

## Study of Anaemia in Correlation with Hematological Parameters among Adults in a Tertiary Care Centre of North-East India

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### ABSTRACT

**Objectives:** The aims of this study are to evaluate the hematological parameters, type and severity of spectrum of anemia in known anemic cases in adult age group.

**Methods:** This study was carried out in the Department of Pathology, in a tertiary health care center on 1330 cases. The cases were from both indoor and outdoor patients admitted in various wards. The samples for test were collected in EDTA tube. The samples were run in hematology cell counter Sysmex XS-800i for hematology indices and other parameters.

**Results:** The overall prevalence of anemia was 71.58%. Moderate degree of Anemia was the most common followed by mild degree. Anemia was present in 39.92% of men and in 60.08% of women. Microcytic hypochromic anemia is the most common type of anemia in adult, more in reproductive age group indicating iron deficiency as the main cause. It was followed by normocytic normochromic anemia both in men and women.

**Conclusion:** Anemia is a widespread public health problem associated with an increased risk of morbidity and mortality, especially in pregnant women and young children. The prevalence of anemia increases with age and is associated with race, chronic diseases, nutritional deficiencies and other

conditions such as infection. A diagnosis of anemia warrants adequate clinical attention, to find out the cause, type, severity and this forms the basis for treatment of anemia. RBC indices provide important guidelines for diagnosis, classification and monitoring the treatment of anemia.

**Keywords:** Anemia, Hematological parameters, Iron deficiency.

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### INTRODUCTION

Anemia is a widespread public health problem associated with an increased risk of morbidity and mortality, especially in pregnant women and young children<sup>1</sup>. Globally 1.62 billion people are anemic, while among the preschool children the prevalence of anemia is 47.4%. Nutritional anemia in South Asia accounts for nearly half of global cases of anemia. In India, anemia continues to be the major health problem in young children, adolescent girls, and pregnant women. Approximately 50% of the population suffers from nutritional anemia as known in countries where meat consumption is low<sup>2</sup>.

According to the World Health Organization (WHO), anemia is defined as a condition in which the hemoglobin content is below normal. This situation occurs because of different pathophysiological mechanisms. Anemia exists if haemoglobin or packed cell volume (PCV) level is below the lower limit of normal for the particular age and sex.

There are many classifications of anemia. One is based on underlying mechanism and second is clinically useful approach classifies anemia according to alterations in red cell morphology, which often point to particular causes. Morphologic characteristics providing etiologic clues include red cell size (normocytic,

microcytic, or macrocytic); degree of hemoglobinization, reflected in the color of red cells (normochromic or hypochromic); and shape. In general, microcytic hypochromic anemias are caused by disorders of hemoglobin synthesis (most often iron deficiency), while macrocytic anemias often stem from abnormalities that impair the maturation of erythroid precursors in the bone marrow<sup>3</sup>. The most prevalent types of anemia are due to nutritional deficiencies (malnutrition and iron, vitamin B12 and folic acid deficiencies) and chronic diseases (such as cancer, kidney disease and congestive heart failure)<sup>4-6</sup>.

According to the World Health Organization (WHO), there are two billion people with anemia in the world and half of the anemia is due to iron deficiency<sup>7</sup>. The anemia of chronic disease occurs in the setting of persistent systemic inflammation and is associated with low serum iron, reduced total iron-binding capacity, and abundant stored iron in tissue macrophages<sup>3</sup>.

Anemia in the elderly is an extremely common problem that is associated with mortality and poorer health-related quality of life, regardless of the underlined cause of the low hemoglobin. However anemia should not be accepted as an inevitable consequence of ageing<sup>8</sup>.

Whatever its cause, when sufficiently severe, anemia leads to certain clinical findings. Patients appear pale. Weakness, malaise, and easy fatigability are common complaints. The lowered oxygen content of the circulating blood leads to dyspnea on mild exertion. Hypoxia can cause fatty change in the liver, myocardium, and kidney<sup>3</sup>.

In order to characterize the type of anemia and formulate a differential diagnosis, the work-up should include physical exams and laboratory tests, such as evaluations of hematocrit, hemoglobin and red blood cell indices. The red blood cell indices should include the cell count, mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), mean corpuscular hemoglobin concentration (MCHC) and red cell distribution width (RDW)<sup>9</sup>.

In fact, the hemoglobin concentration is the parameter that is most commonly used as an indicator of the pathophysiological consequences of anemia<sup>10</sup>. However, this variable is not very specific or sensitive<sup>11</sup>. Hemoglobin levels can be altered in different pathologic conditions, such as infectious and inflammatory processes, hemorrhage, protein-caloric malnutrition, associated to medications and smoking<sup>12</sup>. The MCV guides the diagnosis of anemia and helps in its classification. However, the MCV value, that is, the mean size of the red cells (macrocytic, microcytic and normocytic), should be used together with the RDW, thus directing the interpretation of the variation in the size of red blood cells<sup>13</sup>.

**AIMS AND OBJECTIVES**

To evaluate the hematological parameters, type and severity of spectrum of anemia in known anemic cases in adult age group.

**MATERIALS AND METHODS**

A cross-sectional study was conducted on 1330 cases in Department of Pathology, in a tertiary health care center of North-east region of India. After seeking approval from institutional ethics committee and obtaining informed consent, the blood samples collected in ethylene diamine tetraacetic acid (EDTA) vials that were sent from indoor and outdoor patients from various other departments of the tertiary center were studied. The blood samples were analysed in Sysmex XS-800i hematological analyzer. The parameters evaluated were hemoglobin concentration (Hb), MCV, MCH, MCHC, RDW and red cell count.

**Hb concentrations (g/dL) for the diagnosis of anaemia and assessment of severity according to the World Health Organization**

Age	Mild	Moderate	Severe
Female > 14 years	11-11.9	8-10.9	< 8
Male >14 years	11-12.9	8-10.9	< 8

The reference range of Mean Cell Volume (MCV) was taken as 80-100fl, mean cell hemoglobin(MCH) was taken as 27-32pg, for mean cell hemoglobin concentration 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.

**OBSERVATIONS AND RESULTS**

This study was carried out in Department of Pathology, in a tertiary health care centre. Total 1330 cases were studied.

Out of 1330 cases, anemia were found in 952 patients in the adult age group. Prevalence of anemia was 71.58%.

**Table 1: Prevalence of Anemia**

	Total no. of cases	Anemic cases
No. of cases	1330	952
Percentage (%)	100	71.58

**Table 2: Gender distribution of Anemic cases**

	Males	Females	Total
Total no.	380	572	952
Percentage (%)	39.92	60.08	100

**Table 3: Distribution of Grading of anemia in females**

	Total	Percentage (%)
Mild	155	27.10
Moderate	270	47.20
Severe	147	25.70
Total	572	100

**Table 4: Distribution of Grading of anemia in males**

	Total	Percentage (%)
Mild	132	34.74
Moderate	134	35.26
Severe	114	30.00
Total	380	100

In the study, more than 60% cases were female. Moderate anemia was common in both males and females, while severe anemia was less common in both.

Anemia was most common in the age group 20-30 (50.92%), second peak was seen in the age group 31-40 (21.22%). In our study anemia was least common in age group 51-60 (13.74%).

Out of 1330, more than 50% cases had microcytic hypochromic anemia in both males and females. This is the most common type of anemia in the study. It was followed by normocytic normochromic anemia in both males and females.

**Table 5: Age wise Distribution of Grading of anemia**

Age (yrs)	Mild	Moderate	Severe	Total	Percentage (%)
51-60	61	35	35	131	13.74
41-50	48	58	29	135	14.12
31-40	59	109	34	202	21.22
20-30	114	290	80	484	50.92
Total	282	492	178	952	100

**Table 6: Morphology of RBC according to MCV & MCH in males**

Types	Male	Percentage (%)
Microcytic hypochromic	213	56.05
Normocytic normochromic	134	35.26
Normocytic hypochromic	20	5.26
Microcytic normochromic	07	1.84
Macrocytic normochromic	06	1.59
Total	380	100

**Table 7: Morphology of RBC according to MCV & MCH in females**

Types	Female	Percentage (%)
Microcytic hypochromic	288	50.35
Normocytic normochromic	240	41.96
Normocytic hypochromic	42	7.34
Microcytic normochromic	2	0.35
Macrocytic normochromic	0	0
Total	572	100

## DISCUSSION

In our study, there was a female preponderance of anemia in adult age groups, especially in the reproductive age group. The high proportion of microcytic anaemia in women indicate that iron deficiency was the main cause of anaemia. Other Indian studies have also shown high prevalence of iron deficiency anaemia among young women<sup>14,15</sup>. The high prevalence of iron deficiency anaemia among women in childbearing age has important public health implications. It is estimated that anaemia accounts for 12.8% of maternal mortality in Asia<sup>16</sup>. Iron requirements are greater in pregnancy, and iron deficiency is associated with maternal death, preterm delivery, and low birth-weight<sup>17,18</sup>. In India, only 28% of women consume meat, fish, or eggs on a weekly basis<sup>10</sup> and the iron bioavailability of the vegetarian diet is poor<sup>15,19</sup>. Effective public health programmes aimed at reducing iron deficiency among young women could have a major impact in reducing maternal and infant mortality<sup>20</sup>.

In an attempt to explain the different prevalence rates of anemia for men and women, some authors have argued that estrogens act as inhibitors of erythropoiesis 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<sup>21,22</sup>.

In our study 380(39.92%) were males and 572(60.08%) were females, which was higher than other studies like in the Kaur et al<sup>23</sup> and Nasrin A. Qureshi et al<sup>24</sup>, where there was no statistical difference in both gender, and in contrast to the Chul won choi et al study in which 11.4% were males and 2.1% were females<sup>25</sup>.

In our study Microcytic hypochromic anemia 56.05% (male) and 50.35% (female) is the predominant type of anemia as seen in Gerardo et al studies<sup>26</sup>, Nasrin A. Qureshi et al and S Patel et al<sup>27</sup> study in which microcytic hypochromic anemia was seen in 72%. This finding was in contrast to the Kaur et al<sup>23</sup> in which normocytic normochromic anemia is the predominant type, 56%. In our study, normocytic normochromic anemia was found in 35.26% (male) and 41.96 (female).

## CONCLUSION

In our study, in adults, females are mostly affected and the most prevalent type of anemia is microcytic hypochromic which is mainly due to iron deficiency but other causes like chronic diseases, inflammation, malignancies, etc. may prevalent. Anemia is not a condition; it is a manifestation of a variety of pathologies which deserves adequate medical attention.

Given the multitude of clinical presentations and pathogenetic mechanisms, evaluation of anemia is ever challenging. The study of RBC parameters is the effective way of quantitative assessment of RBC. Along with peripheral blood examination (PBS), it allows broad differential diagnostic impression that provides directions for further specific investigations<sup>28</sup>. RBC indices provide important guidelines for diagnosis, classification and monitoring the treatment of anemia<sup>29</sup>.

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