

Nutritional Anemia in Geriatric Population

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ABSTRACT

Anemia is a rapidly growing cause of concern among the aged population (age older than 65 years) in the world today. It is often multifactorial and remains underdiagnosed, especially in case of nutritional anemia because of its ability to stay insidious for a long period. Furthermore, it has been predicted that the population of the elderly is continually increasing due to the advancements in medical technology and healthcare system, better access to medical facilities and due to enhanced awareness to live a healthy lifestyle. All these factors contribute to increased longevity in the elderly. This is also one of the reasons for increased burden on the healthcare system, as this segment of population is the most vulnerable for developing serious medical conditions such as anemia. Anemia is natural consequence of the process of aging and poses high risk of developing diseases in the older people along with decline in physical performance, increased morbidity and poor quality of life. This article aims at providing useful insights into various factors responsible for developing nutritional anemia. It also aims to provide understanding of relationship between aging and anemia, and summarizes recent management options available for nutritional anemia in the aged population.

Keywords: Aged population, Anemia, Hematological changes, Malnutrition, Nutritional deficiency.

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INTRODUCTION

Anemia in the elderly population constitutes one of the major global health-related issues, with increased prevalence in older men than in women.¹ The definition of anemia strictly is related to decrease in the production of red blood cells (RBCs). However, definition of anemia as per the criteria of the World Health Organization (WHO) in 1968 is, "a condition in which the hemoglobin (Hb) concentration in men is <130 g/L, and <120 g/L in women."² Generally, it has been noted that the levels of hemoglobin are comparatively lower in case of the elderly than the younger people. The reasons for the same are not clearly understood, however, it is estimated to be a part of normal aging process.³ It impacts the patient's quality of life by interfering in the functional as well as cognitive functions. It can aggravate severity of illness in elderly patients who suffer from any disease especially, chronic kidney disease, and chronic heart failure. It also increases the risk of cerebrovascular disorders and may even cause death.^{4,5} Thus, anemia should be deemed as a fatal consequence in the process of aging and should be considered of paramount importance in geriatric practice (Fig. 1).

PREVALENCE OF ANEMIA

The elderly population are at a higher risk of anemia. As per the 3rd US National Health and Nutrition Examination Survey (NHANES-III), it was reported that approximately 11.0% of men and 10.2% of women of age greater than 65 years fulfilled WHO's standards of criteria of anemia (Hb concentration of <130 g/L and <120 g/L in men and women respectively). In India, the prevalence of anemia is quite high. It ranges between 25% and 70%, whereas, in the US it ranges between 15% and 26%.^{1,6,7} The disparity in the prevalence in both the countries is suggestive of huge gaps in the healthcare system, and differences in the accessibility of resources for the elderly. Furthermore, it also underpins the fact that "anemia in the elderly" raises a substantial concern for public health and should be managed adequately to improve clinical prognosis or outcomes and to reduce healthcare burden.

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Factors Responsible for Anemia in the Elderly

There are numerous factors which can lead to anemic condition in the aged population.

- Nutritional anemia: it is the most common type of anemia in the aged population. The term "nutritional anemia", refers to anemia



Fig. 1: Nutritional anemia in geriatric patient

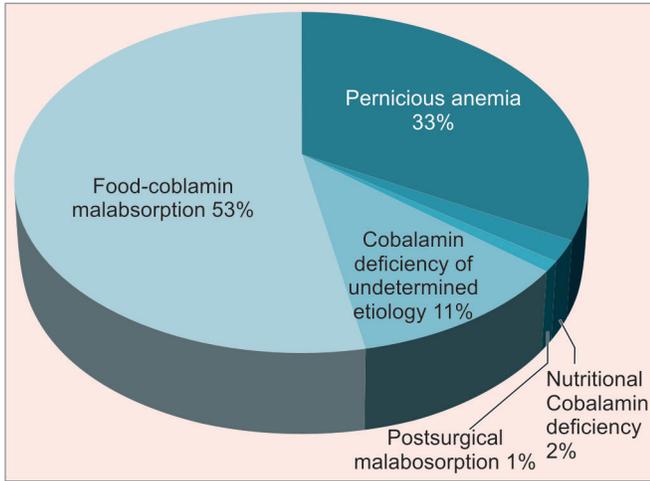


Fig. 2: Etiologies of cobalamin deficiency

caused due to lack of adequate nutrition in the body. Deficiency of various vitamins and minerals like iron, folic acid and vitamin B12 can also lead to bleeding in the peptic ulcers, GI bleeding, etc. Anemia can also occur as a result of certain drug therapy, such as anticoagulation therapy.^{8,9}

- Unexplained anemia of the elderly: this is often termed as idiopathic anemia as the underlying cause for the same cannot be explained.¹⁰ It can be attributed to identifiable comorbid conditions in the elderly in case of chronic kidney disease, myelodysplasia, chronic inflammatory disease, hypertension and diabetes. It can also occur due to age-related physiological changes which cause decrease in the production and decrease in their life span of RBCs.^{11,12} These physiological changes may include: (1) erythropoietin insufficiency, which is a result of decrease GFR (glomerular filtration rate) due to aging. (2) Cytokine inhibition of erythropoiesis with an advancing of age certain proinflammatory cytokines, specifically IL-6 is found to be elevated in the serum. This also is one of the features present in individuals with cancers and atherosclerosis. (3) Reduction in production of hormones like androgen with advancement in the process of aging (both in men as well as women) causes reduction in erythropoiesis. Reduction of the hormone testosterone is often related with prostate cancer therapy which leads to decreased erythropoiesis and results in a drop of 1 g/dL. (4) Bone marrow cells in the human body undergo rigorous mitotic activity throughout life. This way it maintains the continuity in the supply or replenishment of the RBCs. However, as the age progresses, the capacity of hematopoietic progenitor cells or the hematological stem cells to carry out mitosis is reduced due to various factors. Some of these factors include: genetic modifications such as mutation in the mitochondrial DNA, absence of nuclear chromosomes, shortening of telomere, etc. Other factors responsible are reduced cellularity of the marrow, changes in the marrow microenvironment, and alteration in the levels of cytokine or chemokine.¹³⁻¹⁵
- Anemia occurring due to certain diseases—chronic inflammatory diseases such as irritable bowel syndrome (IBS), autoimmune diseases, etc.¹⁶⁻¹⁸

ETIOLOGY OF NUTRITIONAL ANEMIA

Anemia due to nutritional deficiency refers to the type of anemia occurring due to lack of adequate nutrition required for the formation of RBCs in the body. These nutrients are namely, iron, vitamin B9 (folate), B12 (cobalamin), vitamin C, vitamin B2 (riboflavin), vitamin B3 (in pellagra), vitamin B6 (pyridoxine); selenium, zinc, and copper; and protein.¹⁹ It is caused as a result of poor dietary intake and malnutrition, or as a result of an underlying chronic condition such as celiac disease which is responsible for malabsorption of the nutrients in the body. Furthermore, the elderly people are more prone to nutritional anemia because they often have associated comorbid factors and hence are under variety of medications accounting for maximum number of cases of anemia in older population. For instance, anemia is a common side-effect of use of several drugs like, methotrexate, cotrimoxazole, sulfasalazine, and certain anticonvulsants, used in the treatment of various psychological disorders. Increase in the intake of alcohol is also an important factor to consider in case of anemia as it causes deficiency of folic acid in the body. In patients who have underlying disease, such as Biemer's disease (which is also known as pernicious anemia) anemia is caused due to the body's inability to produce intrinsic factor or IF in the stomach, as it is responsible for absorption of vitamin B12. Deficiency of vitamin B12 is also caused by food-cobalamin malabsorption (FCM), in nearly 60–70% of anemic cases in the elderly population (Fig. 2).^{20,21}

CLINICAL PRESENTATION OF ANEMIA IN THE ELDERLY

Presence of nutritional anemia is usually masked in the early stages. Thus, it is often missed by clinicians and left undiagnosed. In the later or severe cases, it may exhibit as exacerbation of certain chronic diseases such as angina, leg edema, or as cognitive dysfunction, dyspepsia, vomiting, ataxia, jaundice, optic atrophy, fecal incontinence, dementia, stroke, thromboembolic disease, urinary infections, etc. Other signs and symptoms include: fatigue, dizziness, weakness, frequent headaches, palpitations, tinnitus, presyncope, dyspnea, pallor, and apathy or depression.^{19,22}

NUTRITIONAL ANEMIA AND HEMATOLOGICAL CHANGES

In geriatric population, anemia is usually "normocytic" in nature, which means there is a reduction of RBCs but they are of a normal size. On the other hand, a nutritional deficient anemia, most significantly with iron deficiency presents itself as "microcytic" in nature. Anemia occurring due to deficiency of vitamin B12 and/or B9 present with "macrocytic" erythrocytes. Elderly suffering nutritional anemia often fall into the category of mild to moderate, with the range of Hb from 8 g/dL to 10 g/dL. Hematological manifestations which occur due to the cobalamin deficiency are presented in Table 1.²³

DIAGNOSIS

It is usually difficult to diagnose anemia in the early stages in the older population as its onset is insidious. However, the initial signs and symptoms such as palpitations, dizziness, weakness, and fatigue should not be ignored, as they may lead to serious

Table 1: Hematological manifestations of cobalamin deficiency²⁴

Parameters	Values
Hemoglobin level (g/dL)	10.3 ± 0.4 (4.9–15.1)
Mean erythrocyte cell volume (fL)	98.9 ± 25.6 (76–142)
Reticulocyte count (%)	15.2 (1–32)
White cell count (/mm ³)	6,200 ± 4,100 (500–20,000)
Platelet count (10 ³ /mm ³)	146 ± 42 (27–580)
Anemia with Hb level <12 g/dL	37%
Anemia with Hb level <6 g/dL	2.5%
Anemia and macrocytosis (MECV > 100 fL)	33.8%
Isolated macrocytosis (MECV > 100 fL)	17%
Microcytosis (MECV < 80 fL)	5%
White cell count <4,000/mm ³	14%
Neutrophil count <1,000/mm ³	3%
Thrombopenia (<150 × 10 ³ /mm ³)	10%
Neutrophil hypersegmentation	32%
Megaloblastosis	60%
Life-threatening manifestations	9%

Hb, hemoglobin; MECV, mean erythrocyte cell volume

cerebral and cardiovascular pathologies. In order to establish the diagnosis of anemia in the aged group of people, taking a detailed history and assessment is of paramount importance. The clinician must ensure important details related to dietary intake, alcohol/tobacco consumption, and medical history are not left out. The practitioner must also look out for physical manifestation of nutritional deficiencies such as blue sclera, yellowish appearance of the eye, and skin for reaching the right diagnosis. It is also crucial to undertake a thorough laboratory investigations.^{24,25} The laboratory workup should include complete blood count examination, quint essentially for hemoglobin, iron, cobalamin, and vitamin counts with indices of various erythrocytes. Other detailed workup can include checking levels of ferritin, serum iron and serum folate, iron building capacity, for providing effective intervention therapy for nutritional deficiency anemia in the elderly population.

The relevance of detailed blood workup is necessary for ruling out the nutritional deficiency anemia from various other differential diagnosis related to anemias caused due to chronic inflammatory diseases, gastrointestinal bleeds, and other underlying pathologies such as neoplasms. The “transferrin receptor ferritin index” is an effective tool to distinguish between nutritional iron deficiency anemia and anemia related to any chronic inflammatory disorders in the elderly.²¹ Similarly, for ruling out deficiency of vitamin B9, the most recommended investigation is of “red cell vitamin B9 concentration” in the blood. In order to exclude a false negative test for diagnosis of vitamin B12 deficiency, serum levels of methyl malonic acid or homocysteine should be investigated. Effective diagnostic workup is crucial in developing strategies for the treatment of anemia in order to improve the quality of life in the elderly population.^{25,26}

MANAGEMENT

In case of the geriatric population special considerations should be made for providing management of nutritional anemia. Primarily, it is important to have a clarity of the type of anemia and the severity

of anemia which the elderly is suffering from. After establishing the cause of anemia, the second important part of the treatment is to take note of the comorbid factor and factors such as alcohol or tobacco intake should be taken into consideration. The most common cause of nutritional deficiency in the aged group of people is the iron deficiency anemia which can be easily treated with iron supplements. Usually the drug ferrous sulfate is administered orally (200–300 g), which is the first line of treatment owing to low cost and easy availability of the drug.^{26,27} It is also very effective in treating of iron deficiency anemia. In case the drug fails to achieve the desired level of iron in the body orally, intravenous admission of the drug is the second-best option. It is usually done for patients who suffer from chronic heart failure and GI bleeds. In certain cases where there is noncompliance for oral route therapy, parenteral iron supplements are used, for instance, iron sucrose, iron dextran, iron isomaltoside to cite a few examples. Vitamin C is also known to enhance the absorption of iron in the body, thus it is recommended along with iron supplements.^{5,28}

Deficiency of vitamin B12 in the elderly is treated with vitamin B12 supplements, commonly via intramuscular route or can be taken orally as well. The dosage is generally 1–2 mg/day orally or with IM injection of B12 on a monthly basis. Vitamin B9 deficiency is treatable with oral supplement ranging from 1 mg/day to 5 mg/day. The supplements are usually considered for a period of 3–6 months, depending on the severity and regular blood check-up.

Dietary modifications are also important along with the supplements to maintain the adequate levels of vitamins and iron in the body. It helps in reducing the risk factors associated with anemia and prevent the recurrence of the same once treated.

In case of severe anemia, blood transfusions are known to be effective, especially when the level of hemoglobin is as low as 6–7 mg/dL.^{5,26,27} However, blood transfusions are risky in case of the aged group of people, and those who suffer from disorders of the heart, such as poor ventricular function and may lead to transfusion associated circulatory overload, also known as TACO. In order to prevent TACO, the blood transfusion is carried out in a slow pace, such as 2–2.5 mL/kg/hour.

In certain cases, such as inflammatory diseases and chronic renal disease, erythropoiesis stimulating agents are used for treatment.²⁸ The oral cobalamin therapy with daily dosage of 1,000 µg along with 2,000 µg of crystalline cyanocobalamin for 1 month is generally prescribed for treatment of FCM and Biermer’s disease. The research conducted by “University Hospital of Strasbourg” concluded significant results for oral cobalamin therapy. The results indicated improvement in the levels of serum B12 in 80% of the participants with vitamin B12 deficiency due to food cobalamin malabsorption. There was also significant increase in the levels of hemoglobin and decrease in mean erythrocyte cell volume (MECV) by administration of oral crystalline cyanocobalamin.^{25,29}

CONCLUSION

In geriatric population, diagnosis and treatment of anemia poses a great challenge in clinical practice. It can be said that in majority of the cases, anemia in the elderly population is associated with other underlying pathologies or presence of various other comorbidities. Treatment outcomes are dependent on ruling out the correct diagnosis of anemia; this is especially true for the nutritional deficiency anemia which can be easily missed due to masking of its clinical features. As, in the aged population, nearly 30–40% people suffer from anemia. However, many a times there is no evidence of an underlying pathology even

after a thorough workup which results in misdiagnosis of anemia as unexplained anemia of the elderly (UAE). Although nutritional anemia can simply be managed by providing supplements for the deficient nutrients and making necessary dietary modifications, it is important to develop clinical insights into the causative factors of anemia and deploy effective strategies for the treatment based on recent advancements and evidence-based studies in order to protect the health of the elderly population and to improve the quality of life.

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