Original Research Article

Prevalence and factors influencing anaemia among urban adolescent females, a cross sectional study

J. S. Poyyamozhi[1], Rajan Rushender[2]*, G. Murali Mohan Reddy[3]

Department of Community Medicine, [1]Dhanalakshmi Srinivasan Medical College, Sirivachur, Perambalur, [2]SRM Medical College, Kattankulathur, Kanchipuram, [3]Chettinad Hospital and Research Institute, Tamil Nadu, India

*Correspondence:
Dr. Rajan Rushender,
E-mail: chiraru@hotmail.com

ABSTRACT

Background: Despite many organized efforts by the government, adolescent anemia remains to be a major public health problem in India. The prevalence of anemia and factors influencing it in urban adolescent females is a relatively less studied aspect. Hence the current study is conducted with an objective of assessing the prevalence and factors influencing anemia among adolescent school girls living in an urban locality.
Methods: The current study was a community-based cross sectional study conducted in the selected schools and colleges of Permabalur town, south India, in the field practice area of Dhanalakshmi Srinivasan Medical College and Hospital between June to December 2017. Total 373 adolescent girls selected by multistage simple random sampling were included in the study. The hemoglobin was assessed by cyanmethemoglobin method.
Results: The prevalence of anaemia among urban adolescent girls was 41.1% (95% CI 0.36-0.46). The proportion of mild and moderate anaemia was 37% and 4.10% respectively and none had severe anaemia. Compared to upper middle class, the odds of anemia were 14.16 times more in the lower class (95% CI 4.54-44.12, p<0.001). Compared to scanty/normal bleeding, the odds of anemia were 2.943 (95% CI 1.4-3.87 p<0.05) more in girls with heavy bleeding. Age, upper lower or lower middle socio-economic strata, religion, type of family and menstrual irregularity did not have any statistically significant association with anemia.
Conclusions: Anemia is highly prevalent among adolescent girls and there is a need to intensify efforts all levels to reduce the prevalence of anemia.

Keywords: Anemia, Adolescent girls, Urban

INTRODUCTION

Adolescence age group bridging childhood and adult life, marks the transition in social role with increasing potential to shape the country's economic prospects and bring about change within the community. Adolescents to include persons aged 10-19 years.[1]

There are about 1.8 billion adolescents globally today and 90% of the adolescent population is reported to be living in developing nations.[2] Even though adolescent age group is considered as relatively healthy period, increasing number of studies are proving that it is a great misconception. The adolescents are at risk of many diseases and nutritional disorders, especially anemia is a major adolescent morbidity.[3]

The prevalence of anemia is reported to be ranging between 30% to as high as 68.8% as reported by various community based studies across India.[4-9] This burden is comparatively similar and in some cases higher than prevalence reported from other developing countries.[10-14] The prevalence depends on the socio demographic

conditions, food intake patterns, cultural beliefs and is quite heterogeneous across the country.[15,16]

In spite of the number of interventions undertaken to combat anemia, its prevalence continues to be high in the adolescent population. In the light of the rapid sociodemographic transition in the country, many of the adolescents are living in urban areas. Even though there were many studies conducted in India on prevalence of anemia in adolescent age group, studies focusing on urban adolescent females are very few. Considering the fact that majority of the urban adolescents are enrolled for their education in the private sector, they are quite often left of the government run prevention and control programmes.[6]

There were very few community based studies, which have attempted to analyze the factors influencing anemia in this age group. The findings of these studies parents's education, standard of living, religion, age at menarche, urban or rural location, social class, BMI are the strong determinants of anemia. So studies determining the influencing factors of adolescent anemia in different socio demographic settings the country are need of the hour to design more effective interventions.

Considering the above scenario, understanding the burden and factors influencing anemia in this population group is vital in drawing the attention of clinicians and policy makers to this important public health problem.

Hence the current study was conducted with an objective of assessing the prevalence of anemia among urban adolescent school going girls and the factors influencing anemia among study population.

METHODS

Study design

The study was a cross sectional study, conducted among selected schools/colleges of Permabalur town, located in south Tamil Nadu.

Study population

Adolescent females between 16-19 years of age, who were studying in selected schools/colleges were included in the study

Study period

The data collection for the study was conducted between June 2017 to December 2017.

Sample size

Considering the prevalence of anemia to be detected as 30%, with an absolute precision of 5%, and95% level of confidence. The following formula was used to calculate the sample size.

$$N = \frac{Z^2 P(1-P)}{d^2}$$

Where N= required sample size

Z= Z statistic for the level of confidence (95%)- 1.96

P= prevalence (0.3)

d= level of precision (0.05)

Using the above calculation, the sample size required for the study would be 323 subjects. To account for non-participation, it was decided to include 360 subjects into the study at the time of planning. The final analysis has included 370 adolescent girls.

Selection of study subjects

A list of colleges in the field area was acquired from the department of secondary education, Tamil Nadu government. Three colleges were randomly selected from the list of the colleges. Necessary administrative approvals were sought from the concerned authorities.120 adolescent girls from each of the three colleges were selected randomly from each college, after acquiring the list of students from the college.

Study tools

A structured questionnaire to capture relevant socio demographic, food intake related and other factors was prepared. The questionnaire was validated by distributing it to five experts in the field. Pretesting of the questionnaire was done on 20 subjects, to assess the feasibility of administering the questionnaire and to further validate the tool.

Ethical consideration

Ethical approval of Institute's Human Ethics committee, was obtained for the study. Ascent of the selected participants and informed written consent from the parents or guardian was obtained, after thoroughly explaining the purpose of the study, risks and benefits involved. Appropriate health education was provided to the participants at the end of the study, and where necessary patients were advised to undergo further evaluation and proper medical management.

Study procedure

After explaining to the patient the purpose of the study and the procedure to subject. 2 ml of venous blood sample was collected under aseptic precautions in an EDTA container and transported in an icepack within 4 hours from the camp site. Haemoglobin estimation was done by cyanmethemoglobin method electronically. 12

samples were placed in one cassette. And approximately 60 samples were processed in one hour. The value of hemoglobin in the blood sample is given in g/dl.

Statistical analysis

Serum hemoglobin level was the primary outcome. Sociodemographic parameters, food intake pattern, menstrual parameters, anthropometry of the participants etc were considered as explanatory variables. Descriptive analysis of the parameters was done by using frequencies and percentages for categorical variables and means and standard deviations for quantitative variables. The association between the explanatory and outcome variables was assessed by univariate logistic regression analysis. Odds ratios and 95% CI and their p values were presented. The final model of factors influencing anemia was developed by variables with statistically significant association in univariate analysis into multivariate logistic regression analysis. IBM SPSS version 21 was used for statistical analysis.

RESULTS

Among the study population, 105 (28.4%) participants were aged 16 years, 101 (27.3%) were aged 17 years, 93 (25.01%) were aged 18 years, and 71 (19.2%) were aged 19 years. Among the study population, 11 (3.00%) participants were in lower class, 200 (54.1%) were in upper lower class, 114 (30.8%) were in lower middle class, and 45 (12.2%) were in upper middle class.

Table 1: Socio demographic parameters of study population (N=370).

Parameters	Frequency	Percentage (%)
Age in years		
16	105	28.4
17	101	27.3
18	93	25.1
19	71	19.2
Socio economic status		
Lower	11	3.0
upper lower	200	54.1
lower middle	114	30.8
upper middle	45	12.2
Type of family		
Nuclear	339	91.6
Joint	31	8.4
Religion		
Hindu	290	78.4
Muslim	34	9.2
Christian	46	12.4
Food habits		
Vegetarian	33	8.9
Mixed diet	337	91.1

Among the study population, 339 (91.6%) were living in nuclear family and 31 (8.4%) were living in joint family. Among the study population, 290 (78.4%) were Hindu, 34 (9.2%) were Muslim, 46 (12.4%) were Christian. Among the study population, 33 (8.9%) were vegetarian and 337 (91.1%) were mixed diet (Table 1).

Table 2: Menstrual history of study population.

Parameter	Frequency	Percentage (%)
Age at menarche		
11.00	31	8.4
12.00	66	17.8
13.00	137	37.0
14.00	87	23.5
15.00	49	13.2
Menstrual pattern		
Regular	296	80.0
Irregular	74	20.0
Severity of bleeding		
Scanty	53	14.3
Moderate	242	65.4
Heavy	75	20.3

Among the study population, 31 (8.4%) women were age at menarche in 11 years. 66 (17.8%) women were in 12 years, 137 (37%) women were in 13 years, 87 (23.5%) women were in 14 years, and 49 (13.2%) women were in 15 years. Among the study population, 296 (80%) women had regular menstrual, and 74 (20%) women had irregular menstrual. Among the study population, 53 (14.3%) had scanty, 242 (65.4%) had moderate bleeding, and 75 (20.3%) had heavy bleeding (Table 2).

Among the study population, 152 (41.1%) had anemia. (95% CI 0.36-0.46). The majority of the, 137 (37%) people had mild (9-12) anemia, and 15 (4.10%) had moderate (95% CI 0.024-0.065) anemia and none of the girls had severe anemia (Table 3).

The odds of anemia were 89 (95% CI 0.73-1.07) times increasing in every year, the association was statistically not significant (p>0.05). Compare to upper middle class, the odds of anemia were 14.167 times more in lower class (95% CI 4.54-44.12), the association was statistically significant (p<0.05). Compare to upper middle class, the odds of anemia in upper middle class was 1.838 times whereas the odds of anemia were 0.589 times in lower middle (95% CI 0.327 to 1.887). In all the cases the association was statistically not significant (p>0.05). Compared to nuclear family, the odds of anemia were 1.835 times more in joint family (95% CI 0.875-3.846), the association was statistically not significant (p>0.05). Compared to Christian, the odds of anemia in Hindu was 0.975 times (95% CI 0.518-1.834), whereas the odds of anemia were 1.122 times (95% CI 0.458-2.748), in Muslim. In all the cases the association was statistically not significant (P value >0.05). Compared to girls with regular menstrual cycle, the odds of anemia were 1.043 times in girls with irregular

menstrual cycle (95% CI 0.622-1.748), the association was statistically not significant (p>0.05). Compare to scanty, the odds of anemia in moderate bleeding group was 1.44 times more (p>0.05). Compare to scanty, the odds of anemia was 2.943 times more in heavy, the association was statistically significant (95% CI 1.44-3.87, p<0.05) (Table 4).

Table 3: prevalence of anemia in study population.

Parameters	Frequency	Percentage	95% CI of proportion	
			Lower	Upper
Anemia	152	41.1%	0.36	0.46
Severity of anemia				
Mild (9-12)	137	37.0%	0.322	0.421
Moderate (6-9)	15	4.10%	0.024	0.065
Severe (<6)	0	0.00	0.00	0.00

Table 4: Univariate logistic regression analysis of factors influencing anemia in study population.

Parameter	Odds ratio	95% CI		P value
		lower	Upper	
Age	0.89	0.73	1.07	0.228
Socio economic status (Baseline= Upper middle)				
Lower	14.167	4.548	44.129	<0.001
Upper lower	1.838	0.839	4.026	0.128
Lower middle	0.589	0.327	1.887	0.786
Type of family (Nuclear)				
Joint	1.835	0.875	3.846	0.108
Religion (Baseline= Christian)				
Hindu	0.975	0.518	1.834	0.937
Muslims	1.122	0.458	2.748	0.801
Age at menarche	1.042	0.866	1.253	0.665
Menstrual pattern (Baseline= Regular)				
Irregular	1.043	0.622	1.748	0.874
Severity of bleeding (Baseline= Scanty)				
Moderate	1.469	0.774	2.778	0.240
Heavy	2.943	1.44	3.87	0.004

DISCUSSION

The current study was conducted with an objective of assessing the prevalence of anemia among a group of urban adolescent girls and found that majority of the participants belonged to lower or lower middle socio-economic strata and were hailing from nuclear families. Majority of the study population were Hindus and were consumers of mixed diet. The age of menarche was ranging from 11 to 15 years and 20% had irregular menstruation, moderate and heavy bleeding was found in 65.4% and 20.3% of the study population.

The prevalence of anemia was 41.1%; 95% CI 0.36-0.46) among the study population. The proportion of mild and moderate anaemia was 37% and 4.10% respectively in study population. None of the study subjects had severe anaemia. Assefa et al have reported a prevalence of 37.6% in their study of adolescent girls, which was slightly lesser than current study.[10] Out of which, 18.1% and 19.6% had mild and moderate anaemia respectively, but in the current study major proportion of anemia was mild. In study by Chaudhary et al 4 35.1% of the adolescent girls had anemia. Desalegn et al have reported 43.7% of adolescent girls to anemic and the major contributor was iron deficiency anemia in 37.4% patients.[17]

In study by Panigrahi prevalence of anemia was 60.8%, of which 39.6, 20.0 and 1.2% women had mild, moderate and severe anemia, respectively.[7] Microcytic hypochromic picture was the most common type indicating iron deficiency status. Other common causes were folate/vitamin B12 deficiency. In study by Shah et al 68.8% of adolescent girls were found to be anemic.[8] Tupe et al in their study have assessed iron status of married adolescent girls from Indian urban slums.[13] The mean bioavailable iron intake was 0.76±0.3 mg/day, which is one-half of the basal iron requirement of adolescent girls. The prevalence of iron deficiency (serum ferritin <12 mg/l) was 25.1%, and anemia (hemoglobin <12 g/l) was seen in 46.4% of MAG.[13]

The factors, which have shown statistically significant association with anemia were lower socio-economic class and heavy menstrual bleeding. Compared to upper middle class, the odds of anemia were 14.167 times more in lower class (95% CI 4.548-44.129), the association was statistically significant (p<0.05). Compare to scanty, the odds of anemia were 2.943 times more in heavy, the association was statistically significant (p<0.05). Age, belonging to upper lower or lower middle socio-economic strata, religion, type of family and menstrual irregularity did not have any statistically significant association with anemia in the study. In study by Assefa et al the factors, which were associated with presence of anaemia were low family income, poor maternal education, and vegetarian diet.[10] Chaudhary et al have reported socio-economic status and literacy status of parents.[5] As the key factors associated with anemia. In study by Desalegn et al the key predictors of anemia among adolescent girls were non consumption of protein and high calories foods, lower socio economic status and presence of intestinal worms.[17] Panigrahi et al has reported lower socioeconomic status, excessive menstrual bleeding and poor intake of green leafy vegetables and pulses as independent risk factors for anemia.[7] Shah, et al have reported contradictory findings, and concluded menarcheal status, socio-demographic factors like parental education or occupation have no association with anemia among adolescent girls and concluded that anemia among adolescent girls affects the entire spectrum of adolescent girls.[8]

Many authors like Ghosh et al have recommended further intensified efforts not only by the government through appropriate policy interventions, but also intensified action by all stake holders, including, parents, teachers, health care providers at different levels.[6] Considering the contribution, the negative influence anemia on adolescent girl's health, academic performance, quality of life and future risk of morbidity during pregnancy and child birth, it should be dealt with utmost priority.

CONCLUSION

The prevalence of anaemia is high among urban adolescent girls, majority of which is mild anaemia. The key factors associated with anemia were lower socio economic status and heavy menstrual bleeding. The factors, which did not have any statistical significant association with anemia were age, upper lower or lower middle socio economic strata, religion, type of family and menstrual irregularity.

Considering the high prevalence of anaemia among adolescent girls across different socio economic strata, appropriate behavioural change communication (BCC) interventions at personal and family level needs to be intensified. Periodic evaluation of the impact of various policy interventions by the government is needed to make them more effective.

REFERENCES

1. UNFPA. Adolescent and Youth Demographics:A brief overview Available at: http://www. unfpa.org/resources/adolescent-and-youth-demographicsa-brief-overview. Accessed on 23 November 2017.
2. UNFPA. The Power of 1.8 Billion: Adolescents, Youth and the Transformation of the Future 2014 Available at: http://eeca.unfpa.org/en/publications/ state-world-population-2014-report. Accessed on 23 November 2017.
3. WHO. The global prevalence of anaemia in 2011. Geneva; 2015.
4. Agarwal KN, Agarwal DK, Sharma A, Sharma K, Prasad K, Kalita MC, et al. Prevalence of anaemia in pregnant & lactating women in India. Indian J Med Res. 2006;124(2):173-84.
5. Chaudhary SM, Dhage VR. A study of anemia among adolescent females in the urban area of nagpur. Indian J Community Med. 2008;33(4):243-5.
6. Ghosh R, Bharati P. Haemoglobin status of adult women of two ethnic groups living in a peri-urban area of Kolkata city, India: a micro-level study. Asia Pac J Clin Nutr. 2003;12(4):451-9.
7. Panigrahi A, Sahoo PB. Nutritional anemia and its epidemiological correlates among women of reproductive age in an urban slum of Bhubaneswar, Orissa. Indian J Public Health. 2011;55(4):317-20.
8. Shah BK, Gupta P. Anemia in adolescent girls: a preliminary report from semi-urban Nepal. Indian Pediatr. 2002;39(12):1126-30.
9. Verma M, Chhatwal J, Kaur G. Prevalence of anemia among urban school children of Punjab. Indian Pediatr. 1998;35(12):1181-6.
10. Assefa S, Mossie A, Hamza L. Prevalence and severity of anemia among school children in Jimma Town, Southwest Ethiopia. BMC Hematol. 2014;14(1):3.
11. Ortega P, Leal J, Amaya D, Chavez C. [Nutritional evaluation, micronutrient deficiencies and anemia among female adolescents in an urban and a rural zone from Zulia state, Venezuela]. Invest Clin. 2010;51(1):37-52.
12. Tesfaye M, Yemane T, Adisu W, Asres Y, Gedefaw L. Anemia and iron deficiency among school adolescents: burden, severity, and determinant factors in southwest Ethiopia. Adolesc Health Med Ther. 2015;6:189-96.
13. Tupe R, Chiplonkar SA, Kapadia-Kundu N. Influence of dietary and socio-demographic factors on the iron status of married adolescent girls from Indian urban slums. Int J Food Sci Nutr. 2009;60(1):51-9.

14. Ulukanligil M, Seyrek A. Anthropometric status, anaemia and intestinal helminthic infections in shantytown and apartment schoolchildren in the Sanliurfa province of Turkey. Eur J Clin Nutr. 2004;58(7):1056-61.
15. Bharati P, Shome S, Chakrabarty S, Bharati S, Pal M. Burden of anemia and its socioeconomic determinants among adolescent girls in India. Food Nutr Bull. 2009;30(3):217-26.
16. Thomas D, Chandra J, Sharma S, Jain A, Pemde HK. Determinants of Nutritional Anemia in Adolescents. Indian Pediatr. 2015;52(10):867-9.

17. Desalegn A, Mossie A, Gedefaw L. Nutritional iron deficiency anemia: magnitude and its predictors among school age children, southwest Ethiopia: a community based cross-sectional study. PLoS One. 2014;9(12):e114059.