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Original Research Paper

Pathology

CORRELATION OF PERIPHERAL SMEAR WITH RBC INDICES AND RBC HISTOGRAM IN THE DIAGNOSIS OF ANAEMIA IN TERTIARY CARE CENTRE

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ABSTRACT

Introduction : Anaemia is a decrease in the oxygen-carrying capacity of the blood. RBC histogram is a standard part and is routinely generated by automated cell analyzers. The well-known Coulter principle of counting and sizing the cells provides a basis for generating a histogram. The peripheral blood smear has been the main diagnostic aid in establishing the etiology of anaemia. Examining the blood films routinely has facilitated the interpretation of various haematological disorders. **Materials and Methods:** The present study was carried out in the haematology laboratory of Kamineni Institute of Medical Sciences, Narketpally over a period of 3 months. EDTA blood samples from 100 anaemic patients were run in a six-part Sysmex analyzer and peripheral smears were prepared and examined. **Results:** A total of 100 patients with peripheral blood smear and RBC histogram from automated analyzer were studied. Out of 100 patients, 60% were females and 40% were males. Normocytic normochromic anaemia (50%) was the most commonly observed anaemia in the present study followed by microcytic hypochromic anaemia (40%). Most common histogram pattern observed was normal bell-shaped curve. In normocytic normochromic anaemia (50%), the majority of the cases show a normal bell-shaped curve (37%) and the remaining 13% of cases showed broad-based curve. In microcytic hypochromic anaemia (40%) most common histogram pattern observed was shift to the left. In dimorphic anaemia (8%) histogram pattern observed was bimodal peak with a broad base. In macrocytic anaemia (2%) most commonly seen histogram pattern was shift to the right. **Conclusion:** Histogram plays an additional role with peripheral smear for diagnosing RBCs disorders. Even in the age of molecular analysis, the blood smear examination remains an important diagnostic tool.

KEYWORDS :

INTRODUCTION:

Anaemia is a decrease in the oxygen-carrying capacity of the blood. Anaemia continues to be a major public health problem worldwide, particularly among females of reproductive age in developing countries.

The automated hematolyzers are based on the impedance principle and rely on the change in conductance as each cell passes through an aperture. This change in conductance results in the development of an electrical pulse the amplitude of which is proportional to the cell volume. The results are displayed as numerical and histograms. RBC histogram is a standard part and is routinely generated by automated cell analyzers. The well-known Coulter principle of counting and sizing the cells provides a basis for generating a histogram.

Histograms are the graphical representation of cell frequencies versus size. X-axis represents the size of the cell and Y-axis represents the number of cells. RBC indices (MCV, MCH, MCHC) has been found abnormal in various haematological conditions.

RBC Indices were first introduced by Wintrobe to determine Abnormalities in red cell histogram including (1) Left shift of the curve in microcytosis, (2) Right shift of the curve in macrocytosis, and (3) Bimodal peak of the curve in double (dimorphic) population of red cells.

- Mean Cell Volume: 80-100 fl.
- Mean Cell Haemoglobin: 27-32 pg.
- Mean Cell Haemoglobin Concentration: 30-35 g/dl
- Red cell distribution width: 9.0-14.5

The peripheral blood smear has been the main diagnostic aid in establishing the etiology of anaemia. Examining the blood films routinely has facilitated the interpretation of various hematological disorders.

MATERIALS AND METHODS:

The present study was carried out in the haematology laboratory of Kamineni Institute of Medical Sciences, Narketpally over a period of 3 months. EDTA blood samples from 100 anaemic patients were run in a six-part Sysmex analyzer and peripheral smears were prepared and examined.

Inclusion Criteria:

All cases with haemoglobin below 9gm /dl were included.

Exclusion Criteria:

Patients having leukemoid reaction, leukaemia, haemoglobin above 9gm/dl were excluded.

RESULTS:

- Total of 100 patients with peripheral blood smear and RBC histogram from automated analyzer were studied. Out of 100 patients, 60% were females and 40% were males. Female to male ratio was 1.5:1 showing female preponderance.

Table 1: Gender distribution

GENDER	TOTAL ANAEMIA CASES
Female	60
Male	40
Total	100

The most common age group was 41-50 years (18%) followed by 31-40 years(16%).

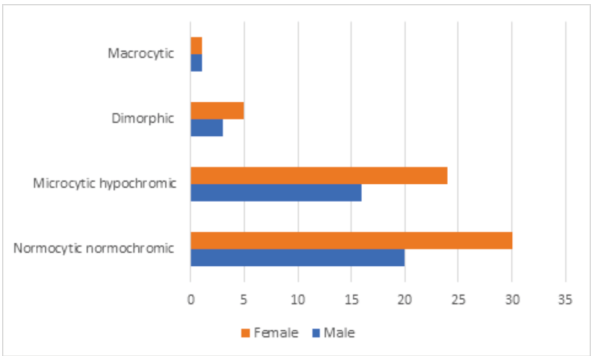
Table 2: Age and Gender distribution

Age group(in years)	Males(N, n)	Females(N, n)	Total (N, n)
1- 10	5 (5%)	1 (1%)	6 (6%)
11-20	0 (0%)	8 (8%)	8 (8%)
21-30	0 (0%)	14 (14%)	14 (14%)
31-40	7 (7%)	9 (9%)	16 (16%)
41-50	10 (10%)	8 (8%)	18 (18%)
51-60	8 (8%)	8 (8%)	16 (16%)
61-70	5 (5%)	9 (9%)	14 (14%)
71-80	4 (4%)	2 (2%)	6 (6%)
81-90	1 (1%)	1 (1%)	2 (2%)

In the females majority of the cases were seen in the age group of 21-30 years (14 cases), followed by 31-40 years and 61-70 years (9 cases) each.

Table 3: Distribution Of Anaemias

Type of anaemia	Male	Female	Total
Normocytic normochromic	20	30	50
Microcytic hypochromic	16	24	40
Dimorphic	3	5	8
Macrocytic	1	1	2



Normocytic normochromic anaemia (50%) was the most commonly observed anaemia in the present study followed by microcytic hypochromic anaemia (40%). The Most common histogram pattern observed was normal bell-shaped curve. In normocytic normochromic anaemia (50%), the majority of the cases showed normal bell-shaped curve (37%) and the remaining 13% of cases show broad-based curve. In microcytic hypochromic anaemia (40%) most common histogram pattern observed was shift to left. In dimorphic anaemia (8%) histogram pattern observed was a bimodal peak with a broad base. In macrocytic anaemia (2%) most commonly seen histogram pattern was shift to the right.

Table 4: Categorization based on histogram

Histogram	Number of patients (N-100)	Percentage (%)
Normal	37	37%
Left shift	40	40%
Right shift	2	2%
Bimodal	8	8%
Broad base	13	13%
Total	100	100%

MCV was decreased in 43% of cases of which, 33% were microcytic hypochromic anaemia and 10% were normocytic normochromic anaemia. MCV was normal in 44% of patients, of which 35% were normocytic normochromic and the remaining 7%, and 2% were microcytic hypochromic and dimorphic anaemia respectively. MCV was increased in 13% of cases, of which 6% were dimorphic anaemia, 5% were normocytic normochromic anaemia and the remaining 2% were macrocytic anaemia.

Table 5: Comparison of MCV with peripheral smear

Histogram	Peripheral Smear				
Mcv	Normocytic Normochromic Anaemia	Microcytic Hypochromic Anaemia	Macrocytic Anaemia	Dimorphic Anaemia	Total
Normal	35	7	0	2	44
Increased	5	0	2	6	13
Decreased	10	33	0	0	43
Total	50	40	2	8	100

DISCUSSION:

Anaemia is a global problem affecting the population in both developing as well as developed countries, and there is a debate on which haemoglobin level limits should be used to define anaemia in the general population. About one-third of the global population is anaemic.

Peripheral smears have been used as a major diagnostic tool for the workup of anaemia. The microscopic examination is still considered as the primary diagnostic tool for the presumptive diagnosis of anaemias and other relative disorders.

The RBC histogram is generated in an automated haematology analyzer depending on the particle size. RBC indices like MCV, MCH, MCHC, and RDW were obtained which helps in the diagnosis and typing of Anaemia.

The RBC histogram shows a normal, symmetrical bell-shaped curve, which is most commonly seen in normocytic normochromic anaemia. Shift to the left in the histogram is seen in microcytic hypochromic anaemia and shift to the right is seen in macrocytic anaemia. Bimodal curve is seen in dimorphic anaemia which showed a mixture of microcytes, macrocytes and normocytes.

In the present study, out of 100 cases studied, 60 cases were females and 40 cases were males showing female predominance. The ratio of females to males was 1.5:1. This is in comparison with swami et.al[1] which also has female predominance.

In the present study, the maximum number of cases with anaemia were noted in the age group of 41-50 years. (18 cases).

Increased variation in red cell size is called anisocytosis. Anisocytosis is due to the presence of microcytes, macrocytes, or both in addition to red cells of normal size.

Microcytes are red cells smaller in size than normal. Macrocytes are red cells larger in size than normal.

In the present study out of 100 cases, normocytic normochromic anaemia was observed in 50 cases, microcytic hypochromic anaemia was observed in 40 cases, dimorphic anaemia was seen in 8 cases and macrocytic anaemia was observed in 2 cases.

This was in comparison with a study done by Dr Preethi[2] on 55 cases of anaemia showing normocytic normochromic anaemia predominance (28 cases).

Abnormalities in red cell histogram include: (1) Left shift of the curve in microcytosis, (2) Right shift of the curve in

macrocytosis, and (3) Bimodal peak of the curve in double (dimorphic) population of red cells

In the present study, out of 50 cases of normocytic normochromic anaemia, 37 cases showed normal bell-shaped curve and 13 cases showed broad base. 40 cases of microcytic hypochromic anaemia showed shift to the left, 2 cases of macrocytic anaemia showed shift to the right and 8 cases of dimorphic anaemia showed bimodal curve.

In normocytic normochromic anaemia (N=50 cases), RBC indices like MCV, MCH, and MCHC are within normal limits in 35 cases,10 cases showed decreased MCV and 5 cases showed increased MCV on peripheral smear.

In macrocytic anaemia, all 2 cases showed increased MCV, MCHC, and MCH on peripheral smear. In microcytic hypochromic anaemia, out of 40 cases, 33 cases showed decreased MCV and 7 cases showed normal MCV on peripheral smear. Out of 8 cases of dimorphic anaemia 6 cases showed increased MCV and 2 cases showed normal MCV on peripheral smear.

These findings correlated with a study carried out by chavda et al[4], Dr Preethi, M[2], and Sandhya et al[3].

CONCLUSION:

Histogram plays an additional role with peripheral smear for diagnosing RBCs disorders. The majority of the cases show good correlation between Peripheral Smear findings and histogram but histogram could be used only as a screening tool and not a diagnostic one. Thus, even in the age of molecular analysis, the blood smear examination remains an important diagnostic tool.

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