

Perinatal Medicine 2019

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Iron Deficiency Anemia in Pregnancy

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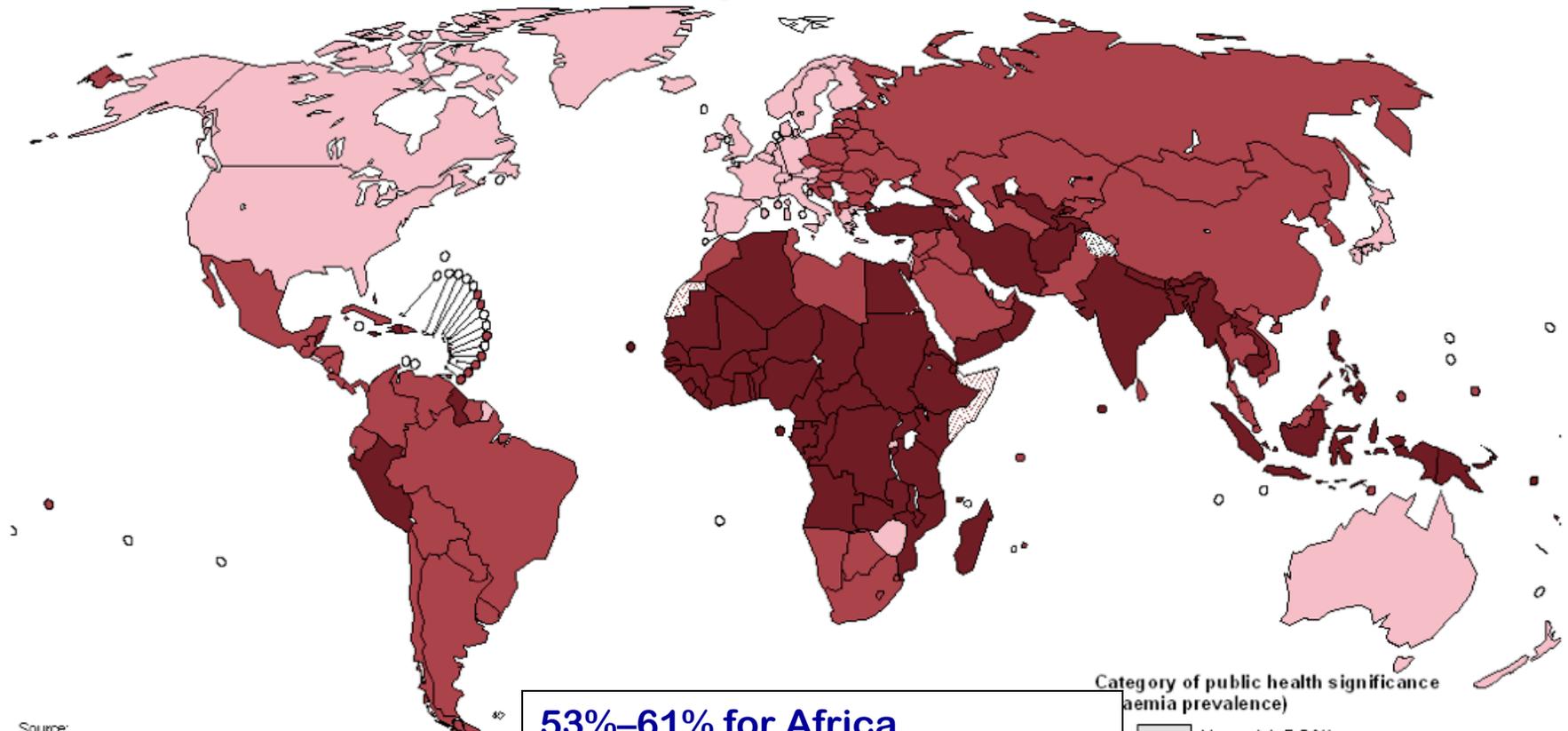
Izmir





Micronutrient Malnutrition Unit
Nutrition for Health and Development

Anaemia as a public health problem by country: Pregnant women



Source:
de Benoist B et al., eds. Worldwide prevalence of anaemia 1993-2005.
WHO Global Database on Anaemia. Geneva, World Health Organization.

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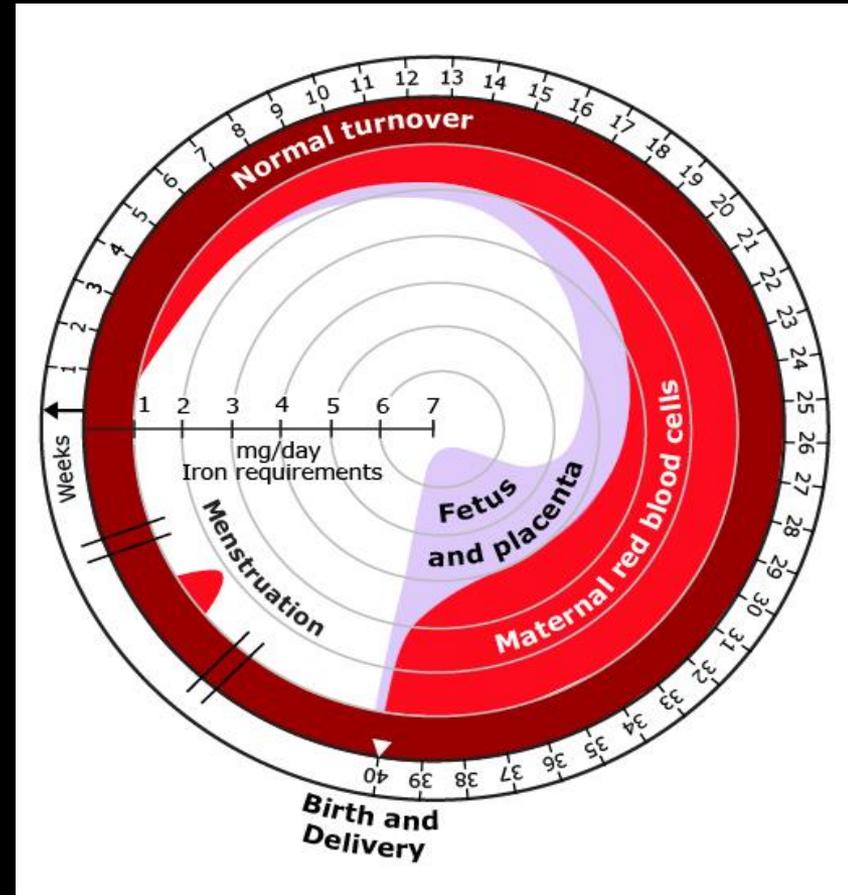
**53%–61% for Africa,
44%–53% for South-East Asia,
17%–31% for Europe and
North America**

Iron needs in pregnancy

1,200mg (55kg)

- Maternal erythrocyte mass ↑(450mg)
- Placenta (90-100 mg)
- Fetus (250-300 mg)
- General losses (200-250 mg)
- Blood loss at delivery 150mg iron (300-500 mL)

40% → serum ferritin <30 $\mu\text{g/L}$
90% → serum ferritin <70 $\mu\text{g/L}$

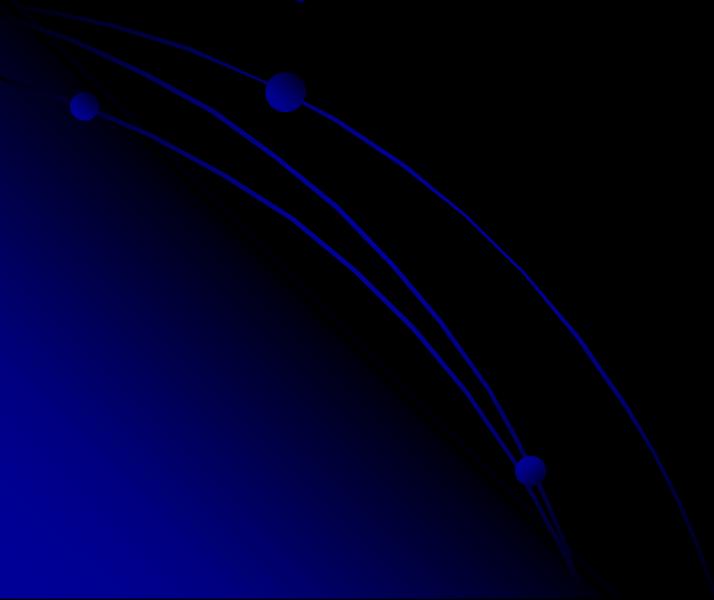


Maternal Risks

Anemia is associated with 40% of maternal deaths worldwide (WHO)

- Fatigue, exhaustion, weakness, "less energy"
- Cardiovascular symptoms (eg, palpitations)
- Pallor, pale mucous membranes, and conjunctivae
- Tachycardia, hypotension
- Cardiac hypertrophy in chronic cases
- Reduced physical and mental performance
- **Maternal mortality** with high blood loss
- Maternal cardiovascular strain
- Increased risk for peripartal blood transfusion

Fetal Risks

- Intra uterine growth retardation (IUGR)
 - Prematurity
 - Death in utero
 - Infection
- 

Diagnosing Anemia During Pregnancy

- **Basic Diagnostic Tests: Hemoglobin and Erythrocyte Indices**
 - Hemoglobin concentration
 - Hematocrit
 - Mean corpuscular volume (MCV)
 - Mean corpuscular hemoglobin (MCH)
 - Erythrocyte count



Diagnosing Anemia During Pregnancy

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- Serum iron, transferrin, and transferrin saturation

Diagnosing Anemia During Pregnancy

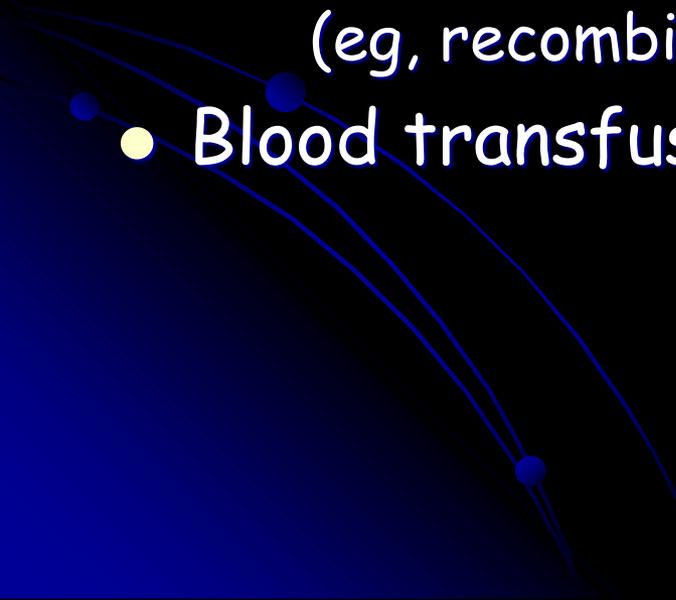
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- **Serum ferritin**
 - Serum ferritin levels of <20 mg/L confirm the presence of iron deficiency, regardless of the hemoglobin level

Laboratory findings during the development of iron deficiency

	Normal	Iron deficiency without anemia	Iron deficiency with mild anemia	Severe iron deficiency with severe anemia
Hemoglobin	Normal range*	Normal range*	9 to 12 g/dL (90 to 120 g/L)	6 to 7 g/dL (60 to 70 g/L)
Red blood cell size and appearance	Normal	Normal	Normal or slight hypochromia (slight decrease in MCHC)	Microcytosis (decrease in MCV) and hypochromia (decrease in MCHC)
Serum ferritin	40 to 200 ng/mL (40 to 200 mcg/L; 89.9 to 449 picoM/L)	<40 ng/mL [†] (<40 mcg/L; <89.9 picoM/L)	<20 ng/mL (<20 mcg/L; <45 picoM/L)	<10 ng/mL (<10 mcg/L; <22.5 picoM/L)
Serum iron	60 to 150 mcg/dL (10.7 to 26.7 microM/L)	60 to 150 mcg/dL (10.7 to 26.7 microM/L)	<60 mcg/dL (<10.7 microM/L)	<40 mcg/dL (<7.1 microM/L)
Total iron-binding capacity (TIBC; transferrin)	300 to 360 mcg/dL (53.7 to 64.4 microM/L)	300 to 390 mcg/dL (53.7 to 69.8 microM/L)	350 to 400 mcg/dL (62.6 to 71.6 microM/L)	>410 mcg/dL (>73.4 microM/L)
Transferrin saturation (serum iron/TIBC)	20 to 50%	20%	<15%	<10%
Bone marrow iron stain	Adequate iron present	Iron absent	Iron absent	Iron absent
Erythrocyte zinc protoporphyrin, ng/mL RBC	30 to 70	30 to 70	>100	100 to 200

Treatment

→ Additional iron supplement of **30 to 120mg/day**

- Oral iron,
 - Parenteral iron,
 - Stimulation of hemopoiesis with growth factors
(eg, recombinant human erythropoietin),
 - Blood transfusion
- 

Oral iron

- **Iron (II) salts.**
 - iron(II) sulfate;
 - iron(II) fumarates, succinates, and gluconates.
- **Iron (III) compounds**
 - Very low bioavailability and are therefore not indicated for oral administration.
- **Iron(III) polymaltose complex.**
 - Dextriferron → slow-release iron preparations.

Low or Limited Response to Oral Iron

- Non compliance
- Gastrointestinal diseases (Crohn's disease, ulcerative colitis)
- The presence of an infection that suppresses erythropoiesis
- Malabsorption of iron (eg, celiac disease)
- Additional complicating disorders (kidney failure)
- Additional hemorrhage (eg, gastrointestinal, of parasitic origin)
- Drugs that inhibit erythropoiesis (eg, cytotoxic agents, immunosuppressants)
- Incorrect diagnosis of iron deficiency

Parenteral iron

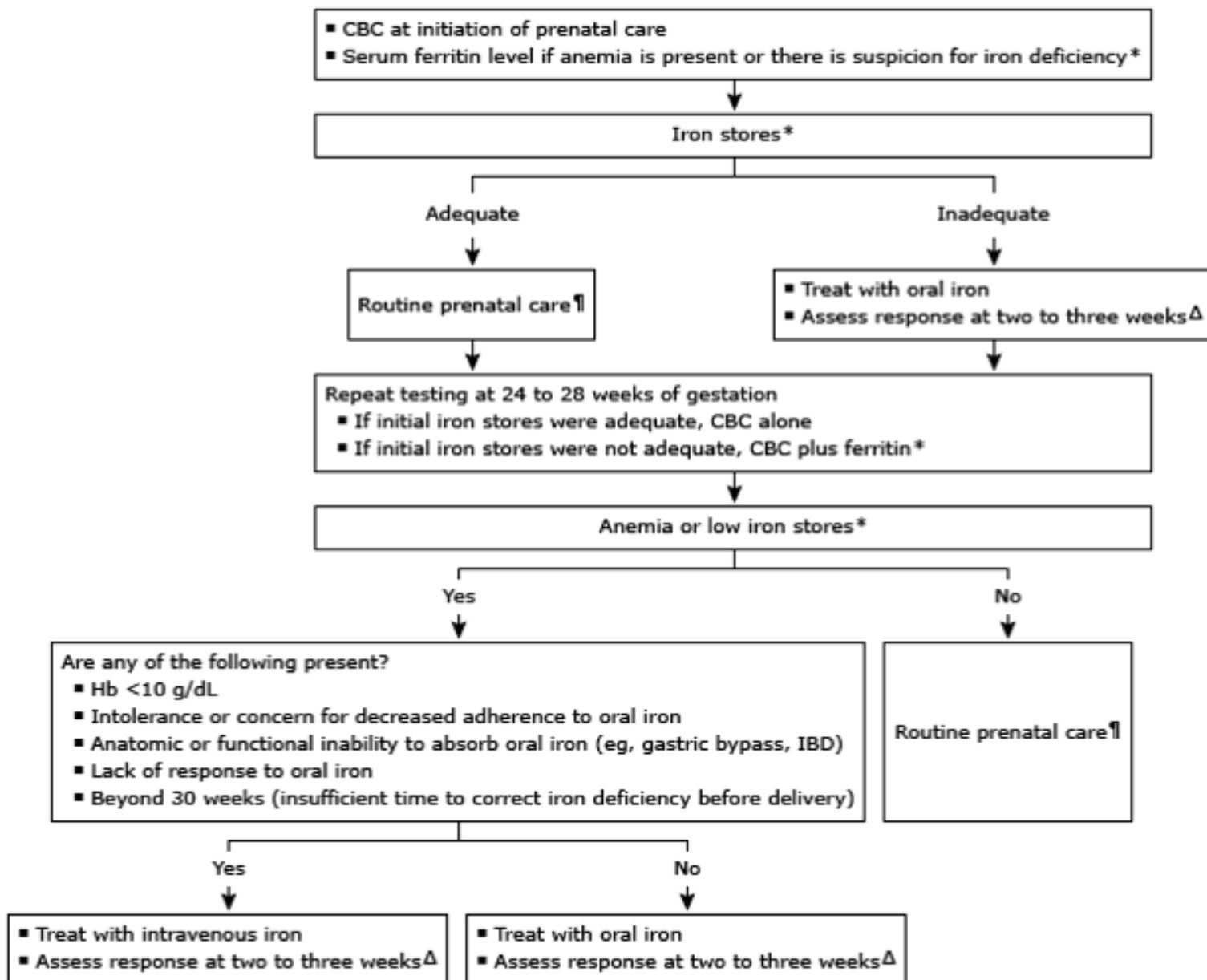
- Insufficient or no response to oral iron
- Severe anemia
- Insufficient absorption of oral iron due to intestinal disease
- The need for rapid efficacy
- Intolerance of oral iron
- Poor compliance

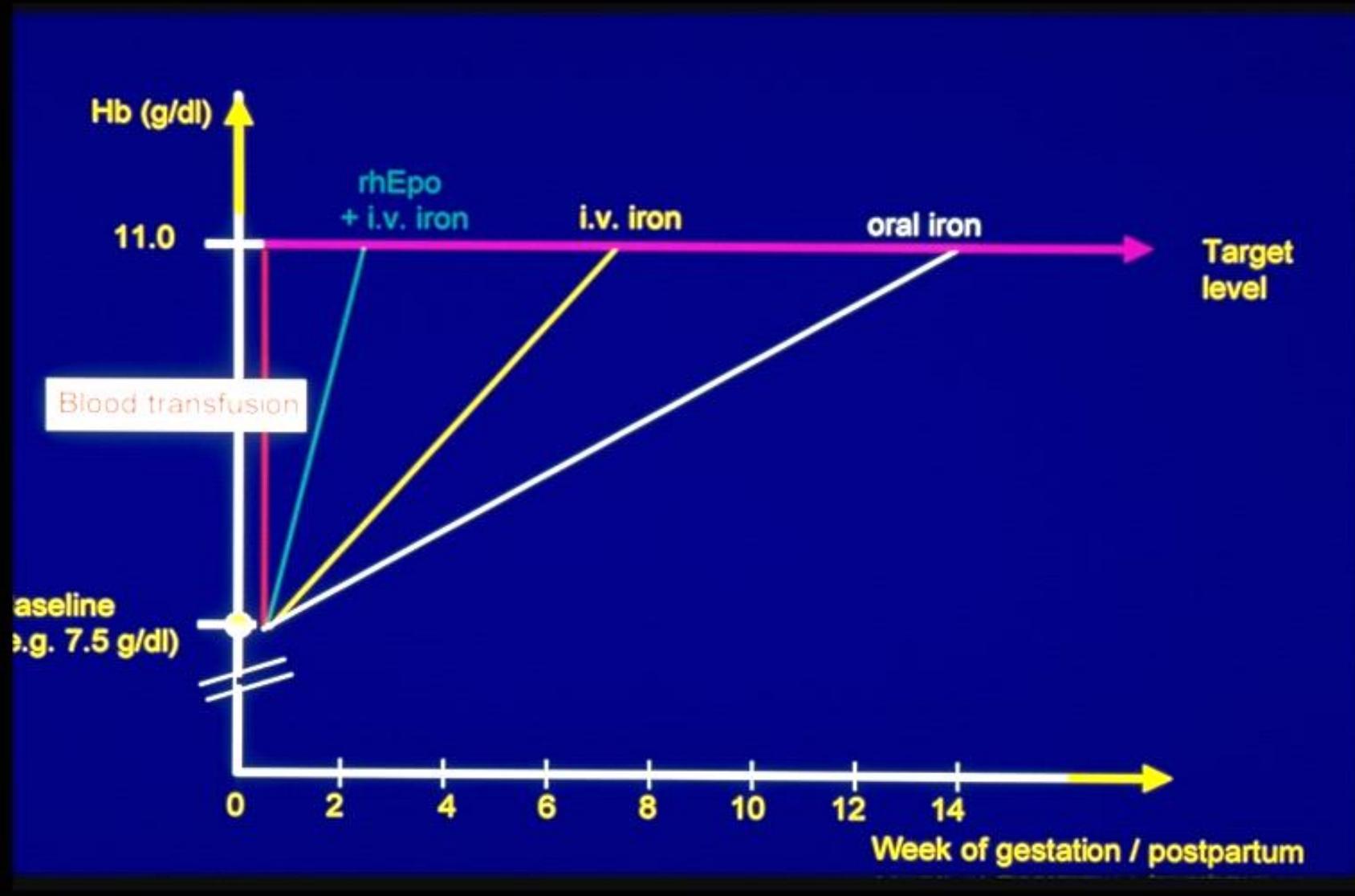
Use of parenteral iron preparations in pregnancy

Substance	Iron Carboxymaltose	Iron Sucrose	Iron Sorbitol	Iron Gluconate (sodium feric gluconate)	Iron Dextran (HMW)	Iron Dextran (LMW)	Iron Polymaltose (iron dextrin)
Trade name	<i>Ferinject (EU)/ Injectafer (US)</i>	<i>Venofer</i>	<i>Jectofer</i>	<i>Ferlicit</i>	<i>Dexferrum</i>	<i>INFeD</i>	<i>Ferrosig, Ferrum Hausmann</i>
Dosage/time	1,000 mg/15 min IV	200 mg (5-15 min) IV	75 mg/dose IM (!)	125 mg (10-60 min) IV	Total dose (1-4 hrs)	Total dose (1-4 hrs) IV	Total dose (2 hrs) IV
Major adverse events	Rare	Rare	Yes	Rare	High !!	Rare	Rare
Neonatal data	Yes	Yes	No	No	No	No	Yes

	Advantages	Disadvantages
Oral iron	<ul style="list-style-type: none"> ■ Effective for most patients ■ Extremely low risk of serious adverse events ■ Initial costs very low 	<ul style="list-style-type: none"> ■ Gastrointestinal side effects are common ■ Compliance may be low ■ May be inadequate for severe or ongoing blood loss ■ May require administration for several months ■ Total costs may be higher
IV iron	<ul style="list-style-type: none"> ■ Effective for most patients ■ More rapid correction of anemia and resolution of symptoms ■ Ability to administer large doses (up to 1000 mg elemental iron) in a single infusion ■ Compliance is assured ■ No gastrointestinal side effects 	<ul style="list-style-type: none"> ■ Requires monitored intravenous infusion ■ Rare cases of allergic or infusion reactions ■ Requires equipment and personnel to treat allergic or infusion reactions ■ Initial costs may be higher

Algorithm for evaluating and treating iron deficiency in pregnancy





CONCLUSIONS

- Iron-deficiency anemia is the most frequent form of anemia in pregnancy and can have serious consequences for both the mother and fetus.
- Diagnosis can easily be made with **hemoglobin and serum ferritin levels**
- Currently, the main interventions are oral iron, parenteral iron and blood transfusions
- If needed, intravenous iron can be used in pregnancy as well (It is more effective and provides more rapid hemoglobin correction)

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Thank You

