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Research Article

ANEMIA PREVALENCE IN ADOLESCENT SCHOOL GOING GIRLS

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ABSTRACT

Aim: The aim was to find out the prevalence of anemia in the adolescent girls in the schools of rural area and the influence of micronutrients on different grades of anemia.
Materials and methods: It was a cross-sectionals study. 501 school going adolescent girls were enrolled for the study after informed consent. Data for demographic profile were collected, followed by blood sample collection for analysis of hemoglobin, iron profile and vitamin B12.
Results: Prevalence of anemia was 40.7% in the study population. Anemia distribution was significantly associated with low socioeconomic class (SEC), low body mass index (BMI), diet pattern and worm infestation. Vitamin B12 deficiency was recorded to be 57.9% which was more prevalent as compared to Iron deficiency anemia which was found to be only 17%.
Conclusion: Annual screening for anemia along with health education and poverty alleviation program would definitely aid in developing strategies and programs to improve adolescence health by ensuring adequate micronutrient store for future pregnancy.

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INTRODUCTION

Anemia is the most prevalent form of anemia in adolescent girls in India with a prevalence rate of more than 80% in major states. The prevalence depicted in this state is above 90%. [1] Adolescence period is highly vulnerable to health issues as this is the transition period from childhood to adulthood and require meeting the health and developmental needs. Social, educational and nutritional negligence has primarily affected the adolescent girls and succumb them for growth retardation, poor physical changes, impaired social and mental behavior and poor reproductive growth in future owing to deficient iron and vitamin B12 reserve.[2–4] Anemia management has been a prime focus of present national programme not only for their optimum growth and development but also to reduce the future risk of maternal mortality and morbidity. Screenings for anemia are being carried out in different geographical areas in different seasonal period. However, very limited data are available in adolescent group from this area of India. This study was undertaken in order to find out the prevalence of anemia in the adolescent girls in the schools of rural area and the influence of micronutrients on different grades of anemia.

MATERIALS AND METHODS

The study was a cross-sectional study conducted in the schools of rural areas of Raipur district. The study was approved by the Institutional Ethics Committee and requisite consent was taken from parents/legally accepted representatives (LAR) and also from the Principals of the schools. 501 school going adolescent girls of age group 10-18 years in Raipur district whose parents/LAR signed consent form were enrolled for the study. Those who were not willing to sign, or those with known cases of hemolytic anemia and those beyond the specified age group were not included in the study. Semi-structured, pre-designed and pre-tested, self-administered questionnaire was used to fill up all required demographic profiles. Blood was collected under all aseptic conditions for evaluating serum iron, total iron binding capacity (TIBC) and vitamin B12 levels. Serum B12 was measured in Electrochemiluminescence method in Cobas e-400 immunoassay autoanalyzer from Roche Diagnostics and serum Iron and TIBC measured by Iron-Ferrozine method in Biosystem B 400 fully automated clinical autoanalyzer from Biosystem reagent and Instruments at Department of Biochemistry, AIIMS Raipur.

Severity of anemia was categorized as given below:

Severity of anemia	Cut-off (WHO criteria)
Mild	10 – 11.9 gm/dl
Moderate	7 – 9.9 gm/dl
Severe	< 7 gm/dl
Vitamin B12	< 200 pg/ml
Ferritin	< 15 ng/ml

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RESULTS

The prevalence of anemia in the study population was found to be 40.7% (n=204/501). The mean±SD age in the study population was 14.1±2.21 years. The distribution of mild, moderate and severe forms of anemia has been illustrated in figure-1. Mild form of anemia was the most prevalent form of all (35.1%). The mean±SD hemoglobin levels for anemic subjects (n=206) was 10.8±1.18 which was significantly low (p<0.001) as compared to non-anemic subjects (n=295) with mean±SD of 12.9±0.67.

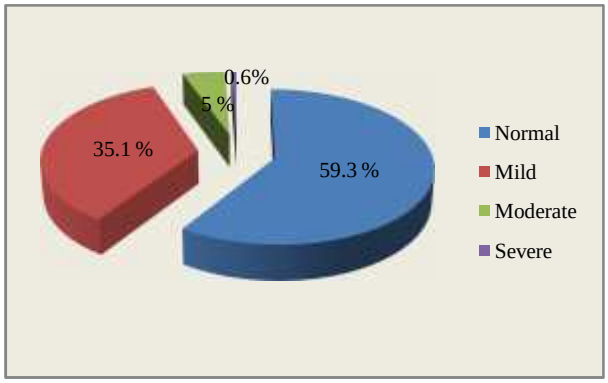

Figure 1 Prevalence of mild, moderate and severe anemia

As elaborated in table-1, hemoglobin concentration of the study population depicted significant association with different SEC, with diet pattern and BMI (p<0.001). Though 69.1% (346/501) of study population preferred mixed diet, however, prevalence of anemia was found to be 41% (142/346) in this group.

Table 1 Distribution of Anemia among different socioeconomic class, diet pattern and BMI

SE class	Haemoglobin (gm %)				Total
	Normal	Mild	Moderate	Severe	
II	12	5	0	1	18
III	107	61	10	0	178
IV	177	109	15	2	303
V	1	1	0	0	2
		P<0.01			
Diet pattern					
Vegetarian	93	53	7	2	155
Mixed	204	123	18	1	346
		P<0.001			
BMI					
Below 18.5	192	109	15	1	317
18.5 -25	101	62	10	2	175
25.1-29	4	5	0	0	9
		P<0.001			

16.6% (83/501) of the study population revealed history of worm infestation and the prevalence of anemia in them was 41.1%. The mean hemoglobin level (10.8±1.8) was found to be significantly low (p<0.01) in these subjects as compared to the subjects without worm infestation (12.3±1.1) as shown in figure-2.

Figure-3 reflects the distribution of nutrient deficiency in the study population. Vitamin B12 deficiency was most prevalent (57.9%) followed by iron deficiency (17%) and combined iron and vitamin B12 deficiency (12.4%). Percentage of girls depicting anemia associated with vitamin B12 deficiency and iron deficiency was 43.4% (126/290) and 80.7% (67/83) respectively. The mean hemoglobin value was significantly lower in iron deficiency cases as compared to B12 deficient state and non-deficient state (p<0.001) as laid out in table-2. However, there was no significant difference in hemoglobin levels in B12 deficient subjects when compared to the non-deficient group.

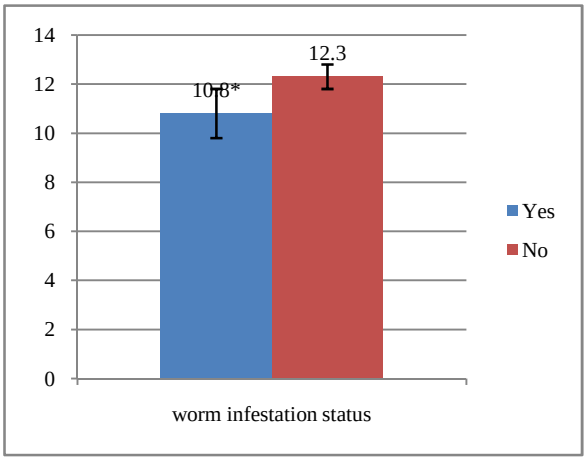

Figure 2 Hemoglobin levels and worm infestation in the study population (*p<0.01)

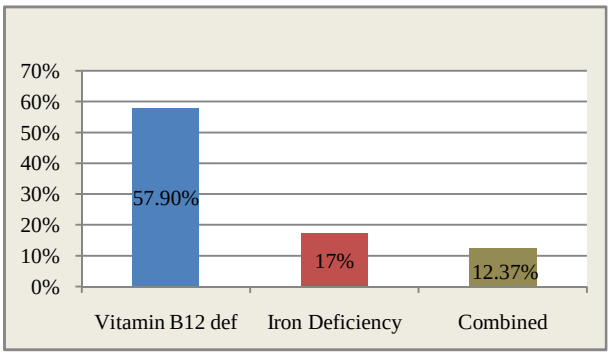

Figure 3 Prevalence of iron and vitamin B12 deficiency

Table 2 Comparison of hemoglobin levels in different groups

Sub-groups	n	mean±SD Hb levels
Non- deficient[a]	125	12.3±1.0
Iron deficient[b]	86	11.2±1.6*
B12 deficient[c]	290	12.2±1.3

* p<0.001(as compared to a and c)

DISCUSSIONS

Prevalence of anemia in the adolescent school going girls in rural areas of Raipur was observed to be nearly 41%. The mean age group of study subjects was 14.1±2.21 years who presented with anemia with mean hemoglobin concentration of 10.8±1.18 gm/dl. Goyal *et al*., in their study had published prevalence of anemia to be 43.11% in adolescent girls in rural area of Nainital with mean age group of 14.29±1.81 years and mean hemoglobin concentration of 11.35gm/dl .[4] Similar results were also depicted by Chaudhary *et al*. and Siddharam *et al* with a prevalence of 35.1% and 45.2% respectively.[5,6] However, anemia prevalence was found to be less in our study population as compared to few other studies. Srinivas *et al*, Pattnaik *et al* and Dutt *et al* reported prevalence of anemia among adolescent girls to be 78.3%, 78.8% and 61% respectively.[3,4,7]

The study population illustrated significant distribution of anemia in different categories of SEC, especially to class IV and also to low BMI. Various studies presented significant association of anemia to low socioeconomic group and low BMI. [3,5] Lack of knowledge of nutrition and quality food intake in lower socioeconomic class could justify low BMI and anemia prevalence in this group. Though majority of the anemic subjects preferred mixed diet, still anemia was prevalent in them. This could be attributed to the poor cooking practices and very low frequency of intake of iron rich food. Worm infestation was also found to be about 17% in this area that reflects lack of education for sanitation and hygiene, both for eating habits and cooking practices. The frequency of worm infestation was quite low in our study population as compared to 31.4% and 71.73% that revealed by Srinivas *et al* and Vinod *et al* respectively.[3,8]

High prevalence of vitamin B12 deficiency (57.9%) as compared to iron deficiency anemia (17%) was unleashed in our study group. Thomas *et al* in their study reported B12 deficiency in 50% of subjects whereas Patra *et al* depicted the same in 42.5% cases .[9,10]

Government of India is providing iron and folic acid supplementation along with deworming with albendazole twice yearly. Successful implementation of the program in this region could be justified by low prevalence of severe form of anemia, low worm infestation rate and high frequency of vitamin B12 deficiency without significant decrease in hemoglobin concentration. Folic acid supplementation is known for masking effect of vitamin B12 deficiency. [11] This might explain the reason why hemoglobin levels in vitamin B12 subjects did not show significant difference to the non-deficient group as the iron deficient subjects revealed. Intake of overcooked food and less frequent meat intake might be the major contributory factor for vitamin B12 deficiency.

CONCLUSION

Anemia prevalence in adolescent girls is a major public health concern. Healthy adolescent girls can only be a healthy mother. Besides IFA supplementation, adequate education regarding quality food, cooking practices and health education should also be emphasized. Nonetheless, revised program along with incorporation of vitamin b12 supplementation is needed to upgrade their nutritional status and further reduce the anemia prevalence.

Clinical Significance

Annual screening for anemia along with health education and poverty alleviation program would definitely aid in developing strategies and programs to improve adolescence health by ensuring adequate micronutrient store for future pregnancy.

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