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Original Research Article

Prevalence & Profile of Anemia in Children of Age 6-59 Months: A Hospital-Based Cross-Sectional Study

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Abstract

Introduction: Anaemia is a global public health concern that affects people in both high and low-socio-economic nations and is an issue for teenage girls, females of childbearing age (especially when the patient is pregnant), and young children. It hurts the overall health status of women & increases the risk of adverse maternal & neonatal outcomes. Globally, around two billion people are affected by anaemia. The study concluded that in these Indian infants, haemoglobin level was significantly related to iron status; however, maternal haemoglobin level, household affluence, and food shortages were also significant determinants.

Aims: To find out the prevalence of anaemia and analyze the associated socio-economic factors of pediatric anaemia.

Objectives: To estimate the prevalence of anaemia and evaluate the types and risk factors associated with anaemia.

Methods: This is a prospective cross-sectional observational study conducted on 323 pediatric patients of age from 6 months to 5 years who visited the pediatric ward. The patients were determined for anaemia (as per WHO criteria), Protein Energy Malnutrition (PEM) by assessing Z-score, and socio-economic status as per the Kuppuswamy index. Statistical analysis (Chi-square) was carried out and prevalence and its associated socioeconomic factors were determined.

Results: The study found the degree of anaemia and mean level of haemoglobin in each age range and found that there is a significant number of patients with anemia (78.6%). Those patients who did not have anemia are either taking iron supplementation bi-weekly or irregularly ($p<0.05$). The study also found that joint families and children whose mothers are working have a high prevalence of anemia. Also, it was found that 37.4% of the patients had severe underweight, 46.1% had severe wasting and 34.6% of patients had severe stunting.

Conclusion: The study has concluded that anaemia is higher in children who do not receive the required nutritional care and those who are from lower and upper-lower socio-economic classes.

Keywords: Anemia, Hemoglobin, Kuppuswamy Index, Iron Deficiency.

Introduction:

Hemoglobin levels that are below average under 11 g/dL among the age group of 6-59 months are referred to as anemia. It can be said that anemia is a global public health concern that affects people in both high and low-socio-economic nations and is an issue for teenage girls, females of childbearing age (especially when the patient is pregnant), and young children. It has a negative impact on the overall health status of women & increases the risk of adverse maternal & neonatal outcomes [1]. Globally, around two billion people are affected by anemia. Most of the anemia burden (more than 89%) occurs in developing countries primarily affecting children and women. About half of the preschool aged children and pregnant women are anaemic [2]. Moreover, more than half of the world's population of preschool-aged children and pregnant women live in countries where anemia is a severe public health problem, Africa and Asia being the most affected. according to the WHO Classification of countries by degree of public health significance of anemia, India comes under the severe category for both children and pregnant women [2,3]. The prevalence of anemia was 22.9% globally in 2019. The prevalence of anemia in India in preschool children (6-59 months) was 56% in 2015-16. Unfortunately, the situation worsened further with a prevalence of 67.1% in NFHS-5 (2019-2021), which is way higher than the average global (42%) prevalence. Haryana exceeds the national average with a prevalence of 70.4%, behind only 3 states (M.P., Punjab & Rajasthan), despite having the highest per capita income in the nation except for Goa, Delhi, Chandigarh & Sikkim i.e. nearly double of the national average [3]. Globally, mild anemia accounts for 54.3% of cases, moderate anemia for 42.7%, and severe anemia for 3.5%Women may have prenatal, perinatal (during birth), or postpartum hemorrhage as the source of its development [3]. Lactational amenorrhea may help to some extent, however iron shortage during pregnancy can continue throughout breastfeeding. Iron deficiency anemia can be caused by low-quality diets. Anemia not only causes acute symptoms like easy fatiguability, and anorexia but is also associated with short-term as well as long-term cognitive dysfunctions like impaired learning performance & capacity of language coordination, psychomotor and cognitive maturity, and reduced intelligent quotient. It also affects their physical growth and increases the risk of morbidity and mortality. Anemia is one of the biggest public health problems for the country and is an indicator of the poor health status of the country.

To enable worldwide comparison of anemia as a public health issue, the WHO has devised a classification system; the issue is termed serious, if anemia prevalence is 40.5%, moderate from 20% to 38.7%, and mild from 6.3% to 18.8% [5]. Anemia has several multifaceted, connected, and situation-specific causes. Low socio-economic status, low parental education, no access to medical care, unsanitary living conditions, and insufficient iron intake in nutrition are the major risk factor for anemia that is most frequently cited in the literature [6].

In diverse environments, harboring intestinal parasites and malaria are risk factors for anemia. Young children's nutritional status is directly impacted by micronutrient deficiencies, and iron deficiency is the most frequent cause of anemia [7]. Childhood anemia is also

influenced by several other variables, such as a lack of vitamin B12, folate, vitamin A, socioeconomic situation, parental education, and many others. To develop more effective interventions, it is crucial to comprehend the extent and significance of each particular risk factor for anemia in populations where anemia is prevalent [8]. Iron deficiency is commonly cited as the primary cause of anemia, with estimates claiming it accounts for 50% of anemia in the world [9].

Materials and Methods

Research Design

This is a prospective, cross-sectional, observational study conducted from July 2022 to December 2022 on 323 pediatric patients of age between 6 months to 5 years who were admitted to Kalpana Chawla Government Medical College, Haryana. The patients were assessed for anemia (as per WHO criteria), Protein Energy Malnutrition (PEM) by assessing Z-score [of weight, height & weight for height], and socio-economic status as per Kuppuswamy index. Data was collected through a questionnaire and per capita income was recorded separately since it was not included in the Kuppuswmy index.

Inclusion and Exclusion Criteria

The study considered a pediatric population of ages from 6 months to 5 years who visited this hospital and were admitted to hospital's pediatric ward during the study period. The parents of the children cooperated with the study process and underwent all the assessments of the parameters needed for the study.

The patients who had recent transfusions & supplementation were excluded.

Statistical Analysis

The study used SPSS 20 and MS Excel for effective data analysis and other calculations. For quantitative variables, mean±SD was calculated and for qualitative variables, frequencies and percentages were calculated. The Association of demographic characteristics with anemia was carried out using the Chi-square test. The Association of demographic characteristics with anemia was carried out using the Chi-square test. Further multivariate logistic regression analysis was carried out for finding the contributing factors of anemia. $P<0.05$ was considered significant.

Ethical Considerations

The study process was explained elaborately to all patients' guardians. Consent was obtained from each patient's guardian. The study was approved by the Ethical Committee of the hospital.

Results

The study has found that there is 73.9% of the general category, 49.53% of the patients belong to the nuclear family and 40.2% of the patients belong to the lower-middle socio-economic class. Table 1 shows detailed findings regarding the socio-economic parameters according to Kuppuswamy's Index.

Table 1: Socio-economic parameters findings as per Kuppuswamy's Index

Parameters	Number (%)
Category	
General	239 (73.9)
SC	53 (16.4)
OBC	31 (9.59)
Type of Family	
Nuclear	102 (33.4)
Joint	215(66.5)
Socio-economic Status (SES)	

Upper Lower and Lower	105 (32.5)
Lower-middle	130 (40.2)
Upper-middle	73 (23.2)
Upper	17 (5.26)

The study found a degree of anemia and mean level of haemoglobin in each age range, and found that there is significant number of patients with anemia (78.6%). There is a significant difference between the number of patients in each degree of anemia (p<0.05). The study further found that the level of hemoglobin is lower with lesser age as compared to the higher age range (p<0.05).

Table 2: Degree of anemia and hemoglobin level in each range of age among the patients

Parameters	**Number of patients; n (%)**	***p*-value**
Degree of Anemia		
No anemia (≥11 g%)	70 (21.6)	
Mild anemia (10-10.9 g%)	110 (34.05)	0.0489
Moderate anemia (7-9.9 g%)	105 (32.50)	
Severe anemia (<7 g%)	3 (12.07)	
Hemoglobin level (mean+SD)	**10.58±9.2**	**0.0442**

The study has shown that there is a significant number of patients not taking iron supplementation who have anemia as compared to the patients who did not have anemia. Those patients, who did not have anemia are either taking iron supplementation bi-weekly or irregularly (p<0.05). The study found that tea intake contributes in the pathophysiology of anemia [9,10] and anemia is found to be more prevalent in patients who are regular tea drinkers.

Table 3: Prevalence of anemia with associated parameters

Parameters	**Anemia**		**p-value**
	Yes (n=226)	**No (n=97)**	
Iron supplementation from age of 6 months			
Bi-weekly	0	60	0.0221
Irregular	46	37	
No supplementation	180	0	
Dietary habits			
Tea	214	3	0.0311
Jaggery	25	85	0.0259
Socioeconomic Status			
Upper	0	17	0.0412
Upper middle	34	40	
Lower middle	98	40	
Upper Lower and Lower	94	0	

Table 4 shows that the prevalence of anemia is more in kuppuswamy's index V. the anemia is seen more in children whose parents are illiterate and who have a low socio-economic status. Joint families and children whose mothers are working have a high prevalence of anemia. It was found that there is significant correlation with

increasing number of patients with history of anemia from Kuppuswamy's index I to V. While the reverse order can be found among them who did not have the history of anemia ($p<0.05$). Again, it has been found that there is correlation with maternal or paternal education with occurrence of anemia. The study has also shown that there is significant more number of patients with anemia whose paternal occupation is labour and maternal age is lesser during the marriage. Although the age at marriage is not synonymous with the age at which first child was born, although, it can be considered that the age at which the first child is born is almost near to the age during marriage. The study further found that there is significant correlation ($p<0.05$) between the occurrence of anemia with that of protein energy malnutrition including all its criteria (underweight, stunting, wasting).

Table 4: Prevalence of anemia based on the socio-economic status of patients

Parameters	Anemia		p-value
	Yes (226)	No (97)	
Kuppuswamy's index			
I	5	109	0.015
II	10	42	
III	26	30	
IV	80	6	
V	105	0	
Maternal/ paternal education			
Illiterate	110	4	0.033
Pre-primary	60	8	
Primary	40	13	
Secondary	10	22	
Graduate	6	50	
Type of family			
Nuclear	98	37	0.085
Joint	128	60	
Mother working			
Yes	126	27	0.091
No	100	70	
Family's income	4532.66±1251.4	6588.225±1211.2	0.047
Maternal Education (in years)	7.24±3.21	10.25±2.22	0.041
Paternal Education	8.21±2.2	12.22±3.22	0.039
Father's Occupation Self-employed Salaried Daily labours	 16 110 100	 45 48 4	0.035
Maternal age Maternal age: Current Maternal age: At marriage	 31.25±6.25 19.58±7.21	 31.247±5.17 24.29±4.11	 0.12 0.031
Family Size	6.2±1.20	4.21±1.25	0.074
Number of siblings	3.21±0.78	2.12±69	0.056
Protein-Energy Malnutrition			
Underweight	145 (64.1%)	12 (12.37%)	0.0325
Stunting	152 (67.2%)	14 (14.43%)	0.044
Wasting	146 (64.6%)	16 (16.4%)	0.0385

The study found the number of patients in each category of Classification of Protein Energy Malnutrition (PEM), according to World Health Organization. It was found that 1.2% of the patients had severe underweight, 2.16% had severe wasting and 0.9% of patients had severe stunting. Table 5 shows the number of patients in each classification of PEM.

Discussion

Most nations lack national-level statistics on iron deficiency, thus many depend on the frequency of anemia as an alternative and assume that roughly 51% of anemia patients are due to iron insufficiency. The danger attributed to any root cause of anemia will vary depending on its relative relevance in a community in comparison to another origin since anemia has several causative variables [10].

Anemia is a widespread concern in public health that has an impact on people of all socioeconomic levels. Nevertheless, the prevalence of it varies significantly by region. In another study, the prevalence of anemia among Ethiopian children of age 6-59 months was evaluated and modeled. The research showed that anemia is a serious public health issue for children in Ethiopia at age 6-59 months, where 42.5% of them are anemic. Therefore, stakeholders should focus on all important aspects identified in this study's research, but the wealth index, rising income of households, and accessibility to safe drinking water are among the most critical factors that need to be enhanced [11].

In the world, anemia affects over 50% of children below the age of 5 and is a serious public health issue. There is little information on the frequency and causes of anemia amongst children below the age of 5 in sub-Saharan Africa, irrespective of the fact that it is the main reason for child death in that region. As a result, the study sought to learn more about the frequency and contributing factors of anemia in children in sub-Saharan Africa between the age of 6 and 59 months. According to the study's findings, anemia in children in sub-Saharan Africa in the age group of 6-59 months is a major public health concern. To prevent childhood anemia, it is advised to improve parental education, provide medication for a parasitic infection, develop interference that addresses febrile illness, diarrhea, and maternal anemia and improve the family's financial situation. To reduce childhood anemia, it is preferable to increase the measures for early detection and treatment of wasted, stunted, and underweight children [12].

Over 75.2% of infants in India are anemic. There is a lack of information on the causes of anemia in India. The purpose of this research was to identify social, dietary, and biological risk factors for anemia in this age group at risk. Children between the age of 12 and 23 months were the subject of a cross-sectional study in two rural Karnataka, India, districts. The study concluded that in these Indian infants, hemoglobin level was significantly related to iron status; however, maternal hemoglobin level, household affluence, and food shortages were also significant determinants. In addition to maximizing iron intake, strategies for reducing childhood anemia should also take into account maternal anemia, poor, and food shortages [13].

A study was done on children population under 5 years to assess the incidence of anemia and its contributing factors. This study, which used information from the State of Pernambuco's Third Health and Nutrition Survey in northeastern Brazil, was cross-sectional. Hemoglobin tests were used to determine the presence of anemia. In a hierarchy of multivariate analysis, robust-variance Poisson regression was used to calculate the incidence ratio as a consequence of biological parameters, child nutritional status, morbidity, housing, socioeconomic factors, hygiene, and maternal factors.

Both rural and urban had comparable rates of childhood anemia. Planning efficient approaches for control should take into account anemia-related issues [14].

In another study, it was shown that anemia in children below the age of five is a serious public health issue. No research has, yet, used a representative national sample to identify the causes of anemia in children below the age of five in the Lao People's Democratic Republic. Therefore, the purpose of this study was to determine the incidence of anemia in children aged 6-59 months as well as its related factors with multilayer variations. Levels of hemoglobin below 11.3 g/dL were considered anemia. The three variables-age, household head education level, and Hmong-Mien ethnicity were inversely related to anemia. to find a solution to the issue of the severity of anemia in children below the age of five in the Lao People's Democratic Republic. The research authors emphasize the necessity of developing a successful strategy to address each risk connected to childhood anemia. The avoidance of childhood anemia should be the main focus of treatments, as it is the Lao People's Democratic Republic's top priority for intervention in public health [15,16].

Conclusion

Anemia is one of the prime cause of morbidity among pediatric population in India. The study concluded that there is high prevalence of anemia in this region among the pediatric population from 6 months to 59 months. In this current study, the study has shown that 78.6% of the patients had anemia in this region, which is extremely higher. The study has concluded that anemia in this region is higher in children whose paternal and maternal education is less. The anemia is found to have contributed significantly by intake of tea but jaggery have protective effect on anemia. The anemia in this region was found to be significantly more in patients who do not receive the required nutritional care from lower and upper-lower socio-economic class. The study further suggested that this high prevalence of anemia in this region among the pediatric population can be controlled effectively by making the associated governmental programs financially stronger. However, the study did not analyze other parameters of the anemia which can be done by conducting more similar studies. Lastly, this current study has brought forward important findings which should be sufficient enough to formulate strategies for nutritional anemia control in future initiatives.

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