

Original research article

Assessment of the prevalence of anemia in exclusively breastfed babies between 3-6 months: an observational study**Dr. Srikant Pandey¹, Dr. Pallavi Sharma², Dr. Sujit Kumar³****¹Senior Resident, Department of Paediatrics, Nalanda Medical College and Hospital, Patna, Bihar, India****²Junior Resident, Department of Anatomy, Nalanda Medical College and Hospital, Patna Bihar, India.****³Associate Professor, Department of Paediatrics, Nalanda Medical College and Hospital, Patna, Bihar, India****Corresponding Author: Dr. Pallavi Sharma****Abstract**

Background: Anemia is a significant health problem in developing countries. Maternal anemia reduces fetal iron stores prior to birth and hence babies born to anemic mothers tend to develop iron deficiency anemia before 6 months which has adverse psychomotor consequences.

Aim: The aim of this study was conducted to estimate the prevalence of anemia in exclusively breastfed babies between 3-6 months of age so that we can identify, prevent and treat anemia and its consequences at an early age.

Material and methods: This retrospective observational study was done the Department of paediatrics, Nalanda Medical College and Hospital Patna, Bihar, India, for 8 months. Exclusive breastfed term infants aged between 3-6 months of age (90 days to 180 days) who undergone complete blood count (CBC) examination for some minor ailments was included in this study. All the infants were looked for anemia and its severity.

Results: Out of 100 infants in the study group, 14 had URI with pallor, 40 had ALRI and another 14 had gastroenteritis with pallor. Three each presented with UTI, Febrile convulsions, Rickettsial fever, septicemia and laryngomalacia. Remaining 17 children had different minor illnesses but none had severe life threatening illness. Among 100 infants, 60 were males and 40 were females. According to age 32, 42 and 26 babies were belonging to 3-4, 4-5 and 5-6 months respectively. Mean age was 4.3 month and Hb was 9.6 mg/dl. Median Hb was 9.5 mg/dl. A total of 85 children had anemia as per WHO criteria of <11 gm% of Hb, giving a prevalence of anemia of 85%. However if we take 10.5 mg% as cut off value 81 (81%) had anemia and for 10 mg%, 60 (60%) had anemia. Segregating by gender, 57 males and 28 females were anaemic.

Conclusion: Exclusively breastfed infants between 3-6 months are at increased risk of anemia. Therefore infants after 3 months should be evaluated for anemia and iron deficiency which is the commonest cause of anemia. Such infants should be supplemented with oral iron in addition to exclusive breast feeding for 6 months, to prevent adverse effects of IDA on infants' growth and development.

Keywords: Anemia, Exclusive breast feeding, Full-term baby, Prevalence

Introduction

Nutrition is the key factor in child's growth and development especially during the first two years of life. Iron deficiency anemia is the most common nutritional disorder in the world especially in developing countries.¹ Iron plays an important role in many metabolic

processes, including oxygen transport, oxidative metabolism, and cellular growth. During infancy, inadequate supply of iron resulting in iron-deficiency anemia is associated with more risk of infectious diseases, impaired growth, and poor psychomotor development which is often irreversible even after the correction of anemia.² Increased incidence of breath holding spells and febrile seizures have also been reported with iron deficiency anemia.³ During pregnancy, maternal serum ferritin usually falls markedly between 12 - 25 weeks of gestation probably due to rapid utilization of iron for the expansion of maternal red blood cell mass. Most iron transfer from mother to the fetus occurs after 30 weeks of gestation.⁴ This transfer of iron from the mother to the fetus is supported by a substantial increase in maternal iron absorption and is regulated by the placenta when the receptors for iron located on the apical surface of placental syncytiotrophoblast gradually increases near term. The capacity of this system may be inadequate to maintain iron transfer to the fetus when the mother is iron deficient. Maternal iron deficiency during pregnancy may hamper the development of fetal iron stores prior to birth, and perhaps well into the first year of life also and therefore increasing the risk of anemia during infancy. This has adverse consequences on the neurological development of these infants. Iron deficiency anemia in pregnancy leads to decreased placental weight and significantly reduced number of placental cotyledons and thus is a risk factor for preterm delivery, intra uterine growth retardation and low birth weight and neonatal mortality. However mounting evidences suggest that even though infants of anemic mothers are born with adequate birth weight, they have low iron stores and are more likely to develop anemia.⁵⁻¹¹ In fact, the infants risk of having low hemoglobin when their birth weight was normal (>2500g) but mother was anemic (<11gm/dl) was greater than the infants who had a low birth weight (<2500g) and were born to non-anemic mother(>11g/dl). So the present study was conducted to estimate the prevalence of anemia in exclusively breastfed babies between 3-6 months of age so that we can identify, prevent and treat anemia and its consequences at an early age.

Material and methods

This retrospective observational study was done the Department of paediatrics, Nalanda Medical College and Hospital Patna, Bihar, India, for 8 months, after taking the approval of the protocol review committee and institutional ethics committee.

Inclusion criteria

Exclusive breastfed term infants aged between 3-6 months of age (90 days to 180 days) who attended OPD of the hospital and had undergone complete blood count (CBC) examination for some minor ailments. According to AAP, CBC is not advised routinely in all infants unless there is clinical suspicion of anemia and risk factors for anemia. So CBC was not done for all infants but done for those who presented with pallor and some illnesses.¹²

Exclusion criteria

Children born prematurely, intrauterine growth retarded babies, those with repeated infections, severe infections, babies with supplements, bottle feeds and haemoglobinopathies were excluded from the study.

Methodology

The patients' data and Hb levels were collected from the hospital software. All the infants were looked for anemia and its severity. Since, there is no established cut off available for hemoglobin concentration to diagnose anemia in infants <6 months, the WHO definition of anemia for infants above 6 months, i.e. hemoglobin concentration <11 gm/dl was used to diagnose anemia for babies between 3-6 months and it was also used to assess for severity;

severe <7 mg/dl, moderate 7.00-8.9 mg/dl and mild 9.00-10.9 mg/dl.^{13,14} In addition, the cut-off values suggested by Domelloff et al (<10.5 mg/dl) and Lonnerdal et al (<10 mg/dl) were also used.^{15,16} So the infants were assessed for all 3 cutoff values i.e. <10 mg mg/dl, <10.5 mg/dl and <11 mg/dl.

Results

Totally 600 infants aged 3-6 months attended OPD during study period. Out of them, 120 infants had their CBC done for various reasons and for pallor. After excluding 20 babies as per our exclusion criteria, 100 infants matched the selection criteria and remained as study group.

Out of 100 infants in the study group, 14 had URI with pallor, 40 had ALRI and another 14 had gastroenteritis with pallor. Three each presented with UTI, Febrile convulsions, Rickettsial fever, septicemia and laryngomalacia. Remaining 17 children had different minor illnesses but none had severe life threatening illness.

Among 100 infants, 60 were males and 40 were females. According to age 32, 42 and 26 babies were belonging to 3-4, 4-5 and 5-6 months respectively. Mean age was 4.3 month and Hb was 9.6 mg/dl. Median Hb was 9.5 mg/dl.

Table 1: Demographic profile of patients

| Gender | Number of patients | Percentage |
|---------------|--------------------|------------|
| Male | 60 | 60 |
| Female | 40 | 40 |
| Age in months | | |
| 3-4 months | 32 | 32 |
| 4-5 months | 42 | 42 |
| 5-6 months | 26 | 26 |

Table 2: Prevalence of anemia based on Hb level

| Hb level | Number of patients | Percentage |
|----------|--------------------|------------|
| <11 gm% | 85 | 85 |
| 10.5 mg% | 81 | 81 |
| 10 mg%, | 60 | 60 |

A total of 85 children had anemia as per WHO criteria of <11 gm% of Hb, giving a prevalence of anemia of 85%. However if we take 10.5 mg% as cut off value 81 (81%) had anemia and for 10 mg%, 60 (60%) had anemia.

Table 3: Age wise distribution of patients

| Age in months | Total no. of patients | Anemic patients | Percentage |
|---------------|-----------------------|-----------------|------------|
| 3-4 months | 32 | 28 | 87.5 |
| 4-5 months | 42 | 36 | 85.71 |
| 5-6 months | 26 | 21 | 80.77 |

Out of 85, 28 (87.5%) babies with age of 3-4 months, 36 (85.71%) aged 4-5 months and 21 (80.77%) aged 5-6 months had anemia (table 3).

Table 4: Gender wise distribution of patients

| Gender | Number of patients | Anemic patients | Percentage |
|--------|--------------------|-----------------|------------|
| Male | 60 | 57 | 95 |
| Female | 40 | 28 | 70 |

Segregating by gender, 57 males and 28 females were anemic (table 4).

Table 5: Severity of anemia

| Severity of anemia | Number of patients | Percentage |
|--------------------|--------------------|------------|
| Mild anemia | 60 | 70.59 |
| Moderate anemia | 22 | 25.89 |
| Severe anemia | 3 | 3.53 |

On classifying anemia based on severity as per WHO criteria for assessing severity of anemia in infants above 6 months, it was found that 60 had mild, 22 had moderate and 3 had severe anemia (table 5)

Discussion

In our study, the prevalence of anemia was 85%. A study conducted by Hemachitra et al to assess the prevalence of anemia in 3-6 months old babies with a similar cut off value of Hb showed a prevalence of 65.8%.¹⁷ In Asia, the prevalence of anemia in children under 2 years of age may exceed 90%.¹⁸ The prevalence of anemia among full-term infants may be as high as 80% at 3-6 months and 90% at 6-9 months of age.¹⁹

The extremely high prevalence of anemia in absolutely breast fed infants between 3-6 months of age is similar to the prevalence of anemia observed in children above 6 months. According to NHFS-III, 79% children under 3 years were anemic and in 6-23 months, 81.8% were anemic.¹⁸ In another study conducted in India, 93.5% prevalence of anemia in children aged between 6 to 23 months.²⁰ A study conducted in Odisha yielded 94% prevalence of anemia in under 5 year children.²¹ In a study conducted in Burma, the prevalence of anemia in children between 6-36 months was 72.65%.²²

We tried to find out the cause of anemia in the study group. Babies had no evidence of hookworm infestation, malaria, recurrent diarrhea, recurrent infections and malnutrition which can cause anemia in this age group. Alpha thalassemia trait is uncommon in this area.

A number of studies, conducted largely among infants aged 6-12 months, found that infants born to anemic mothers had a lower Hb concentration.^{23,24} Eighty percent of the iron present in a newborn term infant is accumulated during the third trimester of pregnancy.²⁵ Hemachitra et al, in their study confirmed that low haemoglobin and poor weight gain in term 3-6 months old babies were significantly associated with maternal anemia in last trimester.¹⁷ In support of this, various studies conducted to know the prevalence of anemia in mothers around this region showed high prevalence of anemia in pregnant mothers. Prevalence of anemia in antenatal mothers was 73-96.5% in other parts of India.²⁶⁻²⁸

Recently it has also been proved by different studies that time of umbilical cord clamping at the time of delivery also affects Hb levels in infants. These studies have reported that late-timing of cord clamping, might be associated with better hemoglobin values, higher stores of iron at 6 months of age and lower incidence of anemia.²⁹⁻³¹ Delayed umbilical cord clamping (approximately 120 to 180 seconds after delivery) is associated with improved iron status (ferritin levels) at two to six months of age.^{32,33}

As per previous literature available, it was understood that the breastfeeding protected children from ID/IDA until the 4th month of age.^{25,34} So surveillance is required by the 4th month after birth in order to identify children in need of iron supplementation in fully breastfed babies when they reach 4 months instead of 6 months of age.²⁹ Therefore it is recommended that exclusive breastfed term infants receive an iron supplementation of 1 mg/kg per day, starting at 4 months of age and continued until appropriate iron-containing complementary foods have been introduced.²⁵ However in our study, Out of 85, 28 (87.5%) babies with age of 3-4 months, 36 (85.71%) aged 4-5 months and 21 (80.77%) aged 5-6 months had anemia. This suggests that anemia is common even at 3 months of age necessitating iron supplementation at 3 months.

Even though the study population in the present study is biased towards sick children, high prevalence value is unexpected and alarming. One of the reason for higher prevalence of anemia in the present study could be the high prevalence of maternal anemia in this region. The timing of cord clamping could not be assessed in our study. The other factors could be, majority of the children were poor, rural and from low socioeconomic status.^{35,36} Low socioeconomic status can play a role in different ways, including poorer nutritional status of the mother, maternal anemia and hence poorer fetal nutrition.^{13,16} One more reason is delayed initiation of iron supplementation.

Limitations of study is that there were no definitive cut-off points for Hb level to define anemia in infants between 3- 6 m for better understanding of prevalence of anemia in this age group. The study being a hospital based study it does not reflect the prevalence of anemia in general population. Serum ferritin levels to know the iron status could not be studied as it was a retrospective study.

Conclusion

Exclusively breastfed infants between 3-6 months are at increased risk of anemia. Therefore infants after 3 months, should be evaluated for anemia and iron deficiency which is the commonest cause of anemia. Such infants should be supplemented with oral iron in addition to exclusive breast feeding for 6 months, to prevent adverse effects of IDA on infants' growth and development.

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