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Deficiency anemias: Causes, clinical picture, diagnosis and treatment

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ABSTRACT

Anemia is a prevalent condition caused by essential nutritional deficiencies such as iron, vitamin B12, and folic acid, impacting the blood's ability to carry oxygen and affecting quality of life. The main deficiency anemias include iron deficiency anemia and megaloblastic anemia, which have different causes and symptoms. Intervention through supplementation and health education is crucial for prevention and effective treatment, especially in vulnerable populations.

Keywords: Iron deficiency anemia, Nutritional deficiency, Megaloblastic anemia.

INTRODUCTION

Anemia is defined according to the World Health Organization (WHO) as a condition in which the concentration of hemoglobin in the blood is below the reference values. Deficiency anemias are a group of conditions characterized by the deficiency of essential nutrients for an adequate formation of the red blood series, that is, the intake of certain nutrients is insufficient to meet the demands for adequate red blood cell synthesis (FREIRE et al., 2020).

Deficiency anemia represents one of the most prevalent and persistent public health problems in the world, being a disease that affects millions of people in all age groups and socioeconomic classes. Characterized by the deficiency of essential nutrients for the production of hemoglobin and the proper formation of red blood cells, thus compromising the ability of the blood to transport oxygen to the tissues of the body. 2022).

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Among the types of anemia, deficiency anemias are an important group, due to their prevalence in the population, they are also called hypoproliferative anemias, where they do not have an increase in reticulocytes. The most common forms include iron deficiency anemia (iron deficiency), megaloblastic anemia (vitamin B12 or folic acid deficiency deficiency), and vitamin B6 deficiency anemia, with iron deficiency anemia being the most prevalent. The main signs and symptoms of iron deficiency anemia are: fatigue, pallor, weakness, dyspnea on exertion, and tachycardia (FREIRE et al., 2020).

Among deficiency anemias, iron deficiency anemia, due to iron deficiency, is the most common, standing out as a significant problem in both developed and developing countries. Iron is a component of hemoglobin, and its insufficiency causes difficulty in maintaining effective erythropoyesis. Iron deficiency anemia can be divided into 3 causes, which are insufficient iron intake, inadequate absorption and blood loss (WALKER et al., 2007).

Insufficient iron intake may be present due to low intake or an increase in the body's metabolic iron needs, thus requiring more iron in the diet (supplementation) to maintain adequate iron levels, as in the case of pregnant women and children (LOPES et al., 2019).

The main causes of iron absorption deficiencies are achlorhydria, atrophic, bariatric and duodenum gastritis, and proximal jejunum, the acidic pH of the stomach is an important means to facilitate the absorption of iron by enterocytes. Iron deficiency anemia also occurs due to loss of an important volume of blood, usually occurs in the gastrointestinal tract, and it may be necessary to perform upper digestive endoscopy and colonoscopy for the investigation, in women of reproductive age, causes of gynecological hemorrhage should also be investigated (LOPES et al., 2019).

Clinical picture of patients with iron deficiency anemia includes asthenia, angular cheilitis in lip rhyme, koilonychia, glossitis (loss of lingual papillae), some patients may have PICA syndrome where there is an eating perversion, feeling the desire to eat inedible objects (DE SÁ MOURA et al., 2021).

In the blood count there will be decreased MCV and MCH, it is a hypoproliferative anemia, that is, it will not increase the reticulocytes. The RDW will be increased as well as the other deficiency anemias, accusing anisocytosis. Regarding the iron profile, ferritin will be decreased, as well as serum iron, and after that the transferrin saturation will also decrease (WALKER et al., 2007).

In addition to iron deficiency, other deficiency anemias may be present in the population, such as megaloblastic anemia, caused by an inadequate intake of vitamin B12 and folic acid, essential nutrients for DNA synthesis and cell division. Deficiency of cyanocobalamin, also called vitamin B12, which is closely related to strict vegetarian diets or absorption problems in the gastrointestinal tract, can lead to a condition known as megaloblastic anemia, characterized by the presence of abnormally large and dysfunctional red blood cells. This pattern of red blood cells is also present in inadequate levels of folic acid, common in diets low in green vegetables and fruits (OBELAR et al., 2008).

Megaloblastic anemia is a deficiency, macrocytic (high MCV), hypoproliferative (low reticulocyte) anemia caused by a deficiency of cyanocobalamin (B12), a vitamin of animal origin, where vegans should supplement. Its absorption occurs in the distal ileum along with the presence of intrinsic factor (IF), produced by gastric parietal cells. In other words, low or non-absorption of B12 can generate megaloblastic anemia, as well as gastrectomy, atrophic gastritis, intestinal malabsorption, absence of IF and metformin ingestion, and the use of chronic PPIs such as pantoprazole/omeprazole (RABELO et al., 2018).

It can also be caused by a deficiency of folic acid (Vitamin B9), which is absorbed in the medial ileum, and has as its main function of transforming homocysteine to methionine. Folio acid is consumed in the formation of DNA, that is, the more "metabolism" is carried out, the more B9 is consumed. Its consumption is increased in situations of large cell proliferation, such as pregnancy, lactation, prematurity, neoplasms, hemolytic anemias, intestinal malabsorption diseases, and the prolonged use of methotrexate (DE SÁ et al., 2017).

Deficiency anemias are very present in vulnerable populations such as children, pregnant women, and women of reproductive age, exacerbating health inequalities and increasing the burden on public health systems. They should be seen as a need for health intervention as they not only affect the physical health of patients, but also have significant implications for cognitive development and academic performance in children, as well as for work productivity and well-being in adults (LOPES et al., 2019).

Studies indicate that iron deficiency in childhood is associated with deficits in cognitive and motor development, which can have long-lasting consequences for the general and educational status of affected children. In adults, fatigue and weakness associated with anemia can decrease the ability to concentrate and work performance, contributing to economic losses and reduced quality of life (OBELAR et al., 2008).

Understanding the causes and risk factors associated with deficiency anemia is essential for the implementation of effective prevention and treatment strategies. Dietary interventions taking into account the greatest needs in some age groups, supplementation in situations such as pregnancy, early childhood, vegetarians and vegans, and the realization of educational programs on an adequate diet, are some of the approaches that can be used to combat these nutritional deficiencies. In addition, health education and increasing awareness among the population about the importance of a balanced diet play a crucial role in raising awareness of this public health problem (RABELO et al., 2018).

Despite the easy identification of anemias, deficiencies in specific tests and the clarity of how therapy should be performed in these patients, many challenges persist. Disparity in socioeconomic classes and access to nutritious foods, the lack of adequate health infrastructure in remote regions, and the

persistence of cultural and dietary practices that limit the intake of essential nutrients are significant barriers that must be addressed to reduce the prevalence of these conditions (OBELAR et al., 2008).

Even with these challenges, the Ministry of Health has programs such as the National Iron Supplementation Program (PNSF) that proposes the distribution of iron, universally and free of charge, to all children, pregnant women and postpartum and post-abortion women, in the Basic Health Units that make up the SUS network, in all Brazilian municipalities (SIQUEIRA et al., 2014).

This program was instituted through Ordinance No. 730, of May 13, 2005, aiming at iron supplementation in vulnerable populations, together with the mandatory fortification of wheat and corn flours with iron and folic acid and providing nutritional guidance to the population, constituting the set of strategies aimed at controlling and reducing anemia due to iron deficiency in the country (SIQUEIRA et al., 2014).

In conclusion, deficiency anemia represents a complex challenge that requires an integrated approach involving efforts and varied public health, education, and social policy programs. Only through a comprehensive understanding of the causes and consequences of these deficiencies, combined with coordinated action by the primary care units with their medical staff, and with adequate supplementation, will it be possible to carry out an adequate treatment of these deficiency anemias, and even effective prevention, thus reducing the impact of deficiency anemias on public health and promoting a better quality of life for the population (DE OLIVEIRA NETO et al., 2023).

OBJECTIVE

GENERAL OBJECTIVE

- Evaluate and determine the main causes of deficiency anemias, the impact of educating patients in appropriate treatment, analyzing how knowledge and educational practices can influence the control of the disease and the reduction of associated complications.

SPECIFIC OBJECTIVES

1. Define deficiency anemias and name the main types of anemia
2. Identify the main causes of deficiency anemia
3. Establish and analyze the diagnostic methods of deficiency anemias
4. Discuss the treatment options available for each of the anemias
5. To propose recommendations for the continuous improvement of health education programs for patients with important risk factors.

METHODOLOGY

Considering that theoretical studies are an indispensable basis for field and laboratory research, we opted for conceptual deepening and search for official data on the object of study, allowing the knowledge of reality as well as the possibility of critical reflection on the subject within the scope of the Brazilian reality.

Based on the understanding of Creswell (2007) for whom the Literature Review is configured as a preliminary stage of scientific studies, then the research is a Literature Review in which articles published in the National Library of Medicine (Pubmed), Virtual Health Library (VHL), Web of Science, Lilacs and Capes Journals were used as the basis of the study by descriptors obtained by the Health Sciences Descriptors (DeCS) of the VHL.

In a dialectical approach that, according to Minayo (1994), the system of relations that constructs the reality where the object of study is inserted, the research is characterized in the scope of medicine with qualifiable data, considering the analysis of the elements that constitute the limitation or potentiation of the procedure, according to the studies analyzed.

SEARCH STRATEGY

This is a literature review of articles published in the National Library of Medicine (Pubmed), Virtual Health Library (VHL), Web of Science, Lilacs and Capes Journals by descriptors obtained by the Health Sciences Descriptors (DeCS) of the VHL.

Foi realizada busca pelos descritores: Anemia AND Iron deficiency Anemia AND Folic acid AND cyanocobalamin AND Public Health em "Todos os campos".

SELECTION STRATEGY

For the selection of articles, the following steps were followed: (I) search for articles in the databases; (II) reading of titles and abstracts, with analysis according to the eligibility criteria and; (III) full-text analysis of the papers, including in the systematic review only those required by the inclusion criteria and did not meet any of the exclusion criteria.

INCLUSION CRITERIA

Published studies were eligible if they met the following criteria:

(1) studies involving the pathophysiology of deficiency anemias; (2) studies that had as the object of study the relationship between an inadequate diet and deficiency anemias and their relationship with public health; (3) articles that studied the etiologies, diagnosis, and treatment of deficiency anemias; (4) articles published in the last 22 years. There were no restrictions on sample size or foreign language.

EXCLUSION CRITERIA

Articles were excluded if: (1) published before 2002; (2) studied situations that do not include deficiency anemias; (3) duplicates; (4) were not directly related to deficiency anemias, iron deficit, cyanocobalamin or folic acid.

DEVELOPMENT

A group of anemias known as deficiency is due to the lack of fundamental elements for an erythropoiesis, such as iron, folic acid or vitamin B12. Globally, iron deficiency anemia is considered the greatest nutritional disorder, with a high prevalence in all socioeconomic groups, mainly affecting children under two years of age and pregnant women (MINISTERIO DA SAÚDE, 2022).

Iron deficiency anemia is a serious public health problem in Brazil. According to data from the National Demographic and Health Survey, the prevalence in Brazil among children under five years of age is 20.9%, with 24.1% in children under two years of age. Studies carried out throughout the country indicate that the average prevalence of anemia in children under five years of age is 50%. This number rises to 52% in children who attend schools or daycare centers and 60.2% in children who attend Basic Health Units (JORDÃO; BERNARDI; BARROS FILHO, 2009).

Preterm labor, preeclampsia, miscarriage, cognitive dysfunction, reduced physical performance, emotional instability, postpartum depression, heart failure, and death are the main maternal complications related to iron deficiency. (RAHMAN et al., 2016)

Serious repercussions can cause iron deficiency anemia in the fetus, such as intrauterine death or growth retardation, which can contribute to prematurity and low birth weight. In children, frequent infections, irritability, apathy, anorexia, lack of nutrition can occur of attention, learning problems and low intellectual and cognitive performance, whose impairment can be irreversible. (WALKER et al., 2007)

In adults, the presence of anemia is an isolated risk factor for other comorbidities and for the increase in surgical complications proportional to the degree of anemia, regardless of transfusions or administration of parenteral iron before the procedure. In the elderly, the presence of anemia causes more hospitalizations, cognitive decline, falls, and fractures. (KULIER et al., 2007)

The choice of treatment will depend on the patient's tolerance to oral iron, as well as the severity of the disease. Gastrointestinal tolerance, the number of daily administrations, the incidence of adverse events, the safety profile with minimal risk of toxicity, and other factors that are related to the actual benefit of an iron supplement. (MINISTRY OF HEALTH, 2013)

The treatment period for iron deficiency anemia should be sufficient to normalize Hb values, around 4 to 8 weeks, and to restore the body's iron stores, in 2 to 6 months, or until serum ferritin ≥ 30 ng/mL is obtained. Therefore, the duration of treatment is at least 90 days and can reach more than 6

months, depending on the intensity of iron deficiency, continuity of blood loss, erythropoietic activity, intraluminal factors that interfere with iron absorption, occurrence of adverse events and adherence to treatment. It is suggested to avoid the administration of daily doses greater than 200 mg, equivalent to 40 mg of elemental iron, because the intestinal mucosa acts as a barrier, preventing the internalization and absorption of iron. (PAVORD et al., 2012)

Long-term vitamin B12 and folate deficiency can cause megaloblastic anemia and provoke various neuropsychiatric symptoms, especially in the elderly. Since the human body is not able to synthesize these vitamins, it is necessary to obtain them through diet. Foods such as beef, fish, seafood, and dairy products are rich in vitamin B12, while green vegetables, oats, fruits, and liver contain high levels of folate. However, folate can be destroyed by overcooking these foods, which underscores the importance of a balanced diet to ensure adequate intake of these vitamins. (PANIS et al., 2005).

The absorption of nutrients occurs in the duodenum, through the intrinsic factor, and continues to the distal ileum, where the final absorption occurs. Therefore, people with absorption problems can also develop megaloblastic anemia. This condition can manifest itself through symptoms such as nausea, tiredness, lack of energy, pallor, loss of appetite, abdominal pain, diarrhea, appearance of mouth ulcers, skin changes, hair loss, in addition to causing premature birth and/or fetal malformations. In children, growth may be delayed and puberty may occur late (ANDRÈS et al., 2007).

The diagnosis of megaloblastic anemia can be made by laboratory tests combined with observation of the patient's symptoms. Tests such as blood count and peripheral smear may indicate macrocytic anemia, with anisocytosis and poikilocytosis, hypersegmented neutrophils and reticulopenia, in addition to reduced hemoglobin. The dosage of vitamin B12 and folic acid is also essential to identify the cause of anemia (MONTEIRO et al., 2019).

Additional tests, such as homocysteine and methylmalonic acid levels, can be evaluated, since normal levels of these markers exclude vitamin B12 and folic acid deficiency (BALUZ et al., 2002).

Treatment for vitamin B12 deficiency can be done orally, with daily doses of 2,000 mcg for four months, or by intramuscular injections of 1,000 mcg, three times a week for two weeks, followed by a monthly injection for another three months. Both methods are effective in correcting the deficiency. The maintenance dose should be applied every three months and the duration of treatment should be evaluated as needed. It is also important to adjust the diet to correct the deficit, and it is possible to interrupt the treatment when the problem is resolved (FÁBREGAS et al., 2011).

Treatment for folate deficiency is done orally, with daily doses of 1 to 5 mg. If the cause of the deficiency is reversible, treatment lasts four months. The first response to treatment is reticulocytosis, which begins in three days and peaks in about seven days. However, neutrophil hypersegmentation persists, and normalization of hematologic changes can take six to eight weeks. The end of treatment

varies, and can last up to six months. If the cause of the deficiency cannot be modified, as in the case of an absorption problem, replacement should be maintained throughout life. During treatment, it is recommended to perform a complete blood count and reticulocyte count around the second week to monitor the evolution of the treatment. (FÁBREGAS et al., 2011)

FINAL CONSIDERATIONS

Therefore, anemia due to iron, folate, and vitamin B12 deficiency are serious public health problems that have a significant influence on many etiological levels and socioeconomic conditions. Iron deficiency anemia is common worldwide, with a high incidence rate in Brazil, especially in children under five years of age and pregnant women. Iron deficiency can lead to serious maternal complications and affect varied fetal and infant development, resulting in problems with growth and cognitive development. In addition, anemia in adults, especially in the elderly, is associated with a higher rate of complications and hospitalizations.

Folate and vitamin B12 deficiency can also result in megaloblastic anemia, which has the potential to cause a variety of neuropsychiatric symptoms and other health problems, especially in older people. A balanced diet is crucial, as the human body is not able to synthesize these vitamins. The cause and severity of the deficiency should be considered in the treatment, while the diagnosis of these conditions should be based on laboratory tests and clinical signs.

Improved health outcomes and correction of deficiency are ensured by the efficient management of these anemias, which involves proper administration of vitamin and mineral supplements and continuous monitoring. It is essential to have a comprehensive approach that involves diet, frequent exams, and specific treatments to deal with these conditions efficiently.

REFERENCES

Andrés, E., Federici, L., & Affenberger, S. (2007). B12 deficiency: A look beyond pernicious anemia. The Journal of Family Practice, 56(7).

Baluz, K., Carmo, M. G. T., & Rosas, G. (2002). O papel do ácido fólico na prevenção e na terapêutica oncológica: Revisão. Revista Brasileira de Cancerologia, 48(4), 597-600.

De Oliveira Neto, T. B., Silva, R. A., & Souza, J. C. (2023). A importância dos fatores socioeconômicos na gênese e manutenção das anemias carenciais. Revista Eletrônica Acervo Saúde, 23(9), e13997.

De Sá Moura, M. E., Silva, M. A., & Lima, L. C. (2021). Fisiopatologia, diagnóstico e tratamento da anemia ferropriva: Uma revisão de literatura. Revista de Casos e Consultoria, 12(1), e23523.

De Sá, L. S. M. (2017). A anemia megaloblástica e seus efeitos fisiopatológicos. Revista Eletrônica e Atualizada de Saúde, Salvador, 5(5), 55-61.

Fábregas, B. C., Vitorino, F. D. T., & Antônio, L. (2011). Deficiência de vitamina B12 e transtorno depressivo refratário. Jornal Brasileiro de Psiquiatria, 60(2), 141-143.

Freire, S. T., Alves, D. B., & Maia, Y. L. M. (2020). Diagnóstico e tratamento da anemia ferropriva. Referências em Saúde do Centro Universitário Estácio de Goiás, 3(01), 124-131.

Jordão, R. E., Bernardi, J. L. D., & Barros Filho, A. A. (2009). Prevalência de anemia ferropriva no Brasil: Uma revisão sistemática. Revista Paulista de Pediatria, 27(1), 90-98.

Kulier, A., Lumb, M., & Glickman, S. (2007). Impact of preoperative anemia on outcome in patients undergoing coronary artery bypass graft surgery. Circulation, 116(5), 471-479.

Lopes, D. L., Silva, E. M., & Santos, T. (2019). Aspectos clínicos pertinentes na anemia ferropriva em crianças. Mostra Científica em Biomedicina, 3(2).

Ministério da Saúde. (2013). Programa Nacional de Suplementação de Ferro: Manual de Condutas Gerais. 24 p.

Monteiro, M., Ferreira, N. F., Marins, F. R., & Assis, I. B. (2019). Anemia megaloblástica: Revisão de literatura. Revista Saúde em Foco, 11.

Obelar, M. dos S. (2008). Anemia carencial na infância: Um importante problema de saúde pública. Revista Paulista de Pediatria, 26, 4-5.

Paniz, C., Lima, C., & Tavares, M. (2005). Fisiopatologia da deficiência de vitamina B12 e seu diagnóstico laboratorial. Jornal Brasileiro de Patologia e Medicina Laboratorial, 41(5), 323-334.

Pavord, S., Myers, B., & Robinson, S. (2012). UK guidelines on the management of iron deficiency in pregnancy. British Journal of Haematology, 156(5), 588-600.

Pio, J. V. F., de Castro, M. N., & Ferreira, P. A. B. (2022). Perfil epidemiológico das internações por anemia ferropriva no estado de Goiás de 2015 a 2021. In CICURV-Congresso de Iniciação Científica da Universidade de Rio Verde.

Rabelo, B. L., Silva, J. P., & Souza, A. L. (2018). Aspectos socioculturais, econômicos e epidemiológicos das principais anemias carenciais: Uma revisão de literatura. Mostra Científica em Biomedicina, 3(1).

Rahman, M. M., Hossain, M. I., & Khan, M. M. (2016). Maternal anemia and risk of adverse birth and health outcomes in low- and middle-income countries: Systematic review and meta-analysis. American Journal of Clinical Nutrition, 103(2), 495-504.

Siqueira, L. das G., Santos, M. T., & Almeida, R. (2014). Dificuldades encontradas por enfermeiros no tratamento de anemia ferropriva em gestantes na estratégia saúde da família.

Walker, S. P., Wachs, T. D., & Gardner, J. M. (2007). Child development: Risk factors for adverse outcomes in developing countries. The Lancet, 369(9556), 145-157.