

ORIGINAL RESEARCH

The Clinical Profile of Anaemia and Factors Associated with Anaemia Among Adolescent (13-19 Yrs) Girls

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ABSTRACT

Background: The worldwide prevalence of anaemia among adolescents is high and even higher in developing countries. The burden of anaemia is a major contributor for low birth weight, lowered resistance to infection, poor cognitive and motor development, weakness, fatigue, difficulty in concentrating and lower productivity. India had reported high prevalence of anaemia among adolescent girls, which is apparently higher when compared with the other developing nations. **Objectives:** To study the clinical profile of anaemia among Adolescent (13-19 years) girl students and to determine the factors associated with anaemia in Adolescent girl students like socio – demographic factors, prevalence of anaemia and clinical profile.

Materials and Methods: Single centre, cross sectional study, sociodemographic and clinical details were collected and analyzed. Blood test was done to estimate anaemia and to classify type of anaemia. Prevalence of anaemia was compared with sociodemographic and other details to look for association.

Results: The prevalence of anaemia in the present study was 25%, 78 (39%) girls belonged to class IV. Students not wearing footwear, not washing hand, not consuming jaggery, history of recurrent infections, passing worms, irregular cycle were anemic. Majority of cases had microcytic hypochromic anaemia.

Conclusion: 25% prevalence is noted in our study which is of moderate magnitude. Most commonly microcytic hypochromic anaemia 60% was noted followed by normocytic normochromic 30%. High risk factors were students belonging to low socio – economic groups, with Low BMI, not using foot wear, and present of menstrual abnormalities like polymenorrhoea.

Keywords: Anaemia, adolescents, clinical profile

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INTRODUCTION

The word Adolescence is derived from a Latin word “adolescere” which means “to grow”. WHO defines Adolescent as a person between 10 and 19 years of age.^[1] There are 1.2 billion adolescents (10 – 19 years) worldwide and India is home to the largest national population of adolescents (243 million).^[2,3]

World health organization also defines Adolescent as a transitional period phase of growth and development between childhood and adulthood.^[4] Adolescence is a crucial period in life of every individual, during which there is a transition from childhood to adulthood.^[5] Anaemia in the adolescence causes reduced physical and mental capacity and diminished concentration in work and educational performance, and also poses a major threat to future safe motherhood in girls.^[6] Anaemia is a condition characterized by reduction in the number of red blood cells and/or hemoglobin (Hb) concentration.^[7] Anaemia is a global public health problem affecting both developing and developed countries.^[8] The worldwide prevalence of anaemia among adolescents is 15% (27% in developing countries and 6% in developed countries).^[9] The burden of anaemia is a major contributor for low birth weight, lowered resistance to infection, poor cognitive and motor development, weakness, fatigue, difficulty in concentrating and lower productivity.^[10,11] India had reported high prevalence of anaemia among adolescent girls, which is apparently higher when compared with the other developing nations.^[12,13]

Iron requirement increases two to three-folds from a preadolescent level of ~0.7–0.9 mg iron/day to as much as 1.37–1.88 mg iron/day in adolescent boys and 1.40–3.27 mg iron/day in adolescent girls.^[14,15] Cost-effective anaemia prevention and control strategies are well-documented and have the power for their intended objectives in different countries.^[9]

Anaemia is characterized by reduction in the number of red blood cells and/or hemoglobin (Hb) concentration.⁷ It is said to be present when the hemoglobin level in the blood is below the lower limit of the normal range for the age and sex of the individual.^[13]

Knowledge of the degree and causes of anaemia in adolescence is important, as this is a window of opportunity for school-based interventions to improve adolescent health. Limited data are available on the prevalence of anaemia, iron deficiency, and associated factors among adolescents in India, particularly in Raichur district of Karnataka. Hence this study was attempted with the objectives of studying the clinical profile of anaemia among Adolescent (13-19 years) girl students and to determine the factors associated with anaemia in Adolescent girl students like socio – demographic factors, prevalence of anaemia and clinical profile.

MATERIALS & METHODS

The present cross-sectional study was conducted among 200 adolescent (13 – 19 years) girls studying 8std -12std in government school Raichur, with the aim of finding prevalence of anaemia and associated risk factors. Socio-demographic profile (Age, education, socio – economic status, religion), Clinical profile (Age at menarche, frequency of menstrual cycles, passage of worms in stool etc.) were collected.

Sample size was calculated using the formula, $N = 4pq/d^2$, from the recent study in Karnataka⁶, prevalence of anaemia among adolescents was 89%. Hence, calculated sample size was 157 and rounded off to 200 considering non-response rate of 20%. Adolescent girls aged 13 – 19 years from the schools were included in the study and girls who were unavailable for data collection during 3 consecutive visits and who did not consent for the study were excluded.

The study was conducted after taking Ethical community clearance and consent from the government school headmaster. Counselling was done and a predesigned pretested proforma was given to the students which contained the questioners regarding the socio-demography and clinical factors associated with anaemia, it was explained in verbal language, then students were asked to complete it and completed proforma was taken for analysis. Complete general physical examination was done and height, weight and BMI of the students were noted.

Blood was collected for analysis of investigations. Initially, hemoglobin, MCV, MCH, MCHC were done followed by Peripheral smear was done for students those who found anemic. Anaemia was categorized into mild, moderate and severe. Severe anaemia cases were further investigated for serum ferritin. The data collected was entered in Microsoft excel and analyzed using epi-info software and SPSS trial version 17. The categorical variables are expressed as percentage and relation between two categorical variables are analyzed using Chi-square test. The continuous variables are expressed as mean and standard deviation and association between two continuous variables are analyzed using Independent Samples Student 't' test. Correlations were used to analyze the relationship between two continuous variables.

RESULTS

In the present study, about 116(58%) were between 17-19 yrs of them 28 (24.2%) had anaemia and 84(42%) were between 13-16 yrs of them 22 (26.2 %) had anaemia, and P value was not found statistically significant. About 24 (12%) girls were studying in 8std out of which 4 (16.6%) had anaemia and 35(17.5%) were studying in 9std of which 12 (34.2%) had anaemia. About 42(21%) girls were studying in 10thstd of which 16(38.1%) had anaemia and 55 (27.5%) girls were studying in 11thclass out of them 9(16.4%) had anaemia and 44 (22%) in 12thclass of which 9 (20.5%) had anaemia.

Table 1: Comparison of socio- demographic factors associated with anaemia

Factors	Number of cases(N=200)	Anaemia (N=50)	No anaemia (N=150)	P value
Socio – economic status				
Upper class- I	01(00.5%)	00 (0)	01 (100.0)	0.006
Upper middle class -II	40(20.0%)	08 (20.0%)	32 (80.0%)	
Lower middle class-III	55(27.5%)	06 (10.9%)	49 (89.1%)	
Upper lower class- IV	78(39.0%)	24 (30.8%)	54 (69.2%)	
Lower class - V	26(13.0%)	12 (46.2%)	14 (53.8%)	
Type of family				
Nuclear	130(65.0%)	19 (14.6%)	111 (85.4%)	0.000
Joint	47(23.5%)	22 (46.8%)	25 (53.2%)	
Extended joint	23(11.5%)	09 (39.1%)	14 (60.9%)	

In our study we noted that according to Socio-economic status, about 78 (39%) girls belonged to class IV next being 55 (27.5%) belonging to class III, combining class III- IV was only 41.7% were anaemia, only class V had 12 i.e., 46.2%, significant P value is found, which indicated high prevalence of anaemia is more among Lower class followed by upper lower class. Majority of the girls, 130 (65%) belonged to nuclear families, 47 (23.5%) to joint families and 23 (11.5%) to extended joint families, and P value was not found statistically significant.

Table 2: Association of anaemia with parents' education status

Parameter	Total cases N=200	Father education			Total cases N=200	Mother education		
		Anaemia(N=50)	No anaemia(N=150)	P value		Anaemia(N=50)	No anaemia(N=150)	P value
Illiterate	38(19%)	19(50%)	19(50%)	0.00	86(43%)	38(44.2%)	48(55.8%)	0.00

Primary school	26(13%)	15(57.7%)	11(42.3%)	0.00	31(15.5%)	08(25.8%)	23(74.2%)	0.00
Middle school	31(15.5%)	06(19.4%)	25(80.6%)	0.00	26(13%)	03(11.5%)	23(88.5%)	0.00
High school	41(20.5%)	08(19.5%)	33(80.5%)	0.00	21(10.5%)	00(00%)	21(100%)	0.00
Higher secondary	22(11%)	01(04.5%)	21(95.5%)	0.00	26(13%)	01(03.8%)	25(96.2%)	0.00
Graduate	37(18.5%)	01(02.7%)	36(97.3%)	0.00	7(3.5%)	00(00%)	07(100%)	0.00
Postgraduate	5(2.5%)	00	05(100)	0.00	3(1.5%)	00(00%)	03(100%)	0.00

Regarding father's education, about 41 (20.5%) were educated till high school, 37 (18.5%) were graduates, 31 (15.5%) completed middle school, 26 (13%) primary school, 22 (11%) higher secondary school or diploma. Only 5 (2.5%) were postgraduates and 38 (19%) were illiterates, and P value was not found statistically significant. Regarding mother's education, about 31 (15.5%) were educated till primary school, 26 (13%) each educated till middle school, 26 (13%) higher secondary school or diploma, 21 (10.5%) till high school, 7 (3.5%) were graduates, only 3 (1.5%) were postgraduates and 86 (43%) were illiterates, and P value was not found statistically significant.

Table 3: Distribution of cases according to BMI

Parameter sBMI	Total no of cases N=200	No anaemia N=150	Anaemia N=50	Severity of anaemia			P value
				Mild anaemia N=8(16%)	Moderate anaemia N=37(74%)	Severe anaemia N=5(10%)	
Underweight	125(62.5%)	87(69.6%)	38(30.4%)	7(18.5%)	27(71%)	4(10.5%)	0.004
Normal	70(35%)	61(87.1%)	9(12.9%)	1(11.1%)	7(77.8%)	1(11.1%)	0.230
Overweight	5(2.5%)	2(40%)	3(60%)	-	3(100%)	-	0.12

In our study we found that out of 200 cases, 125(62.5%) cases were underweight of which 87 (69.6%) had no anaemia whereas 38(30.4%) had anaemia of which majority of cases were of moderate anaemia 27(71%) followed by mild 7(18.5%), severe 4(10.5%). Among 200 cases, 70 (35%) were of normal BMI of which 61(87.1%) had no anaemia whereas only 9(12.9%) had anaemia of which majority being moderate anaemia 7(77.8%) followed by mild and severe anaemia 1(11.1%) and 1(11.1%) respectively. Among 5 overweight cases 2 cases had no anaemia and 3 had anaemia of which all cases were of moderate anaemia(100%). According to analysis of data, when compared with normal and Overweight BMI combined cases by the underweight BMI, p value was found statically significant (0.004), which indicate that low BMI is a risk factor for anaemia.

Table 4: Comparison of other Factors associated with anaemia.

Factors		Number (N=200)(%)	Anaemia (N=50)(%)	No anaemia (N=150)(%)	'P' value
Using footwear	Yes	180(90.0%)	39 (21.7%)	141 (78.3%)	0.001
	No	20(10.0%)	11 (55.0%)	09 (45.0%)	
Washing hands before food	Yes	173(86.5%)	30 (17.3%)	143 (82.7%)	0.000
	No	27(13.5%)	20 (74.1%)	07 (25.9%)	
Jaggery consumption	Yes	165(82.5%)	28 (17.0%)	137 (83.0%)	0.000
	No	35(17.5%)	22 (62.9%)	13 (37.1%)	
Washing hands after toileting	Yes	162(81.0%)	22 (13.6%)	140 (86.4%)	0.000
	No	38(19.0%)	28 (73.7%)	10 (26.3%)	
Recurrent infections	Yes	29(14.5%)	20 (69.0%)	09 (31.0%)	0.000
	No	171(85.5%)	30 (17.5%)	141 (82.5%)	
Passing worms in stool	Yes	22 (11.0%)	16 (72.7%)	06 (27.3%)	0.000
	No	178(89.0%)	34 (19.1%)	144 (80.9%)	
Bleeding incidences	Yes	09(04.5%)	09(100.0%)	00 (00%)	0.000
	No	191(95.5%)	41 (21.5%)	150 (78.5%)	

When we analyzed other associated factors to anaemia, we found that students not wearing footwear, 11 (55%) were anemic girls compared to 9 (45%) non –anemic girls ($p = 0.001$). Even through out of 27 students, not washing hand, majority of that 20(74.1%) were anemic only 7 (25.9%) were non anemic girls ($p = 0.000$), may be because of small number. Similarly, for Jaggery consumption out of 35(17.5%) students not consuming jaggery majority that is 22(62.9%) students were anemic, only 13(37.1%) nonanemic, p value is not statistically significant. Out of 200, 38(19%) students were not washing hands after toileting in which 28 (73.7 %) anemic girls compared to 10 (26.3%) in non-anemic girls, p value is not statistically significant. 162 students washing hands after toileting, majority had no anaemia i.e., 140 (86.4%), were has 22(13.6%) had anaemia. History of recurrent infections was present in 20 (69%) in anemic girls compared to 9 (31%) non anemic girls, p value is not statistically significant. History of passing worms in stool, 16 (72.7%) in anemic girls compared to non-anemic girls, 6 (27.3%) p value is not statistically significant. Among 9 students with History of bleeding incidences (gum bleeding) all 9 (100%) were anemic.

Table 5: Correlation of Menstrual factors associated with anaemia

Factors	Number (N=200)(%)	Anaemia (N = 50) (%)	No anaemia (N=150) (%)	'P' value
Menstrual cycles- normal	152 (76%)	13 (08.6%)	139 (91.4%)	0.000
Abnormal	48(24%)	37 (77.1%)	11 (22.9%)	
No. of pads/day				0.000
1(fully soaked)	05(02.5%)	04 (80.0%)	01 (20.0%)	
2(fully soaked)	85(42.5%)	15 (17.6%)	70 (82.4%)	
3(fully soaked)	84(42%)	12 (14.3%)	72 (85.7%)	
4(fully soaked)	12(06.0%)	09 (75.0%)	03 (25.0%)	
5(fully soaked)	14(07.0%)	10 (71.2%)	04 (28.8%)	
Menstrual abnormalities				0.04
Present	59(29.5%)	39 (66.1%)	20 (33.9)	
Absent	141(70.5%)	11 (07.8%)	130 (92.2)	

Age at menarche				
11-12	01(00.5%)	00 (00%)	01 (100.0%)	0.878
13-14	41(20.5%)	11 (26.8%)	30 (73.2%)	
15-16	104(52.0%)	27 (26.0%)	77 (74.0%)	
>16	54(27.0%)	12 (22.2%)	42 (77.8%)	

In our study among 200 cases, 152 (76%) cases had regular cycle of which 13 (8.6%) had anaemia (indicating other factors may be responsible for anaemia). Among 200 cases, 48 (24%) had irregular cycle of which majority i.e., 37 (77.1%) had anaemia, all though the number is more p value is not statically significant. Interestingly, among girls who used only 1 pad per day were 5(2.5%) cases, out of which 4(80%) cases were anemic, but this was not (P value) statically significant, on further analysis of these 4 anaemia cases has shown the correlation of other factors with anaemia.

Table 6: Comparison of means of laboratory parameters

Parameter	Anaemia (N = 50) No. (%)	No anaemia (N= 150) No. (%)	'P' value
Haemoglobin (gm%)	9.51±1.484	13.24±0.712	0.000
MCV (fl)	70.19±5.694	89.12±4.075	0.000
MCH (pg)	17.79±3.42	32.74±2.20	0.000
MCHC	24.11±3.08	34.68±1.84	0.000

The mean value of hemoglobin levels in anemic cases was 9.51±1.484 and in non-anemic girls was 13.24±0.712 comparatively the value was less.

Table 7: Type of anaemia according to peripheral smear

Parameters	Total no of cases	Mild anaemia	Moderate anaemia	Severe anaemia
N value	50 cases	8 cases	37 cases	5 cases
Microcytic hypochromic	30(60%)	3(10%)	22(73.3%)	5(6.7%)
Normocytic normochromic	15(30%)	3(20%)	12(80%)	-
Macrocytic normochromic	5(10%)	2(40%)	3(60%)	-

Majority of cases had microcytic hypochromic anaemia that is 30 cases (60%) in which moderate anaemia were 22(73.3%) followed by, severe anaemia 5(16.7%) and mild anaemia 3 (10%). Normocytic normochromic anaemia was found in 15 cases (30%), in which 12(80%) were moderate anaemia followed by mild anaemia 3(20%), macrocytic normochromic anaemia was found in a smaller number of cases i.e., in 5 cases (10%).

DISCUSSION

The prevalence of anaemia in the present study was 25%, which is similar to the prevalence in developing countries (27%).⁹ Study conducted by Chandrakumari, et al.^[17] found a prevalence of 48.63% among adolescent girls in a rural area of Tamil Nadu. Patil N et al.^[18] found that the overall prevalence of anaemia was 44.4%. Melwani V et al.^[19] reported that anaemia was present in 57.65% girls amongst adolescent girls residing in slum of Bhopal city. Ayushi Agrawal et, al.^[20] reported a prevalence of 45.7% among adolescent girls in a coastal district of India. A study conducted on nutritional anaemia status in adolescent girls in rural schools of Raipur and found a 36.4% prevalence of anaemia.^[21] The prevalence of

anaemia was 36.59% in a study conducted by Gurpreet Singh, Kuldip Singh in urban college going girl students, whereas study by Bhagyalaxmi Sidenur, Gowri Shankar, anaemia was present in 89% of adolescent girls.^[22,23] Another study by Arya AK, Lal P, Kumar N, Barman S.^[24] found a prevalence of 78.5% among adolescent girls, while the prevalence was 69.2% in a study by Srivastava A, Kumar R, Sharma M,^[25] 54.11% in Assam (Akshay Chandra Deka et. Al),^[26] 21% in a study by P.M. Siva et. Al,^[27] 15.5% in a study by Melkam Tesfaye et. al,^[6] among adolescent girls in Ethiopia, 63.48% in Raipur (Abhaya Joglekar et. Al).^[28] In a study by Shilpa S. Biradar et al,^[29] it was found that 41.1 % were suffering from various degrees of anaemia and that 59.9 % were non-anemic. This indicated that it was a public health problem of high magnitude as per the WHO guidelines.

Mild anaemia was present in 8 (16%) girls, moderate anaemia in 37 (74%) girls and severe anaemia (Hb < 7 gram percent) in 5 (10%) girls, similar to the present study, in a study by Melwani V et al,^[19] also moderate anaemia was seen most commonly, 44.9% while 34.7% had mild and 20.4% had severe anaemia. In the present study, about 116(58%) were between 17-19 yrs and 84(42%) were between 13-16 yrs, unlike the study by Chandrakumari, et al.^[17] in which majority (73.73%) were from the early adolescent age group (10–14 years) and 26.27% were from the late adolescent age group (15–19 years). In a study by Patil N et al. 18 56.5% were mid adolescent and 151 (43.5%) early adolescence.

In the present study, prevalence was significantly more in girls belonging to lower socio – economic class. This is in consistence with previous studies.^[17,24]

Regarding association of anaemia prevalence with father's education, significantly higher prevalence was seen in girls of illiterate fathers, 19 (50%) and primary school education, 15 (57.7%). However, Arya AK et, al,^[20] found no statistically significant association between prevalence of anaemia and father's education. Consistent to our study, Srivastava A et al,^[25] found anaemia to be significantly associated with lower levels of parental education. Melkam Tesfaye et. al,^[6] also identified father's illiteracy as a determinant of anaemia among school adolescents.

Abnormal menstrual cycles were significantly higher among anemic girls and the number of pads used during menstrual cycles were significantly more in anemic girls compared to non-anemic girls. Certain factors related to anaemia were significantly more common in anemic girls. A study by Arya AK, Lal P, Kumar N, Barman S.^[24] also showed that among nutritional correlates, of anaemia, it was more commonly found in the girls who were vegetarian, who had positive history of worm infestation, and who had no iron supplementation and they showed statistically significant association. Melkam Tesfaye et. al,^[6] also supported that being female, household size >5, father's illiteracy, intestinal parasitic infection and low body mass index were identified as determinants of anaemia among school adolescents.

In the present study mean BMI (Body mass index) was significantly lower in anemic girls that is underweight BMI was found in 38(30.4%) compared to non anemic girls (t = 2.929, p = 0.004). Similarly, Tesfaye et al.⁶ also showed that Undernourished school adolescents who had a low BMI, 18.5 kg/m² were 2.54 times more likely to have anaemia as compared to those who have a BMI 18.5 kg/m².

Mean haemoglobin level in the present study was 12.31±1.881gram percent. Minimum haemoglobin level was 5.4 gram percent and maximum was 16.1 gram percent. Mean haemoglobin level of anemic girls was 9.51±1.484 gram percent, while mean haemoglobin level of non-anemic girls was 13.24±0.712 gram percent similar to the study by Abhaya Joglekar et. Al.^[28]

The present study was carried in government school of Raichur district; it might not be generalized to all adolescence population whether school going or not going. All adolescence population should be studied for exploring the magnitude of problem and to act according.

CONCLUSION

25% prevalence is noted in our study which is of moderate magnitude. Moderate anaemia was most found in our study that is 74%. Most commonly microcytic hypochromic anaemia 60% was noted followed by normocytic normochromic 30%, macrocytic normochromic 10%.

High risk factors were students belonging to low socio – economic groups, with Low BMI, not using footwear, and present of menstrual abnormalities like polymenorrhoea (significant P vaule)

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