

## Anemia: its Prevalence, Causes, and Management

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### ABSTRACT

**Background:** Nutritional anemia or anemia due to dietary causes is the most common form, yet the easiest to manage compared to other forms of anemia. Some of the most common nutritional deficiencies are iron, cobalamin, folate, and also other elements like copper. Anemia due to diet is mostly asymptomatic in the initial phase until the stores are depleted, which can take a few months to several years, depending upon the cause.

**Methodology:** We conducted this review using a comprehensive search of MEDLINE, PubMed, and EMBASE from January 1987 to March 2017. The following search terms were used: nutritional anemia, dietary anemia, iron deficiency anemia, cobalamin deficiency, folic acid deficiency anemia, dietary anemia treatment

**Aim of the work:** In this study we aimed to understand about the different types of anemia caused as a result of dietary deficiency. We will also briefly study about their presentation, pathophysiology, and treatment.

**Conclusion:** Various causes, presentations, and complications are associated with different types of nutritional anemia, but they still are the easiest to treat and manage. Most cases are due to an underlying occult disorder rather than simple dietary insufficiency, making diagnosis more difficult in some cases, and requiring thorough history and investigations integration to reach an accurate diagnosis and treat the underlying cause.

**Keywords:** dietary anemia, iron deficiency anemia, cobalamin deficiency, folic acid deficiency anemia, dietary anemia treatment, nutritional anemia.

### INTRODUCTION

Anemia is defined by WHO by a hemoglobin level that is less than 13 g/dL in male adults, and less than 12 g/dL in female adults. This definition is the most commonly used one in both clinical and research settings. Anemia will lead to decreased capacity of RBCs to carry oxygen, eventually causing significant morbidities and mortalities. Anemia presents initially with non-specific symptoms like fatigue, weakness, or even impaired cognitive functions. Elderly with anemia are at a higher risk of hospitalization with higher mortality rates. Anemia can be present in up to 17% of congestive heart failure cases worsening capacity and survival significantly. In children anemia has been shown to cause a decline in psychomotor and cognitive development. Moreover, the risks of preterm labor, low birth weight, and maternal mortality, were all found to significantly increase with the presence of iron deficiency<sup>[1]</sup>. To summarize, children, young women, pregnant women, and elderly have the highest risk of morbidity and mortality associated with anemia. Other important factors include racial and ethnic disparities; African Americans have a 3-fold increase in the prevalence of anemia when compared to whites. The most important cause of anemia is iron deficiency.

However, chronic diseases and other causes that lead to decreased RBCs count, have been dramatically increasing lately<sup>[2]</sup>.

### METHODOLOGY

#### • Data Sources and search terms

We conducted this review using a comprehensive search of MEDLINE, PubMed and EMBASE from January 1987 to March 2017. The following search terms were used: nutritional anemia, dietary anemia, iron deficiency anemia, cobalamin deficiency, folic acid deficiency anemia, dietary anemia treatment.

**The study was done after approval of ethical board of King Abdulaziz university.**

#### • Data extraction

Two reviewers have independently reviewed the studies, abstracted data and disagreements were resolved by consensus. Studies were evaluated for quality and a review protocol was followed throughout.

### Prevalence

The most prevalent health concern worldwide is anemia, with varying prevalence between different

geographical areas. Anemia definition and the general health status are also significant factors that affect the prevalence of anemia in a certain area. In fact, anemia can be found among up to 27% of adolescents who live in a developing country, and 6% of adolescents who live in a developed country. Most of these cases are due to the deficiency of iron, which plays a crucial role in the functions of several organs. Many causes exacerbate the development of iron deficiency, and these include change in hormones, rapid growth, menarche in girls, and malnutrition. Adolescents with iron deficiency anemia can suffer from severe cognitive impairment if not treated well <sup>[3]</sup>.

On the other hand, megaloblastic anemia in children is mainly caused by cobalamin or folic acid deficiencies. Folic acid is naturally found in fruits and vegetables. However, cobalamin is only present in animal products. Further than anemia, cobalamin deficiency is also associated with neurological, and psychiatric manifestations that can lead to impaired cognitive behavior with learning difficulties that will eventually affect school performance. Different societies have varying rates of cobalamin and folic acid deficiencies, and this is directly associated with eating habits within each community along with economic status <sup>[4]</sup>.

Anemia prevalence is different among adults and can reach 23.9% among men and 24.7% among women. A previous study reported that up to 11% of men and 10.2% of women older than 65 years, have WHO-defined anemia. Most of these cases were mild, and only 1% of patients had a severe anemia with hemoglobin levels lower than 10 g/dL <sup>[5]</sup>.

### Causes

Anemia is usually subdivided according to its pathophysiology into: insufficient production, or bleeding/hemolysis causing loss of RBCs. Therefore, the main two types of anemia are hyporegenerative and regenerative. In hyporegenerative anemia, there is impaired bone marrow functions that cause decreased production of precursor cells. This can occur due to abnormal infiltration of bone marrow or malnutrition. On the other hand, regenerative anemia involves proper response of bone marrow to the decrease of RBCs by a compensatory increase in production <sup>[6]</sup>.

### Hypo-regenerative

As mentioned above, hyporegenerative anemia occurs when there are abnormalities with progenitor cells of the bone marrow. When pluripotent cells are involved, the result is usually anemia, leukopenia, and

thrombocytopenia (this is known as pancytopenia). Causes of pancytopenia range from aplasia of bone marrow tissue, leukemias, myelodysplastic syndrome (MDS), and myelofibrosis (all are considered intrinsic causes) to Gaucher disease, metastasis, TB, histoplasmosis, and other causes (considered extrinsic causes). All these possible etiologies will eventually lead to the impairment of proper hematopoietic process <sup>[7]</sup>. In fewer cases, only progenitor cells of erythrocytes are affected, causing what is known as pure red cell aplasia. However, red cell aplasia is a relatively rare cause. On the other hand, patients with dyserythropoiesis have relatively high erythroblasts in their bone marrows, causing abnormal erythropoiesis that causes defects in both function and mortality of RBCs. Both dyserythropoiesis and red cell aplasia, can occur due to hereditary or acquired causes. The most common cause of acquired pure red cell aplasia is an occult thymoma. Malnutrition that is significant enough will cause symptomatic anemia due to reduced RBCs production. These cases are much more prevalent than primary bone marrow dysfunction <sup>[8]</sup>.

### Regenerative anemia

Regenerative anemias, on contrast, are a result of declining hemoglobin levels that will result in compensatory production by the bone marrow causing a classical elevation in reticulocytes. Levels of hemoglobin can decline following bleeding or hemolysis. Bleeding that lead to anemia can either be acute (with obvious symptoms) or chronic (in small quantities). Chronic bleeding can cause a gradual unnoticed decline in MCV and hematocrit. As time passes, anemia due to chronic bleeding can turn into a hypo-regenerative anemia due to depletion of nutrients (most importantly iron). Hemolysis is also a significant cause of anemia and can be either acute or chronic. Hemolysis can also be classified as intravascular (usually acute) or extravascular (usually chronic). Acute hemolysis manifests with clear signs and symptoms that can be further confirmed by decreased plasma haptoglobin and hemoglobinuria <sup>[7; 9]</sup>.

### Management

Complete blood counts, ESR, iron, ferritin, and transferrin, can be enough to make a provisional diagnosis. Results of these tests will guide further management that may include the tests: erythrocyte folate and vitamin B12 if macrocytosis is present, acute phase reactants if anemia of chronic disease is suspected, and LDH, antiglobulin, and haptoglobin

when hemolysis is likely present. After confirming the diagnosis, proper management should be performed to correct the underlying cause and the anemia itself <sup>[6]</sup>.

Treatment for nutritional deficiency anemia

Normal blood counts can normally be achieved following a regimen of oral iron for eight weeks. However, it is recommended to keep patients on treatment for several months later, as this will replenish body stores of iron, and will lead to a significantly decrease in recurrence rates. Intravenous iron is preserved for severe cases or cases with continuous blood loss, noncompliance, or malabsorption. It is also essential to correct the underlying cause of iron deficiency <sup>[10]</sup>.

When it comes to cobalamin deficiency treatment, eight weeks are usually enough for anemia to resolve. However, it is essential to periodically administer vitamin B12 injections to prevent recurrence especially in cases of malabsorption. Irreversible cases will require lifelong therapy. Oral vitamin B12 is not associated with good outcomes due to low bioavailability <sup>[11]</sup>.

When folic acid deficiency is confirmed, treatment will mainly depend on oral supplementation which has a relatively high bioavailability. It is also essential to consider alcoholism and malabsorption as possible etiologies, as nutritional folic acid deficiency is very rare. When oral folic supplementation fails, raise the doses or give folic acid injections. Before administering folic acid by any route, cobalamin deficiency must be ruled out. Otherwise, severe exacerbation of neurological manifestation may occur <sup>[12]</sup>.

### Blood Transfusion

In chronic anemia due to iron deficiency, blood transfusion can be considered. Other cases where we can consider transfusing blood include hemodynamic instability with active hemorrhage, critical anemia with hemoglobin levels less than 7 g/dL, cardiac manifestations, and/or failure of all other approaches to correct anemia. Blood transfusion provides only a temporary treatment of the case, and should be later fortified with regimens that treat and correct the underlying cause. Intravenous iron is usually prescribed with blood transfusion to maintain hemoglobin levels and to decrease the risk of another transfusion <sup>[13]</sup>.

### CONCLUSION

To sum up, anemia is highly prevalent and is associated with several morbidities and mortalities. Moreover, it causes worse quality of life and increased costs of health care. The most important cause of anemia is iron deficiency that usually presents with fatigue, weakness, and/or cognitive dysfunction. Immediately after diagnosis, iron levels should be corrected using proper treatment.

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