www.jmscr.igmpublication.org
Impact Factor 5.84
Index Copernicus Value: 71.58
ISSN (e)-2347-176x ISSN (p) 2455-0450
crossref DOI: https://dx.doi.org/10.18535/jmscr/v5i11.172

IGM Publication
Journal Of Medical Science And Clinical Research
An Official Publication Of IGM Publication

Study of Determinants of Anemia in Urban School Girls in Visakhapatnam City of Andhra Pradesh

Authors
Dr R.Subhashini MD[1], Dr P. Vijaya Sheela MD[2]
[1,2]Assistant Professor of Obstetrics and Gynecology, Andhra Medical College, Visakhapatnam, Andhra Pradesh
[1]Email: *subhashinirevu@gmail.com*
Corresponding Author
Dr P.Vijaya Sheela MD
Assistant Professor of Obstetrics and Gynecology, Andhra Medical College, Visakhapatnam, Andhra Pradesh
Email: *pvsheela195@gmail.com*

Abstract
This study was designed to evaluate the prevalence of anemia among the school going girls in the urban area of Visakhapatnam city in Andhra Pradesh state. A prospective study was carried out among 1208 children of eight different schools from January 2017 to June 2017. The hemoglobin levels were estimated using Sahli's haemometer by acid hemolysis method to find out baseline prevalence of anemia and its determinants in urban school-going girls of Visakhapatnam. This study was designed to evaluate the prevalence of anemia among the school going girls in the urban area of Visakhapatnam city in Andhra Pradesh state. A prospective study was carried out among1208 children of eight different schools. The hemoglobin levels were estimated using Sahli's haemometer by acid hemolysis method to find out baseline prevalence of anemia and its determinants in urban school-going girls of Visakhapatnam. Majority (69.8%) of girls were anemic. The overall prevalence of mild, moderate and severe anemia was 48.3%, 19.8%, 1.7% respectively. It was significantly higher in low socio economic classes, (60.8%), whose mother's education is below high school studies (57.1%) among post menarche girls (70.2%) and with BMI of 18.5 or lower (94.4%). The prevalence of anemia was significantly lower in girls consuming non vegetarian food.
Out of 69.8 of anemic girls 49.0% are menstruating and all forms of anemia are more in menstruating girls when compared to non-menstruating girls. Mild anemia 32.2%vs16.02%, Moderate anemia 15.1% vs 4.7% and severe anemia 1.7% vs 0.08%.
Keywords: *Anemia, school going girls, Prevalence, status of menarche.*

Introduction

Anemia is a global public health problem which affects both the developing and the developed countries and it is an indicator of poor nutrition and poor health with major impact on social and economic development of a population as well.

Globally, anemia affects 1.62 billion people, which corresponds to 24.8% of the population. Anemia is a major health problem in India. Young children and pregnant women are the most affected, with an estimated global prevalence of 43% and 5l% respectively. In the 2005-2006 National Family Health Survey (NFHS-3), a household survey aimed at having national and state representative data on population health and nutrition; the prevalence of anemia In India was 70% in children aged 6–59 months, 55% in females aged 15–49 years, and 24% in males aged 15–49 years. In Andhra Pradesh NFHS-3 reported anemia prevalence is70.8% in children 6–59 months; 62.9% in females 15–49 years; 23.3% in males 15–49 years. Although the NFHS-3 showed that anemia much more prevalent in the rural than in the urban areas there is a rise in anemia prevalence noted even in urban areas, the possible reason for this could be the poor bio- availability of iron in the Indian diets. The rising trend of consuming snacks and junk foods which supply empty calories is also responsible for so called 'healthy' but anemic children

There are two billion people with anemia in the world and half of the anemia is due to iron deficiency[1]. Anemia is a late indicator of iron deficiency, so it is estimated that the prevalence of iron deficiency is 2.5 times that of anemia. There is convincing evidence that Iron deficiency causes impaired physical growth of infants, preschool and school-aged children, developmental delay, and behavioral abnormalities and impairs cognitive function and school performance .It is associated with functional abnormalities of lymphocytes and neutrophils, thus affecting the immune status and morbidity from infections in all age groups. The aim of this study is to describe the prevalence of anemia and its determinants among school going girls in Visakhapatnam city Andhra Pradesh, India.

Aims and Objectives

1. To assess the prevalence of anemia among urban school girls of Andhra Pradesh.
2. To analyze socio-demographic factors especially status of menarche in relation to anemia

Results

The present study was carried out among high school going girls of age (10-16 years) residing in GVMC urban area from January 2017 to June 2017. A total of 1367 girls from 8 randomly selected high schools of Greater Municipal Corporation of Visakhapatnam city of Andhra Pradesh state were included. The general information about age, height, body weight, hemoglobin level (Sahli's method), mother's education, parent's occupation, socioeconomic status, knowledge about anemia, status of menstruation and regarding the consumption of various diets factors were recorded on a structured questionnaire. Out of the1367 girls, 1208 (88.1%) agreed to give blood samples for hemoglobin estimation. Diagnosis of anemia and its severity were made by using WHO guidelines4.

Prevalence of anemia is 69.8% in our study. There is almost equal distribution of students –35.9%, 32.4%, and 31.7% in age groups of 10-12 yrs., 12-14 yrs., and 14-16 yrs. respectively.

56.4% of girl students are with normal BMI, 32.2% of girl students are having BMI more than 25, 10.4% are under nourished with BMI less than 18.594.4% of girls in under nourished group are anemic. 66.7% of overweight and 48% of obese girls are anemic.

84.9% of socio economic Class V are anemic, 84.6% of class IV socio economic status are anemic while only 21.4% of Class I socio economic status are anemic.40.0% of anemic girls belongs to Class IV and 11.8% belongs to Class V and Class III each. Only 6.2% anemic girls belongs to Class I and Class II. 52% anemic girl’s mothers had received either primary education or no education. Mothers who received high school education and above had only 0.24% got anemic children.

817 out of 1208 girls’ attained menarche (67.6%).Out of 817 girls, 69.8% of girls are

anemic and 30.2% of girls are not anemic as per the standards of WHO.

69.1% of anemic girls had mild anemia 28.4 % had moderate anemia and 2.5% had severe anemia less than 7 gm%.

No significant difference in the dietary habits of anemic girls was observed, but 72.9% non-vegetarian diet taking girls are non-anemic.

Table 1: Distribution of subjects according to age

Age distribution	Number of girls	Percentage
10-12	434	35.9
12-14	391	32.4
14-16	383	31.7
Total	1208	100

There is almost equal distribution of students – 35.9%, 32.4%, and 31.7% in age groups of 10-12 yrs., 12-14 yrs., and 14-16 yrs. respectively.

Table 2: Hemoglobin concentrations (g/dL) for the diagnosis of anemia and assessment of severity according to the World Health Organization

Age or gender group	Hemoglobin	Hematocrit
Children 6 months to 59 months	11.0	6.83
Children 5–11 years	11.5	7.13
Children 12–14 years	12.0	7.45
Non-pregnant women (above 15 years of age)	12.0	7.45
Pregnant women	11.0	6.83
Men (above 15 years of age)	13.0	8.07

Table 3: Distribution of students according to BMI

BMI Value		Number of girls	Percentage
15-18.4	Under nutrition	126	10.4
18.5-24.9	Normal	682	56.4
25-29.9	Over weight	256	21.2
30	Obese	144	12.0
Total		1208	100

56.4% of girl students are with normal BMI, 32.2% of girl students are having BMI more than 25, 10.4% are under nourished with BMI less than 18.5

Table 4: Distribution of students in relation to anemia and BMI

BMI Value		Number of girls	Anemic girls	Percentage(Out of 1208)	Percentage
15-18.4	Under nutrition	126	119	9.9	94.4
18.5-24.9	Normal	682	506	41.9	74.2
25-29.9	Over weight	256	122	10.1	66.7
30	Obese	144	96	7.9	48.0
Total		1208	843	69.8	

41.9% of anemic girls are having normal BMI, 9.9% are below 18.5 and 18% are above 25.

94.4% of girls in under nourished group are anemic. 66.7% of overweight and 48% of obese girls are anemic.

Table 5: Distribution of students according to Socio economic class of family (Prasad Classification)

CLASS	Number of girls	Percentage
CLASS –I PROFESSIONALS	56	4.6
CLASS- II WHITE COLLORED JOB HOLDERS	184	15.2
CLASS-III SKILLED WORKERS	234	19.4
CLASS –IV SEMI SKILLED WORKERS	570	47.2
CLASS V UNSKILLED	164	13.6
UNEMPLOYED	0	0
TOTAL	1208	100

60.8% of students' parents belongs to IV and V socio economic class. 4.6% are from class I, 15.2% from class II and 19.4% class III.

Table 6: Distribution of Anemic students according to Socio economic Class of family (Prasad Classification)

CLASS	Number of girls	Number of anemic girls	Percentage	Percentage out of 1208
CLASS –I PROFESSIONALS	56	12	21.4	0.2
CLASS- II WHITE COLLORED JOB HOLDERS	184	71	38.7	6.0
CLASS-III SKILLED WORKERS	234	139	59.4	11.8
CLASS –IV SEMI SKILLED WORKERS	570	482	84.6	40.0
CLASS V UNSKILLED	164	139	84.9	11.8
UNEMPLOYED	0	0	0	0
TOTAL	1208	843		69.8

84.9% of socio economic Class V are anemic, 84.6% of class IV socio economic status are anemic while only 21.4% of Class I socio economic status are anemic.

40.0% of anemic girls belongs to Class IV and 11.8% belongs to Class V and Class III each. Only 6.2% anemic girls belongs to Class I and Class II

Table 7: Distribution of students according to education of mother

Status of education	Number of girls	Percentage
Degree	126	10.4
High school education	393	32.5
Primary school education	635	52.6
No education	54	4.5
Total	1208	100

52.5% of student's mother had primary education, 32.5% had high school education, 10.4% did degree and 4.5% are uneducated

Table 8: Distribution of students according to education of mother

Status of education	Number of girls	Number of anemic girls	Percentage out of 1208	Percentage 0ut 0f 843
Degree	126	3	0.24	0.3
High school education	393	212	17.56	25.2
Primary school education	635	586	48.5	69.5
No education	54	42	3.5	5
Total	1208	843	69.8	100

52% anemic girl's mothers had received either primary education or no education. Mothers who received high school education and above had only 0.24% got anemic children.

Table 9: Distribution of students according to Status of attaining menarche

Age Group	Pre Menarche	Post Menarche	Total
10-12	268	166 (20.3%)	434
12-14	97	294 (36.0%)	391
14-16	26	357 (43.7%)	383
Total	391 (32.4%)	817 (67.6%)	1208

817 out of 1208 girls attained menarche (67.6%). Out of 817 girls, 43.7% are in the age group of 14-16. 36% and 20.3 % are in 12-14 and 10-12 years age group respectively.

Table 10: Distribution of students according to status of anemia According to the World Health Organization (WHO)

Status of anemia	Number of girls	Percentage
anemic	843	69.8
Non Anemic	365	30.2
Total	1208	100

69.8% of girls are anemic and 30.2% of girls are not anemic as per the standards of WHO.

Table 11: Distribution of students according to severity of anemia

Severity 0f Anemia	Hemoglobin gms/dl	Number of girls	Percentage out of 843 anemic patients	Percentage out of total 1208 Girls
Mild	10/<cut off	583	69.1	48.3
Moderate	7-10	239	28.4	19.8
Severe	<7	21	2.5	1.7
Not Anemic	>Cut off	365		30.2
Total		1208	100	100

Out of 1208 girls 48.3% are mildly anemic, 19.8% are moderately anemic and 1.7% are severely anemic.

69.1% of anemic girls had mild anemia 28.4 % had moderate anemia and 2.5% had severe anemia less than 7 gm%.

Table 12: Distribution of cases in relation to severity of anemia with status of menarche (out of 1208 girls)

Severity 0f Anemia	Number of Pre Menarchal girls	Percentage of total (1208)	Number of Post Menarchal girls	Percentage of total (1208)
Mild	194	16.02	389	32.2
Moderate	56	4.7	183	15.1
Severe	1	0.08	20	1.7
Total	251	20.8	592	49.0

Out of 69.8 of anemic girls 49.0% are menstruating and all forms of anemia are more in menstruating girls when compared to non-menstruating girls. Mild anemia 32.2% vs 16.02%, Moderate anemia 15.1% vs 4.7% and severe anemia 1.7% vs 0.08%.

Table 13: Relationship between anemic status and dietary habits

	Total	VEG	Percentage	Non-VEG	Percentage
Anemic	843	369	43.8	474	56.2
Not Anemic	365	99	27.1	266	72.9
Total	1208	468		740	

No significant difference in the dietary habits of anemic girls was observed, but 72.9% non-anemic girls are taking non vegetarian diet

Table 14: Relation to severity of anemia with status of menarche (out of 843 girls)

Severity of anemia	Total	Number of pre menarchal girls	Percentage	Number of post menarchal girls	Percentage
mild	583	194	33.3	389	66.7
Moderate	239	56	23.4	183	76.6
severe	21	1	4.7	20	95.3
Total	843	251	29.8	592	70.2

70.2% of anemic girls have attained menarche and 29.8% not attained menarche.66.7% of girls suffering from mild anemia, 76.6% with moderate anemic and 95.3% severe anemic girls are menstruating.

Table 15: Comparison of prevalence of anemia with other studies

STUDY	Prevalence of anemia
PRESENT STUDY	69.8%
Ravi N.Guptha	85.3%
CMS Rawat 2001	34.5%
A.Verma et.al 2004	81.8%
Rupali V. Sabale2013	53.2%

Table 16: Comparison with other study Relation of anemia with menstrual status

STUDY	Pre menstrual	Post menstrual
Agarwal et.al 2008	6.6%	48.4%
PRESENT STUDY	20.8%	49.0%

Discussion

The present study revealed a high prevalence of anemia among urban school children of lower socio- economic classes, especially after menarche were more at risk to develop anemia. Although school children constitute 25% of the

total population in India, few studies have been done to evaluate their hematological profile. Also most of the studies have focused on the children belonging to rural areas, not in urban areas Anemiain children, especially iron deficiency, is the commonest health problem in many developing countries with an estimated prevalence of 43 % (1)

India has the world's highest prevalence of iron deficiency anemia among women, with 60 to 70 percent of the adolescent girls being anemic[3]. It is estimated that 75% of anemia is related to iron deficiency, followed by folate and vitamin B12 deficiencies[4]. In developing countries it serves as a primary cause for 40% of maternal death either directly or indirectly. World Health report of 2002 identified anemia as one among the top 10 risks for infant mortality, maternal mortality and preterm birth. During adolescence anemia is more prevalent in girls where they are exposed to risk of onset of menarche. Prevalence of anemia is very high in vulnerable groups even in higher socioeconomic status. Hence this study was taken up to study the prevalence and create an awareness about the scenario of the disease state right at the age of childhood and counsel the children regarding the importance of iron rich foods in order to reduce the prevalence of the disease. Following menarche, adolescent females often do not consume sufficient iron
to offset menstrual losses. As a result, a peak in the prevalence of iron
Deficiency frequently occurs among females during adolescence.

Limitation of the study

We did a descriptive study that reports the determinants and severity of anemia in general. The study lacks detailed investigation of the morphological appearance of red blood cells to differentiate anemia due to vitamin B12 and folic acid deficiencies from anemia due to iron deficiency. It gives the ground reality and attention of the policy makers to review the gaps for correcting anemia.

Conclusion

Page Numerous studies among children have shown that the prevalence of anemia ranges from 52-96.50% in India WHO estimates that around two billion people are anemic with approximately 50% of all anemia attributable to iron deficiency.[1] India is among the countries with highest prevalence of anemia in the world.[2] Anemia, a manifestation of under-nutrition and poor dietary intake of iron is a public health problem, not only among pregnant women, infants and young children but also among adolescents.[3] Our study highlights the fact that the prevalence of anemia is very high in school going children. We suggest that there is a need for well- planned, systematic and large-scale studies by using standardized methodologies to estimate the prevalence of anemia as well as the causes of anemia at the community level among males and females in all the age groups, and in different regions of India.

The following recommendations are made;

- Government should implement hemoglobin estimation in school.
- Health programme for all school children on a regular basis.
- Educating parents and children about the importance of deworming and emphasize them to have dewormed once in six months. Parents as well as teachers should be sensitized regarding under nutrition, and consequences of anemia advantages of balanced diet.
- Monitoring and evaluation of government program like ICDS Supplementary Nutriti-onal Program should be strengthened.
- They should be advised for improvement in dietary habits and consumption of green leafy vegetables should be included in diet plan.
- Health education, seminars on menstrual disorders should be conducted at regular interval.

- Efforts should be targeted to reduce poverty, improve health services and sanitation;

Though initiation of Iron fortification had been done, it should be in commonly reachable vehicles like salt, sugar and available for all, which doesn't demand individual co-operation be established with programmes such as those targeting: malaria prophylaxis; hookworm control; immunization; environmental health; control of micronutrient malnutrition; and community-based primary health care. Weekly Iron and Folic Acid Supplementation (WIFS) Programme. The program will cover school-going adolescent females and males from classes

VI to XII enrolled in government/government aided/municipal schools and out of school Anganwadi centers.

These are fundamental elements of any programme to improve nutritional well-being in general, but are especially important in the improvement of iron status in particular. The Indian Government recommends iron and folic acid supplementations to younger children. However, the programme implementation has been poor due to lack of logistic planning and accountability.

The results of this study can be used by public health programmes to design target interventions aimed at reducing the huge burden of anemia in India.

References

1. WHO, UNICEF, and UNU, Iron Deficiency Anemia: Assessment, Prevention and Control, A Guide for Programme Managers, WHO, UNICEF, UNU, Geneva, Switzerland, 2001
2. Worldwide prevalence of anaemia 1993–2005: WHO global database on anaemia / Edited by Bruno de Benoist, Erin McLean, Ines Egli and Mary Cogswell
3. National Consultation on the Control of Nutritional Anaemia in India. Department of Family Welfare (Maternal Health Division), Ministry of Health and Family Welfare, Nirman Bhawan, New Delhi. 1998.
4. M. B. Zimmermann and R. F. Hurrell, "Nutritional iron deficiency," The Lancet, vol. 370, pp. 511–520, 2007. View at Publisher · View at Google Scholar Office of the Registrar General & Census Commissioner, Census of India, 2011.
5. WHO, Hemoglobin Concentrations for the Diagnosis of anemia and Assessment of Severity, WHO, Geneva, Switzerland, 2011, http://www.who.int/vmnis/indicators /haemoglobin/en/.
6. "Recommendations to prevent and control iron deficiency in the United States. Centers for Disease Control and Prevention," MMWR Recommendations and Reports, vol. 47, pp. 1–29, 1998.
7. Thankachan, S. Muthayya, T. Walczyk, A. V. Kurpad, and R. F. Hurrell, "An analysis of the etiology of anemia and iron deficiency in young women of low socioeconomic status in Bangalore, India," Food and Nutrition Bulletin, vol. 28, no. 3, pp. 328–336, 2007.
8. Prevalence of anemia and its determinants inUrban school-going children of Mumbai Rupali V. Sabale,Shobha S. Kowli, Padmaja H. Chowdary International Journal of Medicine and Public Health | Oct-Dec 2013 | Vol 3 | Issue 46.View at Google Scholar · View at Scopus Preva-lence and Severity of anemia Stratified by Age and Gender in Rural India
9. Scholars Academic Journal of Pharmacy (SAJP) ISSN 2320-4206 (Online)
10. Sch. Acad. J. Pharm., 2014; 3(6): 423-426 ISSN 2347-9531 (Print) *Chitra Nisha Nair, Jesni K Jose, Jesina Begam, Nazar Ali, Balakrishna
11. International Journal of Contemporary Pediatrics Garg N et al. Int J Contemp Pediatric. 2016 Feb;3(1):218-223Anemia

and Iron Deficiency in School Children, Adolescents, and Adults:

12. Verma M, Chawla J, Kaur Prevalence of anemia among urban schoolchildren of Punjab. Indian Pediatric 1998; 35:1181-6. Community-Based Study in Rural Amazonia Am. 2007 February; 97(2): 237–239.
13. Anemia cases in India on rise: NFHS.
14. Ministry of Health and Family Welfare. National consultation on control of nutritional anemia in India. Nirman Bhawan, New Delhi. 16-17.
15. Sudhagandhi B, Sundaresan S, Ebenezer W, Prema A. Prevalence of anemia in the school children of Kattankulathur, Tamil Nadu, India. Int JNutr Pharmacol Neurol Dis 2011; 1:184.