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Research Article

PREVALENCE OF ANEMIA AND ITS CORRELATION TO BODY MASS INDEX AMONG SCHEDULED CASTE SCHOOL CHILDREN IN FATEHABAD DISTRICT OF HARYANA

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ABSTRACT
Anemia is a very common problem in paediatric age group in many developing countries with an estimated prevalence of 43% of the World's children. School children constitute 20.25% of total population in India and those are more vulnerable to this disease due to their rapid growth need of high iron. Aim was to study the prevalence of anemia among scheduled caste school children aged 6-12 years of government primary school of Bhima basti in Fatehabad city of Haryana and also to assess its correlation to variable such as Gender and Body Mass Index (BMI). Total 133 children (including both boys and girls) between the ages of 6-12 years formed the study group. Relevant history was taken and a complete physical examination done. Hemoglobin estimation was done using Sahli's Acid-Hematin methods. With clinical symptoms and hemoglobin estimation, the prevalence of anemia was detected. With measurements of height and weight, the prevalence of undernutrition was also detected. The overall prevalence of anemia among scheduled caste children in the age group of 6 to 12 years was 85.72 % (114/133). The highest prevalence of anemia was present in the girls (94.52 %) than boys (75.0 %). It is concluded that anemia still constitutes a health problem among school children belonging to scheduled caste with the present prevalence of 85.72%.

Keywords: *Anemia, Body Mass Index, Hemoglobin, Scheduled Caste School Children*

INTRODUCTION
Anemia, especially iron deficiency, is the most common health problem worldwide today. (UNICEF/United Nation University/ WHO, 2001) An estimated 30 per cent of the world's population is anaemic, with the global prevalence of anaemia among 6-12 yr old children to be 43 per cent and 77 per cent in developing regions respectively (De-Maeyer *et al.,* 1989; Awate *et al.,* 1997). In earlier studies prevalence of anaemia among 5-14 yr old urban and rural Indian children was found to be in the range of 66.7 to 77 per cent. School children constitute 20.25% of total population in India and are more vulnerable to this disease due to their rapid growth need of high iron (Aggarwal *et al.,* 1972; Goyal and Chavan, 1993). In school children, iron-deficiency anemia results in impaired psycho-motor development, coordination and scholastic achievement and decreased physical activity levels. Therefore, it is a critical health concern because it affects growth and physical performance (Grantham-McGregor and Ani, 2001) Anemia is defined as a decreased concentration of hemoglobin and red blood cell mass compared with that of age and sex matched controls (Fauci *et al.*, 1998; Ghai, 2000). According to WHO, 304 million school children are affected with iron deficiency anemia worldwide. There are multiple causes of iron deficiency anemia, including inadequate iron intake, respiratory infections, helminthes' infestation, malaria, diarrhea, and vitamin A and vitamin C deficiencies. (World Health Organization/United Nations University/UNICEF, 2001; UNICEF/UNU/WHO/MI, 1998) Recent studies on prevalence of anemia have been on preschoolers only. There is a paucity of data on prevalence of anemia among school children aged 6-12 years belonging to scheduled caste (Sidhu *et al.,* 2002). The present study was carried out to study the prevalence of anemia among scheduled caste school children aged 6-12 years of government

primary school of Bhima basti in Fatehabad city of Haryana and also assess its correlation to variable such as Gender and Body Mass Index (BMI).

MATERIALS AND METHODS

It was a cross sectional study carried out in government primary school of Bhima basti in Fatehabad city of Haryana. The study was designed to include all scheduled caste children of Class I to V, aged 6-12 years of the school. Ethics approval was received from the school officials, children and the parents. There were 133 scheduled caste children who participated in this study. The school health check-up was undertaken in government primary school of Bhima basti in Fatehabad city of Haryana. A detailed history was taken and each child was clinically examined. As per the WHO recommendations, anemia was diagnosed when Hb was <11 g/dl for children <6 yr and <12 g/dl for 6 to 14 yr old children. Anemia was further graded as mild (Hb = 9.0 - 10.9 g/dl for 5-5.9 yr old and Hb 9.0 - 11.9 g/dl for ≥6 yr old), moderate (Hb = 6.0 -8.9 g/dl) and severe (Hb<6.0 g/dl). (UNICEF/UNU/WHO/MI, 1998) Lectures on nutrition, good eating habits and on anemia were organized in the school. Children were advised to increase the number of daily meals from two meals to 3-4 meals or multiple meals at short duration daily and also encouraged to consume vitamin C rich foods in combination with iron rich foods.

Data Collection

Demographic and socioeconomic data on the subjects were collected using a standard questionnaire.

Subjective Parameters

Age was recorded from birthday by calendar to the nearest of year (<6 months and >6 months). Standing height was recorded without shoes and with light cloths on a wall mounted measuring tape to the nearest of centimeters (<5 mm and >5 mm). Weight was recorded without shoes and with light cloths on a Krups weighing machine with a least count of 500 grams. Body mass index (BMI) from the sample group was calculated on the basis of the observations of their weight and height. BMI was defined as weight (in kilograms) / (height2 [in meters] and international cut-off for BMI were used for classification of subjects as malnourished/malnutrition (BMI below 18.0Kg/m2), normal 18<BMI>25kg/m2), over weight (25<BMI<30 kg/m2) and obesity (BMI>30kg/m2) (WHO, 1975).

Physiological Parameter

Hemoglobin was done using the Sahali's hemoglobinometer using standard procedure protocol (Wintrobe, 1975). The measured values were tabulated and compared to the standard values of grading of anemia according to WHO guidelines with < 12 gram % of hemoglobin considered as anemic (WHO, 1975).

Statistical Analysis

Result of the study are presented in mean ± SD and student't' test was used to compare the anemic and non anemic children.

RESULTS AND DISCUSSION

Table 1: Anthropomorphic and Blood parameters in Girls and Boys in Scheduled Caste school age children (Mean ± SD)

Parameters	Girls(n= 73)	Boys (n=60)	p- value
Age(years)	9.53±1.73	9.3±2.0	NS
Weight (kg)	22.5±6.72	22.72±6.72	NS
Height (metres)	1.24±0.14	1.27±0.14	NS
BMI	14.38±1.72	13.83±1.74	NS
Hb (gm%)	9.29±1.30	10.0±1.76	NS

NS= not significant

Total number of scheduled caste school children was 133 out of which 73 were girls and 60 were boys. All the children were within the age group of 6 to 12 years and were students of class I to class V.
There were no statistically significant differences in anthropomorphic parameters between girls and boys. Mean values of hemoglobin in girls (9.29±1.30) and in boys (10.0±1.76) were not significantly different (Table 1).

Table 2: Hemoglobin gm% in Girls and Boys in Scheduled Caste school age children

Hemoglobin Level	Girls (n= 73)		Boys (n=60)		Total (n=133)	
(Hb gm%)	Number	Percent	Number	Percent	Number	Percent
Less than 12	69	94.52	45	75	114	85.72
12 and more than 12	04	5.48	15	25	19	14.28
Total	73	100	60	100	133	100

Present study showed that overall prevalence of anemia among scheduled caste school children in the age group of 6 to 12 years was 85.72 % (114/133). The highest prevalence of anemia was present in the girls (94.52 %) than boys (75.0 %) (Table 2).
Table 3 shows prevalence of different grades of anemia i.e. 57.53 **%** of girls and 43.33 % of boys were mildly anemic, 35.62% of girls and 31.67% of boys were moderately anemic and 1.37% of girls and 0% boys were severely anemic. There were also high statistical significant differences in grades of anemia between girls and boys ($p < \mathbf{0.05}$). Table 3 also shows prevalence of different grades of undernutrition i.e. 30.14 **%** of girls and 35.0 % of boys were mildly undernourished, 45.29% of girls and 30.0% of boys were moderately undernourished and 13.69% of girls and 15.0% boys were severely undernourished. There were also high statistical significant differences in grades of undernutrition between girls and boys ($p < 0.05$).

Table 3: Nutritional status of Scheduled Caste School Children of Fatehabad

Nutritional parameters	Girls(n=73)		Boys(n=60)		Total(n=133)	
	Number	Percent	Number	Percent	Number	Percent
Hemoglobin Level (Hb gm%)						
> 12 (Normal)	4	5.48	15	25	19	14.29
9.0-11.9 Mild)	42	57..53	26	31.67	68	51.12
6.0-8.9 (Moderate)	26	35.62	19	31.67	45	33.84
< 6 (Severe)	1	1.37	0	0	1	0.75
Undernutrition Grades (According to Gomez Classification)						
> 90.0 % (Normal)	8	10.96	12	20	20	15.04
75-89.9%(Mild	22	30.14	21	35	43	32.33
60-74.9% (Moderate)	33	45.21	18	30	51	38.34
< 60.0% (Severe)	10	13.69	9	15	19	14.29

Table 4: Clinical Features

Clinical Features	Frequency	Percent
Absent	107	80.45
Present	26	19.55
Total	133	100

Table 4 indicates 19.55% of Children who participated in the study shows symptoms of anemia like giddiness, fatigue, dizziness and weakness.
Table 5 shows observations regarding the BMI that out of 133 subjects in the age group of 6 - 12 years, 130 (97.75%) subjects were in the range of low BMI (underweight) and only 3 (2.25%) subjects were in the range of normal BMI. In other words, the BMI profile of the subjects indicated that majority 130 (97.75%) were malnourished having BMI less than 18 kg/m2and anemic.

Table 5: Anemia vs BMI

BMI	Hb Status					
	Abnormal		Normal		Total	
	Number	Percent	Number	Percent	Number	Percent
Underweight	111	83.46	19	14.29	130	97.75
Normal	2	1.5	1	0.75	3	2.25
Overweight	0	0	0	0	0	0
Obese	0	0	0	0	0	0
Total	113	84.96	20	15.04	133	100

DISCUSSION

Gomber *et al.,* (2003) stated that prevalence of anemia in the 5 - 10 years age group of urban slum children was 41.8% (Gomber *et al.,* 2003). Verma et al stated that the prevalence of anemia in the 5 - 15 years age group of urban children in Punjab was 51.50% (Chhatwal and Kaur, 2004). In a study conducted by Sudhagandhi *et al.,* (2011) the prevalence of anemia was observed 52.88%. In girls it was 67.77% and in boys 38 %. Prevalence of anemia was higher in underweight children as compared to children with normal BMI and obese children in age group 8 – 16 years (Sudhagandhi *et al.,* 2011). Another study of Neeraj Jain and Vibha Mangal Jain stated that prevalence of anemia in school children was observed as 56.5% in age group 5 – 16 years and prevalence of anemia was higher in girls than boys (Jain and Jain, 2012). De-Maeyer *et al.,* (1989) reported the prevalence of anaemia in 6-12 yr old children to be 36 per cent. The prevalence was as high as 93 per cent in children from Varanasi. The NFHS-2 survey estimated prevalence of anaemia among children of Delhi to be 69 per cent. On the basis of clinical pallor, 71.60% of Scheduled Caste children were detected to be anaemic. Haemoglobin estimation (Hb g/dl) showed that about 92.40% of Scheduled Caste preschool children had different grades of anaemia (Uppal *et al.,* 2005).
In the present study, the prevalence of anemia was found to be 85.72% **(**114/133) in the scheduled caste school children of government primary school, Fatehabad. The prevalence of anemia in girls (94.52%) was higher than the boys (75.0%). Prevalence of anemia in our study was higher in underweight children (97.75%) when compared to children with normal weight (2.25%). The prevalence of severe, moderate and mild anemia was 0.75%, 33.84% and 51.12% respectively. So, in the present study, prevalence of anemia in scheduled caste school children was higher as compared to the previous studies. Although, the present study was not designed specifically to study all the risk factors for anemia in this population, we stipulate that the higher prevalence could be due to the poor diets with low bioavailability of iron owing

to presence of phytates, oxalates, carbonates, phosphates and dietary fibre which interferes with iron absorption. Indian diet, predominantly vegetarian food, contains large amounts of inhibitors like phytates in bran, tannin in tea, oxalates in vegetables and phosphates in egg yolk, interfering with iron absorption (De-Maeyer *et al.*, 1989).

WHO/UNICEF has suggested that the problem of anemia is of very high magnitude in a community when prevalence rate exceeds 40%. Considering that anemia development is a consequence occurred at a later stage of iron deficiency, the problem of iron deficiency in these scheduled caste school children with a prevalence of 97.75% should be considered serious calls for action.

The frequency of mild (32.33%) and moderate (38.34%) undernutrition was very high in present study. A comparison of male and female children indicates that only 10.96% of girls and 20.0% of boys were normal. On the whole, about 84.96% children suffered from various grades of undernutrition. Thus, the health and nutritional status of Scheduled Caste school children of Fatehabad district of Haryana was, on the whole, very poor.

Conclusion

It is concluded that anemia still constitutes a health problem among school children belonging to scheduled castes with the present prevalence of 97.75%. The study also provides an indication to intitate the anemia prophylaxis measures for school children in India including nutrition education in schools. The government should take effective steps to improve the nutritional status of Scheduled Caste school children by monitoring and improving the existing supplementary feeding programmes.

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