

Factors Responsible for Iron Deficiency Anemia in Children

Maryam Fakhar Qureshi¹, Hina Rafique¹, Khawaja Tahir Mahmood², Fatima Amin¹, Mariam Zaka¹

¹Department Of Pharmacy, Lahore College For Women University, Lahore, Pakistan

²Drugs Testing Laboratory, Punjab, Lahore

Abstract:

Iron deficiency Anemia is a condition where a person has inadequate amounts of iron to meet body demands. It is a decrease in the amount of red cells in the blood caused by having too little iron. It is caused by insufficient iron in the diet and it is one of the most common nutritional disorders in the world. The most vulnerable age for iron deficiency anemia in children is six months to age three. For determination of different factors which could be responsible for developing iron deficiency anemia in children of different age groups, a retrospective study carried out in different hospitals of Lahore, Pakistan. A total of 50 patients, having complaint of anemia, were selected from two hospitals, 'Children Hospital' and 'Services Hospital'. A well designed performa was developed for this study and sufficient data was collected. This data is then evaluated to determine the 'factors responsible for iron deficiency anemia in children. The results showed that all of the 50 patients were suffering from anemia (Hb level=less than 8 mg/dl) most probably due to iron deficiency, many different factors were evaluated which developed iron deficiency anemia in these patients. Poor diet and poverty were the leading causes also accompanied by certain diseases in which IDA can occur as one of their outcomes. Diet related factors are majorly responsible for such a high prevalence of Iron deficiency Anemia in infants and children because of their greater requirements of iron for better growth.

Key Words: Factors, Iron deficiency Anemia, Children, Poor diet

INTRODUCTION:

The condition of having less than the normal number of red blood cells or less than the normal quantity of hemoglobin in the blood is termed as anemia. The oxygen-carrying capacity of the blood is, therefore, decreased. Iron-deficiency anemia is the most common type. Iron deficiency anemia occurs because of a lack of the mineral iron in the body. Bone marrow in the center of the bone needs iron to make hemoglobin, the part of the red blood cell that transports oxygen to the body's organs. Without adequate iron, the body cannot produce enough hemoglobin for red blood cells. Iron has been recognized as a potent hematinic. The consequences of iron deficiency, particularly from a socioeconomic standpoint, are especially important. A recent review indicates that approximately 30% of the estimated world population of nearly 4.5 billion are anemic, and at least half of these, 500 to 600 million people, are believed to have iron deficiency anemia [1].

Iron deficiency anemia is considered the most common nutrition deficiency worldwide. It generally results when the iron demands by the body are not met by iron absorption, regardless of the reason. Individuals with IDA have

inadequate intake, impaired absorption or transport, physiologic losses associated with chronological or reproductive age, or chronic blood loss secondary to disease [2].

It is the main cause of anemia in infancy, childhood and pregnancy. In the developing world the prevalence of iron deficiency is high, and is due mainly to a low intake of bioavailable iron [3].

Early childhood anemia is associated with factors reflecting poor socioeconomic status and recent diarrheal and febrile illnesses [4]. Diets that have a high content of phytate and other modifiers of mineral absorption are associated with an increased risk of iron-deficiency anemia [5]. *H. pylori* infection have a role in the development of some extra gastrointestinal diseases, including iron deficiency anemia [6]. Supplementation with iron is generally recommended during pregnancy to meet the iron needs of both mother and fetus. When detected early in pregnancy, iron deficiency anemia (IDA) is associated with a > 2-fold increase in the risk of preterm delivery. The effects of maternal anemia and iron deficiency on pregnancy outcome [7]. Mounting maternal iron deficiency in pregnancy reduces fetal iron

stores on infant development This evidence supports that iron supplementation during pregnancy should be taken [8].

Most correlational studies have found associations between iron-deficiency anemia and poor cognitive and motor development and behavioral problems. It was indicated that children anemic in infancy continue to have poorer cognition school achievement & more behavior problems into middle childhood [9]. Inflammatory disease as well as iron deficiency may play an important role in the cause of anemia. The relationship between Fe deficiency, inflammatory disease, and anemia was seen. The prevalence of anemia was more than twice as high in the lowest than in the highest income group [10].

Ferritin in serum was quantitated by radioimmunoassay to determine the usefulness of iron stores during normal development and in the diagnosis of iron deficiency in infants and children. The serum ferritin assay promises to be a useful tool in the evaluation of iron status, particularly in children [11]. Examination of the hemoglobin distribution in the population and assessment of the hemoglobin response to supplementation are alternative approaches to defining iron status and the nature of anemia. Prevention and control of iron deficiency requires the combined approach of dietary improvement, fortification of a common staple food when feasible, and appropriate iron supplementation for infants and pregnant women. Controlling iron deficiency requires coordination with other nutrition and primary health care programs as part of an integrated approach to improved health and nutrition of the population. [12]. Even when simple iron deficiency was strongly suspected, the child with severe anemia deserves a careful and thorough work-up before treatment is begun. Many other possible causes of anemia need be excluded. No one test specifically identifies iron deficiency, but the combined use of several tests of iron status can establish iron deficiency with certainty. Hemoglobin level, mean corpuscular volume, serum iron, total iron binding capacity, free

erythrocyte porphyrin and serum ferritin are the important studies [13].

The treatment of iron deficiency should always be initiated with oral iron. When this fails because of large blood losses, iron malabsorption, or intolerance to oral iron, parenteral iron can be given using iron dextran, iron gluconate or iron sucrose [14].

Objective of the Study:

- Observing relationship of IDA with financial status of patient
- Evaluation of diet inadequacies and failure of body to process iron efficiently
- Determination of several GIT disorders which can responsible for IDA
- Study of different Kidney diseases which can lead to IDA
- Role of Infections in developing IDA.

MATERIAL AND METHOD

50 patients who presented in in-patient department and emergency department of 2 Hospitals (Children Hospital, Services Hospital) were studied. In this study, children suffering from anemia were selected. Main focus of this study was to assess different factors responsible for developing iron deficiency anemia in children.

For this purpose, detailed case history of selected patients were studied including their social, family, dietary history and description of chief complaint. Diagnosis of anemia is done through lab test but symptoms in severe cases also confirms this condition. Although Complete Blood Count (CBC) gives preliminary idea about the reason of anemia. During the study, not a single patient was subjected to specific tests which are helpful in assessing iron status of body. This is because, these tests are expensive in cost and most people can not afford the expenses. Thus, physicians mostly take an idea about nature of anemia through CBC report and starts the treatment.

RESULT

The study was carried out in 50 patients of 2 hospitals (Children Hospital, Services Hospital)

to assess different factors which could be responsible for developing iron deficiency anemia in children. A well designed performa was developed to collect the data and then it was evaluated.

FIGURE 1: N=50:

62% patients develop IDA after the birth and 38% have it since birth.

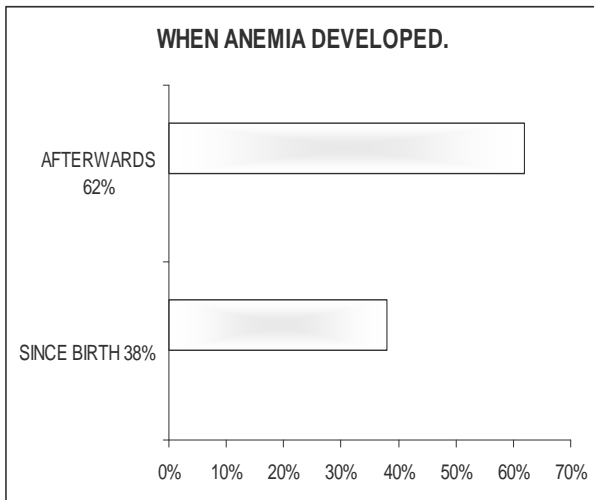


Figure 2: N=50

54% children with age limit of 1-6 years, 30% having age less than 1 year and 6% with age 7-12 years are suffering from IDA.

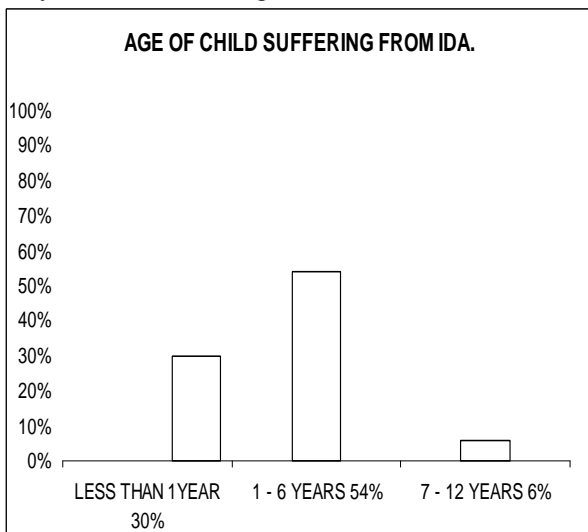


Figure 3: N=50

In our study, Hb level was ranging from 6-7.9 mg/dl of 54% patients, 4=5.9 mg/dl of 34% patients and 1-3.9 mg/dl of 14% patients.

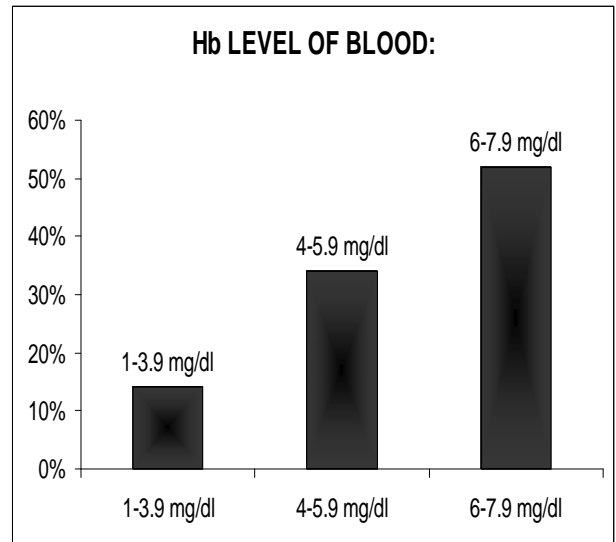


Figure 4: N=50

36% patients inherit iron deficiency from their mothers which leads to IDA afterwards, 52% patients acquire it due to some other reasons, mothers of 12% patients don't know that whether they had iron deficiency during pregnancy or not.

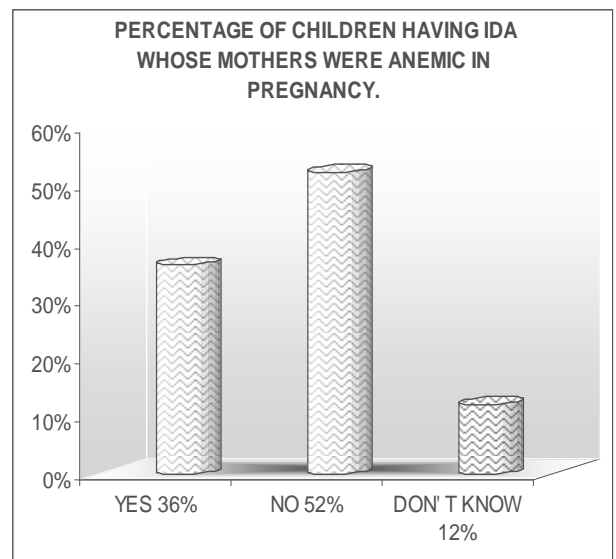


Figure 5: N=50

66% patients belong to lower class, 34% are from middle class

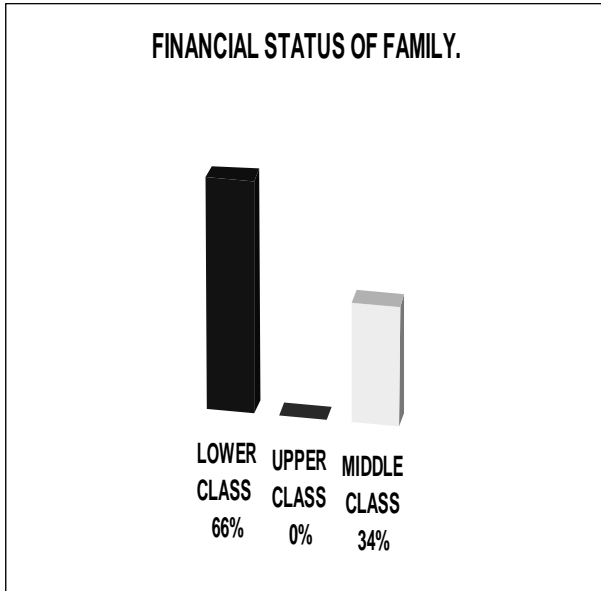


Figure 6: N=50

Out of 50 patients, only 20% take iron rich foods regularly while other 80% do not.

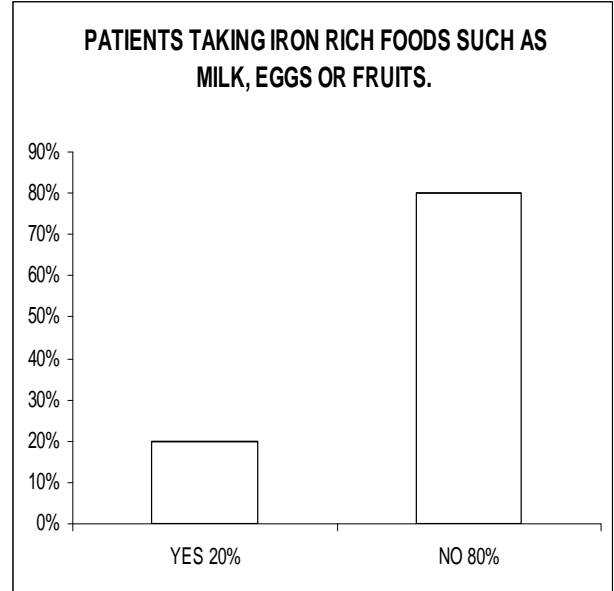


Figure 7: N=50

Out of 50 patients, 36% children have habit of pica, again 36% have habit of taking caffeine containing products such as tea, chocolate, carbonated drinks and 28% take excessive cow's milk.

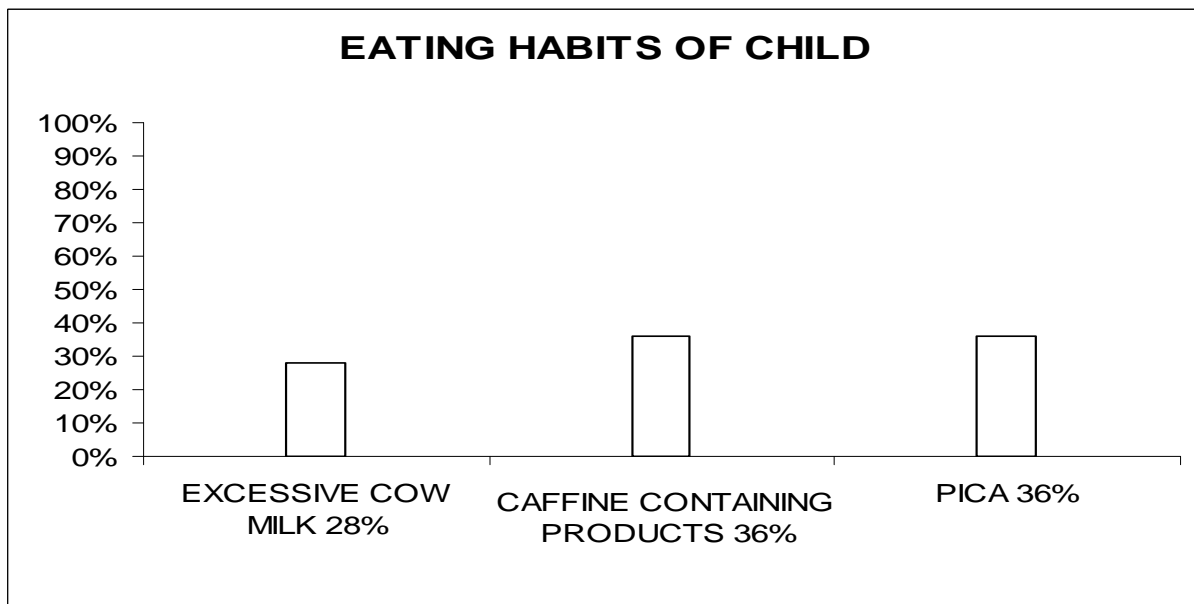
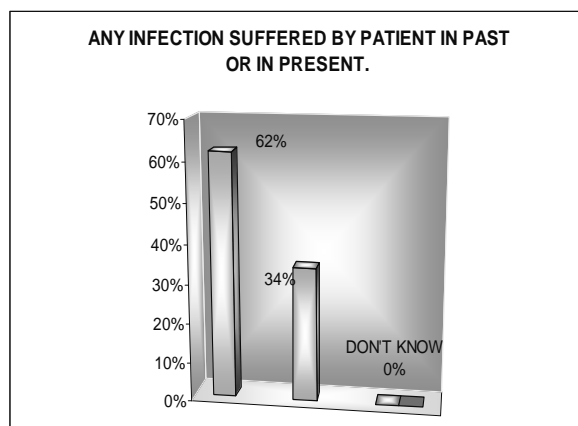
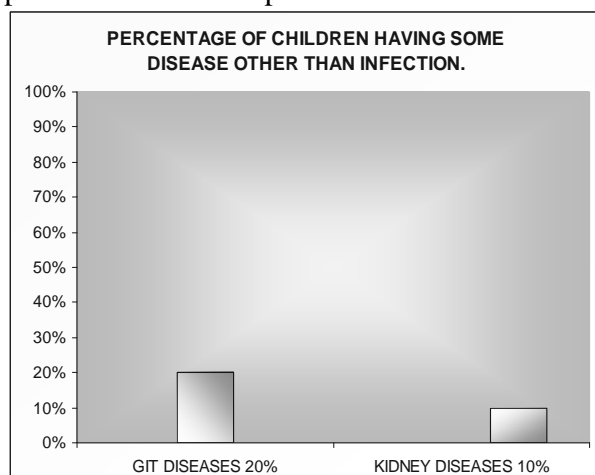


Figure 8: N=50

In our study, 62% patients were found to suffer from different sort of infections.

**Figure 9: N=50**

In our study, apart from infection 20% children was with GIT disorders and 10% were presented with renal problems.

**DISSCUSION:**

Anemia is a condition associated with lesser number of RBC's in blood than normal. There are several types of anemia but anemia due to mineral deficiency(iron) is most common in these days. Iron deficiency anemia(IDA) in children is most commonly occurring problem world wide and it is considered as public health problem. About one fifth of world's population is suffering from this problem. However, the prevalence is greater in developing countries as compared to developed ones. When a body run short of iron, it becomes un-available for hemoglobin synthesis and hemoglobin level

drops leading to iron deficiency anemia.

IDA could be diagnosed through symptoms in severe conditions but mostly lab tests are required for confirmation that either the anemia is due to iron deficiency or not. Lab tests for determining iron status in body are very expensive and mostly Hb level of blood is considered as diagnostic parameter of IDA in Pakistan. There are several factors which are responsible for developing IDA either directly or in-directly in children. Factors directly influencing a child to suffer from IDA include poor financial status, poor intake of iron rich foods, inheritance from mother. Factors indirectly responsible for developing IDA in children include GIT problems, Kidney diseases and Infections. Among the factors mentioned above, poor diet and poor financial status are major contributing factors for incidence of IDA especially in developing countries like Pakistan.

Most of the children developed anemia after birth which shows their poor dietary habits or presence of some sort of diseases or infections. Majority of the patients belong to lower class so due to financial problems people are unable to provide good living facilities (diet, medical etc) to their children. Poor diet intake is the main factor leading to IDA in peads. About 80% of children develop this nutritional deficiency disorder because of unavailability of proper diet. Poor diet intake means either not having proper diet to eat or consuming such food items which can interfere with absorption of essential dietary components such as iron. The body absorbs various forms of iron at different rates. Heme iron comes primarily from animal products, such as meat, fish, poultry and seafood. It is more readily absorbed than the non-heme form of iron, which is mostly found in plant sources such as green leafy vegetables, nuts, whole grain breads, and iron-fortified cereals. Generally, non-heme iron is more difficult for the body to absorb. This is because the absorption of non-heme iron can be inhibited by other food items. Intake of excessive cow's milk and caffeine containing food items contribute in depleting iron stores of body but these factors are not entirely

responsible to develop iron deficiency anemia. Actually, reduced absorption of iron coupled with poor iron intake to render the body iron deficient and then anemic. Sometimes children belonging to poor families eat non food items (pica) to satisfy their hunger. Ingestion of such items fills their stomach and they start eating these craved items and quit regular foods in favor of these non food items. These non food items interfere with absorption of iron in regular foods and leads to anemia (iron deficiency) by displacing iron rich foods. Occurrence of IDA is greater in children after birth due to above mentioned diet related factors but certain infants also inherit this problem from their mothers.

Sometimes, children belonging to poor families eat non food items to satisfy their hunger. Ingestion of such items fills their stomach and they start eating these craved items and quit regular foods in favor of these non food items. These non food items interfere with absorption of iron in regular foods and leads to anemia (iron deficiency) by displacing iron rich foods. Occurrence of IDA is greater in children after birth due to above mentioned diet related factors but certain infants also inherit this problem from their mothers. It is not uncommon for a woman to develop anemia during pregnancy. Anemia in pregnant ladies, due to an iron deficiency, can cause several problems for the baby as well. When a woman gets pregnant her blood needs not only enough iron for herself but for her baby as well. If a mother is suffering from iron deficiency during pregnancy, there is a strong chance for her baby to acquire iron deficiency anemia as well.

Other than diet issues, certain diseases also result in iron deficiency anemia as one of their outcomes. In early stages of life, most of infants are liable to different sort of infections such as gastroenteritis, parasitic infections etc which in severe conditions result in IDA. Different gastrointestinal and kidney diseases such as celiac disease, internal intestinal bleeding, renal failure, nephrotic syndrome and certain urinary tract infections may also contribute in developing IDA in patients suffering from these diseases. Usually IDA

resulting due to some other medical problem is not of very serious nature until or unless it is coupled with poor dietary habits or the disease which the patient is suffering from is of chronic nature.

Iron deficiency anemia is a nutritional disorder and it mainly occurs due to poor nutrition of peds. Thus, it can be easily preventable by improving dietary habits of children and infants. IDA which develops due to different diseases, it is curable simply by treating the disorder which is responsible for it.

CONCLUSION:

Prevalence of iron deficiency anemia (IDA) in children is greater. Among the children (from birth to 15 years), the incidence of IDA is greater for infants and pre-school children because of greater requirements of iron in this age. Among the factors discussed above, major reasons of IDA development are poor diet and poverty. Iron is a mineral which is essential for body and it is not synthesized inside the body and taken from different food sources. If diet does not contain sufficient iron in it to meet the body needs, IDA result. Improvement in diet habits are required for avoiding IDA in children. For this purpose, parents should be properly counseled about dietary requirements of their children. Pregnant mothers should also maintain adequate iron stores in body throughout the period of pregnancy to meet the needs of her body and her baby's as well. Pharmacist are in better position to counsel the parents and pregnant ladies about significance of proper iron rich diet to prevent this most commonly occurring disorder in children.

RECOMMENDATIONS:

IDA is a disorder which mainly develops in peds due to poor diet habits or through inheritance from mother. This is the joint responsibility of health care providers including physicians and pharmacist to create awareness about this most commonly occurring problem in people. Pharmacist, being unique in their knowledge, are in best position to do this task efficiently at community level. Being a pharmacist, there is just need to have faith on

your self and come forward to accept this responsibility for betterment of public health. Pharmacist can counsel parents not only for prevention but also for management of this nutritional disorder in their children. Pharmacist can counsel pregnant ladies to have their proper check-up and blood screening throughout the period of pregnancy, to conduct tests which evaluate iron status of body especially in third trimester of pregnancy, to take iron rich foods during pregnancy abundantly to meet increasing demand of iron. On the other hand, parents can also take advice from their physicians and pharmacist about proper diet plan for their children to meet their growing needs of iron. Pharmacist can educate parents about different foods which are essential for their children and also about those which are not good for their health. In case of management of IDA, pharmacist can design proper treatment strategies depending upon severity and causes of IDA taking into considerations drug-drug and drug-food interactions.

REFERENCES:

- [1]. JD Cook and SR Lync,. *Journal of American Society of Hematology*.1986,68, 803-809.
- [2]. Susan F. Clark,. *Nut Clin Prac*. 2008,23, 128-141.
- [3]. [Manuel Olivares, Tomás Walter, Eva Hertrampf, Fernando Pizarro,. *Br Med Bull*. 1999, 55, 534-543.
- [4]. Khurram Hassan, Kevin M. Sullivan, Ray Yip and Bradely A Woodruff,. *J.Nutr*. 1997, 127, 2194-2198.
- [5]. TA Sanders and S Reddy,. *Am J Clin Nutr*. 1994, 59, 1176-1181.
- [6]. Baysoy, Gökhan; Ertem, Deniz; Ademoglu, Evin; Kotiloglu, Esin; Keskin, Sabiha; Pehlivanoglu, Ender,. *JPGN*. 2004, 38, 117-235.
- [7]. Theresa O Scholl,. *Am J Clin Nutr*. 2005, 81, 1218-1222.
- [8]. Lindsay H Allen,. (2000) *Am J Clin Nutr*. 2000, 71, 1280-1284.
- [9]. Sally Grantham-McGregor³ and Cornelius Ani,. *Am J Clin Nutr*. 2001, 42, 1221-1228.
- [10]. R Yip and P.R Dallman,. *Am J Clin Nutr*. 1988, 48, 1295-1300.
- [11]. Martti A. Siimes Joseph E. Addiego Jr. and Peter R. Dallman,. *Journal of American Society of Hematology*. 1974, 43, 581-590.
- [12]. Noel W Solomons,. *J.Nutr*. 1994, 124, 1479-1490.
- [13]. Pochedly C, May SL,. *PubMed*. 1987, 35, 195-200.
- [14]. [Ann Chen Wu.MD, Leann Lesperance., Henry Bernstein Do,. *Neo Reviews*. 2002, 23, 171-178