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Original Research Article

A comparative study on prevalence of anaemia among urban and rural adolescent high school girls of Davangere, Karnataka

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ABSTRACT

Background: Adolescence is the formative period of life when the maximum amount of physical, psychological, and behavioural changes take place. During this stage the requirement of nutrition and micronutrients is relatively high. Therefore, adolescents, especially girls, particularly those between the ages of 12–15 years, are vulnerable to iron deficiency mainly because requirements are at a peak. This study was planned to highlight the problem of anaemia in adolescent females. The objectives were to study the prevalence and severity of anaemia among urban and rural adolescent high school girls and to compare the prevalence and severity of anaemia among urban and rural adolescent high school girls.
Methods: A school based cross sectional study was done for a period of one year (December 1, 2014 to November 30, 2015) among 650 adolescent high school girls of Davangere city and field practice area of JJM Medical College, Davangere, Karnataka. Colour scale for haemoglobin was used for Hb estimation.
Results: The overall prevalence of anaemia was 84.46%; prevalence was more in rural area (96.88%) than urban area (72.42%). The prevalence of mild, moderate and severe anaemia is 53.69%, 17.54% and 13.23%. Overall the severity of anaemia was highest among rural adolescent high school girls compared to that of urban adolescent high school girls.
Conclusions: The prevalence of anemia was higher among rural girls compared to urban girls considering it to be a major health problem among the adolescents in rural areas.

Keywords: High school, Adolescent girls, Anemia, Urban, Rural, Prevalence

INTRODUCTION

"Nutritional anaemia is a condition in which haemoglobin content of blood is lower than normal as a result of deficiency of one or more essential nutrients, regardless of the cause of such deficiency".[1]

Globally, anaemia affects 1.62 billion people (95% CI: 1.50–1.74 billion), which corresponds to 24.8% of the population (95% CI: 22.9–26.7%) The highest prevalence is in preschool-age children (47.4%, 95% CI: 45.7–49.1), and the lowest prevalence is in men (12.7%, 95% CI: 8.6–16.9%). However, the population group with the greatest number of individuals affected is non-pregnant women (468.4 million, 95% CI: 446.2–490.6).[2]

In India, according to National Health and Family Survey (NHFS-3), the prevalence of anaemia among adolescent girls, 15-19 years, is 55.8% including 39.1% with mild anaemia, 14.9% with moderate anaemia and 1.7% with severe anaemia.[3] In Karnataka, according to National Health and Family survey (NHFS-3), the prevalence of

anaemia among adolescent girls, 15-19 years, is 51.3% including 33.5% with mild anaemia, 16.5% moderate anaemia and 1.3% with severe anaemia.[4] To combat anaemia during adolescence, with far reaching benefits in terms of safe motherhood and healthier future generations, an initiative called "12 by 12 initiative" was launched on 23rd April 2007 at Delhi, by Federation of Obstetrics and Gynaecological society of India (FOGSI), in collaboration with Govt. of India, WHO and UNICEF.[5]

The word adolescence is derived from the Latin word, "adolescere"; meaning "to grow, to mature".[6] The WHO has defined adolescence as the age period between 10 to 19 years of age for both the sexes (married and unmarried).[7] Adolescence is the formative period of life, in the age group of 10 to 19 years, when significant growth and maturation occurs.[8] It is a time of increased demand for iron in the food, more so among girls, not only because of menstruation but also because of social factors like preference to feed more for male children, girls eating last whatever is left, being deprived of good food, workload of household chores, negligence of female children etc, making them vulnerable for the development of anemia.[9] Thus adolescent period not only constitutes a critical period for the development of anaemia but also with the onset of menarche, they enter the reproductive life, constituting potential mothers.

In this connection, an attempt has been made to know the magnitude of the problem of anaemia among the urban high school girls of Davangere city and among rural high school girls of field practice areas of JJM Medical college and to compare the prevalence and severity of anaemia among them in order to meet the challenge of protecting their future maternal health

Objectives

1. To study the prevalence and severity of anaemia among urban and rural adolescent high school girls.
2. To compare the prevalence and severity of anaemia among urban and rural adolescent high school girls.

METHODS

The current cross sectional, school based, comparative study was undertaken in Davangere city and field practice area of JJM Medical College i.e. Anaji and Mayakonda for a period of one year from December 1, 2014 to November 30, 2015 among 650 adolescent high school girls aged 13 to 16 years of 8th to 10th standard i.e. 330 girls from government Seethamma girls H.S of Davangere city and 320 girls from government Deveeramma K. Vetteppa girls H.S of Anaji and G.SC-ST.G. Girls H.S of Mayakonda.

Sampling procedure

Sample size estimation

According to National Family Health Survey (NHFS-3), the prevalence of anemia among school going adolescent girls is 55.8%.[10] It is rounded up to 56%. Using this data, the following formula has been applied to determine the required sample size for the study.

$n = 4pq/d^2$

Where,

n = sample size,
p = prevalence of anaemia i.e. 56%,
q = 100-p =100-56 = 44,
d = admissible error (10% of p) = 10% of 56 =5.6,
n = 4x56x44/5.6x5.6 = 9856/31.36 = 314.28.

The calculated sample size is 314. It is rounded up to 330 for the urban schools and 320 for the rural schools of the field practice area of the college, thus constituting a total of 650 adolescent high school girls as the study group. There are eight government girls high school in the city, each with strength of more than 300. So one school was selected at random, by simple random technique. There is one Girl's high school in each of the three P H C's attached to the college, each school with a strength of more than 160. So two schools were selected at random to obtain the required sample size.

Tools used

1. A pre-designed and pre-tested proforma.
2. Color scale for hemoglobin for Hb estimation.

Criteria for the selection of subjects

Inclusion criteria

Inclusion criteria were high school girls of 8th, 9th and 10th standard, who are in the age group of 13 to 16 years; those girls who have attained menarche; those girls who were present on the day of data collection; those girls, who were cooperative.

Exclusion criteria

Exclusion criteria were girls with chronic illness and heavy menstrual disorders and those with a history of regular consumption of IFA (Iron and Folic acid) tablets in the past three months were excluded from the study.

Method of data collection

Prior permission was obtained from the school authorities for the proposed study. Sampled schools were identified and school address was noted. Selected schools were visited on a prefixed date. Importance of the study was explained to all the girl students of 8th to10th standards and students were encouraged to participate in the study. An empty class room was provided by the school authorities to conduct the study. The class teacher and the students were briefed regarding the purpose of the study and confidentiality maintained. Selection of students was

done by systematic random sampling method. A pre-designed and pre-tested proforma was used to collect the basic information about the participants. A brief, relevant clinical examination was also done.

Lab investigation

Haemoglobin estimation by "color scale for haemoglobin".[11,18]

The prevalence and severity of anemia, in clinical terms, as mild, moderate and severe was assessed by estimating hemoglobin level among the study group by using "color scale for haemoglobin", an ingenious and validated strip method, which shows a sensitivity of 95% and a specificity of 99.6%, validated in August 2009 and obtained from Delhi.

Figure 1: Haemoglobin colour scale kit.

Figure 1 shows Haemoglobin colour scale kit. It comprises a small card with six shades of red that represent that present values of Hb levels at 4,6,8,10,12 and 14 gm/dl respectively.

A drop of blood, collected by finger prick with sterile, disposable lancets supplied, after cleaning the finger with spirit swab, was placed on test strip provided and waited for 30 seconds. Then the color of the blood spot was matched against one of the hues on the scale and severity was graded as per WHO standard.

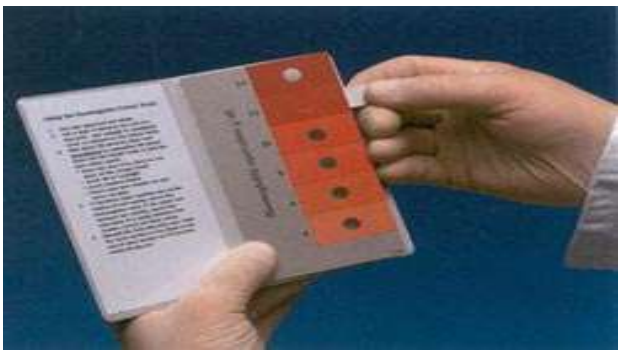

Figure 2: Color scale showing six colors (with apertures between the colors).

Criteria for anaemia

Table 1: Normal haemoglobin range according to age.[12]

Age group	Hb (Range in gm/dl)
Newborn (< 1 week old)	14-22
6 months old	11-14
Children (1-15 yrs)	11-15
Adults	
Men	14-16
Women	12-16

Table 1 shows normal haemoglobin range according to age.[12] Haemoglobin level was used to assess anemia and severity based on cut off values by WHO.[12]

According to the WHO criteria, the cut off level of the haemoglobin concentration in blood for the diagnosis of anaemia is less than 11 gm/dl for pregnant women and for children aged between 6 months and 6 years, less than 12 gm/dl for non-pregnant women and children who are aged 6-14 years old, and less than 13 gm/dl for adult males.[13]

Table 2: Classification of the anaemia according to its severity.[14]

Anaemia	Hb (range in gm/dl)
Mild	10-11.9
Moderate	7-9.9
Severe	<7

Table 2 shows classification of the anaemia according to its severity.[14] As anemia is classified into three degree according to WHO: mild, moderate and severe. Hb Cut-off values of anemia were 10.0-11.9 g/dl (mild), 7.0-9.9 g/dl (moderate) and <7.0g/dl (Severe).

Statistical analysis

The collected information was compiled, tabulated & analyzed for results by using SPSS software package version 17.

Statistical tests used: Percentage, simple Proportion & Chi-square test.

RESULTS

A total of 650 adolescent girls i.e. 320 from field practice area of JJM Medical College and 330 from Davangere city who fulfilled the inclusion and exclusion criteria, were included in the study.

Table 3 shows that, age of students ranged from 13 to 16 years of which 112 (35%); 123 (38.44%); 79 (24.69%) and 6 (1.88%) from rural and 57 (17.27%); 77 (23.33%); 111 (33.64%); 85 (25.76%) from urban were in the age group of 13-14, 14-15, 15-16 and 16 years respectively.

Table 3: Distribution of adolescent high school girls by age.

	Rural		Urban		Total	
Age (years)	**No.**	**%**	**No.**	**%**	**No.**	**%**
13-14	112	35.00	57	17.27	169	26.00
14-15	123	38.44	77	23.33	200	30.77
15-16	79	24.69	111	33.64	190	29.23
Upto 16	6	1.88	85	25.76	91	14.00
Total	320	100.00	330	100.00	650	100.00

Table 4: Distribution of adolescent high school girls by standard.

	Rural		Urban		Total	
Standard	**No.**	**%**	**No.**	**%**	**No.**	**%**
8	110	34.38	80	24.24	190	29.23
9	110	34.38	100	30.30	210	32.31
10	100	31.25	150	45.45	250	38.46
Total	320	100.00	330	100.00	650	100.00

Table 5: Prevalence of anaemia among adolescent high school girls.

	Rural		Urban		Total	
Anemia grading	**No.**	**%**	**No.**	**%**	**No.**	**%**
Normal	10	3.13	91	27.58	101	15.54
Anemic	310	96.88	239	72.42	549	84.46
Total	320	100.00	330	100.00	650	100.00

X^2 =74.0; p<0.001.

Table 6: Distribution of adolescent high school girls by severity of anaemia.

	Rural		Urban		Total	
Anemia grading	**No.**	**%**	**No.**	**%**	**No.**	**%**
Normal	10	3.13	91	27.58	101	15.54
Mild	174	54.38	175	53.03	349	53.69
Moderate	63	19.69	51	15.45	114	17.54
Severe	73	22.81	13	3.94	86	13.23
Total	320	100.00	330	100.00	650	100.00

X2 =107.95; p<0.001.

Table 7: Distribution of mean haemoglobin levels of adolescent girls by age.

	Rural		Urban		Total	
Age (years)	**Mean Hb%**	**SD**	**Mean Hb%**	**SD**	**Mean Hb%**	**SD**
13-14	9.14	1.49	10.07	1.39	9.46	1.52
14-15	8.81	1.64	9.58	1.43	9.11	1.60
15-16	8.10	2.07	10.61	2.08	9.57	2.42
Up to16	9.00	1.10	11.16	2.01	11.02	2.03
Total	8.76	1.74	10.42	1.90	9.60	2.00

Table 4 shows that out of 320 rural adolescent high school girls 110 (34.38%) were from 8th standard, 110 (34.38%) were from 9th standard and 100 (31.25%) were from 10th standard, whereas out of 330 urban adolescent high school girls 80 (24.24%) were from 8th standard, 100 (30.30%) were from 9th standard and 150 (45.45%) were from 10th standard.

Table 5 shows that 650 adolescent high school girls of Davangere city and field practice area of JJM Medical College were assessed for anaemia on age specific WHO criteria with a cut-off point of <12 gm% (WHO standards).

Out of 650 girls examined, 549 were anaemic at the time of study. Thus the prevalence of anaemia was 84.46%

and 15.54% were non anaemic. Out of 320 rural adolescent high school girls examined, 310 were anaemic with prevalence of 96.88% & out of 330 urban adolescent high school girls examined, 239 were anaemic with a prevalence of 72.42%.

Thus the prevalence of anaemia was more among rural adolescent girls compared to urban adolescent girls and this difference was found statistically highly significant ($p<0.005$).

Table 6 shows that out of 650 adolescent high school girls examined, 101 (15.54%) girls had no anaemia, 349 (53.69%) had mild degree of anaemia, 114 (17.54%) had moderate and 86(13.23%) had severe degree of anaemia.

Mild degree was almost similar 54.38% and 53.03% among rural and urban adolescent high school girls. Moderate degree was predominantly more among rural adolescent high school girls 63 (19.69%) compared to urban adolescent high school girls 51 (15.45%).Similarly severe degree anemia was higher among rural adolescent high school girls 73 (22.81%) compared to urban adolescent high school girls 13 (3.94%)

Overall the severity of anaemia was highest among rural adolescent high school girls compared to that of urban adolescent high school girls and this difference was statistically highly significant ($p<0.005$).

Table 7 shows that in relation to age group the mean Hb levels of rural adolescent girls is 8.76 and for urban girls it is 10.42. It is also seen that in rural girls the mean hb level is more in the age group of 13-14 yrs (9.14) and 16 years (9.00) whereas among urban girls it is more among girls in the age group of 16 yrs (11.16) and 15-16 yrs (10.61).

DISCUSSION

Anemia is the most common form of malnutrition amongst adolescents today. It is of public health significance in our country. Adolescents constitute >20% of our population in India and >50% suffer from Iron deficiency anemia. Both urban and rural poor suffer from anemia, being more among girls than boys. The present study is conducted to know the prevalence and severity of anaemia among adolescent girls of Davangere city and field practice area of JJM Medical College, Davangere.

In our study 650 adolescent girls in the age group of 13-16 years were involved of which 330 were from urban and 320 were from rural areas. This was similar to a study conducted by Kaur. Deshmukh and Garg in rural Wardha which included a sample of 630 adolescent girls in the age group of 13-16 years, whereas only 308 adolescent girls were included in a study conducted byBaral.[15,16]

In our study the overall prevalence of anemia was 84.46%, where as in a studies conducted by Chaudhary, Bulliyy et al, Gawarika, Baral, Rajaratnam and Kaur.[9,16-18] Deshmukh the prevalence was 35.1%, 96.5%, 96.5%, 78.3%, 44.8% and 59.8% respectively.[15]

The prevalence of mild, moderate and severe anemia in our study was 53.69%, 17.54% and 13.23%, where as in study conducted by Bulliyy et al the prevalence of mild, moderate and severe anemia was 45.2%, 46.9% and 4.4% respectively.[17]

The high prevalence of mild and moderate anaemia demands due emphasis on iron and folic acid supplementation and health education on the consumption of iron rich foods, so as to bring down the total prevalence of anaemia among the adolescents age group.

In our study the prevalence of anemia among rural adolescents is 96.88% and among urban adolescents it is 72.42%, where as in a study conducted by Baral K P[16] prevalence of anemia in age group 10-14 years was 85.7% in the urban and 77.8% in the rural female adolescents and in the age group 15-19 years the prevalence was 83.71% among urban and 71.9% among rural adolescent females.

Thus, the results of various studies which have been mentioned above, demonstrated that the prevalence of anaemia in the adolescents group was high. This indicated the importance of including adolescents in the risk group to improve their iron status and the need for planning interventional programs that would increase the haemoglobin levels among the adolescent girls through prophylaxis treatment, dietary modification and helminth control.

CONCLUSION

The present study revealed that the prevalence of anemia is higher among rural girls compared to urban girls considering it to be a major health problem among the adolescents in rural areas. There was a higher prevalence of mild anaemia as compared to moderate and severe anaemia. This demands due emphasis on iron and folic acid supplementation and health education on the consumption of iron rich foods, so as to bring down the total prevalence of anaemia among the adolescent girls.

Recommendations

- All girls should be screened for anemia by Hb estimation at the time of high school entry.
- Strengthening “Kishori Shakti Yojana” by incorporating “12 by 12 initiative” in it.
- Weekly Iron and Folic Acid Supplementation (WIFS) Programme for Adolescent Girls and Boys (10–19 Years)[20]

Supplementation through the life cycle, for this target segment the following interventions are proposed:

- Administration of supervised weekly IFA supplementation (100 mg elemental iron and 500 mcg folic acid) throughout the calendar year, i.e., 52 weeks each year.
- Albendazole (400 mg) tablets for biannual de-worming for helminthic control.
- Screening of target groups for anaemia & referring these cases to an appropriate health facility.
- Information and counselling for improving dietary intake and for taking action for prevention of intestinal worm infestation.

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REFERENCES

1. Nutritional Anaemia. WHO. Geneva; p. 5: WHO Tech Report Series 405. Available at: http://apps.who.int/iris/bitstream/10665/40707/1/WHO_TRS_405.pdf. Accessed on 4 November 2017.
2. Worldwide Prevalence of Anaemia. Global Data Base on Anaemia. 1993-2005.
3. Nutrition and Anemia; NFHS-3. Report 2005-2006: Vol 1. 2007: 310.
4. Nutrition and Anaemia; NFHS-3. Karnataka. Report 2005-2006: Vol 1. 2008: 89.
5. Mittal S. 12 by 12 Initiatives. Implementation Strategies. GOI, WHO, UNICEF and FOGSI collaboration. 2007: 16.
6. Nayar PD, Mehta R. Child Health. In: Gupta P, Ghai OP, Editors. Textbook of Preventive and Social Medicine. 2nd ed. New Delhi: CBS Publishers and Distributors; 2007: 428-437.
7. WHO. Young People‟s Health. A Challenge for Society. WHO Technical Report Series no 731, WHO, Geneva, Switzerland. 1986.
8. Programming for adolescent health and development.WHO. WHO Tech Rep Ser No. 886; 1996: 2.
9. 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.
10. Tiwary K, Sheshardri S. Prevalence of anaemia and morbidity profile among school going adolescent girls of Kathmandu, Nepal. J Medical Assoc. 2000;39:319.
11. Stott GJ, Lewis SM. A Simple and Reliable Method for Estimating Hemoglobin. Bulletin of WHO. 1995;73(3):369-73.
12. Bell A. Introduction to the Anemias: Approach to Diagnosis. In: Rodak BF, Ed. Diagnostic Haematology. Philadelphia: W.B. Saunders Company; 1995: 170-180.
13. Dhaar GM, Rabbani I. Editors. Foundations of Community Medicine. 2nd ed. New Delhi: Elsevier India; 2008: 272-276.
14. Lal S, Pankaj A, Editors. Textbook of Community Medicine (Preventive and Social Medicine).1st ed. New Delhi: CBS Publishers and Distributors; 2007: 166-168.
15. Kaur S, Deshmukh PR, Garg BS. Epidemiological Correlates of Nutritional Anemia in Adolescent Girls of Rural Wardha. Indian J Community Med. 2006;31(4):255-7.
16. Baral KP, Onta SR. Prevalence of Anemia Amongst Adolescent in Nepal; A community Based Study in Rural and Urban areas of Morang District. Nepal Med Coll J. 2009:11(3):179-82.
17. Bulliyy G, Mallik G, Sethy GS, Kar SK. Hemoglobin states of non school Going Adolescent Girls in Three Districts of Orissa. Int J Adolosc Med Health. 2007;19:395-406.
18. Gawarika S, Mishra AK. Prevalence of Anaemia in Adolescent Girls Belonging to Different Economic group. Indian J Community Med. 2006;31(4):287-8.
19. Rajaratnam J, Abel R, Asokan JS, Jonathan P. Prevalence of Anemia among Adolescent Girls of Rural Tamil Nadu. Indian Pediatric. 200;37:532-6.
20. Verma R, Kharb M, Yadav SP, Chaudhary V, Ruchi, Ajay. Prevalence of anaemia among adolescents under ibsy in rural block of a dist. Of northern India. Int J Social Sci Interdisciplinary Res. 2013;2(9):95-106.

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