Original Research Article

Assessing Prevalence and Associated Risk Factors for Anaemia in Under Five-Year-Old Children: A One Year Study in a Tertiary Care Hospital, Bihar: Observational Research

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Abstract

Background: Anaemia is a condition characterized by a decrease in the concentration of haemoglobin (Hb) in the blood. It adversely affects children's mental, physical and social development. The aim of this study is to determine the prevalence of and the associated risk factors for anaemia in under five -year -old children in a Tertiary Care Hospital, Bihar

Material & methods: This was a prospective observational study conducted in Department of Paediatrics, BMIMS, Pawapuri, Nalanda, Bihar for the duration of one year. Total 200 anaemic children were enrolled into the study.

Results: A higher proportion of boys (n=104, 52%) had greater effects in comparison to females (n=96, 48%). Based on the classification of anaemia severity, it is seen that among the sample of children, 100 individuals (50%) exhibit mild anaemia, 90 individuals (45%) exhibit moderate anaemia, and 10 individuals (5%) exhibit severe anaemia. According to the categorization based on age categories, it was observed that a higher prevalence of anaemia was seen among children aged 2-5 years (n=110, 55%) compared to children aged 6 months-2 years (n=90, 45%). The findings indicate that a significant proportion of mothers with anaemic children had a primary level of education (n=112, 56%), whereas a smaller proportion had attained a secondary level or higher education (n=64, 32%). Out of the total sample size, it was observed that 24 women, constituting 12% of the population, were identified as illiterate, in the context of having children diagnosed with anaemia. A majority of the children, namely 59%, are affiliated with lower socioeconomic classes, which may be further broken down into Class IV comprising 54 children (27%) and Class V including 64 children (32%). Among the whole cohort of 200 children, a notable proportion of 30 cases (15%) had a dimorphic blood picture, which is indicative of a shortage in iron and other crucial hematological components, namely folic acid.

Conclusion: Anaemia burden remains high particularly in developing countries. The primary cause of anaemia in the current research is nutritional deficit, namely iron deficiency. In conjunction with dietary insufficiency, socioeconomic variables including as gender, maternal education, and socioeconomic status significantly contribute to the onset and progression of anaemia.

Keywords: Anaemia, Pre-school children, Prevalence, Under five-year-old children.

Introduction

Anaemia is a condition characterised by a decrease in the concentration of haemoglobin(Hb) in the blood, or alternately it is defined as a decrease (>2SD) in haemoglobin compared with the mean value for age. [1] It is a prevalent nutritional issue on a global scale. [2] Anaemia is a medical disorder that is defined by a decrease in the quantity of red blood cells or a loss in their ability to transport oxygen, therefore resulting in an insufficient supply to fulfill the physiological requirements of the body. [3] The severity and manifestation of anaemia may vary depending on factors such as age, gender, altitude, smoking habits, and pregnant status. Anaemia is seen across all phases of the human life cycle, although its incidence is particularly elevated among younger preschool-aged children. This may be attributed to the heightened need for iron during periods of rapid development. Anaemia affects

about 1.62 billion individuals worldwide, accounting for 24.8% of the global population. Among preschool-aged children, the prevalence of anaemia is particularly high, reaching 47.4%. [4,5]

Based on the most recent nationally representative survey conducted in India, it has been determined that 70% of children between the ages of 6 and 59 months are afflicted with anaemia. This includes 3% who are severely anaemic, 40% who are moderately anaemic, and 26% who are slightly anaemic (NFHS 3, 2005-06). Anaemia is a significant contributing factor to morbidity and child mortality, making it a crucial health concern for preschool-aged children in India. [6-8] Anaemia is correlated with several variables, including social, biological, environmental, and dietary influences. [9,10] The primary variables linked with anaemia among children were identified as nutritional inadequacies, including iron insufficiency, vitamin B12 deficiency, and folate deficiency. Additionally, the lack of knowledge among mothers about this issue, along with their poor educational standing, improper dietary practices, and parasite infestations, were also recognized as contributing factors. [11] The global prevalence of nutritional anaemia is significant. Approximately 50% of instances of anaemia may be attributed to a lack of iron. Iron insufficiency is mostly attributed to inadequate dietary iron intake and limited iron bioavailability. [4,12] This condition, known as iron deficiency anaemia, has detrimental effects on both the physical and mental aspects of human development. [4,13] In the context of the Indian population, various potential causes of anaemia have been identified. These include factors such as inadequate intake of iron and vitamin C, reduced gastric acidity, parasitic infections like hookworm and malaria, and multiple pregnancies among women of reproductive age. [14] It is well recognized that the increased occurrence of anaemia in children under the age of five may be attributed to the confluence of heightened iron requirements resulting from rapid growth and development, mostly stemming from diets lacking in heme iron. [15] In children under the age of five, anaemia has been seen to result in immune system depression, leading to an elevated susceptibility to infections. Additionally, anaemia has been associated with impaired cognitive function, growth, and psychomotor development, ultimately resulting in learning problems and decreased physical ability. [16] These alterations may last beyond the administration of suitable pharmacological intervention. [17]

The primary objective of this research was to assess the prevalence of anaemia and identify the related risk factors among children under the age of five in a Tertiary Care Hospital, Bihar.

Material & Methods

This was a prospective observational study conducted in Department of Paediatrics, BMIMS, Pawapuri, Nalanda, Bihar, India for the duration of one year (June 2022 to May 2023).Total 200 anaemic children were enrolled into the study. Written informed consent was obtained from patient before enrolling them into the study.

Inclusion criteria

• Children with the both gender and age group of 6 months to 5 years admitted in Paediatric ward of BMIMS, Pawapuri, Nalanda, Bihar and diagnosed having anaemia were included in this study.

Exclusion criteria

• The children who were not investigated with complete hemogram; and/or having final diagnosis as haemoglobinopathies; and/or currently consuming multivitamin and/or mineral supplements on a regular basis were excluded from the study.

For the diagnosis of anaemia, WHO criteria for haemoglobin (Hb) threshold in different age group were used and according to this haemoglobin threshold is 11.0gm/dl for age group of 6 months to 5 years. [18]

According to WHO criteria, severity of anaemia is classified as:

(i) severe anaemia: Hb <7.0gm/dl;
(ii) moderate anaemia: Hb 7.0-8.9gm/dl; and
(iii) mild anaemia: Hb 9.0-10.9gm/dl.[18]

Mid-upper arm circumference (MUAC) at the left arm and head circumference (HC) were measured using single-slotted insertion tapes. The growth and development statuses of children were evaluated by (i) weight-for-age ratio Z score (WAZ); (ii) height-for-age ratio Z score (HAZ); (iii) weight-for-height ratio Z score (WHZ); and (iv) HC Z score according to WHO's Child Growth Standards 2006. WAZ <-2 SD, HAZ <-2 SD, and WHZ <-2 SD were defined as underweight, stunting, and wasting, respectively.16 HC Z score <-2 SD was defined as small HC. [19]

A detailed history of the patient was evaluated; a thorough physical examination was carried out and laboratory investigations including complete haemogram and peripheral smear study were done. Various data on a range of socioeconomic, demographic, and childhood related illnesses were captured. Important information:

(i) Child-information: gender, age, height, weight, feeding practices, and illness 2 weeks prior to survey; and

(ii) Family-specific-socioeconomic and demographic characteristics of parents, including education level, and marital status. Socioeconomic status of family of children was determined with the help of updated BG Prasad socioeconomic

classification scale, which is based on per capita monthly income of the family. [20]

Statistical analysis

The data was entered in the excel sheet. The data was analysed using descriptive statistics. The test variables were compared using Chi-square test for qualitative variables and Student's test for quantitative variables. The p-value <0.05 was considered statistically significant for difference and association between variables

Results

Table 1: Characteristics of anaemic children

Characteristics		Frequency	Percentage
Gender	Girls	96	48
	Boys	104	52
Severity of anaemia	Mild	100	50
	Moderate	90	45
	Severe	10	5
Age	>6 months-2 years	90	45
	>2 years-<5 years	110	55
Education ofmother	Illiterate	24	12
	Primary	112	56
	Secondaryor above	64	32
Socioeconomicstatus	Class I	20	10
	Class II	30	15
	Class III	32	16
	Class IV	54	27
	Class V	64	32
Types of anaemia	Microcytic	80	40
	Normocytic	90	45
	Dimorphic	30	15

Boys (n=104, 52%) were more affected as compared to girls (n=96, 48%). According to severity of anaemia, 100 (50%) children have mild anaemia, 90 (45%) children have moderate anaemia, and 10 (5%) children have severe anaemia. As per the division according to age groups, children of age group of between 2-5 years (n=110, 55%) was more suffered from anaemia as compared age group of between 6 months-2 years (n=90, 45%). A majority of the mother of anaemic children had primary level of school education (n=112, 56%), followed by secondary or above level of education (n=64, 32%). 24 (12%) mothers of anaemic children found to be illiterate. More than half of the children (59%) belong to lower socioeconomic (SE) classes [Class IV: 54 (27%) + Class V: 64 (32%)]. Out of total 200 children, 30 cases (15%) showed dimorphic blood picture indicating deficiency of iron and other essential hematopoietic factors, mainly folic acid.

Table 2: Age-distribution of the children according to types and severity of anaemia

Types and severity of anaemia		6 months - 2 years		2 years - 5 years		Total	
		N	%	N	%	N	%
Severity of anaemia	Mild	48	24	52	26	100	50
	Moderate	56	28	34	17	90	45
	Severe	6	3	4	2	10	10
Types of anaemia	Microcytic	36	18	44	22	80	40
	Normocytic	40	20	50	25	90	45
	Dimorphic	20	10	10	5	30	15

According to age-distribution of the children, types and severity of anaemia both age groups showed similar type of distribution.

Table 3: Distribution of the children according to concomitant diseases

Concomitant diseases	Frequency	Percentage
Infectious diseases	76	38
Respiratory	64	32
Gastrointestinal	44	22
Cardiovascular system	22	12
Central nervous system	20	10
Renal	18	9
Other	28	14

As per analysis of the anaemic children according to concomitant diseases, infectious diseases (n=76, 38%) found to be more prevalent, followed by respiratory tract diseases (n=64, 32%) and gastrointestinal tract diseases (n=44, 22%).

Table 4: Distribution of the children according to nutritional status

Nutritional status	Frequency	Percentage
Wasting	104	52
Stunting	100	50
Underweight	120	60

According to nutritional status of anaemic children, wasting (WHZ score <-2 SD) were in 104 (52%) cases; stunting (HAZ score <-2 SD) was in 100 (50%) cases and underweight (WAZ score <-2 SD) were in 120 (60%) cases.

Discussion

Anaemia is a prominent public health issue that contributes to substantial morbidity and death among children on a global scale. [21] This issue is widely recognized as a significant public health concern on a global scale, impacting nations of varying economic statuses and yielding substantial ramifications for human well-being, as well as societal and economic progress. [21,22] Despite a decline in its frequency across many countries, the issue of this particular public health hazard continues to persist on a global scale. [23] Anaemia is seen across all stages of the human life cycle; however, its incidence is particularly elevated in younger preschool-aged children. This may be attributed to the heightened need for iron as a result of rapid development. [24] The negative impact on the cognitive and physical growth of youngsters leads to a notable decline in their ability to function well in both job and school settings. [23,25,27]

Among the participants, it was observed that a higher proportion of boys (n=104, 52%) experienced a greater degree of impact in comparison to females (n=96, 48%). Based on the classification of anaemia severity, it is seen that among the sample of children, 100 individuals (50%) exhibit mild anaemia, 90 individuals (45%) display moderate anaemia, and 10 individuals (5%) manifest severe anaemia. According to the categorization based on age categories, it was observed that a higher proportion of children in the age group of 2-5 years (n=110, 55%) had a greater prevalence of anaemia compared to children in the age group of 6 months-2 years (n=90, 45%). The research conducted by Kanchana et al. revealed a comparable distribution of anaemia across different age groups. [28] Physiological anaemia may manifest in early infancy as a result of a gradual decrease in hemoglobin levels during the first weeks of life. Iron deficiency anaemia may occur in newborns who have a limited iron reserve and/or do not get sufficient iron via their food. This phenomenon is often seen within the demographic of individuals aged 9 to 24 months. [29] The findings indicate that a significant proportion of the mothers of children with anaemia had a primary level of education (n=112, 56%), whereas a smaller proportion had attained a secondary level or higher education (n=64, 32%). Out of the whole sample population, it was observed that 24 women, constituting 12% of the group, were identified as lacking literacy skills. Numerous studies have shown the significant influence of mother educational attainment on the prevalence of anaemia among children in the pre-school age group. [30,31] A majority of the children, namely 59%, are affiliated with lower socioeconomic classes, which may be further broken down into Class IV comprising 54 children (27%) and Class V including 64 children (32%). Among the whole cohort of 200 children, a notable proportion of 30 cases (15%) had a dimorphic blood picture, which is indicative of a shortage in iron and other crucial hematological components, namely folic acid. One research has shown a correlation between socioeconomic level (SES) and the occurrence of anaemia. [32] Numerous studies have also shown a correlation between the occurrence of anaemia and several variables such as poor levels of parental education, limited household finances, and demographic characteristics including age, gender, and family size. [33-37]

Based on the age distribution of the children, it was observed that both age groups had a similar distribution pattern in terms of the kinds and severity of anaemia. Based on an examination of children with anaemia and their associated disorders, it was shown that infectious diseases (n=76, 38%) were the most frequent, followed by respiratory tract diseases (n=64, 32%) and gastrointestinal tract diseases (n=44, 22%). Previous research has shown that parasitic diseases, particularly hookworm infestation, have a significant role in predicting anaemia in children. [31,38] Based on the assessment of the nutritional status of children with anaemia, it was observed that 52% of the cases exhibited wasting, as indicated by a weight-for-height z-score (WHZ) below-2 standard deviations (SD). Additionally, 50% of the patients showed stunting, as shown by a height-for-age z-score (HAZ) below -2 SD, while 60% of the cases were classified as underweight, with a weight-for-age z-score (WAZ) below-2 SD. The findings of the research done by Rocha et al. [39] indicate a greater incidence of wasting, stunting, and underweight,

which aligns with the results of the present investigation.

Conclusion

Anaemia in children is a prevalent and avoidable health concern in the context of India. The primary cause of anaemia in the current research is nutritional deficit, namely iron deficiency. Furthermore, the development of anaemia is influenced by socioeconomic variables like as gender, maternal education, and socioeconomic status, in addition to dietary deficiencies. The prevalence of this condition is higher in children aged below two years, which might potentially result in hematologic, infectious, psychomotor, and developmental abnormalities in this susceptible group. The prevention of these problems may be largely achieved via the adoption of appropriate dietary habits and the provision of effective therapy.

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