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Iron Deficiency Anemia: Peripheral blood smear investigation with special reference to RBC morphology.

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ABSTRACT

Iron deficiency anemia is one of the world's most widespread health problems, especially among children: approximately 40 percent of children are anemic across various African and Asian settings. Iron deficiency anemia leads to weakness, poor physical growth, and a compromised immune system decreasing the ability to fight infections and increasing morbidity and is also thought to impair cognitive performance and delay psychomotor development. Recent macroeconomic estimates suggest that the impact of iron deficiency anemia through both physical and cognitive channels could be as large as 4 percent of GDP on average in less developed countries. Through its impact on school participation and learning, anemia could also be central to understanding the intergenerational transmission of poverty. Peripheral blood smear investigation reveled the shape of different blood cells from affected persons.

Key words : Iron Deficiency Anemia, Peripheral blood smear.

Introduction:- Although much is known about iron metabolism, the health consequences of iron deficiency continue to be a subject of research and debate. This is partly because in many regions of the world iron supplements are the standard of care for individuals with anaemia. Most trials of iron supplementation have measured haemoglobin concentration as the primary outcome. There is a relatively small body of clinical trials of iron repletion to humans with functional iron deficiency (i.e.iron deficiency severe enough to affect erythropoiesis) with pregnancy outcomes or mortality as primary objectives. There is surprisingly little evidence to either support or refute a causal link between iron deficiency and these important adverse health outcomes. As processes like this comparative risk assessment (CRA) bring to light the overall weakness of evidence either supporting or refuting the relationship, new research priorities may emerge.

Material and Method:- Collection of blood

- Disposable latex gloves (Use non-latex, e.g. nitrile or vinyl, if the employee and/or client has a latex allergy).
- 70% isopropyl alcohol
- Cotton balls or gauze
- Blood lancets for finger puncture (capable of making a puncture to the depth of 1.5 mm)
- E. Blood lancet designed for heel sticks on infants and premature babies, to a depth of less than 2.0 mm (e.g. BD Quikheel™ Lancet).
- F. Puncture resistant sharp's containers
- G. Band Aids (optional)
- H. Appropriate microcuvettes or tubes for micro sampling
- I. Disinfectant (freshly prepared 10% household bleach) for bench tops.

Procedure:- 1) Small drop of blood (with or without anticoagulant) was place on new slide.
2) Push forward the spreader with a quick, smooth and single movement so as to make 2-3 cm long smears with convex edge.
3) Smear was dried quickly and stained the slides by using Leishman stain and methanol was used as a fixative.
4) Permanent slide was prepaired by covering with cover slip.

Observation and Result

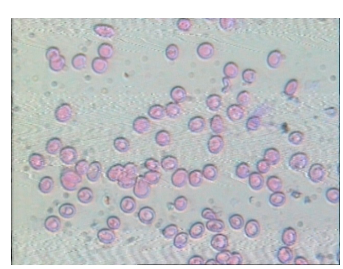
Peripheral Blood Smear Examination

The examination starts with a macroscopic view to evaluate the quality of the smear based on overall appearance. The microscopic analysis begins on lower power (10X), primarily to assess cellular distribution, staining quality, and to select an area where the RBCs are barely touching each other. This area is used to conduct a complete assessment of the cellular elements on higher magnification. All of the detailed analysis of the cellular elements on higher magnification. All of the detailed analysis of the cellular elements is performed using oil immersion. This final microscopic examination was perform at 50X and 100 X oil immersion and includes.

- A WBC differential
- The identification of abnormal and peculiar leukocytes.
- Assessment of RBC morphology
- The number and morphology of the platelets
- The identification of intra- and extra-cellular elements.
- Assessment of any organisms present.
- Following criteria was used to examine the peripheral blood smear of anemic patients.
- Size
- Shape
- Color
- Inclusions
- Peculiarities
- Relationships

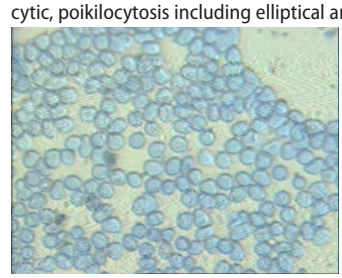
Sample 1

Peripheral blood smear shows that fragmented red blood cell. Fragmented cells are seen. Specific terms, depending on the shape, include schistocyte, acanthocyte, spur cells, and burr cells.

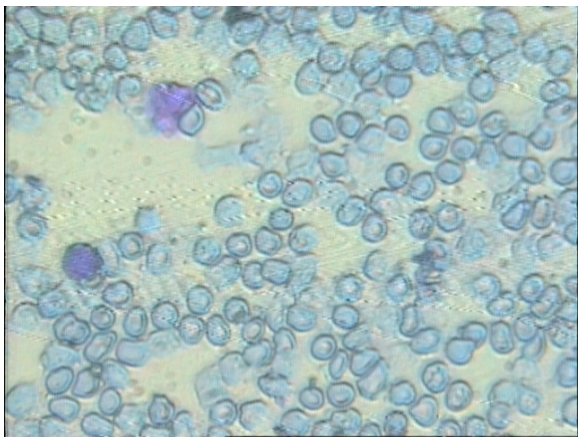


Sample2

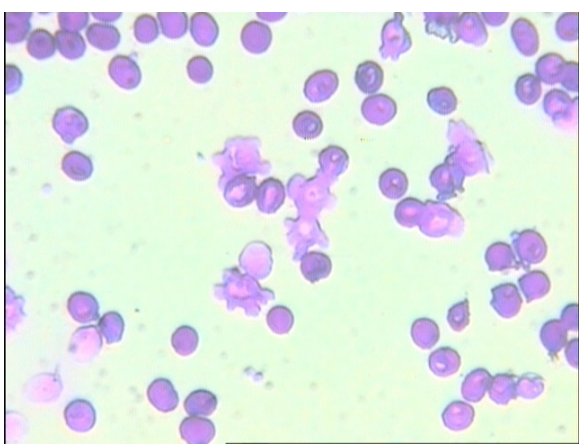
This microphotograph depicts polychromasia. Referring to the blue-gray color of the red cell. Peripheral blood smear also showing microcytic, poikilocytosis including elliptical and elongated RBCs.



Sample 3
The arrowed cells are anisocytes, target cell and tear drop cell also clearly seen. Microcytsosis also depicts. A microcyte is a small red blood cell, having a diameter of less than 7 um.



Sample 4
Peripheral blood smear shows an platelet aggregation, vacuoles in RBCs. Microcytic, hypochromic, anisocytosis and poikilocytosis also observed.



Analysis of Peripheral Blood Smear
Peripheral blood smear examination showed different size and shape of RBCs including schistocyte, acanthocyte, spur cells, tear dorp cell and burr cells. Microcytosis also depict. Red blood cell count showed lower values in 57% of patients studied. The haemoglobin level was found to be below normal. The haematocrit value was also found to be below normal. However the white blood cell count was consistently elevated in the population affected with IDA. Hemolytic anemia causes change in red cell morphology may identify the cause of erythrocyte destruction (eg, the presence of bite cells points to a Heinz body hemolytic anemia) and the ultimate diagnosis (eg, oxidant damage to the red cell secondary to drugs)Iron Deficiency anemia also causes Thrombocytopenia – Distinguishing between increased platelet consumption and reduced platelet production can often be made through review of platelet size. Anisocytosis - variable sizes of red blood cells may indicate anemia; RBCs smaller than 7 µm are referred to as microcytes and RBCs larger than 7 µm are called macrocytes.Poikilocytosis - various shapes of red cells; these may include echinocytes, acanthocytes, elliptocytes, keratocytes, rouleaux, sickle cells, target cells, teardrop cells, and shistocytes. As part of a blood smear evaluation, a manual WBC differential is performed. Typically, at least 100 WBCs are found, counted, and categorized according to type. The percentage of each type is calculated. In addition, the appearance (morphology) and stage of development of the WBCs are noted. White blood cells have a nucleus surrounded by cytoplasm. All WBCs are derived from bone marrow stem cells. In the marrow, they differentiate into two groups: myelocytic and lymphoid cells. They mature into five distinct types of WBCs.

Those with granules in their cytoplasm are also called 'granulocytes' and include:

- Neutrophils (10-18 µm) are cells that have cytoplasm with pink or purple granules. They compose the majority of WBCs in a healthy adult. They are involved in the defense against infections.

- Eosinophils (10-15 µm) are easily recognized in stained smears with their large, red-orange granules. Generally low in number (1-3%), they most often increase in number in individuals with allergie s and parasitic infections.

- Basophils (10-15 µm) have large, black granules and are the least often seen type of WBC (1%).

The non-granulocytes include:
Monocytes are usually the largest of the WBCs (12-20 µm) and are often referred to as scavenger cells (phagocytes). They can ingest particles such as cellular debris, bacteria, or other insoluble particles.

Lymphocytes are smaller in size (10-12 µm) and have a homogeneous cytoplasm and a smooth, round nucleus. One type of lymphocyte, the B-cell, is responsible for the production of antibodie s (immunoglobulins). All these abnormalities are seen.

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