# Anemia
# A Public Health Problem

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# Anaemia

- is a condition in which the number of RBCs or the Hb concentration within them is lower than normal. Hb is needed to carry oxygen, and if too few or abnormal RBCs , or not enough Hb, there will be a decreased of oxygen carried to the body's tissues via blood
- The optimal Hb concentration needed to meet physiologic needs varies by age, sex, elevation of residence, smoking,& pregnancy
- Anemia is a global public health problem affecting both developing and developed countries
- with major consequences for human health as well as social and economic development.
- It occurs at all stages of the life cycle, but is
- more prevalent in pregnant women and young children

- Anemia is the result of a wide variety of causes
  - **Indeed these factors are multiple and complex**
- **The most common causes of anemia include**
  - **Nutritional deficiencies particularly Iron deficiency**
- **Globally**, the most significant contributor to the onset of
  - **anemia is iron deficiency (IDA)**
  - **So, IDA and anemia are often used synonymously and**
  - the **prevalence of anemia** has often been used as a proxy for IDA.
- **It is generally assumed that 50%** of the cases of anemia are due to **iron deficiency** but **the proportion may vary among population groups** and in **different areas** according to the local conditions

**In 2002, iron deficiency anemia (IDA) was considered to be among the most important contributing factors to the global burden of disease**

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- though deficiencies in folate, vitamins B12 and A **are also**
- **important** causes; **haemoglobinopathies**; and **infectious diseases**, such as malaria, tuberculosis, HIV and parasitic infections

- **The primary objective of the WHO Global is to fight against anemia. This needs** collection of information on anemia prevalence

# Types of dietary iron

There are two distinct types of dietary iron-haem and non-haem iron.

- **Haem iron**

is a constituent of haemoglobin and myoglobin and therefore is present in meat, fish and poultry, as well as in blood products.

- **non-haem iron**,

- is the second type of dietary iron, it is more important source;
- it is found to varying degrees in all foods of plant origin.
- non-haem iron is absorbed in a fundamentally different way from haem iron.
- Hem iron Its bioavailability is little affected by the nature and composition of a given meal.
- meat, and fish are enhancers the of iron absorption of the non-heam contained in the rest of the meal

In contrast, the absorption of non-haem iron **is highly variable** and

- ❖ depends on what other foods are eaten with the meal,
- ➢ **especially on the balance between foods that promote and those that inhibit iron bioavailability.**

❑ **Besides the iron derived from food, the diet may also contain**

❑ **exogenous iron originating from;**

- ❖ **the soil, dust, water or cooking vessels.**
- ❖ **such contamination iron in a meal may be several times greater than the amount of food iron.**
- ❖ **Another form of exogenous iron is** that **present in foods such as**
- ❖ **flour, sugar and salt** which are **deliberately fortified** with iron or iron salts.

❑ **How much iron is effectively absorbed by the body varies considerably depending on a number of factors,**

# Absorption of dietary iron

The absorption of dietary iron is influenced by the amount and chemical form of the iron, **the consumption during the same meal of** factors **enhancing and/or inhibiting** iron absorption, and the health and iron status of the individual

## Major Determinants Of Iron Absorption

### Dietary Factors:

**(1) factors that enhance non-haem iron absorption:**

- **Ascorbic Acid (vitamin C)**
- **Meat, poultry, fish and other seafood**
- **Low pH (e.g., lactic acid)**

**(2) factors that inhibit non-haem iron absorption:**

- Phytates whole grains, seeds, legumes, some nuts
- polyphenols, including tannins

### Host Factors:

(1) iron status

(2) health status (infections, malabsorption

# Main Risk Factors For IDA Include ;

a. **Low intake of iron,**
b. **Poor absorption of iron from diets high in phytate or phenolic compounds,**
c. **Period of life when iron requirements are especially high (i.e.growth and pregnancy).**
d. **Heavy blood loss as a result of menstruation, or parasite infections such as hookworms, ascaris, and schistosomiasis can lower blood Hb concentrations.**
e . **Acute and chronic infections, including malaria, cancer, TB, and HIV can also lower blood Hb concentrations.**

***Infections interfere with food intake and the absorption,*** *storage and* ***use of many nutrients, iron among them.***

***repeated episodes of infection*** may result in the **development of anaemia, particularly in young children whose** morbidity burden is much higher than that of adults. This explains in part the high prevalence of anaemia among infants and preschool children.

**f. The presence of other micronutrient deficiencies, including vitamins A and B12, folate, riboflavin, and copper can increase the risk of anemia.**

**g. Furthermore, the impact of haemoglobinopathies on anemia prevalence needs to be considered within some populations.**

***Congenital haemolytic diseases such as sickle-cell anaemia and thalassaemia are also found in certain populations, particularly in Africa, Asia, and some Pacific islands, although they rarely constitute a significant public health problem. In some Asian countries,*** **Thailand and Viet Nam, the high prevalence of thalassemia should be taken into account when iron supplementation programmes are envisaged.**

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**Anaemia can cause a range of symptoms including fatigue, weakness, dizziness and drowsiness.**

## *Health consequences*

**Anemia is an indicator of both poor nutrition and poor health.**

- **The most dramatic health effects of anemia (IDA ), i.e.,**
- **increased risk of maternal** and **child mortality** due to severe anemia, have been well documented

- **In addition the negative consequences of IDA on**
- **cognitive and physical development of children,** and
- **on physical performance– particularly work productivity in adults** – are of major concern

- **The consequences of IDA are many.**

**They include the following:**

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## ❑ *In infants and children*

- **impaired motor development and coordination;**
- **impaired language development and scholastic achievement**
- **psychological and behavioural effects** (inattention, fatigue, insecurity, etc) **decreased physical activity**

## ❑ *In adults of both*

- ✓ **decreased physical activity :**
- ✓ **decreased physical work and earning capacity;**
- ✓ **decreased resistance to fatigue.**

## ❑ *In pregnant women;*

- increased maternal morbidity and mortality;
- increased fetal morbidity and mortality;
- increased risk of low birth weight.

There is a growing body of evidence, based on animal studies, that iron deficiency as such, even before the stage of frank anaemia is reached, **adversely affects the immune system.**

# *Assessing anaemia*

- Hb concentration is the most reliable indicator of anaemia at the population level,
  - **Measuring Hb concentration is relatively easy and inexpensive, and this measurement is frequently used as a proxy indicator of iron deficiency.**
- However, anaemia can be caused by factors other than iron deficiency.
- the causes of anaemia need to be identified considering that they may vary according to the population
- **Anemia may be diagnosed with confidence when the Hb concentration is lower than the level considered normal for the person's age/sex group.**

When the anemia is due to iron deficiency, increasing

**When the anemia is due to iron deficiency, increasing the person's intake of absorbable iron will raise the Hb concentration**

However, many individuals with **seemingly normal Hb levels** likewise **respond to iron** administration with a rise in haemoglobin, which implies that they w**ere actually deficient in iron .**

Assessing the frequency of iron deficiency anemia in a population by means of haemoglobin

**Table 5.2:** Stages of anemia. Source (48) and values used in demographic and health surveys.

| | Anemia measured by hemoglobin (g/dL) | | | |
|---|---|---|---|---|
| | Anemia | Mild | Moderate | Severe |
| Children 6–59 months | <11.0 | 10–10.9 | 7.0–9.9 | <7.0 |
| Children 5–11 years | <11.5 | 10–11.4 | 7.0–9.9 | <7.0 |
| Children 12–14 years | <12.0 | 10–11.9 | 7.0–9.9 | <7.0 |
| Non-pregnant women above 15 years | <12.0 | 10–11.9 | 7.0–9.9 | <7.0 |
| Pregnant women | <11.0 | 10–10.9 | 7.0–9.9 | <7.0 |
| Men (above 15 years) | <13.0 | 12–12.9 | 9.0–11.9 | <9.0 |

Note: Hemoglobin values change with altitude and formulas are available to adjust hemoglobin values at different altitudes to define anemia.

# Magnitude of the problem

*Table 2.3* ***Classification of anaemia as a problem of public health significance***

| Prevalence of anaemia (%) | Category of public health significance |
|---|---|
| ≤4.9 | No public health problem |
| 5.0–19.9 | Mild public health problem |
| 20.0–39.9 | Moderate public health problem |
| ≥40.0 | Severe public health problem |

Source: adapted from reference (2)

# Prevalence

- Globally, anemia affects 1.62 billion people
  - which corresponds to 24.8% of the population

- The highest prevalence is in preschool-age children (47.4%)&
- the lowest prevalence is in men (12.7%,

Anaemia is a serious global public health problem that particularly affects young children and pregnant women.

- Worldwide, WHO estimates that anemia.
  - 42% of children less than 5 years of age and
  - 40% of pregnant women
  - non-pregnant women 35%, and
  - adult males 18%

- The **prevalence of anemia remains high globally, particularly in low-income settings**, where a significant proportion of **young children and women of childbearing** age can be assumed to be anemic.

- **Iron deficiency anaemia is considerably more prevalent in the developing** (36%-**versus 8%-**) **than in the industrialized world**,

- **Africa and South Asia have the highest overall regional prevalence rates**
- **estimated prevalence of anemia in all groups is more than 40% in both regions and is as high as 65% in pregnant** women in South Asia.

# Prevalence of Anemia in Jordan

prevalence of anaemia to be
**4.9% in males,**
**19.3% in non-pregnant females, and**
**27.4% in pregnant females.**

**Anaemia was predominantly mild**
**males: 81%,**
**non-pregnant females: 57%, and**
**pregnant females: 65.2%.**

**Iron deficiency anaemia (IDA) accounted for**
**68% of an anemic females and**
**38% of an anemic male**

# Control of anaemia

- Given the multifactorial nature of this disease,
- correcting anemia often **requires an integrated approach**.
- In order to effectively combat it, the **contributing factors must** be identified and addressed.

1-In **settings where iron deficiency** is the most frequent cause, **additional iron** intake is **usually provided through;**

- **Iron Supplements to vulnerable** groups; in particular pregnant women and young children.
- Food Based Approaches to increase iron intake through
- food fortification and **dietary diversification a**re important
- **sustainable strategies** for preventing IDA in the general population.

2-In settings where **iron deficiency is not the only cause** of anaemia, approaches that **combine iron interventions with other measures are needed.**

**taking into account the specific etiology and prevalence** of **anemia in a given setting and population group**

## Prevention Deficiency of iron anaemia

The **four basic approaches** to the prevention of iron deficiency anemia are;

1. **Supplementation with medicinal iron,**
2. Education and associated measures to increase dietary iron intake,
3. **Control of infection**, and
4. **Fortification of a staple food with iron.**

## Supplementation with medicinal iron

- Supplementation with medicinal iron has the advantage of
- **producing rapid improvements** in iron status.
- **it can be targeted at the population at greatest risk of becoming iron-deficient.** such as **pregnant women, infants and preschool children,**

**The effectiveness of iron supplementation is constrained by two important factors:**

a. **the gastrointestinal side-effects of oral iron and**
b. **the difficulty of sustaining motivation for two to three months in "patients" who do not perceive themselves to be ill.**

- **Both factors result in poor compliance with treatment,**

## II Dietary modification

**Dietary iron intake can be increased in poor communities in two ways.**

**A. First** is to ensure that people **consume larger amounts of their** habitual foods so that their energy needs are fully met

**Since no qualitative changes** in the diet are needed, this approach may appear **to be simple but it involves** increasing the **purchasing power of households-which** is **beyond the capabilities of the health sector alone.**

B. **Second basic** approach **is dietary manipulation**

**Enhancing the bioavailability of the iron ingested, rather than its total amount either on;**

**Promoting the intake of iron absorption enhancers, including haem iron, or on**

**reducing the ingestion of absorption inhibitors such as tannin and phytic acid**

## III Control of viral, bacterial and parasitic infections

- Effective, timely curative care could diminish the adverse nutritional consequences of viral and bacterial disease.
- **preschool children, in particular, would benefit from such improvements in** health care.
- **It is vital to educate the family about proper feeding practices during and after periods of infective illness**
- **Breast-feeding should not be interrupted.**
- **Immunization**

## IV Food Fortification

- **Iron fortification of foods is a preventive measure that aims at**
- **improving and sustaining iron nutrition on a permanent basis**
- **It can be targeted to**

a. **groups at risk of iron deficiency** or
b. **to whole populations,**

## Fortification of foods

**a. can include only iron (single fortification)**, or it can

b. be extended to encompass two or more nutrients (multiple fortification).

It can use a variety of iron compounds and vehicles

**For fortification of any kind to be effective,**

**Three Essential Factors Are Necessary:**

**(1) an effective and affordable iron compound must be available and acceptable;**

(2) **a food vehicle must also be available and accessible**; and

(3) **detailed production instructions and monitoring procedures must be in place and enforced by law.**

**A variety of foods have been used for iron fortification**.

- Ideally, **the food selected is; consumed regularly in sufficient, stable quantities by the target populations and is centrally processed,**
- **easy to fortify**,
- **stable in storage**,
- **inelastic to price,**
- **minimally altered by the addition of the fortificant**, and
- amenable to proper regulation and monitoring.

The food that is used also needs to be priced so that an increment in cost of the fortified product, including packaging, can be absorbed by the population, the government, the producer, or the retailer, or in some combination of these groups

Thank You