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Original Research Article

A Study to Determine the Prevalence of Anemia in Exclusively Breastfed Full Term Babies

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Abstract

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. **Methods:** This retrospective observational study was done the Department of Pediatrics, Nalanda Medical College and Hospital, Patna, Bihar, India, for 13 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. **Result:** The prevalence of anemia was 83.20%. Among 125 infants, 75 were males and 50 were females. According to age 41, 53 and 31 babies were belonging to 3-4, 4-5 and 5-6 months respectively. Mean age was 4.4 month and Hb was 9.8 mg/dl. Median Hb was 9.5 mg/dl. A total of 104 children had anemia as per WHO criteria of <11 gm% of Hb, giving a prevalence of anemia of 83.20%. However, if we take 10.5 mg% as cut off value 93(74.40%) had anemia and for 10 mg %, 75 (60%) had anemia. Out of 104, 36 (87.80%) babies with age of 3-4 months, 45 (84.91%) aged 4-5 months and 23 (74.19%) aged 5-6 months had anemia. Segregating by gender, 70 males and 34 females were anemic. **Conclusion:** The **e**xclusively 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.

Keywords: Anemia, Exclusive Breast Feeding, Full-Term Baby, Prevalence.

Introduction

Iron deficiency is the most common micronutrient deficiency and the most common cause of anemia in childhood[1]. Iron is important for both growth and development of the infants. Ferropenic 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 dysfunction[2].

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 deficient[1]. Glader recommended that infants exclusively breastfed should receive iron supplementation from four months of age[3]. 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 life[4]. Dewey et al. also evaluated the effect of introducing complementary foods before six months of age in exclusively breastfed infants in Honduras[5]. 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 occurred at about 12 months of age[6]. Similarly Owen et al. found that infants breastfed until 20 weeks of life, had sufficient iron stores at 6 months of age[7]. Zavaleta et al. reported an interesting observation that maternal anemia did not affect breast milk iron or lactoferrin concentration at birth and during early lactation[8]. 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 anemia[9-11]. 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 Pediatrics, Nalanda Medical College and Hospital, Patna, Bihar, India. for 13 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 prematurly, 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 cut off values i.e. <10 mg mg/dl, <10.5 mg/dl and <11 mg/dl.

Statistical analysis

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

Results

Totally 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.

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, Ricketsial fever, septicemia and laryngomalacia. Remaining 22 children had different minor illnesses, but none had severe life-threatening illness.

Among 125 infants, 75 were males and 50 were females. According to age 41, 53 and 31 babies were belonging to 3-4, 4-5 and 5-6 months respectively. Mean age was 4.4 month and Hb was 9.8 mg/dl. Median Hb was 9.5 mg/dl

Table 1: Demographic profile of patients

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

Table 2: Prevalence of anemia based on Hb level

Hb level	Number of patients	Percentage
<11 gm%	104	83.2
10.5 mg%	93	74.4
10 mg%,	75	60

A total of 104 children had anemia as per WHO criteria of <11 gm% of Hb, giving a prevalence of anemia of 83.20%. However, if we take 10.5 mg% as cut off value 93(74.40%) had anemia and for 10 mg%, 75 (60%) had anemia.

Table 3: Age wise distribution of patients

Age in months	Total no. of patients	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

Out of 104, 36 (87.80%) babies with age of 3-4 months, 45 (84.91%) aged 4-5 months and 23 (74.19%) aged 5-6 months had anemia (table 3).

Table 4: Gender wise distribution of patients

Gender	**Number of patients**	Anemic patients	Percentage
Male	75	70	93.33
Female	50	34	68

Segregating by gender, 70 males and 34 females were anemic (table 4).

Table 5: Severity of anemia

Severity of anemia	**Number of patients**	**Percentage**
Mild anemia	75	72.11
Moderate anemia	24	23.08
Severe anemia	5	4.81

On classifying anemia based on severity as per WHO criteria for assessing severity of anemia in infants above 6 months, it was found that 75 had mild, 24 had moderate and 5 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 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 was72.65%[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 malanurishment 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% in Belgaum and 96.5% in Koppal, Karnataka

India, whereas it was 98% in Sonipat Haryana 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 4months 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 104, 36 (87.80%) babies with age of 3-4 months, 45 (84.91%) aged 4-5 months and 23 (74.19%) 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 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. 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.

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.

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