

Anemia in early life (up to the age of 6 months) – Is it really a disease burden? A cross sectional study from Sub Himalayan region

DOI: 10.52629/jamsa.v10i1.358

Seema Sharma (1), Charu Maggoi (2)

1- Medical Student, Faculty of Medicine, Dr RPG Medical College, India

2- Associate Professor, Department of Pediatrics, Dr RPG Medical College, India

*Corresponding author:
Seema Sharma*

1- Dr RPG Medical College, Kangra, India

seema406@rediffmail.com

Abstract:

Background The study aims to settle the question of giving prophylactic iron to all breastfed infants (up to age of 6 months). It will determine the disease burden & clinicopathological profile of anemia in infants up to 6 months and its correlation with maternal Hb levels.

Material and Methods A hospital based cross-sectional study was undertaken for four months in all infants up to 6 months of age and their mothers getting admitted in the pediatrics ward of a tertiary

health care centre in Sub-Himalayan region.

Results 42 % of infants and 64 % of mothers were found to be anemic. It was found that mothers of 74% of total anemic infants were also anemic. Also in 79% cases mothers with good ferritin stores (≥ 12 ng/ml) also have infants with good ferritin stores (≥ 10 ng/ml). It was found that mothers who have not consumed adequate amount of iron in their pregnancy, 44% of them have anemic infants. Though the relationship between infant and maternal parameters is not statistically significant, the figures are large enough, indicating the need for a further comprehensive study to determine the relationship between the two.

Conclusions High rates of anemia in early life points to the need of multicentric as well as population based study so that we can collect evidence to start iron prophylaxis in this highly vulnerable developing age group of 0 to 6 months. Further higher rates of anemia in mothers warrants the strengthening in the implementation plan of IFAS to all females of reproductive age group.

Keywords: Anemia, Development, Infant, Iron deficiency

Introduction

In early years of life, iron deficiency anemia is associated with psychomotor & cognitive development problems which may be irreversible even after appropriate treatment. Hence nutrition interventions are important at many points in life course and attention to practices in the early period will bring benefits throughout [1]. Infants in early life (up to the age of 6 months) are exclusively breastfed, making the concentration of iron and lactoferrin in breast milk essential to maintain body iron levels in them. Maternal anemia could affect these concentrations in breast milk. There is evidence that even children with normal birth weight, but born of anemic mothers will have low iron reserves at birth and are more likely to develop anemia [2]. Based on recent estimates from the WHO, the prevalence of anemia is 24.8% globally and the highest rates are found in pre-school age children (67.6%) and pregnant women (57.1%) in sub Saharan Africa.[3] Therefore knowledge of risk factors, which may be already present in early life, is essential to support control and prevention strategies. WHO committee has expressed concern that some exclusively breast fed infants may become iron deficient.[4]

Glader and Calvo et al in their work have recommended that infants who are exclusively breastfed should receive iron supplementations from 4 months of age.[5,6] Dewey et al has also recommended iron drops for breastfed infants with birth weight between 2500 g & 3000 g.[7] On the contrary Mc Millan et al and Owen et al have reported that term breastfed infants did not need supplemental iron until 12 months of age[8] and 6 months of age[9] respectively. Zavaleta et al has reported that maternal anemia did not affect breast milk iron or lactoferrin concentration at birth or during lactation.[10]

Hence there is controversy about adequacy of breast milk in maintaining optimum iron status of exclusively breastfed infants. Although iron deficiency has been reported as the most common nutritional deficiency in the world, the available literature of disease burden due to anemia in early life (up to 6 months) is limited. Thus the question of giving prophylactic iron to all breastfed infants remains far from settled. We have planned to do this study to find the status of disease burden due to anemia in infants up to the age of 6 months so that appropriate measures can be taken for early identification and treatment of anemia in these infants.

Subsequently we can plan strategies to strengthen maternal health services for improvement of maternal iron status.

Material and Methods

This was a hospital based cross sectional study, conducted in the Department of Pediatrics of our tertiary care institute for 4 months after taking approval from the institutional ethic committee. All the infants up to 6 months of age admitted in pediatric wards and mother-baby pairs were taken into the study group after taking informed consent. Exclusion criteria for infants were: Infants getting discharged after stay in NICU/SNCU during neonatal period, the infants with recurrent admissions and/or suffering from chronic illness.eg hemolytic diseases, parvovirus infection, chronic kidney disease etc, infants on iron therapy in last one month, infants who received blood transfusion in last 2 months or infants who have undergone double volume exchange/partial exchange in last 2 months, infants with any bleeding disorder or coagulation defect and infants with any acute blood loss. eg. Trauma. Exclusion criteria for enrollment of mothers were: Any chronic illness in the mother, mother who had suffered from any excessive bleeding during antenatal and postpartum period in

last 2 months, mother suffering from any bleeding disorder, mothers who have received blood transfusion in last 2 months and mothers who are on therapeutic doses of iron therapy. After history taking and detailed examination, following investigations were sent for infant-mother pairs - haemogram, peripheral blood film, reticulocyte count, iron studies, vitamin B12 levels, folate levels, electrophoresis if there is evidence of haemolysis.(Fig. 1 Study design) Blood sample was taken by peripheral venipuncture method, 5 ml of blood from the mother and 3 ml blood from the infant was withdrawn under all aseptic conditions and was collected in EDTA vials and plain vials for further processing. A predesigned Performa was used for collection of data which included: Socio-demographic and socio-economic information of the households and the care giver for example; name, age, sex, marital status , Infant information included type of feeding , feeding practices, complementary feeding practices, health information and anthropometric measurements and morbidity experience of the infant. Maternal information included maternal nutrition status, iron supplementation status during pregnancy, incidences of anemia etc. Definitions utilized for the present study were - Anemia in infants: Hb

levels < 10 g/dl for infants up to 5 months (Brault-Dubuc et al.) and < 11 g/dl for infants of 6 months of age. (WHO). Iron deficiency in infants: plasma ferritin concentration <10ng/ml. Anemia in mothers: Hb <12g/dl. (WHO). Iron deficiency in mothers: plasma ferritin <12 ng/ml. (WHO). Data collected was then transferred to MS Excel sheet for further analysis. It was analyzed as mean, percentage, frequency; other statistical tests were applied as per requirement. Chi-square test was used for categorical variables. The value of P <0.05 was considered statistically significant.

Results

During our study period of four months, 1750 patients were admitted in the pediatric ward. Out of these 547 patients were infants. In the infants 398 were of age ≤6 months. Out of these 398 patients, 298 patients were excluded on the basis of exclusion criteria given in the methodology section. Our study group hence comprised of 100 infants. Majority of infants in our study group belong to age group of 0 to 2 months (38%) followed by 31% of infants each in 2.1 -4 and 4.1 -6 months. 68% of total study group were males, making ratio of male to female of about 2:1.(Fig.2) Majority of infants presented with chief complaints of cough (54%) followed

by fever (51%). About 16 % of infants have history of previous hospitalization due to variable complaints. Exclusive breastfeeding was found to be the most common mode of feeding (72%). A declining trend was observed with increasing age in practice of exclusive breastfeeding as only 51% of total infants of age 4.1-6 months were exclusively breastfed compared to 79% of infants of 0-2 months. Majority of infants (63%) weighed ≥2.5 kg at birth. Majority of infant mother pairs (64%) belong to upper middle class according to Modified Kuppuswamy scale. 21% of infants were found to have abnormal OFC. 54 % of infants were found to have length < -2 SD. 64% of infants were having weight below -2 SD with maximum cases above 2 months of age (44%).42% of infants were found to be anemic with maximum cases at 2.1 to 4 months of age. (Fig. 3) 97% of mothers in our study group were found to be literate. 61% of them have completed their high school and 24% are graduated. 84% of mothers have taken IFAS for adequate period. However 16% have consumed incompletely, out of which 2 % have never consumed the prophylaxis. 64% of mothers were found to be anemic.24% of them have mild anemia (11-11.9 g/dl) and 35% moderate anemia (8-10.9g/dl) and 5% severe anemia (hb<8gm/dl). (Fig. 3)

31% of mothers were found to have serum iron < 41 µg /dl. 12% of mothers were found to have poor ferritin stores (<10 ng/ml). It was found that mothers of 74% of total anemic infants were also anemic. (Table 1) Also in 79% cases mothers with good ferritin stores (≥12ng/ml) also have infants with good ferritin stores (≥10 ng/ml). (Table 1) It was found that mothers who have not consumed adequate amount of iron in their pregnancy, 44% of them have anemic infants. (Table 1)

Discussion

We have conducted this study at our tertiary care health centre to find out the burden of anemia in early life (up to the age of 6 months). During our study period of four months, the infants up to the age of 6 months were 22.7% of total admissions and 72.7% of total infants.

Our study group comprised a total of 100 infants which were further divided into 3 age groups. Maximum number of infants were from 0-2 months (38%) followed by 31 % each of 2.1-4 and 4.1-6 months. 68% of the total study group were males, making the ratio of male to female of about 2:1. These finding on age distribution are comparable to those reported by Etti Sudaryati in which 50% of study group was from 0-2 months, 31% from 2.1-4 and 19% from 4.1-6 months.[11]

Majority of infants in our study group were admitted with chief complaints of cough (54%) and fever (51%). Other illnesses reported were lethargy, diarrhea, convulsion, failure to thrive and excessive crying. An almost similar trend was witnessed by Nyamasege who found common cold to be the commonest illness in his study group[12]. In our study group 16% infants also have a history of previous hospitalization due to variable symptoms, with maximum infants admitted due to respiratory illness (38%). This could be due to the fact that infants' immunity is not well developed which makes them more prone to infections like common cold, pneumonia, etc.

In feeding practices, exclusive breastfeeding was found to be the most common mode of feeding (72%). A declining trend was observed with increasing age in practice of exclusive breastfeeding as only 51% of total infants of age 4.1-6 months were exclusively breastfed compared to 79% of infants of 0-2 months. Overall the rate of exclusive breastfeeding is higher when compared to study at Nairobi which reported 57% of exclusive breastfeeding.[12] This could be attributed to better awareness programs regarding exclusive breastfeeding being implemented in

India. However this rate is lower when compared to the recommendation of 90% given by WHO (2009) for exclusive breastfeeding among infants up to age of 6 months.

Majority of infants (63%) weighed ≥ 2.5 kg at birth. Majority of our study population belong to the upper middle class according to the Modified Kuppuswamy Scale. Anthropometric measurements of infants were done at the time of admission and it was found that 21% of infants were of abnormal head circumference (11% microcephaly and 10% macrocephaly). The mean weight in the study sample was 4.5 ± 1.3 with the lightest child weighing 2 kg and heaviest child 11 kg. 64% of infants have weight for age $< -2SD$, with a drastic increase in number as the age group shifts from 0-2 months (53%) to 2.1-4 months (71%). The mean length was found to be 57.4 ± 6 with the shortest child of length 37 cm and longest child of 71 cm. 54% of the population have length for age $< -2SD$ with maximum number in 0-2 months of age (23%). The rates were found to be higher when compared to findings at Nairobi where only 9.2% of infants were found to be suffering from failure to thrive and only 11.2% were stunted.[12] The rates depict the poor nutritional status of infant –mother pairs in India. Reasons could range

from poverty (making mothers unable to buy required amount of food) to consumption of highly adulterated foods.

Hematological profile of infants was analyzed and it was observed 42% of the study group were anemic with maximum cases in age group 2.1-4 months (38%). The mean hemoglobin level was found to be 9.9 ± 2.7 g/dl. Results are comparable to findings of RK Chandyo et al. in Nepal where 49% infants were found to be anemic.[13] These findings were in contrast to the assumption that breast fed infants do not develop anemia as they get whatever they need from their mother's milk. Also 8% of infants in our study groups were found to have low ferritin stores.

Majority of women in our study group are literate (97%). 61% of them have completed their high school and 24% have graduated. The values are high when compared to the national women literacy rate of 65.46% as per census 2011. Higher education rates is probably the reason for higher exclusive breastfeeding rates in our region.

Most mothers (84%) in our study group have consumed iron and folic acid supplementation for the required period of 180 days. 16% mothers have consumed it for lesser duration, out of which 2% have never

consumed the prophylaxis. The results are comparable to findings at Nairobi where 73% mothers have consumed IFAS tablets for the required period of time.[12] The number are very high when compared to findings of national family health survey (2015-16) where an average of only 30.3% of mothers consumed IFAS for 100 or more days, this ranged from the lowest in Nagaland (4.4%) to the highest in Lakshadweep (82.1%). The better rates in our region could be attributed to better implementation of government schemes and better educational status of women.

Hematological profile of the mother was analyzed. 64% of mothers were found to be anemic. 24% of them have mild anemia (11-11.9 g/dl) and 35% moderate anemia (8-10.9g/dl) and 5% severe anemia (Hb<8gm/dl). The figures were less when compared to results of Rita Panyang's cross sectional study in Assam which found 100 % population to be anemic with 91.6% suffering from moderate anemia and 8.4% from severe anemia.[14] The high rates of mild, moderate and severe anemia demands a due emphasis on implementation of INIPI program and health education regarding consumption of iron rich foods to bring down the prevalence of anemia

among the women of reproductive age group in India.

31% of mothers were found to have low serum iron <41µg/dl. 12% of total mothers had low ferritin stores (<10ng/ml).

It was found that mothers of 74% of total anemic infants were also anemic. Also in 79% cases mothers with good ferritin stores (≥ 12 ng/ml) also have infants with good ferritin stores (≥ 10 ng/ml). It was found that mothers who have not consumed an adequate amount of iron in their pregnancy, 44% of them have anemic infants.

Conclusions

42 % of infants and 64 % of mothers were found to be anemic. Mothers of 74% of total anemic infants were also anemic. 79% cases mothers with good ferritin stores (≥ 12 ng/ml) also have infants with good ferritin stores (≥ 10 ng/ml). Also mothers who have not consumed adequate amount of iron in their pregnancy, 44% of them have anemic infants. Though the relationship between the two is not statistically significant but the figures indicating anemia burden in early life, hence we suggest a multicentric as well as population based study so that we can collect evidence to start iron prophylaxis in this highly

vulnerable developing age group of 0 to 6 months. Further we suggest strengthening the implementation plan of IFAS to all females of reproductive age group.

Declarations

Ethics approval and consent to participate

Not applicable.

Availability of data and material

Not applicable.

Conflict of interests

Not applicable.

Funding

Not applicable.

Authors' contributions

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