Original Research Article

Evaluation of Iron Deficiency Anemia in Infants and Toddlers

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ABSTRACT

Objective: Iron deficiency anemia (IDA) is the commonest nutrient deficiency in India with prevalence of about 75% in children under the age of 5 years. The intractable nature of this problem underscores the need to understand the epidemiology of childhood anemia and plan appropriate interventions. So this study was conducted to determine the prevalence and epidemiological correlates of iron deficiency anemia in children of (6-36) months of age group
Material and methods: Children between age group of 6-36 months were clinically suspected to have anemia were selected and subjected to routine haematological and biochemical studies. Data was recorded and analysed in detail.
Results: Out of 140 microcytic hypochromic anaemia cases, 100 were found to be Iron deficiency anaemia and most of the cases i.e. 34 cases were from age group 6-12 months
Conclusions: The prevalence of Iron Deficiency Anemia 71.42% amongst all cases of anemia and prevalence is more predominant in 25-36 months of age group.

Key Words: Iron deficiency anaemia, Infant, Toddler

INTRODUCTION

Iron is essential for virtually all living organisms. The quantitatively dominating function of iron in the human body is as the oxygen-binding core of haemoglobin (Hb), the red pigment of blood, transporting oxygen from the lungs to all tissues. During the progress of iron deficiency (ID), Hb synthesis in the bone marrow is restricted and anaemia (low Hb in blood) results. Iron deficiency (ID) and iron deficiency anemia (IDA) are considered the major public health problems and the most common nutritional deficiency around the world due to their high prevalence, effects on development and growth, resistance to infections and association with the mortality of infants younger than 2 years. [1]

There is an estimate that 25% of the world population is affected by ID, the population groups most affected being infants aged between 4 and 24 months, school-age children, female adolescents, pregnant women and nurturing mothers. [2] Infants and young children have a high risk for developing ID because they have a

high demand for iron during the period of rapid growth. [3]

Iron deficiency, defined as a stage in which there is insufficient iron to maintain the normal physiological function of tissues such as the blood, brain and muscles is the most widespread nutrition disorder in the world, affecting more people globally than any other condition. [4-6] Iron deficiency remains a major nutritional problem among infants and young children in India. The National Family Health Survey II (1998-99) documented a 73.6% prevalence of anemia in Indian children between 6 months and 35 months of age. [7]

In Maharashtra where prevalence of anemia among children in this age group is 76%. [8] Studies conducted in different regions of the country over the past decades have also reported similar findings. [9-13]

These data are of concern for several reasons. Recent studies suggest that later iron supplementation may not reverse the effects of moderate-to-severe iron deficiency anemia occurring during the first 18 months of life. [14-16]

The intractable nature of this problem underscores the need to understand the epidemiology of childhood anemia and plan appropriate interventions. Hence the present study was undertaken to study the epidemiological correlates of iron deficiency anemia in children 100 random aged between 6 months and 36 months attending pediatric OPD & IPD in Dr. Panjabrao Deshmukh Memorial Medical College, Amravati.

MATERIALS AND METHODS

The present work is prospective study and was carried out at Department of Pathology, Dr. Panjabrao alias Bhausaheb Deshmukh Memorial Medical College, Amravati over a period of two and half year from June 2012 to October 2014. Each participant gave an informed consent and this study was approved by the ethical and research committee. Children between age group of 6-36 months were clinically suspected to have anemia by a set of questionnaire were selected and subjected to routine hemogram and patients having Hb < 11gm/dl , MCV < 80fl , MCH < 27fl , MCHC < 33fl and peripheral smear study showing microcytic hypochromic picture were included in this study.

Collection and processing of blood samples: About 5 ml of venous blood was drawn under aseptic precautions in a sterile bulb from selected subjects. Serum was separated by centrifugation and was used for analysis. Serum Iron, Total Iron Binding Capacity (TIBC), Serum Ferritin and Transferrin saturation were estimated. The sample was run on Automated Blood Cell Counter (AcT diff 2 Coulter) and values for different parameters like hemoglobin, mean corpuscular volume, mean corpuscular hemoglobin, mean corpuscular hemoglobin concentration, Red Cell Distribution Width (RDW) etc were obtained. Peripheral smear was stained with Leishman's stain for all the cases and examined in detail. Serum Iron and TIBC were estimated by Iron and TIBC kit in semiautoanalyzer, (Erba Chem 5plus) which uses Ferrozine method. Transferrin saturation was calculated as Serum iron $\times$ 100 / TIBC. Serum ferritin was estimated by Chemiluminescence Immunoassay. Data was recorded and analyzed in detail. Statistical analysis was done using mean, standard deviation, proportion & chi-square test with the help of SPSS-16.0 version software.

RESULT

In present study total 140 cases having age ranging from 6 months to 36 months were randomly selected depending on haematological indices and peripheral smear showing microcytic hypochromic picture during the specified period. Most of

the cases were present in age group 6 – 12 months which comprise of 55 (39.28%) (Table I).

Table I: Distribution of cases depending on age group

Age Group (in months)	Cases	Percentage
7 – 12	55	39.28%
13 – 18	15	10.71%
19 – 24	28	20.00%
25 – 30	13	09.28%
31 – 36	29	20.71%
Total	140	100%

82 patients were male while 58 were females with Male: Female ratio of 1:0.70. 64 cases (45.71%) were graded as mild anaemia, 61 (43.57%) cases were moderate and 15 (10.71%) were cases of severe anemia. Most of these cases were from age group 6 -12 months followed by 31 – 36 months of age group. (Table II).
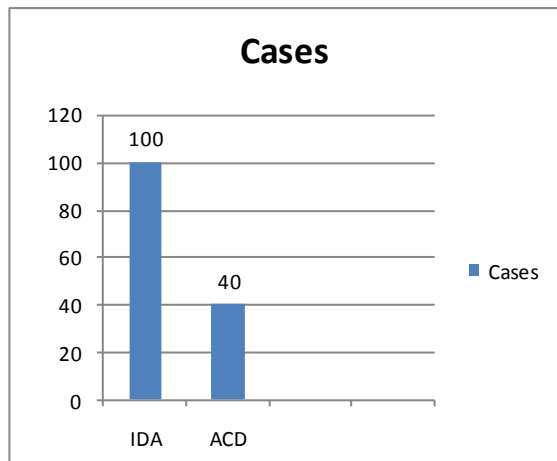
Table no II: Distribution of cases depending on age and severity of anaemia

Age group (in months)	Mild (10.0 – 11.0 gm%)	Moderate (7.0 - 9.9 gm%)	Severe (< 7.0 gm%)	Total
7 – 12	21 (32.81%)	29 (47.54%)	5 (33.33%)	55 (39.29%)
13 – 18	7 (10.94%)	7 (11.48%)	1 (06.68%)	15 (10.71%)
19 - 24	14 (21.88%)	12 (19.67%)	2 (13.33%)	28 (20.00%)
25 – 30	7 (10.94%)	4 (06.56%)	2 (13.33%)	13 (09.29%)
31 – 36	15 (23.43%)	9 (14.75%)	5 (33.33%)	29 (20.71%)
Total	64 (100%)	61 (100%)	15 (100%)	140 (100%)

Chi sqaure test=5.96 ;d (f) = 8; p = 0.65 > 0.05 (NS)

On the basis of serum studies showing Serum ferritin < 12ng/mL, serum iron < 50 ug/dL, total iron binding capacity > 450 ug/dL and % Iron saturation < 16, 100 (71.42%), cases were labelled as Iron Deficiency Anemia (IDA). Rest of the 40 (28.58%) cases on the basis of raised serum ferritin > 12ng/mL. were graded as Anaemia of Chronic Disorder (ACD) (Figure I)

graded as mild anaemia, 45 (45.00%) cases were moderate and 15 (15.00%) were cases of severe anemia (Table III).

Table III: Distribution of cases of IDA depending on severity of anaemia

Severity	Cases	Percentage
Mild (10.0 – 11.0 gm%)	40	40.00%
Moderate (7.0 – 9.9 gm%)	45	45.00%
Severe (< 7.0 gm%)	15	15.00%
Total	100	100%

Figure I. Classification of cases into IDA and ACD depending on Serum studies

Most of these cases i.e. about 66 were males and 34 were females and most of them were between age group of 6 – 12 months (Table IV)

Table IV. Distribution of IDA depending on age and sex

Age group (in months)	Males	Females	Total	Percentage
7 to12	24 (24%)	10 (10%)	34	34%
13 to 18	8 (8%)	5 (5%)	13	13%
19 to 24	14 (14%)	6 (6%)	20	20%
25 to 30	6 (6%)	4 (4%)	10	10%
31 to 36	14 (14%)	9 (9%)	23	23%
Total	66 (66%)	34 (34%)	100	100%

Chi square = 1.0; d (f) = 4; p = 0.90 p >0.05 (NS)

Out of 100 diagnosed cases of Iron Deficiency Anaemia, 40 (40.00%) were

Out of 100 Iron deficiency anaemia cases, 34 (34%) cases were in age group 7 – 12 months in which most of the cases i.e 19 (19%) of moderate anemia. 23(23%) cases

were in 31- 36 months of age group which included most cases of mild anemia i.e. 10(10%) (TableV).

Table V. Distribution of IDA depending on age and severity

Age group (in months)	Mild (10.0 – 11.0 gm%)	Moderate (7.0 - 9.9 gm%)	Severe (< 7.0 gm%)	Total/ Percentage
7 to 12	10 (10%)	19 (19%)	5 (5%)	34 (34%)
13 to 18	6 (6%)	6 (6%)	1 (1%)	13 (13%)
19 to 24	8 (8%)	10 (10%)	2 (2%)	20 (20%)
25 to 30	6 (6%)	2 (2%)	2 (2%)	10 (10%)
31 to 36	10 (10%)	8 (8%)	5 (5%)	23 (23%)
Total	40 (40%)	45 (45%)	15 (15%)	100 (100%)

Chi square = 6.73; d (f) = 8; p = 0.56 p >0.05 (NS)

The prevalence of Iron Deficiency Anemia was 71.42% amongst all cases of anemia with microcytic hypochromic picture that were selected (TableVI)

Table VI. Prevalence of IDA depending in age group

Age in months	IDA	ACD	Total
7 – 12	34 (61.82%)	21 (38.18%)	55 (100%)
13 – 24	33 (76.74%)	10 (23.26%)	43 (100%)
25 – 36	33 (78.57%)	09 (21.43%)	42 (100%)
Total	100 (71.42%)	40 (28.58%)	140 (100%)

DISCUSSION

In present study total 140 cases of anemia having microcytic, hypochromic blood picture were studied with reference to age, sex, haematological indices and serum studies. Out of 140 cases in age group 6-36 months studied most of the cases i.e. 55 (39.28%) were in age group 6-12 months which correlates with study of Welong et al. [17] 82 (58.53%) cases were males and 58 (41.43%) cases were females which correlates with studies of Kadivar et al [18] and B. Sudhagandhi et al [19] wherein most cases were males. Depending on severity of anaemia these cases were divided into mild, moderate and severe anemia with present study showing 64 (45.71%) cases of mild anemia followed by 61 (43.58%) cases of moderate anemia which correlates with study of Maria D. Lourdes et al [20] wherein most cases are of mild anaemia. When these cases were correlated with age and severity of anaemia it was found that most of the cases were mild or moderate which was also found in studies of Kapur et al [21] and Wenlong et al [17]

Depending on serum studies these cases were categorized into IDA and ACD and were found that most cases 100 (71.42%) cases were of IDA. Similar findings were noted by Ramoteme et al [22] B Kamer et al [23] and Manojemzadeh et al [3] having cases of IDA 75.75%, 63.46% and 57.93% respectively. Depending on severity of anaemia, the 100 cases of IDA were categorized into mild 40 cases, moderate 45 cases and severe 15 cases. Most of the cases were of moderate anaemia, followed by mild anaemia which was also observed by Firdos Saba et al [24] with 75.83% cases of moderate anemia followed by 12.72 % cases of mild anaemia. Depending on age group and severity of anemia the cases of IDA were divided into mild, moderate and severe and it was observed that in age group 6 – 24 months most cases were of moderate anemia followed by mild anemia which correlates with study of Kapur et al [21] In age group 25 - 36 months most cases were of mild anemia followed by moderate anemia which correlates with study of Wenlong et al. [17]

CONCLUSION

To conclude the prevalence of Iron Deficiency Anaemia in children in age group 6-36 months was found to be 71.42% among all the cases of anemia having microcytic hypochromic blood picture which correlates well with other studies.

Most of these cases were categorized as moderate anaemia which differs from some of the studies which showed most cases to be of mild anaemia. This variability is possibly due to difference in socioeconomic status among two groups and lack of facilities to carry out serum studies (Sr. ferritin). As we are aware that due to lack of personal hygiene infectious diseases are very common in this age group, so we need to rule out the cases of Anaemia of Chronic Disease. This will help us in correct and early diagnosis of Iron Deficiency Anaemia, for which it is necessary to implement Sr. studies as routine test in all the cases presenting with Microcytic Hypochromic Blood picture

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