***“Anemia of diminished erythropoiesis part-1-”***

***Includes:***

Iron deficiency anemia & chronic disease anemia are discussed in part 1

1. Anemia caused by an inadequate dietary supply of nutrients (iron, folic acid ,and vitamin B12)

Note: inadequate dietary supply means insufficient amount of nutrients in the human body whether it was caused by low intake of them or other reasons.

1. Anemias associated with systemic inflammation (chronic disease anemia)
2. Anemia associated with bone marrow failure (aplastic anemia)
3. Anemia associated with bone marrow infiltration by tumor or inflammatory cells (myelophthisic anemia)

***Iron deficiency anemia (the most common type of anemia):***

**Iron is found in 2 main compartments:**

1. Functional compartment: in hemoglobin (80%)/ myoglobin / iron containing enzymes.
2. Storage compartment: ferritin and hemosiderin. Because serum ferritin (ferritin in the blood) is derived from this storage pool it is considered a good indicator of iron stores.

The exchange of iron between those 2 compartments is achieved by transferrin which transports iron in the plasma.

**Iron regulation:**

1. There is no regulated pathway for iron excretion , so the amount of iron excreted through shedding of mucosal and skin epithelial cells is constant
2. On the other hand, iron absorption is highly regulated by hipcidin, how????
* When Storage sites are rich with iron and erthropoietic activity is normal-----🡪 plasma hipcidin levels are high ----🡪 which leads to down regulation of ferroportin and trapping of most of the absorbed iron in mucosal ferritin which is lost when duodenal epithelial cells shed into the gut.

Ferritin is highly saturated with iron.

* When body iron stores decrease or erythropoiesis is stimulated--🡪 hipcidin levels fall----🡪ferroportin activity increases -----🡪allows a greater amount of iron to enter the blood stream.

Transferrin is upregulated to transfer higher amounts of iron.

Serum ferritin declines.

**Iron deficiency causes:**

1. Chronic blood loss: the most common sources of bleeding are the GI tract (e.g., peptic ulcer, colonic cancer, hemorrhoids) and the female genital tract (menorrhagia, metrorrhagia, cancers)
2. Low intake (most common among vegetarians)
3. Increased demands not met by normal dietary intake in pregnancy and infancy.
4. Malabsorbtion in celiac disease or after gastroctomy.

**Clinical features:**

Iron deficiency anemia is:

1. Usually mild and asymptomatic with non specific manifestations ( weakness /pallor/ listlessness/ abnormalities of the fingernails such as: thinning, flattening ,and spooning/ pica which is the desire to consume nonfood stuff such as dirt)
2. Under the microscope: red cells are microcytic and hypochromic.
3. Diagnosed by:
4. Microcytic hypochromic RBCs with RDW: red cell distribution width

Very important

1. Ferritin /serum iron /total iron binding capacity / transferrin saturation
2. Erythropoietin levels are increased but bone marrow response is weak duo to iron deficiency.
3. For unclear reasons, platelet count
4. Treated by: iron supplementation.

***Anemia of chronic disease (most common form of anemia in hospitalized patients):***

**Cause: suppression of erythropoiesis by systemic inflammation. How & why??**

 **How:**

1. Inflammation causes the release of cytokines (IL-6) --**🡪** upregulation of hipcidin production----**🡪** causes down regulation of ferroportin in macrophages---**🡪**blocks the transfer of iron to erythroid precursors.
2. Chronic inflammation decreases erythropoietin synthesis---**🡪**lowering RBCs production.

 **Why:**

 To inhibit the growth of iron dependent microorganisms or to enhance human body immunity.

**Types of chronic inflammations associated with anemia:**

1. Chronic microbial infection = osteomyelitis, bacterial endocarditis, and lung abscess.
2. Chronic immune disorders= rheumatoid arthritis & regional enteritis.
3. Neoplasms =Hodgkin lymphoma & lung and breast carcinoma.

**Clinical features:**

**Symptoms:**

Similar to iron deficiency anemia

**Diagnosis:**

1. **As in iron deficiency anemia: serum iron / red cells are microcytic and hypochromic**

Very important

1. **Unlike iron deficiency anemia: storage iron in the bone marrow / serum ferritin /total iron binding capacity**

**Treatment:**

Can be improved by iron and erythropoietin administration but the only cure is treating the underlying cause.

**Done by: Fekra..…good luck!!!**