International Journal of Advances in Medicine
Sharma MK et al. Int J Adv Med. 2019 Aug;6(4):1027-1031
http://www.ijmedicine.com
pISSN 2349-3925 | eISSN 2349-3933
DOI: http://dx.doi.org/10.18203/2349-3933.ijam20193104

Original Research Article

Clinico-hematological profile of anaemia in adolescent girls in a tertiary care hospital of North India

Manoj Kumar Sharma[1]*, Preeti Parashar[2], Neelima Jain[1]

[1]Department of Medicine, Vardhman Mahavir Medical College, New Delhi, Delhi, India
[2]Department of Anesthesia, Maulana Azad Medical College, New Delhi, Delhi, India

Received: 15 June 2019
Accepted: 01 July 2019

***Correspondence:**
Dr. Manoj Kumar Sharma,
E-mail: drmanojsharma04@gmail.com

ABSTRACT

Background: Anaemia in adolescent girls leads to foetal morbidity and mortality in future. The current study was done with the aim to study the clinico-haematological profile of anaemia in adolescent girls in a tertiary care hospital of North India.
Methods: An observational study was conducted among 50 adolescent girls with anaemia (Hb <12 g/dl) in the Department of Medicine in collaboration with Department of Pediatrics and Department of Haematology at VMMC and Safdar-jang Hospital, New Delhi. Detailed previous history of the patients was collected. Blood samples were collected from all the patients and analysed for hematological parameters. Data were analysed statistically and p values less than 0.05 was considered significant.
Results: The prevalence of anaemia was common in the patients of age group of 15-19 years (58%). The common symp-tom observed was fatigue (82%). Pallor was the common sign noticed in 66% patients. Majority of the patients with anaemia belongs to upper lower class (52%). Mean value of haemoglobin was high (7.80±1.22) in microcytic hypo-chromic anaemia compared to other types of anaemia. Serum iron levels were low in both microcytic and dimor-phic group but the difference was statistically not significant (p=0.43). Serum vitamin B12 levels were low in mac-rocytic and dimorphic anaemia and the difference was statistically significant (p=0.001).
Conclusions: This study showed that nutritional deficiency anaemia was more prevalent in adolescent girls of age group between 15-19 years of upper lower socioeconomic status. Nonspecific symptoms like fatigue and weakness should not be ignored in the adolescent girls as they could be important indicators towards incidence of anaemia in these patients.

Keywords: Adolescents, Anaemia, Hematological parameters

INTRODUCTION

Adolescence is an important phase in person's life and starts at the age of 10 years. This phase includes many physical and physiological changes and needs more nutrition to meet the requirements of the body. Nutritional deficiency in adolescent stage, mainly girls are more vulnerable to anaemia. The worldwide prevalence of anaemia in adolescents is 15%.[1] It constitutes about 21% of Indian population. During this time they gain up to 20% of their adult height, almost 20% of adult weight and 40-50% of skeletal muscle mass.[2]

In India, adolescent girls, form a vulnerable group and are at a greater risk of morbidity and mortality. The adolescents are at an increased risk of developing it due to increasing iron demand during puberty, menstrual

losses in cases of females, limited dietary iron intake and faulty dietary habits.[3]

Socio-economic status and parent's education plays a very significant role in preventing the prevalence of anaemia in adolescent age. Hence, there is need to develop strategies for intensive adult education and to improve the socio-economic status of the population.[4] Anaemia in adolescent girls attributes to high rate of abortions, maternal mortality, high incidence of low birth weight babies, and high perinatal mortality.[5]

Despite the high rate of prevalence, the awareness of anaemia and its treatment are relatively low, suggesting a nationwide need for preventing anaemia in India in order to avert and prevent complications of anaemia. Very few studies have been done on anaemia in adolescent girls in India. Hence, the present research is done with the objective of assessing the clinico- hematological profile of anaemia in adolescent girls in a tertiary care hospital of North India.

METHODS

This observational study was conducted in the Department of Medicine in collaboration with Department of Pediatrics and Department of Hematology at VMMC and Safdarjung Hospital, New Delhi. The ethical clearance for the study was obtained from the Institutional ethics committee. All the subjects were well informed about the nature of study and informed consent was obtained. A total of 50 adolescent girls of age between 10-19 years presenting with anaemia (Hb <12 g/dl), attending outpatient department (OPD) or admitted in Departments of Medicine, paediatrics and hematology for the first time to the hospital were included in the study. Study was carried out for two years.

Patients of age <10 years and >19 years, pregnant females, already diagnosed cases of anaemia, patients who have received any hematinics, any red blood transfusion in prior 3 months, substance abusers or mental health or other problems that would make compliance with the study unlikely were excluded from the study.

Detailed history of the patients (including socio-demographic factors like socioeconomic status, dietary history, occupation, patient's education, parent's education, age at menarche) were collected in a predesigned format.

All patients were subjected to detailed clinical examination. Blood samples were collected in EDTA vials for haemoglobin, total leucocyte count (TLC), differential leucocyte count (DLC), peripheral smear, platelet count, reticulocyte count, mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH), mean corpuscular haemoglobin concentration (MCHC) and Red cell distribution width (RDW). These were done by automated cell counter (sysmex kα-21).

Serum iron, TIBC, serum ferritin was determined by chemiluminescence method. Patients with microcytic hypochromic anaemia were also evaluated for gastrointestinal bleed by faecal occult blood test. Serum vitamin B12 and serum folate levels were measured using Chemiluminescent immunoassay on Access 2 Immunoassay System. (Beckman Coulter, Inc., USA). Haemoglobin electrophoresis was done by high performance liquid chromatography (HPLC) method with BIO-RAD VARIANT II machine, to determine abnormal globin chain in suspected cases of thalassemia.

Statistical analysis

The data was entered into Microsoft excel® for analysis. Descriptive statistics i.e. Mean, Median, and Standard deviation (SD) for the continuous variables, and frequency distribution and their percentages for categorical variables was calculated. P value less than 0.05 was considered significant statistically.

RESULTS

Demographic and clinical findings of the 50 patients were given in Table 1. In this study majority of patients were in age groups of 15-19 years (58%) followed by age group of 10-14 yrs (42%). Microcytic hypochromic anaemia was seen in 48% patients followed by macrocytic anaemia in 26%, dimorphic anaemia in 22% and normocytic normochromic anaemia in 6% patients. Majority of the patients with anaemia belongs to upper lower class (52%) followed by lower middle class (30%). Among the study population, 58% of the patients had low calories intake (<2000) as compared to their normal daily requirement and remaining 42% were found to have normal calories intake. Majority of the patients (66%) had body mass index between 18.5-25 kg/m^2. Fatigue was the most common symptom observed (82%) followed by anorexia (64%). Pallor was the most common sign noticed (66%) followed by cheilosis (14%) in the patients. Among the study population, 74% patients were vegetarian and 26% were non-vegetarian. On comparing with the type of anaemia, (34%) vegetarian and (12%) non-vegetarian were in microcytic hypochromic anaemia, among macrocytic anaemia (20%) were vegetarians and (6%) non-vegetarian and however this was statistically insignificant (p-value=0.84) (Figure 1).

Hematological observations in the patients were demonstrated in Table 2. Mean value of haemoglobin was high (7.80±1.22) in microcytic hypochromic anaemia, as compared to macrocytic anaemia (7.47±0.88), dimorphic anaemia (7.14±0.78) and normocytic normochromic anaemia (4.90±0.78). Difference between microcytic and macrocytic group (p=0.39), and between microcytic and dimorphic anaemia (p=0.11) was statistically not significant however, p value

was significant between microcytic and normocytic normochromic group (p=0.001). Similarly, p value for Hb was found to be significant between macrocytic and dimorphic group when compared with normocytic group (p=0.02 and p=0.001 respectively).

Table 1: Demographic and clinical characteristics of the study population (n=50).

Characteristics	Number of patients (N)	Percentage (%)
Age group (years)		
10-14	21	42
15-19	29	58
Body mass index (BMI) (kg/m^2)		
<18.5	17	34
18.5-24.99	33	66
Socioeconomic status		
Upper middle (II)	4	8
Lower middle (III)	15	30
Upper lower (IV)	26	52
Lower (V)	5	10
Type of anaemia		
Microcytic hypochromic anemia	23	46
Macrocytic anemia	13	26
Dimorphic anemia	11	22
Normocytic normochromic anemia	3	6
Dietary pattern		
Vegetarian	37	74
Non-vegetarian	13	23
Symptoms		
Fatigue	41	82
Anorexia	32	64
Shortness of breath	8	16
Palpitation	8	16
Syncope	5	10
Swelling of limbs	4	8
Fever	5	10
Signs		
Pallor	33	66
Icterus	2	4
Hepatomegaly	3	6
Splenomegaly	4	8
Koilonychia	4	8
cheilosis	7	14
Glossitis	2	4
Pedal edema	5	10

Serum iron levels were low in both microcytic and dimorphic group whereas they were normal in other two groups, but the difference of serum iron in microcytic hypochromic and dimorphic anaemia was statistically not significant (p=0.43). Serum vitamin B12 levels were normal in microcytic and normocytic anaemia whereas they were low in macrocytic and dimorphic anaemia and the difference was statistically significant (p=0.001).

*On excluding thalassemia from microcytic group, mean value of serum ferritin for microcytic hypochromic group was 11.46±2.21 (µg/l).

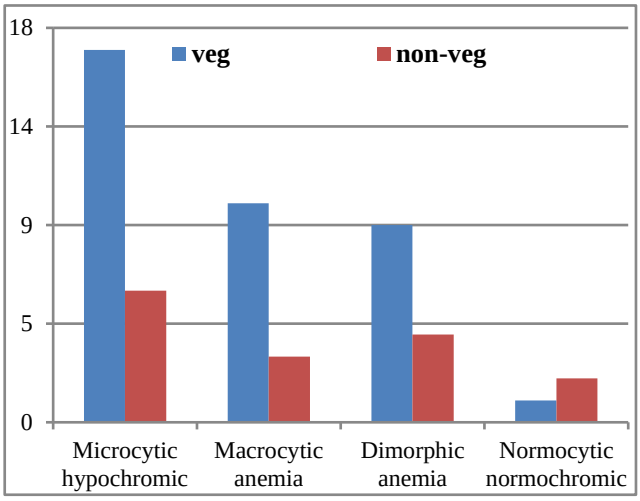

Figure 1: Comparison of dietary pattern with types of anaemia.

The cause of anaemia in the study population was presented in Table 3. Nutritional deficiency was the common cause of anaemia observed in 58% of adolescent girls and it was seen in iron deficiency anaemia, macrocytic anaemia as well as dimorphic anaemia. Menorrhagia was the other cause anaemia in 18% of patients. Worm infestation was seen in 14% of patients out of which 5 patients had hookworm infection and one had round worm and one had mixed infection. 2 girls had thalassemia minor on Hb electrophoresis and they had microcytic hypochromic picture.

Bone marrow examination was done in 6 patients. 3 of these had borderline levels of serum vitamin B12 and folic acid and 3 patients had normocytic normochromic picture who also had pancytopenia which was diagnosed after bone marrow examination as aplastic anaemia where no cause could be found.

DISCUSSION

The aim of this study was to explore the clinico-hematological profile and etiology of anaemia in adolescent girls. Fifty newly diagnosed anaemic adolescent girls between 10-19 years who had haemoglobin <12 gm/dl were included in the study. The prevalence of anaemia was more in the age group of 15-19 years. This was similar to the studies Tesfaye et al, in Ethiopia.[1] In another study by Singh reported similar trend in a study on anaemia among adolescent girls and observed that incidence of anaemia increases from 10 years onwards and continues to remain high till 18 years of age.[6]

Table 2: Mean values of hematological parameters in various types of anaemia.

Haemotological parameters	Microcytic hypochromic (M/H) (Mean±SD)	Normocytic normochromic (N/N) (Mean±SD)	Macrocytic anemia (MA) (Mean±SD)	Dimorphic anemia (D/H) (Mean±SD)
Hb (gm/dl)	7.80±1.22	4.90±0.78	7.47±0.88	7.14±0.78
MCV (fl)	72.25±3.6	90±2.0	123±7.0	100±6.0
MCH (pg)	19.86±1.34	32.9±0.44	36.7±2.32	31.08±2.40
MCHC (g/dl)	27.47±1.06	36.56±0.88	29.8±0.66	30.9±1.51
PCV (ml)	28.4±4.46	13.4±0.95	25.09±3.06	23.1±2.26
Serum iron (µg/dl)	36.8±34.92	142.13±4.3	116.7±9.9	45.28±4.32
TIBC (µg/dl)	466.0±36.9	373.0±26.6	346.5±23.4	377.9±17.9
Serum ferritin (µg/l)	21.36±34.4*	95.5±6.7	134.4±8.2	11.79±2.5
Serum vit B12 (ng/l)	424.2±77.7	396.0±139.0	298.1±124.1	129.1±6.6
Serum folate (ng/l)	9.17±1.9	7.8±1.1	3.68±2.6	2.46±0.27

Table 3: Etiology of anaemia.

Causes	Number of cases	Percentage (%)
Nutritional	29	58
Menorrhagia	9	18
Worm infestation	7	14
Unknown	3	6
Hemoglobinopathies	2	4

The common symptom associated with anaemia was fatigue (82%) and the sign observed was pallor (66%). Among the study population, 74% patients were vegetarians and 26% were non-vegetarian. Verma et al, also quoted that compared to non-vegetarians (38%), more vegetarians (65.9%) were anaemic.[7]

Majority of patients belonged to upper lower class (52%) followed by lower middle class (30%) of socioeconomic status. This association between socio-economic status and prevalence of anaemia in adolescent girls also seen by various authors.[8] In a study by Vasanthi et al, it was found that mean haemoglobin showed a rising trend with improved socioeconomic status and most of the children belonging to lower socio-economic status were anaemic.[9] This may be because of better availability of high quality of food for children with better socio-economic status.

On the basis of peripheral smear examination, patients were classified into four groups. It was found that microcytic hypochromic anaemia was the most common type of anaemia (46%) followed by macrocytic anaemia (26%), dimorphic anaemia (22%) and normocytic normochromic anaemia (6%). Chaudhary et al, in their study on anaemia in adolescent girls in Nagpur also found that microcytic hypochromic picture was more common than other types of anaemia.[8]

In this study, the difference of mean value of haemoglobin between microcytic and macrocytic group (p=0.39), and between microcytic and dimorphic anaemia (p=0.11) was not significant statistically. However, the difference between microcytic and normocytic normochromic group (p=0.001) value was significant statistically. Serum iron levels were low in both microcytic and dimorphic group whereas they were normal in other two groups, but the difference of serum iron in microcytic hypochromic and dimorphic anaemia was statistically not significant (p=0.43). Serum ferritin value in microcytic group was high (21.36±34.4) because out of total 23 patients in microcytic group 2 patients of thalassemia had normal to high levels of serum ferritin. On excluding thalassemia group mean and SD of serum ferritin was 11.46±2.21. Serum vitamin B12 levels were normal in microcytic, normocytic and macrocytic anaemia whereas they were low dimorphic anaemia and difference was statistically significant (p=0.001) between macrocytic and dimorphic anaemia. The possible reason of getting vitamin B12 levels in normal range in macrocytic anaemia may be because most of the patients in the macrocytic group were folic acid deficient.(i.e.7 out of total 13 were folic acid deficient, 3 had both borderline folic acid and vitamin B12 levels and remaining 3 were vitamin B12 deficient). In a study done by Haq et al, it was observed that folic acid deficiency was the most common cause of megaloblastic anaemia (62.5%) followed by Vitamin B12 deficiency (30%) and 7.5% had normal levels of vitamin B12 and folic acid.[10] These results were also in agreement with study by Gracia-Casal et al.[11]

Our study also revealed that 58% of the patients had low calories intake (<2000 kcals) and remaining 42% were found to have normal calories intake. Nutritional deficiency was the cause of anaemia in 58% of adolescent girls and it was seen in iron deficiency anaemia, macrocytic anaemia as well as dimorphic anaemia. Kapoor et al, also found that anaemia was more common in undernourished adolescent girls.[12] Similarly, study by Das showed 80-85% of anaemia was due to nutritional factor with iron deficiency anaemia in up to 70% cases.[13]

In the present study, nutritional deficiency was found to be the main cause for anaemia. This was in accordance with the findings of Tesfaye et al.[1] Menorrhagia was the other cause of iron deficiency anaemia in 18% of patients observed. Worm infestation was seen in 14% of patients out of which 5 patients had hookworm infection, one had round worm and one had mixed infection. Patients with menorrhagia had microcytic hypochromic anaemia whereas those with worm infestation had microcytic and dimorphic anaemia.

CONCLUSION

The findings of the study conclude that the prevalence of anaemia was more in adolescents of age group between 15-19 years. The main etiology associated with the prevalence was under-nutrition and iron deficiency in diet besides other factors. Hence, need for routine iron supplementation should be considered to meet the physical and physiological requirements of adolescents. Nonspecific symptoms like fatigue and weakness should not be ignored in the adolescent girls as they could be important pointers towards presence of anaemia in these patients. An effort should always be made to reach etiological diagnosis before instituting specific therapy.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Sharma MK, Parashar P, Jain N. Clinico-hematological profile of anaemia in adolescent girls in a tertiary care hospital of North India. Int J Adv Med 2019;6:1027-31.