

Evaluation of the Hematological Parameters in Correlation with Peripheral Smear Examination to Analyze the Prevalence, Type and Severity of Anemia in Different Age and Sex in Shahjahanpur, Uttar Pradesh

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ABSTRACT

Background: Anemia is defined as a decrease in the total amount of Red Blood Cells (RBC) or Hemoglobin in the blood or lowered ability of the blood to carry Oxygen. There are many classifications of anemia but clinically useful approach is alterations in Red Cell morphology including the size and amount of hemoglobin in each cell. According to the WHO, there are two billion people with anemia in the world and half of the anemia is due to iron deficiency. Young children and women of childbearing age are the most affected one. The aim of the study was to assess the hematological parameters along with peripheral blood examination to evaluate the type, severity and prevalence of anemia in various age groups.

Methods: This study was carried out in VAMC & Rohilkhand Hospital for a period of 3 month from March 2017 to May 2017. Total 1140 cases were studied including outdoor as well as indoor. The samples for test were collected in EDTA tube. The slides for peripheral blood examination were prepared and stain with Giemsa. The sample were run in automated cell counter for hematological parameters and RBC indices.

Results: In our study out of 1140 cases 52.63% were male and 47.36% were female and commonest group 46.14% affected were adults followed by the patients in the third decade 20.35%. Results showing high proportion of microcytic hypochromic anemia and their association with women following menarche period indicating iron deficiency as a main cause. Microcytic Hypochromic anemia was commonest morphologically classified anemia 49.10% of which, majority had moderate type 64.47% and majority are females and children followed by normocytic normochromic anemia accounting 40.01% and majority of which had mild type of anemia 62.52% and the predominant age group in this category was elderly. Macrocytic anemia 12.54% does not show any significant variation with severity and age group and only 51 had dimorphic anemia in which 64.7% had mild type.

Conclusion: In different age group the prevalence and the severity of various types of anemia is different, which is because of different etiology. The prevalence of anemia increases with age and is associated with chronic diseases, inflammation, nutritional deficiencies and other conditions such as infection, reduction in bone marrow response. As a result, a diagnosis of anemia warrants adequate clinical attention, to find out the cause, type, severity which provides basis treatment in anemic.

Keywords: Anemia; Hematology indices, Peripheral smear, Shahjahanpur, Uttar Pradesh.

INTRODUCTION

Anemia is defined as a decrease in the total amount of Red Blood Cells (RBC) or Hemoglobin in the blood [1,2] or lowered ability of the blood to carry Oxygen. [3] There are many classifications of anemia but clinically useful approach is alterations in Red Cell morphology including the size and amount of hemoglobin in each cell. [4] If the cells are small, it is microcytic anemia. If they are large, it is macrocytic anemia while if they are normal sized, it is normocytic anemia. [5] Degree of hemoglobinization, reflected in the colour of red cells (normocytic or hypochromic).

According to the World Health Organization, there are two billion people with anemia in the world and half of the anemia is due to iron deficiency. Young children and women of childbearing age are the most affected one. The estimated prevalence of anemia in developing countries is 39% in children <5 years, 48% in the children 5-14 years, 42% in women 15-59 years, 30% in men 15-59 years and 45% in adults >60 years. [6]

Anemia in the elderly is an extremely common problem that is associated with mortality and poorer health related quality of life, regardless of the underlying cause of the low hemoglobin. However anemia should not be accepted as inevitable consequences of ageing. [7] Studies indicate that the prevalence of anemia increases with advancing age and under 75 years, anemia is more common in females, but over 75 years it is more common in males. [8] Multiple pathophysiologic abnormalities in elderly patient with anemia are well known. [9] Various cohort studies have found that the two most common causes of anemia in elderly are chronic disease and inflammation and iron deficiency. [10,11]

In general, microcytic hypochromic anemia are caused by disorders of hemoglobin synthesis (most often iron deficiency), while macrocytic anemia often stem from abnormalities that impair the maturation of erythroid precursors in bone

marrow. Normocytic normochromic anemia has diverse etiologies. [4]

In order to characterize the type of anemia and formulate a differential diagnosis, the work up should include physical exams, hematological parameters including hemoglobin, hematocrit, red blood cell indices like the cell count, MCV, mean corpuscular hemoglobin (MCH), mean corpuscular hemoglobin concentration (MCHC), red cell distribution width (RDW) along with peripheral smear examination to evaluate cell morphology. [12] The cut-offs by the recommended WHO values for hemoglobin were used for defining severity of anemia. [13,14]

The aim of the study was to assess the hematological parameters along with peripheral blood examination to evaluate the type and severity and prevalence of anemia in various age groups.

METHODS

The study was carried out in Varun Arjun Medical College & Rohilkhand Hospital, Banthara, distt. Shahjahanpur, Uttar Pradesh for a period of 3 months. The patients of all age groups attending outdoor as well as indoor were included in study. 1140 patients with hemoglobin concentration (g/dl) for the diagnosis of anemia according to World Health Organisation were selected. The blood samples were collected in EDTA tubes and were immediately analyzed in automated hematology analyzer in clinical Pathology Laboratory. The evaluated parameters included the hemoglobin concentration and red blood cell indices- Mean Cell Volume (MCV), Mean cell hemoglobin (MCH), Mean cell hemoglobin concentration (MCHC), hematocrit (PCV), Red blood cell count, total leucocyte count, differential count and platelet count along with peripheral blood smears.

Haemoglobin concentrations (g/dL) and RBCs indices range for the diagnosis of anemia and assessment of severity according to the World Health Organization.

Age	Mild	Moderate	Severe
6-59 months	10-10.9	7-9.9	< 7
5-11 years	11-11.4	8-10.9	<8
12-14 years	11-11.9	8-10.9	<8
Female>14 years	11-11.9	8-10.9	<8
Male>14years	11-12.9	8-10.9	<8

The reference ranges of following were taken as:

Mean Cell Volume (MCV) = 80-100fl
 Mean cell hemoglobin (MCH) = 27-32pg
 Mean cell hemoglobin concentration (MCHC) = 32-36g/dl.

Microcytic anemia was taken as MCV value less than 80fl and MCH less than 27. Macrocytic was taken when MCV is greater than 100fl. Normocytic Normochromic was taken when all hematological indices are within range.

RESULTS

The observations and results of our study of 1140 subjects by analyzing the hematological parameters, RBC indices and Peripheral blood smear examinations are summarize in the following tables:

Table 1: Gender distribution of subjects

	Total Numbers	Percentage
Male	640	52.63%
Female	540	47.36%

In the study total numbers of males were 600 and female were 540. There was no statistical difference in both genders.

Table 2: Grading of Anemia

Severity of Anemia	Numbers of subjects	Percentage
Mild	542	47.50%
Moderate	482	42.30%
Severe	116	10.20%
Total	1140	100%

In our study, Mild anemia was most common followed by moderate and severe anemia.

Table 3: Gender wise Distribution of Grading of Anemia

	Mild	Moderate	Severe
Male	307(56.79%)	227 (47.01%)	53 (45.33%)
Female	235 (43.21%)	255 (52.99%)	63 (54.67%)
	542(100%)	482 (100%)	116 (100%)

Mild anemia was common in males 56.79%, while moderate and severe anemia was more common in females.

Table 4: Age wise Distribution of Grading of Anemia

Age in years	Mild	Moderate	Severe	Total	Percentage
>40	238	214	54	506	46.14%
31-40	104	100	18	222	20.35%
21-30	74	96	96	196	18.07%
11-20	62	40	40	124	12.63%
<10	30	42	42	92	8.07%

Anemia is most common in adult population, 46.14%, second peak was seen in the age group 31-40(20.35%) and the least common seen in age group <10 years.

Table 5: prevalence of morphological anemia by Peripheral smear examination

Peripheral smear examination	Total subjects	Percentage
Microcytic hypochromic	560	49.12%
Normocytic normochromic	456	40%
Macrocytic	90	7.80%
Dimorphic	34	2.98%

Table 6: Peripheral smear examination in Mild anemia

Peripheral smear examination	Total subjects	Percentage
Microcytic hypochromic	128	23.53%
Normocytic normochromic	338	62.52%
Macrocytic	43	7.94%
Dimorphic	33	6.01%

Table 7: Peripheral smear examination in Moderate anemia

Peripheral smear examination	Total subjects	Percentage
Microcytic hypochromic	310	64.47%
Normocytic normochromic	100	20.82%
Macrocytic	57	11.68%
Dimorphic	15	3.03%

Table-8: Peripheral smear examination in severe anemia

Peripheral smear examination	Total subjects	Percentage
Microcytic hypochromic	53	48.50%
Normocytic normochromic	11	9.88%
Macrocytic	43	39.25%
Dimorphic	3	2.40%

Out of 1140 anemic patients 560 had microcytic hypochromic anemia (49.14%) this is the most common type of anemia in the study. Majority of the subjects (310) had moderate degree of anemia and 116 had mild type followed by severe type of anemia, which is seen in 53 subjects. Majority of patients were female in childbearing age group and children. Out of 1140 456 had normocytic normochromic anemia accounting for 40.0%. 62.52% of Normocytic group had mild anemia. Majority in this group were adult males. Macrocytic anemia accounting for 12.54% of 57 patients in this group (63.3%) had moderate anemia, 43 had severe anemia, and 43 had mild anemia, macrocytic group did not show significant association with the severity. In dimorphic anemia, 33(64.7%) in

this group had mild anemia, 15 had moderate and 3 were in severe category.

In our study it was found that, mild anemia was common in males 52.21%, while moderate and severe anemia was more common in females.

DISCUSSION

In our study by using hematological parameters and peripheral smear examination, anemia was present in the majority of adults and young children. Results showing high proportion of microcytic hypochromic anemia and their association with women following menarche period indicating iron deficiency as a main cause. In the study by Qureshi et al [15] anemia was present in the majority of adults and young children as similar to our study. Other Indian studies have also shown high prevalence of microcytic anemia due to iron deficiency among young women. [16,17] The high prevalence of iron deficiency in women of childbearing age has major public health implications, it is estimated that anemia accounts for 12.8% of maternal mortality in asia [18]

Effective health programs and survey aimed to reduce iron deficiency associated microcytic anemia in women and children have a major impact in reducing maternal, infant and children mortality rate.

In an attempt to explain the different prevalence rates of anemia for men and women, some authors have argued that estrogen act as inhibitors of erythropoietin and make women more vulnerable to the development of anemia. However, while postmenopausal estrogen levels decrease, there is an increase in red cell mass to levels that are similar to those in males, which makes it unreasonable to use different criteria for anemia in each gender. [19,20]

In our study 52.63% were males and 47.36% were females, which was similar to the Kaur et al [21] in which 37% were males and 33% were females, and in contrast to the Chul Won [22] study in which 11.4% were males and 2.1 % were females.

Multiple conditions can lead to anemia in adult person. Moreover, in majority of cases in adult the most common cause include deficiency of iron, chronic disease and inflammation, chronic kidney disease, decrease marrow response along with decreased ratio of bone marrow to fat cells. [23] In various studies it was found that hematopoietic growth factors support stem cell proliferation, differentiation and survival which serve as a primary regulator of RBC production. [24] In another study showing that EPO regulation occurs primarily in kidney with a smaller contribution by liver hepatocytes. [25]

Microcytic Hypochromic anemia was commonest morphologically classified anemia followed by normocytic normochromic anemia accounting 49.10% and 40.01% respectively, similar to the Gerado et al [26] and S Patel et al [27] study in which microcytic hypochromic anemia was seen in 72%. This finding was in contrast to the Kauret al [21] in which normocytic normochromic anemia is the predominant type 56%

In our study normocytic normochromic anemia was found in 40.01% majority of which had mild type of anemia 62.52% and the predominant age group in this category was elderly.

In our study majority of the patients were adults 46.14%% followed by the patient in the third decade 20.35%% similar to the study by Kaur et al [21] in which 55% were found in the age group 60-69 years and in contrast to the S. Patel et al [27] in which peak age group was 21-30 years, 46%.

CONCLUSION

Our study showed the high prevalence of microcytic anemia followed by normocytic normochromic anemia by analyzing the hematological parameters and peripheral smear examination which differ in various age groups and gender reflecting the varying etiologies behind this. In women and younger age group the predominant type is microcytic hypochromic anemia which primarily contributing iron

deficiency. In adults the type most prevalent is normocytic normochromic which may be cause of chronic disease, inflammation, blood loss, malignancy, depletion of bone marrow response and cellularity or ageing process. Majority of patients with microcytic anemia had moderate type and normocytic normochromic had mild type. In India anemia is a major public health problem accounting for high mortality of children and women in childbearing age, though anemia is not a condition it is a manifestation of a variety of pathologies which deserves adequate medical attention along with various programs and projects to prevent and control anemia must be constrained for effective interventions.

Declaration

Ethics approval and consent to participate: Ethical approval was obtained from the ethical committee of the Department of Pathology, VAMC & RH, Shahjahanpur UP. Patients that gave consent were those that participated in the study. Verbal consent was adequate for the study as suggested by the committee. Refusal to give consent did not influence the management of patient involved.

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