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## Incidence of Various Hematological Conditions Based on Peripheral Smear in Anaemic Persons

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### ABSTRACT

Anemias are generally classified by a functional or morphologic scheme or by a combination of the two. The morphologic classification includes three general categories based on erythrocyte indices: normocytic hypochromic (MCV-81-fl), microcytic hypochromic (MCV<80fl) and microcytic (MCV>100fl). These are characteristically associated with specific erythrocyte size (normal, small, or large) and hemoglobin content. Data collection was done by collecting the bone marrow smears, which are obtained from bone marrow aspiration done in Department of pathology. These bone marrow smears will be stained by Perls' stain and assessed microscopically according to Gale's histological grading method and intensive histological grading method for iron stores. The blood investigation reports of complete hemogram, peripheral smear, serum ferritin, serum iron and serum TIBC from blood samples sent to central diagnostic laboratory was collected. In our study, on peripheral smear, the most common diagnosis was pancytopenia (18, 34.6%), followed by dimorphic anemia (11, 21.1%), macrocytic anemia (9, 17.3%), normocytic normochromic anemia (6, 11.5%), microcytic hypochromic anemia (5, 9.6%) and normocytic hypochromic anemia (3, 5.7%).

## INTRODUCTION

Haemopoiesis, the production of blood cells is a basic concept in hematology. The work of Neumann and Bizzozero established the relationship between blood and the bone marrow in the eighteenth century. Neumann in 1868, noted that bone marrow was a very important organ for the formation of all types of blood cells<sup>[1]</sup>. Anemia is functionally defined as an insufficient Red Blood Cell (RBC) mass to adequately deliver oxygen to peripheral tissue. Total erythrocyte mass (M) in the steady state is equal to the number of new erythrocytes produced per day (P) times the erythrocyte life span (S), which is normally about 100-120 days. Thus, the average 70kg man with 2 liters of erythrocytes must produce 20ml of new erythrocytes each day to replace the 20ml normally lost due to cell senescence<sup>[2]</sup>. From this formula, it is clear that if the survival time of the erythrocytes is decreased by one-half as can occur in hemolysis or hemorrhage, the bone marrow must double production to maintain mass at 2000ml. Anemias are generally classified by a functional or morphologic scheme or by a combination of the two. The morphologic classification includes three general categories based on erythrocyte indices: normocytic hypochromic (MCV<81-fl), microcytic hypochromic (MCV<80fl) and macrocytic (MCV>100fl). These are characteristically associated with specific erythrocyte size (normal, small, or large) and hemoglobin content<sup>[3]</sup>. Dimorphic anemia (DA) is characterized by two different cell populations. One population is microcytic hypochromic and the other is either normocytic or macrocytic. Pancytopenia is a reduction in all three major elements of blood formed, i.e., erythrocytes, leukocytes and platelet. The functional classification uses the Immature reticulocyte fraction (IRF) or Reticulocyte Production Index (RPI) and serum iron studies to classify the anemias according to pathophysiology: proliferation defect, maturation defect and survival defect<sup>[4]</sup>.

## MATERIALS AND METHODS

**Study Design:** Descriptive cross-sectional study.

**Study Population:** Bone marrow aspirate of patients age <18 years and of either sex, who are referred to the Department of Pathology, as part of diagnostic work up for anemia were included in this study.

**Sampling Method:** Consecutive samples as per the inclusion and exclusion criteria.

### Inclusion Criteria:

- Bone marrow smears and blood investigation report of patients age <18 years and of either sex who are referred to the Department of Pathology for bone marrow aspiration as part of diagnostic work up for anemia were included in this study.

### Exclusion Criteria:

- Marrow sample found to be diluted with blood.
- Marrow smears having poor material or inadequate material.
- Marrow samples from those who undergoing blood transfusion one week prior to bone marrow aspiration.
- Marrow samples from those who are on parenteral or oral iron supplementation one week prior to bone marrow aspiration.

**Data Collection:** Data collection was done by collecting the bone marrow smears, which are obtained from bone marrow aspiration done in Department of pathology. These bone marrow smears will be stained by Perls' stain and assessed microscopically according to Gale's histological grading method and intensive histological grading method for iron stores. The blood investigation reports of complete hemogram, peripheral smear, serum ferritin, serum iron and serum TIBC from blood samples sent to central diagnostic laboratory was collected.

**Analysis:** The data collected will be entered in excel sheet and analysed using Epi data/SPSS software. Descriptive statistics like frequency, proportions, percentage, mean, standard deviation and inferential statistics like chi square test to know the association, t-test to know the difference between two groups and other relevant tests will also be used as applicable.

## RESULTS AND DISCUSSIONS

**Table 1: Distribution of Participants According to Age Group**

Age group	Frequency	Percentage
21-40 years	24	46.2
41-60 years	20	38.5
61-80 years	8	15.4
<b>Total</b>	<b>52</b>	<b>100</b>

**Table 2: Distribution of Participants According to Gender**

Gender	Frequency	Percentage
Male	29	55.8
Female	23	44.2
<b>Total</b>	<b>52</b>	<b>100</b>

**Table 3: Distribution of Cases Based on Hemoglobin Level<sup>[5]</sup>**

Haemoglobin in g/dl (anaemia grading)	Frequency	Percentage
< 8 (Severe)	27	51.9
8-10.9 (moderate)	22	42.3
11-11.9 (mild)	3	5.8
<b>Total</b>	<b>52</b>	<b>100</b>

**Table 4: Incidence of Various Hematological Conditions Based on Peripheral Smear**

Diagnosis	Frequency	Percentage
Pancytopenia	18	34.6
Dimorphic anaemia	11	21.1
Macrocytic anaemia	9	17.3
Normocytic normochromic anaemia	6	11.5
Microcytic hypochromic anaemia	5	9.6
Normocytic hypochromic anaemia	3	5.7
<b>Total</b>	<b>52</b>	<b>100</b>

**Table 5: Comparison of Distribution of Participants According to Age Group**

Study	Mean age
Bableshtar <sup>[5]</sup>	41.6
Dharwadkar <sup>[6]</sup>	47
Sharma <sup>[7]</sup>	54.6
Present study	43.4±16.1

In the present study, majority of the patients belonged to the mean age group of 43.4±16.1 years. This is comparable to the studies done by Bableswhar RS, Dharwadkar A and Sharma S et al. who found the mean age group affected was 41.6%, 47% and 54.6% of cases respectively.

**Table 6: Distribution of Participants According to Gender**

Gender	Male	Female	M:F Ratio
Singh <sup>[8]</sup>	54.5%	45.5%	1.2:1
Dharwadkar <sup>[6]</sup>	60%	40%	1.5:1
Bableswhar <sup>[5]</sup>	60%	40%	1.5:1
Present study (N=52)	55.8%	44.2%	1.26:1

In the present study, majority of the patients were male with 55.8%, female patient being 45.5% and M:F ratio of 1.26:1. This is comparable to the studies done by Singh M *et al.*, Dharwadkar A *et al.* and Bableswhar RS *et al.* who had male and female cases of 54.5% and 45.5%, with M:F ratio 1.2:1, 60% and 40%, with M:F ratio 1.5:1 and 60% and 40%, with M:F ratio 1.5:1 respectively.

**Table 7: Comparison of Distribution of Cases Based on Haemoglobin Level**

Haemoglobin in g/dl	Sharma <sup>[7]</sup>	Bableswhar <sup>[5]</sup>	Present study
Moderate to Severe	5.53g/dl (Range 2.8-10g/dl)	<7 g/dl. (Range 1.9-9.2g/dl)	7.5±2.1 (Range 2.6-11.9 g/dl)

In the present study, the majority of the hemoglobin level of participants ranged from 2.6-11.9 g/dl with a mean value of 7.5±2.1g/dl. The majority of the cases belonged to either moderate or severe anemia. This is comparable to the study done by Sharma<sup>[7]</sup> who had a hemoglobin level of participants ranging from 2.8-10 g/dl with a mean value of 5.53 g/dl. In another study by Anupama<sup>[9]</sup> mean hemoglobin value was 7.4 g/dl in the iron deficiency cases and another study by Bableswhar RS *et al.* showed a majority of the patients with a hemoglobin level of <7g/dl. In our study, on peripheral smear, the most common diagnosis was pancytopenia (18, 34.6%), followed by dimorphic anemia (11, 21.1%), macrocytic anemia (9, 17.3%), normocytic normochromic anemia (6, 11.5%), microcytic hypochromic anemia (5, 9.6%) and normocytic hypochromic anemia (3, 5.7%). This is comparable with the study done by Sharma<sup>[7]</sup> who found dimorphic anemia as the commonest pattern followed by microcytic hypochromic anemia. Another study done by Anupama<sup>[9]</sup> had the majority of cases of dimorphic anemia, refractory anemia and pancytopenia. Similarly, Pujara<sup>[10]</sup> found a majority of cases to be microcytic hypochromic, megaloblastic, and dimorphic anemia.

## CONCLUSION

- Anemia is a commonly encountered hematological condition in day-to-day clinical practice.
- A Complete hemogram with the peripheral smear findings is one of the crucial steps in evaluating patients with anemia.

- Males accounted for 55.8% of cases and females accounted for 44.2% of cases. Male to female ratio in the current study was 1.26:1.
- Lowest Hemoglobin level noted was 2.6g/dl, with mean hemoglobin being 7.5±2.1g/dl.
- Most common peripheral smear finding was pancytopenia, seen in 18 cases (34.6%).

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