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Research Article

A STUDY OF ANAEMIA AMONG ADOLESCENT GIRLS IN TIRUPATI RURAL AND URBAN AREAS THROUGH GOVERNMENT HIGH SCHOOLS

T. Jaya Chandra Naidu¹, Sekar M N², Sasi kumar B², Hemavathi³, Shankar Reddy Dudala⁴, Manohar B¹, K Siva Ramudu²

¹Professor in Department of Paediatrics, Sri Venkateswara Medical College, Tirupati, A.P., India

²Assistant Professor, Department of Paediatrics, Sri Venkateswara Medical College, Tirupati, A.P., India

³Post graduate, Department of Paediatrics, Sri Venkateswara Medical College, Tirupati, A.P., India

⁴Assistant Professor, Department of Community Medicine, S.V. Medical College, Tirupati, A.P., India

*Corresponding Author T. Jaya Chandra Naidu

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ABSTRACT

Our study was planned to assess the magnitude of problem of anaemia in adolescent girls in rural and urban areas of Tirupati and its association with various factors. The main objective was to study about the prevalence, various risk factors and anthropometric data in relation to anemia in adolescent girls who attended Government high schools in Tirupati rural and urban areas. A school based cross-sectional study was carried out during the period of October 2013 to October 2014. 314 adolescent girls from rural Government high schools and 314 adolescent girls from urban Government high schools a total of 628 school going adolescent girls were selected. The SPSS software was used for the analysis of the data. Chi-square test was used for the statistical analysis. The present study revealed anaemia is a major health problem among the adolescent girls in both rural and urban areas in the present study area. Majority of the adolescent girls were within mild to moderate anaemia in both rural and urban groups. There is no significant difference in the severity of anaemia between early adolescence and late adolescence in both rural and urban groups. The prevalence of severity of anaemia was more among girls who belong to lower socio economic status. The prevalence of severity of anaemia was high among post menarchial girls in both rural and urban groups. The prevalence of severity of anaemia was high among post menarchial girls with menstrual problems in rural group.

Key words: Adolescent girls, Anaemia, Urban, Rural.

INTRODUCTION

The word “adolescence” is derived from the Latin word, ‘adolescere’; meaning “to grow, to mature”¹. Adolescence has been defined by World Health Organization as period of life spanning the ages between 10 to 19 year² for both the sexes (married and unmarried). There are about 1.2 billion adolescents in the world, which is equal to 1/5th of the world’s population and their numbers are increasing. Out of these, 5 million adolescents are living in developing countries. India’s population has reached the 1 billion mark, out of which 21% are adolescents; out of these nearly 113 million adolescents are girls³. Reduced haemoglobin or reduced rbc count can be called as anaemia which is a global public health problem⁴. Anaemia is widely prevalent in India and affects both sexes and all age groups. Among adolescents girls constitute a vulnerable group and in a family with limited resources female child is more likely to be neglected⁵. Girl’s iron requirement increases dramatically during adolescence as a result of the expansion of the lean body mass, increase in total blood volume and the onset of menstruation⁶. Demographic factors, socio economic factors also play an important role on the health of adolescent girl. All these factors make adolescent girls more susceptible to anaemia, which has lasting negative consequences for them and for survival, growth and development of their children later in life. So this study was planned to assess the magnitude of problem of anaemia in adolescent girls who attended the Government high schools in rural and urban areas of Tirupati and its association

with various factors. The main objective was to study about the prevalence, various risk factors, socio demographic factors and anthropometric data in relation to anemia in adolescent girls who attended the Government high schools in Tirupati rural and urban areas.

MATERIALS AND METHODS

Among School going adolescent girls aged 10-15 years from different Government high schools located in rural and urban areas of Tirupati, a total of 628 school going adolescent girls were selected. The estimated prevalence of anaemia among adolescent girls as per National Family Health Survey-3 data is 56%. Considering this, by using formula $n = \frac{pq}{d^2}$ sample size for our study was estimated, with an allowable error of 10%, the estimated sample size was 314. So, 314 adolescent girls from rural Government high schools and 314 adolescent girls from urban Government high schools were selected. The adolescent girls who are suffering from chronic illnesses, who are on prolonged drug usage, who are recently ill or hospitalized within the past 3 months and physically handicapped with anomalies were excluded from the study. After obtaining permission from Institutional Ethical Committee, district and municipal authorities, students and institutional heads, a school based cross-sectional study was carried out during the period of October 2013 to October 2014. Data was collected in the form of pre-designed pre-tested Proforma.

Data analysis: The SPSS software was used for the analysis of the data. Chi-square test was used for the statistical analysis. The differences were considered as significant at a p value of <0.05.

All girls were clinically examined for signs of anaemia. Anthropometric data collected as per standards. Body Mass Index is calculated by BMI = WEIGHT (kgs) / HEIGHT (.m2)

Nutritional status determined as per WHO growth charts based on BMI.

Haemoglobin Estimation

Due to feasibility and cost effectiveness haemoglobin estimation was done by Sahli's haemoglobin meter by Capillary blood was drawn by finger prick method According to the WHO criteria, the cut off level of the haemoglobin concentration in blood for the diagnosis of anaemia is less than 11gm/dl for pregnant women and for children who are aged between 6 months and 6 years, less than 12 gm/dl for non- pregnant women and children who are aged 6-14years old^{7,8}.

Adolescent girls were classified as anemic if hemoglobin is less than 12 gm/dl⁹

List of variables

Age was recorded to the nearest completed years and was determined from the register of the school.

The adolescence period was classified as early and late adolescence.

Classification of the adolescents¹¹

Early adolescence: 10-13 yrs, Late adolescence: 14-16 yrs

OBSERVATIONS AND RESULTS

The study population comprised of 314 adolescent girl students from Government high schools from rural area and 314 girls from urban area of Tirupathi.

Table 1: Anaemia with respect to the Age group

Anemia	Rural			Urban		Total
	Early adolescence (10 to 13years)	Middle adolescence (14 to16 years)	Total	Early adolescence (10 to 13years)	Middle adolescence (14 to16 years)	
Mild	19(73.07%)	7(26.92%)	26 (100%)	11 (91.6%)	1 (8.3%)	12 (100%)
Moderate	176(63.9%)	103(36.91%)	279 (100%)	228 (78%)	64 (21.9%)	292 (100%)
Severe	6(66.66%)	3(33.33%)	9 (100%)	8 (80%)	2 (20%)	10 (100%)
Total	201(64.01%)	113(35.99%)	314 (100%)	247(78.66%)	67(32.33%)	314(100%)

Chi-square value 1.06; degree of freedom 2; p value = 0.589 Chi-square value 1.278; degree of freedom 2; p value = 0.528

Out of 314 participants in rural 9 members with severe anaemia, 6 members (66.6%) in early adolescence, 3 members (33.3%) in middle adolescence. Out of 279 members with moderate anaemia, 176 members (63.1%) in early adolescence, 103 members (36.91%) in middle adolescence. Out of 26 members with mild anaemia, 19 members (73.07%) in early adolescence, 7 members (26.92%) in middle adolescence. Out of 314 participants in urban

10 members with severe anaemia, 8 members (80%) in early adolescence, 2 members (20%) in middle adolescence. Out of 292 members with moderate anaemia, 228 members (78.08%) in early adolescence, 64 members (21.92%) in middle adolescence. Out of 12 members with mild anaemia, 11 members (91.66%) in early adolescence, 1 member (8.33%) in middle adolescence.

Table 2: Anaemia with respect to the Status of menarche

Anemia	Rural			Urban		Total
	Attained menarche	Not attained menarche	Total	Attained menarche	Not attained menarche	
Mild	10 (38%)	16 (61%)	26 (8.2%)	5 (41%)	7 (58%)	12 (3.8%)
Moderate	150 (53%)	129 (46%)	279 (88%)	106 (36%)	186 (63%)	292 (92%)
Severe	5 (55.5%)	4 (44.4%)	9 (2.8%)	3 (30%)	7 (70%)	10 (3.1%)
Total	165 (52.55%)	149 (47.45%)	314 (100%)	114(36.3%)	200(63.69%)	314(100%)

Chi-square value 2.267; degree of freedom 2; p value = 0.322 Chi-square value 0.321; degree of freedom 2; p value = 0.852

In rural group premenarcheal girls are 149(47.45%), postmenarcheal girls were 165(52.55%), most of the girls in both groups belongs to mild to moderate anaemia.

Where as in urban group postmenarcheal girls are 114(36.31%), premenarcheal girls are 200(63.69%), most of the girls in both groups belongs to mild to moderate anaemia.

Table 3: Anaemia with respect to the Post menarcheal girls with menstrual problems

Anemia	Rural			Urban		
	No menstrual problems	Menstrual problems present	Total	No menstrual problems	Menstrual problems present	Total
Mild	10 (100%)	0	10 (100%)	3 (60%)	2 (40%)	5(4.39%)
Moderate	123 (82%)	27 (18%)	150(90%)	86 (81.1%)	20 (18.8%)	106(92.98%)
Severe	0	5 (100%)	5 (100%)	2 (66.6%)	1 (33.3%)	3(2.63%)
Total	133(80.60%)	32(19.39%)	165(100%)	91(79.82%)	23(20.18%)	114(100%)

Chi-square value 23.374; degree of freedom 2; p value = 0.001 * Chi-square value 1.655; degree of freedom 2; p value = 0.437

Out of 165 members of rural group post menarcheal girls, 150 members (90%) had moderate anaemia in rural group. 133 members (80.60%) of the girls had regular menstrual cycles, 32 members (19.39%) girls had menstrual problems. This is statistically significant (p value <0.05).

In Urban group of 114 members with post menarcheal status, 5(4.39%) members had mild anaemia, 106(92.98%) had moderate anaemia, severe anaemia found in 3 members (2.63%). Out of 114 members, 91 members (79.82%) had regular menstrual cycles with no menstrual problems, 23(20.18%) had menstrual problems statistically not significant.

Table 4: Anaemia with respect to height for age in urban adolescent girls

Age (in Years)	Mild			Moderate			Severe			Total
	-2SD to +2SD	<-2SD	>+2SD	-2SD to +2SD	<-2SD	>+2SD	-2SD to +2SD	<-2SD	>+2SD	
10	0	0	0	4	0	0	1	0	0	5
11	0	1	0	23	6	0	0	0	0	30
12	5	4	0	42	19	0	2	0	0	72
13	9	0	0	55	27	0	1	2	0	94
14	4	2	0	29	17	0	1	0	0	53
15	1	0	0	41	16	0	0	2	0	60
N=96		7(7.29)			85(88)			4(4.7%)		96(30.57%)
								Total Sample		314

In present study in adolescent girls in rural group out of 314, 6 members (30.57%) were with height for age less than 2 SD, out of this 3 members (4.17%) had severe anaemia, 53 members (88.54%) had moderate anaemia, 3 members (7.29%) had mild anaemia (p value not measured).

Table 5: Anaemia with respect to height for age in urban adolescent girls

Age	Mild			Moderate			Severe			Total
	-2SD to +2SD	<-2SD	>+2SD	-2SD to +2SD	<-2SD	>+2SD	-2SD to +2SD	<-2SD	>+2SD	
10	2	0	0	17	0	4	2	0	0	25
11	1	1	0	63	10	0	2	1	0	78
12	3	1	0	57	15	0	1	2	0	79
13	2	1	0	47	15	0	0	0	0	65
14	0	0	0	19	4	0	1	0	0	24
15	1	0	0	32	9	0	1	0	0	43
N=59		3 (5.08%)			53 (89.83%)			3 (5.08%)		
								Total Sample		314

In urban group out of 314, 9 members (18.79%) were with height for age less than 2 SD, out of this 3 members (5.08%) had severe anaemia, 53 members (89.83%) had moderate anaemia, 3 members (5.08%) had mild anaemia (p value not measured).

Table 6: Average Anthropometry and hemoglobin in rural and urban group

Average	Mild anaemia		Moderate anaemia		Severe anaemia	
	Rural	Urban	Rural	urban	Rural	Urban
Hemoglobin	10.21	10.08	8.51	8.47	6.11	6.24
BMI	16.9	19.1	17.59	19.04	18.62	19.66
Height	144.81	148.5	145.64	146.98	143.67	143.7
Weight	35.55	42.29	37.46	41.22	38.39	41.11
Total (n=628)	26 (8.3%)	12 (3.82%)	279 (88.9%)	292 (92.99%)	9 (2.9%)	10 (3.18%)

In Rural students Average weight, height, BMI in mild anaemia group respectively 35.55; 144.81; 16.9. Average weight, height, BMI in moderate anaemia group respectively 37.46; 145.64; 17.59. Average weight, height, BMI in severe

anaemia group respectively 38.39; 143.67; 18.62. Average weight, height, BMI in mild anaemia group respectively 42.29; 148.5; 19.1. Average weight, height, BMI in moderate anaemia

group respectively 41.22; 146.98; 19.04. Average weight, height, BMI in severe anaemia group respectively 41.11; 143.7; 19.66.

Table 7: Socio demographic factors anaemia in Rural and Urban groups:

S. No.	Variable	Rural			urban		
		Chi square value	Degree of freedom	p Value	Chi square value	Degree of freedom	p Value
1	Age	7.659	10	0.662	7.659	10	0.662
2	Stage of adolescence	1.278	2	0.528	1.278	2	0.528
3	Birth order	3.14	4	0.535	3.14	4	0.535
4	Type of family	1.189	2	0.552	1.189	2	0.552
5	Socio-economic status	1.439	2	0.487	1.439	2	0.487
6	Menstrual status	0.321	2	0.852	0.321	2	0.852
7	Worm infestation	5.293	2	0.071	5.293	2	0.071
8	Nutritional status	2.371	4	0.668	2.371	4	0.668
9	Father's educational status	11.371	6	0.078	11.371	6	0.078
10	Mother's educational status	4.411	6	0.621	4.411	6	0.621

DISCUSSION

Present study was conducted in adolescent girls of age 10 to 15 years studying in Government high schools of Tirupathi rural and urban areas. Total number of participants in the present study was 628, among 314 children from rural and 314 children from urban areas. All the children included in the study were anaemic according to WHO classification of anaemia (<12 gm/dl) with a prevalence of 100%.

Anaemia with respect to the severity

The study population comprised of 314 adolescent girl students from Government high schools from rural area of Tirupathi. Out of 314 participants included in this study 64% were in early adolescence that is 10 to 13 years age group, 36% in middle adolescence (14 to 16 years) that is 14 to 15 years in present study All are found anaemic. Out of 314 , severe anaemia found in 9 members with prevalence 2.9%, moderate anaemia found in 279 members with prevalence 88.9%, mild anaemia found in 26 members with prevalence 8.3%. Out of 314 urban adolescent girls, severe anaemia was found in 10 members with prevalence 3.18% moderate anaemia was found in 292 members with prevalence 92.99%. Mild anaemia was found in 2 members with prevalence 3.82%. Among the rural adolescent girls out of 314 girls 26 had mild anaemia, 279 girls had moderate anaemia and 9 girls had severe anaemia. Majority of girls (88.9%) had haemoglobin in the range of 7-10gm/dl (moderate anaemia), 8.3% had mild anaemia and 2.9% had severe anaemia. Among the urban adolescent girls out of 314 adolescent girls 12 girls (3.8%) had mild anaemia. 292(92.99%) girls had moderate anaemia and 10 girls (3.18%) had severe anaemia. In both the urban and rural group majority of girls had moderate anaemia. In our study prevalence of anaemia is 100% with severe anaemia 2.9% which is closely correlated with reports by Bulliyy³ et al, found that 96.5% prevalence. Meenal Vinay Kulkarni⁴ et al., from urban slums, Nagpur (90.1%) girls were found to be anaemic. Majority of the girls (88.6%) were having mild to moderate anaemia and only 1.5% girl were severely anaemic in contrast with Mehta⁵ et al. And Kapoor G¹⁸ et al had reported a comparatively lower prevalence of 63.8% and 56% respectively.

Anaemia with respect to the age

In general, prevalence of anaemia increases with increasing age because of various factors like attainment of menarche, growth spurt but it was not seen in present study prevalence is

maximum in age category 11-13 years in both rural and urban groups than in aged 14-15 years as was study done by Binay Kumar Shah²⁷ et al., In present study out of 9 members with severe anaemia, 6 members in early adolescence with prevalence 66.66%, 3 members in middle adolescence with prevalence 33.33%. Out of 279 with moderate anaemia, 176 members, with moderate anaemia in early adolescence that is with prevalence 63.1%, 103 members in middle adolescence with prevalence 36.91%. Out of 26 with mild anaemia, 19 members in early adolescence with prevalence 73.07%, 7 members in middle adolescence with prevalence 26.92%. Where as in urban group 78.66% were in early adolescence, 32.33% in middle adolescence. 10 members with severe anaemia, 8 members in early adolescence with prevalence 80%, 2 members in middle adolescents with prevalence 20%. Out of 292 members with moderate anaemia, 228 members in early adolescence with prevalence 78.08%, 64 members in middle adolescence with prevalence 21.92%. Out of 12 members with mild anaemia, 11 members with early adolescence with prevalence 91.66%, 1 member in middle adolescence (8.33%). In present study it is found that anaemia was more prevalent in girls who were less than 13 years of age as compared to girls who were more than 13 years in both rural and urban groups. There was a declining trend of anaemia with increase in the age of the girls. But it is not statistically significant. A study done by Meenal Vinay Kulkarni⁵ et al., they found that prevalence of anaemia was slightly higher below 14 years i.e. 92.2% as was present study. In a study conducted by Shilpa S. Biradhar⁸ et al., at Belgaum and a study conducted by Swati Dixit²⁰ et al., In the present study, age, stage of adolescence was not statistically significant in urban group and in rural group related with anaemia. As was study by Siddaram S M⁷ et al., and Choudhary SM²¹ et al., also reported that age is not a significant correlate of anaemia.

Anaemia with respect to the status of menarcheal

In present study in adolescent girls in rural group out of 314, post menarcheal girls are 165(52.55%), pre menarcheal girls are 149(47.45%), most of the girls in both groups belongs to mild to moderate anaemia. Out of 165 members of post menarcheal girls 133(80.60%) of the girls had regular menstrual cycles with no menstrual problems, 32(19.39%) girls had menstrual problems. There was no significant difference between the average levels of Haemoglobin of pre menarcheal girls (8.59 gm/dl) and girls with regular menstrual cycle. But there was significant difference between the average level of Haemoglobin of pre menarcheal girls (8.59 gm/dl) and girls with regular menstrual

cycle (8.57 gm/dl) and girls with menstrual problems i.e. 7.62 gm/dl, this is statistically significant. In contrast with Studies by Choudhary²⁰ S M et al., Kaur S¹⁴ et al., In a study conducted by Siddaram S⁶ M et al., in Hassan, Karnataka prevalence of anaemia was higher in post menarcheal girls (71%) compared to premenarcheal (29%). J Rajaratnam²¹ et al Rekha Dutt⁸ et al., had documented that the prevalence of anaemia was 45.2% in postmenarcheal girls and 40.7% in premenarcheal²³ girls, Studies conducted by Kaur¹⁴ et al., and Goel²² et al., also show that anaemia was significantly higher in group of girls that had excessive menstrual bleeding. In a study conducted by Premalatha T¹² et al., showed higher Haemoglobin average in premenarcheal girls. Rajaratnam²¹ et al., in 2010 which explicated that the menstrual bleeding was not an associating factor for anaemia.

Averages of anthropometry in rural and urban group

In present study in rural group out of 314, 6 members (30.57%) were with height for age, less than 2 SD, out of this 3 members (4.17%) in severe anaemia group, 53 members (88.54%) in moderate anaemia group, 3 members (7.29%) in mild anaemia group (p value not measured). In urban group 314, 9 members (18.79%) were with height for age less than 2 SD, out of this 3 members (5.08%) in severe anaemia group, 53 members (89.83%) in moderate anaemia group, 3 members (5.08%) in mild anaemia group (p value not measured) similar with Siddharam S M⁷ et al., found that no association between anthropometry and anaemia. Binay kumar shah²³ Premalatha T¹³ et.al. found that no association between anthropometry and anaemia as was present study. Rita Singh²⁴ et al., A study conducted by A Verma¹⁰ et.al., it is observed that high prevalence of anaemia in those having a BMI of 18.5 gm/dl or lower (82.4%) as compared to those with BMI more than 18.5 (79.7%). The association of anaemia and BMI also well established in a study by Choudary S²⁰ et al., The average weight is significantly less in urban group with severe anaemia, but no difference seen in rural group.

CONCLUSION

In conclusion, the present study revealed anaemia is a major health problem among the adolescent girls in both rural and urban areas in the present study area. Majority of the adolescent girls were within mild to moderate anaemia in both rural and urban groups. There is no significant difference in the severity of anaemia between early adolescence and late adolescence in both rural and urban groups. The prevalence of severity of anaemia was more among girls who belong to lower socio economic status. The prevalence of severity of anaemia was high among postmenarcheal girls in both rural and urban groups. The prevalence of severity of anaemia was high among postmenarcheal girls with menstrual problems in rural group. It was observed that socio demographic factors like nuclear families and low parental education were significant in both rural and urban groups. A statistically significant association was found between socio economic status and post menarcheal girls with menstrual problems in rural group.

Limitations of the study

Small Sample size.

Variability and accuracy of Sahli's method in estimation of haemoglobin concentration gm/dl in blood in diagnosing anaemia has sensitivity of 83.7% & 90% and specificity of 63.25 & 60.2% in capillary and venous blood respectively⁵³. As majority (>90%) girls were from low socio economic status with nuclear families, illiterate parents and mixed diet

pattern. So, anaemia with respect to these factors was not significantly comparable.

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