

A Cross Sectional Study Study of Anemia Among Adolescent (13-19) Girl Students

Dr. Bhaskar Prasad Singh¹, Dr. Md. Kamran Fazal², Dr. Jolly³, Dr. Amrendra Narayan Chaudhary⁴

1.Tutor, Department of Community Medicine JLNMC, Bhagalpur

2.Assistant Prof. Department of Community Medicine JLNMC, Bhagalpur

3.Tutor, Department of Community Medicine JLNMC, Bhagalpur

4.Associate Prof. Department of Community Medicine JLNMC, Bhagalpur

Corresponding Author-Dr. Bhaskar Prasad Singh

Address- Dr. Bhaskar Prasad Singh, Sinha Homeopharma Amarpali Hotel Campus
Bus Stand Purnea Bihar Pin- 854301

Abstract

Background: Anemia is a global public health problem affecting both developing and developed countries, the prevalence of anemia is higher among developing nations, because of low socioeconomic status and indigent access to the healthcare services. Adolescence is the period of most rapid growth second to childhood. The physical and physiological changes that occur in adolescents place a great demand on their nutritional requirements and make them more vulnerable to anemia. **Methodology:** This study was a cross-sectional study conducted among 200 adolescent girls of age 13 to 19 yrs studying in government school in Bhagalpur, Bihar. from May 2018 to June 2020, , the information regarding age, sociodemographic status, menstrual history, and clinical details were recorded. Blood samples were collected and analyzed using automated hematology analyzer. **Results:** The prevalence of anemia was found to be 25%. The majority of the anemic girls (74%) were having moderate anemia, followed by mild anemia (16%) and severe anemia (10%). Prevalence of anemia was high among the adolescents those who were having low BMI (30.4%) , history of not using footwear (55%) , parents illiterate (32%) and belonging to low socioeconomic class (46.2%). **Conclusion:** This study showed that anemia was a major public health problem in this population. School-based interventions on identified associated factors are important to reduce the burden of anemia among school adolescents. **Keywords:** anemia, adolescents, socio – demographic factors.

Date of Submission: 01-04-2022

Date of Acceptance: 10-04-2022

I. Introduction

The word Adolescence is derived from a Latin word “adolescere” which means “to grow”. WHO defines Adolescent as a person between 10 and 19 years of age.¹ There are 1.2 billion adolescents (10 – 19 years) worldwide² and India is home to the largest national population of adolescents (243 million), followed by China (207 million), the United States (44 million), Indonesia, and Pakistan (both 41 million each).³ World health organization also defines Adolescent as a transitional period phase of growth and development between childhood and adulthood.⁴ Adolescence is a crucial period in life of every individual, during which there is a transition from childhood to adulthood. This period is characterized by rapid physical, biological, and hormonal changes resulting in psycho-social, behavioral changes and sexual maturity in an individual. Anemia due to nutritional deficiency is a globally prevalent condition. However, the situation is worrisome in developing countries like India, since it has reached the proportions of major public health problem. Though it is found to occur in all age groups, a special attention is to be devoted to the adolescent age group, since adolescent age group is the window of opportunity to correct nutritional status of children. If we intervene correctly during this period we can prevent future consequences of nutritional deficiencies. It is becoming increasingly evident that control of anemia in pregnant women can be more easily achieved if a satisfactory iron status can be ensured in the adolescent females prior to marriage. Anemia is a condition characterized by reduction in the number of red blood cells and/or hemoglobin (Hb) concentration.⁷ Anemia is a global public health problem affecting both developing and developed countries and has major consequences for human health as well as social and economic development. It affects 24.8% of the world population.⁸ The burden of anemia varies with a person's age, sex, altitude, and

pregnancy.⁷ The worldwide prevalence of anemia among adolescents is 15% (27% in developing countries and 6% in developed countries). Interventions to reduce the burden of anemia and iron deficiency anemia should address the causatives. Cost-effective anemia prevention and control strategies are well-documented and have the power for their intended objectives in different countries.⁹ Knowledge of the degree and causes of anemia in adolescence is important, as this is a window of opportunity for school-based interventions to improve adolescent health. There is a scarcity of data on anemia in adolescents living in developing countries in the complex ecologic context of poverty, parasitism, and malnutrition.

Objectives

To determine the following factors associated with anemia in Adolescent girl students
Socio – demographic factors, Prevalence of anemia, Clinical profile.

II. Review of Literature

Definition: Anemia is characterized by reduction in the number of red blood cells and/or hemoglobin (Hb) concentration.⁷ It is said to be present when the hemoglobin level in the blood is below the lower limit of the normal range for the age and sex of the individual. According to the WHO criteria, the cut off level of the hemoglobin concentration in blood for the diagnosis of anemia is less than 11 gm/dl for Adolescent 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 6-14 years old. Studies conducted by the WHO have reported that iron deficiency is the most prevalent nutritional deficiency and with its timely correction, there could be an increase of up to 20% in the national productivity. Dietary deficiency: substances that diminish absorption of ferrous and ferric iron include phytates, oxalates, phosphates, carbonates and tannates. Malabsorption of iron: Prolonged achlorhydria may produce iron deficiency because acidic conditions are required to release ferric iron from food, Starch and clay eating produce malabsorption of iron and iron deficiency anemia, Extensive surgical removal of proximal small bowel or chronic diseases (e.g., untreated sprue or celiac syndrome) can diminish iron absorption. Bleeding for any reason produces iron depletion, Hemosiderinuria, hemoglobinuria (paroxysmal nocturnal hemoglobinuria, brisk intravascular hemolytic anemia associated with implantation of artificial valves) Pulmonary hemosiderosis. Iron is absorbed in the duodenum and upper jejunum. Absorption of iron is determined by the type of iron molecule and by what other substances are ingested. Iron absorption is best when food contains heme iron (meat). Dietary non-heme iron is usually in the ferric state and must be reduced to the ferrous state and released from food binders by gastric secretions. Non-heme iron absorption is reduced by other food items (eg, vegetable fiber, phytates and polyphenols; tea tannates, Chandrakumari, et al. (2019) studied prevalence of anemia among adolescent girls in a rural area of Tamil Nadu and found that among 255 adolescent girls in the study population, overall prevalence of anemia was 48.63% (n = 124). Mild degree of anemia was seen most commonly (55.64%, n = 69), while 42 (33.87%) had moderate anemia and 13 (10.48%) had severe anemia. Overall, the mean Hb level was 10.33 ± 1.34. Among the total (255), 188 (73.73%) were from the early adolescent age group (10–14 years) and 67 (26.27%) were from the late adolescent age group (15–19 years). Prevalence of anemia was significantly high among late adolescents (52.24%), compared to early adolescents (47.34%). About 79.22% of the girls belonged to socioeconomic class IV, 11.37% to class III, 6.67% to class V and 2.74% to class II. The prevalence of anemia was significantly high (70.59%) among the girls who belonged to class V, followed by class IV (50.49%) and class III (34.48%). The mean age was 14.34 ± 1.8 years. About 72.7% were on mixed diet and 88.3% belonged to nuclear family. Majority 92.2% (n=320) of the participants were Hindus followed by Muslims 5.2% (n=18), Christians 1.2% (n=4), Jains 0.9% (n=3) and sikhs 0.5% (n=2). According to WHO age Z-score for adolescents, BMI showed 54 (15.6%) had mild thinness and 14 (4.0%) were overweight. The overall prevalence of anemia was 44.4% (n=154). Majority of the anemic girls, 131 (85.0%) were healthy, 17 (11.1%) were underweight and 6 (3.9%) were overweight. Among the anemic girls, 79.8% (n=123) had attained menarche and 6.5% (n=10) reported passing worms in stools. While 253 (72.9%) girls among the total of 347 had attained menarche, 79.8% (n=123) out of 154 anemic girls, had attained menarche and 20.1% of them had not attained. Among non-anemic girls (Hb >12 g%) 67.3% (n=130) had attained menarche. The length of the menstrual cycle varied in anemic girls. Most (44.1%) of them had menstrual cycle for 5 days whereas, 1.9% girls had longer cycle for 7 days. Ayushi Agrawal et, al. (2018) conducted a study on anemia among adolescents in a coastal district of India and found that the total prevalence of anemia among boys was 30.7% and girls was 45.7% which was significantly higher in girls (p<0.001). The prevalence of anemia was found to decrease with increasing age among boys whereas it was found to be the other way among girls, that is anemia prevalence increased with increasing age among girls. Other demographic factors like education and occupation of parents, religion, socio-economic status and dietary pattern had no statistical significance.

III. Material And Methods

This study was a cross-sectional study conducted among 200 adolescent girls of age 13 to 19 yrs studying in government school in Bhagalpur, Bihar. from May 2018 to June 2020, , the information regarding age, sociodemographic status, menstrual history, and clinical details were recorded. Blood samples were collected and analyzed using automated hematology analyzer. **Study variables:** Socio-demographic profile (Age, education, socio – economic status, religion), Clinical profile (Age at menarche, frequency of menstrual cycles, passage of worms in stool etc.,

Inclusion criteria

Adolescent girls aged 13 – 19 years

Exclusion criteria

girls who were unavailable for data collection during 3 consecutive visits, Those girls who did not consent for the study.

Data collection

The study is conducted after taking Ethical community clearance, consent from the government school principal, Counseling was done first , after that porforma were given to the students. A predesigned pretested Porforma was used to collect data. It contained identification details, socio – demographic details and clinical details. Porforma was given to the students which contained the questioners regarding the socio-demography and clinical factors associated with anemia, it was explained in verbal language, then students were asked to complete it and completed porforma was taken for analysis. After completing the porforma complete general physical examination was done, then height weight and BMI of the students were noted. Measurement of weight: Weight was recorded in Kilograms to the nearest 0.5 kg using a standard portable weighing machine. Measurement of height: Height was recorded in centimeters to the nearest 0.1 cm using the height measuring rod. Measurement was taken in erect standing position barefoot with feet together, heels against the wall & looking straight ahead. The Body mass index (BMI) was calculated by weight (kg)/ height² (m). Blood was collected for analysis of investigations :- Under aseptic conditions, 2 ml of venous blood was collected into a sample bottle containing ethylene diamine tetra acetate and gently mixed to prevent clotting. The sample was transported .to CRL laboratory of Navodaya medical college using vaccine carrier and analyzed using an automated blood analyzer model/medonic.

IV. Results

In our study we noted that according to Socio-economic status , about 78 (39%) girls belonged to class IV next being 55 (27.5%) belonging to class III, combining class III- IV was only 41.7% were anemia, only class V had 12 i.e., 46.2% , significant P value is found , which indicated high prevalence of anemia is more among Lower class followed by upper lower class. Majority of the girls, 130 (65%) belonged to nuclear families, 47 (23.5%) to joint families and 23 (11.5%) to extended joint families, and P value was not found statistical significant.

Comparison of socio – demographic factors associated with anemia

Factors'	Number of cases(N=200)	Anemia(N=50)	No anemia(N=150)	Chi value square (χ^2)	P value
Socio – economic status					
Upper class- I	01(00.5%)	00 (0)	01 (100.0)	14.281	0.006
Upper middle class -II	40(20.0%)	08 (20.0%)	32 (80.0%)		
Lower middle class-III	55(27.5%)	06 (10.9%)	49 (89.1%)		
Upper lower class-IV	78(39.0%)	24 (30.8%)	54 (69.2%)		
Lower class - V	26(13.0%)	12 (46.2%)	14 (53.8%)		
Type of family					
Nuclear	130(65.0%)	19 (14.6%)	111 (85.4%)	21.848	0.000
Joint	47(23.5%)	22 (46.8%)	25 (53.2%)		
Extended joint	23(11.5%)	09 (39.1%)	14 (60.9%)		

Regarding father's education, about 41 (20.5%) were educated till high school, 37 (18.5%) were graduates, 31 (15.5%) completed middle school, 26 (13%) primary school, 22 (11%) higher secondary school or diploma. Only 5 (2.5%) were postgraduates and 38 (19%) were illiterates, and P value was not found statistical significant. Regarding mother's education, about 31 (15.5%) were educated till primary school, 26 (13%) each educated till middle school, 26 (13%) higher secondary school or diploma, 21 (10.5%) till high school, 7 (3.5%) were graduates, only 3 (1.5%) were postgraduates and 86 (43%) were

illiterates, and P value was not found statistical significant.

Comparison of parent’s education with anemia

Parameters	Father			Mother		
	Illiterate	Literate	P value	Illiterate	Literate	P Value
N= 200	N= 38	N=162		N=186	N=14	
Anemia (50)	16(32%)	34(68%)	0.034	42(84%)	8(16%)	0.230
No Anemia (150)	22(14.6%)	128(85.4%)	0.052	144(96%)	6(4%)	0.023

In our study 50 cases were anemic among these 16 (32%) had illiterate father compared to 34 (68%) literate father with p value 0.034(which is not statically significant), but majority of them, that is 42 (84%) had illiterate mother and only 8(16%) had literate mother. This signifies that mother’s education plays an important role in prevalence of adolescent students anemia, as she is directly involved in managing the nutritious status of adolescents girls however p value was not statically significant. **PREVALENCE OF ANEMIA:** Anemia was present in 50 (25%) of the study participants. Mild anemia (Hb 11 – 11.9 gram percent) was present in 8 (16%) girls, moderate anemia (Hb 7 – 10.9 gram percent) in 37 (74%) girls and severe anemia (Hb < 7 gram percent) in 5 (10%) girls. Majority of cases had microcytic hypochromic anemia that is 30 cases (60%) in which moderate anemia were 22(73.3%) followed by, severe anemia 5(16.7%) and mild anemia 3 (10%). Normocytic normochromic anemia was found in 15 cases (30%), in which 12(80%) were moderate anemia followed by mild anemia 3(20%), macrocytic normochromic anemia was found in less number of cases i.e., in 5 cases (10%). The mean value of hemoglobin levels in anemic cases was 9.51±1.484 and in non anemic girls was 13.24±0.712 comparatively the value was less but p value was not statistically significantly and t value is 23.685.

V. Discussion

comparison of prevalence of anemia with other studies

Authors	Prevalence of anemia
Chandrakumari, et al. (2019)	48.63%
Patel S, Dhuppar P, Bhattar A (2017)	36.4%
Gurpreet Singh, Kuldip Singh (2017)	36.59%
P.M. Siva et. al.	21%
Melkam Tesfaye et. al,	15.5%
In our study	25%

The prevalence of anemia in the present study was 25%, which is similar to the prevalence in developing countries (27%).⁹ Many other studies have showed varying prevalence of anemia in India. Study conducted by Kapoor and Aneja in public and government schools in Delhi found prevalence of 50.8%. Chandrakumari, et al. (2019) found a prevalence of 48.63% among adolescent girls in a rural area of Tamil Nadu. Patil N et al. (2018) found that the overall prevalence of anemia was 44.4% among adolescent girls in North Karnataka. Melwani V et al.(2018) reported that anemia was present in 57.65% girls amongst adolescent girls residing in slum of Bhopal city. Ayushi Agrawal et, al.(2018) reported a prevalence of 45.7% among adolescent girls in a coastal district of India. Patel S, Dhuppar P, Bhattar A (2017) conducted a study on nutritional anemia status in adolescent girls in rural schools of Raipur and found a 36.4% prevalence of anemia. The prevalence of anemia was 36.59% in a study conducted by Gurpreet Singh, Kuldip Singh (2017) in urban college going girl students, whereas in a study by Bhagyalaxmi Sidenur, Gowri Shankar (2017), anemia was present in 89% of adolescent girls. Another study by Arya AK, Lal P, Kumar N, Barman S. (2017) in an urban slum of Kanpur found a prevalence of 78.5% among adolescent girls, while the prevalence was 69.2% in a study by Srivastava A, Kumar R, Sharma M. (2016), 54.11% in Assam (Akshay Chandra Deka et. Al), 21% in a study by P.M. Siva et. al., 15.5% in a study by Melkam Tesfaye et. al,⁶ among adolescent girls in Ethiopia, 63.48% in Raipur (Abhaya Joglekar et. Al). In a study by Shilpa S. Biradar et al it was found that 41.1 % were suffering from various degrees of anemia and that 59.9 % were non- anemic. This indicated that it was a public health problem of high

magnitude as per the WHO guidelines.

In a study by Melwani V et al. majority of the study subjects belonged to lower middle class 47 (55.2%) followed by lower class 27 (31.7%). Similarly, in a study by Shilpa S Biradar et al, out of the 840 adolescent girls, a majority (84.2%) belonged to the socio-economic class IV, whereas 11.5% of them belonged to class III and only 4.3% belonged to class V. None of the girls belonged to classes I and II. In the present study, all girls had attained menarche, whereas in a study by Patil N et al, 253 (72.9%) girls among the total of 347 had attained menarche, 79.8% (n=123) out of 154 anemic girls, had attained menarche and 20.1% of them had not attained. Among non-anemic girls (Hb >12 g%) 67.3% (n=130) had attained menarche. In a study by Melwani V et al, among 68 (80%) study participants who had attained menarche, 25 (37.7%) were found to be anemic. Patel S, Dhuppar P, Bhattar A (2017) in their study, found no significant association of haemoglobin levels with age or attainment of menarche. In a study by Srivastava A et al, most favorable factors for anemia occurrence were found to be low socioeconomic status, joint family, family size >4, parents education less than or equal to primary school and working status of mothers. Anemia was more prevalent in lower socioeconomic class than in higher classes. This inverse relation was also found statistically significant. Statistically significant association was found also with mother's educational status (p value 0.007), father's educational status (p value 0.041) and family size (p value 0.002). Regarding association of anemia prevalence with father's education, significantly higher prevalence was seen in girls of illiterate fathers, 19 (50%) and primary school education, 15 (57.7%) ($\chi^2 = 45.059$, $p = 0.000$). However, Arya AK, Lal P, Kumar N, Barman S and Ayushi Agrawal et, al. found no statistically significant association between prevalence of anemia and father's education. Consistent to our study, Srivastava A, Kumar R, Sharma M. found anemia to be significantly associated with lower levels of parental education. The minimum haemoglobin level among anemic girls was 5.4 gram percent and maximum was 11.6 gram percent, while the minimum haemoglobin level among nonanemic girls was 12 gram percent and maximum was 16.10 gram percent. In a study by Abhaya Joglekar et. In our study the prevalence of anemia is 25% which is comparable to the P M siva et al (2008) study which has prevalence of 21% and Gurpreet singh kuldip singh et al (2017) which is 36%. In our study the sample size was 200, which is comparable to Chandrakumari et al (2019) which is 255 and in study conducted by Akshay Chandra et al (2016), were sample size is 262. In our study the prevalence of mild anemia is 16%, which is comparable to Abhayajoglekar et al (2015) where the mild anemia prevalence was 16.8%

VI. Conclusion

Anemia is a major public health problem of severe magnitude according to WHO. 25% prevalence is noted in our study which is of moderate magnitude. (government school, Bhagalpur Bihar. Moderate anemia was most commonly found in our study that is 74%. On peripheral smear, Most commonly microcytic hypochromic anemia 60% was noted followed by normocytic normochromic 30%, macrocytic normochromic 10%. High risk factors were students belonging to low socio-economic groups, with Low BMI, not using foot wear, and present of menstrual abnormalities like polymenorrhoea.

References

- [1]. World Health organization. Adolescent health and development. Available at: http://www.searo.who.int/en/Section13/Section1245_4980.htm (last accessed on October 10, 2012).
- [2]. United Nations, Department of economic and social affairs, population division, world population prospects: The 2008 revision. Available at: <http://www.esa.un.org/unpd/wpp2008/index.htm> (last accessed on October 12, 2012).
- [3]. The state of the world's children 2011 – Adolescence an age of opportunity.
- [4]. UNICEF. (last accessed on October 10, 2012).
- [5]. World Health Organization. Programming for adolescent health and development. WHO Tech Rep Ser No. 886, 1996. p. 2.
- [6]. Operational framework, Weekly iron & folic acid supplementation Program for adolescents – MOHFW. (last accessed on September 5, 2012).
- [7]. Tesfaye et al. Anemia and iron deficiency among school adolescents: burden, severity, and determinant factors in southwest Ethiopia. *Adolescent Health, Medicine and Therapeutics* 2015;6:189–196
- [8]. De LM, Pena-Rosas RJP, Cusick S, et al. Hemoglobin Concentrations for the Diagnosis of Anemia and Assessment of Severity; Vitamin and Mineral Nutrition Information System. Vol 11. Geneva: World Health Organization; 2011:1.
- [9]. Benoist BD, McLean E, Egli I, et al. Worldwide Prevalence of Anemia 1993–2005. Geneva: World Health Organization; 2008.
- [10]. Balc YI, Karabulut A, Gürse D, et al. Prevalence and risk factors of anemia among adolescents in Denizli, Turkey. *Iran J Pediatr*. 2012;22(1):77–81.
- [11]. Achievement of ICMR, accelerated efforts to achieve elimination of iron deficiency anemia
- [12]. Shah VB, Shah BS, Puranik GV. Evaluation of non-cyanide methods for hemoglobin estimation. *Indian J Pathol Microbiol*. 2011;54(4):764-768.
- [13]. Nelson's essential of pediatrics' 16th edition
- [14]. Guidelines for control of iron deficiency anemia: Adolescent division, MoH&FW, Government of India.
- [15]. ICMR study in Karnataka *Euro J zool res*, 2014,3 (1): 32-36

- [16]. Ganong's Review of Medical Physiology 24 edition
- [17]. Essential of hematology 20th edition Park K. Preventive Medicine in Obstetrics, Paediatrics and Geriatrics. Text book of Preventive and Social Medicine, 25th Edition: M/s Banarsidas Bhanot
- [18]. Melwani V et al. A study to assess the prevalence of anemia amongst adolescent girls residing in selected slum of Bhopal city Int J Community Med Public Health. 2018 Mar;5(3):1096-1099
- [19]. Ayushi Agrawal et, al. Anemia among Adolescents in a Coastal District of India. National Journal of Community Medicine | Volume 9 | Issue 6 | June 2018: 396-401
- [20]. Patel S, Dhuppar P, Bhattar A (2017) Nutritional Anemia Status in Adolescent Girls in Rural Schools of Raipur, India. Med Chem (Los Angeles) 7: 853-856. doi: 10.4172/2161-0444.10004