

# Anemia in school-going adolescent girls of age between 11 and 16 years in rural area – A cross-sectional study

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## ABSTRACT

**Background:** Adolescent age group (10–19 years) is characterized by rapid physical, psychological, and cognitive development. This is a vulnerable period for the development of nutritional anemia. Lack of knowledge concerning nutrition is one of the most significant reasons for nutritional problems and inappropriate nutritional practices can lead to numerous complications. **Objectives:** The objectives of the study were (1) to estimate the prevalence of anemia among school-going adolescent girls aged 11–16 years in rural area, (2) to know sociodemographic factors associated with anemia, and (3) to assess knowledge, attitude, and practices regarding anemia and its prevention. **Materials and Methods:** A descriptive cross-sectional study was conducted in rural area during November 1, 2018–January 15, 2019 among 1152 school-going adolescent girls of age between 11 and 16 years and resident of rural area using multistage sampling method. **Results:** In rural school-going adolescent girls, the prevalence of anemia was 67.36%. Anemia in adolescent girls was significantly associated with mother's education and occupation. About 44.18%, 43.4%, and 38.28% girls did not know about causes, symptoms, and prevention of anemia, respectively. About 53.82% of girls worried about anemia, 61.81% of girls like to eat iron-rich food, and 64.76% of girls think that iron-rich foods are beneficial in anemia. About 21.88% of girls eat iron-rich foods and 57.2% eat Vitamin C rich foods regularly. **Conclusion:** There was poor knowledge in girls and unsatisfactory practices about anemia and its prevention, but positive attitude was seen to prevent anemia.


**KEY WORDS:** Anemia; Adolescent; Knowledge, Attitude, and Practice Study

## INTRODUCTION

According to the World Health Organization, adolescent age group is defined as life span between 10 and 19 years.<sup>[1]</sup> This period is characterized by rapid physical, psychological, and cognitive development. This is a vulnerable period in the human life cycle for the development of nutritional anemia.<sup>[2]</sup>

In India, adolescents constitute about 25% of the population and form an important physiological group whose nutritional needs demand special attention.<sup>[3]</sup> Their current nutritional status will decide the well-being of the present as well as the future generations. As adolescent age is the formative years for development, anemia at this stage of life has some long-term consequences, such as stunted growth, poor school performance, reduced immunity, menstrual irregularities, and later on poor pregnancy outcomes such as intrauterine growth restriction, low birth weight, and increased perinatal morbidity and mortality.<sup>[2]</sup>

During the adolescent growth spurt, the risk of iron deficiency anemia reappears for both boys and girls. Adolescent girls are a particularly vulnerable group as their requirements of iron as well as its losses from the body are high.<sup>[3]</sup> India has the

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highest prevalence of iron deficiency anemia among women, including adolescents, worldwide. Between 60% and 70% of Indian adolescent girls are anemic (hemoglobin [HB] <12 g/dl).<sup>[3,4]</sup> As per the National Family Health Survey 4, in India, 54.1% of women of age 15–19 years are anemic.<sup>[5]</sup>

In developing countries, it is not only poverty but social factors also play in poor nutrition and poor health management among girls in adolescence as they remain neglected for being a girl child. Awareness regarding iron and folic acid supplementation in pubertal girls helps to build up the iron stores in them and when addressed to them who soon enter married life and motherhood, could be just a proper solution to the problem of anemia in pregnant women, which can be attempted forming a bedrock platform in the concept of continuum of care. It is essential to identify the scope of this micronutrient deficient disease, first, by assessing the knowledge, attitude, and practice of this important micronutrient, that is, iron and then by spreading the word regarding its importance in the development of adequate iron stores.<sup>[6,7]</sup>

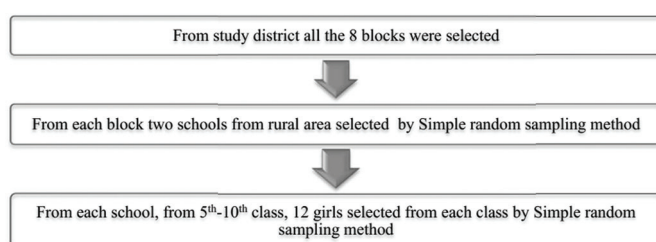
With this background, this study has been undertaken to estimate prevalence of anemia, to know factors associated, and to assess knowledge, attitude, and practices among school-going adolescent girls regarding anemia.

## MATERIALS AND METHODS

A descriptive cross-sectional study was conducted over 6 months during September 1, 2018– February 28, 2019 in the secondary schools in rural area of Osmanabad district from Maharashtra among school-going adolescent girls of age between 11 and 16 years resident of rural area.

There are no national data collected on anemia in adolescents. From various studies, the prevalence of anemia in adolescent girls observed is 60–70%.<sup>[4]</sup> Taking prevalence as 60%, sample size at 95% confidence interval taken is by applying sampling formula: Sample size ( $n$ ) =  $(1.96)^2 pq/L^2$  Where  $P$  is prevalence of anemia in adolescent girls (60%),  $q$  is  $100-P = 40\%$ , and  $L$  is allowable error which is 5% of  $P$ , it comes 3. Thus, the sample size came as 1066. For feasibility reason, 1152 samples were taken for this study.

Sample was selected using multistage random sampling method.



As there are eight blocks (Tahsils) in study district, to have equal representation of adolescent girls, from each block, 144 samples were taken. From each block, two schools were selected by simple random sampling method. To have equal representation from each age group between 11 and 16 years, 12 girls were taken from each age group between 11 and 16 years, by simple random sampling method. Thus from each school, a total of 72 girls were taken.

Adolescent girls of age between 11 and 16 years who were willing to participate in study and gave consent for the same and who were present on the day of visit in the school are included in the study while those adolescent girls who are not willing to participate or not giving consent were excluded from the study.

Data were collected with the use of a pretested semi-structured questionnaire. With the help of Rashtriya Bal Swasthya Karyakram (RBSK) teams working in respective blocks, data were collected. A prior permission was taken from district health officer. Ethical approval for this study was taken from the Institutional Ethical Committee. A pre-intimation was given in school about visit of the RBSK team to school to get maximum presence of adolescent girls in the school on the day of visit. HB estimation was conducted using digital HB meter which was calibrated. The study information was given to participants and consent was taken, after that interview of participants was taken and HB estimation was conducted.

Data were entered and analyzed using Microsoft Office Excel 2007 and were presented in the form of tables, figures, and graphs wherever necessary. Statistical methods such as Chi-square test and other appropriate statistical tests of significance were applied.

## Classification of Anemia

For classification of anemia, reference range of hemoglobin was used as per the WHO classification.<sup>[1]</sup> Anemia in adolescents is called when HB level is <12 g%. Mild, moderate, and severe anemia are when the HB levels are 11–11.9 g%, 8–10.9 g%, and <8 g%, respectively.

## RESULTS

From 16 schools from rural area of study district, a total of 1152 adolescent girls from class 5<sup>th</sup> to 10<sup>th</sup> were taken for this study. Out of them, 776 (67.36%) girls were found anemic (HB <12 g%) in HB estimation. The mean HB was 11.05 g% with standard deviation 1.79 g% and range 7.5–14.6 g% at 95% confidence level.

Table 1 shows distribution of anemic status of girls according to class and age. Majority of girls of age 11 years are found anemic followed by girls of age 16 years and least number

**Table 1:** Class and age-wise prevalence of grades of anemia

Class	Modal age (year)	No anemia (HB $\geq$ 12 g%)	Mild (11–11.9 g%)	Moderate (8–10.9 g%)	Severe (<8 g%)	Total
		$\chi^2 - 10.29, df - 5$ <i>P</i> =0.067	$\chi^2 - 4.71, df - 5$ <i>P</i> =0.452	$\chi^2 - 9.49, df - 5$ <i>P</i> =0.091	$\chi^2 - 20.53, df - 5$ <i>P</i> =0.001	
5 <sup>th</sup>	11	47 (24.48%)	37 (19.27%)	108 (56.25%)	0 (0.00%)	192(100%)
6 <sup>th</sup>	12	76 (39.58%)	41 (21.35%)	74 (38.54%)	1 (0.52%)	192(100%)
7 <sup>th</sup>	13	61 (31.77%)	49 (25.52%)	77 (40.10%)	5 (2.60%)	192(100%)
8 <sup>th</sup>	14	71 (36.98%)	31 (16.15%)	80 (41.67%)	10 (5.21%)	192(100%)
9 <sup>th</sup>	15	69 (35.94%)	40 (20.83%)	77 (40.10%)	6 (3.13%)	192(100%)
10 <sup>th</sup>	16	52 (27.08%)	46 (23.96%)	82 (42.71%)	12 (6.25%)	192(100%)
Total		376 (32.64%)	244 (21.18%)	498 (43.23%)	34 (2.95%)	1152

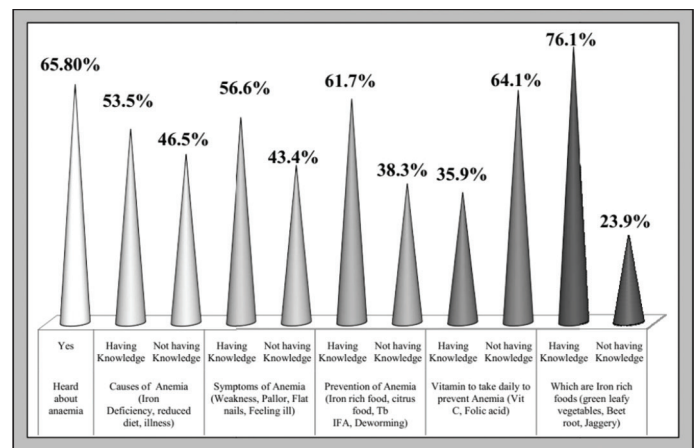
in 12-year-old girls. About 32.64% of girls are found non-anemic. About 21.18%, 43.23%, and 2.95% of girls are found mild, moderate, and severe anemic, respectively. Majority of girls are moderate anemic. Applying goodness of fit test, severe anemia in adolescent girls is found significantly associated with age of girls. Vulnerability to severe anemia increases with increasing age. Overall, the age is also found significantly associated with anemia in adolescent girls (Chi-square – 15.38, *P* = 0.0088)

In this study, association of anemia in adolescent girls is tested with sociodemographic factors such as socioeconomic status, dietary habits, mother’s education, father’s education, and mother’s occupation, as shown in Table 2.

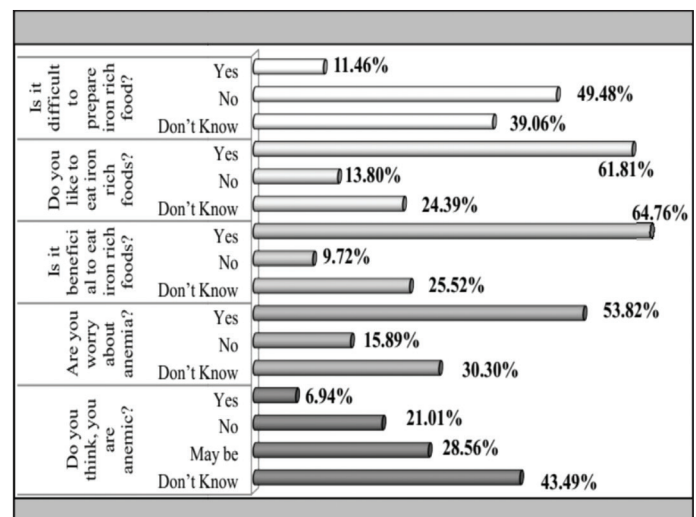
Anemia in adolescent girls belonging to Class V (lower class) socioeconomic status (according to modified B. G. Prasad classification) is 63.6%. Anemia is comparatively more in Class II (72.3%) and Class I (70%). SES is not found statistically significantly associated with anemia in adolescent girls. Anemia is more in strictly vegetarian girls (67.81%) than in non-vegetarian or mix diet girls (64.56%), but it is not found statistically significant.

Anemia in adolescent girls is found significantly associated with mother’s education and highly significantly associated with mother’s occupation. Majority girls of illiterate mothers are anemic as compared with educated mothers. Anemia in adolescent girls is seen decreasing with increase in educational level of their mothers. Anemia is found more in girls whose mothers are engaged in unskilled work like laborers. It is less in daughters of housewife and lesser in mothers engaged in semiskilled and higher occupation. Anemia in girls is not found significantly associated with father’s education.

As shown in Figure 1, the present study revealed that 65.8% of adolescent girls were heard about anemia, while 53.5% of girls were knowing correct causes of anemia such as dietary iron deficiency, reduced diet intake, and illnesses. About 56.6% of girls were able to tell the symptoms of anemia such as weakness, pallor, and flat nails. About 61.7% of girls were aware that taking iron-rich foods, citrus foods deworming



**Figure 1:** Knowledge of the study participants about anemia



**Figure 2:** Attitude of the study participants about anemia

can prevent anemia. Majority of girls were knowing iron-rich foods such as green leafy vegetables, beetroot, and jaggery. Only 35.9% of girls knew that intake of Vitamin C rich foods in daily diet can help to prevent anemia.

Figure 2 shows the attitude of adolescent girls regarding anemia. About 53.8% of girls worried about anemia, only 6.94% of girls thought that they are suffering from anemia. About 64.76% of girls agreed about intake of iron-rich foods

is beneficial in preventing the anemia and 61.8% of girls actually like to eat iron-rich foods daily. About 49.48% of girls told that preparing iron-rich foods daily is not difficult.

With regard to practices as shown in Table 3, only 21.88% and 57.2% of girls eat iron-rich foods and citrus fruits daily, respectively. About 32.73% and 37.85% of girls take

tea or coffee daily, respectively. About 7.64% of girls were diagnosed as anemic in past but out of them only 26.14% of girls had taken treatment for that. About 70.9% of girls had consumed weekly iron folic acid tablets given in the school. About 30.12% of girls had habit of going outdoor barefoot. About 93.4% of girls had good habit of washing hands with soap after toilet.

**Table 2:** Association of sociodemographic factors and anemia in adolescent girls

Sociodemographic factors	Groups	Anemic girls		Total girls	$\chi^2$ value	P value
		Number	%			
Socioeconomic status	Class I	42	70	60	6.659	0.155
	Class II	34	72.3	47		
	Class III	75	68.81	109		
	Class IV	282	71	397		
	Class V	343	63.6	539		
Dietary habits	Vegetarian	674	67.81	994	0.655	0.4184
	Non-veg/mix	102	64.56	158		
Mother's education	Graduate and above	53	53.54	99	14.788	0.0052
	HSC or diploma	107	61.85	173		
	Secondary school	455	70.11	649		
	Primary school	78	66.67	117		
	Illiterate	83	72.81	114		
Father's education	Graduate and above	135	59.47	227	9.1258	0.052
	HSC or diploma	206	71.53	288		
	Secondary school	309	68.21	453		
	Primary school	61	67.03	91		
	Illiterate	65	69.89	93		
Mother's occupation	Unskilled	89	78.76	113	18.655	<0.001
	Housewives	638	67.58	944		
	Semiskilled and above	47	50.54	93		

**Table 3:** Practices regarding anemia prevention and management

Practice	Frequency	%	Practice	Frequency	%
What ate yesterday?			Takes tea/coffee daily		
Veg	933	80.99	Yes	377	32.73
Non-veg	69	5.99	Occasional	436	37.85
Mix	89	7.73	No	339	29.43
Fast food	61	5.30	Was diagnosed as anemic in past		
Eats iron-rich foods daily			Yes	88	7.64
Yes	252	21.88	No	529	45.92
No	368	31.94	Don't Know	535	46.44
Do not know	532	46.18	Taken treatment for anemia		
Consumes citrus fruits after meal?			Yes	23	26.14
Yes	659	57.20	No	65	73.86
No	219	19.01	Goes bare foot outdoor		
Do not know	274	23.78	Yes	347	30.12
Consumes WIFS tablets given in schools weekly			No	805	69.88
			Washes hands with soap water after toilet		
Yes	817	70.90	Yes	1076	93.40
No	335	29.10	No	76	6.60

## DISCUSSION

In the present study of anemia in 1152 school-going adolescent girls of age 11–16 years from rural area, the prevalence of anemia was 67.36% of which maximum girls (64.2%) were having moderate anemia. In the present study, age of girl, mother's education, and occupation were found significantly associated with anemia in adolescent daughters. Anemia prevalence was seen increasing with increasing age of girls. In the present study, anemia in adolescent girls was found highest whose mothers were engaged in unskilled works as labor work than the daughters of housewives or mothers with semiskilled or above occupation. In the present study, socioeconomic status and dietary habits were found not significantly associated with anemia in adolescent girls.

In the present study, the prevalence of anemia was 67.36% of which 31.4% of girls had mild anemia, 64.2% of girls had moderate, and 4.4% of girls had severe anemia; in the study of Patnaik *et al.*,<sup>[8]</sup> the prevalence of anemia was more 78.8%. In the study of Veena *et al.*,<sup>[2]</sup> the overall prevalence of anemia among adolescent girls was found to be 57.65%, of which 34.7%, 44.9%, and 20.4% of girls had mild, moderate, and severe anemia, respectively. Majority of girls were found having moderate anemia. This may be due to occasional and low dietary intake of iron-rich foods in rural community, inability of coping up the blood losses due to menstruation. In the present study, age of girl, mother's education, and occupation were found significantly associated with anemia in adolescent daughters. Anemia prevalence was seen increasing with increasing age of girls. This may be due to menstrual losses, food faddism, etc. About 72.8% of girls of illiterate mothers were anemic while 53.5% only in daughters whose mothers educated graduate or above. Comparably similar findings were seen in a study of Patnaik *et al.* 87.4% of daughters of mothers educated below or up to primary education were found anemic while 60.4% of daughters of mothers educated secondary or above education which was significantly associated. Similar findings were found in the study of Vineeta *et al.*<sup>[2]</sup> Awareness of mothers about anemia and its prevention increases with education, so they can act regardingly for improving quality and quantity of diet, personal hygiene, and health-seeking behavior. In the present study, anemia in adolescent girls was found highest whose mothers were engaged in unskilled works as labor work than the daughters of housewives or mothers with semiskilled or above occupation. This might be due to dietary compromise and poor hygiene and sanitation in the families where mothers are doing labor works. In the present study, socioeconomic status and dietary habits were found not significantly associated with anemia in adolescent girls, similar findings were observed in the study of Patnaik *et al.*<sup>[8]</sup> and Vineeta *et al.*<sup>[2]</sup> Quality of diet is seen improving with increasing socioeconomic status, while food faddism also increases with socioeconomic status, so though good food is available for girls of upper socioeconomic status, it

does not get consumed due to food faddism. In our study, 65.8% of girls were heard about anemia which is similar as in study conducted by Vineeta *et al.*<sup>[2]</sup> Our study shows that 53.5%, 56.6%, and 61.7% of girls were having knowledge of causes, symptoms, and prevention of anemia, respectively. In the study of Vineeta *et al.*, 71%, 76%, 46%, and 48.3% of girls were knowing the same, respectively. In this study, 64.8% of girls think that including iron-rich foods in diet are beneficial; while in a study of Navinkumar *et al.*,<sup>[9]</sup> 64% of girls are having similar opinion. In the present study, 71% of girls take tea or coffee, 57.2% of girls consume citrus foods, and 30% of girls go outdoor bare foot. In a study of Arohi *et al.*,<sup>[10]</sup> 96% of girls take tea or coffee, 70% of girls consume citrus foods, and 25.5% of girls go outdoor barefoot.

### Strengths and Limitations of Study

Sample size taken was large and at 5% precision. Representative samples from all blocks were collected. All necessary approvals were taken. Involvement of concerned officials such as RBSK teams and school teachers was taken, to ease to have improvements in future.

However, the whole adolescent group (10–19 years) was not taken. As girls from only rural area were taken into study, the study findings cannot be generalized to the urban area.

## CONCLUSION

In rural school-going adolescent girls (11–16 years age), the prevalence of anemia was high (67.36%) with majority of girls are moderately anemic (HB level between 8 and 10.9 g%). More efforts should be put in implementation of WIFS program (weekly iron folic acid supplementation). Anemia in adolescent girls was significantly associated with age ( $P = 0.0088$ ), mother's education ( $P = 0.0052$ ), and occupation ( $P < 0.001$ ), while it is not associated with socioeconomic status and dietary habits, so women empowerment plays a key role in reducing anemia. The knowledge among adolescent girls regarding anemia should be upgraded and practices should be modified by conducting education and demonstration sessions with intersectoral coordination between education, health, and ICDS departments. Positive attitude is seen to prevent anemia, so comprehensive nutritional education can yield great dividend in future.

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