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A Review On: Interpretation and Methodology of Blood Count

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ABSTRACT:
The most common haematological test that cases request is the complete blood count (CBC) or full blood count (FBC). The complete blood count (CBC) is a set of assays that evaluates a variety of cells, including red blood cells(RBCs), white blood cells(WBCs), and platelets(PLTs). The CBC can descry a variety of conditions and conditions, similar as leukemia, anemia, and infections, in addition to assessing your overall health. pressing the substantiation- grounded interpretation of whole blood count values in both health and sickness was the thing of this review. In a lab that follows GLP, the dimension of FBC should be grounded on bribe and using validated outfit, certified reagents, and quality- controlled Internal Quality Control and External Quality Control (IQC and EQA) testing. For this, one of the three- or five- part discriminational haematology analyzers can be used.

Keywords: Blood, Full Blood Count,RBC, WBC, Platelet, Interpretation,Manual Blood Count Method, Automated Blood Count Method.

I. INTRODUCTION:

Blood is composed of both solids and liquids. Protein, salts, and water make up the liquid portion, known as plasma. More than half of your blood is composed of plasma. Blood's solid component contains red blood cells, white blood cells, and platelets.Red blood cells that aid in tissue perfusion, white blood cells that support host immunity, and platelets that aid in hemostasis and coagulation are all measured by a complete blood count test [1]. Disorders of the blood cells can be categorized as either qualitative or quantitative. All cells look normal in quantitative changes, but they are present in aberrant amounts, either in excess or in deviation from normal values; in qualitative defects, on the other hand, abnormal cell appearance, abnormal cell function, or extrinsic cells are detected in circulation [2].

In 1657, one of the earliest scientists, Athanasius Kircher, reported "worms" in the blood. When Athanasius Kircher first discovered "worms" in the blood in 1657, Anton van Leeuwenhoek described red blood cells in 1674 [3]. Giulio Bizzozero did not, however, designate platelets as "petites plaques" until the late 1800s [4]. The most often done hematology-related test on patients is probably the complete blood count (FBC). When appropriately reviewed, thoroughly considered, and taken into consideration in conjunction with the clinical history, it can provide significantly useful information to aid in the diagnosis of disease, drug monitoring, and therapy [5]. Clinical data from laboratory medicine tests support up to 70% of clinical evaluations and diagnoses, according to published research. In order to diagnose and treat patients, certain tests are necessary [6].

The Clinical Significance of the Full Blood Count's Components

The 13–19 criteria that make up the Full Blood Count (FBC) test are not in many ways related to one another biologically.

1. Plasma (55%)
2. Blood components (45%)

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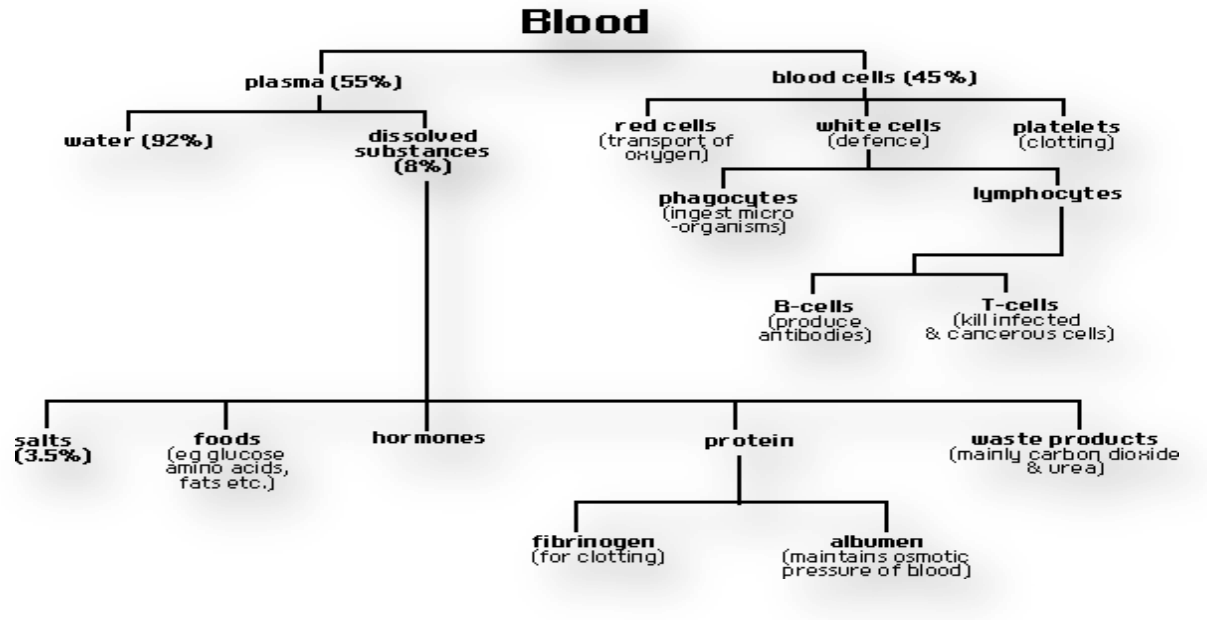

Fig no.1 Composition of blood

a) White Blood Cells (WBCs)
b) Red Blood Cells (RBC)
c) Haematocrit (Hct)
d) Haemoglobin (Hgb)
e) Mean Corpuscular Volume (MCV)
f) Mean Corpuscular Haemoglobin (MCH)
g) Mean Corpuscular Haemoglobin Concentration (MCHC)
h) Red Cell Distribution Width (RDW)
i) Differentials (%) and Absolute Values
• Neutrophils
• Lymphocytes
• Monocytes
• Eosinophils
• Basophils
j) Reticulocyte count (% and absolute values)
k) Platelets
l) Platelet Distribution Width (PDW)
m) Mean Platelet Volume (MPV)
n) Platelet Large Cell Ratio (PLCR)
o) Immature granulocytes (IG)

REDBLOOD CELL(RBC):

Erythrocytes is another name of red blood cells, are created in the bone marrow and released into the bloodstream when they are fully mature. A protein called hemoglobin, which aids in the body's oxygen transport, makes them up [7]. A red blood cell has a 120-day lifetime. In order to replace RBCs that age and deteriorate or are lost due to bleeding, the bone marrow must continuously manufacture new ones. Conditions that may cause major bleeding are not the only ones that might impact the lifespan and/or creation of new red blood cells. While the size and shape of red blood cells are typically similar, a number of diseases, including iron insufficiency and deficits in vitamin B12 and folate, can modify how red blood cells appear [8,9]. Anemia, a common disease affecting red blood cells, is characterized by decreased haemoglobin and red blood cell numbers. Anemia can be caused by a number of diseases; therefore, further testing is frequently required to identify the actual reason.

Test	Normal Range	Diseases associated with low RBC	Diseases associated with High RBC
Red Blood Cell Count (RBC)	Conventional Units Men: 4.5-5.9 x10 /microliter Women: 4.1-5.1x 10 microliter SI Units	1. Anemia 2. Acute or chronic bleeding 3. RBC destruction (e.g., haemolyticanemia, etc.) 4. A lack of certain nutrients, such as iron, vitamin B12, or folate	1. Polycythemia 2. Dehydration Lung (pulmonary) disease 3. Kidney or other tumor that produces excess erythropoietin

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	Men: 4.5-5.9 x 10 /L Women: 4.1-5.1x 10 /L	5. Bone marrow disorders or damage 6. Chronic inflammatory disease 7. Chronic kidney	4. Smoking 5. Living at high altitude 6. Genetic causes (altered oxygen sensing, abnormality in hemoglobin oxygen release) 7. Polycythemia vera—a rare disease
Haemoglobin (Hb)	Standard Units 14–17.5 g/dL for men and 12.3–15.3 g/dL for women SI Units Men: 140-175g/L Women: 123-153g/L	tiredness, weakness and shortness of breath	dizziness, fatigue, easy bruising and other symptoms
Haematocrit (HCT)	Conventional Units Men: 41.5-50.4% W omen: 35.9- 44.6% SI Units Men: 0.415- 0.504 volume fraction Women: 0.359- 0.446 volume fraction	1.Anemia 2.Bleeding 3. Bone marrow being unable to produce new RBC	1. Polycythemia 2. Erythrocytosis
(MCV)Mean corpscular volume	Conventional Units 80-96 micrometer SI Units 80-96 fL	Indicates RBCs are smaller than normal (microcytic); caused by iron deficiency anemia or thalassemias,	Indicates RBCs are larger than normal (macrocytic), for example in anemia caused by vitamin B12 or folate deficiency, 1. myelodysplasia, 2.liver disease, 3.hypothyroidism
(MCH) Mean corpuscula	Conventional Units 27.5-33.2 pg SI Units 27.5-33.2 pg	Iron deficiency anemia	Macrocytic anemia
(MCHC)Mean corpuscular hemoglobine concentration	Conventional Units 33.4-35.5 g/dL SI Units 334-355 g/L	1. Hypochromia 2. Iron deficiency anemia and thalassemia.	1.Autoimmune hemolyticAnemia 2. Hereditary spherocytosis, 3.Rare congenital disorder.
Reticulocyte Count	Conventional Units 0.5-1.5% or 25-125 x 10 /microliter SI Units 0.005-0.015 number fraction or 25-125 x 10 /L	1. Bone marrow disorder or damage, 2. Nutritional deficiency (iron, B12 or folate)	1.Hemolytic anemia 2.Erythroblastosis fetalis

Table No 1:RED BLOOD CELL (RBC), Range& disorder

White Blood Cell (WBC):

Leukocytes, another name for white blood cells, are cells found in tissues, the lymphatic system, and the blood. They are a crucial component of the body's immune system, which is its natural defensive mechanism. They support the body's ability to fight against infections. For white blood cell counts, a reading that is within a range established by testing adults, children, and males of all ages is regarded as normal. WBCs come in five different varieties, and each one serves a unique purpose. They are made up of neutrophils, eosinophils, monocytes, basophils, and lymphocytes [10]. The WBC content of the blood is relatively consistent. However, these levels could abruptly go higher or lower depending on what's happening in the body. For instance, an infection may trigger your bone marrow to produce more neutrophils in order to combat a bacterial infection. Eosinophil levels might rise as a result of allergies. Increased lymphocyte production could be the outcome of a viral infection. Leukemia is one of the abnormalities that causes abnormal (mature or immature) white blood cells to grow rapidly[11,12,13].

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Test	Normal Range	Diseases associated with low WBC	Diseases associated with High WBC
White Blood Cell Count (WBC)	Conventional Units 4,500-11,000 white blood cells per microliter (mcL) SI Units 4.5-11.0 x 109 per liter (L)	1.leukopenia 2. Bone marrow disorders or damage 3. Autoimmune conditions 4. Severe infections (sepsis) 5.Lymphoma or other cancer that spread to the bone marrow 6. Dietary deficiencies 7. Diseases of immune system (e.g., HIV/AIDS)	1.leukocytosis 2.Infection, most commonly bacterial or viral Inflammation 3. Leukemia, myeloproliferative neoplasms 4.Allergies, asthma 5. Tissue death (trauma, burns, heart attack) Intense exercise or severe stress
Absolute neutrophil	Conventional Units Percent (mean): 56% Absolute count (per microliter): 1800-7800 SI Units Mean number fraction: 0.56 Absolute count X 10 per liter: 1.8-7.8	1. neutropenia 2.Severe,overwhelming infection (sepsis) 3. Autoimmune disorders 4. Dietary deficiencies 5. Reaction to drugs 6. Immunodeficiency 7. Myelodysplasia Bone marrow damage (e.g., chemotherapy, radiation therapy) 8. Cancer that spreads to the bone marrow 9.Congenital neutropenia	1. Eutrophilia 2. Acute bacterial infections Inflammation 3. Trauma, heart attack, or burns 4. Stress, rigorous exercise 5. Certain leukemias (e.g., chronic myeloid leukemia) 6. Cushing syndro
Absolute lymphocyte	Conventional Units Percent (mean) 34% Absolute count (per microliter): 1000-4800 SI Units Mean number fraction: 0.34 Absolute count X 10 per liter: 1.0-4.8	1. lymphocytopenia 2.Autoimmune disorders (e.g., lupus, rheumatoid arthritis) 3.Infections (e.g., HIV, viral hepatitis, typhoid fever, influenza, Covid 19) 4.harm to the bone marrow (e.g., radiation treatment, chemotherapy)) 5. Corticosteroids	1. lymphocytosis 2. Acute viral infections (e.g., chicken pox, cytomegalovirus (CMV), Epstein-Barr virus (EBV), herpes, rubella) 3. Certain bacterial infections (e.g., pertussis (whooping cough), tuberculosis (TB)) 4. Toxoplasmosis 5. Chronic inflammatory disorder (e.g., ulcerative colitis) 6. Lymphocytic leukemia, lymphoma 7. Stress (acute)
Absolute monocyte	Conventional Units Percent (mean) 4% Absolute count (per microliter) 0-800 SI Units Mean number fraction 0.04 Absolute count X 10 per lit	1. Bone marrow damage or failure 2. Hairy cell leukemia 3. Aplastic anemia	1. Chronic infections (e.g., tuberculosis, fungal infection) 2. Infection within the heart (bacterial endocarditis) 3. Vascular illnesses caused by collagen (such

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			as vasculitis, rheumatoid arthritis, lupus, and scleroderma) 4. Monocytic or myelomonocytic leukemia (acute or chronic)
Absolute eosinophil	Conventional Units Percent (mean) 2.7% Absolute count (per microliter) 0-450 SI Units Mean number fraction 0.027 Absolute count X 10 per liter 0-0.45	1. Excessive stress 2. Alcohol misuse 3. Underlying condition.	1. Asthma, allergies such as hay fever 2. Drug reactions 3. Parasitic infections 4. Inflammatory disorders (celiac disease, inflammatory bowel disease) 5. Some cancers, certain acute or chronic leukemias or lymphomas 6. Addison disease 7. Connective tissue disorders
Absolute basophil	Conventional Units Percent (mean) 0.3% Absolute count (per microliter) 0-200 SI Units Mean number fraction 0.030 Absolute count X 10 per liter 0-0.20	Acute infections	1.Rare allergic reactions (hives, food allergy) 2. Inflammation (rheumatoid arthritis, ulcerative colitis) 3. Some leukemiasUremia

Table No: 2 White Blood Cell (WBC), Range & disorder

Platelets:

In reality, platelets—also known as thrombocytes—are microscopic cell fragments that circulate in blood and are necessary for proper blood clotting. Platelets adhere to the injury site and clump together to create a temporary plug that helps stop bleeding when there is an injury. Additionally, they release chemical cues that draw in and encourage the clumping of more platelets, which ultimately form a stable blood clot at the site of the damage and stay there until the injury heals [14]. If anyone suffer from an illness or condition that results in low platelets (thrombocytopenia) or platelet dysfunction, they may be more susceptible to severe bleeding and injuries. Excessive clotting may result from thrombocytosis, or an excessive number of platelets[15,16,17].

Test	Reference Range	Examples of Causes of Low Result	Examples of Causes of High Result
Platelet Count (Plt)	Conventional Units 150-450 x 10 /microliter SI Units 150-450 x 10 /L	1.Thrombocytopenia 2.Viral infection (mononucleosis, measles, hepatitis) 3.Rocky mountain spotted fever 4. Platelet autoantibody 5.Drugs (acetaminophen, quinidine, sulfa drugs) Cirrhosis 6.Autoimmune disorders (e.g., ITP)	1.Thrombocytosis 2.Cancer (lung, gastrointestinal, breast, ovarian, lymphoma) 3.Rheumatoid arthritis, inflammatory bowel disease, lupus 4.Iron deficiency anemia 5.Hemolytic anemia6.Myeloproliferative disorder (e.g., essential

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		Sepsis 7. Leukemia, lymphoma 8.Myelodysplasia 9.Chemo or radiation therapy	thrombocythemia)
Mean Platelet Volume (MPV)		Indicates average size of platelets is small; older platelets are generally smaller than young ones and a low MPV may mean that a condition is affecting the production of platelets by the bone marrow.	suggests that the blood contains a large number of younger, bigger platelets; this might be because the bone marrow produces and releases platelets into the bloodstream quickly.
Platelet Distribution Width (PDW)		shows that the platelets' sizes are consistent	suggests that there is a problem affecting platelets, as seen by greater variation in platelet size.

Table No3:Platelets, Range & Disorder

Methodology:

A highly mechanized, extremely sophisticated science that includes molecular investigation, clinical laboratory haematology has developed from simple observations and descriptions of blood and its constituents. On the other hand, a few fundamental tests have altered over time.

CBC can be done by two ways-

I. Manual Blood Count Method

II. Automated Blood Count Method

I.Manual Blood Count Method:

A hemacytometer, also known as a counting chamber, is used for manual cell counts, while automated pipettes and diluents (either commercially available or manufactured in a lab) are used for manual dilutions. The idea behind performing cell counts for white blood cells (WBCs), red blood cells (RBCs), and platelets is basically the same; the main differences are in the dilution, dilution fluid, and area counted[18].

a. RBC Count: The Levy chamber with enhanced Neubauer rule is the most widely used one. Each of the two elevated surfaces, which are separated by an H-shaped moat, has a counting area or grid that is 3 mm by 3 mm square (total area 9 mm2). This grid is comprised of nine 1 mm x 1 mm squares, The center square is then divided into 25 smaller squares, and each of the four corner (WBC) squares is further subdivided into 16 squares. These tiniest squares are all 0.2 mm by 0.2 mm, or 0.04 mm2, or 1/25 of the center square.

Calculation: The following generic formula, which can be used to compute any kind of cell count by hand, is as follows:

$$\text{Total Count} = \frac{\text{Cells counted} \times \text{Dilution factor } 10*}{\text{Area (mm 2)}}$$

The calculation yields the number of cells per millimeter (mm3).One mm3 is equal to one microliter (mL). The count per mL is multiplied by ten to get the count per litter (L)[19].

b. MCH Count: The mean globin weight in a red blood cell, or MCH, is measured in picograms (pg), or 10−12 g. For instance, if the RBC count is 5 × 10−12 and the hemoglobin is 16 g/dL, the MCH is 32 pg. For adults, the reference interval is 26–32 pages. Generally speaking, the MCH is not taken into account when classifying anemias[20].

$$\text{Calculation: Total Count} = \frac{\text{HGB } (\frac{\text{gm}}{\text{dl}}) \times 10}{\text{RBC Count} \times 10 * \frac{12}{\text{L}}}$$

c. MCV Count: Milliliters (fL), or 10-12L, are used to quantify the mean cellular volume, or MCV. For instance, the MCV = 90 fL if the RBC count is 5× 10−12/L and the HCT is 5 45%. For MCV, the reference interval is 80–100 fL. RBCs are classified as macrocytic if their MCV is greater than 100 fL and microcytic if it is less than 80 fL[20].

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Calculation: MCV in fl = (Hct [in L/L]/RBC [in x1012/L]) x 1000 Where Hct is the hematocrit, which is the percentage of blood volume made up of red blood cells (RBCs).

d. MCHC: The average hemoglobin concentration in each individual red blood cell is known as the MCHC. Grams per deciliter are the units of measurement (formerly expressed as a percentage). For instance, the MCHC = 33.3 g/dL if the HGB = 16 g/dL and the HCT = 5 48%. Red blood cell numbers for normochromic individuals fall between 32 and 36 g/dL, hypochromic individuals have values below 32 g/dL, and "hyperchromic" individuals have values over 36 g/dL.

Calculation: MCHC (g/dL) = hemoglobin (g/dL) ÷ hematocrit (%) [21].

e. ESR: Erythrocyte sedimentation rate (ESR) is ordered in conjunction with other tests for the purpose of diagnosing temporal arteritis, polymyalgia rheumatica, and rheumatoid arthritis, as well as to detect and track the progression of infections and certain cancers[21].

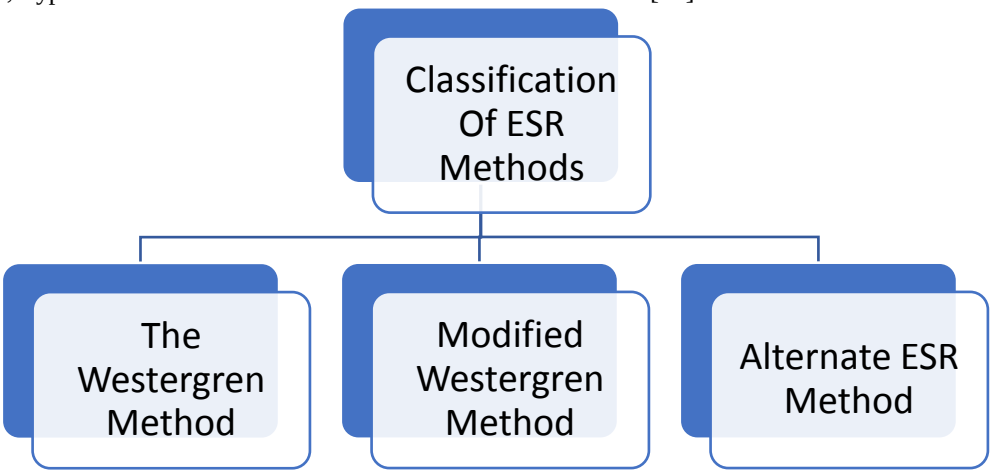

Fig no. 2 Classification of ESR Methods

f. WBC Count: One microliter (mL) or one liter (L) of blood contains the same number of white blood cells (WBCs) as the leukocyte count. Blood from a skin puncture is diluted with 1% buffered ammonium oxalate or a mild acid solution (3% acetic acid or 1% hydrochloric acid) before being used as whole blood anticoagulated with ethylenediaminetetraacetic acid (EDTA). To stop nonnucleated red blood cells from interfering with the count, the diluting fluid lyses them in the sample. Typically, blood is diluted 1:20 for the WBC count.

Calculation: There are 96 cells on average between the chamber's two sides. Applying the formula's average:

$$\text{WBC Count} = \frac{\text{Cells counted} \times \text{Dilution factor}}{\text{Area (mm 2)} \times \text{Depth}}$$

Sources of Error:

1. Before using the hemacytometer and coverslip, make sure they are thoroughly cleaned. The cells may be difficult to differentiate from one another due to dust and fingerprints.
2. Contaminations should not be present in the diluting fluid [22].

g. Platelets Count: The quantity of platelets in one litter (L) or one microliter (mL) of whole blood is known as a platelet count. Platelets are hard to count because they stick to one other and to other objects. Additionally, due to their small size, they are readily mistaken for dirt or trash. In order to lyse the nonnucleated red blood cells, whole blood is diluted 1:100 with 1% ammonium oxalate while EDTA is used as the anticoagulant [23].

Calculation:
Platelet count/µL approximated by multiplying the average count in 10 fields by 15,000

II.Automated styles :(24)

With the probable exception of phase platelet counting under specific conditions, automated blood cell analysis has substantially superseded homemade haemoglobin, haematocrit, and cell counting since the 1980s due to its

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increased delicacyand perfection. multitudinous instrument manufacturers vend haematology analysers. With 200 mL or lower of whole blood, these analysers generally yield the eight standard haematological parameters (complete blood count (CBC)) in lower than a nanosecond, along with a three- part, five- part, or six- part discriminational leukocyte count. robotization makes it possible to manage workloads more effectively and to diagnose and cure ailsmore snappily.

a. Microhematocrite Reader -

The quantity of closely spaced red blood cells that can be found in a specific volume of whole blood is known as the hematocrit. This is frequently referred to as the packed cell volume (PCV). It's expressed either in liters per liter(0.36 L/ L) or as a chance(e.g., 36).

b. Centrifugal capillary tube -

For every centrifuge, the optimal time to achieve maximum red blood cell quilting should be caught on. It's recommended to use lately drawn, completely mixed blood that has been anticoagulated with ethylenediaminetetraacetic acid (EDTA) for indistinguishable microhematocrit assays. It's recommended to use two samples, one of which should have a known hematocrit of at least 50. Centrifuge duplicates every 30 seconds starting at 2 twinkles, also note the outgrowth. The alternate time period should be employed to determine the microhematocrit formerly optimal quilting has been reached, which occurs when the hematocrit stays at the same value for two successive readings.

c. Automated ESR -

The conventional Westergren and Wintrobe ways, as well asnon-traditional ways like centrifugation, are used in a number of automated ESR systems. An automated ESR analyzer that uses infrared dimension is called the Sedimat15(Polymedco, Cortlandt Manor, NY). It can test one to eight samples at arbitrary or all at formerly, and it can produce results in fifteen twinkles.

Validation, Calibration, Maintenance, QC of Haematology Analyzer and use of SOP

The National Committee for Clinical Laboratory Standards (NCCLS) [25], the International Committee for Standardization in Haematology (ICSH) [26], accreditation agencies, and regulatory bodies all mandate that laboratory equipment meant for patient sample testing and subsequent clinical judgment be validated prior to purchase, calibrated on a regular basis (based on major maintenance or bias in QC results), and quality controlled daily. A sample with known content is called a quality control sample. Following baseline validation and routine maintenance according to manufacturer guidelines (daily, weekly, monthly, biannually, and annually), an analyzer's control is based on the identification of internal quality control [27] and external quality control techniques that will identify loss in accuracy and precision, respectively. The techniques employed must be sensitive enough to detect performance loss that could jeopardize the assay values for the patient, but not so sensitive as to indicate the existence of mistakes when none are present [28]. To guarantee high-quality patient care, all laboratories must enroll in an external quality assessment program and implement intralaboratory quality control (QC) as a minimum. This will allow them to monitor and control every step of the process, from collecting blood specimens to the actual processing and analysis, creation, and reporting of laboratory results [29]. A quality control program's successful implementation depends on ongoing education. In a haematology laboratory, quality control (QC) comprises four crucial elements: proactive, routine maintenance, calibration, monitoring of instrument and procedure accuracy and precision (EQA and IQC), and confirmation of test result dependability. The majority of accrediting and regulatory bodies advise using a combination of commercial controls (three levels) and enrollment and involvement in national and/or regional quality control programs to evaluate accuracy and precision over an extended period of time [30]. The action limits that are typically applied in the clinical interpretation of FBC are based on the reference ranges that have been defined. Some of the generated test values may mistakenly be outside the clinically significant reference points if a haematology analyzer reaction changes. This could lead to incorrect clinical judgments and conclusions that could have a detrimental effect on the patients. Standard operating procedures must serve as the foundation for laboratory testing according to the GLP principle (SOP). SOPs are detailed instructions or protocols for doing laboratory tasks accurately and consistently. The protocol should be written clearly, succinctly, and in a language that is easy to comprehend. It should also include relevant information about the personnel categories and the level of skill and training needed to carry out the SOP [31].

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Effect of Gender on Full Blood Count Parameters:

In prepubertal humans, there are no significant variations in haemoglobin or red blood cell count betweenthe sexes. It appears that the commencement of menstruation precedes the gender-related variations in haemoglobin levels [32]. Ten years after menopause, when the haemoglobin concentration approaches that of aged matched men, the gender-related variances appear to return to normal [33]. In terms of health, adult men and women differ in terms of haemoglobin, red blood cell count, and packed cell volume. This gender disparity is not related to iron status: premenopausal iron-replete women have mean haemoglobin levels that are about 12% lower than those of age- and race-matched men [34]. The general consensus is that the variations in mean venous haemoglobin levels and red cell mass that are related to gender are brought about by the direct stimulation of androgen in men's bone marrow in conjunction with erythropoietin, the stimulation of androgen on kidney erythropoietin production, and the inhibitory effect of oestrogen on women's bone marrow [35,36]. After gastrectomy, female patients had a considerably larger proportion of neutrophils, a significantly lower proportion of lymphocytes and monocytes, and a higher N/L than male patients in the gender comparison research [37,38].

Haematology Normal Adult Reference Ranges	Male	Female	SI Unit
Haemoglobin (HB)	130-180	115-165	g/l
White Cell Count (WBC	5000-10000	4500-10000	109/l
Platelet Count (PLT)	150-500	150-500	109/l
Red Blood Count (RBC)	4.5-6.5	3.8-5.8	1012/l
Mean Cell Volume (MCV)	80-100	80-100	Fl
Packed Cell Volume (PCV)/Haematocrit (HCT)	0.40-0.52	0.37-0.47	L/l
Mean Cell Haemoglobin (MCH)	27-32	27-32	Pg
Mean Cell Haemoglobin Concentration (MCHC)	320-360	320-360	g/l
Neutrophil Count	2.0-7.5	2.0-7.5	109/l
Lymphocyte Count	1.5-4.5	1.5-4.5	109/l
Monocyte Count	0.2-0.8	0.2-0.8	109/l
Eosinophil Count	0-0.4	0-0.4	109/l
Basophil Count	0-0.1	0-0.1	109/l
Reticulocytes	0.2-2.0	0.2-2.0	%

Table No 4: Full Blood Count [FBC]- Ranges Based on Gender

II. CONCLUSION:

It can be used to identify diseases or illnesses at an early stage. The complete blood count (CBC) is a routine, basic test whose individual results are not diagnostically specific. Because so much information is gathered from all the components, it is the most widely used test in the medical field. The goal of the complete blood count (CBC), which consists primarily of related tests, is to be evaluated holistically and then connected with the clinical picture. Early sickness or illness detection is possible with its help. This reviewcan help to know the normal ranges of blood components. This also help to know different methodology to test the blood sample. This information can also help to treat the patient with proper treatment.

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CONFLICTS OF INTEREST:
No conflict of interest was declared by the authors. The authors alone are responsible for the content and writing of the paper.

DATA AVAILABILITY STATEMENT:
There is no data set associated with this submission

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