

# Iron Deficiency Anemia

## / Microcytic Hypochromic Anemia

[DEPTH OF BIOLOGY]

↓  
caused by deficiency of Fe

\* Most common type of anemia worldwide

↓  
# RBC → If we see we find [RBC ↓↓]

↓  
There are millions of proteins (copies) called Hb

↓ [DEPTH OF BIOLOGY]  
Binds with  $O_2$  → Transport to cell.

# Hb protein

↓  
made up of 4 **Heme molecule**. In the middle Fe is present.

• each **Hb molecule** bind with 4 molecules of Oxygen.

# Additionally, [DEPTH OF BIOLOGY]

\* Iron is important part of protein like Myoglobin which delivers and store oxygen in muscle.

\* And mitochondrial enzyme like cytochrome oxidase which help to generate ATP

Now →

Normally when RBC dies some Fe is recycled from it.

• But we also lose about milligram of Iron everyday.

→ By sweat  
→ By skin cells.

[DEPTH OF BIOLOGY]

→ By GIT cell which gets out through faeces.



## But

- We take 10-20mg of dietary Iron everyday and absorb about 10% of it (1-2 mg)
- Now our diet contain two forms of Iron

① Heme → Bind to Hb or Myoglobin. <sup>Fe<sup>2+</sup> STATE</sup>  
Iron → comes from animal products like meat.

② Non-Heme Iron [DEPTH OF BIOLOGY]

comes from plant products or plant based food.  
→ free iron molecule in the form of ferric of Fe<sup>3+</sup> state

Now,

food → broken down in stomach → Release Fe.

- Heme Iron absorbed directly into duodenal cells

↓  
where it is broken down to release Fe<sup>2+</sup> molecule

- Non Heme Iron (reduced) → Heme Iron  
into [DEPTH OF BIOLOGY]

\* Stomach HCl → activates group of enzymes in duodenal cells collectively called Ferric-Reductase

↓  
reduces Non-Heme Iron

Binds with protein

Ferritin

← into Fe<sup>2+</sup> ← Temporarily stores Iron

# when Fe is needed in body [DEPTH OF BIOLOGY]

• some Fe<sup>2+</sup> molecules released from ferritin and transport into the blood.

# where enzyme Hephaestin converts Fe<sup>2+</sup> → Fe<sup>3+</sup>

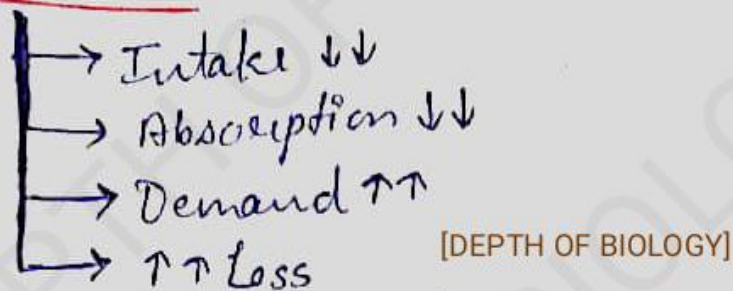
(Fe<sup>3+</sup>) → Binds to Iron Transport Protein Transferrin

they carry Iron → and release in cell or tissue where needed.





## # Main Causes



① → Intake ↓↓ — Most comm. cause of Fe deficiency anemia.  
• occurs in infants (since milk has Ca and Ca inhibits the Fe absorption)  
• vegetarians.

② → Absorption ↓↓ → stomach acid ↓↓ (after Gastrectomy)  
• Inf. Bowel Disease or Celiac disease  
• Inflammation and destruction of duodenal cells.  
[DEPTH OF BIOLOGY]

③ → Demand ↑↑ → In Adolescents and children  
↓  
due to rapid Growth → Blood vol. ↑↑  
requires more Hb  
• During pregnancy → because frequency in Foetal development  
[DEPTH OF BIOLOGY]

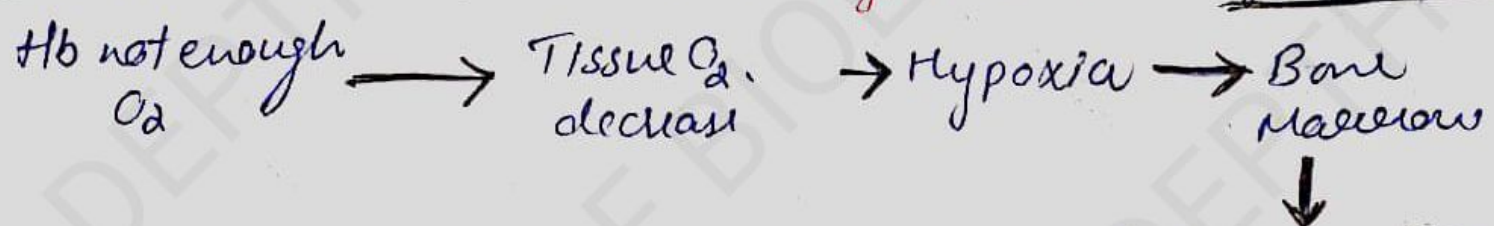
④ → Fe loss → In chronic slow bleeding during MC  
• People with bleeding gastric ulcers  
• elderly males with colon cancer.  
\* This first symptoms is Iron defi. anemia.

⑤ Another cause Helicobacter pylori Infection  
↓  
Gastric ulcers and GI bleed

⑥ Hookworms  
↓  
in intestine  
↓  
sucks blood.  
[DEPTH OF BIOLOGY]



# Iron deficiency → Impaired Hb production (not enough)  
# Cells contain less Hb called **Hypochromic** → appear pale.



Bone marrow pumps out incomplete RBC ← To increase RBC production

[DEPTH OF BIOLOGY]

various sizes called **Isocytosis** and various shapes  
**Poikilocytosis**

[DEPTH OF BIOLOGY]

enters in circulation

• Fe deficiency → results in defective production of mitochondrial enzymes.

Symptoms [DEPTH OF BIOLOGY]

# specific symptoms → koilonychia, Hair loss, PICA, Plummer **VINSON** Syndrome, Glossitis, Esophageal webs.

# General symptoms

- Pallor
- Palpitations
- Shortness of breath
- Easy fatigability.

## Diagnosis

- ① Hb  $\downarrow\downarrow$  —————  $\text{♂}$  —  $< 13.5 \text{ g/dL}$   
 $\text{♀}$  —  $< 12.0 \text{ g/dL}$
- ② MCV  $\downarrow\downarrow$  (Mean Corpuscular Value).
- ③ serum Fe  $\downarrow$
- ④ ferritin  $\downarrow$
- ⑤ TIBC  $\uparrow\uparrow$  (unbound transferrin) (Total Iron Binding Capacity)
- ⑥ RBC distribution width  $\uparrow\uparrow$  (RDW)

## Treatment [DEPTH OF BIOLOGY]

- ① oral Fe supplement (FeSO<sub>4</sub>)

• Taken with Vit C - orange juice or lemon water  
    (Increase Fe absorption).

side effects

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graph LR
  A[side effects] --> B[Nausea]
  A --> C[CONSTIPATION]
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\* If not treated with this  $\rightarrow$

- (a) Intravenous Iron Infusion

• severe cases also may require blood transfusion.