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Case Study

A Study on the Prevalence of Anemia among School Children in Karimnagar Telangana

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A B S T R A C T

Anemia and poor nutritional status are major health concerns among school-aged children. Nutritional deficiencies and socioeconomic factors play a key role in their occurrence. Anemia can adversely affect growth, health, and academic performance. Assessing nutritional status and anemia prevalence is essential for early detection and effective intervention. A mixed methods approach using questionnaires, interviews, and observations will be necessary to gather information for the paper. Depending on the level of clarity required, the sample size will then be approximated over the course of 20 weeks using descriptive statistics and thematic analysis. The study found that schoolchildren had a high prevalence of anemia (51.6%), with females being more affected than boys. Compared to children with normal BMI, underweight children had a higher prevalence of anemia. While a significant percentage of participants were under weight and obese, the majority had normal nutritional status. These results highlight the significance of early risk factor identification, dietary evaluation, and routine screening. Reducing anemia and enhancing general child health can be achieved in large part by providing nutrition programs, dietary education, and preventive measures

Keywords : Anemia, Nutritional status, School children, Prevalence, Adolescent,Hemoglobin, Iron Deficiency, Body Mass Index (BMI), Dietary Intake.

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INTRODUCTION

According to recent data from the World health Organization (WHO) and India's National Family Health Survey (NFHS-5) (2019-2021), Anaemia remains a major public health concern internationally, nationally, and in Telangana [1]. Nutritional anaemia refers to a situation in which the haemoglobin content of the blood is lower than normal because of a deficiency of one or more vital nutrients, regardless of the cause of such deficiency. Anaemia is associated with less-than-ideal conduct in young children and babies. Anaemia is a dietary concern globally and its prevalence is greater in poorer nations to the developed nations [2].

Poor dietary habits combined with decreased physical activity have led to an increase in overweight and obesity among adults and children. Overweight and obese children are not only at risk for insulin resistance, hypertension, dyslipidaemia and hyper-triglyceridemia, but also for micronutrient deficiency. Despite their excessive dietary and caloric intake, obese children and adolescents may be at risk of iron deficiency (ID) due to their tendency to consume unbalanced meals, especially those high in fat and carbohydrates. Both obesity and ID are also more widespread in all socioeconomic categories, who consume fastfoods that are deficient in key nutrients and abundant in fats, sugars and preservatives [3]

IDA is a nutritional illness that may be prevented and treated. Adolescent children are more vulnerable to develop iron deficiency anaemia due to fast growth in demand for iron, poor dietary intake of iron, high prevalence of infection and worm infestations as well as the societal norm of early marriage and adolescent pregnancy. Adolescents tend to take more carbonated drinks and snacks made from refined cereals, but they are less likely to eat fruits and vegetables [6].

It also causes impairment of maximal work capability and has a great significance on the economy of the country. According to research, pregnant women who continue to be iron deficient also have a higher risk of LBW premature birth and neonatal death[5]

Numerous metabolic processes, including the transportation of oxygen in haemoglobin, depend on iron in the form of heme. The biggest non-functional iron reserves, either as ferritin or hemosiderin are found in the liver, which is also where transport proteins are produce. Ferritin is the main protein that stores iron and is both soluble and diffuse. The duodenum is where dietary iron is mostly. Ferrous iron alone is absorbed, and a divalent metal carries it over the enterocyte's apical membrane transporter.. Ater, an unidentified process moves it from the enterocyte to the basolateral membrane[6]

METHODOLOGY

SURVEY SITE: Schools of Karimnagar.

STUDY DESIGN: CROSS-SECTIONAL STUDY

SAMPLE SIZE: 250 SAMPLING

PERIOD: 6 months.

INCLUSION CRITERIA:

- Children of age group 10-19 years.
- Willingly participating students.
- Students without any diagnosed chronic illnesses that may affect anaemia or nutritional status.
- Available and present on the day of data collection.

EXCLUSION CRITERIA:

- Children with chronic illness (e. g: CKD).
- Those who are on treatment of anaemia and other nutritional deficiencies.

PARAMETERS TO BE CONSIDERED:

- Demographic details, social history.
- Anthropometric measurements, dietary parameters, clinical signs.
- Haemoglobin estimation.

ORIGIN OF REASEARCH: Through school-based child interaction.

INVESTIGATION PROCEDURE:

After obtaining approval from the District Educational Officer (DEO) of Karimnagar and the concerned school authorities. The data were collected by interacting with school children by questionnaire and recording their haemoglobin. A structured questionnaire was used, which included basic demographic details and information related to dietary habits and health status. The collected data were entered into MS Excel and analysed using SPSS software(version IBM)

Statistical Analysis:

- Descriptive statistics: frequency, percentage.
- Chi-square test to assess associations .
- Correlation analysis is used to measure the strength and direction of the relationship between two variables.
- p-value < 0.05 will be considered statistically significant Statistical analysis performed using SPSS version 31.

RESULTS

Tabular& graphical data analysis *(table 1) .Age* distribution of the participants reveals that 15-year-old made up the largest group of schoolchildren (32.8%participants), followed by 14- and 16-year-old. The age categories of 11 and 17 had the fewest participants. This suggests that the mid-adolescent age group comprised the bulk of the research population.

The data (*table 3)* indicates that a majority of the school children did not show pallor on clinical examination (76% participants). However, a considerable number exhibited signs of pallor, with 20.8% showing mild pallor and 14.8% showing severe pallor. This finding suggests a notable prevalence of anemia-related clinical signs among the children, highlighting the need for nutritional assessment and early intervention.

The data (*table 4)* indicates that a majority of the school children were non-anemic (48% participants). However, a substantial proportion showed varying degrees of anemia, with 26%having mild anemia, 12.4% moderate anemia, and 12.8%severe anemia. This highlights a considerable prevalence of anemia among the study population, emphasizing the need for timely nutritional assessment and appropriate interventions.

The data *(table5)* shows that most of the school children had a normal nutritional status (60.4% participants). However, a significant proportion was underweight (24.4%), while a smaller number were overweight (15.2%). The presence of undernutrition among a considerable number of children may contribute to poor health outcomes, including an increased risk of anemia, highlighting the need for nutritional interventions

The data *(table 6)* shows that out of the total school children assessed, 51.6% were found to be anemic, while 48.4% were non-anemic. This indicates that more than half of the participants had anemia, highlighting a considerable prevalence of anemia among the study population. The findings suggest that anemia remains a significant nutritional health concern in school-going children and underscores the need for timely nutritional interventions and preventive strategies

There is a strong negative correlation between anemia classification and hemoglobin level ($r = -0.851$).This relationship is highly statistically significant ($p < 0.001$) with a sample size of 250.As hemoglobin decreases, the severity/classification of anemia increases.Thus, hemoglobin level is a strong inverse indicator of anemia severity.

Tables graph and figures

Tables 1: Age- wise frequency of all participants

AGE	NO. OF PARTICIPANTS	PERCENTAGE (%)
11	16	6.4
12	26	10.4
13	32	12.8
14	38	15.2
15	82	32.8
16	41	16.4
17	15	6

Tables 2: Gender Distribution among study Population

GENDER	NO. OF PARTICIPANTS	PERCENTAGE (%)
MALE	54	21.6
FEMALE	196	78.4

Tables 3: Distribution of participants by clinical pallor status

PALLOR ON EXAMINATION	NO. OF PARTICIPANTS	PERCENTAGE
YES	42	16.8
NO	119	76
MILD	52	20.8
SEVERE	37	14.8

Tables 4: Classification of anemia severity among participants

ANEMIA CLASSIFICATION	NO. OF PARTICIPANTS	PERCENTAGE (%)
NONE	120	48
MILD	67	26.8
MODERATE	31	12.4
SEVERE	32	12.8

Tables 5: Distribution of Participants by utritional status

NUTRITIONAL STATUS	NO. OF PARTICIPANTS	PERCENTAGE (%)
NORMAL	151	60.4
UNDER-WEIGHT	61	24.4
OVER-WEIGHT	38	15.2

Tables 6: Distribution of Participants by Anaemia status

ANEMIA STATUS	NO. OF PARTICIPANTS	PERCENTAGE (%)
YES	129	51.6
NO	121	48.4

Tables 7: D Mean and Standared deviation

Parameters	Mean Value	Standard Deviation
Age	14.31	1.56
Weight	45.35 kg	10.18 kg
BMI	19.24cm	4.8 cm
Height	149.6 cm	9.8 cm
MUAC	22cm	5.2 cm
Hemoglobin	11.2 g/dl	2.5 g/dl

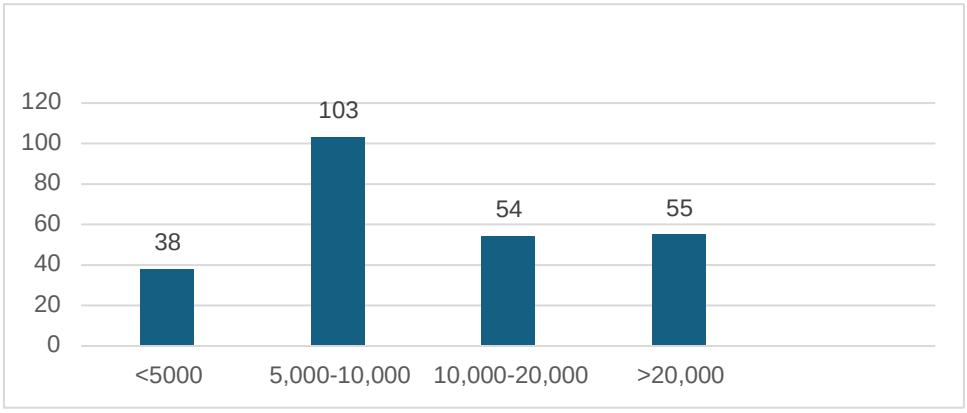

Figure 1: Socioeconomic Status of Participants Based on Monthly Family Income

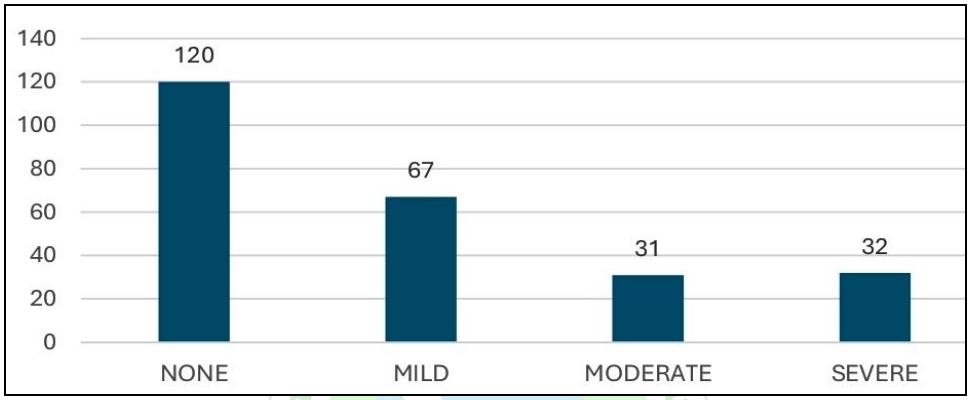

Figure 2: Distribution of Anemia Severity in the Study Population

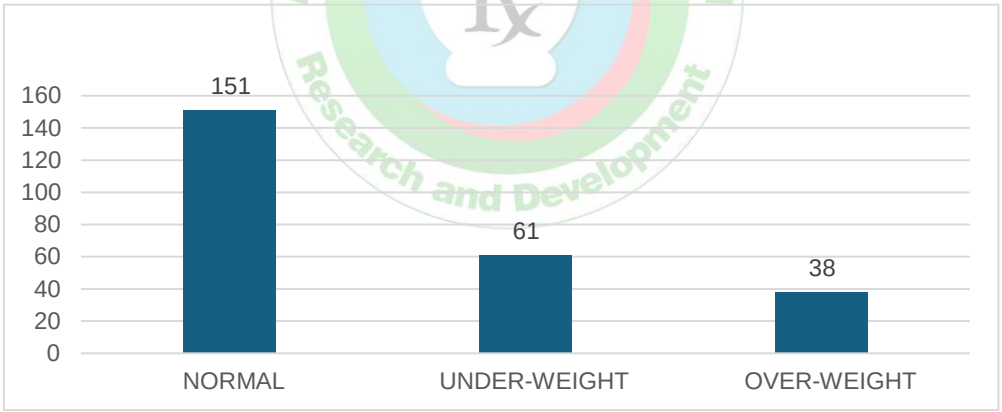

Figure 3: Frequency Distribution of Nutritional Status Among Participants

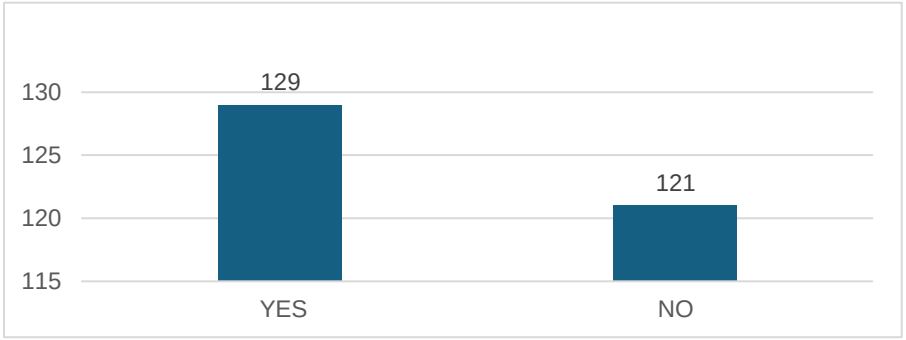

Figure 4: Distribution of Participants According to Anemia Status

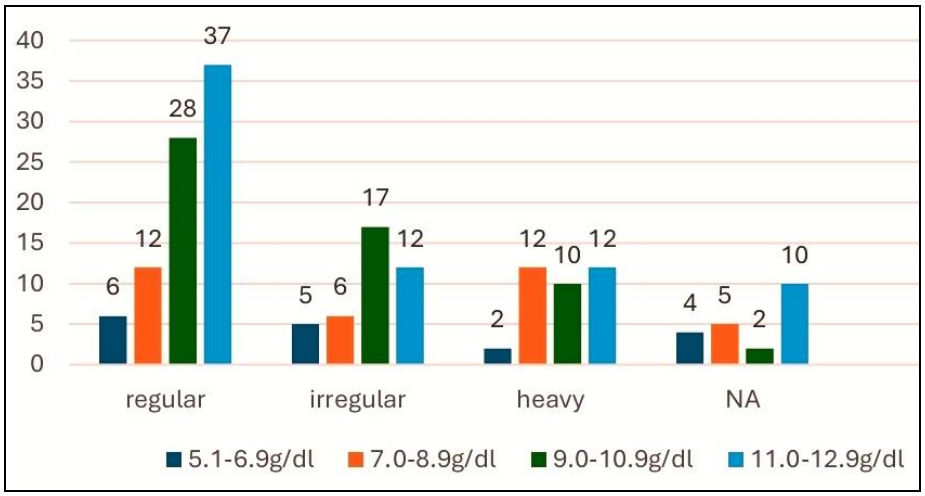

Figure 5: Comparison of Hb status according to Menstrual pattern

Figure 1: Screening procedure for assessment of nutritional status among school students.

Figure 2: Measurement of hemoglobin levels using point-of-care testing method.

Figure 3: Data collection process through questionnaire among participants

Figure 4: Data collection process through questionnaire among participants

DISCUSSION

The parent study conducted by Sudhagandhi et al. assessed the prevalence of anemia among schoolchildren aged 8–16 years in Kattankulathur, Tamil Nadu, using a cross-sectional design. The cyanmethemoglobin method was used to estimate hemoglobin in a large sample of 900 government school students after finger-prick blood was collected. To evaluate nutritional status, anthropometric data like height and weight were noted, and body mass index (BMI) was computed.

The study found an overall anemia prevalence of 52.88% using WHOrecommended hemoglobin cut-off values, with a significantly greater incidence among girls (67.77%) than among males (35.55%). Additionally, the study showed a substantial correlation between undernutrition and anemia, with underweight children having a higher prevalence of anemia. Anemia is a significant public health issue among seemingly healthy schoolchildren, according to a thorough analysis of parameters like age, gender, BMI, and grades of anemia (mild and moderate).

In contrast, the current study, which was carried out among school-age children in Karimnagar, Telangana, attempts to evaluate the prevalence of anemia as well as the nutritional status utilizing straightforward, field-appropriate, and minimally invasive techniques. Anthropometric data, such as height, weight, and BMI-for-age, are used to assess nutrition, and a digital hemoglobinometer is used to estimate hemoglobin levels in order to assess anemia. The frequency distribution shows that most participants belonged to the 11–15 years age group, accounting for 32.8% of the total sample. Class-wise distribution revealed that students from the 7th class formed the majority (37.2%), followed by other classes.

In terms of gender, both males and females participated, with females representing a higher proportion (78.4%) compared to males (21.6%). A greater number of participants were from urban areas (53.2%) when compared to rural (9.6%) and semi-urban areas (7.2%). Parental (mother) background indicated that 34.4% had primary education, and 37.2% of fathers were engaged in private jobs. Most families had a monthly income between ₹5,000–10,000 (41.2%), and the majority of students consumed school mid-day meals

(36.4%), followed a mixed diet (80.4%), and had three meals per day (50%), and the majority of student nutritional status was normal (60.4%).The results of the study indicated that the prevalence of anemia was 51.6% in the school children of Karimnagar. The results of the study showed that 51.6% were anemic, the prevalence of anemia in girls (74.4%) was higher than in the boys (25.55%).

The result of the study corroborated the findings of the prevalence of anemia in the 5– 15 years age group of school children in Karimnagar was 51.6%. Similarly, a study by Gomber et al., stated that the prevalence of anemia in school children from urban slums, aged 5–10.9 years was41.8%. The prevalence of anemia in our study was higher in underweight children when compared to children with normal BMI, and obese children According to the study's findings, 151 participants had normal nutritional status (60%), 61 were underweight (24%), and 38 were obese (15.2%). The World Health Organization defines mild anemia as having a hemoglobin concentration above 10 g/dL but below the cutoff threshold, moderate anemia as having a concentration between 7 and 10 g/dL, and severe anemia as having a value below 7 g/dL.

The results showed that the prevalence of anemia was much greater in females (23.9%, 141/590) than in boys (7.7%, 41/530). Anemia was found to affect 77.7% of tribal children in Mysore District, Karnataka. Similar findings show that the incidence of anemia was much greater in females than in boys (girls 83.33% and boys 70.89%). The total incidence of anemia among teenage females attending school in urban 54.4% of people lived in urban Kathmandu, Nepal. Another study including 393 kids found that 66.4% of primary school students (6–11 years old) in Delhi's national capital region had anemia. The majority of participants belonged to the middle-income categories, especially those making between ₹5,000 and ₹10,000 per month (43.4%), according to the monthly household income distribution.

Fewer participants were from the lowest income category, whereas a substantial percentage of households belonged to the higher income categories. Access to healthcare and the quality of one's nutrition are significantly influenced by socioeconomic level. Therefore, schoolchildren's nutritional health and anemia prevalence may be influenced by their financial level The data demonstrates the distribution of hemoglobin levels in response to menstrual flow patterns (42%) in school-aged females. Lower hemoglobin levels are more prevalent in those with heavy (22.8%) and irregular menstrual (26.2%) flow, suggesting a higher risk of anemia. Girls with regular menstrual periods, on the other hand, are more likely to have normal hemoglobin levels. A study of young teenage school females found a prevalence of anemia of 67.8%. Mild and moderate anemia were observed at 32.6% and 34.7%, respectively, with no cases of severe anemia. A greater frequency of anemia in adolescent age could be because of hormonal changes which occur at the time of onset of menarche.

The prevalence of anemia is disproportionately high in developing countries due to poverty, inadequate diet, certain diseases, pregnancy/lactation and poor access to health services. This further emphasizes the need for corrective measures for anemia in girls before they enter adolescence so as to compensate the additional requirement for growth and development during puberty and combat the extra losses during menstruation. According to WHO if the prevalence of anemia at community level is more than 40% considered as a problem of high magnitude. Adolescent age may result from hormonal changes during menarche. Anemia is more prevalent in poorer nations because to poverty, poor food, illnesses, pregnancy/lactation, and limited access to healthcare services. Corrective therapy for anemia in females should begin before adolescence to compensate for growth and development throughout puberty and menstrual losses. WHO considers anemia to be a significant issue if it affects more than 40% of the community.

CONCLUSION

The prevalence of Anemia in this study is 51.6% in school children, Karimnagar. The anemia prevalence in girls was 74.5%, while in boys, it was 25.5%. The prevalence of anemia was estimated using clinical signs such as nail changes, BMI, nutritional status, Hemoglobin levels, socio-economic status and menstrual history. Out of 250 children, 56 children (22.4%) showed nail changes, 61 children (24.4%) were under weight. These symptoms may considered as a sign of nutritional iron deficiency which may lead to anemia. There is a correlation between hemoglobin levels and anemia. About 44% of girls showed low hemoglobin levels, which is also a reason for anemia. This highlight need for proper nutrition and good iron intake in school-going children. The children with mild-moderate anemia were advised to consult a physician, while other healthy students were explained about the importance of nutritional diet and need for early assessment of anemia.

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