Iron deficiency anemia (IDA) is the single most common disorder affecting mankind. It is estimated that more than 2 billion people suffer from IDA worldwide. It is seen in all parts of the world – developed as well as developing countries.

Though iron deficiency is universal, it is more marked in developing world. In India nearly 70% of women are estimated to be iron deficient.

Iron deficiency and IDA are not synonymous. Iron deficiency can exist without anemia. IDA is very late manifestation of iron deficiency because iron deficiency is very well tolerated. Anemia does not develop till storage iron is exhausted. To understand the pathogenesis of iron deficiency we need to understand various aspects iron metabolism.

**IRON METABOLISM**

Functionally, iron is found in three main compartments in the body:

1. **Hemoglobin**
   
   This is the single largest compartment of body iron, forming about 70% of total body iron (about 2-2.5 gm of iron). Red blood cells contain 1 mg iron per ml of packed cells. This compartment is very important since it is concerned with tissue oxygenation. Iron in the hemoglobin pool acts as a contributor as well as receiver from a labile iron pool. When red cells become old, they are destroyed by the reticulo-endothelial cells of the spleen. The hemoglobin of the cells is broken down, iron from this hemoglobin is preserved and utilized for formation of new hemoglobin which again enters the circulation and helps in tissue oxygenation. Thus the same iron is conserved and reutilized. Therefore, under conditions of blood loss from the body, this iron from hemoglobin compartment is lost and body iron is diminished.

2. **Storage iron**
   
   This constitutes about 25% of total body iron (about 1.5 gm of iron). Iron is stored in the form of ferritin or hemosiderin in the reticulo-endothelial system in the liver, spleen and bone marrow.

   *Ferritin* occurs in all cells of the body and also in the tissue fluids. The plasma ferritin concentration usually correlates with total body iron stores; hence measurement of plasma ferritin is an important diagnostic marker for disorders of iron metabolism. It is not visible under light microscope and does not take up Prussian blue stain.

   *Hemosiderin* occurs in macrophages of monocyte-macrophage system. It can be seen microscopically in unstained tissue sections or marrow films as clumps or granules of golden refractive pigment.

   The size of storage compartment is variable. In adult men it is about 800-1000 mg while in adult women it is much less. Storage iron provides a reserve which is utilized for formation of hemoglobin whenever needed. Hence a person, whose iron stores are normal, can withstand blood loss equivalent to 1000 mg iron without developing IDA. A person, whose diet totally lacks iron, will be able to sustain his hemoglobin level for as long as 2 years if his storage iron is normal. Thus depending upon iron stores, we have various stages of IDA:

   1. Normal: Normal iron stores, normal red cells on blood smear and normal tissue iron.
   2. Latent iron deficiency: reduced marrow iron stores, but normal red cells on blood smear and normal transferrin saturation (TS).
   3. Early IDA: absent marrow iron stores; TS < 20%; but normocytic, normochromic anemia
   4. Late IDA: absent marrow iron stores; TS < 10% and hypochromic, microcytic anemia
   5. Tissue iron deficiency: absent marrow iron; TS < 10%; hypochromic, microcytic anemia; spoon nails, glossitis, dysphagia and manifestation of other organ system affection.

   The new born child has no iron stores. As the child grows, it needs iron not only for physiological growth but also to increase storage iron from zero to adult level of 1000 mg. Thus a growing child needs to take a diet rich in iron and if this is not sufficient, iron supplements would be needed to prevent iron deficiency. In our country; poverty, ignorance, helminthiasis, amebiasis, diarrhea, malabsorption, all contribute to cause iron deficiency.

3. **Tissue Iron**

   Tissues contain iron in form of myoglobin in muscle tissue and iron containing enzymes which are present in all living cells and are essential for cellular respiration. Although a small compartment, it is an extremely vital one that is sensitive to iron deficiency.

**DIETARY IRON**

Food articles rich in iron are muscle tissues, liver, egg yolks, blood and bone marrow amongst non-vegetarian group and green leafy vegetables, dry fruits and jaggery amongst vegetarian group. Iron is present in outer “husk” of cereals – often discarded to produce refined cereals, thus making them poorer in iron. In olden days food was cooked in iron utensils, making it richer in iron. Nowadays we mainly use stainless steel utensils, so there is no contamination of food with iron, thus making our diet poorer in iron.

**Minimal daily iron requirement is 10-15 mg in adult males and post menopausal women; 20 mg in growing children and young non-pregnant women while it should be at least 30 mg in pregnant women.**

**IRON ABSORPTION**

Iron is absorbed in the brush border of epithelial cells of the intestinal villi, mainly in...
duodenum and upper jejunum. It is absorbed in ferrous form whereas in food, iron is in ferric form. Gastric juice is responsible for stabilizing iron in ferrous form, thus facilitating its absorption.

Cereals like rice, wheat etc have high phytate content. They form insoluble complexes with iron, thus retarding its absorption. The exact mechanism regulating iron absorption from intestines is not known but absorption is regulated to meet body’s needs - the absorbed fraction is reduced when body iron stores are high. Earlier mucosal block theory was believed to act to regulate iron absorption but now it has been shown to be only partially effective as for each increment in the dose of an inorganic iron compound, there is a corresponding increment in the amount of iron absorbed.

TRANSPORT OF IRON

Once iron is absorbed into circulation it combines with protein transferrin which transports it mainly to the marrow where it is utilized in hemoglobin synthesis. The newly formed red cells circulate for about four months after which they are destroyed by the phagocytic macrophages of the spleen and iron is released back into plasma to repeat the cycle. Relatively small amounts of iron are also transported to other tissues as iron is an integral part of many enzymes in the body.

IRON EXCRETION

The body efficiently conserves iron. Daily excretion of iron is about 1 mg only and almost all this is via feces. In menstruating women iron excretion is about 2 mg. Iron loss also occurs in urine and by exfoliation of skin, hair and nails but in much smaller amounts. Iron excretion is increased in persons with iron overload to as much as 4 mg daily, yet this mechanism is insufficient to prevent iron accumulation.

WHO RELEASES NEW REPORT ON GLOBAL PROBLEM OF ORAL DISEASES

24 FEBRUARY 2004 | GENEVA — Oral diseases such as dental caries (tooth decay), periodontitis (gum disease) and oral and pharyngeal cancers are a global health problem in both industrialized and increasingly in developing countries, especially amongst poorer communities, the World Health Organization (WHO) said today.

Announcing the findings of the World Oral Health Report, WHO said that an estimated five billion people worldwide had experienced dental caries. "Worldwide, losing teeth is seen as a natural consequence of ageing, but it is in fact preventable,” said Dr Catherine Le Gales-Camus, WHO’s Assistant-Director General, Noncommunicable Diseases and Mental Health.

"There is a perception that dental caries is no longer a problem in the developed world, but it affects 60-90% of schoolchildren and the vast majority of adults. Dental caries is also the most prevalent oral disease in several Asian and Latin American countries."

The impact of oral diseases in pain, suffering, impaired function and reduced quality of life, is both extensive and expensive. Treatment is estimated to account for between 5-10% of health costs in industrialized countries, and is beyond the resources of many developing countries.

While it appears to be less severe in most African countries, the report states that with changing living conditions, dental caries is expected to increase in many developing countries in Africa, particularly as a result of the growing consumption of sugars and inadequate exposure to fluorides. "In many developing countries, access to oral health care is limited and teeth are often left untreated, or extracted," said Dr Poul Erik Petersen, coordinator of WHO’s Global Oral Health Programme. “In Africa, the dentist-to-population ratio is approximately 1:150,000, against about 1:2,000 in most industrialized countries. And while we have made limited progress in reducing tooth decay amongst younger people in the developed world, for many older people it remains a major source of pain and ill-health.”

Globally, most children shows signs of gingivitis (bleeding gums) and among adults, the initial stages of periodontal disease are prevalent. Severe periodontitis, which may result in tooth loss, is found in 5-15% of most populations. In industrialized countries, studies show that smoking is a key risk factor for periodontal disease.

The prevalence of oral cancer is the eighth most common cancer of men worldwide. In south central Asia, cancer of the oral cavity ranks amongst the three most common types of cancer. However, sharp increases of oral/pharyngeal cancers have also been reported for several countries and regions such as Denmark, Germany, Scotland, central and eastern Europe, and to a lesser extent, Australia, New Zealand, Japan and the USA. Smoking, smokeless tobacco, chewing betel, and alcohol use, are all risk factors.

The major priorities and components of WHO’s Global Oral Health Programme are set out in the new report. In addition to addressing modifiable risks such as oral hygiene practices, sugar consumption, lack of calcium and micronutrients, and tobacco use, key elements include addressing the major sociocultural determinants. These include: poor living conditions, low education level,