

## A prospective study of morphological pattern of anemia at a tertiary care centre

Sujeet Kumar<sup>1</sup>, Dilip Kumar<sup>2</sup>, Imtiaz Ahmad<sup>3</sup>, Tripurari<sup>4\*</sup>

<sup>1</sup>Tutor, Department of Pathology, Vardhman Institute of Medical Sciences, Pawapuri, Nalanda, Bihar, India

<sup>2</sup>Associate Professor, Department of Pathology, Patna Medical College and Hospital, Patna, Bihar, India

<sup>3</sup>Associate Professor, Department of Pathology, Vardhman Institute of Medical Sciences, Pawapuri, Nalanda, Bihar, India

<sup>4</sup>Tutor, Department of Pathology, Jannayak Karpoori Thakur Medical College and Hospital, Madhepura, Bihar, India

Received: 22-10-2021 / Revised: 13-11-2021 / Accepted: 13-01-2022

### Abstract

**Introduction:** Anaemia is a medical condition in which the haemoglobin (Hb) concentration and erythrocyte count are lower than the normal range. The normal range of Hb and RBCs in general vary between males and females, it is defined as a Hb level of <13.5 g/dL and <12.0 g/dL in adult males and females respectively. The main causes of anaemia are a decrease in RBCs, insufficient Hb synthesis or increased RBCs destruction, and the primary cause is an iron deficiency. **Materials and Methods:** A hospital based observational study was carried out at Department of Pathology, Vardhman Institute of Medical Sciences, Pawapuri, Nalanda, Bihar, India from October 2020 to September 2021. 250 patients were evaluated for morphological pattern of anaemia based on red cell indices, peripheral smear, and leukocyte and platelet parameters. Anaemia was defined according to WHO criteria as haemoglobin concentration lower than 13 g/dL in men and 12 g/dL in women. **Results:** The results of CBC and PBP showed that 72 (29%), 138 (55%), and 40 (16%) of the patients had normocytic normochromic, microcytic hypochromic and macrocytic pattern of anaemia respectively [Table 1]. The gender wise classification of the patterns revealed that 44 male patients and 28 female patients had normocytic normochromic patterns, while 105 female patients and 33 male patients had microcytic hypochromic patterns whereas 23 males patients and 17 cases of female patients showed macrocytic pattern [Table 2]. **Conclusion:** In our present study, adolescent women were found to have high prevalence of anaemia. Since anaemia is more prevalent among low socio-economic groups, the higher diagnostic tests lead to financial burden to the patients. The study of basic blood parameters and peripheral smear examination are less expensive and mandatory in the work up of anaemia. Morphological patterns of anaemia reflects the underlying etiology, the study of which would ensure benefits in the early detection and appropriate treatment. Iron deficiency anaemia being a nutritional anaemia which can be prevented by improving nutritional status, creating awareness and educating people.

**Keywords:** Anaemia, CBC and PBP, microcytic hypochromic.

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

### Introduction

Anaemia is a medical condition in which the haemoglobin (Hb) concentration and erythrocyte count are lower than the normal range. The normal range of Hb and RBCs in general vary between males and females, it is defined as a Hb level of <13.5 g/dL and <12.0 g/dL in adult males and females respectively[1]. The main causes of anaemia are a decrease in RBCs, insufficient Hb synthesis or increased RBCs destruction, and the primary cause is an iron deficiency. Anaemia is the most common health issue in the world, and it affects a large population in almost all countries[2]. The most frequent etiologies of anaemia are nutritional deficiencies, malaria, parasitic infections, blood loss, bone marrow replacement, or suppression and haemoglobinopathies. In India and other developing countries, nutritional anaemia most common clinical health problem. It is estimated that ranges from 33% to 89% among pregnant woman and is more than 60% in adolescent girls. National family health survey -3 (NFHS) 2005-06, ministry of health and family welfare gov[3]. of India conducted series of survey based on a sample of households that are representative at national and state level. Survey estimates the prevalence of anaemia 55.3% among women of reproductive age (nonpregnant, non-lactating women) and 24% of

men, 69.5% in children under 5 years of age[4]. During reproductive life of female, menstrual blood loss, inadequate intake, helminthic infection, pregnancy, parturition and lactation significantly results in negative iron imbalance. In India and other developing countries, prevalence of nutritional anaemia in reproductive age group ranges from 60-80% compared to 10- 20% in developed countries[5]. Whatever the cause, moderate to severe anaemia leads to certain sign and symptoms. Patients appears to Pale, along with complaints of Weakness, malaise and easy fatigability[6]. Lowered oxygenated blood in the body leads to dyspnoea on mild exertion. Hypoxia may lead fatty change in liver, myocardium and kidney.

### Materials and methods

A hospital based observational study was carried out at Department of Pathology, Vardhman Institute of Medical Sciences, Pawapuri, Nalanda, Bihar, India from October 2020 to September 2021. 250 patients were evaluated for morphological pattern of anaemia based on red cell indices, peripheral smear, and leukocyte and platelet parameters. Anaemia was defined according to WHO criteria as haemoglobin concentration lower than 13 g/dL in men and 12 g/dL in women. Informed consent was obtained from patients. Elderly was defined as a person 60 years and above according to WHO criteria. Anaemia was further graded into Mild, Moderate and Severe according to WHO criteria as under Mild 11-12.9 g/dL (Men) 11-11.9 g/dL (women) Moderate 8-10.9 g/dL Severe < 8 g/dL Hb Concentration Microcytic anaemia was defined as MCV below 80 fl, normocytic as MCV between 80 and 100 fl and macrocytic anaemia by an MCV above 100 fl. Dimorphic anaemia was defined with a

\*Correspondence

**Dr. Tripurari**

Tutor, Department of Pathology, Jannayak Karpoori Thakur Medical College and Hospital, Madhepura, Bihar, India.

E-mail: [tripurari33@gmail.com](mailto:tripurari33@gmail.com)

normal MCV but a raised RDW (normal – 11- 15%). All were correlated with Peripheral smear examination.

#### Inclusion Criteria

Patients fulfilling the WHO criteria of anaemia haemoglobin of less than 13 gm/dL in males and less than 12 gm/dL in females.

#### Exclusion Criteria

Patient who's Hb is less than 13 gm% but has received blood transfusion in the last 3 months. Patients on treatment with iron, folic acid, B12 supplements.

#### Statistical Analysis

The data was collected and analysed using standard statistical chi – square test,  $p < 0.05$  statistically significant. Data was entered in Microsoft excel and analysis was done using SPSS version 22.

#### Results

The results of CBC and PBP showed that 72 (29%), 138 (55%), and 40 (16%) of the patients had normocytic normochromic, microcytic

hypochromic and macrocytic pattern of anaemia respectively [Table 1]. The gender wise classification of the patterns revealed that 44 male patients and 28 female patients had normocytic normochromic patterns, while 105 female patients and 33 male patients had microcytic hypochromic patterns whereas 23 males patients and 17 cases of female patients showed macrocytic pattern [Table 2]. Other significant findings seen in this study among patients of anaemia are: pancytopenia 30 (12%), neutrophilia 25 (10%), PMN toxic granules 7 (03%), eosinophilia 3 (01%), lymphocytosis 25 (10%), and immature cells 8 (03%). Patients having pancytopenia and immature cells further advised for bone marrow examination to rule out and diagnosis of aleukemic leukemia, subleukaemic leukemia, leukemia and other causes of anaemia. 8 (03%) cases of anaemia in this study had already diagnosed leukemia.

**Table 1: Frequency of Morphological Patterns of Anaemia among Study Participants**

S.No	Morphological Patterns of Anaemia	Frequency (%)
1	Normocytic normochromic	72(29%)
2	Microcytic hypochromic	138(55%)
3	Macrocytic anaemia	40(16%)
4	Total	250

**Table 2: Frequency of Morphological Patterns among Study Participants with regard to Gender Groups**

S.No	Morphological Patterns of Anaemia	Males	Female	Total
1	Normocytic normochromic	44	28	72
2	Microcytic hypochromic	33	105	138
3	Macrocytic anaemia	23	17	40
4	Total	100	150	250

**Table 3: Other Significant Findings in Study Groups**

Other Significant Findings	Frequency (%)
Pancytopenia	30 (12%)
Neutrophilia	25 (10%)
Lymphocytosis	25 (10%)
PMN Toxic granules	8 (03%)
Immature cells	8 (03%)
Eosinophilia	03 (01%)

#### Discussion

The most common morphological type of anaemia was microcytic hypochromic anaemia (138) [55%], which was in accordance with Joshi et al. (55.53%) and Ahmed et al. (56.6%). In a study done by M. Bukar et al 2009, Microcytic hypochromic anaemia was the commonest pattern with 64.9% followed by Dimorphic anaemia with 34.7% and Macrocytic anaemia with 0.4%[7]. Our study showed that the Microcytic hypochromic pattern of anaemia was more frequent than the macrocytic pattern. The gender wise classification of the patterns revealed a microcytic hypochromic pattern of anaemia was more common among females. Malnutrition, an increase of blood loss due to pregnancy or menstruation, and lack of iron absorption are the main causes. In male patients, the frequency of the normocytic normochromic pattern of anaemia was high, which may be mainly due to blood loss or chronic diseases[8]. In normocytic anaemia, the important issue is to identify the main cause and to prescribe the right treatment. The aetiologies of normocytic normochromic anaemia are nutritional, renal diseases (e.g., renal failure) and increased red cell destruction[9]. In macrocytic anaemia, the main causes are a low level of Vitamin B12 and a low level of erythrocyte folate. The estimation of both patterns of anaemia will guide the proper diagnosis of macrocytic anaemia[10]. The most common cause of folate deficiency is either nutritional or malabsorption of this vitamin. In contrast, the deficiency of Vitamin B12 is almost resulting from malabsorption.

#### Conclusion

Iron deficiency anemia is the most common type affecting especially in women with reproductive age group. In our present study, adolescent women were found to have high prevalence of anemia. Since anemia is more prevalent among low socio-economic groups, the higher diagnostic tests lead to financial burden to the patients. The study of basic blood parameters and peripheral smear examination are less expensive and mandatory in the work up of anemia.

**Conflict of Interest: Nil Source of support: Nil**

Morphological patterns of anemia reflects the underlying etiology, the study of which would ensure benefits in the early detection and appropriate treatment. Iron deficiency anemia being a nutritional anemia which can be prevented by improving nutritional status, creating awareness and educating people.

#### References

- Hoffbrand AV. Erythropoiesis and general aspects of anaemia. In: Hoffbrand AV, Pettit JE, eds. Essential Haematology. 3rd edn. Oxford: Blackwell Scientific 1993; p. 12-35.
- International Institute for Population Sciences (IIPS) and Macro International. 2007. National Family Health Survey (NFHS-3), 2005–06: India: Volume II. Mumbai: IIPS.
- Mehta BC, Jhaveri K, Patel JC. Anaemia in pregnancy. A study of 210 cases. Indian J Med Sci 1971;25 (5):301-7.
- Henderson PA, Hillman RS. Characteristics of iron utilization in man. Blood 1969;34 (3):357-75.
- Hibbard BM, Hibbard EE. Folate metabolism and pregnancy. Brit Med Bull 1968;24:10.
- DC Dutta. Textbook of Obstetrics. 6th edn. Central Book Agency Pvt. Ltd., 2009.
- Kumar V, Abbas AK, Fausto N. Robbins & Contran Pathologic basis of disease. 8th edn. Saunders Publication 2009.
- Naigamwalla DZ, Webb JA, Giger U. Iron deficiency anaemia. Can Vet J 2012;53 (3):250-6.
- Sierra LM, Calderon SS, Gomez J, et al. Prevalence of anaemia and evaluation of transferrin receptor (sTfR) in the diagnosis of iron deficiency in the hospitalized elderly patients: anaemia clinical studies in Chile. Anaemia 2012;2012:1-6.
- Kotze MJ, van Velden DP, van Rensburg SJ, et al. Pathogenic mechanisms underlying iron deficiency and iron overload: new insights for clinical application. EJIFCC 2009;20 (2):108-23.