International Journal of Medical and Health Research
ISSN: 2454-9142
Received: 27-08-2019; Accepted: 30-09-2019
www.medicalsciencejournal.com
Volume 5; Issue 10; October 2019; Page No. 134-138

Clinical evaluation of factors responsible for prevalence of anemia in childrens in north Bihar region

Dr. Shaantanu Kumar[1], Dr. Nagendra Prasad Gupta[2*], Dr. Krishna Kumar Jha[3], Dr. Nishant[4], Dr. Satyendra Paswan[5], Dr. Vivekanand Paul[6], Dr. Baiju Kumar[7]

[1, 5] Post Graduate Student, Department of Paediatrics, Darbhanga Medical College and Hospital, Laheriasarai, Darbhanga, Bihar, India
[2, 3] Associate Professor, Department of Paediatrics, Darbhanga Medical College and Hospital, Laheriasarai, Darbhanga, Bihar, India
[4] Professor, Department of Paediatrics, Darbhanga Medical College and Hospital, Laheriasarai, Darbhanga, Bihar, India
[6, 7] Senior resident, Department of Paediatrics, Darbhanga Medical College and Hospital, Laheriasarai, Darbhanga, Bihar, India
[*] Corresponding Author: Dr. Nagendra Prasad Gupta

Abstract
Iron deficiency is the most common and widespread nutritional disorder in the world. It is the only nutrient deficiency which is also significantly prevalent in all industrialized nations. According to the data of the World Health Organization (WHO), the prevalence of iron deficiency anemia (IDA) in industrialized countries and in non-industrialized countries is 10–20% and 50–60%, respectively. Iron deficiency impairs the cognitive development of children from infancy through adolescence. It also damages immune mechanisms and is associated with increased morbidity rates. The importance of iron deficiency and anaemia as a public health problem has been increasingly recognized by health authorities and policy makers. Although efforts are targeted primarily to prevent iron deficiency, it is still the most common nutrient deficiency all over the world. Hence present study was planned for clinical evaluation of factors responsible for prevalence of anemia in childrens referred to hospital in north Bihar region.

The present study was planned in Department of Paediatrics, Darbhanga Medical College and Hospital, Laheriasarai, Darbhanga. Total 540 cases of the childrens were evaluated in the present study. Out of 540 cases there are 45 cases were found anaemic. Hemoglobin was estimated by Sahli's method and expressed in gm%, peripheral smear was stained by Leishman's stain. A detailed history was recorded with particular emphasis on symptoms suggestive of anemia such as weakness and easy fatigability, breathlessness on exertion, pica. A thorough clinical examination of every child was done especially for pallor, nail changes, glossitis, fundus of eye, cardio vascular involvement in form of tachycardia, haemic murmur, congestive cardiac failure, raised JVP and edema.

Anaemia is still a major health problem in our country. Childhood anaemia still continues to be a significant public health problem in school children between 6-12 years. Nurses need to be aware of prevalence of Anemia among the school going children. Interventions should be implemented to increase the hemoglobin level in children. Nurses can educate parents, teachers and students regarding advantages of balance diet supplementation and intake of iron rich food.

Keywords: Anemia, childrens, north Bihar region, iron, clinical evaluation etc

Introduction

Malnutrition affects the mental and physical development of a child from the time it begins to grow in its mother's womb. If the mother is malnourished the child is very likely to be unhealthy at the time of birth. From conception to 24 months of age is the critical period. Primarily poor access to nutritional diets is the cause of malnutrition in both mother and child. In nutritional anemia the blood hemoglobin level drops to an abnormally low level due to deficiency in food nutrients (iron, folic acid and vitamin B12). The level of iron in a child's blood at the time of birth depends upon the store of iron in the mother during pregnancy. Iron deficiency hampers both mental and physical growth in children as iron plays an important role during rapid growth of a child. The brain is the fastest developing organ during infancy and childhood. The damage is irreversible. But iron deficiency is preventable with timely intervention.

Iron-deficiency anemia is anemia caused by a lack of iron. Anemia is defined as a decrease in the number of red blood cells or the amount of hemoglobin in the blood. When onset is slow, symptoms are often vague such as feeling tired, weak, short of breath, or having decreased ability to exercise. Anemia that comes on quickly often has more severe symptoms, including: confusion, feeling like one is going to pass out or increased thirst. Anemia is typically significant before a person becomes noticeably pale. Children with iron deficiency anemia may have problems with growth and development. There may be additional symptoms depending on the underlying cause [1].

Iron-deficiency anemia is caused by blood loss, insufficient dietary intake, or poor absorption of iron from food. Sources of blood loss can include heavy periods, childbirth, uterine fibroids, stomach ulcers, colon cancer, and urinary tract bleeding. Poor absorption of iron from food may occur as a result of an intestinal disorder such as inflammatory bowel disease or celiac disease, or surgery such as a gastric bypass. In the developing world, parasitic worms, malaria, and HIV/AIDS increase the risk of iron deficiency anemia. Diagnosis is confirmed by blood tests [2].

Iron deficiency anemia can be prevented by eating a diet containing sufficient amounts of iron or by iron supplementation. Foods high in iron include meat, nuts,

spinach, and foods made with iron-fortified flour. Treatment may include dietary changes and dealing with underlying causes, for example medical treatment for parasites or surgery for ulcers. Iron supplements and vitamin C may be recommended. Severe cases may be treated with blood transfusions or iron injections [3].

Iron-deficiency anemia affected about 1.48 billion people in 2015. A lack of dietary iron is estimated to cause approximately half of all anemia cases globally. Women and young children are most commonly affected. In 2015 anemia due to iron deficiency resulted in about 54,000 deaths – down from 213,000 deaths in 1990 [4].

Iron deficiency anemia may be present without a person experiencing symptoms. If symptomatic, patients may present with the sign of pallor (reduced oxyhemoglobin in skin or mucous membranes), and the symptoms of fatigue, lightheadedness, decreased exercise tolerance, headache, and weakness. None of these symptoms (or any of the others below) are sensitive or specific. The symptom most suggestive of iron deficiency anemia in children is pallor of mucous membranes (primarily the conjunctiva). Even so, a large study showed that pallor of the mucous membranes is only 28% sensitive and 87% specific (with high predictive value) in distinguishing children with anemia (defined as hemoglobin < 11.0 g/dl) and 49% sensitive and 79% specific in distinguishing severe anemia (hemoglobin < 7.0 g/dl) [5]. Thus, this sign is reasonably predictive when present, but not helpful when absent, as only one-third to one-half of children who are anemic (depending on severity) will show pallor.

Iron deficiency anemia tends to develop slowly; therefore the body has time to adapt, and the disease often goes unrecognized for some time. In severe cases, shortness of breath can occur. Pica may also develop; of which consumption of ice, known as pagophagia, has been suggested to be the most specific for iron deficiency anemia [6].

A diagnosis of iron-deficiency anemia requires further investigation into its cause. It can be caused by increased iron demand, increased iron loss, or decreased iron intake. Increased iron demand often occurs during periods of growth, such as in children and pregnant women. For example, during stages of rapid growth, babies and adolescents may outpace their dietary intake of iron which can result in deficiency in the absence of disease or a grossly abnormal diet. Iron loss is typically from blood loss. One example of blood loss is by chronic gastrointestinal blood loss, which could be linked to a possible cancer. In women of childbearing age, heavy menstrual periods can be a source of blood loss causing iron-deficiency anemia. People who do not consume much iron in their diet, such as vegans or vegetarians, are also at increased risk of developing iron deficiency anemia [7].

The body normally gets the iron it requires from foods. If a person consumes too little iron, or iron that is poorly absorbed (non-heme iron), they can become iron deficient over time. Examples of iron-rich foods include meat, eggs, leafy green vegetables and iron-fortified foods. For proper growth and development, infants and children need iron from their diet. For children, a high intake of cow's milk is associated with an increased risk of iron-deficiency anemia. Other risk factors for iron-deficiency anemia include low meat intake and low intake of iron-fortified products [8].

The National Academy of Medicine updated Estimated Average Requirements and Recommended Dietary Allowances in 2001. The current EAR for iron for women ages 14–18 is 7.9 mg/day, 8.1 for ages 19–50 and 5.0 thereafter (post menopause). For men the EAR is 6.0 mg/day for ages 19 and up. The Recommended Dietary Allowance is 15.0 mg/day for women ages 15–18, 18.0 for 19–50 and 8.0 thereafter. For men, 8.0 mg/day for ages 19 and up. (Recommended Dietary Allowances are higher than Estimated Average Requirements so as to identify amounts that will cover people with higher than average requirements.) The Recommended Dietary Allowance for pregnancy is 27 mg/day, and for lactation, 9 mg/day. For children ages 1–3 years it is 7 mg/day, 10 for ages 4–8 and 8 for ages 9–13. The European Food Safety Authority refers to the collective set of information as Dietary Reference Values, with Population Reference Intakes instead of Recommended Dietary Allowances, and Average Requirements instead of Estimated Average Requirements. For women the Population Reference Intake is 13 mg/day ages 15–17 years, 16 mg/day for women ages 18 and up who are premenopausal and 11 mg/day postmenopausal. For pregnancy and lactation, 16 mg/day. For men the Population Reference Intake is 11 mg/day ages 15 and older. For children ages 1 to 14 the Population Reference Intake increases from 7 to 11 mg/day. The Population Reference Intakes are higher than the US Recommended Dietary Allowances, with the exception of pregnancy [9].

Anemia can result from significant iron deficiency. When the body has sufficient iron to meet its needs (functional iron), the remainder is stored for later use in cells, mostly in the bone marrow and liver. These stores are called ferritin complexes and are part of the human (and other animals) iron metabolism systems. Men store about 3.5 g of iron in their body, and women store about 2.5 g [7].

Iron is a mineral that is important in the formation of red blood cells in the body, particularly as a critical component of hemoglobin. About 70% of the iron found in the body is bound to hemoglobin. Iron is primarily absorbed in the small intestine, in particular the duodenum and jejunum. Certain factors increase or decrease absorption of iron. For example, taking Vitamin C with a source of iron is known to increase absorption. Some medications such as tetracyclines and antacids can decrease absorption of iron. After being absorbed in the small intestine, iron travels through blood, bound to transferrin, and eventually ends up in the bone marrow, where it is involved in red blood cell formation. When red blood cells are degraded, the iron is recycled by the body and stored [10].

When the amount of iron needed by the body exceeds the amount of iron that is readily available, the body can use iron stores (ferritin) for a period of time, and red blood cell formation continues normally. However, as these stores continue to be used, iron is eventually depleted to the point that red blood cell formation is abnormal. Ultimately, anemia ensues, which by definition is a hemoglobin lab value below normal limits [11].

In India, anemia is one of the most familiar health problems which is much more widespread in the rural than in the urban areas. Anemia is a nutrition problem worldwide and its prevalence is higher in developing countries when compared to the developed countries [12]. Anemia affects mainly women of child-bearing age, and adolescent girls. Adolescent girls are more prone to anemia and malnutrition. Insufficient nutritional diet in adolescent age can have

disastrous effects during their reproductive period [13]. If adolescents are well nourished, they can make optimal use of their skills, talents and energies today, and be healthy and responsible citizens and parents of healthy babies tomorrow. Iron deficiency is the most common and widespread nutritional disorder in the world [14]. It is the only nutrient deficiency which is also significantly prevalent in all industrialized nations. According to the data of the World Health Organization (WHO), the prevalence of iron deficiency anemia (IDA) in industrialized countries and in non-industrialized countries is 10–20% and 50–60%, respectively [15]. Iron deficiency impairs the cognitive development of children from infancy through adolescence. It also damages immune mechanisms and is associated with increased morbidity rates. The importance of iron deficiency and anaemia as a public health problem has been increasingly recognized by health authorities and policy makers. Although efforts are targeted primarily to prevent iron deficiency, it is still the most common nutrient deficiency all over the world [15]. Hence present study was planned for clinical evaluation of factors responsible for prevalence of anemia in childrens referred to hospital in north Bihar region.

Methodology

The present study was planned in Department of Paediatrics, Darbhanga Medical College and Hospital, Laheriasarai, Darbhanga. Total 540 cases of the childrens were evaluated in the present study. Out of 540 cases there are 45 cases were found anaemic. Hemoglobin was estimated by Sahli's method and expressed in gm%, peripheral smear was stained by Leishman's stain. A detailed history was recorded with particular emphasis on symptoms suggestive of anemia such as weakness and easy fatigability, breathlessness on exertion, pica. A thorough clinical examination of every child was done especially for pallor, nail changes, glossitis, fundus of eye, cardio vascular involvement in form of tachycardia, haemic murmur, congestive cardiac failure, raised JVP and edema.

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

Patients with anemia in age group of 1 yearsto 14 years admitted in pediatric ward.

Exclusion criteria

Children less than 1 years and teenagers more than 14 years. Out patients who were not admitted in the hospital. Patients having mild to moderate anemia, severe anemia due to malaria, and patients collapsed due to congestive cardiac failure within 12 hours of admission, communicable diseases like HIV, tuberculosis & hepatitis were excluded.

Results and Discussion

The term 'nutritional anemia' encompasses all pathological conditions in which the blood hemoglobin concentration drops to an abnormally low level, due to a deficiency in one or several nutrients. The main nutrients involved in the synthesis of hemoglobin are iron, folic acid, and vitamin B. Iron deficiency is by far the first cause of nutritional anemia worldwide. Folic acid deficiency is less wide-spread and is often observed with iron deficiency. Vitamin B deficiency is Far rarer.

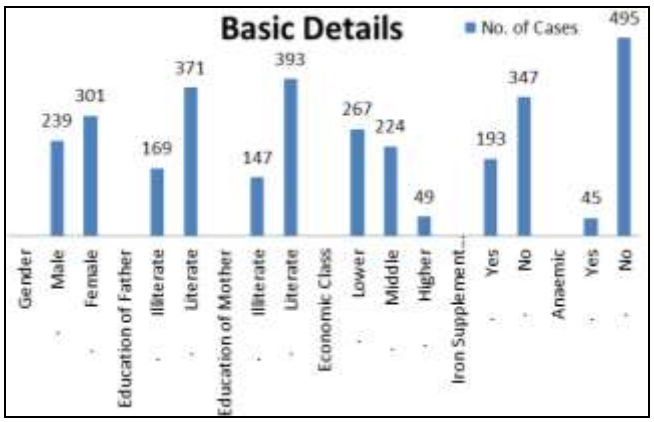

Fig 1: Demographic Parameters

Table 1: Age group and No of Cases

Age	Number of Cases	Positive Cases
1 to 2 year	43	6
2 to 3 years	59	11
3 to 6 years	128	16
6 to 9 years	143	9
9 to 12 years	167	5
Total	540	45

Table 2: Distribution of Anemia based in Hemoglobin Levels

Age	Number of Anaemic Cases
Below 6 years	
10.0 – 10.9g/dl(mild)	9
9.0 – 9.9 g/dl (moderate)	7
< 9.0 g/dl(severe)	5
Total Cases	21
Above 6 years	
11.0 – 11.9 g/dl (mild)	10
10.0 – 10.9g/dl (moderate)	5
< 10.0 g/dl (severe)	9
Total Cases	24

In a recent study conducted in semi urban Nepal, the prevalence of anemia in adolescent girls aged 11-18 years was found to be about 68.8% [16]. In some of the less developed countries like Peru Indonesia and Bangladesh, the prevalence of anemia in girls has been found to be around 25-30% [17]. Aggarwal, *et al.* [18] in a government school based study from middle socioeconomic group of North East Delhi reported a prevalence of anemia as 45%. Similarly, studies on prevalence of anemia from different states of rural India, reported a prevalence of anemia from 46% to 98% [19, 21].

There are hardly any studies on the prevalence of anemia in boys. In our study, the overall prevalence of anemia in boys was 8% similar to one from a developed county like Norway [22]. In rural area, the prevalence of anemia in the boys was 15.3%. Since the overall prevalence of anemia in the girls from rural population in our study is relatively low as compared to national standards, we speculate that if more studies are conducted in boys from low socio-economic group or rural or slum area, the prevalence of anemia in boys will be much higher nation-wide. Various studies

confirm that serum ferritin is one of the most sensitive method for assessment of iron stores and for the detection of mild iron depletion [23]. Its levels are directly related to bone marrow iron in all disease groups except those involving chronic inflammatory stage, malignancy and increased red cell turnover.

a study in tribal area of childhood anaemia in Mohana block in Orissa 5yrs to 14yrs by T sahu, N C Sahani, L Patnaik showed almost all children (99%) were found to be anaemic, more than 60% of them had moderate to severe anaemia. In their study they found mild, moderate, severe anaemia to be 42.1%, 49.1%, 8.8% respectively [24].

Anemia is more prevalent in vegetarian group of children compared to non-vegetarian group of children as like in Verma *et al*. study [25]. Prevalence of anemia decreases with improvement in socioeconomic status.

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. And may be due to hormonal changes which occurs at the time of onset of menarche and loss of menstrual blood in girls who already attained menarche. Prevalence of anemia is significantly higher in vegetarian group of children this is due to poor bioavailability of dietary iron coupled with low intake of haem iron derived from animal food, low intake of green leafy vegetables and dairy products. Major components of diet in developing countries like India are cereals and roots which are not favorable for iron absorption as compared with meat and fish. The frequency and amount of consumption of non-vegetarian food among the included population in quiet less as greater number of lower socioeconomic status children were included in our study.

Under iron deficiency condition, formation of Hb is reduced resulting in a reduction of MCH [26]. The transmembrane protein (ferroportin) is responsible for the transfer of iron from enterocytes and monocytes/macrophages to the circulation. It was found that ferroportin mRNA expression was significantly reduced in monocytes of anemic subjects compared with controls [27]. Importantly, the decreased expression of ferroportin was paralleled by increased iron storage in monocytes of anemia of chronic disease patients as estimated by hyperferritinemia. As a functional consequence of decreased ferroportin expression and the subsequent reduction of cellular iron export, intracellular iron levels will increase which interferes in the process of erythropoiesis, thus decreasing expression of monocytes leading to decrease in Hb. In this study, inverse relationship of RDW was seen with the Hb in iron deficiency anemia; however, no such correlation happened with non-iron deficiency anemia [28].

Childhood anemia is a challenging issue in healthcare centers and hospitals. Microcytic hypochromic anemia is the commonest type in pediatric age group. Since iron deficiency is the most common etiology for microcytic hypochromic anemia, it is possible to correct anemia with combined supplemental iron and improved diet [29]. Apart from iron deficiency, other conditions like childhood infections, inherited diseases, deficiency of micronutrients and environmental conditions also play an important role in anemia. The underlying cause may vary with different regions of the world [30].

Nutrition and Health Education sessions should be conducted in schools and in community to inculcate healthy eating habits. Adolescents should be informed about correct dietary practices for increasing iron intake. They should be informed about the causes, symptoms and ill effects of the anemia and importance of prophylactic/curative treatment for anemia. Also training should be given to them to understand the importance of each body part so that they don't feel shy. Apart from these, the health messages should include prevention of worm infestation, passing of blood in stools and personal hygiene.

Out study has certain limitations. Since the sample size in our study is small, the data of this study cannot be generalized. Hence, more studies should be done in future with larger sample size to reduce bias and improve generalisability. Long-term follow-up is necessary in iron deficiency patients to record longterm neurodevelopmental outcome, which was not done in our study.

Conclusion

Anaemia is still a major health problem in our country. Childhood anaemia still continues to be a significant public health problem in school children between 6-12 years. Nurses need to be aware of prevalence of Anemia among the school going children. Interventions should be implemented to increase the hemoglobin level in children. Nurses can educate parents, teachers and students regarding advantages of balance diet supplementation and intake of iron rich food.

References

1. Janz TG, Johnson RL, Rubenstein SD. "Anemia in the Emergency Department: Evaluation and Treatment". Emergency Medicine Practice. 2013; 15(11):1-15. PMID 24716235.
2. How Is Iron-Deficiency Anemia Diagnosed?". NHLBI. 26 March 2014. Archived from the original on 15 July 2017. Retrieved, 2017.
3. What Is Iron-Deficiency Anemia? - NHLBI, NIH. Www.nhlbi.nih.gov. 26 March 2014. Archived from the original on 16 July 2017. Retrieved 17 July, 2017.
4. GBD. Mortality Causes of Death Collaborators (2016). "Global, regional, and national life expectancy, all-cause mortality, and cause-specific mortality for 249 causes of death, 1980-2015: a systematic analysis for the Global Burden of Disease Study 2015". Lancet. 2015; 388 (10053):1459-1544. doi:10.1016/s0140-6736(16)31012-1. PMC 5388903. PMID 27733281.
5. "Detecting Iron Deficiency Anemia among Children (9-36 Months of age) by implementing a Screening Program in an Urban Slum". Archived from the original on 2012-07-12. Retrieved 2012-05-15.
6. Goldman Lee, Schafer Andrew. Goldman-Cecil Medicine. pp. 1052–1059, 1068–1073, 2016, 2159-2164. ISBN 978-1-4557-5017-7.
7. Edward T, Bope Rick, Kellerman D. Conn's Current Therapy. Philadelphia: Elsevier, 2018, pp. 403-405.
8. Decsi T, Lohner S. "Gaps in meeting nutrient needs in healthy toddlers". Ann Nutr Metab. 2014; 65(1):22-28. doi:10.1159/000365795. PMID 25227596.
9. "Overview on Dietary Reference Values for the EU

population as derived by the EFSA Panel on Dietetic Products, Nutrition and Allergies" (PDF). European Food Safety Authority, 2017.
10. Howard Martin, Hamilton Peter. Haematology: An Illustrated Colour Text, 2013, pp. 24-25. ISBN 978-0-7020-5139-5.
11. Porwit Anna, McCullough Jeffre, Erber Wendy. Blood and Bone Marrow Pathology, 2011, 173-195. ISBN 9780702031472.
12. Garg N, Bhalla M. To study the prevalence of anaemia among school going children in rural area of Faridkot district, India. Int J Contemp Pediatr. 2016; 3:218-23.
13. Nayar PD, Mehta R. Child Health. In: Gupta P, Ghai OP, Editors. Textbook of Preventive and Social Medicine. 2nd ed. New Delhi: CBS Publishers and Distributors, 2007, 428-37.
14. DeMaeyer E, Adiels-Tegman M. The prevalence of anaemia in the world. World Health Stat Q. 1985; 38(3):302-16. [PubMed]
15. World Health Organisation, Iron Deficiency Anaemia Assessment, Prevention, and Control, A Guide for Programme Managers, WHO, 2001. [PubMed]
16. Shah BK, Gupta P. Anemia in adolescent girls: A preliminary report from semi urban Nepal. Indian Pediatr. 2002; 39:1126-1130.
17. Gupta P, Shah BK. Weekly vs daily iron and folic acid supplementation in adolescent Nepalese girls. Arch PediatrAdolsc Med. 2002; 156:131-135.
18. Agarwal KN, Gomber S, Bisht H, Som M. Anaemia prophylaxis in adolescent school girls by weekly or daily iron-folate supplementation. Indian Pediatr. 2003; 40:296-301.
19. Kanani S. Combating anemia in adolescent girls: a report from India. Mothers Child. 1994; 13:1-3.
20. Pathak P, Singh P, Kapil U, Raghuvanshi RS. Prevalence of iron, vitamin A and iodine deficiencies among adolescent pregnant mothers. Indian J Pediatr 2003; 70:299-301.
21. Sampath Kumar V, Rajaratnam A. Prevalence of anaemia and hookworm infestation among adolescent girls in one rural block of Tamil Nadu. Indian J Matern Child Health. 1997; 8:73-75.
22. Richard LG. Iron deficiency and iron deficiency anemia. Richard LG, Foerster J, Lukem J, Paraskevas F, Green JP, Rodgus GM, editors. Wintrobe's Clinical Haematology. 10th ed. Baltimore: Interprint, 1999, p 979-1010.
23. Jacob RA, Sandotead HM, Klevay LM. Utility of serum iron as a measure of iron deficiency in normal males undergoing repetitive phlebotomy. Blood. 1980; 56:786-791.
24. Sahu T, Sahani NC, Patnaik L. Iron deficiency in India. Recent advances in paediatrics special volume in haematology. Eds. GupteSuraj. Published By Jaypee. 2000; 7:1-21.
25. Verma M, Chhatwal J, Kaur G. Prevalence of anaemia among urban school children of Punjab. In Pediatrics 1998; 35:1181-6.
26. Thompson B. Food-based approaches for combating iron deficiency. In Nutritional Anemia, M. B. Zimmermann and K. Kraemer, Eds., SIGHT and LIFE Press, Basel, Switzerland, 2007, pp. 338-358.
27. Theurl I, Mattle V, Seifert M, Mariani M, Marth C, Weiss G. Dysregulated monocyte iron homeostasis and erythropoietin formation in patients with anemia of chronic disease. Blood. 2006; 107(10):4142-4148.
28. Aulakh R, Sohi I, Singh T, Kakkar N. Red cell distribution width (RDW) in the diagnosis of iron deficiency with microcytic hypochromic anemia. Indian Journal of Pediatrics. 2009; 76(3):265-267.
29. Kamil KH, Mohammad NS. À laboratory study of Anemia in children Aged 6 months to 6 years in Erbil City. Medical Journal of Babylon. 2014; 11(2):274-284.
30. Gao W. Severity of Anemia among Children under 36 Months Old in Rural Western China. PLoS ONE. 2013; 8(4):e62883.