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Review Article

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An update on Iron deficiency anaemia among children with congenital heart disease

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Abstract

The factors including low iron intake haemolysis, malaria, sickle cell malaria and low education level with the risk factors most likely to cause diet being malaria and sickle cell.Red cell distribution width performs well as a screening diagnostic test for identifying iron deficiency anaemia among children with congenital heart disease health works should encourage caregiver to children with CHD to increase on the amount of fruits given to the children. Ministry of health should consider providing iron supplements to children suffering from congenital heart disease. Care givers to children with CHD should be advised to make their children to eat foods rich in iron so as to increase the levels of iron in the body of such children.

Keywords: iron, iron deficiency anaemia, children, congenital heart disease

Introduction

Congenital heart disease (CHD) patients frequently have low oxygen saturation in their blood because of inappropriate intra-cardiac communication. The need for an increased circulating hemoglobin mass in cyanotic infants puts a severe stress on their endogenous and dietary iron supplies resulting in relative iron deficiency [1-3].Patients with iron deficiency will have higher morbidity rates presenting with symptoms of hyper viscosity such as cerebrovascular accidents, cyanotic spells, anorexia, exercise intolerance, poor appetite, poor weight gain, irritability and poor mental development [4-5].On top of anaemia, children with congenital heart diseases (CHD) are at an increased risk for wasting, underweight and stunting [6]. Anaemia is one of commonest problems worldwide whereby one third of the world's population suffers from anaemia. Anaemia is a public health problem globally, with its impact felt more in human health, social and economic development of both individuals and nations [7]. Anaemia is a condition in which the concentration of Hemoglobin, Packed Cell Volume, and number of red blood cells is below the lower limits recommended for individual's age, sex and altitude [8]

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Anaemia

Anaemia is a decrease in the number of red blood cells (RBCs) or there's less than the normal quantity of hemoglobin in the blood to provide adequate oxygen to the tissues. However, it can include decreased oxygen-binding ability of each hemoglobin molecule due to deformity or lack in numerical development as in some other types of hemoglobin deficiency globally, anaemia represents a public health emergency and affects 293 million children under five years of age [7].

A research conducted in Sudan the prevalence of anaemia among preschool children in Karma Albalad village is 80.4% [9]. This is consistent with the results of the household survey conducted in Sudan in 1994 which reported a prevalence of anaemia in preschool children in Sudan as 84.9%.

Thalassemia minor and sickle cell trait can be detected by genetic tests and hemoglobin electrophoresis. Hemoglobin electrophoresis identifies abnormal hemoglobin in the blood and it is used to diagnose sickle cell anaemia, thalassemia and other inherited forms of anaemia [8].

Epidemiology of congenital heart disease

Severe cases of malaria and co-infections result in severe anaemia. Anaemia in vulnerable children under five years of age develops through one or more of several mechanisms including blood loss, hemolysis and inflammation, splenic sequestration and also bone marrow impairment are considered major factors in inducing anaemia. Poor diet or micronutrient deficiencies have been described as contributing factors in malaria endemic areas [10]. Folate and vitamin B12 deficiency are essential for DNA synthesis and are therefore needed by all dividing cells in the body, particularly hematopoietic cells in the bone marrow [8]. Therefore, their deficiencies lead to nuclear maturation being blockedwhich prevents dividing cells (cytoplasmic maturation is not locked) hence leads to anaemia. Vitamin B12 is also needed to prevent degenerative changes in the nervous system. Folate and vitamin B1 deficiencies cause megaloblastic changes in the bone marrow with a macrocytic anaemia and pancytopenia (low numbers of red cells, granulocytes and platelets) in the advanced stage [11].

Anaemia is a frequent complication of glucose 6 phosphate Dehydrogenase (G6PD) deficiency through neonatal jaundice, infection-induced jaundice, drug induced hemolysis and favism. The severity of diseases arising from G6PD deficiency depends on the inheritance of a defective G6PD gene. Fauvism commonly affects young children under five years of age [12]. G6PD is involved in the generation of Phosphorylase Nicotinamide-adenine Dinucleotide (NADPH) in the pentose phosphate pathway (hexose monophosphate shunt). NADPH is needed to provide glutathione (GSH) which maintains hemoglobin and other red cell proteins in a reduced active form. Exposure to an oxidant drug increases the need for NADPH and GSH. G6PD deficiency prevents this need from being met, resulting in the oxidation of hemoglobin to meet hemoglobin This precipitates to form Heinz bodies which attach to the red cell membrane, cells containing Heinz bodies are easily damaged and lysed both extra and intra-vascular hence causing anaemia [13].

Determinants of in congenital heart disease

Infants and children especially those who congenial heart disease and those who don't get enough iron from breast milk or infant formula are at risk of anaemia particularly iron deficiency. Children who don't get a routine balanced diet are at risk of anaemia. Disorders which affect the absorption of nutrients in small intestines such as Crohn's disease and celiac disease are at risk of anaemia [12]. Children with chronic conditions such as cancer, kidney, liver failure and other chronic conditions, may be at risk for called anaemia of chronic disease. Children with family history of inherited conditions such as sickle cell anaemia are at increased risk [15]. Other factors including; a history of certaininfections, parasites, blood diseases, autoimmune disorders, burns, exposure to toxic chemicals and also the use of

some medications like NSAIDS lead to anaemia [15].

Causes of anaemia

Mainly malnutrition associated particularly with Iron deficiency anaemia that is caused by insufficient iron intake or the iron in the diet is in a form which is not easily absorbed [16]. Increased loss of iron due to chronic blood loss as occurs in severe hookworm infection, schistosomiasis, trichuris-trichuria, gastrointestinal bleeding and menorrhagia disease. Infectious diseases like Parasitic, bacterial and viral infections are also associated with anaemia such as malaria which is the commonest cause of death in young children in tropical countries and also chronic disease such as tuberculosis, pneumonia, pulmonary abscess, bacterial endocarditis, pelvic inflammatory disease, osteomyelitis, HIV disease/AIDS treated with antiretroviral drugs such as zidovudine, hookworm infestation, visceral leishmaniasis, African trypanosomiasis and viral hemorrhagic fever. Non-infectious diseases, malignancies, systemic lupus erythematosus, rheumatoid arthritis and other connective tissue disorders. Therefore, all those conditions above are also causes of anaemia [17]. Inherited haemoglobinopathies including; Sickle cell disease, Thalassemia syndromes, glucose 6 phosphate dehydrogenase (G6PD) deficiency, obstetrical complications causing excessive blood loss and acute bleeding from wounds and surgical procedures [18].

Prevention and control

Anaemia can be prevented by choosing a diet that includes iron, folic acid and a variety of vitamins such as vitamin C, Vitamin B12 that help increase iron absorption [19]. Children, especially those who are breastfeeding should get enough iron from breast milk toreduce iron deficiency. If a family history of an inherited anaemia such as sickle cell anaemia or Thalassemia, parents should talk to doctor and possibly a genetic counselor about the risk and ability to pass on these conditions to their children. Sleeping under treated mosquito nets reduces the risk of infection such as malaria and early diagnosis and treatment of other chronic diseases which causes anaemia may reduce risk of having anaemia. Avoid self-medication and taking drugs that suppress the immune system which may be attacking red blood cells hence causing anaemia [20]. HIV infection has been associated with increased risk of anaemia among children.

Conclusion

The factors including low iron intake, haemolysis, malaria, sickle cell anaemia and low education level with the risk factors most likely to cause anemia with congenital heart disease patients.

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