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Study of anemia prevalence in Darbhanga medical college and hospital, Darbhanga, Bihar

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Abstract

Of anaemia is seen in developing countries. Anaemia is widely prevalent in India and affects both sexes and all age groups. Global anemia prevalence when examined for each physiological group using the WHO global data on anaemia reports that most affected groups are pregnant women (69%) and school age children. Because of the high prevalence and severe consequences of anaemia are long lasting and possibly irreversible in children has led international organizations like WHO, UNICEF, NFHS, Govt. of India and other NGO's agencies to reduce the prevalence of anaemia as major goal. Several strategies were implemented to achieve this goal including iron fortification, use of iron supplements, deworming for school children, Mid-day meal programme and education regarding nutrition, but the goal still needs to be achieved. Hence based on above findings the present study was planned for Study of Anemia Prevalence in Darbhanga medical College and Hospital, Darbhanga, Bihar.

The present study was planned in Department of Paediatrics, Darbhanga medical College and Hospital, Darbhanga, Bihar, India. The study was conducted from April 2019 to Sept 2019. In the present study total 25 cases of the anaemic childrens were enrolled and evaluated for different parameters.

It is evident from our study that a significant proportion of apparently healthy children suffer from anemia. That may be due to faulty habits of consumption of poor-quality diet and rising trend of consuming snack and junk food. Which have lack of iron and other micronutrients. Prevalence of anemia is significantly higher in girls when compared to boys, similar to other studies. This may be due to customs and believes in the families to provide nutritious food to boys than girls.

Keywords: Anemia, Iron, hemoglobin, Bihar region, childrens, etc

Introduction

Iron is very important ingredient of human diet. This is essential for formation of haemoglobin Low levels of Haemoglobin causes Iron deficiency anaemia. The red cells contain haemoglobin. The red cells are important particles in blood. Haemoglobin in red cells carry oxygen all over the body. Iron-deficiency anemia (or iron-deficiency anemia) is a most common form of anemia (low red blood cell or hemoglobin levels).

Pediatric anemia refers to a hemoglobin or hematocrit level lower than the age-adjusted reference range for healthy children. Physiologically, anemia is a condition in which reduced hematocrit or hemoglobin levels lead to diminished oxygen-carrying capacity that does not optimally meet the metabolic demands of the body.

Anemia is not a specific disease entity but is a condition caused by various underlying pathologic processes. It may be acute or chronic [1]. This article provides a general overview of anemia, with an emphasis on the acute form. In addition, conditions are emphasized in which anemia is the only hematologic abnormality. The combination of anemia with leukopenia, neutropenia, or thrombocytopenia may suggest a more global failure of hematopoiesis, caused by conditions such as aplastic anemia, Fanconi anemia, myelofibrosis, or leukemia, or may suggest a rapid destruction or trapping of all blood elements, such as hypersplenism, localized coagulopathy in a large hemangioma, or hemophagocytic lymphohistiocytosis (HLH) or macrophage activation syndrome (MAS).

The main physiologic role of red blood cells (RBCs) is to deliver oxygen to the tissues. Certain physiologic adjustments can occur in an individual with anemia to compensate for the lack of oxygen delivery. These include (1) increased cardiac output; (2) shunting of blood to vital organs; (3) increased 2,3-diphosphoglycerate (DPG) in the RBCs, which causes reduced oxygen affinity, shifting the oxygen dissociation curve to the right and thereby enhancing oxygen release to the tissues; and (4) increased erythropoietin to stimulate RBC production.

The clinical effects of anemia depend on its duration and severity. When anemia is acute, the body does not have enough time to make the necessary physiologic adjustments, and the symptoms are more likely to be pronounced and dramatic. In contrast, when anemia develops gradually, the body is able to adjust, using all 4 mechanisms mentioned above (1, 3, and 4 in most cases), ameliorating the symptoms relative to the degree of the anemia.

Acute and severe anemia can result in cardiovascular compromise. Moreover, if individuals with acute anemia are not treated immediately and appropriately, the resulting hypoxemia and hypovolemia can lead to brain damage, multiorgan failure, and death. Long-standing anemia can result in failure to thrive.

Many studies have shown the deleterious effects of iron deficiency anemia or iron deficiency without anemia on the neurocognitive and behavioral development in children. Other complications can include congestive heart failure, hypoxia, hypovolemia, shock, seizure, and acute silent cerebral ischemic event [2].

To evaluate anemia, obtain initial laboratory tests, including

the complete blood count (CBC), reticulocyte count, and review of the peripheral smear. Chest radiography is performed in patients who may have congestive heart failure (CHF) and to rule out mediastinal mass (associated with acute leukemia and lymphoma). Abdominal ultrasonography is used to assess for gallstones or splenomegaly in hemolytic anemia, while computed tomography (CT) scanning is used to evaluate occult bleeding in blunt trauma (eg, splenic rupture, subcapsular hemorrhage of the liver) or a bleeding disorder. Abdominal Doppler study is used to detect portal vein thrombosis.

Transfusion with packed red blood cells (PRBCs) is the universal treatment for most individuals with severe acute anemia. The indication to transfuse should not be based solely on the hemoglobin or hematocrit levels; more importantly, one must consider the clinical effects or the signs and symptoms of the individual with anemia [3].

Girls with heavy and/or prolonged menstrual periods should seek medical attention (should tell parents to obtain CBC count). One of the most common reasons for fainting spell or syncope in adolescent girls is rapidly developing anemia due to menstrual blood loss. Toddlers who drink more than 24 oz of milk a day most likely have iron deficiency. Primary care physicians should inquire about the amount of milk intake [4]. Children diagnosed with anemia should be taught to look at their stool color and to report to their parents if it is tarry or bloody.

Educate the patient and/or the family about the specific disease that causes the anemia. For example, provide a list of drugs, food, and other agents to avoid because of their effect of triggering acute hemolysis in glucose-6-phosphate dehydrogenase (G-6-PD) deficiency.

In pediatrics beyond the immediate neonatal period, acute anemia is rare in otherwise healthy children. In most instances, it is due to blood loss, usually through the GI tract or via a heavy menstrual period, or in some instances, as a result of an acute hemolytic episode in a child with undiagnosed G-6-PD deficiency. The most common reason for hospitalization because of acute anemia is so-called aplastic crisis in children with chronic hemolytic anemia who otherwise had been stable. The most common varieties are hereditary spherocytosis and sickle cell disease. Therefore, it would be prudent to educate parents regarding this complication, at the time when the diagnosis is established.

Causes of anemia are either inherent in the RBCs or related to an external factor. The underlying pathologic processes that cause anemia can be broadly categorized as (1) decreased or ineffective red cell production, (2) increased red cell destruction (hemolysis), and (3) blood loss, although more than 1 mechanism may be involved in some anemias. Obvious or occult sites of blood loss may include the GI tract or intra-abdominal, pulmonary, or intracranial (in neonates) sites. Patients with bleeding disorders are at particular risk for massive hemorrhage (internal or external).

Anemia associated with acute infection is common. This may be mediated by increased destruction by erythrophagocytosis [7] and suppression of erythropoiesis by the infection. In adolescents and adults, normal values for the hemoglobin and hematocrit levels vary according to sex. Racial differences are also apparent, with black children having lower normal values than white and Asian children of the same age and socioeconomic background.

Among all races, ages, and socioeconomic groups studied, an overall steady decline (from 7.8% in 1975 to 2.9% in 1985) in prevalence of anemia in the US pediatric population (aged 6 mo to 6 y) has been observed. Data showed continued decline in the prevalence of anemia from the mid-1980s to the mid-1990s [8]. Iron deficiency was the most common etiology.

A prevalence study of anemia on selected groups using the National Health and Nutrition Examination Surveys covering 1988-1994 and 1999-2002 showed a decrease in the prevalence of anemia from 8% to 3.6% in children aged 12-59 months and from 10.8% to 6.9% in women aged 20-49 years. However, no significant change in the prevalence of iron deficiency anemia was seen in either group [9].

In developing nations, the prevalence of anemia is extremely high. This is particularly true in preschool-aged children, in whom the prevalence reached as high as 90% of the sample population studied. Although iron deficiency is identified as the major factor, the etiology is often multifactorial, including recurrent or chronic infections (bacteria, parasites), malnutrition, and reduced immunity.

In addition, the prevalence of certain hereditary forms of anemia (eg, thalassemia, sickle cell disease) varies with ethnicity and, thus, with geography. For instance, α thalassemia, which may be the most common single gene disorder in the world, has a frequency of as much as 68% in the southwest Pacific, 20-30% in western Africa, and 5-10% in the Mediterranean region. Beta thalassemia mutations have high frequencies in the Mediterranean, northern Africa, Southeast Asia, and India, but they have low frequencies in Great Britain, Iceland, and Japan.

A study by Mujica-Coopman *et al* of anemia rates in children under age 6 years in Latin America and the Caribbean found the lowest rates in Chile (4.0%), Costa Rica (4.0%), Argentina (7.6%), and Mexico (19.9%). Anemia was found to pose a severe public health threat in Guatemala, Haiti, and Bolivia [10]. A study by Aladjidi *et al* estimated that in the Aquitaine region of France, the incidence of the rare disease autoimmune hemolytic anemia in persons under age 18 years is 0.81 per 100,000 per year [11].

Acute anemia is universal, but the likely underlying etiologies are influenced by race. Inherited red cell disorders are predominant in certain racial populations, such as sickle cell disease in black persons, β thalassemia in persons of Mediterranean ethnicity, and α thalassemia in Asians, African Americans, and others [12].

Sex predisposition to anemia varies according to the underlying etiology. For instance, certain hereditary X-linked red cell disorders (eg, G-6-PD deficiency) are observed in males. Anemia caused by blood loss can be observed in males with an X-linked bleeding disorder (eg, hemophilia). Females with the autosomally inherited von Willebrand disease may be anemic because of heavy blood loss during menstruation. Even without this disorder, they have a high risk of developing iron deficiency and iron deficiency anemia, quite often worsened by acute blood loss. Acquired hemolytic anemia related to autoimmune disorders such as systemic lupus erythematosus is more common in females because of their relative predisposition to autoimmune disease.

Acute anemia most commonly occurs among newborns. Significant blood loss can occur from birth trauma or blood exchange from the baby's mother (fetomaternal transfusion) or the placenta. Isoimmune anemia can result from maternal

antibodies crossing the placenta. Neonates have a shorter red cell life span and limited erythropoiesis that can aggravate any hemolytic process. Abnormalities of fetal hemoglobin may cause anemia that resolves with the normal shift to adult-type hemoglobins. Deletion of α globin gene, unlike β globin gene mutation, causes anemia in neonates. Hemoglobin H disease is a good example (in neonates Hb parts is the abnormal hemoglobin rather than Hb H).

Nutritional anemia is common in infancy because of the associated rapid growth (necessitating an increase in red blood cell mass) and dietary adjustments. With exposure to new infections in early childhood, the anemia of acute infection is common. Rarely, severe autoimmune hemolytic anemia can be triggered by certain infections. Adolescence is characterized by rapid growth and vulnerability to nutritional anemia. In addition, blood loss with heavy menstruation can be observed in adolescent girls.

The prognosis depends on the severity and acuteness with which the anemia develops and the underlying cause of the anemia. Mortality and morbidity rates vary according to the underlying pathologic process causing the anemia, the degree of severity, and the acuteness of the process. When a precipitous drop in the hemoglobin or hematocrit level occurs (eg, due to massive bleeding or acute hemolysis), the clinical presentation is typically dramatic and can be fatal if the person is not immediately treated. A good example is so-called splenic sequestration crisis in infants and young children with sickle cell anemia (equivalent to massive blood loss). In this instance, the patients may develop a state of shock due to pooling of the blood in the spleen. In addition to the signs and symptoms of anemia, patients can present with congestive heart failure (CHF) or hypovolemia. Cerebral injury has been reported in perioperative patients with anemia [13].

Anaemia is the most common haematological disease of the pediatric age group. Highest prevalence of anaemia is seen in developing countries. Anaemia is widely prevalent in India and affects both sexes and all age groups. Global anemia prevalence when examined for each physiological group using the WHO global data on anaemia reports that most affected groups are pregnant women (69%) and school age children. Because of the high prevalence and severe consequences of anaemia are long lasting and possibly irreversible in children has led international organizations like WHO, UNICEF, NFHS, Govt. of India and other NGO's agencies to reduce the prevalence of anaemia as major goal. Several strategies were implemented to achieve this goal including iron fortification, use of iron supplements, deworming for school children, Mid-day meal programme and education regarding nutrition, but the goal still needs to be achieved. Hence based on above findings the present study was planned for Study of Anemia Prevalence in Darbhanga medical College and Hospital, Darbhanga, Bihar.

Methodology

The present study was planned in Department of Paediatrics, Darbhanga medical College and Hospital, Darbhanga, Bihar, India. The study was conducted from April 2019 to sept 2019. In the present study total 25 cases of the anaemic childrens were enrolled and evaluated for different parameters.

Venous blood sample was collected in all children under strict aseptic precautions in EDTA anticoagulant for hematological investigations. Hemoglobin (Hb) estimation was done using cyanmethemoglobin method 20 micro liter of anticoagulated blood was added to 5ml of freshly made standardized Drabkin's solution in a vial. This was inverted several times to mix the solution. It was allowed to stand for 10min, and the solution was read in spectro-photometer at 540nm and grading of Anemia was done by hemoglobin levels according to recent WHO guidelines. Peripheral blood smear study was performed on all the children. Peripheral smear was stained by Leishman's stain. Staining characteristics and morphological abnormalities of red cells were observed. The distribution, anisocytosis, poikilocytosis, along with white blood cell morphology and platelet morphology were observed.

All the patients were informed consents. The aim and the objective of the present study were conveyed to them. Approval of the institutional ethical committee was taken prior to conduct of this study.

Following was the inclusion and exclusion criteria for the present study.

Inclusion Criteria: School children in the age group of 6 months -12 years both boys as well as girls.

Exclusion criteria: Children age less than 6 months and more than 12 years are excluded from the study. Children suffering from any illness are not taken into the study.

Exclusion criteria were based on the relevant information from the parents / guardians and with complete physical examination.

Results & Discussion

Anemia is a major global health problem, especially in developing countries like India, despite the fact that this problem is largely preventable & easily treatable. It is the commonest disease affecting humankind and is responsible for morbidity and mortality among general population. About 30% or nearly one third of world's population is suffering from anemia due to various causes [14, 17].

Anemia can be of various types, but most common in developing countries is nutritional anemia. Nutritional anemia can be due to Iron deficiency (most common cause), Folic acid deficiency, Vitamin B12 deficiency or may be combination of these factors, which can present with dimorphic picture. These conditions are seen in all types of medical practice ranging from neonatology to geriatrics and public health and are an ongoing concern to all physicians. Other types include hemolytic anemia, which can be either congenital or acquired. Congenital causes include membrane defect, hemoglobin defects and enzyme defect while acquired causes can be immune or non- immune. Aplastic anemia, anemia due to blood loss and anemia of chronic disease are the some other types of anemia [18].

Table 1: Age group and No of Cases

Age	Anaemic Cases
6 months to 2 year	3
2 to 3 years	6
3 to 6 years	10
6 to 9 years	5
9 to 12 years	1
Total	25

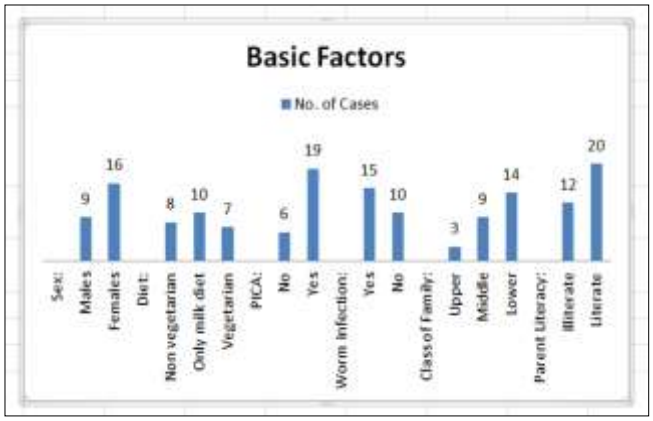

Fig 1: Different Variables responsible for Haemoglobin

Table 2: Distribution of Anemia based in Hemoglobin Levels

Age	Number of Anaemic Cases
Below 6 years	
10.0 – 10.9 g/dl (mild)	3
9.0 – 9.9 g/dl (moderate)	5
< 9.0 g/dl (severe)	8
Above 6 years	
11.0 – 11.9 g/dl (mild)	4
10.0 – 10.9 g/dl (moderate)	3
< 10.0 g/dl (severe)	2
Total Cases	25

Nirmala K Murty, Sivangani and P Rani in 1989 conducted study on anemia and endurance capacity among children and woman of 6-26 years at Coimbatore found that iron defiency anemia was most common cause of anemia in these participants [19]. In 1994 study conducted by Vasanthi *et al* in adolescent girls from rural area and urban area who have not attained menarche found rural girls <12 years showed higher prevalence of anemia (37.2%) as compared to urban girls [20].

In 1997 I.W. Booth *et al*. in their personal view on iron defiency anemia in infancy and early childhood have shown that in inner cities in UK, iron deficiency anemia occurs in infant with the same frequency as in developing countries [21].

In 1999 Balgir RS, Murmu B and Dash BP conducted study on nutritional status of the Ashram school for tribal children in Northern Orissa and found high prevalence ranging from 59 to 81% of children belonging to different tribes [22].

In 1999 Jaishree P. Jandhale, Snehalata Reddy N and Vijay M. Nalwade conducted a study on prevalence of anemia among school going adolescents' girls of Parbhani (India) and found that 88.3% of them to be anemic [23].

B. Sudhagandhi *et al* in 2009-2010 studying on prevalence of anemia in the school children of Kattankulathur, Tamil Nadu, India found among these children was 52.88% [24].

Neeraj Jain and Vibha Mangal Jain conducted study in 2010 regarding prevalence of anemia in school children aged 5-16 years from government school of Rishikesh, Uttaranchal, India and found anemia in 51.5% of cases [25].

Iron deficiency of dietary origin seems to be the main cause of anemia in this population, as indicated by dietary intake data, with iron being the single nutrient deficient in the di*et al*ong with energy (88% children having serum ferritin <12 µg/L). The red cell morphology also showed higher prevalence of iron defi-ciency more common in moderately anemic alongwith vitamins folate/B12 deficiency. Therefore, anemic children <3 years of age (dimorphic >45%) should receive these vitamins alongwith iron. Similar findings were reported in earlier studies [26, 27].

Iron intake on an average was approximately one-third of the RDA and approximately 98% children had an intake below the RDA. The iron density of the diet was found to be. 008 mg/unit calories, almost 20% less than the recommended. The main source of iron in the diet was cereals. Consumption of green leafy vegetables and pulses was limited. Access to meat and flesh foods (sources of haem iron) was limited (with mean daily intake of 4 g). Diluted milk boiled in aluminium pans, serving, as main diet is the important cause of anemia. Such diet reduced appetite for other dietary items. Intake of tea (an iron inhibitor) ranged from 1-6 times a day. The availability of iron from such a diet would have been low. Though the bioavailability of iron in the diet was not estimated, but based on evidence [28], it would not be very wrong to presume that the bioavailability of iron from such a diet (consisting primarily of cereals, pulses, vegetable and tea) would not be more than 1.8-4.5%. Inadequate intake (with adequacy ranging from 13% to 56% as compared to RDA for children) coupled with possible low bioavailability of dietary iron would have been a major contributor to the high prevalence of anemia recorded in the study. Seasonal green leafy vegetables and fruits are becoming affordable, these will provide iron, enhancers for absorption and vitamins. In addition, cooking in cast iron utensils will improve dietary iron intake [29].

Conclusion

It is evident from our study that a significant proportion of apparently healthy children suffer from anemia. That may be due to faulty habits of consumption of poor-quality diet and rising trend of consuming snack and junk food. Which have lack of iron and other micronutrients. Prevalence of anemia is significantly higher in girls when compared to boys, similar to other studies. This may be due to customs and believes in the families to provide nutritious food to boys than girls.

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