

## A Study to Evaluating the Burden of Anaemia and its Association with Socioeconomic Status and Dietary Habits among School Children (5-16 Year) in Rural Area of Northern India

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### Abstract

**Background:** Anaemia is the most common hematological disease of the pediatric age group. Highest prevalence of anaemia is seen in developing countries. Anaemia is widely prevalent in India and affects both sexes and all age groups. Anaemia has significant negative impact on the health of school children including poor scholastic performance and cognitive impairment. The main aim of this study is to estimating the burden of anemia among school going children (5-16 year) in rural area, of northern India and their association with socioeconomic and dietary habits.

**Materials and methods:** This cross sectional study would be conducted in government and private rural school of Bareilly district from February 2021 to August 2022. All children would have venous blood samples taken while adhering to stringent aseptic procedures in an EDTA anticoagulant for a haematological study. Sahli's approach would be used to estimate haemoglobin.

**Results:** A total of 386 cases in age group of 5-16 years were studied. 56.73% were males and 43.27% were females. Prevalence of anaemia was more in male comparison to female. The overall prevalence of anaemia was found to be 38.7%.

**Conclusion:** Childhood anaemia still continues to be a significant public health problem in school children between 5-16 years. Compared to earlier studies, our study found that there is significant prevalence of anemia among school going children.

**Keywords:** Anaemia, School Children, Northern India.

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### Introduction

Both emerging and wealthy nations are impacted by the worldwide public health issue of anaemia, which has negative effects on people's health as well as social and

economic development. [1] Although an iron shortage is the predominant cause, it is not always the only one. It occurs more frequently in conjunction with a number of

other factors, such as haemoglobinopathies, parasite infections, starvation, and malaria. [2,3]

Only when they are combined with a description of the causative variables that lead to the development of anemia in particular situations are estimates of anaemia prevalence meaningful. Given the significance of anemia for public health, it is surprising that many nations lack information on national prevalence rates. Anemia often manifests in everyday diets due to iron, vitamin B12, and folic acid deficiencies, particularly in children. Regarding children's health, iron insufficiency and iron deficiency anemia are the main global problems. [3] As a consequence of either chronic iron loss from the body or inadequate intestinal absorption of iron, which is required to replace the body's increased need for iron during vigorous development phases, there may be an iron shortage. Anemia caused by a lack of iron is one of a number of disorders that contribute significantly to the morbidity and death rates among growing children, particularly in underdeveloped nations. [4,5]

Additionally, it is well established that school-age children of 5 to 16-year-old children are at a greater risk of iron insufficiency, which is linked to increased iron requirements due to fast development. The effects of an iron shortage are many and have a negative impact on people's health as well as the development of communities and nations. For young children, anemia is a severe risk since it may affect their ability to learn, behave appropriately, develop their motor skills and language, coordinate their movements, and succeed academically. It can also increase their risk of contracting infectious illnesses. [6,7]

The main objectives of this study are to estimate the burden of anemia among school going children (5-16 year) in rural area of northern India and the association of

anaemia with, socioeconomic status and dietary habit.

### **Material and Methods**

This cross sectional study would be conducted in government and private rural school of Bareilly district from February 2021 to August 2022. It was done with formal approval from the SMO and school principals. The kids' participation readiness was questioned. Sahli's approach was used to measure Hb in an aseptic environment.

### **Inclusion Criteria**

1. School children in the age group of 5-16 years of age irrespective of gender.
2. Those children whose guardian/teacher gives consent for the study.

### **Exclusion criteria**

1. Children age less than 5 years and more than 16 years are excluded from the study.
2. Children suffering from any chronic illness or on any medications are not taken into the study.
3. Children who are suffering from any chronic illness also were excluded.
4. Those who did not give consent for blood sampling are excluded.

### **Method of collection of data**

About 386 children were included in the study after obtaining consent from parent and school teacher. Two governments and two private schools would be selected. All children would have venous blood samples taken while adhering to stringent aseptic procedures in an EDTA anticoagulant for a haematological study. Sahli's approach would be used to estimate haemoglobin. Gently combine the EDTA sample with the pipette's 0.02ml of blood. Fill the HCl-containing tube with blood. The sample should be left alone for 10 minutes. Drop by drop; add distilled water to the solution in the hemoglobinometer tube while it is in the

comparator. Stir the glass with the glass rod until the colour is the same as the comparator glass. According to new WHO standards, the grade of anemia would be determined by the haemoglobin levels and would be shown by the reading of the lower meniscus of the solution. [8]

Collected data was transcribed into MS Excel datasheet and analyzed by using SPSS (version 19) software. Study variables depending on the data type were summarized using appropriate measure of central tendency (mean) and dispersion - standard deviation (SD). Categorical variables were expressed as frequencies and percentages.

Pearson's Chi-square test was done for comparison of categorical variables. Value of  $p \leq 0.05$  was considered statistically significant along with the 95% confidence interval for the test statistic was computed.

### Result

During the study period a total 386 children studied, 32.65% belonged to the age group of 10-15 years with the rest 67.35% belonging to the age group of 5-10 years. The age proof of all children was obtained from school documents. (Figure 1) Out of them majority were males around 56.73% and remaining 43.27% were female. (Figure 2)

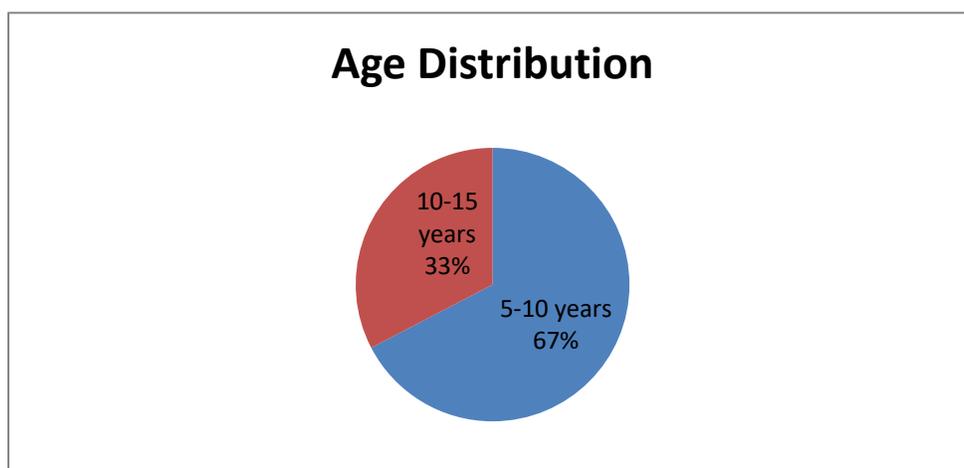


Figure 1: Age distribution of subjects studied

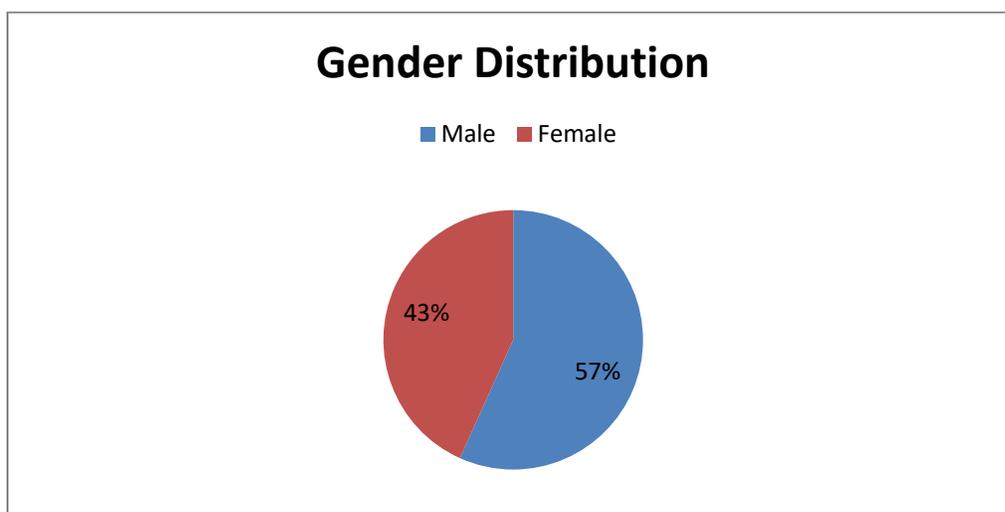


Figure 2: Gender distribution of children studied

Children of the study population were classified according to their Socio-economic Status according to Modified Kuppuswamy classification and majority (53.2%) were belonged to class IV(upper lower), followed by class III (41.4%) and class V(4.41%). [9] (Table-1)

**Table 1: Socio economic status of the Children**

Socioeconomic Status	No of Children
Class I	0
Class II	0
Class III	167 (43.26%)
Class IV	202 (52.33%)
Class V	17 (4.41%)

In the total 386 cases, 207(53.62%) children were vegetarian and 179(46.38%) were non-vegetarian. After obtaining the history of pattern of breakfast consumption the majority of the children 313(81.08%) were taking breakfast regularly. Body mass index is a parameter of the health of an individual and in this study 233(57.78%) children had low BMI. (Table-2)

**Table 2: Distribution of children according to Dietary habits, pattern of breakfast consumption and BMI**

	Dietary Habits		Breakfast Consumption		BMI	
	Vegetarian	Non-Vegetarian	Regular	Irregular	Normal	Low
386 cases	207 (53.62%)	179 (46.38%)	313 (81.08%)	73 (18.92%)	163 (42.22%)	233 (57.78%)

In this study a total 147 (38.08%) cases were presented with anaemia of them 86(58.5%) cases were male and 61(41.5%) were female. According to severity of anaemia, cases were classified in mild, moderate and severe anaemia. The total cases of mild anaemia were 90 and cases of moderate and severe were 46 and 11 respectively. (Table-3)

**Table 3: Distribution of cases of anaemia according to gender and severity of disease**

Variables	Anaemia				p value
	Mild	Moderate	Severe	Total	
Male	53(24.20%)	26(11.87%)	7(3.1%)	86(58.5%)	0.273
Female	37(22.15%)	20(11.97%)	4(2.3%)	61(41.5%)	
Total	90	46	11	147	386

Out of total 386 children, 104 children (60.11%) being aged 5-10 years with the other 43 children (20.18%) who had anemia were aged 10-15 years. (Table-4)

**Table 4: Anaemia in different age groups**

Age in years	Anaemia				p value
	Mild	Moderate	Severe	Total	
5-10 years	67(38.72%)	30(17.34%)	7(4.0%)	104(70.74%)	0.073
10-16 years	23(10.79%)	16(7.5%)	4(1.8%)	43(29.25%)	
Total	90	46	11	147	386

A maximum number of 94(63.94%) cases of anaemia were belonging to grade 4 (upper lower) socio-economic status and 18(12.24%) cases were belonging to lower socio-economic status.

Anaemia were significantly associated with lower class of population.(p value 0.00009) In our study we found most of the anaemia patients were vegetarian (68.70% cases) and anaemia were significantly associated with vegetarian diet.(p value 0.0078) Out of 147 anaemia cases 94(63.94%) children were consuming breakfast irregularly while 53(36.05%) children were getting breakfast regularly.(p value 0.00005) Most of the anaemia patients 115(78.23%) had low BMI and the 32(21.76%) children with normal BMI had anaemia.(p value 0.00001)(Table-5)

**Table 5: Showing distribution of anaemia according to different variables.**

Variables		Anaemia			Total	P value
		Mild	Moderate	Severe		
Socio-economic Status	3(lower middle)	23(65.71%)	12(34.28%)	0(0%)	35(23.81%)	
	4(upper lower)	61(64.89%)	26(27.65%)	7(7.4%)	94(63.94%)	
	5(lower)	6(33.33%)	8(44.44%)	4(22.22%)	18(12.24%)	0.00009
Dietary habits	Vegetarian	65(64.34%)	28(27.72%)	8(7.9%)	101(68.70%)	0.0078
	Non-vegetarian	25(54.34%)	18(39.13%)	3(6.52%)	46(31.29%)	
Pattern of breakfast consumption	Regular	22(41.50%)	24(45.28%)	7(13.20%)	53(36.05%)	
	Irregular	68(72.34%)	22(23.40%)	4(4.25%)	94(63.94%)	0.00005
BMI	Normal	18(56.25%)	12(37.50%)	2(6.25%)	32(21.76%)	
	Low	72(62.60%)	34(29.56%)	9(7.82%)	115(78.23%)	0.00001

## Discussion

The present study was undertaken to know the prevalence of anaemia in school going children and to know the influence of factors like sex, socioeconomic status and diet in prevalence and severity of anaemia. This cross sectional study conducted in government and private rural school of north India from February 2021 to August 2022. A total data of 386 students of both government and private school were studied. The prevalence of anemia among school going children in our study was 38.7%.

Majority of the anaemic patients were male and most of the patients were belonged to the age group 5–10 years. Anemia among school going children were more among those who reported regular intake of tea/coffee along with major meals. The iron rich food consumption among children is poor. A school health anemia prevention program with behavior change communication for dietary modification and universal supplementation of iron need to be considered. [10].

**Table 6: Comparison of age of patients in different studies**

Studies	Djokic D [11] (2010)	Saluja N [12] (2007)	Mutthayya S[13] (2006)	Present study
No of subjects	525	515	2030	386
Age group	7-14 years	5-11 years	5-15 years	5-16 years
Males	274	265	1037	219
Females	251	250	993	167

The age group of our study was similar to the study conducted by S Mutthayya *et al.* [13] Male: Female distribution was similar to all other studies quoted, with males being predominant in number. Out of total 386 children, 43(11.13%) children who had anemia were aged 10-15 years, with the other 104(26.94%) children being aged 5-10 years.

**Table 7: Comparison of prevalence of anaemia in different studies**

Studies	WHO World-wide study [14]	Djokic D [10]	Saluja N [12]	Mutthayya S [13]	Present study
Prevalence of Anaemia	25.4%	18%	37.7%	13.6%	38.7 %

The prevalence of anaemia in our study was 38.7% which was comparable with the study conducted by N Sajuja *et al* in same socio-demographic area. The WHO survey included kids from all across the globe, where the frequency was 25.4%. [14] The study conducted Djokic *et al.* had showed the much lower prevalence of anaemia than other studies, it was due to the variation in the socio-demographic area and dietary habits. All children who participated in that study were non-vegetarians. [10]

### Conclusion

In our nation, anemia continues to be a challenge for public health. Anaemia is still a major health problem in our country. Childhood anaemia still continues to be a significant public health problem in school children between 5-16 years. Compared to earlier studies, our study found that there is significant prevalence of anemia among school going children.

Prevalence of anaemia is more among government school children compared to private school children. In anemic children, most of them have mild grade anemia. we recommend deworming as a routine for at risk and diagnosed individuals.[15] Government policies should be made to fortify iron with flour, salt, oil etc., in order to tackle the problem of anemia at gross root level. A school health anemia prevention program with behavior change communication for dietary modification and

universal supplementation of iron need to be considered modification and universal supplementation of iron need to be considered. [16]

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