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Original Research Article

A Hospital Based Assessment of Maternal Nutritional Awareness and Iron Deficiency Anemia in Children Aged 6 Months–2 Years: A Questionnaire Study

Upendra Prasad Sahu[1], Sunanda Jha[2], Bhardwaj Narayan Chaudhary[3], Pawan Kumar[4]

[1]Associate Professor, Department of Pediatrics, RIMS, Ranchi, Jharkhand, India
[2]Associate Professor, Department of Pediatrics, RIMS, Ranchi, Jharkhand, India
[3]Senior Resident, Department of Pediatrics, RIMS, Ranchi, Jharkhand, India
[4]Senior Resident, Department of Pediatrics, RIMS, Ranchi, Jharkhand, India

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Corresponding author: Dr. Upendra prasad Sahu
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Abstract

Aim: This study aimed to analyze the risk factors and vital role of mothers in prevention of nutritional anemia in the early childhood.

Methods: This study was carried out at department of Pediatrics, RIMS-Ranchi India for the period of one year. Children aged 6 months–2 years admitted at the hospital during the study period were included. Any child with chronic disorders such as hemoglobinopathies, hemolytic anemia, and treated for anemia and those on any immuno suppressants such as steroids and biologics were excluded as an indirect measure to eliminate anemia of chronic disease.

Results: Of the 500 children, 270 (54%) were anemic. Moderate anemia was found in 120 (24%) and only 10 (2%) had severe anemia. Mean age of anemic children was 13.23±5.15 months. Mean maternal age was 26.49±3.46 years, ranging between 19 and 36 years. Majority (78%) of the mothers were aware that neural development of child could be affected by anemia. Despite WHO's efforts to enforce exclusive breastfeeding until 6 months of age, 18% of mothers preferred to initiate complementary feeds at 4 months of age. Maternal knowledge regarding cow's milk was poor as 84% had a faulty belief that it increases iron absorption, whereas 16% were unaware of the relationship between cow's milk and anemia. Around 80% and 70% mothers recognized green leaves and jaggery to be enriched with iron. On an attempt to establish a correlation between maternal education status and anemic children, we found that mothers with better literacy rates had significant awareness regarding anemia and nutrition.

Conclusion: Recognizing the causative factors plays an essential role in preventing iron deficiency anemia (IDA). Exclusive breastfeeding must be promoted, along with avoiding excessive cow's milk intake. Intervening at the right period with age-appropriate foods becomes a necessity. Maternal illiteracy has a positive correlation with anemia in infants. Improving maternal awareness by the physicians will pave the road toward a nation free from anemia.

Keywords: Maternal awareness, Iron deficiency anemia, Child nutrition, Weaning.

Introduction

Anemia is the most common nutritional deficiency disorder globally, affecting a quarter of the world population, especially children and women of reproductive age group, resulting in public health problem of paramount importance. [1] Globally, anaemia affects 1.62 billion people (95% CI: 1.50–1.74 billion), which corresponds to 24.8% of the population (95% CI: 22.9–26.7%). Estimated 447 million persons with anaemia, causes India to contribute almost one quarter to the global burden as calculated by the global burden of disease in 2016. [2] Anaemia, defined as a low blood haemoglobin concentration, is the most common nutritional problem in the world. It is a global public health problem affecting both developed and developing nations leading to impairment in cognitive and functional ability of the affected individuals, thereby leading to serious consequences in the health, social and economic status of these nations. According to WHO statistics on the global prevalence of anaemia (2011), the worldwide prevalence of anaemia in infants and children in the age group 6months to 59 months with anaemia is 42.6%. [3]

Anaemia has a significant impact on the physical and cognitive development of children. Iron deficiency anaemia can lead to delayed motor development, poor neurocognitive development and impaired psychosocial skills in the affected children. [4,5] These effects have been attributed to the dysregulation of normal cellular functions, impaired myelination of the corticospinal tract, a decrease in the dopamine D2 receptors in the cerebral cortex, altered metabolism of serotonin and noradrenaline, seen in iron deficiency. [4-6] All these factors, leading to IDA during infantile and early childhood, has a negative impact on the motor and neuro-cognitive function. [7]

Anaemia has a significant impact on the physical and cognitive development of children. Iron deficiency anaemia can lead to delayed motor development, poor neurocognitive development and impaired psychosocial skills in the affected children.8,9 These effects have been attributed to the dysregulation of normal cellular functions, impaired myelination of the corticospinal tract, a decrease in the dopamine D2 receptors in the cerebral cortex, altered metabolism of serotonin and noradrenaline, seen in iron deficiency. [8-10]

Most infants with anemia are asymptomatic but they can have nonspecific symptoms like irritability and anorexia. Further, anemia in infancy and early childhood is associated with behavior-al and cognitive delays, including impaired learning, decreased social achievement, and lower scores on tests of mental and motor development. Understanding the underlying barriers influencing the hemoglobin level by the mothers, thereby, early detection and timely correction are an important way to prevent anemia. However, the evidence regarding the maternal influence on these risk factors is scarce. No single literature has focused on the core weaning population that was being affected. This study, therefore, was driven with an aim to compile all the contributive elements to nutritional anemia with special emphasis on mother's role in prevention.

This study aimed to analyze the risk factors and vital role of mothers in prevention of nutritional anemia in the early childhood.

Materials and Methods

This study was carried out at department of Pediatrics, RIMS-Ranchi India for the period of one year. Children aged 6 months–2 years admitted at the hospital during the study period were included.

Any child with chronic disorders such as hemoglobinopathies, hemolytic anemia, and treated for anemia and those on any immunosuppressants such as steroids and biologics were excluded as an indirect measure to eliminate anemia of chronic disease. The study protocol was approved by the Hospital Ethics and Scientific Committee. An informed written consent was obtained from the mothers of these children. Later, a pre-designed pro forma was used to record the relevant information.

The two pages pro forma would include six sets of questionnaires. Only the mother was allowed to answer the questionnaire. The first part comprises general details including demography, personal data, socioeconomic status, and family background. Information pertaining to significant history of both mother and child was included in the second part. A detailed nutritional history of the child was assessed in the third part of the pro forma. Clinical presentation and investigation details were recorded in the fourth and the fifth, respectively. The final part of the questionnaire was added to analyze the awareness of the mothers on anemia and their extent of knowledge on the risk factors, clinical features, and the importance of treating IDA.

Length and weight were measured uniformly using infantometer and digital weighing machine to the nearest 0.1 cm and 0.001 kg, respectively. Nourishment was graded based on the World Health Organization (WHO) guidelines and chronically malnourished children were excluded from the study.[8] Children were classified based on Modified Kuppuswamy scale of socioeconomic strata.[11] Two generations of family living in the same household were considered 'nuclear" family. Anything beyond was considered "joint" family. Complete blood count including red blood cell indices was calculated using Coulter LH 780 Hematology analyzer. Mentzer index was calculated along to differentiate between IDA and Thalassemia. Anemia was graded as per the WHO guidelines.[4]

Questionnaire was prepared in both English and vernacular language for better understanding. On designing the questionnaire, it was validated by an expert panel consisting of a Pediatrician, healthcare workers, and academic professionals including experts in vernacular language for easy comprehensibility.

A total of 550 parents were given the questionnaire on a one to one interview basis. Average time taken to complete the questionnaire was 20 min. Any queries raised by the parents, while answering the questions was clarified in person. Of them, 15 parents were not willing to answer. 34 answer sheets were excluded as the answers were incomplete. Answers from 500 parents were collected, of which 20 children had chronic malnutrition.

Statistical Analysis

Anemia was the primary outcome variable and knowledge on nutrition/anemia was considered as the secondary variable. Descriptive analysis was carried out by mean and standard deviation for quantitative variables, frequency, and proportion for categorical variables. The association between variables of anemia and quantitative outcome was assessed by comparing the mean values. Independent sample t-test was used to assess the statistical significance.

Results

Table 1: Patient details

Variables	N%
Anemia	270 (54)
Moderate Anemia	120 (24)
Severe Anemia	10 (2)

Mean age of anemic children	13.23±5.15 months
Mean maternal age	26.49±3.46

Of the 500 children, 270 (54%) were anemic. Moderate anemia was found in 120 (24%) and only 10 (2%) had severe anemia. Mean age of anemic children was 13.23±5.15 months. Mean maternal age was 26.49±3.46 years, ranging between 19 and 36 years.

Table 2: Tabular column showing the percentage of answers by the mothers

Questions	No. of correct answers (%)	No. of incorrect answers (%)
Anemia is a deficiency of hemoglobin	360 (76)	100 (20)
Iron is important for carrying oxygen in the blood to various organs	150 (30)	350 (70)
Infants at weaning age are at high risk for anemia	100 (20)	400 (80)
Low birth weight is a risk factor for anemia in newborns	125 (25)	375 (75)
Anemia affects both vegetarians and non-vegetarians equally	90 (18)	410 (82)
Large quantities of cow's milk decreases iron absorption	80 (16)	420 (84)
Complementary feeds should be started at 6 months	90 (18)	410 (82)
Jaggery contains more iron	350 (70)	150 (30)
Green leaves are rich in iron	360 (72)	140 (28)
Meat is rich in iron	90 (18)	410 (82)
Orange is rich in vitamin C	400 (80)	100 (20)
If mother takes iron supplements, breastfed infant doesn't get more iron	400 (80)	100 (20)
Vitamin C is necessary for absorption of iron	380 (76)	120 (24)
Anemia is often asymptomatic	390 (78)	110 (22)
Anemia can cause Neurodevelopmental delay in infants	390 (78)	110 (22)
Government provides free iron supplements	50 (10)	450 (90)
Anemia can be prevented	360 (72)	140 (28)
Iron causes constipation but should not be avoided	20 (4)	480 (96)
Blood transfusion is not necessary for all children with anemia	50 (10)	450 (90)

Majority (78%) of the mothers were aware that neural development of child could be affected by anemia. Despite WHO's efforts to enforce exclusive breastfeeding

until 6 months of age, 18% of mothers preferred to initiate complementary feeds at 4 months of age. Maternal knowledge regarding cow's milk was poor as 84% had a faulty belief that it increases iron absorption, whereas 16% were unaware of the relationship between cow's milk and anemia. Around 80% and 70% mothers recognized green leaves and jaggery to be enriched with iron. Although 76% identified vitamin C containing fruits, many were not aware of its vital role in increasing the iron absorption. These results stress the importance of maternal knowledge on nutrition and iron.

Table 3: Comparison of knowledge among the mothers of anemic and non-anemic and non-anemic children

Maternal awareness	**%**
Poor Knowledge	
Yes	95%
No	5%
Fair Knowledge	
Yes	55%
No	45%
Good Knowledge	
Yes	22%
No	78%

Mothers with "poor" awareness, a whopping 95% had anemic children. Mothers with "fair" awareness had half (55%) their children affected by anemia.

Table 4: Association between maternal awareness and their education status

	Poor Knowledge %	**Fair Knowledge %**	**Good Knowledge %**
Upto primary	46	38	16
Middle school	20	68	12
High school	12	70	18
Graduate & PG	14	74	12

On an attempt to establish a correlation between maternal education status and anemic children, we found that mothers with better literacy rates had significant awareness regarding anemia and nutrition.

Discussion

Anemia is a significant public health problem that occurs worldwide in both developed and developing countries. The WHO Global Data-base on Anemia for 1993–2005, estimated the prevalence of anemia worldwide at 25 % with higher percentage noted in developing countries (43%). [12] Anaemia is defined as a low blood haemoglobin concentration, is the most common nutritional problem in the world. It is a global public health problem affecting both developed and developing nations leading to impairment in cognitive and functional ability of the affected individuals, thereby leading to serious consequences in the health, social and economic status of these nations.

Our study had more anemic children in older mothers unlike other studies probably due to higher age cutoff and associated health effects. [13,14] Mother's level of education and the impact on the child has been re-established in our study as mothers with minimal education (upto primary school) had 85% of their children with anemia. [15,16] Apprehension on when to start the complementary feeds and lack of awareness on exclusive breastfeeding was common among mothers. With regard to the duration of

breastfeeding, half (52.20%) of the children in our study were partially breastfed (4–6 months) and only 31% of them had exclusive breastfeeding. To our dismay, all the infants deprived of breast milk had anemia. Among the partially breast fed infants, higher proportion (62.14%) were anemic. This stresses the importance of the WHO's exclusive breast feeding in the early infancy sufficing the lesser iron requirements. [16] Only 16% of mothers were aware of the importance of timely introduction of complementary feeds, proving the misconceptions on duration of breast feeding. Iron requirements after 6 months are 0.9–1.3 mg/kg/day [17], whereas the iron content of cow's milk is 0.2–0.5 mg/L, of which only 10% is absorbed. [18] In addition, cow's milk causes asymptomatic micro-hemorrhages in intestine further increasing the loss of iron. [19] This explains the reason why excess cow's milk had a negative influence on hemoglobin level in our study (p 0.002).

Several mothers believed that only children on vegetarian diet would be affected by IDA. However, iron status is a common nutritional problem among both vegetarian and nonvegetarian consumers, despite few studies reporting IDA of higher incidence in the former. This relative increase in IDA among vegetarians is probably due to their dependence on non-heme iron and the presence of iron absorption inhibitors in plant foods. [20] Apt feeding practices are thus fundamentally important to ensure an appropriate nutrition in a growing child.

On a positive note, 78% of the mothers had acknowledged the possibility of neural development being affected by anemia. Understanding this would stress the importance of supplementing iron in infants. The prime source of knowledge in our study was the community health workers. Training and engagement of the health workers are critical in increasing the healthcare awareness in low- to middle-income countries. [21] Parenting knowledge plays a key role in the biological, physical, socioeconomic, and cognitive needs of the child. It also has a direct influence on their everyday decisions about upbringing, developmental expectations which, in turn, determines their child's health and well-being. [22] Overall most of the mothers had "fair" knowledge of anemia and its implications. Mothers with "poor" understanding of nutrition predominantly had anemic children. Furthermore, mothers with better educational status had better awareness in terms of questionnaire. Thus, maternal knowledge plays a key role in preventing anemia. [22]

Conclusion

Despite the advent of the internet available in everyone's hand, the knowledge of anemia remains shallow. Nutrition in the latter half of infancy is vital. Information regarding the negative influences of cow's milk on hemoglobin ought to be spread. Mothers must be enlightened on the importance and source of nourishment in a weaning child. Improving maternal educational status will address the concerns on IDA. Ultimate goal must be to target the mothers to take rational decisions rather than believing the faculty of age-old aphorisms. Role of Pediatricians in creating adequate awareness among these mothers is enormous.

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