



TO ASSESS ROLE OF NUTRITION IN ADOLESCENT GIRLS WITH ANEMIA

Dr Aruksita Bisht*	Department of Obs and Gynae, GSVM medical college, Kanpur, Uttar Pradesh, India. *Corresponding Author
Dr Seema Dwivedi	Professor, Department of Obstetrics and gynaecology, GSVM medical college, Kanpur, Uttar Pradesh, India.
Dr Pratima Verma	Associate Professor, Department of Obstetrics and gynaecology, GSVM medical college, Kanpur, Uttar Pradesh, India.
Dr Preeti Tyagi	Associate Professor, Department of Obstetrics and gynaecology, GSVM medical college, Kanpur, Uttar Pradesh, India.

ABSTRACT **Background:** Adolescent girls are at a high risk for anaemia and malnutrition and inadequate nutrition during adolescence can have serious consequences throughout the reproductive years of life and beyond. This study was conducted to highlight the problem of anaemia in adolescent girls and to study sociodemographic factors related to anaemia and role of nutritional education to improve the micronutrient intake was considered. **Methods:** A complete enumeration cohort study was conducted for 1 year to assess iron deficiency anaemia and associated factors among adolescent girls from age 15-19 yrs in Government schools of Kanpur Nagar. The study was approved by the Ethical Committee of the Faculty of GSVM medical college, Kanpur, Uttar Pradesh with approval number 321/UN6.KEP/EC/2018. **Results:** In our study, total 389 participants were enrolled, in which total 213 (54.76%) in anemic and 176 (45.24%) in non-anemic group. Moreover, the anemic girls were significantly more (commonly) in lower middle class, and lower class. The anemic girls were significantly more (commonly) in rural area as compared to non-anemic group. Anemia in a teenage girl was protected against by the mother's educational level. Moreover, after proper nutritional education provided to the girls, total 29.58% girls were change from anemic to non-anemic group at 3 months and total 53.05% girls were change from anemic to non-anemic group at 6 months of follow up. **Conclusions:** We conclude that adolescent girls have tendency to consume junk food and not enough food rich in iron sources. Thus increasing awareness and knowledge among adolescent girls will improve anemia in long run. And potential of applying this experience (study) through schools, colleges and other organisations reaching adolescent girls provides an exciting and feasible opportunity.

KEYWORDS : Adolescent, Anemia, nutrition, education.

INTRODUCTION

The Latin term "Adolescere," which meaning "to grow" or "become mature," which means "to grow" or "become mature." The development process speeds up from the puberty stage, which lasts from 11 to 13 years old. As a result, it's important to inform this demographic about dietary, health, and reproductive difficulties. This population needs to be educated, especially girls and women, who will soon be mothers. Every nation needs healthy mothers for its development. Children can only be raised by women who are in good health.

The shift from a dependent childhood to an independent adulthood occurs during adolescence, according to the World Health Organization (WHO), which is defined as the period between the ages of 10 and 19^[1]. Teenagers make up about 1.2 billion of the world's population, or more than 18%. About 90% of them live in developing countries, and 600 million of them are female.

Adolescent girls are at a high risk for anaemia and malnutrition. Inadequate nutrition during adolescence can have serious consequences throughout the reproductive years of life and beyond. Very often, in India, girls get married and pregnant even before the growth period is over, thus doubling the risk for anaemia. During this period, iron requirements increase dramatically as a result of the expansion of the total blood volume, the increase in lean body mass and the onset of menses in young females. The overall iron requirements increase from a preadolescent level of ~0.7-0.9 mg Fe/d to as much as 2.2 mg Fe/d or perhaps more in heavily menstruating young women.^[2-6]

In response to the problem, the Government Of India launched The POSHAN Abhiyan in March 2018 with the goal of reducing anaemia.^[9] The Anaemia Mukh Bharat strategy was created to help India meet the goals of the NITI Aayog-set POSHAN Abhiyan and National Nutrition Strategy. Through the Anaemia Mukh Bharat strategy, it has been decided to lower the prevalence of anaemia by three percentage points annually across all age groups from 2018 to 2022.^[10]

Nutrition is the science of food and its relationship to health. Food plays an important role in health as well as in disease.^[11] With the

current increase in lifestyle disorders around the world, it is important to promote healthy nutrition in all age groups. Improving eating habits is not just for an individual but for the whole population. Nutrition is double edged sword as both over and under nutrition is harmful to health.

Iron Deficiency Anemia

Iron is present in foods of both animals and vegetable origin, but it is absorbed well from those of animal origin. Foods relatively rich in iron include red meat (especially liver), dark green leafy vegetables, pulses, and tubers. Absorption of iron can be greatly enhanced by consuming foods of animal origin and also by increasing dietary vitamin C content. The presence of certain substances in cereals and in tea and coffee seriously inhibits iron absorption. Tea and coffee contain significant quantities of absorption-inhibitors and should therefore be drunk 2 hours before or after meals rather than with them.

Micronutrient deficiency may have bearing upon improper dietary practices such as inadequate food allocation in the family and individual likes and dislikes, high phytate content of Indian diet, worm infection, parents' education, living conditions, family income, fathers' income, family size, fathers' profession, and physical activities.

Micronutrient deficiency leads to poor physical and mental health among adolescent children. In fact, nutritional education to improve the micronutrient intake is considered to be necessary. Food-based approaches with dietary diversification and provisions of hygienic environment are important sustainable strategies for correction of micronutrient deficiency. Educational strategies focussing on consumption of balanced diet along with provision of variety of nutrient rich healthy food, are needed.^[12,13] This study was conducted to highlight the problem of anemia in adolescent girls and to study sociodemographic factors related to anemia and role of nutritional education to improve the micronutrient intake was considered.

METHODS

A complete enumeration cohort study was conducted for 1 year to assess iron deficiency anemia and associated factors among adolescent girls from age 15-19 yrs in Government schools of Kanpur Nagar. The study was approved by the Ethical Committee of the Faculty of GSVM medical college, Kanpur, Uttar Pradesh with approval number

321/UN6.KEP/EC/2018.

Consent–

Assent will be taken from all participants. All details of participating individuals will be recorded. After establishing rapport with the students, a questionnaire will be filled by the students, based on the dietary habits, eating pattern.

Thereafter session will be taken to create awareness regarding nutritional value of food, importance of fortified foods available over the counter, role of albendazole and role of multivitamin.

- Adolescent girls which screened positive for anemia were enrolled into the study as study population.
- Information's will be gathered on –
- 1) patients particulars, education status, height, weight, BMI, parent's education status and income, history of worm infestations
- 2) eating habits, dietary pattern, history of intake of iron supplementation
- General examination, relevant investigations will then be done

Blood samples were taken from anterior cubital vein and Haemoglobin Estimation was done by Sahli's Method after taking the consent of the subjects on prescribed proforma.

If the haemoglobin level is <12 gm/dl for the participant, it indicated the presence of anemia.

Based on WHO classification, Hb level <8 gm/dl was considered severe anemia, Hb 8-10.99 gm/dl as moderate anemia and 11-11.9 gm/dl as mild anemia.

The above data will be taken and is taken as baseline at the time of enrollment of the girls.

Nutritional counseling will be taught to the adolescent girls which were screened positive for anemia, by –

- 1) Group counseling
- 2) Pamphlets distribution
- 3) Audio visual aid

Group counseling shall cover the following areas –

- 1) Essential nutrients
- 2) Diet diversity

Repeat investigations and questionnaire will be filled by the adolescent girls which were screened positive for anemia after 3 and 6 months.

The girls were also advised to increase the number of daily meals with vitamin c rich foods in combination with iron rich foods daily.

Household Dietary Diversity Score –(HDDS)

The DDS was calculated by summing the number of different food groups irrespective of the amount consumed over the past 24-hour period. It was classified as poor, medium, and high DDS if the participants consume 3, 4–6, and > 6 food items in the last 24 hrs

RESULTS

Table 1. In this study, total 389 participants were enrolled, in which total 213 (54.76%) in anemic and 176 (45.24%) in non-anemic group

Table 1: Distribution Of Girls According To Anemic Status

	n	%
Non-anemic group	176	45.24
Anemic group	213	54.76

Modified Kuppaswamy scale was used to assess the socioeconomic status of the family. A statistically significant association of anemia was found with the socio-economic status. The percentage of upper class, upper middle class, middle class, lower middle class, and lower class Social-economic status were 9.66%, 26.14%, 42.05%, 19.89%, and 2.27% in Non-Anemic group and 4.69%, 14.08%, 46.48%, 30.05%, and 4.69% in anemic group. Moreover, the anemic girls were significantly more (commonly) in lower middle class, and lower class.

The percentage of rural and urban was 9.09% and 90.91% in Non-Anemic group and 26.76% and 73.24% in anemic group. Moreover, the anemic girls were significantly more (commonly) in rural area as compared to non-anemic group.

Table 2: Comparison Of Frequencies Of Different Social-economic Status In Non-anemic And Anemic Group

Social-economic status	Non-Anemic group (n=176)		Anemic group (n=213)		Total	Chi Sq.	p-Value
	n	%	n	%			
Upper Class	17	9.66	10	4.69	27	16.49	0.002*
Upper Middle Class	46	26.14	30	14.08	76		
Middle Class	74	42.05	99	46.48	173		
Lower Middle Class	35	19.89	64	30.05	99		
Lower Class	4	2.27	10	4.69	14		

*=Significant (p<0.05)

Table 3: Comparison Of Frequencies Of Different Residence In Non-anemic And Anemic Group

Residence	Non-Anemic group (n=176)		Anemic group (n=213)		Total	Chi Sq.	p-Value
	n	%	n	%			
Rural	16	9.09	57	26.76	73	18.60	<0.001*
Urban	160	90.91	156	73.24	316		

*=Significant (p<0.05)

The percentage of Illiterate, Up to Primary, High School, Intermediate and Graduation Education of HOF were 4.55%, 4.55%, 0.00%, 11.36%, 79.55% in Non-Anemic group and 7.51%, 15.49%, 3.76%, 5.63%, and 67.61% in anemic group. Moreover, the frequencies of education of head of family (HOF) up to primary were significantly more (commonly) in the anemic girls as compared to non-anemic group.

Table 4: Comparison Of Frequencies Of Different Education Of HOF In Non-anemic And Anemic Group

Education of HOF	Non-Anemic group (n=176)		Anemic group (n=213)		Total	Chi Sq.	p-Value
	n	%	n	%			
Illiterate	8	4.55	16	7.51	24	24.67	<0.001*
Up to Primary	8	4.55	33	15.49	41		
High School	0	0.00	8	3.76	8		
Intermediate	20	11.36	12	5.63	32		
Graduation	140	79.55	144	67.61	284		

*=Significant (p<0.05)

The comparison of frequencies of different nutritional pattern in anemic group. Out of 213 anemic girl at registration, only 150 girls were anemic at 3 month and 113 girls at 6 months follow-up. Moreover, total 29.58% girls were change from anemic to non-anemic group at 3 months and total 53.05% girls were change from anemic to non-anemic group at 6 months. The frequencies of girls on the basis of drink tea/coffee, take green leafy Vegetable do you take in diet, fruit per day, eat junk, fried food or carbonated drinks (cold drinks every day, Iron supplementation, feel tired, dizzy or faint, and medicine used to kill worms were significantly different in followup..

Table 06: Changes Of DDS (Dietary Diversity Score) And Meals Frequency Per Day From Enrolment To 6 Month

N=389	At enrolment		At 3 months follow up		At 6 months follow up	
Variables	N	%	N	%	n	%
DDS (Dietary diversity score)						
0 – 3	105	26.99	88	22.62	54	13.88
4 – 6	180	46.27	174	44.73	186	47.81
>6	104	26.74	127	32.65	149	38.30
Meals frequency per day						
Twice	59	15.17	46	11.83	32	9.67
Three or more	330	84.83	343	88.17	299	90.33

Table 05: Comparison Changes Of Frequencies Of Different Nutritional Pattern From Registration To 6 Months Follow Up In Anemic Group

		At registration		At 3 months				At 6 months				
		Anemic group (n=213)		Non Anemic (n=63)		Anemic (n=150)		Non Anemic (n=100)		Anemic (n=113)		p-Value
		n	%	n	%							
How often do you drink tea/coffee?	>once per week	0	0.00	10	15.9	0	0.0	55	55.0	0	0.0	<0.001*
	once a day	117	54.93	40	63.5	102	68.0	36	36.0	50	44.2	
	>2 times a day	96	45.07	13	20.6	48	32.0	9	9.0	53	46.9	
How much Amount of Green leafy Vegetable do you take in diet?	>2 times per week	16	7.51	10	15.9	20	13.3	30	30.0	10	8.8	<0.001*
	<one time per month	165	77.46	15	23.8	100	66.7	10	10.0	86	76.1	
	one time per month	32	15.02	38	60.3	30	20.0	60	60.0	17	15.0	
do you take at least one serving of fruit per day?	Yes	32	15.02	40	63.5	50	33.3	90	90.0	23	20.4	<0.001*
	No	181	84.98	23	36.5	100	66.7	10	10.0	80	70.8	
how often do i eat junk , fried food or carbonated drinks (cold drinks) ?	very rare	89	41.78	40	63.5	20	13.3	80	80.0	3	2.7	<0.001*
	Occasional	64	30.05	10	15.9	10	6.7	10	10.0	10	8.8	
	Every day	60	28.17	13	20.6	120	80.0	10	10.0	100	88.5	
Do you take any Iron supplementation?	Yes	0	0.00	50	79.4	0	0.0	90	90.0	0	0.0	<0.001*
	No	213	100.00	13	20.6	150	100.0	10	10.0	113	100.0	
do you feel tired , dizzy or faint sometimes ?	Yes	189	88.73	53	84.1	150	100.0	97	97.0	113	100.0	<0.001*
	No	24	11.27	10	15.9	0	0.0	3	3.0	0	0.0	
Do you take any medicine to kill worms?	Yes	0	0.00	10	15.9	0	0.0	100	100.0	0	0.0	<0.001*
	No	213	100.00	53	84.1	150	100.0	0	0.0	113	100.0	

Table 07 show the change the anemic status of participants after 6 months. The percentage of non-anemic, mild anemic, moderate anemic and severe were 45.24 36.76 14.65 3.34 at registration, 58.10 28.28 13.88 1.29% at 3 month and 72.75 16.20 11.05 0.00% at 6 month, respectively. The change the anemic status of participants was significantly decreased after 6 months as compared to registration and at 3 month

Table 07: Change The Anemic Status Of Participants After 3 Months And 6 Months

	At Registration		At 3 month follow-up		At 6 month follow-up		Chi Sq.	p-Value
	n	%	n	%	n	%		
Non-Anemic	176	45.24	226	58.10	283	72.75	65.25	<0.001*
Mild Anemic	143	36.76	110	28.28	63	16.20		
Moderate Anemic	57	14.65	54	13.88	43	11.05		
Severe	13	3.34	5	1.29	0	0.00		

*=Significant (p<0.05)

DISCUSSION

In our study, total 389 participants were enrolled, in which total 213 (54.76%) in anemic and 176 (45.24%) in non-anemic group. Moreover, out of 389, total 176 girls were no anemic, whereas 143 (36.76%) girls had mild anemia and 60 (14.65%) had moderate anemia and 13 (3.34%) had severe anemia. Verma et al. (2022), reported that the total prevalence of anemia was present in 56.32% of teenage girls, with mild anaemia accounting for 51.70% of cases, moderate anaemia for 39.54%, and severe anaemia for 8.81% of cases.^[14] The results of our investigation agree with those of prior studies.^[15-17]

In this study the percentage of upper class, upper middle class, middle class, lower middle class, and lower class Social-economic status were 9.66%, 26.14%, 42.05%, 19.89%, and 2.27% in Non-Anemic group and 4.69%, 14.08%, 46.48%, 30.05%, and 4.69% in anemic group. Moreover, the anemic girls were significantly more (commonly) in lower middle class, and lower class. According to Chandrakumari et al. (2019), the majority of the girls (79.22%) belonged to socioeconomic class IV, whereas the percentages of females in classes III, V, and II were 11.37%, 6.67%, and 2.74%, respectively.^[18] Girls did not attend class I. Girls in class V had the highest prevalence of anaemia (70.59%), followed by those in class IV (50.49%) and class III (34.48%). It was discovered that this was statistically significant. Anemia is highly prevalent among lower socioeconomic group members, according to other research of a similar nature undertaken to study anaemia in females from Uttar Pradesh, Nagpur, Chandigarh, and Delhi. According to Verma et al. (2022), anaemia was linked to a girl's lower socioeconomic position and the number of siblings. Low Hb levels were associated with unfavourable living circumstances, including a high prevalence of parasitic illnesses and undernutrition, which were made worse by subpar sanitary conditions and housing.

In this study the percentage of rural and urban was 9.09% and 90.91% in Non-Anemic group and 26.76% and 73.24% in anemic group. Moreover, the anemic girls were significantly more (commonly) in rural area as compared to non-anemic group. Other studies carried out in diverse rural areas of India indicated prevalence rates between 46% and 68.8%; Anemia was shown to be quite common (88.3%) in a community-based study of rural adolescent girls (12–19 years) in 2017. According to Kaur et al study 's in rural Wardha, the prevalence was higher among those who were undernourished (5th percentile) with 66.7%. Anemia frequency varies greatly across India, with rural Rajasthan having a particularly high prevalence.

Previously, According to a study, there was no statistically significant difference between the two groups in terms of education level (p = 0.144), household monthly income (p = 0.202), father and mother education (p = 0.198 and 0.186, respectively), mother's occupation (p = 0.331), and father's occupation (p = 0.221). Anemia in a teenage girl was protected against by the mother's educational level. Similar results have also been observed by other investigations. Many additional health metrics, such as infant and child mortality, have shown that a mother's education has a positive impact.

In our study the percentage of semi-skilled, skilled, business, and professional occupation of HOF were 40.00%, 6.82%, 31.82%, 61.36% in Non-Anemic group and 11.74%, 9.39%, 30.05%, and 48.83% in anemic group. Moreover, the frequencies of Semi-skilled occupation of head of family (HOF) were significantly more (commonly) in the anemic girls as compared to non-anemic group. According to Jeihooni et al., there was no statistically significant difference in the occupation of the mother (0.331) or the father (p = 0.221) between the anaemic and non-anemic groups.

In this study, the percentage of <10000, 10000-40000 and >40000 Income (/month) of HOF were 2.27%, 4.55%, and 93.18% in Non-Anemic group and 5.63%, 19.25%, and 75.59% in anemic group. Moreover, the 40,000 monthly income) of HOF was significantly more (commonly) in the anemic girls as compared to non-anemic group. According to Kamalaja et al. (2018), the subjects' families made the most money between Rs. 5000 and 10,000 (49%) followed by Rs. 10,000 to 15,000 (23%) and Rs. 15,000 per month. The prevalence of anaemia and iron deficiency anaemia declines from the lowest to the highest quartile of household income, according to a population-based study on anaemia in teenage females.

In this study the percentage of Underweight, Normal weight, Overweight and Obese were 0.00%, 100.00%, 0.00%, 0.00% in Non-Anemic group and 7.51%, 77.46%, 15.02%, and 0.00% in anemic group. Moreover, the overweight girls were significantly more (commonly) in the anemic group as compared to non-anemic group.

In our study the frequencies of girls which take >2 times a day drink tea/coffee, <one time per month green leafy Vegetable do you take in diet, no fruit per day, eat junk , fried food or carbonated drinks (cold drinks every day, no Iron supplementation, feel tired , dizzy or faint,

and no medicine used to kill worms were significantly more in anemic group as compared to non-anemic group. Moreover, out of 213 anemic girl at registration, only 150 girls were anemic at 3 month and 113 girls at 6 months follow-up. Moreover, total 29.58% girls were change from anemic to non-anemic group at 3 months and total 53.05% girls were change from anemic to non-anemic group at 6 months. The frequencies of girls on the basis of drink tea/coffee, take green leafy Vegetable do you take in diet, fruit per day, eat junk , fried food or carbonated drinks (cold drinks every day, Iron supplementation, feel tired , dizzy or faint, and medicine used to kill worms were significantly different in follow-up.

In this study the percentage of different history of excessive bleeding during menses was 0.0% in Non-Anemic group and 45.07% in anemic group. Moreover, the different history of excessive bleeding during menses in girls was significantly more (commonly) in the anemic group as compared to non-anemic group. Some women are not moved by the severity of their condition, even when it results in possibly fatal anaemia due to chronic, excessive menstrual blood loss. Women will gain from understanding the negative effects chronic excessive blood loss has on their health. Medical professionals should take aggressive steps to address this clinical concern since chronic excessive blood loss should be recognised as an urgent and potentially recurring issue. In women with IDA associated with menorrhagia and excessive uterine haemorrhage, intravenous iron therapy has been compared to oral iron. It has been demonstrated that intravenous iron dramatically increases Hb levels more than oral iron. However, the serious adverse reactions and repeated doses associated with intravenous iron preparations have their own drawbacks. In our study the change the anemic status of participants was significantly decreased after 6 months as compared to registration.

DECLARATIONS

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Ethical approval: A complete enumeration cohort study was conducted for 1 year to assess iron deficiency anemia and associated factors among adolescent girls from age 15-19 yrs in Government schools of Kanpur Nagar. The study was approved by the Ethical Committee of the Faculty of GSVM medical college, Kanpur, Uttar Pradesh with approval number 321/UN6.KEP/EC/2018.

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