International Journal Dental and Medical Sciences Research
Volume 5, Issue 1, Jan-Feb 2023 pp 502-514 www.ijdmsrjournal.com ISSN: 2582-6018

Study of Iron Deficiency and Iron Deficiency Anaemia in Children between 1 to 6 months of age in a Tertiary Health Care Centre

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Submitted: 01-02-2023 Accepted: 10-02-2023

ABSTRACT:As we know Iron Deficiency anaemia is one of the commonest nutritional deficiencies in childhood which if left untreated is responsible for a variety of manifestations including neurological problems affecting the overall growth of the child. However, iron deficiency exists even in the absence of iron deficiency anaemia and can be diagnosed by measuring serum ferritin levels at an earlier stage thus preventing the onset of iron deficiency anaemia and its manifestations. This study aims the recognise the need for early diagnosis of iron deficiency anaemia in children between 1 to 6 months of age.

KEYWORDS:Iron deficiency, Iron deficiency anaemia, serum ferritin.

I. INTRODUCTION:

Iron deficiency anaemia (IDA) is one of the most prevalent nutritional deficiencies worldwide. Infants are especially susceptible because of high iron requirement for their rapid growth.[1]Iron deficiency is a state in which there is insufficient amount of iron to maintain normal physiologic functions. It is a result of inadequate iron absorption in order to accommodate increase in requirements needed for growth or as a result of long-term negative iron balance which may lead to a decrease in iron stores which are measured by serum ferritin (SF) concentrations or by bone marrow iron content. ID is not always accompanied by IDA. Iron Deficiency Anaemia on the other hand, is defined as a haemoglobin (Hb) concentration of 2 SDs below the mean haemoglobin concentration for a normal population of the same age and gender, as defined by the World Health Organization, the United Nations Children's Fund, and United Nations University.[2]

As per the data submitted by the World health Organization (WHO) in 2001, 30% of the children aged between 0 and 4 years and 48% of the children between 5 and 14 years of age are anaemic in developing countries.[3] The occurrence of Iron Deficiency Anaemia (IDA) is greatest in children of 1–5 years of age attaining 50 to 60 per cent of the population in developing countries and 10 to 20 per cent in industrialized countries. [4-7]

The terms Iron Deficiency and Iron Deficiency Anaemia are often used interchangeably as anaemia is the most important indicator of iron deficiency. However, iron deficiency can occur in the absence of anaemia and various body tissues may be affected from this condition. After iron stores are decreased, the haemoglobin levels stays normal for a period of time, which means that iron deficiency is observed even in the absence of anaemia. At this moment, only plasma ferritin level and plasma transferrin saturation are reduced. Negative iron balance carries on after iron stores are consumed and is eventually exhibited with reduced haemoglobin. Conclusively, decreased body iron stores have been described as Iron Deficiency (ID) and worsening of this condition with development of anaemia is described as Iron Deficiency Anaemia (IDA). This study aims to detect iron deficiency before it manifests with anaemia.

Etiology

The leading causes of Iron Deficiency Anaemia (IDA) observed in children include low birth weight, inadequate intake with rapid growth and gastrointestinal losses resulting from excessive consumption of cow's milk. During the intrauterine period, the only source of iron to the baby is maternal iron crossing through the placenta which is approximately 75 mg/kg in the third trimester. Physiological anaemia develops during the postnatal period and iron stores are sufficient for erythropoiesis in the first six months of life provided there is no significant blood loss or major disease-causing blood loss. In low-birth-weight babies and in babies with perinatal blood loss, the stores are depleted earlier, as they are smaller.

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Delayed umbilical cord clamping by allowing some quantity of blood to flow to the neonate may improve the iron status and thus reduces the risk of iron deficiency. 8 The quantity of iron in breastmilk is highest in the first month, but gradually decreases over the subsequent months and is reduced up to 0.3 mg/L approximately by the fifth month. 9 It has been proven that maternal diet does not affect the amount of iron in breastmilk. 10 Even though the quantity of iron received from breastmilk is low, its absorption is considerably high (50%), however it is less than the amount required for rapid growth.

It is well known that all infants should be exclusively breastfed during their first six months of life and any other foods items given during this period in addition to breast-milk may disrupts the absorption of iron present in breastmilk. Conclusively, iron absorption is high but it is lower than the amount which is required for rapid growth. That is why, infants use iron in their body in the 1st six months until the amount of iron received from other food items increases.

Complimentary feeding given after the 6th month of life should be rich in iron, phosphorus, zinc, magnesium, vitamin B6 and calcium. According to data from World Health organization (WHO), around 98% of the iron required by infants between 6–23 months is to be preferably met by solid foods. 11,12 These solid foods should include products rich in eggs, meat, fish and vitamin C to meet this iron requirement. Giving excessive amount of cow's milk is another mistake which is made while feeding infants. In infants, this may cause chronic blood loss in relation with heat-sensitive proteins present in cow's milk. In addition, iron absorption from cow's milk is much lower as compared to breastmilk. Cow's milk cannot substitute iron-rich foods and in addition calcium and caseinophosphopeptides present in cow's milk may disrupt iron absorption. Iron deficiency develops easily if infants after their 6th month of life are fed with iron-poor foods as they exhaust almost all of their iron stores. Blood loss as an underlying cause of anemia should also be considered in infants and especially in older children, if inadequate intake is excluded or in case the response to oral iron treatment is inadequate. Chronic iron deficiency anemia which usually develops with occult bleeding is not very uncommon in children. It may occur as a result of gastrointestinal problems including polyp, peptic ulcer, Meckel's diverticulum, inflammatory bowel disease or hemangioma. Insensible blood loss can sometimes be related to chronic diarrhea, celiac disease, or pulmonary hemosiderosis; however, it is possible to exclude them based on history.

In developing countries, it should always be kept in mind that parasitic infestations may also contribute to iron deficiency.

Clinical findings

The most important definite finding of iron deficiency is anemia, since the majority of iron in the body is used for synthesis of hemoglobin. In iron deficiency anemia, clinical findings secondary to anemia may be found or in the absence of any clinical findings, the diagnosis can be made by using laboratory investigations. Sometimes slowly progressing paleness may be missed by families. Table 1 summarizes the clinical findings observed in iron deficiency anemia. The effects of iron deficiency on the neurocognitive system are particularly emphasized.

Table: 1

Skin
Pallor
Nails
Koilonychia
Musculoskeletal system
Decreased effort capacity
Exercise limitation

Cardiovascular system
Increased cardiac output
Tachycardia
Cardiomegaly
Heart failure
Gastrointestinal system
Loss of appetite
Angular stomatitis
Atrophic glossitis
Dysphagia
Pica
Gluten sensitive enteropathy
Plummer-Vinson syndrome
Immune system disorders
Decreased resistance against infections
T lymphocyte and polymorphonuclear leukocyte dysfunction
Central nervous system
Irritability-malaise
Fainting
Papilledema
Pseudotumor cerebri
6^{th} nerve palsy
Restless leg syndrome
Breath holding spell
Sleep disturbance

Attention deficit
Learning difficulty
Behavioural disorder
Decrease in perception functions
Retardation in motor and mental developmental tests
Increased absorption of heavy metals
Lead intoxication

Diagnosis and laboratory findings

A detailed history and physical examination is essential in the diagnosis of all diseases. Especially pre and postnatal period, nutrition, time of starting breastmilk and complimentary foods and bleeding history if any should be interrogated in detail. Also, signs of anemia and other systemic diseases which may accompany should be searched for.

Table 2 summarizes the laboratory investigations which should be ordered in patients in whom iron deficiency is considered.

Complete blood count
Peripheral blood smear
Reticulocyte count
Ferritin
Serum iron, total iron binding capacity, transferrin saturation index
Urea, creatinine
Serum soluble transferrin receptor level[a]
Free erythrocyte protoporphyrin[a]

[a]Used with a low rate in practice

Proper assessment of (CBC) complete blood count may give many clues in the diagnosis of many diseases of childhood.[13] In complete blood count, the hemoglobin and hematocrit values should be primarily checked for the respective age and gender (if anemia is present). The World Health Organization has specified lower limits of normal by age and gender and may be used, since they are practical and values lower than these limits are considered anemia (Table 3). In infants younger than 6 months, lower hemoglobin values are observed because of physiological anemia of infancy; but if there is no other accompanying factor, hemoglobin is not expected to be lower than 9 g/dL in physiological anemia in term infants.

Table 3: Lower limits for hemoglobin and hematocrit values specified by the World Health Organization (WHO) by age and gender

Groups by age and gender	**Hemoglobin (g/dL)**	**Hematocrit (%)**
Children aged between 6–59 months	11	33
Children aged between 5–11 years	11.5	34
Children aged between 12–14 years	12	36

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Girls aged >15 years	12	36
Boys aged >15 years	13	39

When the hemoglobin inside the erythrocytes is reduced, they appear pale and smaller in size than normal. This is manifested by reduced (MCV) mean erythrocyte volume and reduced (MCH) mean erythrocyte hemoglobin in complete blood count. Therefore, on the peripheral blood smear the erythrocytes are microcytic (smaller in size) and hypochromic (pale). The normal value of mean erythrocyte volume (MCV) ranges between 80 and 99 fL, but normal values according to the age should be considered in children.

Iron deficiency develops in the body in three stages

1. Prelatent stage: In this stage, iron stores are lowered or absent while hemoglobin, serum iron concentration and hematocrit are normal. This stage of iron deficiency is manifested with reduction or absence of iron stores in the bone marrow and reduced serum ferritin level.
2. Latent stage: (SI) Serum iron and transferrin saturation are reduced in addition to the reduced iron stores. In this stage hemoglobin and hematocrit values are within normal limits.
3. Marked IDA In this stage, in addition to the depletion of iron stores, transferrin saturation and serum iron, hemoglobulin and hematocrit levels are reduced

Table 4. Laboratory findings in iron deficiency[14-17]

Complete blood count:
RDW>14
RBC: low
Hb, Hct: low according to age and gender
MCV: low according to age and gender
When specifying the lower limit of MCV: 70+age (for >10 years)
(if MCV is <72, generally abnormal)
Upper limit of MCV: 84 + age x 0,6 (for >6 months)
(if MCV>98: always abnormal)
MCH<27 pg
MCHC<30%
Thrombocytosis
Rarely: Thrombocytopenia, leukopenia
Peripheral smear:
• Hypochromia
• Microcytosis
• Anisochromia
• Anisocytosis
• Pencil cells
• Rarely: basophilic stippling, target cells, hyper segmented neutrophils
Serum ferritin<12 ng/mL

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[a]Serum iron: <30 mcg/dL
[a]TIBC>480 mcg/dL
Transferrin saturation (Iron/TBCx100)<16%
Metzner index (MCV/RBC)<13

aMay change by age, gender and other factors. Should be evaluated together. Hb: hemoglobin; Hct: hematocrit; RDW: erythrocyte distribution volume; TIBC: total iron binding capacity.

Prevention

World Health Organization, American Academy of Pediatrics and other well-known pediatrics organizations have proposed a number of recommendations for the prevention of iron deficiency. These recommendations include enrichment of foods with iron, giving iron-rich formulas when breastmilk is not sufficient, avoiding ingestion of cow's milk in the first year of life, screening infants between 9–12th months of age in terms of iron deficiency and giving them iron prophylaxis.[18]

Treatment

The main principles in treatment of iron deficiency anemia firstly includes making the diagnosis, investigating the cause or the condition which causes iron deficiency and elimination of this cause/condition, replacement of deficiency, improvement of the child's nutrition and education of patients and family members. Two forms of iron are found in diet; non-heme iron and heme iron. Non-heme iron is usually found in food products other than meat and heme iron is found in meat and meat products and the absorption of heme iron is much higher, but only 10% of the iron in diet is heme iron. While the absorption of heme iron is affected by environmental factors with a very low rate, non-heme iron is affected by other food substances and pH of the environment. Therefore, increasing consumption of meat and meat products is very important in prevention and treatment of iron deficiency. The other foods rich in iron include egg, green vegetables, well-done legumes, and dry fruit.

Oral iron treatment is generally preferred because it is economical and has fewer side effects. Iron preparations may be found as +2 ferrous or +3 ferric forms and the ferric form has to be transformed into the ferrous form to be absorbed. Therefore, the biologically significant form is +2 ferrous iron. The most commonly used oral +2 ferrous iron preparations include ferrous gluconate, ferrous sulphate, ferrous succinate and ferrous fumarate. The first study about this issue was performed by Nathan Smithin 1950, the most inexpensive and efficient one among 1970 iron preparations was shown to be ferrous sulphate.[19] Absorption of ferrous sulphate is very well and it also has high, but it may have side effects including gastrointestinal system irritation, nausea, constipation, vomiting and epigastric pain. The most commonly used dose for is 3–6 mg/kg/day and there are different recommendations related to the dose, in the literature and textbooks. It is known that ascorbic acid increases absorption of iron, but use of preparation containing vitamin C in combination with iron has a high cost. The rate of iron absorption also depends on the severity of anemia and reaches the highest values in the first month of treatment. Signs observed in patients include disappearance of restlessness, loss of appetite and fatigue rapidly with initiation of treatment. An increase in the reticulocyte count is expected after 7–19 days of treatment. If an increase of 1 g/dL or more is observed in hemoglobin after ten days, the diagnosis is correct. In this case, treatment can be continued for at least 3 months to fill iron stores and should not exceed 5 months. If there is an insufficient increase after one-month treatment, incompliance, continuing blood loss despite iron replacement, disruption in absorption of iron, high gastric pH (use of antacids or H2 receptor antagonists), wrong diagnosis or inefficient iron preparation should be considered. Parenteral iron therapy is administered when oral iron treatment cannot be tolerated, in cases where anemia is to be corrected rapidly and in gastrointestinal absorption disorders including celiac disease or inflammatory bowel disease and in cases of noncompliance. Parenteral iron treatment is administered by intramuscular (im) or intravenous (iv) route.

II. METHODOLOGY

The present study was conducted in the Department of Pediatrics at a medical college and tertiary health care centre. It is a cross sectional hospital-based study. A total of 95 infants aged 1-6 months were included in the study after satisfying the eligibility criteria and after obtaining the written informed consent. Details were collected in predesigned proforma. Hemoglobin levels, mean corpuscular volume, red cell width distribution

levels, c- reactive protein levels and serum ferritin levels were estimated. The parameters were compared among cases and controls using appropriate statistical tool. The Complete Blood Count was analyzed on the Beckmann Coulter/ Nihon Koden automated cell count analyzers with EDTA samples obtained from peripheral venipuncture of the neonates The C- reactive protein levels will be noted from the Microbiology department. They were analyzed on the CHEM5 (Semi Automated Clinical Chemistry Analyzer) using fresh plain red bulb samples using the Infinite Turbilatex CRP reagent set. The test uses 450µL of reagent R1 with 50µL of reagent R2 and 5µL of serum. Serum Ferritin was analyzed on Beckman Coulter access 3 machine.

Data Analysis Procedure: Statistical Analysis- All the results were expressed in percentages. Data was entered in Microsoft Excel sheet &analyzed using statistical software. Data was depicted in the form of tables wherever required. Results were documented in proportions and percentages with appropriate statistical tests by using appropriate statistical software.

III. RESULTS

Table no 1: Age group amongst study population

Age	Frequency	Percent
1 months	16	16.8
2 months	19	20.0
3 months	17	17.9
4 months	15	15.8
5 months	9	9.5
6 months	19	20.0
Total	95	100.0

As seen in the above table, most of the babies belongs to age of 2 months and 6 months (20% each) followed by 3 months (17.9%) and 1 months (16.8%)

Table no 2: Gender amongst study population

Gender	Frequency	Percent
Female	42	44.2
Male	53	55.8
Total	95	100.0

As seen in the above table, there was male predominance (55.8%) amongst study population as compared to female population (44.2%).

Table no 3: Babies with and without anemia amongst study population

Anemia	Frequency	Percent
Anemia	54	56.8
No Anemia	41	43.2
Total	95	100.0

As seen in the above table, anemia was observed in 56.8% of babies.

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Table no 4: Clinical features amongst study population

Clinical features	Frequency	Percent
Pallor	16	16.8
Loss of Appetite	11	11.6
Developmental delay	4	4.2
Irritability	8	8.4
Loss of Weight	9	9.5
Breathlessness	3	3.2
Loose stools	3	3.2
Frequent Infections	3	3.2

As seen in the above table, pallor (16.8%) was the most common clinical features amongst study population followed by Loss of Appetite (11.6%), Loss of Weight (9.5%) and Irritability (8.4%)

Table no 5: Hemoglobin level amongst study population

Hemoglobin	Frequency	Percent
less than 7	2	2.1
7.1 to 10	52	54.7
more than 10	41	43.2
Total	95	100.0

As seen in the above table, most of the babies had hemoglobin between 7.1 to 10 (54.7%) followed by more than 10 (43.2%) and less than 7 (2.1%).

Table no 6: MCV level amongst study population

MCV	Frequency	Percent
less than 70	13	13.7
71 to 80	40	42.1
more than 80	42	44.2
Total	95	100.0

As seen in the above table, most of the babies had MCV between more than 80 (44.2%) followed by 71 to 80 (42.1%) and less than 70 (13.7%)

Table no 7: Ferritin level amongst study population

Ferritin	Frequency	Percent
less than 12	18	18.9
12 to 400	75	78.9
more than 400	2	2.1
Total	95	100.0

As seen in the above table, most of the babies had Ferritin between 12 to 400 (78.9%) followed by less than 12 (18.9%) and more than 400 (2.1%).

Table no 8: Type of anemia amongst study population

Type of anemia	Frequency	Percent
MCHC	54	56.8
NCHC	12	12.6
NCNC	29	30.5
Total	95	100.0

As seen in the above table, MCHC (56.8%) was the most common type of anemia followed by NCNC (30.5%) and NCHC (12.6%).

Table no 9: Maternal Anemia with Anemia amongst study population

Maternal Anemia with Anemia	Frequency	Percent
No	69	72.6
Yes	26	27.4
Total	95	100.0

As seen in the above table, 27.4% of babies had history of maternal anemia.

Table no 10: Maternal Anemia Without Anemia amongst study population

Maternal Anemia Without Anemia	Frequency	Percent
No	81	85.3
Yes	14	14.7
Total	95	100.0

As seen in the above table, 14.7% of babies had no history of maternal anemia.

Table no 11: Breast Feed with Anemia amongst study population

Breast Feed	Frequency	Percent
No	58	61.1
Yes	37	38.9
Total	95	100.0

As seen in the above table, 38.9% of babies with anemia were on breastfeeding.

Table no 12: Formula Feed with Anemia amongst study population

Formula Feed	Frequency	Percent
No	78	82.1
Yes	17	17.9
Total	95	100.0

As seen in the above table, 17.9% of babies with anemia were on formula feed.

Table no 13: Poor Socioeconomic status With Anemia amongst study population

Poor Socio economic status with Anemia	Frequency	Percent
No	87	91.6
Yes	8	8.4
Total	95	100.0

As seen in the above table, 8.4% of babies with anemia had poor socioeconomic status.

Table no 14 : Term baby with IUGRWith Anemia amongst study population

Term baby with IUGR With Anemia	Frequency	Percent
No	89	93.7
Yes	6	6.3
Total	95	100.0

As seen in the above table, 6.3% of babies with anemia were **Term baby with IUGR**.

Table no 15: Term baby with IUGRWithout Anemia amongst study population

Term baby with IUGR without anemia	Frequency	Percent
No	89	93.7
Yes	6	6.3
Total	95	100.0

As seen in the above table, 6.3% of babies without anemia were **Term baby with IUGR**

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Table no 16: Babies of mother with Multiple Gestation with anemia amongst study population

Babies of mother with Multiple Gestation with anemia	Frequency	Percent
No	87	91.6
Yes	8	8.4
Total	95	100.0

As seen in the above table, 8.4% of babies of mother with Multiple Gestation had anemia

Table no 17: Babies of mother with Multiple Gestation without anemia amongst study population

Babies of mother with Multiple Gestation without anemia	Frequency	Percent
No	91	95.8
Yes	4	4.2
Total	95	100.0

As seen in the above table, 4.2% of babies of mother with Multiple Gestation were without anemia.

IV. DISCUSSION

Nutritional anaemia is a worldwide problem with the highest prevalence in developing countries.[1] More than 30% of the world population i.e., 1500 million people are suffering from anaemia. Aanemia is the commonest cofactor encountered in pediatric patients in both indoor as well as outdoor practice.[2]

Anaemia is a serious concern for young children because it can result in impairments in cognitive performance, behavioural and motor development, coordination, language development, and scholastic achievement as well as increased morbidity from infectious diseases.[3]

In the present study, most of the babies belongs to age of 2 months and 6 months (20% each) followed by 3 months (17.9%) and 1 months (16.8%). Saba et al and Verghese et al who studied anaemia in children of different age groups, observed that its occurrence was maximum in infants between 6-12 months of age.[7,8] Infants are the most vulnerable group for developing anaemia. Similar findings were reported in study by Marol R et al., in which highest prevalence (92.3%) was observed at 3 months of age.[13]

In the present study, there was male predominance (55.8%) amongst study population as compared to female population (44.2%). Out of 131 anaemic infants,75 (57.3%) were males and 56 (42.7%) were females with a male: female ratio of 1.3:1.Saba et al reported a male predominance with a ratio of 1.82:1.[7]

In the present study, anemia was observed in 56.8% of babies.Pallor (16.8%) was the most common clinical features amongst study population followed by Loss of Appetite (11.6%), Loss of Weight (9.5%) and Irritability (8.4%). Most of the babies had hemoglobin between 7.1 to 10 (54.7%) followed by more than 10 (43.2%) and less than 7 (2.1%). In the study by Kanchana et al.[9], higher proportion of moderate anemia was seen (46.8%) along with 26.6% of children having mild anemia and 3.6% with severe anemia. In the same study, she also evaluated proportion of anemia based on the peripheral blood picture, with 45% having normocytic anemia, 37% with microcytic anemia, and 18% with dimorphic anemia. In a study conducted by Marol and Marol[13]in Haveri, Karnataka, 71 (87.6%) out of a total 81 infants between the age groups of 3 and 6 months had anemia (69% mild, 28% moderate, and 2.8% severe). Most of the babies had MCV between more than 80 (44.2%) followed by 71 to 80 (42.1%) and less than 70 (13.7%). Most of the babies had Ferritin between 12 to 400 (78.9%) followed by less than 12 (18.9%) and more than 400 (2.1%). In the study by Chanpura VR et al., it was found that, among 111 infants and toddlers 103 had low MCV level. Amongst these 78 infants and

toddlers had low serum ferritin levels.MCHC (56.8%) was the most common type of anemia followed by NCNC (30.5%) and NCHC (12.6%). Khandelia (68.4%) and Saba et al (48.1%) have also reported microcytic hypochromic anemia as the most common type of anemia.[7,20] Iron deficiency is still the most important cause of nutritional anemia in infants although the incidence of vitamin B12 deficiency is increasing especially in infants on a purely vegetarian diet.

In the present study, 27.4% of babies had history of maternal anemia and 14.7% of babies had no history of maternal anemia. 38.9% of babies with anemia were on breastfeeding. This finding was in accordance with the study conducted by Monajemzadeh and Zarkesh in which they observed that the tendency to have iron deficiency anemia was 27% in exclusively breastfed infants.17.9% of babies with anemia were on formula feed.8.4% of babies with anemia had poor socioeconomic status.Mehrotra et al have reported that 78.4% of anemic children in their study belonged to lower socio-economic status.[14] Also,6.3% of babies with anemia were Term baby with IUGR. Spinellie et al found low birth weight and not having breastfed as risk factors associated with anemia in infants.[10]

In the present study, 6.3% of babies without anemia were Term baby with IUGR. Also, Joo et al observed that low birth weight infants were at a higher risk of developing iron deficiency anemia.[17]Low birth weight and preterm infants have low iron stores at birth and have a higher iron requirement for catch-up growth. Therefore, they are at a higher risk of developing anemia and require early iron supplementation.8.4% of babies of mother with Multiple Gestation had anemia and 4.2% of babies of mother with Multiple Gestation were without anemia.

V. CONCLUSION

Most of the babies belongs to age of 2 months and 6 months (20% each) followed by 3 months (17.9%) and 1 months (16.8%). There was male predominance (55.8%) amongst study population as compared to female population (44.2%). Anemia was observed in 56.8% of babies.Pallor (16.8%) was the most common clinical features amongst study population followed by Loss of Appetite (11.6%), Loss of Weight (9.5%) and Irritability (8.4%). Most of the babies had hemoglobin between 7.1 to 10 (54.7%) followed by more than 10 (43.2%) and less than 7 (2.1%).Most of the babies had MCV between more than 80 (44.2%) followed by 71 to 80 (42.1%) and less than 70 (13.7%).Most of the babies had Ferritin between 12 to 400 (78.9%) followed by less than 12 (18.9%) and more than 400 (2.1%).MCHC (56.8%) was the most common type of anemia followed by NCNC (30.5%) and NCHC (12.6%).In 27.4% of babies had history of maternal anemia.14.7% of babies had no history of maternal anemia and 38.9% of babies with anemia were on breastfeeding and17.9% of babies with anemia were on formula feed.8.4% of babies with anemia had poor socioeconomic status.6.3% of babies with anemia were Term baby with IUGR.8.4% of babies of mother with Multiple Gestation had anemiaand 4.2% of babies of mother with Multiple Gestation were without anemia.

As anaemia in infancy and early childhood is also associated with delayed development especially behavioural and cognitive delay and impaired learning and mental skills along with various cardiovascular and gastrointestinal complications, early detection and treatment of iron deficiency could be done before manifestations of iron deficiency anaemia develop.

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