

Anemia in exclusively breastfed full-term babies: Factsheet at a tertiary care centre of Bihar

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Abstract

Aim: The aim of this study was to assess the prevalence of anemia in exclusively breastfed babies between 3-6 months of age so that anemia and its consequences could be identified, prevented and treated at an early age.

Methods: This observational study was done in the Department of Pediatrics, Narayan Medical College and Hospital, Rohtas, Bihar, India, for 15 months [October 2019 to December 2020]. Exclusively breastfed term infants aged between 3-6 months of age (90 days to 180 days) who had undergone complete blood count (CBC) for some minor ailments were included in this study.

Result: Among 125 infants, 75 were male and 50 were female. 41, 53 and 31 babies belonged to 3-4, 4-5 & 5-6 months age-categories respectively. Mean age was 4.4 month and mean hemoglobin was 9.8 g/dl. Median hemoglobin was 9.5 g/dl. The prevalence of anemia was 83.20% (104 in 125) [as per WHO criteria of <11 gm% of Hb]. However, on taking 10.5 g% as cut off value, 93 (74.40%) had anemia and for a cut off of 10 g%, 75 (60%) had anemia. Age wise prevalence of

anemia was found to be 87.8% (36 in 41) in 3-4 months, 84.9% (45 in 53) in 4-5 months and 74.19% (23 in 31) in 5-6 months age categories. Segregating by gender, 70 were male and 34 were female anemic babies.

Conclusion: Exclusively breastfed infants between 3-6 months are at increased risk of anemia. Therefore, infants after 3 months, should be evaluated and treated for anemia and iron deficiency which is the commonest cause of anemia.

Keywords: Anemia, Exclusive breastfed, Full-term babies.

Abbreviations: Hb [Hemoglobin], WHO [World Health Organization], URI [Upper Respiratory Tract Infections], ALRI [Acute Lower Respiratory Tract Infections], AAP [American Academy of Pediatrics], CBC [Complete Blood Count], UTI [Urinary Tract Infections], OPD [Out Patient Department], ID [Iron Deficiency], IDA [Iron Deficiency Anemia], NFHS [National Family Health survey].

Introduction

Iron is important for both growth and development of the infants. Iron-deficiency is the most common

micronutrient deficiency and the most common cause of anemia in childhood¹. Ferroperenic anemia caused by severe iron deficiency in infancy is associated with impaired health and serious neurological impairment, such as mental, motor, social, emotional, neurophysiological, and neurocognitive dysfunction². However, there is controversy about the adequacy of breast milk in maintaining optimum iron status of exclusively breastfed babies. A WHO committee expressed concern that some exclusively breastfed infants may become iron deficient¹. Glader recommended that infants exclusively breastfed should receive iron supplementation from four months of age³. Calvo et al. evaluated the iron and nutritional status of exclusively breastfed infants for a prolonged period in relation to their growth rate and dietary changes and recommended that breastfed infants should be given supplemental iron from the fourth month of life⁴. Dewey et al. also evaluated the effect of introducing complementary foods before six months of age in exclusively breastfed infants in Honduras⁵. They recommended iron drops for breastfed infants with birth weights between 2500 g and 3000 g. But McMillan et al. reported that term breastfed infants did not need supplemental iron until the birth weight tripled, which occurs at about 12 months of age⁶. Similarly, Owen et al. found that infants breastfed until 20 weeks of life, had sufficient iron stores at 6 months of age⁷. Zavaleta et al. reported an interesting observation that maternal anemia did not affect breast milk iron or lactoferrin concentration at birth and during early lactation⁸. The 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 anemia⁹⁻¹¹. 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 observational study was done in the Department of Pediatrics, Narayan Medical College and Hospital, Sasaram, Rohtas, Bihar, India, for 15 months after taking 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 anemia¹². So, CBC was not done for all infants but done for those who presented with pallor and some illnesses.

Exclusion criteria

Children born prematurely, intrauterine growth retarded babies, those with repeated infections, severe infections, babies with supplements, bottle-fed and known 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 its severity; severe <7 g/dl, moderate 7.00-8.9 g/dl and mild 9.00-10.9 g/dl^{13,14}. In addition, the cutoff values suggested by Domelloff et al (<10.5 g/dl) and Lonnerdal et al (<10 g/dl) were also used^{15,16}. So the infants were assessed for all 3 cut-off values i.e. <10 g/dl, <10.5 g/dl and <11 g/dl.

Statistical analysis

All the data were entered into MS-Excel sheet and later exported to SPSS Version 20. Results were presented in terms of frequencies and percentages.

Results

Total 610 infants aged 3-6 months attended OPD during study period. Out of them, 145 infants had their CBC done for various reasons and for pallor. After excluding 20 babies as per our exclusion criteria, 125

infants matched the selection criteria and remained as study group {figure 1}.

Out of 125 infants in the study group, 20 had URI with pallor, 50 had ALRI and another 18 had gastroenteritis with pallor. Three each presented with UTI, Febrile convulsions, Rickettsial fever, septicemia and laryngomalacia. Remaining 22 children had different minor illnesses but none had severe life-threatening illness {figure 2}.

Among 125 infants (study subjects), 75 were male and 50 were female. 41, 53 and 31 babies belonged to age categories 3-4, 4-5 and 5-6 months respectively. Mean age was 4.4 month and mean Hb was 9.8 g/dl. Median Hb was 9.5 g/dl. A total of 104 children had anemia as per WHO criteria of <11 gm% of Hb, giving a prevalence of 83.20%. However, if 10.5 g% was taken as cut off value, 93 (74.40%) had anemia and for a cut off of 10 g%, 75 (60%) had anemia. Age wise prevalence of anemia was found to be 87.8% (36 in 41) in 3-4 months, 84.9% (45 in 53) in 4-5 months and 74.19% (23 in 31) in 5-6 months age categories {table 3}. Segregating by gender, 70 male and 34 female babies were anemic {table 4}. Based on WHO criteria for assessing severity of anemia in infants above 6 months, it was found that 75 (72.11%) had mild, 24 (23.07%) had moderate and 5 (4.8%) had severe anemia {table 5}.

Discussion

A variety of heterogeneous agents that possess antimicrobial activity are found in human milk. As a result, infants who are exclusively breastfed in the initial 4 months of life have fewer episodes of diarrhea, otitis media, pneumonia, bacteremia, and meningitis during the 1st year of life in comparison with infants who are formula-fed.

In our study, the prevalence of anemia was 83.20%. 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 NFHS-III, 79% children under 3 years were anemic and in 6-23 months, 81.8% were anemic¹⁸. In another study conducted in India, 93.5% prevalence of anemia in children aged between 6 to 23 months²⁰. A study conducted in Orissa yielded 94% prevalence of anemia in under-5 years children²¹. 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 malnourishment 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 pregnancy²⁵. 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 trimester¹⁷. 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% in Belgaum and 96.5% in Koppal, Karnataka India, whereas it was 98% in Sonapat Haryana India²⁶⁻²⁸.

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 anemia²⁹⁻³¹. 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 age²⁹. Therefore, it is recommended that exclusive breastfed term infants should 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 introduced²⁵. However, in our study, age wise prevalence of anemia was found to be 87.8% (36 in 41) in 3-4 months, 84.9% (45 in 53) in 4-5 months and 74.19% (23 in 31) in 5-6 months age categories. 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. One of the reasons 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, as many babies were out-born. The other factors could be that majority of the children belonged to rural area and were from low socioeconomic status (lower middle, upper lower and lower class from Modified Kuppuswamy scale)^{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 in babies.

Conclusion

The present study concluded that the 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.

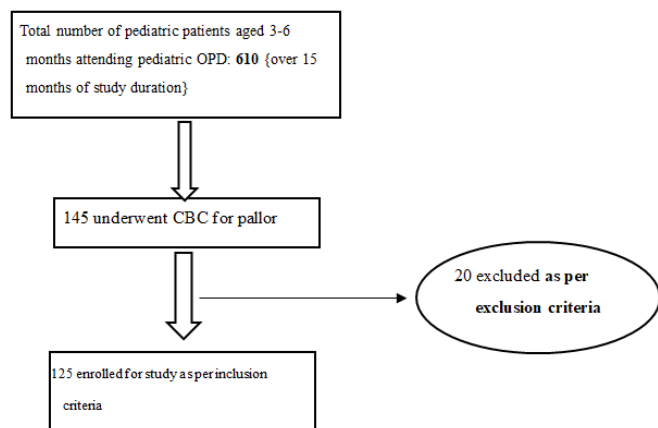


Fig.: 1: Study protocol

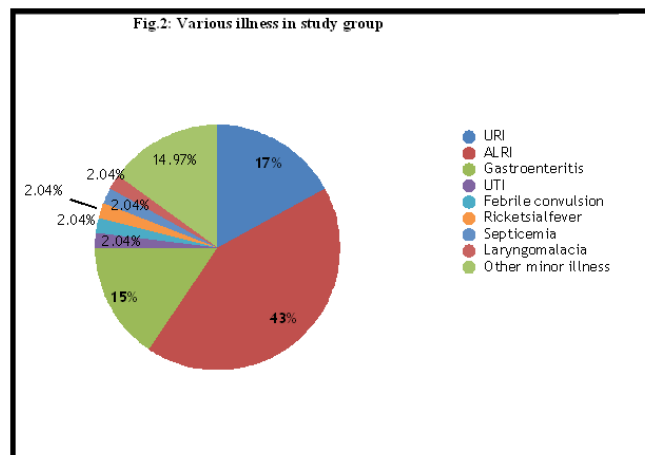


Table 1: Demographic profile of patients [n =125]

Gender	Number of patients	Percentage
Male	75	60 %
Female	50	40 %
Age in months		
3-4 months	41	32.8 %
4-5 months	53	42.4 %
5-6 months	31	24.8 %
Socio-economic strata (Modified Kuppuswamy Scale)		
Upper	13	10.4%
Upper Middle	26	20.8%
Lower Middle	41	32.8%
Upper Lower	33	26.4%
Lower	12	9.6%
Residential status		
Urban	46	36.8%
Rural	79	63.2%

Table 2: Prevalence of anemia based on Hb level

Hb level	Number of patients [out of 125]	Percentage
<11 gm%	104	83.2 %
<10.5 gm%	93	74.4 %
<10 gm%,	75	60 %

Table 3: Age wise distribution of patients

Age in months	Total no. of patients = 125	Anemic patients=104	Percentage
3-4 months	41	36	87.80 %
4-5 months	53	45	84.91 %
5-6 months	31	23	74.19 %

Table 4: Gender wise distribution of patients

Gender	Number of patients [n = 125]	Anemic patients [n = 104]	Percentage
Male	75	70	93.33 %
Female	50	34	68 %

Table 5: Severity of anemia

Severity of anemia	Number of patients [n = 104]	Percentage
Mild anemia	75	72.11 %
Moderate anemia	24	23.08 %
Severe anemia	5	4.81 %

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