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Original Research Article

ASSESSMENT OF STATUS OF ANEMIA AMONG SCHOOL GOING ADOLESCENTS IN BHOPAL, MADHYA PRADESH - A CROSS SECTIONAL STUDY

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ABSTRACT

Background: In developing countries, anemia is not only a problem of pregnant women or children but also a major problem of adolescents [5]. According to WHO adolescent ages are from 10 to 19 years [7]. Nutritional requirements in both boys and girls increase significantly during adolescent due to growth spurt [6]. In adolescents iron deficiency anemia can untowardly influence on growth, more prone to infection, and also worsen mental development, decreases scholastic performance and learning ability [8]. Objective of our study is to assess the status of anemia among adolescents of selected schools of Bhopal district.

Materials and Methods: It is a cross sectional study carried out in a selected schools of Bhopal (M.P.), India after approval from Institutional ethical committee.

Results: Among total 257 study participants, 128 boys and 129 girls prevalence of anemia is 32.8 % among boys and 57.4% among girls. Prevalence of mild, moderate and severe anemia among boys was 18.8%, 10.2% and 3.9% respectively. In case of girls prevalence of mild, moderate and severe anemia was 36.4%, 14% and 7% respectively. These were found statistically significant ($p < 0.05$). There was a significant association of anaemia with socio-economic status, where anemia was more prevalent in lower socioeconomic class in class IV and V (71.7% and 71.1% respectively) than in higher classes (Modified Kuppuswamy Classification)

Conclusion: Anemia is highly prevalent among adolescent girls as well as boys. It is high time to pay attention on more education and information via schools as well as prevention and treatment provided according to national programmes.

Keywords: Anemia, Adolescents, School going, Bhopal.

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1. INTRODUCTION

Anemia is a state in which the number and size of red blood cells, or the haemoglobin concentration, falls below a defined cut-off value, as a result the capacity of the blood to transport oxygen around the body impaired. Anemia is a measure of both poor nutrition and poor health [1].

Anemia is one of the most common preventable causes of maternal and child deaths in malaria endemic regions. It can also lead to death if it is very severe. Iron deficiency is responsible for about 50 percent of anemia in school children and in women of reproductive age-group, and 80 percent in children 2–5 years of age, among a lot of causes of anemia. Besides iron other nutritional deficiencies, such as vitamin B12, folate and vitamin A, can cause anemia although the significance of their impact is not clear. Infectious diseases in particular malaria, helminth infections, tuberculosis and haemoglobinopathies – are other important responsible causes to the high prevalence of anemia [2]. The haemoglobin cut-offs which are used for diagnosing anemia among adolescents are described in Table below.

Adolescents	**Non-Anemia (gm/dl)**	**Anemia (gm/dl)**		
		Mild	**Moderate**	**Severe**
Children of 10-11 years of age	≥11.5	11.0-11.4	8.0-10.9	<8.0
Children of 12-14 years of age	≥12.0	10.0-10.9	8.0-10.9	<8.0
Girls aged 15-19 years	≥12.0	11.0-11.9	8.0-10.9	<8.0
Boys aged 15-19 years	≥13.0	11.0-12.9	8.0-10.9	<8.0

The term adolescence is taken from a Latin word which means “to grow to maturity” [6]. According to WHO adolescent ages are from 10 to 19 years [7].

Adolescence is a transformational phase from childhood to adulthood and denoted by rapid physical, hormonal, and biological changes that leads to psychosocial, behavioural, and sexual transformations in an individual. Nutritional requirements in both boys and girls increase significantly during adolescent due to growth spurt [6].

In adolescents iron deficiency anemia can untowardly influence on growth, more prone to infection, and also worsen mental development, decreases scholastic performance and learning ability [8].

According to WHO report 2018-19 around 1.2 billion people, or 1 in 6 of the world’s population, are adolescents and more than 1.1 million adolescents aged 10-19 years died in 2016, over 3000 every day, mostly from preventable or treatable causes. Iron deficiency anemia was the top second cause of years lost by adolescents to death and disability in 2016[9].

In India the prevalence of anemia among adolescent girls is 54% and in boys 29% whereas in Madhya Pradesh it is 53.2% among adolescent girls and 36.5% in adolescent boys [10].

Studies showing prevalence of anemia among adolescents were done previously in other states but not identified in Bhopal or MP (we had search by all possible ways no documents

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available online). So, this study was planned to assess prevalence of anemia among school going adolescents of Bhopal district.

2. METHODS

It is a cross sectional community based study.

Study Area: Randomly Selected 4 Government schools of Bhopal

Study Population: Adolescents selected from 4 Government schools of Bhopal

Study Duration: 3 months (May 2019 to July 2019)

Inclusion Criteria:

- Adolescents present on first day of visit (10-19 years) and willing to participate in study and whose parents also given consent were selected as per sample size.

Exclusion Criteria:

- Adolescents suffering from any type of hemoglobinopathies like sickle cell anemia, thalassemia etc. or having chronic disease affecting hemoglobin level.

Sample Size: In Madhya Pradesh, prevalence of anemia is 53.2% among adolescent girls and 36.5% among adolescent boys [47]. Therefore, mean prevalence among adolescents is 44.85%.

On applying formula

$n = Z^2pq/l^2$

Where n = sample size

Z = 1.96 at 95% Confidence Interval

p = Mean Prevalence i.e. 44.85

q = 1- p i.e. 55.15

l = absolute error, which is p times allowable error. Here allowable error is taken as 15%, so p X 15% i.e. 44.85 X 15/100

= 6.73

So,

n = 1.96 X 1.96 X 44.85 X 55.15 ÷ 6.73 X 6.73

= 209.8 ≈ 210

To maintain homogeneity among number of boys and girls and to cover loss to follow up (20%) we took 280 as sample size i.e. 280 adolescents of 10-19 years of age.

Sampling: The list of all schools was initially obtained from district education office. Later 4 schools were selected randomly by lottery method. 70 adolescents meeting the criteria were selected by random selection without replacement method from each school in which 35 boys and 35 girls were of age group 10-19 years and likewise required sample size of 280 adolescents were selected from 4 Government schools.

Consent: Verbal consent was obtained from the study participants and then written consent from their parents was obtained after explaining them the nature and purpose of the study. They were assured that privacy would be stringently maintained. The option to withdraw from the study was always open.

ISSN: 0975-3583, 0976-2833 VOL15, ISSUE1, 2024

3. METHODOLOGY

After obtaining clearance from the Institutional Ethical Committee, permission from District Education Officer of Bhopal (M.P.) was taken. Then list of all schools was obtained, out of which desired schools were selected as per requirement. Permission was also taken from the respective school's Principals. Later we visited the respective schools on fixed days of the week and approached the eligible participants for the present study. After obtaining informed consent from participants and their parents, participants were then later interviewed using a Semi structured questionnaire. The questionnaire included socio-demographic variables such as age, education and occupation of parents, monthly income, number of family member, religion, type of family, dietary practices etc. Hemoglobin level was also estimated using a digital hemoglobinometer. We were able to study 257 adolescents as rest denied to participate.

STATISTICAL ANALYSIS: Data was entered MS excel 2007, analysis was done with the help of Epi-Info 7 software. Frequency and percentage were calculated & statistical test (Chi Square) was applied wherever applicable; P value <0.05 was taken as statistically significant.

4. RESULTS

Here 257 study participants were from ages 10-19 years. Among 257, there were 128(49.8%) males and 129 (50.2%) females. Mean age of study participants was 14.8 ± 2.79 year. (Table-1)

Table - 1 Distribution of Gender according to Age.

S No.	Age (in years)	Male n (%)	Female n (%)	Total n (%)
1	10	10(7.8)	9(7)	19(7.4)
2	11	10(7.8)	12(9.3)	22(8.6)
3	12	12(9.4)	14(7.8)	22(8.6)
4	13	13(10.2)	14(10.9)	27(10.5)
5	14	14(10.9)	14(10.9)	28(10.9)
6	15	13(10.2)	14(10.9)	27(10.5)
7	16	14(10.9)	14(10.9)	28(10.9)
8	17	14(10.9)	14(10.9)	28(10.9)

ISSN: 0975-3583, 0976-2833 VOL15, ISSUE1, 2024

9	18	14(10.9)	14(10.9)	28(10.9)
10	19	14(10.9)	14(10.9)	28(10.9)
Total		128(100)	129(100)	257(100)

Prevalence of anemia is 32.8% among boys and 57.4% among girls. The distribution is found statistically significant ($p < 0.05$).

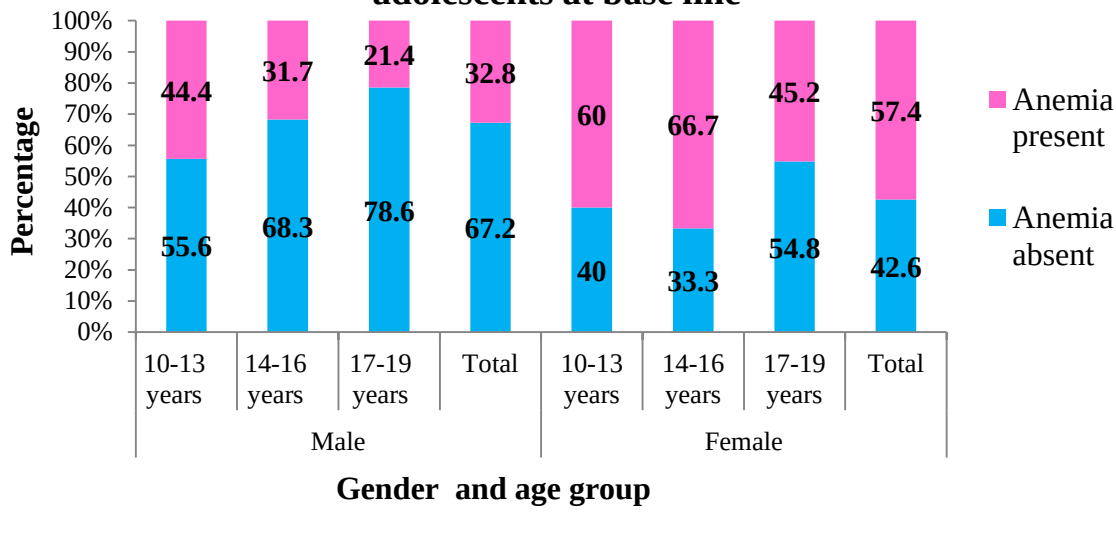
Prevalence of mild anemia was 18.8% in males and 36.4% in females and that of moderate anemia was 10.2% in males and 14% in females and prevalence of severe anemia was 3.9% in males and 7% in females. (Table-2) These were found statistically significant ($p < 0.05$).

Table 2- Gender wise distribution of status of anemia in adolescents

S No.	Anemia status	Male n (%)	Female n (%)
1	No anemia	86(67.2)	55(42.6)
2	Mild anemia	24(18.8)	47(36.4)
3	Moderate anemia	13(10.2)	18(14)
4	Severe anemia	5(3.9)	9(7)
Total		128(100)	129(100)
P-Value		**0.0001**	

Age-wise distribution showed that the prevalence of anemia was more in early age group boys (10-13 years) 44.4% followed by middle adolescent boys (14-16 years) 31.7% and least in late adolescent boys (17-19 years) 21.4%, However in case of girls, prevalence of anemia was more in middle age group (66.7%) followed by early adolescent girls (60%) and late adolescent girls (57.4%) (Fig 1). These were found statistically significant ($p < 0.05$).

Figure - 1 Gender and age group wise prevalence of anemia in adolescents at base line



ISSN: 0975-3583, 0976-2833 VOL15, ISSUE1, 2024

Among male participants prevalence of mild anemia is more in early age group i.e. 22.2% and is least in late adolescent age group 14.3%, whereas in case of female participants it is more in middle adolescent age group 52.4% and least in late adolescent age group26.2%.
In case of prevalence of moderate anemia among male participants it is more in early age group i.e. 15.6% then in middle and late adolescent age group i.e. 7.3 and 7.1% respectively; similarly among female it is more in early age group 17.8% and least in middle age group i.e. 9.5%.
Severe anemia is also more in early age group among male participants i.e. 6.7% then in middle age group 4.9% and is not seen in late adolescent age group; similarly it is more in early age group adolescent females 11.1% then middle and late age groups i.e. 4.8% in each. (Table-3) These were found statistically significant ($p < 0.05$)

Table - 3 Gender and age-group wise status of anemia in adolescents

S. No.	Anemia status	Male Age group (in years)				Female Age group (in years)			
		10-13 n (%)	14-16 n (%)	17-19 n (%)	Total n (%)	10-13 n (%)	14-16 n (%)	17-19 n (%)	Total n (%)
1	No anemia	25 (55.6)	28 (68.3)	33 (78.6)	86 (67.2)	18 (40)	14 (33.3)	23 (54.8)	55 (42.6)
2	Mild anemia	10 (22.2)	8 (19.5)	6 (14.3)	24 (18.8)	14 (31.1)	22 (52.4)	11 (26.2)	47 (36.4)
3	Moderate anemia	7 (15.6)	3 (7.3)	3 (7.1)	13 (10.2)	8 (17.8)	4 (9.5)	6 (14.3)	18 (40)
4	Severe anemia	3 (6.7)	2 (4.9)	0 (0)	5 (3.9)	5 (11.1)	2 (4.8)	2 (4.8)	9 (7)
Total		45 (100)	41 (100)	42 (100)	128 (100)	45 (100)	41 (100)	42 (100)	128 (100)
P-value		**0.04**							

According to modified Kuppuswamy socio-economic status in majority anemic boys i.e. 38(90.5%) belong to upper lower class (IV) followed by lower middle class (III) 3(7.1%) and

ISSN: 0975-3583, 0976-2833 VOL15, ISSUE1, 2024

least 1(2.4%) belong to lower class (V), similarly majority anemic girls i.e. 54(73%) belong to upper lower class (IV) followed by lower middle class (III) 19(25.7%) and least 1(1.4%) belong to lower class (V). No anemic study participants belong to Upper middle class (II) and how ever no study participants in our study belong to Upper class (I).
(Table -4). The distribution was found significant (p-value < 0.05)

Table -4 Gender wise distribution of anemia in adolescents according to Socio-economic status

S No.	Socio-economic Class	Male n (%)	Female n (%)
1	Upper (I)	0(0)	0(0)
2	Upper middle (II)	0(0)	0(0)
3	Lower middle (III)	3(7.1)	19(25.7)
4	Upper lower (IV)	38(90.5)	54(73)
5	Lower (V)	1(2.4)	1(1.4)
Total		42(100)	74(100)
P-Value		**0.039**	

5. DISCUSSION

In India the prevalence of anemia among adolescent girls is 54% and in boys 29% whereas in Madhya Pradesh it is 53.2% among adolescent girls and 36.5% in adolescent boys [10].
In the present study, 257 study participants were from ages 10-19 years. Among 257, there were 128(49.8%) males and 129 (50.2%) females. Mean age of study participants was 14.8 ± 2.79 years. In a study conducted by Jyothi Lakshmi Naga Vemuri et.al [11] (Aug- Oct 2018) among 313 students 114 were boys and 199 were girls and found between 11 and16 years of age with the mean age (yrs) of the students was 13.58 ± 1.68, while in another study by Hema Divakar et.al [12] (2017) among 95 adolescent girls reported that the all subjects were between ages 11 to 19 years.
In the present study among 128 boys and 129 girls prevalence of anemia is 32.8 % among boys and 57.4% among girls. Prevalence of mild, moderate and severe anemia among boys was 18.8%, 10.2% and 3.9% respectively. In case of girls prevalence of mild, moderate and severe anemia was 36.4%, 14% and 7% respectively. These were found statistically significant (p < 0.05). In a study by Veena Melwani et al [13] (2017), prevalence was found to be 57.65%, of which 34.7% girls had mild anaemia, 44.9% girls have moderate and 20.4% girls had severe anaemia; while in a study to assess prevalence of anaemia among adolescent girls in urban area of central Madhya Pradesh by Shinde et al [14] (2015), on 267 school girls, the overall prevalence of anaemia was found to be 52.06%, of them 70.5%, 28.06% and 1.44% girls have mild, moderate and severe anaemia respectively.
In the present study, age-wise distribution showed that the prevalence of anemia was more in early age group boys (10-13years) (44.4%) followed by middle adolescent boys (14-16years) (31.7%) and least in late adolescent boys (17-19) (21.4%), However in case of girls, prevalence of anemia was more in middle age group (66.7%) followed by early adolescent

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girls (60%) and late adolescent girls. These were not found statistically significant ($p > 0.05$). According to a cross sectional study by Veena Melwani et.al [13] (2017) found that anaemia was present in 42.8%, 45.2% and 23% girls in early, middle and late adolescence and p value was found to be significant; while in a study conducted by Shinde et al[14] (2015), 11.6% girls in early adolescence, 52.1% girls in middle adolescence and 36.3% girls in late adolescence were found to be anaemic,

In the present study, according to modified Kuppuswamy socio-economic status in majority anemic boys i.e. 38(90.5%) belong to upper lower class (IV) followed by lower middle class (III) 3(7.1%) and least 1(2.4%) belong to lower class (V), similarly majority anemic girls i.e. 54(73%) belong to upper lower class (IV) followed by lower middle class (III) 19(25.7%) and least 1(1.4%) belong to lower class (V). No anemic study participants belong to Upper middle class (II) and how ever no study participants in our study belong to Upper class (I). The distribution was found significant (p-value < 0.05). In the study by Anurag Srivastava et.al [15] (Aug - Dec 2014),there was significant association of anaemia with socio-economic status similar to our study, whereas anemia was more prevalent in lower socioeconomic class in class IV and V (71.7% and 71.1% respectively) than in higher classes. In another study by T. Jain et.al [16] (2010) reported that majority of upper lower class students (55.6%) were anemic and the prevalence of anemia decreased with increase in socio-economic status but the difference was not statistically significant.

6. CONCLUSION

Anemia is highly prevalent among adolescent girls as well as boys. As we know that adolescent period precedes adulthood, so it is a matter of great concern to emphasis in this period only. Limited number of studies were done on this topic. Boys as well as girls are suffering from anemia as there is less knowledge and perception about anemia and it's deadly complications known to them and their families and also in their syllabus. Schools are the best place to educate them regarding this, about it's prevention and treatment via teachers and various national health programmes. Mild and moderate cases are more suggesting that only improving nutrition in diet, compliance to Iron Folic acid supplementation, Deworming, Proper hygiene and periodic health checkups can definitely combat this life threatening condition.

7. REFERENCES

1. WHO. (2012). Anaemia Policy Brief. 6, 1–7. http://www.who.int//iris/bitstream/10665/148556/1/WHO_NMH_NHD_14.4_eng.pdf
2. Anemia Mukt Bharat operational guidelines for programme managers.2018. https://www.fitterfly.com/site/pdf/anemia-mukt-bharat.pdf/ Accessed Sep 11 2020.
3. FAO, WHO. World Declaration and Plan of Action for Nutrition. International Conference on Nutrition. Rome, Food and Agriculture Organization of the United

ISSN: 0975-3583, 0976-2833 VOL15, ISSUE1, 2024

Nations, December 1992. Available at http://whqlibdoc.who.int/hq/1992/a34303.pdf/ Accessed Sep 11 2020.

4. WHO, UNICEF, UNU. Iron deficiency anaemia: assessment, prevention and control, a guide for programme managers. Geneva, World Health Organization, 2001. Available at http://www.who.int/nutrition/publications/micronutrients/anaemia_iron_deficiency/WHO_NHD_01.3/en/index.html)
5. AK, S., & SA, T. (2016). Evaluation of Weekly Iron and Folic Acid Supplementation Programme for adolescents in rural schools of Kannur, North Kerala, India: A cross-sectional study. International Journal of Medical Science and Public Health, 5(11), 2259. https://doi.org/10.5455/ijmsph.2016.01042016452
6. Bansal RD, Mehra M. Adolescent girls: an emerging priority. Indian J Public Health. 1998;42(1):1-2.
7. WHO. Adolescents, The critical phase, the challenges and the potential published by WHO
8. Shah, S. P., Shah, P., Desai, S., Modi, D., Desai, G., & Arora, H. (2016). Effectiveness and Feasibility of Weekly Iron and Folic Acid Supplementation to Adolescent Girls and Boys through Peer Educators at Community Level in the Tribal Area of Gujarat. Indian journal of community medicine : official publication of Indian Association of Preventive & Social Medicine, 41(2), 158–161. https://doi.org/10.4103/0970-0218.173498
9. https://www.who.int/news-room/fact-sheets/detail/adolescents-health-risks-and-solutions/Accessed on Sep 11 2020.
10. Wilcox, W. (2015). Madhya Pradesh. State Politics in India, 127–174. https://doi.org/10.4135/9789353287832.n38
11. Vemuri JLN, Kandikonda SH, laxmi SB, Rao RLL. A study on the weekly iron and folic acid supplementation in the government schools and anganwadi centres in urban field practicing area of a tertiary health care centre, Hyderabad, Telangana. Int J Community Med Public Health 2019;6:1274-8.
12. Divakar, H., Dutta, S., Kulkarni, B., & G.V, D. (2017). Anaemia Eradication in Adolescents- a New Hope With Weekly Iron Folic Acid Supplementation (Wifs) (Pilot Study). Journal of Evidence Based Medicine and Healthcare, 4(17), 968–973.
13. Melwani V, Dubey M, Khan A, Toppo M, Choudhary Y, Priya A. A study to assess the prevalence of anaemia amongst adolescent girls residing in selected slum of Bhopal city. Int J Community Med Public Health 2018;5:1096-9.
14. Mohan Shinde, Anita Shinde, Ashok Shrivastava. "Prevalence of Anemia among Adolescent Girls in Urban Area of Central Madhya Pradesh". Journal of Evolution of Medical and Dental Sciences 2015; Vol. 4, Issue 56, July 13; Page: 9750-9754, DOI: 10.14260/jemds/2015/1407
15. Srivastava, A., Kumar, R., & Sharma, M. (2016). Nutritional anaemia in adolescent girls: an epidemiological study. International Journal of Community Medicine and Public Health, 3(4), 808–812.

ISSN: 0975-3583, 0976-2833 VOL15, ISSUE1, 2024

16. Jain, T., Chopra, H., Mohan, Y., & Rao, S. (2011). Prevalence of anemia and its relation to socio-demographic factors: Cross-sectional study among adolescent boys in urban Meerut, india. Biology and Medicine, 3(5), 1–5.