# Study of iron deficiency anemia in early childhood

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**Abstract**
**Background:** Iron deficiency is a global public health problem with unique cultural, dietary and infectious hurdles that are difficult to overcome. Iron is vital for all living organisms as it is essential for multiple metabolic processes including oxygen transport, DNA synthesis and electron transport. **Aims and Objectives:** [1]To study clinical profile of Iron deficiency anemia in hospitalised patients. [2]To study association between socio-economic status and IDA.[3]To study symptomatology in IDA. [4]To find out risk factors and disease association with IDA. **Material and Method** This was retrospective study of iron deficiency anemia in early childhood, carried out from July 2016 to November 2018 in a tertiary care hospital. Total 100 patients were enrolled for the study. Informed consent was taken from relatives. Selection Criteria:  Age group upto 5 years, Hemoglobin < 11 gm/dl. Anemia was classified based on WHO recommendation cut off value of < 11.0 gm/dl. Hb concentration less than 7 gm/dl was considered severe anemia. 7 to 10 gm /dl moderate anemia and < 11 gm/dl but > 10 gm/dl as mild anemia. All details were filled in the preformed proforma. Necessary investigations were performed on venous blood in standard laboratories. Data was analyzed and results were obtained.
**Observation and Results**: In our study almost 80% patient were between 6 months to 36 months. It is more common in poor socioeconomic class. Pallor, cognitive changes and fever were the most common presenting symptoms. Most common cause for IDA is poor intake in 69 % patients. Worm infestation is present in 17% of patients. 35% patients were from Grade III and IV of PEM.
**Key Word:** IDA-iron deficiency anemia, PEM- protein energy malnutrition, HB- hemoglobin, CNS- central nervous system.

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## INTRODUCTION

Iron deficiency is a global public health problem with unique cultural, dietary and infectious hurdles that are difficult to overcome. Iron deficiency is more common in developing countries where children consumes iron poor food and are infected with malaria and infested with parasites. Iron is the fourth most abundant element in the earth's crust. Iron plays a central role in erythropoiesis and is required for formation of hemoglobin and keeping body's hemostasis in balance. Iron is vital for all living organisms as it is essential for multiple metabolic processes including oxygen transport, DNA synthesis and electron transport. More than 30% of the world's population is suffering from anemia. According to UNICEF based statistics, the estimated prevalence of IDA in children under 5 years of age is 75%.[15] Besides anemia, iron deficiency leads to many other systemic changes notable among them is its effect on growing brain where it has been shown to lead to cognitive dysfunction, which is sometimes permanent. With advances in practical hematology it is easy to establish the diagnosis of iron deficiency anemia. Simple treatment with iron can avoid all complications which is cost effective and easily available medicine. As health care providers, one must strive to prevent iron deficiency through parental education and dietary iron supplementation, particularly in infants and children who are most vulnerable to consequences of iron deficiency.

Because iron-deficiency anemia can have damaging long term consequences, it should be prevented in every child especially in early childhood.

## AIMS AND OBJECTIVES

1. To study clinical profile of Iron deficiency anemia in hospitalised patients.
2. To study association between socio-economic status and IDA.
3. To study symptomatology in IDA.
4. To find out risk factors and disease association with IDA

## MATERIAL AND METHOD

This was retrospective study of iron deficiency anemia in early childhood, carried out from July 2016 to November 2018 to a tertiary care hospital. Total 100 patients were enrolled in the study. Total admissions during 3 years were 6550. Out of that patients with anemia were 1445. Approximately 500 of IDA patients were observed. From that multistage random sampling technique was applied and 20% of patients were selected. Informed consent was taken from relatives.

**Selection Criteria:** Age group upto 5 years Hemoglobin <11 gm/dl Anemia was classified based on WHO recommendation cut off value of < 11.0 gm/dl. Hb concentration less than 7 gm/dl was considered severe anemia. 7 to 10 gm /dl moderate anemia and < 11 gm/dl but > 10 gm/dl as mild anemia. Venous blood was collected in Wintrobe's oxalate bulb for hematological investigations. Peripheral smear was also seen for each patient. Haemoglobin estimation, hematocrit, RBC, WBC and Platelet count were done in automated cell counter. Peripheral smears were examined which were stained with Leishman's stain and thick - thin smear for malarial parasites. MCV, MCH, MCHC, RDW, reticulocyte count were obtained by automated cell counter and the type of anemia was confirmed. Serem iron, iron binding capacity were sent as and when required. Details were filled in the preformed proforma. Data was analyzed and results were obtained.

## OBSERVATIONS AND DISCUSSION

**Table 1:** Age Incidence of Iron Deficiency Anemia

| Age | No. Of patients | Percentage (%) |
|---|---|---|
| 0 – 12 month | 36 | 36% |
| 13 – 24 months | 34 | 34% |
| 25 – 36 months | 11 | 11% |
| > 36 months | 19 | 19% |

It was seen that among these 100 IDA patients almost 81% of patients are from the age group 6 months to 36

months, while only 19% were beyond this age group. Study done by James *et al* documented that iron deficiency was more common in children in second year of life (25%).[24] Iron deficiency is most common between 6 months to 36 months because of insufficiency of dietary iron to meet the needs of rapid growth. After first four to six months of life, iron stores present from birth have been exhausted and the infant depend on dietary iron. An infant maintained on milk and carbohydrate without supplements of iron containing foods is likely to develop iron deficiency. Of the total 100 patients 54% were male and 46% were females. Sex is not a markedly attributable factor for iron deficiency anemia.

**Table 2:** Socio-Economic Status

| | No. of patients | Percentage |
|---|---|---|
| I | 04 | 4% |
| II | 16 | 16% |
| III | 30 | 30% |
| IV | 40 | 40% |
| V | 10 | 10% |

Majority of patient were from low socio economic group. Almost 50% of patients belonging to class IV and V. A study by Booth *et al* suggested – socioeconomically deprived populations, the prevalence of IDA between 6 and 24 months varies between 25 and 40%.[26] A study by Khan *et al* indicates that IDA was more in low per capita monthly income. 60.9% patient were having IDA.[32]

**Table 3:** Symptomatology in ida

| | No. of patients |
|---|---|
| Fever | 55 |
| Pallor | 84 |
| Fatigue | 27 |
| Anorexia | 14 |
| Cough cold | 26 |
| Cognitive changes | 64 |

Pallor is the most common presenting symptom in 84 cases. Fever is seen in 55 cases explained because of infections. Total 64 patients had CNS symptoms. Among them, 37 cases presented with cognitive changes in form of lethargy, decreased attention span, poor scholastic performances and less able to concentrate. 27 cases had irritability. 12% patient had history of delayed development in our study. History of pica was present in 26% patients. Out of these 26 patients, 19 patients (73%) were presented with severe anemia. Study done by Agarwal *et al*[11] had detected pica in 31% patients and worms in stool in 12% patients. History of worms in stool were present in 17% patients. Most of the worms in stool were hookworms. It is known that each worm is capable of drawing 0.03 ml to 0.2 ml of blood / per day per worm.[6]

**Table 4:** Causative Factors and IDA

|  | No. of patients | Percentage |
|---|---|---|
| Nutritional | 69 | 69% |
| Prematurity | 14 | 14% |
| Blood loss | 17 | 17% |

14% of patients were preterm delivered with low birth weight. Prematurity contributes to iron deficiency as there is less storage of iron in premature babies. Premature infants are in the shallow end of iron storage pool and can develop iron deficiency sooner than their full term contemporaries. 17% of patient had h/o. blood loss in form of worm infestations.

**Table 5:** Diet in Iron deficiency anemia

|  | No. of patients |
|---|---|
| Exclusive BF | 14 |
| Bottle feeding | 45 |
| Prolonged BF | 16 |
| Vegetarian | 19 |
| Non Vegetarian | 06 |

Out of all causative factors 69% had IDA due to nutritional problem. These nutritional factors are mostly due to h/o. bottle feeding, prolonged BF, and in vegetarian diet, 45% of patients had h/o. bottle feeding. These children are bottle fed and also top fed given cow's milk. Infants who are younger than 12 months of age and are fed cow milk develop iron deficiency because of poor iron bioavailability and occult blood loss that frequently associated with protein losing enteropathy. Feeding of whole cow's milk should be avoided during the first year of life because it may cause occult gastrointestinal bleeding.[25]16% patient had h/o. prolonged breast feeding. Prolonged breast feeding considered after 2 years of age. None of them were provided with any iron supplementation in their feeding. Only 14% of patient who were exclusively breast fed had IDA. However breast feeding does not reliably protect against iron deficiency after 6 months of age.

**Table 6:**

|  | Mild | Moderate | Severe | Total |
|---|---|---|---|---|
| FTT | 0 | 03 | 07 | 10 |
| Gr. I | 1 | 10 | 07 | 18 |
| Gr.II | 1 | 09 | 10 | 20 |
| Gr. III | 1 | 05 | 11 | 16 |
| Gr. IV | 0 | 04 | 11 | 15 |
| Undernourished | 0 | 00 | 09 | 09 |
|  |  |  |  | 88 |

PEM was present in 88 (88%) cases, in which FTT in 10 cases (11%), under nutrition in 9 cases (10.5%), Grade I, II, III, IV were 20%, 22%, 18% and 17% respectively. Study done by Khan *et al* indicates that undernutrition was seen in 31.9% of IDA patients. Most common morbidity observed in study is respiratory tract infections in form of viral tonsillopharyngitis, bronchiolitis, pneumonia, empyema etc. 28% patients presented with RTI. 11% had moderate and 16% had severe IDA. 2nd most common disease was acute gastroenteritis. 25% patients had AGE. Out of that 12% had moderate and 12% severe IDA. Malaria was seen in 23% patients. 21% malarial patients presented with severe IDA.

## SUMMARY AND CONCLUSION

- IDA is found in early childhood. In our study almost 80% patient were between 6 months to 36 months.
- Socio-economic status played a major role in incidence of iron deficiency anemia. 80% of children were from class III, IV and V of socio-economic status. They are from very poor, illiterate, socio-economically backward families.
- Pallor, cognitive changes and fever were the most common presenting symptoms.
- Pica was found in 26% patients. Out of this 19% patients presented with severe anemia.
- Worms in stool were present in 17% of patients.
- Iron deficiency develops as a consequence of inadequate intake. (nutritional). 69% of patient had nutritional causes, while prematurity and blood loss was 14% and 17% respectively.
- Nutritional status also plays an important role in IDA. 35% patients were from Grade III and IV of PEM.
- Most of the IDA patients presented with respiratory tract infections, AGE and malaria. 28% patients had Respiratory tract infection. 23% were having malaria of which 21% cases had severe anemia. AGE in 25% cases.
- Iron deficiency continues to plague children and is still disturbingly common in all country. IDA is causally associated with developmental delay and poor growth, both of which are reversible with treatment atleast when treatment offered early in childhood. Infants are at the greatest risk of iron deficiency because of their rapid growth rates. Moreover, they may be at greatest risk of neuro cognitive adverse events because of dynamic development processes that occuring in their brains.
- Emphasis should be given on exclusive breast feeding till 6 months of age, avoiding top feeding and cow's milk. Iron supplementation should be started beyond 6 months of age.
- Key to the success in management of IDA is proper nutritional counselling. Parents should be made to understand the need for a well balanced diet particularly in growing children.

- Prevention of iron deficiency is paramount and can be accomplished with proper parental education and iron supplementation during early childhood
- Oral iron therapy has worked excellently in the regeneration of hemoglobin slowly and steadily without any significant side effects.

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