A cross sectional study of prevalence of anemia in school children in Maharashtra

Kalpalata Abhiman Bhaisare[1*], Kiran Bhojraj Bhaisare[2], Rahul Rajaram Chopade[3]

[1]Assistant Professor, [3]Associate Professor, Department of Community Medicine BKL Walawalkar Rural Medical College, Savarde Chiplun, Ratnagiri, Maharashtra, INDIA.
[2]Associate Professor, Department of Paediatrics, Vilasrao Deshmukh Government Medical College, Latur, Maharashtra, INDIA.
Email: kalpalatamanik@gmail.com

Abstract
Background: In India Childhood anaemia cuts across all the sections of society with varying intensity. Its prevalence, as per the WHO classification, is a severe public health problem for India (3). Anaemia has significant negative impact on the health of school children including poor scholastic performance and cognitive impairment. (4) There are numerous studies on prevalence of anemia in preschool children and pregnant women. The data on anemia among school children are scarce, and school-aged children are not commonly included in health and nutrition surveys like NFHS and DLHS. This study is an attempt to meet this gap particularly in this tribal area of Maharashtra. The main objective of the study was to estimate the prevalence of anemia in school children of tribal area of Palghar district and to look for socio-economic factors associated with anaemia. **Design:** Community based, Cross-sectional study. **Setting:** Government schools in Jawhar a tribal area in Palghar district Maharashtra**. Subjects:** A total of 190 boys and girls, aged 6 -14 years, attending randomly selected govt school in this tribal area of Jawhar. Informed consent was obtained from parents. **Results:** Anemia prevalence was based on measure of blood hemoglobin (Hb). Results of the study are presented in mean ± SD. Mean weight of students was 21.73 kg with St. Deviation of 4.655. Mean height was 134.9 cm with std deviation of 10.06 cm. The prevalence of anemia among school children was found to be 74.2%. Anaemia is still a severe public health problem in school children particularly in this tribal area. Almost 79.3%% (88) students in lower class were anemic, 70.4% (38) student in lower middle class were suffering from anaemia. 87.0% (40) student in 12-14 years age group were having anaemia as compared to 70.1% (101) in 5-11 years category. with Pearson chi square 2 tailed p value 0.023. 80% children in 5-10 years age group were low weight for age. Only 20% (22) were having normal weight for age ,33.6% (37) were underweight. 46.4% (51) were severely underweight. 81.1% (154) children were having normal height for their age. 18.9% children were having low Height for their age. out of these 17.4% were stunted and 1.6% were severely stunted. Most of male students (82) was having BMI <3SD (86.3%), means they were too very thin for their age.
Keywords: Anemia, Hemoglobin, school children, BMI, Jawhar, tribal.

[*]**Address for Correspondence:**
Dr Kalpalata abhiman Bhaisare, Flat No. 303, Swapnapoorti CHS, Kharghar Sector 36., INDIA.
Email: kalpalatamanik@gmail.com

Access this article online	
Quick Response Code:	Website: www.medpulse.in
	DOI: https://doi.org/10.26611/10112113

INTRODUCTION

Anaemia is common health problems in developing countries with children being the most vulnerable. 25.4 % school - age children are affected globally which accounting for 305 million children affected by anemia.[1] Africa and South Asia have the highest overall regional prevalence rates. Except for adult males, the estimated prevalence of anaemia in all groups is more than 40% in both regions. Anaemia prevalence among school-age children is 37%, in children.[6-9] In India Childhood anaemia cuts across all the sections of society with varying intensity. Its prevalence, as per the WHO classification, is a severe public health problem for India.[3] Studies have documented that rapid physical and physiological development makes school-age children more vulnerable for anemia, especially for IDA. Consequences of anemia on school-age children are poor psychomotor

development, negative last-longing effects on central nervous system, poor IQ, poor school performance, reduced work capacity, and poor quality of life.[4] Anaemia has significant negative impact on the health of school children including poor scholastic performance and cognitive impairment.[5] The key role that haemoglobin plays in transporting oxygen to tissues accounts for the diminished work capacity and physical performance of persons with a diminished concentration of haemoglobin. The iron lost in menstrual blood must be taken into consideration for women of reproductive age. Anaemia may be diagnosed with confidence when the haemoglobin concentration is lower than the level considered normal for the person's age/sex group. Iron deficiency is by far the commonest nutritional cause of anaemia. Iron deficiency anaemia is considerably more prevalent in the developing than in the industrialized world. (36%- in developing countries, versus 8%- in developed countries).[2] Anaemia is an indicator of both poor nutrition and poor health. Hb concentration is the most reliable indicator of anaemia at the population level. Measuring Hb concentration is relatively easy and inexpensive, and this measurement is frequently used as a proxy indicator of iron deficiency. If prevalence of anaemia is ≤4.9 No public health problem, 5.0–19.9 Mild public health problem, 20.0–39.9 Moderate public health problem, ≥40.0 Severe public health problem.[1] Anaemia is a major health problem in Maharashtra, especially among women and children. Anaemia among children is widespread in every group. Almost half (49%) of children in Maharashtra are anemic even if their mother has 12 or more years of schooling.[6] The present study was done with the primary objective to estimate the prevalence of anemia among school going children in Palghar district. Jawhar area in Palghar district has predominantly tribal population. Educational inequality among tribal children is the resultant of the socio-economic backwardness of their home environment and the illiteracy of their parents. Scheduled Tribes (ST) are the Indian communities that are explicitly recognized by the Constitution of India as previously 'depressed classes'.[7] There are numerous studies on prevalence of anemia in preschool children and pregnant women. The data on anemia among school children are scarce, and school-aged children are not commonly included in health and nutrition surveys like NFHS and DLHS. so, in this study attempt has been done to meet this gap particularly in this tribal area of Maharashtra.

MATERIALS AND METHODS

A cross-sectional study was carried out in children studying in 1st to 7th standard in the Jawhar in 2 randomly selected govt. schools (Kogda and Patilpada). Total 190 school children (including both boys and girls) between the ages of 6-14 years who were willing to participate in study were enrolled in the study. Jawhar area is predominantly a tribal area with most of the population is Adivasis, so no. of students in each class was less compared to schools in other area. The study was carried out from September2020 to December 2020. Ethical approval taken from institutional ethics committee. Parental consent was obtained in the written format. The school health check-up was undertaken in these schools. All children were present in the school were interviewed and examined by a team of trained medical doctor, by using pre-designed and pre-tested questionnaire. Anthropometric measurements such as height and weight of each child were measured using an electronic weighing scale and stadiometer respectively. Hemoglobin of 190 students of was estimated using HemoCue 201 photometer. The HemoCue photometer has been widely used for estimation of hemoglobin in recent years because it is portable, requires only a small sample of capillary blood, is relatively simple to use, does not require electricity, and gives immediate, digitally displayed results. Hemoglobin determined by the HemoCue method is comparable to that determined by both the Cyanmethemoglobin and automated hematology analyser.[5] For Children 5 - 11 years of age 11.5 or higher is normal level. 11-11.4 is mild 8 to 10.9, and less than 8 is severe anemia. Children 12 - 14 years of age 12 or higher is considered normal. 11-11.9 as mild, 8-10.9 as moderate and lower than 8 was considered as severe.[8]

Statistical analysis: Data was entered into Microsoft Excel and analyzed using SPSS version 20.0. Results of the study are presented in mean ± SD. Prevalence of anemia was expressed using frequencies and percentages. WHO's weight for age, height for age and BMI for age tables for 5-19 years old boys and girls were used for comparing anthropometric measurements like weight, height and BMI. The association between anemia in school children and their parents' socio-economic variables such as education, socioeconomic class and sex of the child were calculated using the Chi-square (χ^2) test.

RESULTS

All students were in age group of 6 to 14 years. Mean age of participants was 10.18 with standard deviation of 1.631. There were 50% (95) male student and 50% (95) female students. School students were categorized into 2 categories according to age a)5-11 years and b)12-14 years. Approximately 75.8% (144) students were in 5-11 years age group and 24.2% (46) children were in 12-14 years age group out of total 190 school children. Mean weight of students was 21.73 kg with St.

Deviation of 4.655. Weight of children was in range of 14 to 37.Mean height was 134.9 cm with std deviation of 10.06 cm. Height of children was in range of 57.5 to 167 cm. 144 (60%) students were Adivasi (scheduled tribes),10(5.3%) were Maratha,48 (25.3%) were OBC and 18 students belonged to Scheduled caste.Approx.59.5% (113) student were Below poverty line, 35.6% (68) were above poverty line.4.7 % (9) was not having Rashaan cards. 45.8% (87) were staying in joint family,19.5% (37) were living in three generation family and 34.7% (66) were staying in nuclear family. Approximately 51.1 % (97) were having 5 or less than 5 members in family. 44.2% (84) were having 6-10 family members and 4.7% (9) were having 11-14 family members in family Acco. to BG prasad Socioeconomic scales (9), 58.4% (111) children belongs to lower socioeconomic class,28.4% (54) belong to lower middle class.11.6% (22) belong to middle class and only 1.6% (3) were from upper middle class. none of the children belonged to upper class. The prevalence of anemia among school children was found to be 74.2%. Almost 79.3%% (88) students in lower class were anemic, 70.4% (38) student in lower middle class were suffering from anaemia. But it was not statistically significant. 87.0% (40) student in 12-14 years age group were having anaemia as compared to 70.1% (101) in 5-11 years category. with Pearson chi square 2 tailed p value 0.023 For children above 10 years of age, there are no weight for age reference standards given by WHO. So, we excluding these children we analyzed rest of 110 children for WHO weight for age criteria. None of the children was having weight for age above median.80% (88) children's weight for age less than -2SD.80% children in 5-10 years age group were underweight for age. Only 20% (22) were having normal weight for age ,33.6% (37) were underweight. 46.4% (51) were severely underweight (10,15).81.1% (154) children were having normal height for their age.18.9% children were having low height for their age. out of these 17.4% were stunted and 1.6% were severely stunted. (11) Most 93.7% (178) student were having BMI less than -2SD (12). Most of male students (82) was having BMI <3SD (86.3%), means they were too very thin for their age. Almost 9.5% were having BMI between -3SDand-2SD. Only 2.1%were having BMI between -2SDand-1SD and same no. of student was having BMI in -1SDand median. Most of female students (70) was having BMI <3SD (73.7%) i.e. very thin for their age. 17.9% (17) were having BMI in -3SDand-2SD. Only 7.4% (7) were having BMI between -2SDand-1SD and only 1 student was having BMI between -1SDand median. Approximately 65.7 % (125) children's weight was beyond -2SD which shows that most of data was negatively skewed. most children were wasted. Only 3.2% children's weight was were between mean+1SD.

Table 1: Prevalence of anaemia across the gender

			Anaemia		Total
			no	yes	
Gender	male	Count	25	70	95
		% within gender	26.3%	73.7%	100.0%
	female	Count	24	71	95
		% within gender	25.3%	74.7%	100.0%
	Total	Count	49	141	190
		% within gender	25.8%	74.2%	100.0%

Table 2: Prevalence of anaemia in socio economic class

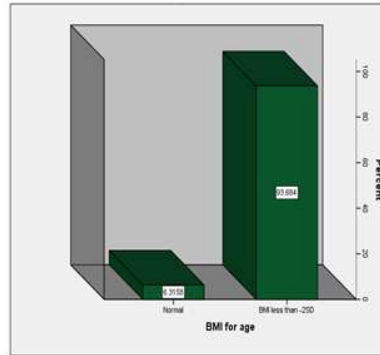|			anaemia		Total
			no	yes	
BG prasad class	Upper middle	Count	1	2	3
		% within anaemia	2.0%	1.4%	1.6%
	Middle class	Count	9	13	22
		% within anaemia	18.4%	9.2%	11.6%
	Lower Middle	Count	16	38	54
		% within anaemia	32.7%	27.0%	28.4%
	Lower class	Count	23	88	111
		% within anaemia	46.9%	62.4%	58.4%
Total		Count	49	141	190
		% within anaemia	100.0%	100.0%	100.0%

Figure 1: BMI age in school children

Table 3: Weight for age school children 5-10 years

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Normal	22	11.6	11.6	11.6
	underweight	88	46.3	46.3	57.9
	Above10yr	80	42.1	42.1	100.0
	Total	**190**	**100.0**	**100.0**	
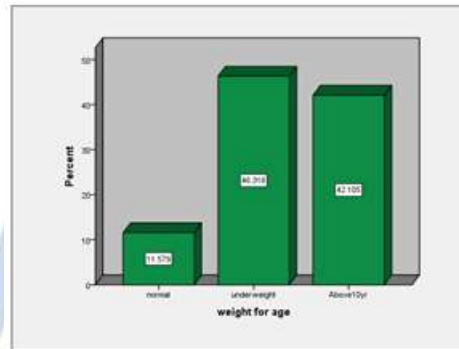
Figure 2: Weight for 5-10 year school children

Table 4: Height for age

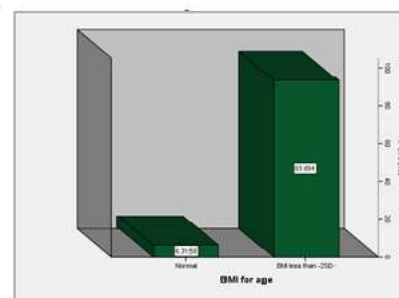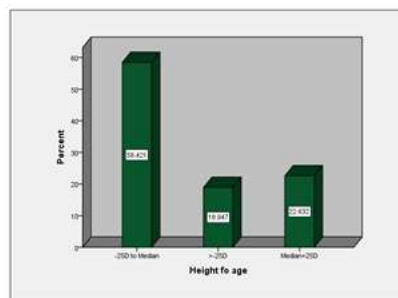|		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	normal	154	81.1	81.1	81.1
	stunted	33	17.4	17.4	98.4
	severely stunted	3	1.6	1.6	100.0
	Total	**190**	**100.0**	**100.0**	

Figure 3: Height for age in school children; **Figure 4:** BMI for age in school children

DISCUSSION

The prevalence of anemia among school children was found to be 74.2%. which is comparable with a study by Bhise RM *et al.* where prevalence of anemia among children in the age group of 8 to 16 years was 77.10 % in tribal ashram schools.[6] Bhise RM *et al.* found the prevalence of anemia in girls (87.8%) was higher than the boys (65.1%) which is not same in this study.[6] We found that prevalence of anemia was almost same in both genders 73.7%in male students and74.7%in female students. Robel Tezera *et al.* found the same finding: male school-aged children had higher prevalence of anemia (28%) compared with female counterparts (25%).[3] No statistical differences in Hb or anemia by sex were evident in a study by Iannotti LL *et al.*[10] prevalence of anaemia was more in lower and lower middle socio-economic class children. Almost 79.3%% (88) students in lower class were anemic, 70.4% (38) student in lower middle class were suffering from anaemia. Same finding is seen in NFHS 4 survey, children from rural, household of poor economic condition show higher prevalence of anaemia than their respective counterparts.[6] overall prevalence of anemia among children in the age between 8 and 16 years was 52.88%in a study by Sudha Gandhi *et al.* which is lower as compared to finding in this study.[14] 12-14 years age group was more vulnerable for anemia with prevalence of 87%.In a study by Sudha gandhi *et al.* ,45.9% children were underweight which is low as compared to 80% (88) children in our study having weight for age less than -2SD.[14] In a study by Srivastava A *et al.*, overall 33.3% of children were wasted whereas 18.5% were stunted, which is similar to findings in this study where total 18.9% children were stunted.

CONCLUSION

Anemia is a severe public health problem among the school children in this area. There is very high prevalence of anaemia in school children along with most of children are too thin for their age due to poor socio-economic condition in this tribal region.so emphasis should be given to proper execution of Anaemia Mukt Bharat programme for weekly iron supplementation and deworming should be conducted on regular basis. Health education regarding nutritious diet particularly to mothers should be imparted.

REFERENCES

1. Benoist BD, McLean E, Egll I, Cogswell M. Worldwide prevalence of anaemia 1993-2005: WHO global database on anaemia. Geneva: WHO global database on anaemia; 2008
2. Who Preventing And Controlling Iron Deficiency Anaemia Through Primary Health Care A guide for health administrators and programme managers
3. Chungkham HS, Marbaniang SP, Narzary PK. "Childhood Anemia in India: an application of a Bayesian geo-additive model". BMC Pediatr. 2021 Nov 30;21(1):529. doi: 10.1186/s12887-021-03008-0. PMID: 34847925; PMCID: PMC8630875.
4. Robel Tezera1*, Zekariyas Sahile2, Delelegn Yilma2, Equilnet Misganaw3 and Ermiyas Mulu Prevalence of anemia among school-age children in Ethiopia: a systematic review and meta-analysis Systematic Reviews (2018) 7:80 pg 2-7
5. Rakesh, P. S., George, L. S., Joy, T. M., George, S., Renjini, B. A., and Beena, K. V. (2019). Anemia Among School Children in Ernakulam District, Kerala, India. Indian journal of hematology and blood transfusion: an official journal of Indian Society of Hematology and Blood Transfusion, 35(1), 114–118. https://doi.org/10.1007/s12288-018-1001-6
6. National Family Health Survey (NFHS-4) India 2015-16 Maharashtra National Family Health Survey 2015-16 International Institute for Population Sciences.
7. Bhise, R.M., Wadekar, K.B. and Tarpe, V.C. (2013), "Prevalence of anemia in the children of tribal ashram schools in Ahmednagar district of Maharashtra", International Journal of Development and Sustainability, Vol. 2 No. 1, pp. 298-305
8. WHO. Haemoglobin concentrations for the diagnosis of anaemia and assessment of severity. Vitamin and Mineral Nutrition Information System. Geneva, World Health Organization, 2011 (WHO/NMH/NHD/MNM/11.1) (http://www.who.int/vmnis/indicators/haemoglobin. pdf assessed on 10/01/2022.
9. 9.https://www.researchgate.net/publication/333563563_Modified_BG_prasad_socio-economic_classification_update_-_2020 assessed on 10/01/2022
10. https://www.who.int/tools/growth-reference-data-for-5to19-years/indicators/weight-for-age-5to10-years assessed on 6/01/2022
11. https://www.who.int/tools/growth-reference-data-for-5to19-years/indicators/height-for-age assessed on 7/01/2022
12. https://www.who.int/tools/growth-reference-data-for-5to19-years/indicators/bmi-for-age assessed on 11/01/2022
13. Iannotti LL, Delnatus JR, Odom AR, Eaton JC, Griggs JJ, Brown S, Wolff PB. Determinants of Anemia and Hemoglobin Concentration in Haitian School-Aged Children. Am J Trop Med Hyg. 2015 Nov;93(5):1092-8. doi: 10.4269/ajtmh.15-0073. Epub 2015 Sep 8. PMID: 26350448; PMCID: PMC4703262
14. Sudhagandhi B, Sundaresan S, William W E, Prema A. Prevalence of anemia in the school children of Kattankulathur, Tamil Nadu, India. Int J Nutr Pharmacol Neurol Dis 2011; 1:184-8
15. Srivastava A, Mahmood SE, Srivastava PM, Shrotriya VP, Kumar B. Nutritional status of school-age children - A scenario of urban slums in India. Arch Public Health. 2012 Apr 17;70(1):8. doi: 10.1186/0778-7367-70-8. PMID: 22958757; PMCID: PMC3436633.
16. https://dapa-toolkit.mrc.ac.uk/anthropometric-indices/growth assessed 0n 19.01.2022