Decrease or production disorder of GR is central anemia;

- Increased destruction of Gr by hemolysis (Algorithms 1 and 2).

Algorithm 1: *Etiological classification of anaemia.*

Algorithm 2: *Etiological classification of anaemia.*

Iron deficiency is the most common cause of anemia and then comes the other nutritional deficiencies (folic acid, vitamin B12) [1,3-6].

It has been ranked by the World Health Organization (WHO) as one of the ten most serious problems in the modern world and is the most widespread deficiency problem in the world [1,4,5,7]. It is estimated that, for the world as a whole, it reaches the figure of 2 billion people with a prevalence of 24.8%, of which 9 out of 10 live in developing countries [5,6,7]. The most exposed are infants, children in periods of intensive growth, elderly subjects and pregnant women [8-13].

In most developing countries, where it is responsible for half of all cases of anemia, the diet in most households provides only a food iron bioavailability of 15 - 25g Fe/kg/d.

In Africa and Asia, anemia is thought to be responsible for 3.7% to 12.8% of maternal deaths during pregnancy and childbirth. Microcytic hypochromic anemia comes out on top (56% of the anemias found) [8,12-16].

Conclusion

Anemia is defined by the decrease in hemoglobin levels below normal, depending on age and sex, it is very important to determine its etiology to quickly propose a therapeutic because sometimes the life prognosis is put into play. It all relies on oriented interrogation, clinical examination and a good interpretation of the hemogram according to chemometric constants and reticulocyte levels. Based on the data obtained, an etiological diagnosis can be easily labeled.

Anemia is associated with other hemogram abnormalities in different categories of leukocytes and platelets. Nutritional anemia by martial deficiency and vitamin B12 deficiency is the most common and requires immediate preventive action targeting elderly people, pregnant women and socially disadvantaged people.

Bibliography

1. De Benoist B., *et al*. "Worldwide Prevalence of anemia 1993-2005". World Health Organization, Database on Anemia. Genève, Organisation Mondiale de la Santé (2008).

2. N Richard., *et al*. "Anemia". Compass (2010): 83-96.

3. Braillard A., *et al*. "Hypovitaminosis B12, what's new?" *Revue Médicale Suisse* 8 (2012): 1805-1810.

4. WHO. "Haemoglobin concentrations for the diagnosis of anaemia and assessment of severity: Vitamin and Mineral Nutrition Information System". Geneva: World Health Organization (2011).

5. McLean E., *et al*. "Worldwide prevalence of anemia, WHO Vitamin and Mineral Nutrition Information System, 1993-2005". *Public Health Nutrition* 12.4 (2009): 444-454.

6. Beutler E and Waalen J. "The definition of anemia: what is the lower limit of normal of the blood hemoglobin concentration?" *Blood* 107.5 (2006): 1747-1750.

7. J Celi., *et al*. "Iron deficiency, inflammatory or mixed anemia: how to guide the diagnosis?" *Revue Médicale Suisse* 7 (2011): 2018-2023.

8. E Frangos., *et al*. "Anaemia of the elderly: a common pathology not to be trivialized". *Revue Médicale Suisse* 6 (2010): 2125-2129.

9. Kassebaum NJ., *et al*. "A systematic analysis of global anemia burden from 1990 to 2010". *Blood* 123.5 (2014): 615-624.

10. Ben Salem T., *et al*. "Etiological profile of iron deficiency anaemia in an internal medicine department: about 187 cases". *The Journal of Medecine Intern* 1 (2014): A93.

11. Fretham SJ., *et al*. "The role of iron in learning and memory". *Advances in Nutrition* 2.2 (2011): 112-121.

12. Diouf S., *et al*. "Prevalence and determinants of anemia in young children in French-speaking Africa. Role of iron deficiency". *Archives de Pédiatrie* 22.11 (2015): 1188-1197.

13. Pautas E., *et al*. "Anemia of the elderly subject Biotribune". Quarterly (2010).

14. Ben Salem T., *et al*. "Macrocytic anemia: etiological and evolutionary profile". *The Journal of Internal Medicine* 35.1 (2014): A93-A94.

15. Kechida M., *et al*. "Clinical, Biological and Etiological Spectre of megaloblastic anemia in an internal medicine ward". *The Journal of Medecine Intern* 37.2 (2016): A142.

16. Médaoud S., *et al*. "Clinical-biological profiles and etiologies of megaloblastic anaemia". *The Journal of Medecine Intern* 30.2 (2009): S109.

Volume 15 Issue 3 March 2020