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Tackling Iron deficiency Anemia: A global Perspective on Diagnosis, Treatment and Prevention

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ABSTRACT

Anemia is a widespread disease affecting more than 30% of world's population making it a significant global health concern demanding its diagnosis, treatment, and prevention. In particular, Iron deficiency anemia is the most common form which occurs due to various factors such as inadequate iron intake, reduced iron absorption, elevated iron demand, and increased iron loss. Specifically, the diagnosis of iron deficiency anemia comprises of clinical evaluation and blood tests. For instance, symptom severity is often linked with the duration of illness rather than blood count. High-risk groups include individuals with dietary restrictions, chronic illnesses, and family history. Treatment is conducted in accordance with hemoglobin levels and may involve iron supplementation, transfusions, or addressing underlying causes of iron deficiency anemia. Early detection and public awareness campaigns, coupled with the World Health Organization's initiatives, will diminish the worldwide prevalence of this disease.

Introduction

Anemia ranks as the most widespread blood and nutritional disorder globally. The world health organization (WHO) indicates that more than 30% of people worldwide are affected by this disease [1]. Thus, the consistent prevalence of this disease necessitates an urge for its diagnosis, treatment and prevention. Anemia is characterized by the inadequacy of red blood cells or hemoglobin, an iron-rich protein, in the bloodstream; both blood components have an active role in delivering oxygen to various body tissues. Particularly, amongst the various types of anemia, iron deficiency anemia is the most frequent, accounting for over half of all anemia cases [1,2]. Certainly, varied homeostatic imbalances present the underlying causes of Iron deficiency anemia including (1) insuffcient iron intake (2) decreased iron absorption (3) elevated iron demand (4) and increased iron loss [3]. Indeed, the cornerstones of evaluating and treating iron-deficiency anemia are the identification of the etiology of the condition, prescription of the optimal medications, and enhancing iron intake.

Diagnosis

Diagnosing iron deficiency anemia requires conducting specific laboratory tests to confirm low iron stores. For instance, Anemia manifests when hemoglobin levels are two standard deviations below op-

timal According to patient age and sex. To illustrate, normal levels of Hb are presented in the table below [Table 1,4,5]. Notably, although iron is the most significant contributor to microcytic anemia, about 40 percent of individuals diagnosed with iron deficiency anemia present with normocytic erythrocytes [6]. Complete patient diagnosis should commence with a thorough evaluation of the medical history focusing on factors regarding the the onset and duration of symptoms of the disease, family history, dietary habits as well as a comprehensive physical examination. Typically, an anemic patient presents with chronic fatigue symptoms, exertional intolerance and exertional chest pain, palpitation, dizziness, headache and cold extremities. The severity of symptoms often depends more on duration of the illness than the low blood count levels clarifying why individuals with chronic anemia suffer from milder symptoms despite having a blood count that is much lower than in individuals of acute anemia. This difference in blood counts could be explained by the adaptation of body mechanisms, especially the cardiovascular system, in response to chronic anemia. Furthermore, common signs of anemia include pale skin, brittle nails and weak hair [7].

Diagnostic criteria for iron deficiency anemia	
Serum markers	*Diagnosis for IDA*
Haemoglobin	<130 g/L males <120 g/L females <110 g/L in pregnancy
Ferritin*	<30 ug/L if no inflammation <100 ug/L if inflammation
Transferrin†	Raised
Total iron binding capacity	Raised
Iron	Reduced
Transferrin saturations	<20%
Mean corpuscular volume	Low

Table 1 presents criteria for diagnosing iron deficiency anemia serum marker for IDA hemoglobin

*Is a positive acute phase protein which might be elevated in inflammatory condition

The diagnosis of anemia significantly comprises of conducting complete blood count in order to reveal microcytic hypochromic anemia [6]. Other rare yet relevant etiological factors of microcytic hypochromic anemia include thalassemia, sideroblastic anemia, and lead poisoning [1]. Moreover, testing serum ferritin, a protein reflecting the overall iron stores in the body, is crucial in the diagnosis of iron deficiency anemia [8]. Remarkably, iron deficiency anemia is diagnosed When Serum ferritin levels are below 15ng per mL (33.70 pmol per L). Serum ferritin is an acute phase reactant which increases during inflammatory reactions [9]. Furthermore, to confirm the diagnosis of iron deficiency anemia in a patient where the diagnosis is unclear, the following tests can be applied: (1) Soluble transferrin receptor (2) erythrocyte protoporphyrin testing [6]. Subsequently, after the completion of the relevant diagnostic tests, the physician should identify the causes that led to the iron deficiency anemia [Figure 1].

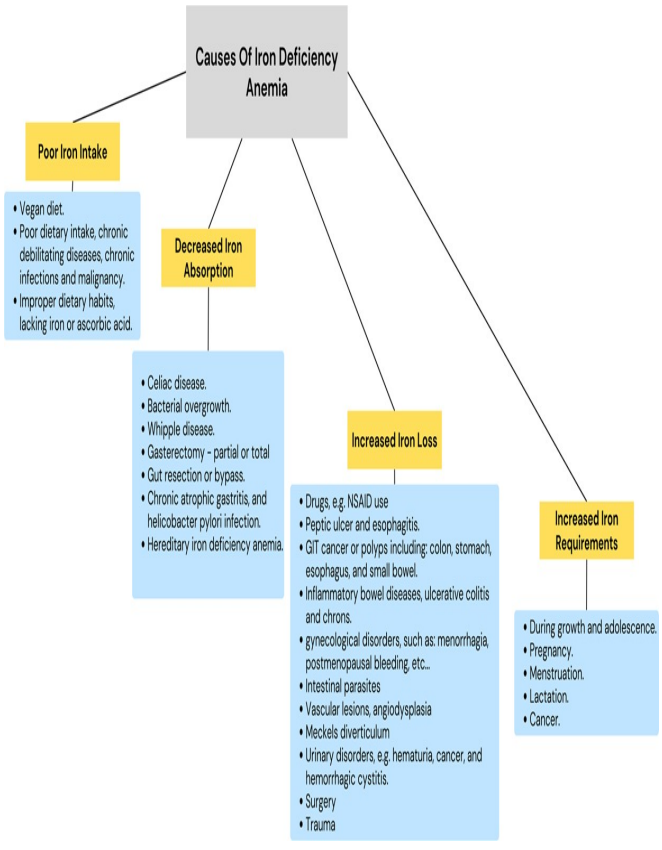

Figure 1 presents the possible causes of IDA

High risk groups

Notably, there are certain categories of people that are more susceptible to anemia; these high-risk individuals include those who:

1) follow a vegan diet
2) experience significant blood loss as in cases of melena and menorrhagia
3) have malabsorption syndromes such as celiac disease
4) have undergone bariatric surgery
5) suffer from chronic diseases like renal failure or rheumatological disorders
6) have a family history of hereditary iron deficiency anemia
7) are elderly cancer patients aged 50 years or older
8) are pregnant
9) have ulcers, colon polyps, or colon cancer
10) utilize specific medications such as aspirin or methotrexate.
11) Exhibit Glucose-6-phosphate dehydrogenase (G6PD) dificiency, a metabolic disorder
12) experience blood conditions like sickle cell diseases, thalassemia or apalastic anemia
13) consume diets lacking adequate iron, folic acid or vitamin B12 [2]

Management

Management of IDA depends on two primary strategies. The first targets replenishing the body's iron stores and increasing red blood cells count, while the second focuses on identifying the underlying cause of IDA. In order to determine the etiology of IDA, a comprehensive investigation may include various biochemical tests. These encompass complete laboratory assessment of liver and renal functions, testing for celiac disease antibodies, hydrogen breath test for bacterial overgrowth, stool analysis for fecal occult blood and for helminthiasis, and peripheral blood smear to identify abnormal morphology of red blood cells. Also, if malignancy is suspected, imaging techniques may be performed. Furthermore, upper and lower gastrointestinal endoscopies could be necessary to exclude gastrointestinal disorders [7].

Treatment

Once we identified the causes of IDA we will start treatment accordingly. Firstly, in cases where hemoglobin (Hb) levels are less than 7g/dl, and the patient present with severe symptoms, a blood transfusion will be required. If the patient is less symptomatic, especially in chronic patients, parenteral iron may be required. Such chronic cases specially include post bariatric surgery patients and malabsorption syndromes patients. Secondly, in cases who have Hb levels from 7-10g/dl, iron infusion constitutes the major therapy. Thirdly, in cases who have Hb levels greater than 10g/dl, oral preparations including ferrous iron are required. Besides, Haem iron drugs are also a treatment option that has better tolerability and easily absorption rates and less adverse effects [Figure 2]. Other treatment options are performed according to the etiology of IDA. For instance, treating gastrointestinal bleeding, menorrhagia, H pylori infection, bacterial overgrowth, malignancy and discontinuing certain medications like aspirin. "Beside medications" patients should be encouraged to consume a healthy diet rich in iron and ascorbic acid like meat, fish, poultry, beans, dark green leaves, dried fruits, iron fortified cereals, as well as breads and pasta.

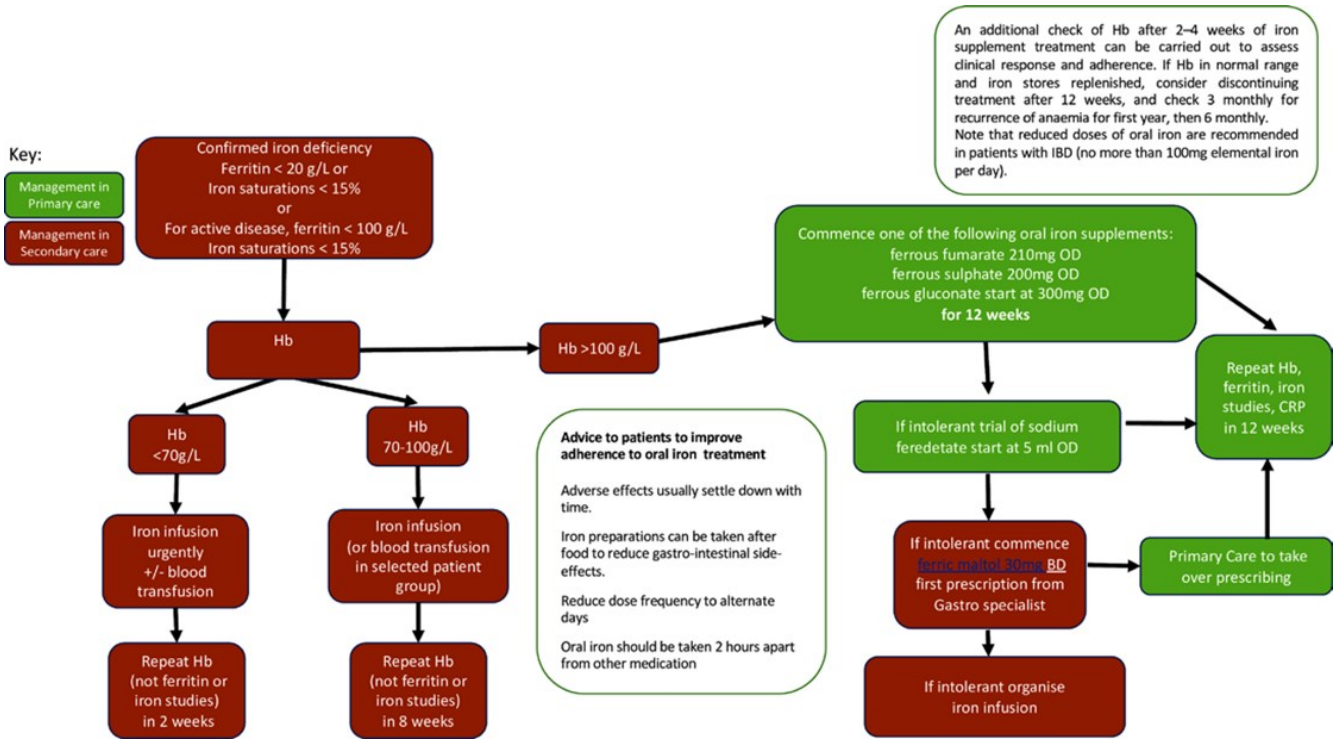

Figure 2: Iron deficiency treatment pathway in patients with inflammatory bowel disease patients according to the South East London Clinical Commissioning Group

Prevention

Early detection and treatment of individuals in high risk categories can significantly contribute to reducing the impact of IDA. These vulnerable groups encompass pregnant women, children, adolescents, elderly individuals lacking access social and medical care, low-income communities, and patients suffering from chronic diseases. Remarkably, the World health organization is actively invested in areas where IDA is highly prevalent. Specifically, these initiatives primarily seek to enhance dietary diversity and micronutrients availability though the distribution of food fortified with iron, folic acid, and other vitamins [1]. Anemia could be further prevented by motivating individuals to approach a more comprehensive healthy diet rich in iron and ascorbic acid. To accomplish this, raising awareness campaigns could be organized to educate the general population about the risks associated with anemia and techniques to prevent its onset.

Conclusion

In conclusion, the continued increase in iron deficiency anemia cases necessitates the management of this prevalent blood disorder. To achieve a reduction in the number of cases, a multifaceted approach is required. Particularly, once Iron deficiency is diagnosed using blood tests and clinical assessments, the physician should target the replenishment of iron stores and should address the underlaying causes of anemia. In addition, this should be coupled with early detection of IDA through public screening campaigns and public health awareness raised about this disease and its significant impact on health. In particular, this contributes to the motivation for patients to seek healthcare before advancement of the disorder and to effectively elevate blood iron levels through dietary modifications leading to an improvement of health of communities worldwide.

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