

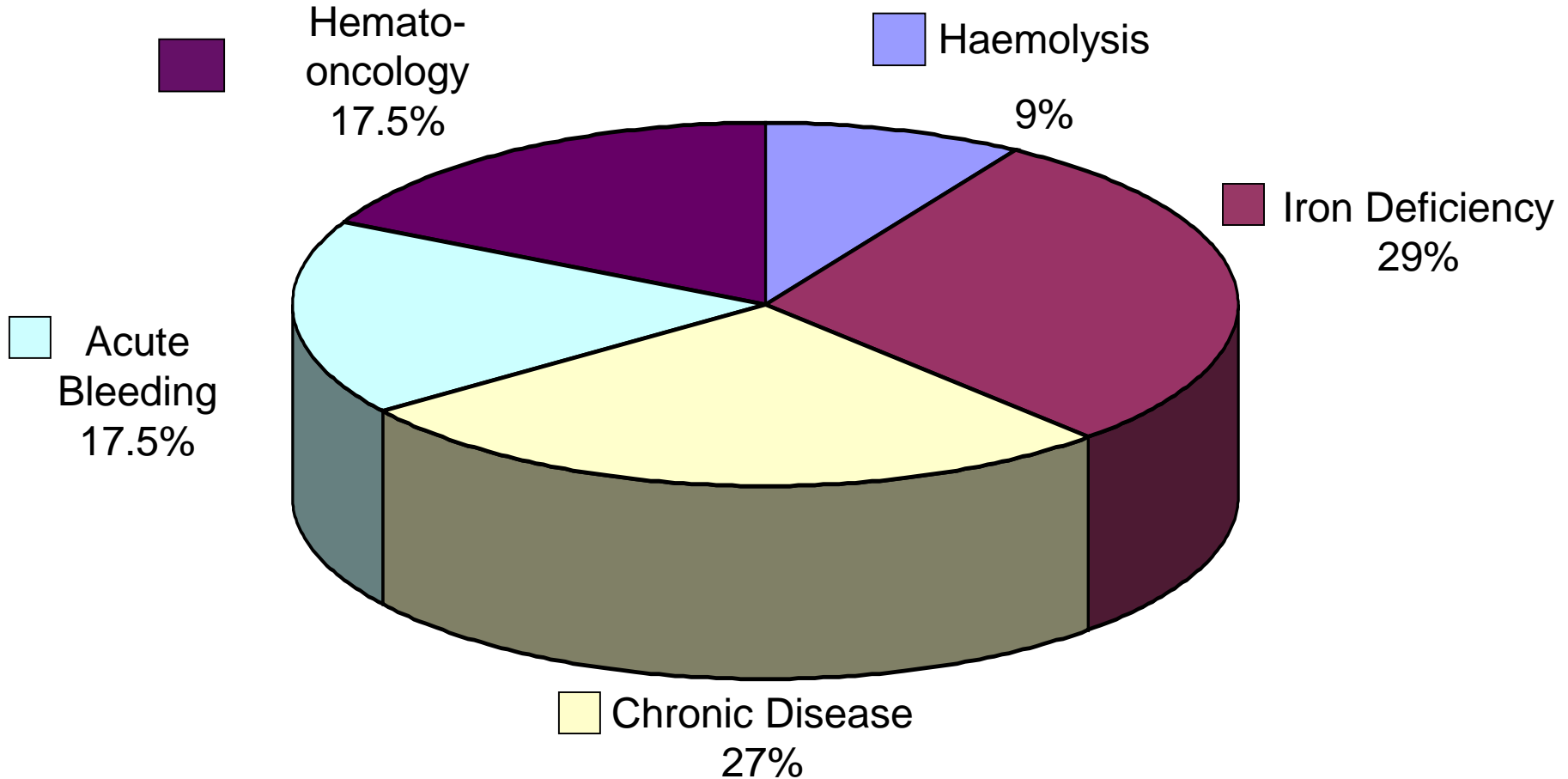
Anemias part 1

MUDr.A.Jonášová

Definition

- Anemia, like a fever, is a **symptom of disease** that requires investigation to determine the underlying etiology
- Anemia should be defined as a **decrease in red blood cell (RBC) mass.**
- In practice, anemia is usually quantified by measurement of **hemoglobin (Hb) concentration**
- WHO definition is: Hb < 120 g/l in women
Hb <130 g/l in men

Main Causes of Anaemia



Prevalence

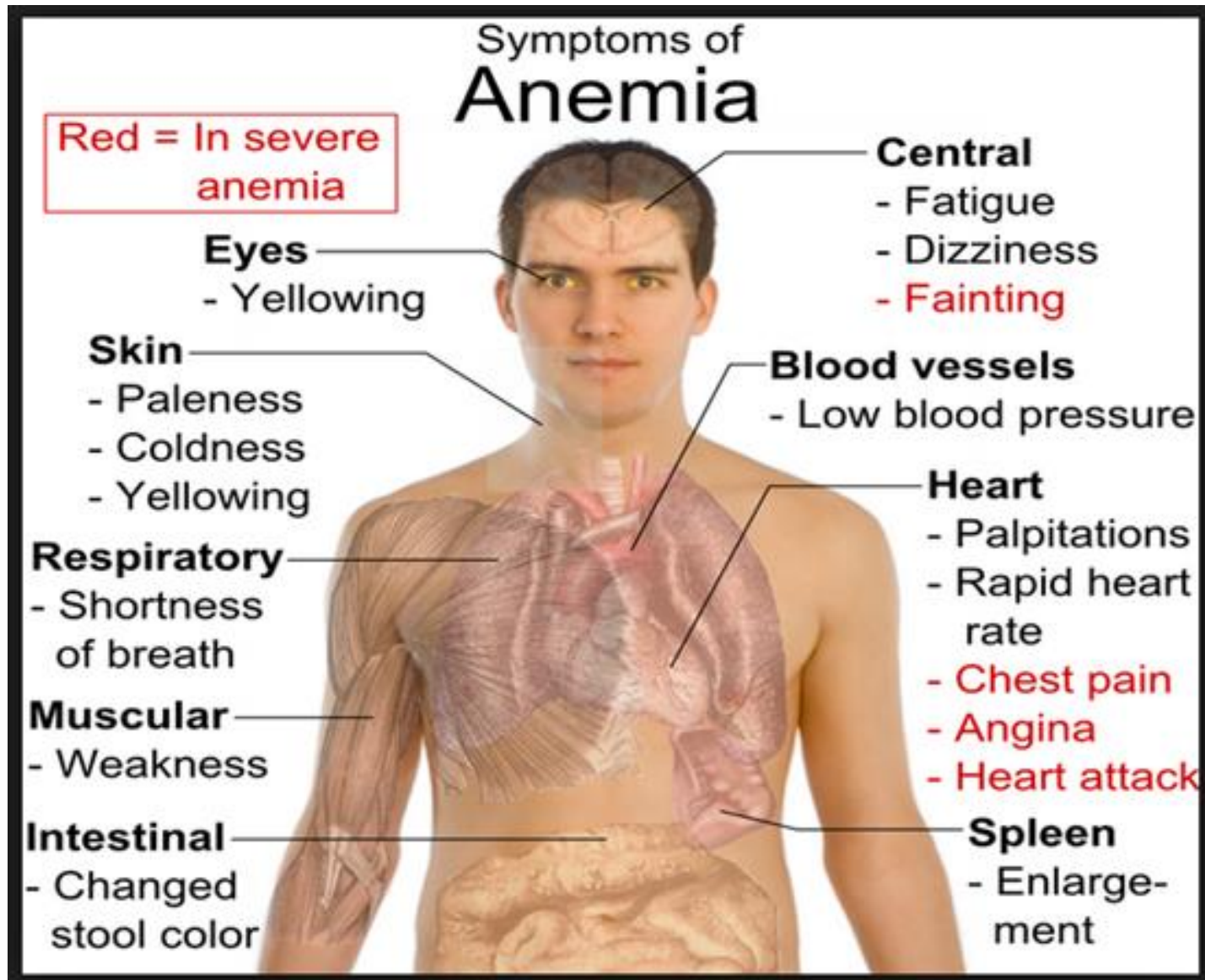
- **Developed countries:**
- **8% women, 10% > 65 years**
- **4% men, 11% > 65 years**
- **>20% > 80 years**
- **24% hospitalized**
- **59% nursing homes**
- **34% out of them are not explained**
- **15% Myelodysplastic syndromes**

- **Developing countries: 2-5x higher (thalassemia, sickle cell disease, malaria, bad nutrition, chronic infections)**

Classification - according to etiopathogenesis

- Impaired production of erythrocytes
- Abnormal losses
- Both (combination)
- (Acute blood loss)

Symptoms



Symptoms

The main symptom of most types of anemia is **fatigue**.

Other anemia symptoms include:

- **Weakness**
- **Shortness of breath (dyspnea)**
- **Dizziness**
- Numbness or coldness in extremities
- Cognitive problems
- **Headache, depression**
- Palpitation
- Skin and conjunctival and mucosal pallor
- A fast or irregular heartbeat (tachycardia)
- Edemas
- Jaundice
- Initially, anemia can be so mild it goes unnoticed.

Anemia- Impaired production

- **Due to deficiency of**
 - Iron
 - Vitamin
 - Other nutritional factors
- **Erythropoetin (EPO) underproduction, resistance**
(almost all kidney diseases, EPO resistance - inflammation, hyperparathyroidism, aluminium accumulatin)
- **Hemato-oncology diseases:**
 - Myeloproliferative
 - Lymphoproliferative
 - MDS
 - AA
 - MM
- **Anemia of chronic diseases**

Impaired erythrocyte production

- Impaired **haem** synthesis
- Sideropenic (iron deficiency)
- Sideroblastic

- Impaired **DNA** synthesis (vitamin B12, FA)

- Impaired **globin** synthesis – thalassemias
hemoglobinopathies

Investigating anemia: History

Anemia in family history

Ethnic origin

Onset of anemia

Bleeding (stool, urine, lungs)

**Symptoms from other organs ,
gastrointestinal..**

Jaundice, dark urine

Diet: vegetarians

Alcohol consumption

Drugs









Investigating anemia - physical

- **Pallor**
- **Icterus**
- **Bruising, purpura, petechiae**
- **Temperature**
- **Lymfo nodes**
- **Enlarged spleen**
- **Tachycardia, hypotension**
- **Nales, tongue**

Investigating anemia - laboratory

- CBC (WBC, PLT low- impaired hemopoiesis)
- Reticulocytes (low –low production, high-high destruction)
- MCV (iron or vitamin deficiency, thalassemia)
- RBC morphology (SS, spherocytosis, ovalocytosis, anisocytosis – MDS, schizocytes – microangiopathy, agglutination –cold agglutinins)
- Bilirubin (uncunjugated), LDH, haptoglobin
- Coombs test (direct, indirect)
- Kidney function test (epo production, epo level)
- Occult blood in the stools (iron deficiency anemia)
- C-reactive protein (inflammation, infection)
- Iron studies: ferritin, transferin saturation, TIBC, Fe
- Level of vitamin B12, folic acid
- Complete biochemistry
- Thyroid function tests

Erythrokinetic Classification of Anemia

Anemia	Marrow Production	Reticulocyte Index
Normal		
Hypoproliferative		
Ineffective		
Hemolytic		

Impaired production-**haem** synthesis

- **Iron deficiency anemia (29%)**
- Sideroblastic anemias
(uncommon)

1. Case report

Male 52 years

- Medical history:

Personal : so far has not been critically ill, 3 years therapy hypertension, dyslipidemia

Working : bus driver

Family : mother + 70 breast cancer, father + 80 CMP, brother healthy

Smoker 20/day, alcohol beer 1-2/day

Medicaments: Agen, hypolipidemic

Subjective findings

- In the last couple of months slight weakness, gets tired easier, more sleepy, over the last few weeks he notices shortness of breath, while walking up a hill or stairs he must rest, otherwise self-sufficient, manages work
- Slightly lowered appetite , but maintains weight, slight tendency to constipation, stool completely normal, no blood, no dyspepsia
- No pains, no more frequent infections, no signs of bleeding, permanently afebrile

Objective findings

- Obese, slightly pale skin, no shortness of breath,
- Good state of hydration
- Blood pressure 105/60 Heart rate 100/min regg
- Head, neck without pathologies except for pale oral mucosa, conjunctiva
- clear breathing , action – tachykardia regg.
- Soft stomach, doesn't hurt, without palpation
- Lower limbs without swelling, without varicose veins without infections

Laboratory findings

CBC:

- WBC 9,0, ANC 6,7
- Ery 2,4
- Hb 88
- PLT 450
- MCV 66
- Diff. count normal
- Reticulocytes increased (25)

Laboratory findings

Biochemistry:

- Ions normal
- Renal functions, liver tests – normal
- Total protein 66
- Albumin 35
- C-reactive protein (CRP) 25
- Ferritin 6
- Fe 3,2

Differential diagnosis

- 52 male with isolated microcytic anemia, signs of sideropenia
- Diff. dg:
- **Sideropenic anemia**
- Unlikely hemoglobinopathia

Further examination

- Stool occult bleeding test- positive
- Referred to GE
- Gastroscopy: no abnormality except for small hiatus hernia
- Koloskopy: tumor between descending and sigmoid colon with fragile slightly bleeding surface
- **Histology: colorectal cancer**
- CT- without metastasis

Iron Deficiency - Aetiology

- **Increased demand** for iron and/or haematopoiesis
- **Iron loss**
- **Decreased iron intake** or absorption

Iron Deficiency—Increased Demand

- Infancy and adolescence
- Pregnancy and lactation
 - Low socioeconomic status and poverty greatly increase the prevalence of iron deficiency in this category of populations
- In patients receiving erythropoietin therapy (= functional iron deficiency)
Accelerated erythropoiesis

Iron Deficiency—Iron loss

- In physiologic conditions
 - Menstruation
- In pathologic conditions
 - Surgery, delivery
 - Haemoglobinuria, haemoptysis
 - Gastrointestinal tract pathology
- In therapeutic procedures
 - Phlebotomy
- In blood donation

Iron Deficiency—Decreased Iron Intake or Absorption

- Vegetarians or malnutrition (low-cost diet)
- Malabsorption syndromes
 - Coeliac disease and Crohn's disease
- After gastric and intestinal surgery
- Intestinal parasitosis (ankylostomiasis)
- *Helicobacter pylori* infection
- Autoimmune atrophic gastritis (low HCL)

Iron Deficiency

Clinical Manifestations (I)

- Fatigue
- Decreased exercise tolerance
- Tachycardia
- **Dermatologic manifestations**
- Decreased intellectual performance
- Dysphagia
- Depression, increased incidence of infections

Iron Deficiency

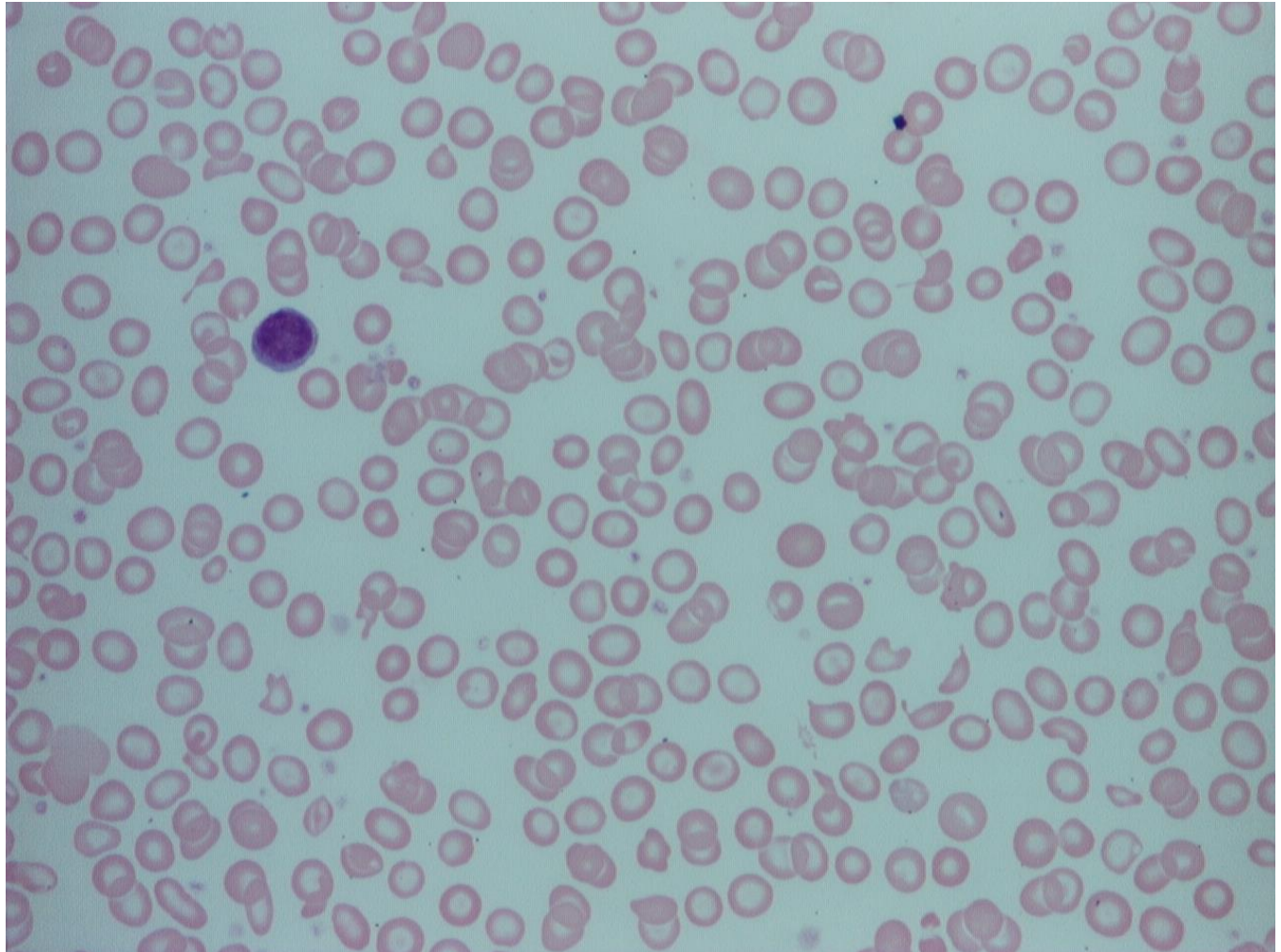
Clinical Manifestations (II)



- Skin and conjunctival pallor
- Koilonychia
- Angular cheilosis
- Burning tongue / Glossitis
- Hair loss (alopecia areata)

Diagnosis of Iron Depletion in the Body—Haematology

Peripheral blood smear of a patient with severe iron deficient anaemia. Note the important **microcytosis** (compare red blood cells with lymphocyte) as well as hypochromia, target cells, and poikilocytosis.



Hypochromic, microcytic anaemia usually with high platelets

Differential diagnosis of microcytosis

- Iron deficiency
- Thalassaemia syndromes
- Anaemia of chronic diseases
- Haemoglobinopathies (E,C,CS, Lepore...)
- Familial sideroblastic anaemia
- Miscellaneous (lead intoxication...)

Diagnosis of Iron Depletion in the Body—Clinical Chemistry

- Serum iron
- Transferrin (iron binding capacity)
- **Transferrin saturation**

These parameters are modified by inflammation and by fasting state.
They are thus of limited value.

Serum ferritin, soluble transferrin receptors (sTfR) are excellent tools for screening iron stores

Other tests

- **Depending on history and symptoms:**
 - 1. Occult stool bleeding**
 - 2. Gastrointestinal investigation – endoscopy**
 - 3. Gynecology**

Treatment

- Iron drugs (100 mg-200mg/day)
- Duration depends on the cause of ID
- Some times I.V. infusions