



Original Research Article

PREVALENCE AND PREDICTORS OF ANAEMIA AMONG SCHOOL GOING ADOLESCENTS IN RURAL AREAS OF AMRITSAR, PUNJAB, INDIA

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ABSTRACT

Background: Anaemia is the major public health problem affecting both developed and developing countries with significant consequences for both human health as well as social and economic development. It is an important sign that indicates poor nutrition as well as poor health. The study aimed to assess the prevalence of anaemia among adolescents and the associated factors among school going adolescents in Amritsar, Punjab, India

Materials and Methods: A cross-sectional study was carried out in various schools located in the rural field practice area of Department of Community Medicine Sri Guru Ram Das Institute of Medical Sciences and Research, Sri Amritsar. Information regarding sociodemographic profile of students was assessed with the help of pre- designed, pretested proforma. The haemoglobin estimation was done by using portable Hemo-Cue Hb 201.

Results: The overall prevalence of anaemia among study subjects was 54.90%. The prevalence of anaemia was more among female study subjects (83.1%) than male study subjects (33.62%). Association between anaemia and variables like gender of study subjects, type of diet and consumption of iron folic acid tablets and deworming tablets was found to be statistically significant.

Conclusion: Prevalence of anemia was more in female study subjects as compared to male study subjects. Majority i.e. more than 80% of female study subjects were anemic than male study subjects. Compliance regarding intake of iron-folic acid and deworming tablets was alarmingly low. Prevalence of moderate to severe anemia was seen more among study subjects consuming vegetarian diet as compared to non-vegetarian diet.

Keywords: Anaemia, School going Adolescents, Rural areas, Iron-Folic Acid tablets, Deworming tablets.

INTRODUCTION

Anaemia is a significant public health issue impacting both developed and developing nations, with serious implications for human health as well as social and economic development. It is an important sign that indicates poor nutrition as well as poor health. Nutritional anaemia is a condition characterized by a lower-than-normal level of haemoglobin in the blood, typically caused by a

deficiency of one or more nutrients, particularly iron.^[1]

Adolescence is a distinct and formative stage of life where they experience physical, cognitive and psychosocial growth.^[2] In 2016, the second leading cause of years lost by adolescents to death and disability worldwide was iron deficiency anaemia.^[2] Adolescent boys and girls are both at risk for anaemia due to rapid growth, weight gain, and increased blood volume. Adolescent girls are

especially at risk for anaemia due to depletion of body iron reserve in adolescent girls with the commencement of menstruation.

The World Health Organization (WHO) estimates that anaemia affects two billion people all over the world.^[3] In India prevalence of anaemia has been documented as 39.86%.^[4] Anaemia affects 40% of girls and 18% of boys in India.^[5] According to CNNS(Comprehensive National Nutrition Survey) conducted in 2016- 2018, reported that 28.5% of adolescents were anaemic, out of which 39.6% were girls and 17.6% were boys with variation by region and state.^[6]

According to the National Family Health Survey (NFHS) conducted between 2019 and 2021, the prevalence of anaemia among Indian adolescents aged 15 to 19 years has shown a slight increase. The increase observed among adolescent girls was from 55.8% to 59.1% whereas in boys it was 30.2% to 31.1%.^[7]

Anaemia occurs mainly due to micronutrients deficiency such as iron, folic acid, and vitamin B12. Anemia mainly affects physical health, mental health, economic and social well-being of adolescents. The major health problems experienced by adolescents due to anemia are poor cognition, concentration, memory and scholastic performance, low immunity, recurrent infections, poor motor development outcomes, and irregular menstruation.^[8]

In India, malnutrition in the form of anaemia affects more than 56% of adolescent girls and 30% of adolescent boys.^[9,10]

Anaemia due to micronutrient deficiencies can be tackled through school based food literacy interventions like iron-folic acid tablets and deworming tablets and adopting the appropriate dietary practices among adolescents. According to the FY 2024-2025, Till Q2 under Anemia Mukh Bharat, 5.6 crore adolescents were given 4-5 iron-folic acid, blue tablets each month and a total of 28.09 crore children and adolescents were covered under National Deworming Day round held in February 2024.^[11]

Therefore, anaemia in adolescents should be tackled through well-designed public health policies specifically focused on this age group. Hence this study was conducted to assess the prevalence of anaemia in adolescents and the associated factors in adolescents residing in Punjab, India.

MATERIALS AND METHODS

A cross-sectional study was carried out in various schools located in the rural field practice area of Department of Community Medicine Sri Guru Ram Das Institute of Medical Sciences and Research, Sri Amritsar. Cluster sampling method was used to draw sample. The sample size was calculated using the prevalence of Anaemia among adolescents as 59.1%.^[7]

The sample size was calculated using:

$$n = 4pq/L^2,$$

n = Sample size

p = Prevalence

$$q = 1 - p$$

L = Allowable error

$$p = 59.1\%$$

$$q = 100 - 59.1 = 40.9\%$$

$$L = 5\%$$

$$n = 4 \times 59.1 \times 40.9 / 5 \times 5$$

$$n = 386.7$$

Expecting a dropout of 5%, the final sample size came out to be 405.

The students in the age group of 14-19 years, studying in class 9 to 12 were selected. Information regarding sociodemographic profile of students was assessed with the help of pre- designed, pretested proforma. Socio -economic status was assessed by Modified BG Prasad scale.^[12]

The haemoglobin estimation was done by using portable Hemo-Cue Hb 201. The sensitivity of the method used in the study is 99.1%.^[13] The finger of the study subjects was cleaned with disinfectant and was allowed to dry. It was then pricked with the help of lancet and the sample of blood was transferred on to the haemoglobin strip. Within 10 seconds the haemoglobin value of sample was displayed on the screen. The reading was recorded for each study subject. The waste generated was disposed off as per the BMW handling rules, 2016.

Interpretation of Anaemia was done using WHO classification of anaemia among adolescent age group.^[14]

Classification of Anaemia	Range (in gm/dl)
Mild Anaemia	11.9-10
Moderate Anaemia	9.9-7
Severe Anaemia	<7

Informed consent: The study subjects were informed about the purpose of the study and their assent was taken before the start of the study. Informed written consent was obtained from the parents of the study subjects for haemoglobin estimation, and assent was obtained from the study subjects themselves. The consent was given by the parents of 413 study subjects. Thus the haemoglobin testing was performed on 413 study subjects.

Data was entered, cleaned and analysed using Epi Info 7.2.5.

Ethical consideration: The ethical clearance was given by the Ethics committee of Sri Guru Ram Das institute of Medical sciences. (Ref. no. SGRD/IEC/2022-144).

RESULTS

The study population consisted of 56.9% male and 43.1% female adolescents. Majority (59.3%) of them belonged to 16-17 years age group, 36% of adolescents belonged to 14-15 years age group and 4.7% belonged to 18-19 years age group. Majority

(57.8%) of the adolescents were Sikh by religion, 35% of adolescents were Christian and remaining 7.2% were Hindu by religion. As per the type of family, majority (74.9%) belonged to joint family [Table 1].

Majority (70.9%) of mothers of adolescents were illiterate, 15% of mothers were educated upto primary class, 12.6% were educated upto middle school and 1.5% of them were educated upto graduation and above. Most (88.1%) of the mothers of study subjects were housewives [Table 1].

Education wise distribution of fathers of study subjects revealed that maximum (43.1%) were illiterate. Only 1% fathers of study subjects were educated up to graduation and above. The main (80.8%) occupation of fathers of study subjects was agriculture whereas 3.1% were unemployed [Table 1].

According to the socioeconomic status, 3% belonged to social class I, 14.5% belonged to social class II, 32.4% belonged to social class III and only 50.1% belonged to social class IV [Table 1]. A higher proportion (88.61%) of study subjects were neither consuming iron-folic acid tablets nor consuming deworming tablets (87.16%).

Majority (55.44%) of study subjects were consuming vegetarian diet and remaining 44.56% were consuming non-vegetarian diet.

In 14-15 years age group, mild anemia was found in 37.58% and moderate to severe anemia was found in 26.18% of study subjects. In 16-17 years age group, mild anemia was seen among 30.61% whereas moderate to severe anemia was seen among 20.01% of adolescents. In 18-19 years age group, 26.31% of study subjects were suffering from mild anemia while 15.88% were suffering from moderate to severe anemia. Moderate to severe anemia was more prevalent among female study subjects (45.50%) as compared to male study subjects (4.26%).

The study subjects consuming vegetarian diet (34.93%) were suffering from moderate to severe anemia as compared to study subjects consuming non-vegetarian diet (5.99%). Moderate to severe anemia was more prevalent among study subjects who were not consuming iron-folic acid (22.13%) and deworming tablets (22.50%).

Across various age group, anemia was observed to be 63.76% in 14-15 years age group, 50.62% in 16-17 years age group and 42.11% in 18-19 years age group. Association between anemia and other variables like gender of study subjects ($\chi^2=135.494$, $p= 0.001$), type of diet ($\chi^2=56.108$, $p= 0.001$) and consumption of iron folic acid tablets ($\chi^2=9.412$, $p= 0.009$) and deworming tablets ($\chi^2=7.935$, $p= 0.019$) was found to be statistically significant, whereas no association was observed between anemia and age of study subjects ($\chi^2=7.874$, $p= 0.096$) [Table 2].

[Figure 1] shows the distribution of study subjects according to status of anemia. The overall prevalence of anemia among study subjects was 54.90%. More female study subjects (83.1%) were anemic than male study subjects (33.62%).

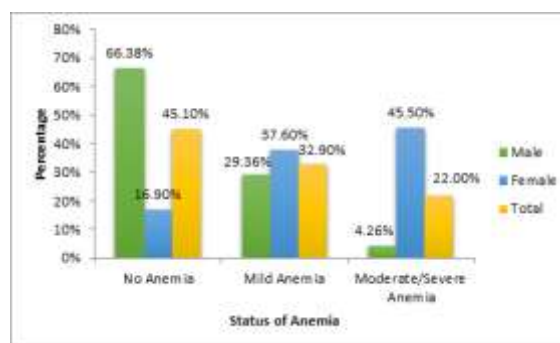


Figure 1: Distribution of study subjects according to status of anemia.

Table 1: Distribution of study subjects according to sociodemographic factors.

Sociodemographic Factors	Frequency(N)	Percentage (%)
Age		
14-15	149	36.0
16-17	245	59.3
18-19	19	4.7
Gender		
Male	235	56.9
Female	178	43.1
Religion		
Sikh	239	57.8
Christian	144	35
Hindu	30	7.2
Type of Family		
Nuclear	104	25.1
Joint	309	74.9
Mother Education		
Illiterate	293	70.9
Upto Primary	62	15.0
Upto middle school	52	12.6
Graduation and above	6	1.5
Father Education		
Illiterate	178	43.1
Upto Primary	128	31.0
Upto middle school	103	24.9

Graduation and above	4	1.0
Father Occupation		
Unemployed	13	3.1
Daily wager	46	11.1
Skilled worker	6	1.4
Agriculture	334	80.8
Service /business	14	3.6
Mother Occupation		
Housewife	364	88.1
Working	49	11.9
Socioeconomic status		
Class I	12	3
Class II	60	14.5
Class III	134	32.4
Class IV	207	50.1

Table 2: Association of anaemia with other variables.

Age (Years)	Status of Anaemia			χ^2	p value
	No Anaemia n=186 (%)	Mild Anaemia n=136(%)	Moderate/ Severe Anaemia n=91(%)		
14-15 (n=149)	54 (36.24)	56 (37.58)	39 (26.18)	7.874	0.096 (NS)
16-17 (n=245)	121 (49.38)	75 (30.61)	49 (20.01)		
18-19 (n=19)	11 (57.81)	05 (26.31)	03 (15.88)		
Gender					
Male(n=235)	156 (66.38)	69 (29.36)	10 (4.26)	135.494	0.001 (HS)
Female(n=178)	30 (16.90)	67 (37.60)	81 (45.50)		
Type of Diet					
Vegetarian (n=229)	75 (32.76)	74 (32.31)	80 (34.93)	56.108	0.001 (HS)
Non-Vegetarian (n=184)	111 (60.32)	62 (33.69)	11 (5.99)		
Consumption of Iron and Folic Acid Tablets					
Yes(n=47)	30 (63.83%)	07 (14.89%)	10 (21.28%)	9.412	0.009 (S)
No(n=366)	156 (42.62%)	129 (35.25%)	81 (22.13%)		
Consumption of Deworming Tablets					
Yes(n=53)	33 (62.26)	10 (18.87)	10 (18.87)	7.935	0.019 (S)
No(n=360)	153 (42.50)	126 (35.00)	81 (22.50)		

DISCUSSION

The present study was conducted among school going adolescents in the rural field practice area of department of Community Medicine, Sri Guru Ram Das Institute of Medical Sciences and Research, Sri Amritsar. This study aimed at assessing the prevalence and associated factors of anaemia among school going adolescents aged 10–19 years in rural areas of Amritsar, Punjab, India.

In this study it was found that the prevalence of anaemia was more among female study subjects as compared to male study subjects. The findings were in accordance to the National Family Health Survey-5 which showed that anaemia was more among adolescent females (60.3%) as compared to adolescent males (32.17%).^[15] Other studies conducted by Chauhan S et al. and Aggarwal A et. al reported the same.^[16,17] This may be due to physiological blood loss in girls in the form of menstrual cycle which tends to make females more anaemic than males.

In the present study, age wise distribution of anaemia showed that out of the total study subjects, majority were anaemic in the age group of 14-15 years in comparison to other age groups. Association between anaemia and age was found to be statistically insignificant. The results were in line

with a cross-sectional study conducted in Uttarakhand, India, among adolescents, where it was observed that association between anaemia and age of study subjects was found to be statistically insignificant (p value 0.442).^[18]

It was observed in our study that the association between anaemia and gender was found to be statistically highly significant ($\chi^2 = 135.494$, p value= 0.001). The findings were in line with the cross-sectional study conducted in Tanzania, which showed that more female study subjects were anaemic than male study subjects and this difference was found to be statistically significant (p value <0.001).^[19]

In the present study, more number of study subjects (34.93%) consuming vegetarian diet were having moderate to severe anaemia than the study subjects (5.99%) consuming non-vegetarian diet. Association between anaemia and type of diet was observed to be statistically highly significant. ($\chi^2 = 56.108$, p value 0.001)

Likewise a study conducted in Gujrat, India among adolescents, showed that more number of study subjects consuming vegetarian diet were having moderate to severe anaemia than the study subjects consuming mixed diet. The study also showed association between type of diet and anaemia was

observed to be statistically significant (p value 0.000).^[20]

In the present study, out of total study subjects who were consuming iron folic acid tablets, 63.83% were found to be non-anaemic while 36.17% were anaemic. Whereas those who were not consuming iron and folic acid tablets, 42.62% were found to be non-anaemic and 57.38% were anaemic. The difference was found to be statistically significant ($\chi^2 = 9.412$, p value= 0.009). These findings were consistent with a study conducted by Goyal N. et.al. among adolescents, which showed that association between anaemia and consumption of iron folic acid tablets were statistically significant. (p value<0.001).^[18]

Similar findings were reported in another study conducted by Chauhan S. et. al among adolescents, that the study subjects who were not consuming iron and folic acid tablets were found to be suffering from moderate to severe anaemia than the study subjects who consumed iron and folic acid tablets. Similar to our findings association between anaemia and consumption of iron and folic acid tablets was statistically significant.^[16]

In our study, out of total study subjects who were consuming deworming tablets, 62.26% were found to be non-anaemic while 37.74% were anaemic. Whereas those who were not consuming deworming tablets, 42.5% were found to be non-anaemic and 57.5% were anaemic. The difference was found to be statistically significant.

Another study conducted in Bihar and Uttar Pradesh, India among adolescents that the study subjects who were not consuming deworming tablets were found to be suffering from moderate to severe anaemia than the study subjects who consumed deworming tablets. Similar to our findings association between anaemia and consumption of deworming tablets was found to be statistically significant.^[16]

CONCLUSION

The present study concluded that the overall prevalence of anaemia among school going adolescents was 54.90%. The prevalence of anaemia was higher among female study subjects than male study subjects. It was observed in our study that the compliance regarding iron folic acid tablets and deworming tablets among study subjects was very poor.

Limitations of study: It is a single centre study in particular area of Punjab hence it has limited generalisation.

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