

Anemia

→ **Reduction** of **oxygen carrying capacity** of blood secondary to decrease in red cell mass

→ Leads to tissue hypoxia

* Practically, measure by **Hemoglobin concentration**, and **Hematocrit**

Anemia and Erythropoietin

Anemia ⁺triggers **production of erythropoietin**



Causes **compensatory erythroid hyperplasia** in bone marrow (BM)

In severe cases

In acute anemia

* causes **extramedullary hematopoiesis** in secondary hematopoietic organs

(spleen, liver and lymph nodes)

* production can **increase by 5x or more** in healthy people



Exceptions:

ما في
**extramedullary
Hematopoiesis**

anemia of **renal failure** , anemia of **chronic inflammation**

Classification according to **cause**

1) Blood loss

2) Diminished RBC production

- Iron deficiency anemia
- Anemia of chronic inflammation
- Megaloblastic anemia
- Aplastic anemia
- Pure red cellaplasia
- Myelophthisic anemia
- Myelodysplastic syndrome
- Anemia of renal failure
- Anemia of hypothyroidism

3) Increased destruction (hemolytic anemia)

Extrinsic factors :

(infection, antibody, mechanical)

①

②

③

Intrinsic RBC abnormalities:

1) Hereditary :
(membrane, enzyme, Hg abnormalities)

2) Acquired:
(Paroxysmal nocturnal hematuria)

Classification according to **morphology**

Size

Color

Shape

anisopoikelocytosis

normocytic , microcytic , macrocytic

normochromic , hypochromic

(spherocytes, sickle, schistocytes)

Test : (MCV)

هو الذي يدل على حجم الخلية

Test : (MCH)

هو يدل على لون الخلية

Test : (RBC Distribution width)

هو يدل على تشابه الخلايا أو اختلاف أشكالها

~ **Hypochromic microcytic** anemia usually reflects **impaired Hg synthesis**

~ **Macrocytic** anemia reflects **stem cell disease and maturation**

RBC Indices : Can be directly measured, or automated

Slight variation is present between labs, geographic areas.

Sex, age, race, mobility status **have effect**

	Units	Men	Women
Hemoglobin (Hb)	g/dL	13.2–16.7	11.9–15.0
Hematocrit (Hct)	%	38–48	35–44
Red cell count	$\times 10^6/\mu\text{L}$	4.2–5.6	3.8–5.0
Reticulocyte count	%	0.5–1.5	0.5–1.5
Mean cell volume (MCV)	fL	81–97	81–97
Mean cell Hb (MCH)	pg	28–34	28–34
Mean cell Hb concentration (MCHC)	g/dL	33–35	33–35
Red cell distribution width (RDW)		11.5–14.8	

*Reference ranges vary among laboratories. The reference ranges for the laboratory providing the result should always be used in interpreting a laboratory test.

Reticulocyte count

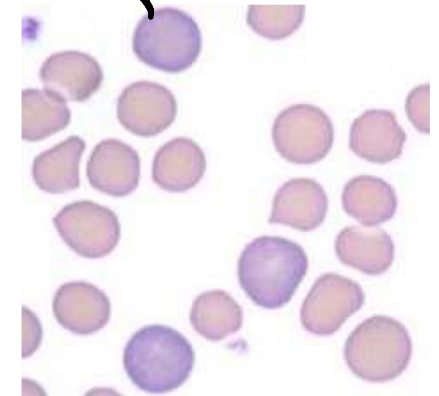
high

low

hemolytic anemia

Aregenerative anemia

Reticulocyte



Clinical features of Anemia :

- 1) Dizziness (**hypotension**)
- 2) Fatigue
- 3) Pallor
- 4) Headache

Adaptive changes:

تغيرات للتكيف مع Hypoxia

- * Tachycardia
- * Tachypnea
- * **Increased** red cell 2,3-diphosphoglycerate

* If the patient has heart or lung diseases, symptoms will be worse

Clinical symptoms of special types of anemia

Chronic hemolytic anemia:

Jaundice , pigmented gall bladder stones, redurine

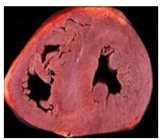
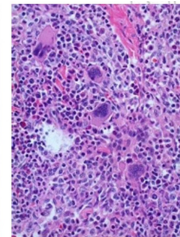


* note:

Extramedullary hematopoiesis: splenomegaly, hepatomegaly

Thalassemia major and sickle cell anemia

growth retardation, bone deformity, secondary hemochromatosis (damage to heart, endocrine glands)



Anemia of

Acute blood loss

Symptoms are related to **decreased** intravascular volume.

If loss is **> 20 % of blood volume**, patient might have hypovolemic shock and death

Body **responds** by **shifting fluid** from **interstitial to intravascular space**, causing **dilutional anemia** and **worse hypoxia** (stays **2-3 days**)

Erythropoietin secretion **is stimulated**, activating BM erythropoiesis (needs **5-7 days**)

The **Anemia** is **normochromic normocytic**.

with Reticulocytosis

In **external and GIT** hemorrhage

iron is lost, which complicates anemia

In **internal** hemorrhage

iron is restored from extravasated RBCs and used again in erythropoiesis

Chronic blood loss

Occurs when:

the **rate of RBC loss** exceeds **regeneration**

loss > Regeneration

Mostly occurs in :

- 1) **gastrointestinal** diseases
- 2) **excessive** menstruation

Results in : **iron deficiency**.

Anemia appears **hypochromic and microcytic**.

low Reticulocytes

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

﴿وَلَا تَحْسَبَنَّ الَّذِينَ قُتِلُوا فِي سَبِيلِ اللَّهِ أَمْوَاتًا بَلْ أَحْيَاءٌ عِنْدَ رَبِّهِمْ يُرْزَقُونَ﴾ [آل عمران: ١٦٩]

صدقة الله العظيم

- هذا الملخص صدقة عن أرواح شهداء الأمة في أرض قبلتنا و
مسجدنا فلسطين الحبيبة .

وأخص بالذكر الصحفي من غزة (علي نسمان) الذي
وصلني خبر استشهاده في نفس وقت كتابتي لهذا
الملخص ، بدي اطلب منكم تدعو له بالرحمة .



Done by : Mohammad Al Smadi