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# Approach to the Adult Patient with Anaemia

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Anaemia is defined as a reduction in one or more of the red blood cell indices of haemoglobin (Hb) concentration, hematocrit, and red blood cell (RBC) count. However, haemoglobin concentration is the most widely used parameter.

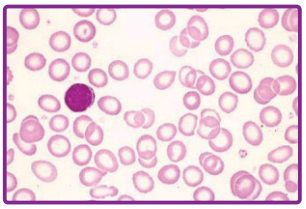
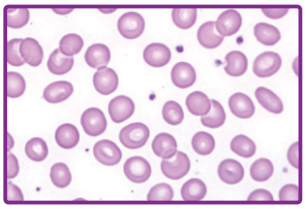
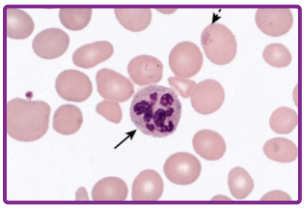
Normal lower limits of Hb varies with age, sex and race.

As a clinician, one is often familiar with the Kinetic Approach to a patient with anaemia. This approach classifies anaemia by the mechanisms causing the anaemia. These mechanisms are decreased red blood cell production, increased red blood cell destruction and blood loss.

However, when one is faced with interpreting a patient's full blood count result, and anaemia is present, the Morphologic Approach can be used to work through the possible causes of the anaemia. The morphologic approach divides anaemia into Macrocytic Anaemia, Normocytic Anaemia and Microcytic Anaemia, based on the size of the red blood cells.

The parameter in the full blood count that indicates red cell size is the Mean Corpuscular Volume (MCV) measured in femtolitres (fL).

**MORPHOLOGIC APPROACH TO AN ADULT PATIENT WITH ANAEMIA**

| MICROCYTIC | NORMOCYTIC | MACROCYTIC |
|---|---|---|
| MCV < 80 fL | MCV 80 – 100 fL | MCV > 100 fL |
|  |  |  |

The following tables outline the causes of Microcytic and Normocytic Anaemia. Macrocytic Anaemia will be discussed as a separate topic in a follow-up newsletter.

**MICROCYTIC ANAEMIA**

| Condition | Differential diagnosis/ Causes | Mechanism | Condition Specific Clinical Signs | Peripheral blood smear | Additional Investigations |
|---|---|---|---|---|---|
| Iron Deficiency | Blood loss<br>• menorrhagia,<br>• GIT bleed (haemorrhoids, peptic ulcer, etc.)<br>• bleeding disorders<br><br>Malabsorption<br>• e.g. gluten enteropathy<br><br>Poor dietary intake<br>Pregnancy | Inadequate supply of iron for erythropoiesis. | Koilonychia<br>Angular chelosis<br>Glossitis | Hypochromia<br>Poikilocytes<br>Elliptocytes | <u>Iron studies</u>:<br>Serum iron ↓<br>Serum Ferritin↓<br>Transferrin↑ |
| Thalassaemias | Alpha Thalassaemia<br><br>Beta Thalassaemia | Disorders of globin production | Hepato-splenomegaly<br>Thalassaemic facies - bossed skull, prominent frontal and parietal bones, enlarged maxilla | Hypochromia<br>Tear drops<br>Target cells<br>Basophilic stippling | Haemoglobin electrophoresis<br><br>HPLC Hb quantification |

| | | | | | |
|---|---|---|---|---|---|
| Sideroblastic anaemia | Acquired primary<br>• refractory anaemia with ring sideroblasts (MDS) | Clonal disorder with impaired haem synthesis | | Hypochromia<br>Target cells<br>Basophilic stippling<br>Poikylocytosis<br>Pappenheimer bodies<br><br>Red cells can be microcytic or macrocytic | Iron studies:<br>Serum Iron ↑<br>Ferritin↑<br><br>Bone marrow aspirate |
| | Acquired Secondary<br>• Drugs e.g. isoniazid, pyrazinamide, chloramphenicol, alcohol, lead toxicity, copper deficiency.<br>• Systemic disease e.g. carcinoma, rheumatoid arthritis | Mitochondrial toxicity/impaired haem synthesis | | Red cells can be microcytic or macrocytic | |
| | Congenital<br>• X-linked<br>• Autosomal | Underlying molecular defects affecting synthesis of the haem group | Syndromic features | Hypochromia<br>Target cells<br>Basophilic stippling<br>Poikylocytosis<br>Pappenheimer bodies | Biochemical assay of enzymes |
| Severe cases of Anaemia of inflammation / chronic disease | See below under normocytic anaemias | | | | |

## NORMOCYTIC ANAEMIA

| Condition | Differential diagnosis/ Causes | Mechanism | Condition Specific Clinical Signs | Peripheral blood smear | Additional Investigations |
|---|---|---|---|---|---|
| Aplastic anaemia (AA) | Acquired<br>• Drugs e.g. chloramphenicol, Sulphonamides, linezolid, diclofenac, phenytoin, carbamazepine, thiouracil phenothiazides, chloroquine, allopurinol, mebendazole, thiazides etc.<br>• Environmental e.g. benzene, pesticides , cutting oils, lubricating agents, recreational drugs | Inadequate supply of iron for erythropoiesis. | Koilonychia<br>Angular chelosis<br>Glossitis | Hypochromia<br>Poikilocytes<br>Elliptocytes | <u>Iron studies</u>:<br>Serum iron ↓<br>Serum Ferritin↓<br>Transferrin↑ |
| | Inherited<br>• Congenital bone marrow failure syndromes | | Syndromic features | | |
| Pure red cell aplasia | Transient<br>• Infections e.g. Parvovirus B19, CMV, HIV, Mumps<br>• Drugs<br><br>Chronic<br>• Idiopathic<br>• Congenital syndromes<br>Immunological e.g. thymoma, haematological malignancies, autoimmune diseases | Serum antibodies with selective cytotoxicity for marrow erythroid cells, immunological suppression of erythropoiesis | | Normocytosis or macrocytosis | ↓Reticulocyte count<br><br>Bone marrow aspirate & trephine biopsy<br><br>PCR for Parvovirus B19<br><br>Screening for auto-antibodies |
| Systemic disorders / Chronic disease | Anaemia of inflammation (previously called anaemia of chronic disorders)<br>Infections (bacterial, viral and fungal)<br>Acute/chronic autoimmune conditions<br>Chronic diseases<br>Ageing | Changes in iron handling/systematic iron distribution under control of hepcidin, red blood cell production due to a "blunted" Erythropoietin (EPO) response and reduced red blood cell lifespan | | Mild-normocytic red cells, severe "Microcytic" red cells<br>Rouleaux formation<br>Neutrophilia or Neutrophilia with toxic granulation and left shift<br>lymphopaenia<br>Thrombocytopaenia | Iron Studies:<br>Serum iron↓<br>Ferritin N/ ↑<br>Infective markers:<br>↑ CRP<br>↑ PCT<br>↑ ESR<br>Autoimmune screen<br>Viral studies<br>Blood Culture |

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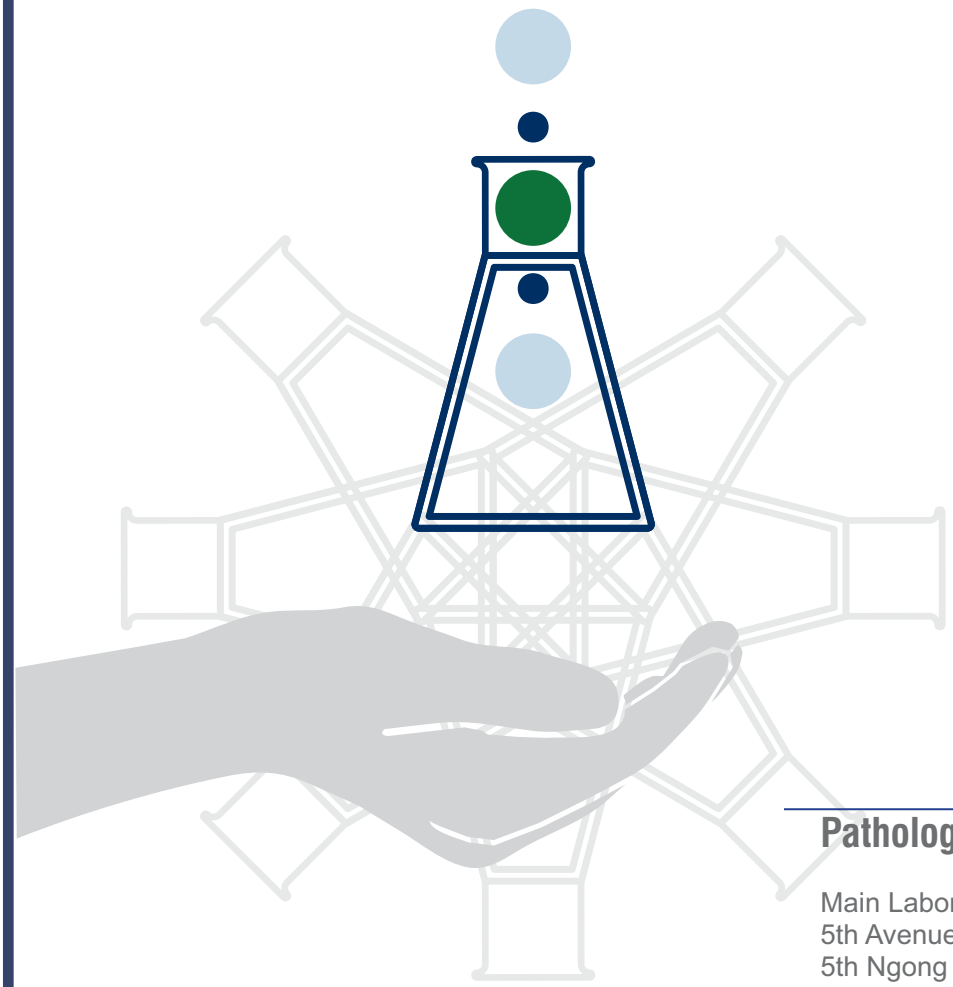
|---|---|---|---|---|---|
| Chronic Renal Disease | | Deficiency of EPO production by the renal interstitial cells | | | U&E and eGFR EPO levels |
| Malignancy | | Anaemia of inflammation, therapy related, bone marrow infiltration | | | Bone marrow biopsy |
| Acquired Anaemia in Hospitalised Patients | | Blood loss during procedures Anaemia of inflammation Changes in nutrition (especially in ICU) | | | |


**References:**

1. Schrier, SL. Approach to the adult patient with anaemia. In UpToDate. Mentzer, WC (Editor). (Accessed on January 22 2015).
2. Hoffbrand AV, Catovsky D, Tuddenham EGD, Green AR (Eds.). Postgraduate Haematology, 6th edition. Oxford, United Kingdom: Wiley-Blackwell; 2011.
3. Bain BJ. Blood cells. A practical guide, 4th edition. Oxford, United Kingdom: Blackwell Publishing; 2006.
4. Tkachuk DC, Hirschmann JV (eds.). Wintrobe's atlas of clinical hematology, 1st edition. Philadelphia, USA: Lippincott Williams & Wilkins; 2007.
5. DeLoughery TG. Microcytic anemia. N Engl J Med 2014; 371(14): 1324 ? 1331.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