Case Report

Clinical profile of severe anemia in adolescents from a hilly terrain tertiary care hospital in north India

Kumar P.[1], Sharma S.[2], Sharma M.[3], Patel A.[4]

[1]Dr. Pradeep Kumar, Senior Resident, [2]Dr. Seema Sharma, Associate Professor, [3]Dr. Milap Sharma, Assistant Professor, [4]Dr. Ashish Patel, Junior Resident, all authors are affiliated with Department of Pediatrics, Dr. Rajendra Prasad Govt. Medical College, H.P, India.

Corresponding Author: Dr. Seema Sharma, House No 23, Block-B, Type-V, DR. RPGMCH, Kangra at Tanda, H.P. India. E-mail: dr.seema73.ss@gmail.com, E mail: seema406@rediffmail.com

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Abstract

Introduction: Adolescence is a vulnerable period for development of anemia. Anemia in adolescence has serious implications for a wide range of outcomes. It causes reduced resistance to infection, impaired physical growth and mental development, reduced physical fitness, work capacity and school performance. **Objectives:** The aim of the present study was to study the clinical profile of the adolescents (10-18 years) admitted with severe anemia. **Methods:** A hospital based retrospective study was conducted in the Department of Pediatrics, Dr Rajendra Prasad Government Medical College Kangra, a tertiary care institute in North India, during the period from January 2015 to December 2016. The participants in our study were the adolescent patients (10-18 years) admitted with primary diagnosis of severe anemia (Hemoglobin <7gm %). The diagnosis of type of anemia was based on hematological indices and red cell morphology on peripheral smear. **Results:** There were 39 patients admitted with severe anemia. This constituted 1.90% of all the admissions during the study period. The mean age of the patients was 14.97 ($\pm$ 1.86) years and the mean hemoglobin was 4.66 ($\pm$1.28) gm%. There was a female preponderance with 66.67% females as against 33.33% males. Megaloblastic anemia was the most common type of anemia (52.28%) followed by iron deficiency anemia (30.77%) and dimorphic anemia (15.38%). All of the patients belonged to poor socioeconomic status and most of them (89.74%) were vegetarian. **Conclusion:** Although iron deficiency anemia is the most common type of anemia in India, yet in adolescents megaloblastic and dimorphic anemia should be looked for whenever the adolescents present with severe anemia especially in the setting of malnutrition and dietary inadequacy.

Keywords: Adolescence, Anemia, Megaloblastic anemia

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Introduction

Anemia is a major health problem worldwide. It affects mostly preschool children, adolescents and pregnant women. There are about 1.2 billion adolescents in the world, which is equal to 1/5th of the world's population and their numbers are increasing. Out of these, 5 million adolescents are living in developing countries. India's population has crossed the 1 billion mark, out of which 21% are adolescents [1].

Adolescent period is very crucial, since these are the formative years in the life of an individual, when major physical, psychological and behavioral changes take place. The nutritional and the health needs of the adolescents are also more because of the growth spurt and the increase in physical activity in them [2].

In females, adolescence also marks the beginning of the menstrual cycle or reproduction. Adolescent girls are, therefore, at a high risk for anemia and malnutrition. Inadequate nutrition during adolescence can have serious consequences throughout their reproductive years of life and beyond [3]. Very often, in India, girls get married and pregnant even before the growth period is over, thus doubling the risk for anemia [4].

Iron deficiency anemia is the most prevalent anemia in adolescent age group in India. Several community studies have reported upto 60% of adolescents having iron deficiency anemia [5,6]. Some community based studies showed that megaloblastic anemia is also common in India. However, severe anemia is uncommon and can have varied etiology [7,8]. Hospital based studies on patients admitted with severe anemia are lacking. So, the present study was conducted to find

the profile of adolescent (10-18 Years) patients with primary diagnosis of severe anemia in a tertiary care hospital.

Material and Methods

Place of study- The present study was conducted in the Department of Pediatrics, Dr Rajendra Prasad Government Medical College Kangra, a tertiary care institute in North India.

Type of study- The present study was a hospital based retrospective study conductedduring the period from January 2015 to December 2016. The participants in our study were the adolescent patients (10-18 years) admitted with primary diagnosis of severe anemia (Hemoglobin < 7gm %).

Inclusion Criteria- All the patients in the age group of 10-18 years with severe anemia requiring hospital admission for the first time due to anemia were included in the study group.

Exclusion Criteria- The patients, who had other co-morbid conditions causing anemia like hematological malignancy, chronic illness like chronic renal failure, immunodeficiency, tuberculosis etc. were excluded from the study. The cases that were diagnosed previously and were admitted for either transfusions of

blood or its components or for other reasons were also excluded from the study.

Data collection- Out of all patients admitted in Dr Rajendra Prasad Government Medical College Kangra from January 2015 to December 2016, adolescent patients (10-18 years) were selected. Out of these adolescent, case files of those admitted with severe anemia for the first time were reviewed.

Investigations- All the study cases had undergone complete hemogram and peripheral smear examination. The hemoglobin was estimated by Sahli's method and expressed in gm%, peripheral smear was stained by Leishman's stain. PCV, MCV, MCH, MCHC and RDW were determined by automated cell counter. Normal values were taken as follows: PCV 35-45%, MCV 77-95fl, MCH 25-33pg, MCHC 31-37gm/dl and RDW 14.5-18.5. Reticulocyte count was done by Brilliant crystal stain method. Vitamin B12 levels, serum folate levels, iron studies and bone marrow examination could not be done in all the patients due to financial constrains. Hence, the diagnosis of type of anemia was based on hematological indices and red cell morphology on peripheral smear.

Diagnostic criteria for type of anemia- The diagnosis of type of anemia was based on hematological indices and red cell morphology on peripheral smear.

Results

A total of 8635 patients were admitted in pediatric wards at this institute from January 2015 to December 2016, of which 2053 (23.78%) belonged to adolescent age group (10-18 years). Out of 2053 adolescent patients 1159 (56.45%) were male and 894 (43.55%) were female. 39 (1.90%) of these adolescent patients were admitted with the primary diagnosis of severe anemia (Hb< 7 gm/dl).

Among the 39 patients, 13 (33.33%) were male and 26 (66.67%) were female patients. Maximum number of 19 (48.72%) patients was from age group 13-15 years, followed by 16 (40.02%) patients from age group 16-18 years. (Table 1)

Table- 1: Age and sex wise distribution of patients with severe anemia.

Age Group	Male	Female	Total
10-12 Year	1	3	4
13-15 Year	7	12	19
16-18 Year	5	11	16
Total	13	26	39

Most patients presented with easy fatigability (84.62%), Breathlessness on exertion (61.54%) and progressive paleness (58.97%). Other important symptoms on presentation were decreased appetite (30.77%), palpitations (20.51%), fever (15.38%), lethargy (12.82%), pain abdomen (7.69%) and swelling over body (5.13%). Most common findings were pallor (100%), splenomegaly (58.97%) and hepatomegaly (53.85%). Other important signs detected were haemic murmur (33.33%), knuckle hyperpigmentation (25.64%) and icterus (17.95%). Signs of congestive cardiac failure were present in 17.95% patients. Tongue and nail changes were observed in 17.95% and 15.38% patients respectively.

Table-2: Distribution of the patients as per the clinical feature.

Clinical Features	Number	Percentage
Symptoms		
Easy Fatigability	33	84.62
Breathlessness on exertion	24	61.54
Progressive paleness	23	58.97
Decreased appetite	12	30.77
Palpitations	8	20.51
Fever	6	15.38
Lethargy	5	12.82
Pain abdomen	2	7.69
Swelling over body	2	5.13
Signs		
Pallor	39	100
Splenomegaly	23	58.97
Hepatomegaly	21	53.85
Haemic murmur	13	33.33
Knuckle hyperpigmentation	10	25.64
Icterus	7	17.95
Congestive cardiac failure	7	17.95
Tongue changes	7	17.95
Nail changes	6	15.38

On peripheral smear examination microcytic hypochromic picture was seen in 12 (30.77%), macrocytic hypochromic picture was seen in 20 (51.28%) and dimorphic picture was seen in 6 (15.38%) of patients.In 01 (2.56%) patient normocytic normochromic picture was detected.

In the current study megaloblastic anemia was most common followed by iron deficiency anemia and dimorphic anemia. (Figure 1) Iron deficiency anemia was found in 12 (30.77%) patients, the prevalence being more in females i.e. 20.51% as against 10.25% in males. The megaloblastic anemia was found in 20 (51.28%) patients, with 13 (33.33%) female as against 7 (17.94%) male patients. The dimorphic anemia was detected in 6 (15.38%) patients, with 5 (12.82%) female and 01 (2.56%) male patients. One patient (2.56%) was found to have aplastic anemia.
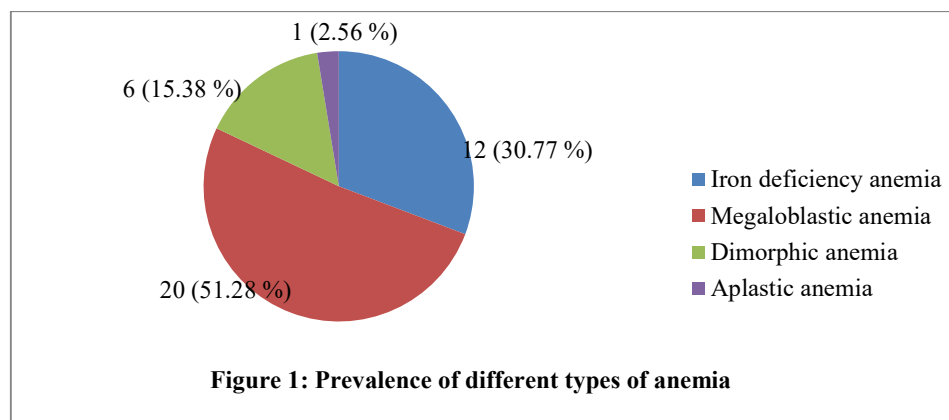
Figure 1: Prevalence of different types of anemia

In iron deficiency anemia MCV, MCH and MCHC were found decreased. In megaloblastic anemia MCV and MCH were increased whereas MCHC was found normal. In dimorphic anemia variations were seen in these red cell indices. RDW was done in 24 patients. It was found increased in cases of iron deficiency anemia and dimorphic anemia. Reticulocyte count was done only in 10 patients and it was normal in all these patients. (Table 3)

Table-3: Relation of RBC indices in anemia.

Parameter	Iron deficiency anemia	Megaloblastic anemia	Dimorphic anemia	Aplastic anemia
MCV Normal			2 (5.13 %)	1 (2.56 %)
MCV Decreased	12 (30.77 %)			
MCV Increased		20 (51.28 %)	4 (10.26 %)	
MCH Normal		2 (5.13 %)	2 (5.13 %)	1 (2.56%)
MCH Decreased	12 (30.77 %)			
MCH Increased		18 (46.15 %)	4 (10.26%)	
MCHC Normal	1 (2.56 %)	20 (51.28 %)	5 (12.82 %)	1 (2.56 %)
MCHC Decreased	11 (28.21 %)			
RDW Normal	3 (7.69 %)	8 (20.51 %)		
RDWDecreased		1 (2.56 %)		
RDW Increased	5 (12.82 %)	3 (7.69 %)	4 (10.26 %)	

MCV, mean corpuscular volume; MCH, mean corpuscular hemoglobin; MCHC, mean corpuscular hemoglobin concentration; RDW, red cell distribution width.

Most of the patients in this study belonged to class V (53.85%) followed by class IV (43.85%) while one (2.56%) patient belonged to class III of modified Kuppuswamy socioeconomic scale.

Most of the patients in this study were vegetarian (89.74%). Out of 13 male patients 12 (92.31%) and out of 26 female patients 23 (88.46%) were vegetarian. The non-vegetarian constituted only 10.26% of the patients. 74.36% of the patients had calories and protein deficit. Severe thinness (BMI< -3SD) was found in 15.38% patients and thinness (BMI -2SD to - 3SD) was found in 35.64% of the patients. Rest of the patients had normal BMI.

Most the patients in this study were symptomatic from 15-30 days (51.28%). However, 25.64% of the patients presented with symptoms of duration less than 15 day and 23.07% of the patients had symptoms for more than 30 day at presentation. The mean duration of hospital stay was 6.5 (± 2.5) days.

In this study 10.26% patients with iron deficiency anemia, 15.38% patients with megaloblastic anemia and 7.69% patients with dimorphic anemia were transfused packed red blood cells. The remaining patients were managed by oral hematinics and B12 as per protocol.

Discussion

Adolescence is the formative period of life when the maximum amount of physical, psychological, and behavioral changes take place. This is a vulnerable period in the human life cycle for the development of nutritional anemia [9]. Anemia has a negative effect on cognitive performance in adolescents [10]. Compared to the vast amount of work done in pregnant mothers and young children, there are relatively few published studies in India evaluating nutritional anemia and its association with severity of anemia [10].

The present study was conducted to find the profile of adolescent patients admitted with severe anemia. This was a hospital based study on 39 adolescent patients with a 1:2 male-female ratio. The females outnumbered

males. The present study was in accordance with Khanduri et.al [11] and Salma Haq et.al [12] with a female preponderance.

In the present study the incidence of adolescent patients hospitalized with a primary diagnosis of severe anemia was found to be 1.90% where as in a similar study by Patra et al. [7], have reported the incidence of 3.37%. Though iron deficiency anemia has been reported as most prevalent anemia in adolescent age group in India [5, 6], the commonest type of anemia in the present study was megaloblastic anemia (51.28%) followed by iron deficiency anemia (30.77%) and dimorphic anemia (15.38%). One case of aplastic anemia (2.56%) was also found. In the study by Patra, *et al*[7] on severely anemic

adolescents admitted in a tertiary care hospital, megaloblastic anemia was most common type of anemia (42.5%). This was followed by aplastic anemia (27.5%) and iron-deficiency accounting for 15% cases.

Easy fatigability (84.62%), breathlessness on exertion (61.54%) and progressive paleness (58.97%) were the most common symptoms. Other important symptoms on presentation were decreased appetite (30.77%), palpitations (20.51%), fever (15.38%), lethargy (12.82%), pain abdomen (7.69%) and swelling over body (5.13%). Most common findings were pallor (100%), splenomegaly (58.97%) and hepatomegaly (53.85%). Other important signs detected were haemic murmur(33.33%), knuckle hyperpigmentation (25.64%) and icterus (17.95%). Signs of congestive cardiac failure were present in 17.95% patients. Tongue and nail changes were observed in 17.95% and 15.38% patients respectively. Theses clinical features were similar to earlier studies on clinical profile of anemia in children [13,14].

In iron deficiency anemia MCV, MCH and MCHC were found decreased. In megaloblastic anemia MCV and MCH were increased whereas MCHC was found normal. In dimorphic anemia variations were seen in these red cell indices. This is in accordance with the previous studies [15,16].

Global anemia prevalence statistics show that the incidence is higher in developing countries and significantly high in poor socioeconomic countries [17,18]. Most of the patients in this study belonged to class V (53.85%) followed by class IV (43.85%) while one (2.56%) patient belonged to class III of modified Kuppuswamy socioeconomic scale. These findings were in accordance with earlier reported studies [19,20].

Most of the patients in present study were vegetarian (89.74%). Out of 13 male patients 12 (92.31%) and out of 26 female patients 23 (88.46%) were vegetarian. Vegetarianism was significantly associated with severe anemia in the studies by Verma et al [20] and Kakkar et al. [21]. Malnutrition and anaemia are very closely related. In present study severe thinness (BMI< -3SD) was found in 15.38% patients and thinness (BMI -2SD to -3SD) was found in 35.64% of the patients. These findings were similar to the studies by Chhabra et al. [13] and Viswanadhan K [14].

Most the patients in the present study were symptomatic from 15-30 days (51.28%). The mean duration of hospital stay was 6.5 (± 2.5) days. In this study 10.26% patients with iron deficiency anemia, 15.38% patients with megaloblastic anemia and 7.69% patients with dimorphic anemia were transfused packed red blood cells. The remaining patients were managed by oral hematinics.

Limitations- The present study was a hospital based retrospective study dependent on the review of case files of the patients. Certain socio-demographical parameters like type of family, parental educational status, history of worm infestation and menstrual history in female adolescents were not documented in the case records. Investigations like reticulocyte count, red cell distribution width (RDW), serum folate and vit B_{12} level and iron studies could have given strength to our study.

Conclusion

We conclude that Megaloblastic anemia is common in adolescents, which is caused by deficiency of either folate or B12 deficiency. It has a significant correlation with diet pattern as it is more common in vegetarian people and predominantly seen in low socioeconomic status. Along with iron and folic acid, B12 supplementation is needed through nutritional programmes.

Periodic screening of adolescents may detect anemia at early stage and also the need for these supplements. Education about proper dietary habits is very essential. Large scale prospective studies on the prevalence and etiology of severe anemia in adolescents are needed.

What this study adds

Megaloblastic anemia is common in adolescents presenting with severe anemia. It is more common inadolescents on vegetarian diet and belonging to low socioeconomic class.

Contributors: SS and MS have conceptualized the concept. SS, PK, AP and MS were involved into collection of data and its analysis. All authors approved the final manuscript.

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