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Study of Nutritional Anemia in Children Admitted to Pediatric Department in Rural Teaching Hospital of Telangana

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ABSTRACT

Background: Globally, around 600 million preschool and school aged children are affected by anemia. According to World Health Organization, 65.5% of preschool children in southeast asia are anemic. Nutritional anemia is the commonest cause of anemia resulting from deficiencies of nutrients essential for red blood cell formation. Iron deficiency anemia is the most common nutritional deficiency amounting to 50%, followed by vitamin B12 and folate deficiency. This study is conducted to study the incidence of nutritional anemia among hospitalised children in a territory care teaching hospital in rural Telangana, in the age group of 6 months to 18 years and to bring awareness regarding the diet requirements in children in order to prevent deficiencies thereby the consequences of nutritional deficiencies.

Method: This was a prospective hospital-based study conducted to study the incidence of Nutritional anemia along with clinical and hematological profile of nutritional anemia amongst children admitted to the Department of pediatrics in the age group of 6 months to 18 years at Mediciti Institute of Medical Sciences, Ghanpur, Telangana, from January 1^{st} 2020 to June 30^{th} 2021. All the children who had satisfied the inclusion criteria after taking consent from their parents were included in the study.

Result: The incidence of nutritional anemia in the present study was found to be 52.08%, with both males and females equally affected. The age group of 6–12 years was particularly impacted, accounting for 49.3% of the cases. A significant 94% of the cases were associated with inadequate protein intake as per ICMR guidelines. Children from socio-economic classes 2 and 3, as per the Kuppuswamy scale, were more frequently affected. Severe anemia was observed in 8.7% of the cases. Peripheral smear analysis revealed microcytic, hypochromic red blood cells in 64.4% of the cases, with 94% of the children showing decreased serum iron levels.

Conclusion: Nutritional anemia is the major cause of anemia in hospitalised children affecting majorly children in the age group of 6-12 years. Inadequate protein intake is the major contributor accounting to 94%, which can be prevented with proper dietary measures

KEYWORDS: Nutritional anemia, IDA, Dietary risk factors, Prevalence, NFHS

INTRODUCTION

According to the National Family Health Survey 5 (2019-21), anemia prevalence across all ages is extremely high in India. It is varying from 30 percent to 69 percent. It is also to be noted that in the last 10 years (NFHS-3, 2005/06 to NFHS-4, 2015/16 NFHS 5 2019/21), the percentage point reduction of anemia prevalence has been extremely low in most age groups. [1, 2]

Anemia can be of various types, but most common in developing countries is nutritional anemia and the prevalence of nutritional anemia worldwide is 40%. [3] Nutritional anemias result when the intake of certain nutrients involved in the synthesis of haemoglobin like iron, folic acid, vitamin B12 and other micronutrients like copper, cobalt, zinc and vitamin and B6 are deficient.

Iron deficiency is by far the first cause of nutritional anemia worldwide. WHO estimates around two billion people are anemic with approximately 50% of all anemias attributable to iron deficiency. Prevalence of iron deficiency anemia was higher in 1 year to 4 years old children (31.9%)

and adolescent girls (30.4%), but lower in adolescent boys and 5 years to 9 years old children (11%- 15%)owing to the high iron requirements needed for their rapid growth and development, particularly during the first 2 years of life. [1, 2]

Complementary foods fed to children are low in iron content (in quantity and bioavailability) and have high contents of inhibitors of iron absorption. Regular blood loss that occurs with menstruation increases iron losses and thus iron requirements. Periods of high growth and development during adolescence results in increased iron needs.

Iron deficiency impairs cognitive development of children. It also damages immune mechanisms and is associated with increased morbidity rates, non-specific symptoms include fatigability, irritability, anorexia, weakness, decreased activity, palpitations, dizziness, breathlessness and headache. [4]Early phases of deficiency lead to Non-specific symptoms whereas severe anemia leads to hyperdynamic cardiac failure, edema, ascites. [5]

Although efforts are targeted to prevent iron deficiency such as National iron plus initiative [6], it is still most common nutrient deficiency all over the world. An improved policy guidelines and strategies for evaluation and management of nutritional anemia through awareness and administration of supplements to infants on breast feeds, school- based programs, such as national iron plus initiative, integrated child development services scheme [7], anemia mukt bharat could possibly reduce the impact of nutritional deficiencies. [8]

This study is conducted to estimate the incidence of nutritional anemia, to describe the Demographic/clinical profile of nutritional anemia and to evaluate the dietary risk factors causing nutritional anemia in hospitalized children aged 6 months to 18 years, serving as a tool in the road to prevent nutritional anemia

METHOD

This was a prospective hospital-based study conducted at Mediciti institute of medical sciences from January 2020 to June 2021. MIMS is a secondary care teaching hospital which caters to patients belonging to lower and middle - class strata in rural and semi urban parts of Telangana. The study was approved by the ethics committee of the hospital. Data was collected in a predetermined proforma after taking informed consent from the attenders.

All the children in the age group 6 months to 18 years admitted in pediatric ward were included in the study. Children who were re-admitted in pediatric ward, children who were already on treatment for nutritional anemia or children diagnosed with Anemia other than nutritional cause as final diagnosis and children who did not undergo complete hemogram, or refused to give informed consent were excluded from the study.

A detailed history was recorded based on symptoms suggestive of anemia such as weakness, easy fatigability, breathlessness, pica. Diet history was taken by 24-hour recall method, and food frequency questionnaire. This questionnaire consists of a finite list of foods, beverages, or supplements with respective food categories to indicate usual frequency and variety of food components consumed over a specific time period.

History regarding feeding milestones like breast feeding or other feeding methods, time and mode of weaning, introduction of solids, food preferences and picky eating habits were analysed. protein estimation was calculated and interpreted as adequate or inadequate as per ICMR 2010 guidelines. [9]

A thorough clinical examination of every child was done for pallor, nail changes, Oral changes (glossitis, cheilosis, angular stomatitis), cardio vascular involvement in form of tachycardia, hemic murmur, congestive cardiac failure, and edema.

Investigations like complete hemogram was done for all children who were admitted. children who were found to decreased haemoglobin levels were investigated further with Retic count, peripheral smear, and RBC indices Peripheral smear examination showing Microcytic hypochromic anemia, with decreased MCV, MCHC, MCH and increased RDW is suggestive of iron deficiency anemia and child will be subjected to further evaluation with serum iron profile (Serum iron /Total iron binding capacity). Peripheral smear showing macrocytic hypochromic picture, were evaluated for serum B12 and folate levels. Data was entered in Microsoft Excel and all statistical analyses was performed by using Statistical product for service solutions (SPSS) software. The results of the descriptive analysis of independent variables were expressed as percentages and mean and standard deviations.

RESULTS

A total of 165 children were diagnosed with anemia. Among them, 1 case (0.6%) was identified as sickle cell disorder, 2 cases (1.2%) as thalassemia, 4 cases (2.4%) as tuberculosis, 3 cases (1.8%) as malaria, 2 cases (1.2%) were already receiving treatment for iron deficiency anemia, 2 cases (1.2%) were previously admitted children, and 1 case was not willing to undergo further evaluation. Thus, 15 cases were excluded from the analysis. Out of the remaining 150 cases diagnosed with nutritional anemia, 77 (51.3%) were males, and 73 (48.7%) were females. Age-wise distribution showed that 34% of the cases were in the 6 months to 5 years age group, 49.3% were in the 6 to 12 years age group, and 16.7% were in the 12 to 18 years age group (See Table 1).

Out of the 150 children diagnosed with anemia, 77 (51.3%) belonged to Class III (lower middle), 69 (46%) to Class II (upper middle), and 4 (2.7%) to Class IV (upper lower) socio-economic status according to the modified

Kuppuswamy classification. Of these cases, 15 (10%) were vegetarian, while 90% were on a mixed diet. A total of 99 children (66%) had inadequate protein intake, whereas 51 (34%) had adequate protein intake. Additionally, nearly 87% of the children consumed fewer than three food groups per day, and 76% had picky eating habits, including consuming junk foods more than twice a day (See Table 1).

Variable	Total	Percent
SEX DISTRIBUTION		
Males	77	51.3%
Females	73	48.7%
AGE GROUP		
6 Months - 6 Years	51	34%
6y - 12 y	74	49.3%
13Y-18 y	25	16.7%
SOCIO ECONOMIC CLASS [Kuppuswamy]		
Class 2	69	46%
Class 3	77	51.3%
Class 4	4	2.7%
DIETARY CONSUMPTION		
Vegetarian diet	15	10%
Mixed diet	135	90%
PROTEIN CONSUMPTION		
Adequate protein intake	51	34%
Inadequate protein intake	99	66%

Table 1: Socio-Demographic variables in Nutritional Anemia

Many children presented with symptoms of fatigue (87.3%) and dullness (69.3%). Additionally, 37.3% of children experienced lack of concentration, 24.6% had a history of pica, and 8.7% reported breathlessness. In terms of anemia severity, 74 children (49.3%) had mild anemia, 42% had moderate anemia, and 8.7% had severe anemia (See Table 2).

Peripheral smear examination revealed that 97 children (64.4%) had a microcytic hypochromic picture, followed by dimorphic anemia in 40 children (26.4%). The sensitivity of the microcytic hypochromic picture in the peripheral smear for diagnosing iron deficiency anemia was 93%, though its specificity was limited to 44%. Among these cases, 141 children (94%) had decreased serum iron levels, with similar

Variable	Total	Percent
Fatigue	131	87.3%
Dullness	104	69.3%
Lack of concentration	56	37.3%
PICA	37	24.6%
Breathlessness	13	8.7%
Pallor	145	96.6%
Hepatomegaly	3	2%
Splenomegaly	10	6.6%
Hepato-splenomegaly	2	1.3%

Table 2: CLINICAL PROFILE OF NUTRITIONAL ANEMIA

number showing increased serum total iron-binding capacity (SeeTable 3).

Variable	Total	Percent
SEVERITY OF ANEMIA (W H O)		
Mild	74	49.3%
Moderate	63	42%
Severe	13	8.7%
PERIPHERAL SMEAR		
Microcytic-hypochromic	97	64.4%
Dimorphic	40	26.7%
SERUM IRON LEVELS (decreased)	141	94%
TOTAL IRON BINDING CAPACITY (increased)	141	94%

Table 3: LABORATORY PROFILE OF NUTRITIONAL ANEMIA

DISCUSSION

In the present study, 150 out of 288 admitted children were diagnosed with nutritional anemia, resulting in an incidence rate of 52.08%. This rate aligns with findings from studies conducted by Srinivas Kotla et al. [10], Venkatesh et al. [11], Vaidya S et al. [12], Ramana Sastry et al. [13], and Jain N et al. [14]Additionally, the prevalence of anemia among children aged 6 months to 59 months, as reported by NFHS 5 [1], was 67.1%, which is comparable to the results of this study.

Desalegn W et al. [15] in Ethiopia found that children aged 6-12 years who did not consume protein-rich foods were 2.3 times more likely to be anemic compared to those who did. Similarly, Kokubo Y et al. [16] in Japan reported

that 73% of adolescent girls with inadequate protein intake were anemic, while only 11% of those with adequate intake were anemic. Agarwal A et al. [17] in Meerut observed that among children aged 12-35 months, the mean protein intake was significantly lower in anemic children (16.75 ± 5.1 gm/day) compared to non-anemic children (19.36 ± 6.09 gm/day; p=0.0012). In the present study (2020-2021) conducted in Hyderabad, it was found that 66% of children with inadequate protein intake were anemic, compared to 34% of those with adequate protein intake.

Among the 150 cases diagnosed with anemia, 15 children (10%) were vegetarian, while 135 children (90%) followed a mixed diet. Anemia was observed in 99 children (66%) with inadequate protein intake and in 51 children (34%) with adequate protein intake. These findings suggest that the type of diet—vegetarian or mixed—offers no significant advantage unless a diverse range of food groups is included, and food fads or picky eating behaviors are avoided. This conclusion is supported by studies conducted by Abhishek A et al. [17] and Naik R R K et al. [18] Furthermore, the majority of anemic children exhibited symptoms of fatigue (87.3%) and dullness (69.3%), similar to results reported by Naik R R K et al. [18] where 125 children (74.8%) experienced easy fatigability.

Microscopic examination of the 150 diagnosed cases of nutritional anemia revealed that the majority (64.4%) exhibited a microcytic hypochromic picture, followed by dimorphic anemia (26.4%), normocytic hypochromic anemia (7.3%), and macrocytic hypochromic anemia (1.6%). Additionally, decreased serum iron levels and increased total iron-binding capacity were observed in 94% of the cases. These findings are consistent with studies by Ramana Sastry et al. [13] Sunil S Vaidya et al. [12], and Venkatesh et al. [11]

CONCLUSION

Based on the findings of this study, it can be concluded that nutritional anemia is the most prevalent form of anemia, contributing significantly to morbidity among children. Dietary interventions, particularly the consumption of foods with greater diversity to prevent micronutrient deficiencies, along with ensuring adequate protein intake, are critical in the prevention and management of nutritional anemia. Promoting balanced and varied diets, while discouraging picky eating habits and the consumption of junk foods, is essential for reducing the incidence of this condition.

LIMITATIONS

- The study was done during Covid period, leading to a limited sample size.
- Serum vitamin B 12 levels and Folate levels were not done due to cost constraints.

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