The Review Article on Anemia

Mission :- Anemia Mukt Bharat

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Abstract

Anemia is not a specific disease. It is a condition in which there is reduction in oxygen transporting capacity of blood. A normal adult Man has approx. **5.0 millions** of RBCs per cubic millimeter of blood where women have **4.5 millions** of RBCs per cubic millimeter of blood respectively. The total count of RBCs is more in Man than in a Woman because the woman undergo menstruation. **The less amount of haemoglobin below normal range leads to Anemia.**
Anemia may be caused by loss of blood (haemorrhage), destruction of RBCs (haemolysis of faulty formation of blood) etc. The purpose of this review is to learn more about anemia, including its types, causes, symptoms, and treatment, and to inform the public about the disease.

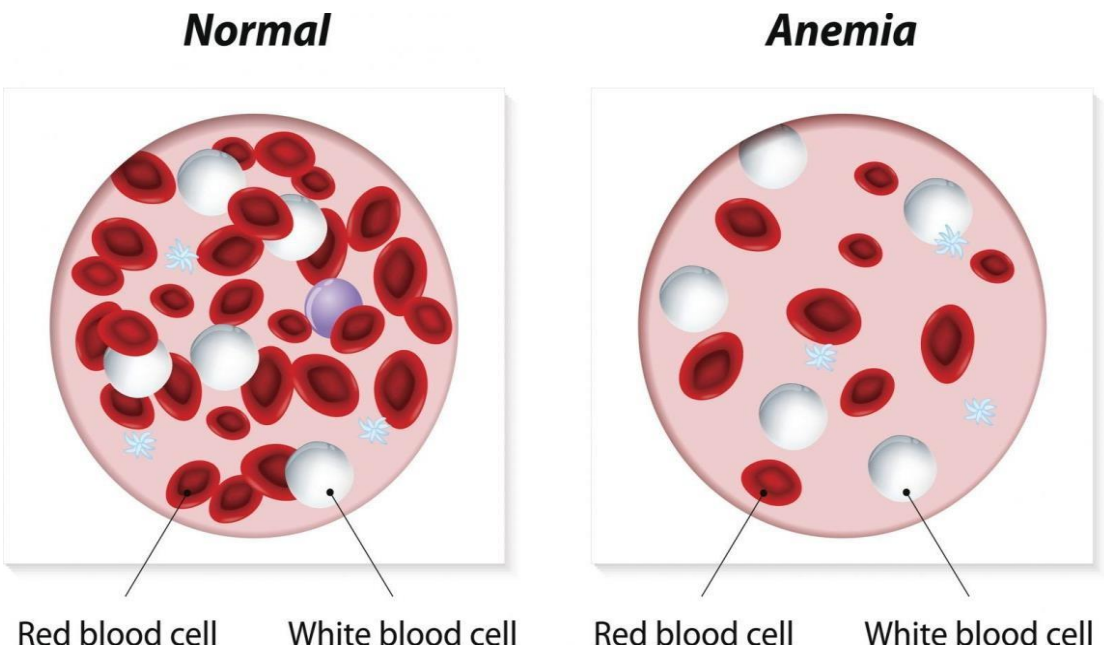
INTRODUCTION

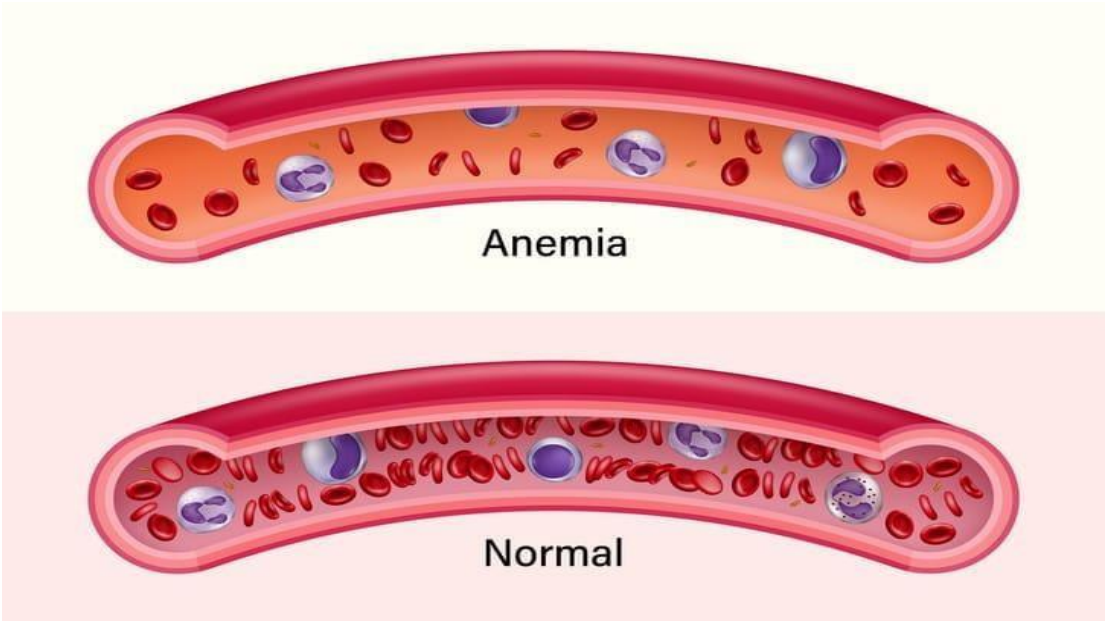
Anemia is a serious global public health problem that particularly affects young children, menstruating adolescent girls and women and pregnant and postpartum women**. WHO** estimates that **40% of children 6–59 months of age, 37% of pregnant women, and 30% of women 15–49 years of age** worldwide are anaemic.

Children and pregnant women are especially vulnerable, with more severe cases of anaemia leading to an increased risk of **maternal and child mortality.**

Iron deficiency anaemia has also been shown to affect cognitive and physical development in children and reduce productivity in adults.

Anaemia is an indicator of both poor nutrition and poor health. It is problematic on its own, but it can also impact other global public health concerns such as stunting and wasting, low birth weight and childhood overweight and obesity due to lack of energy to exercise. School performance in children and reduced work productivity in adults due to anaemia can have further social and economic impacts for the individual and family.


Normal
Anemia
Red blood cell
White blood cell
Red blood cell
White blood cell


Anemia
Normal

Symptoms observed in Anemia :-

1. Fatigue
2. Weakness
3. Dizziness
4. Shortness of Breath
5. Pallor
6. Dyspnea
7. Palpitation
8. Headache
9. Vertigo
10. Lack of Concentration

Symptoms observed in Severe Anemia :-

1. Glossitis
2. Atrophy of the tongue papillae
3. Stomatitis
4. Fissures at the angles of severe anemia.

Anemia may also be caused by several factors :-

1. Nutrient deficiencies through inadequate diets or inadequate absorption of nutrients
2. Infections (e.g. malaria, parasitic infections, tuberculosis, HIV)
3. Inflammation
4. Chronic diseases
5. Gynaecological condition
6. Obstetric condition

7. Inherited red blood cell disorders.

8. The most common nutritional cause of Anemia is iron deficiency, deficiencies in folate, vitamins B12 and A are also important causes.

Classification of Anemia :-

1. **Morphological Classification**
2. **Etiological Classification**

1. Morphological Classification :- This classification depends on the examination of blood which include the determination of Hb, enumeration of red cells, red cell indices & the examination of PBF. The levels of Hb and red cell count determine the severity of anemia.

Smaller cells: Microcytic anaemia Larger cells: Macrocytic anaemia Normal cells : Normocytic anaemia

Types of Anemia according to morphological classification :-

A) Normocytic Normochromic Anemia :- Causes:-

a) Sudden blood loss

b) Hemolytic anemia

c) Hemoglobinopathis

d) Aplastic anemia

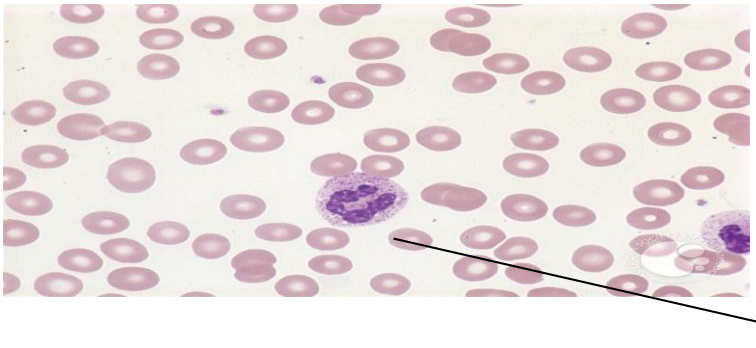
Lab. Finding

a) Smear Impression :- PBF shows few red cells but relatively normal and there is decreased number of red cells.

b) MCV, MCH, MCHC are normal.

c) PCV low

d) Reduced haemoglobin.



Normocytic Normochromic Cell

B) Microcytic Hypochromic Anemia :-

It is also known as iron deficiency anemia.

Causes:-

a) Blood loss

b) Carcinoma of Stomach, colon, cecum and rectum.

c) Hookworm infestation

d) Hematuria (Blood in Urine)

Increased Requirement :-

a) Decreased iron stores

b) Growth

c) Reproductive age groups :- Menstruation , Pregnancy, Lactation, Post Delivery

Improper absorption :- Gastrectomy (absence of HCl), Gastroenterostomy, Damage of intestinal mucosa.

Improper intaking :- Improper feeding, Poverty.

Laboratory Finding :-

a) Decreased in Red Cells

b) Low Hb and PCV

c) Reduced MCV, MCH, MCHC

d) Serum iron decreased as well as serum binding capacity decreased.

e) Reduced in Life span

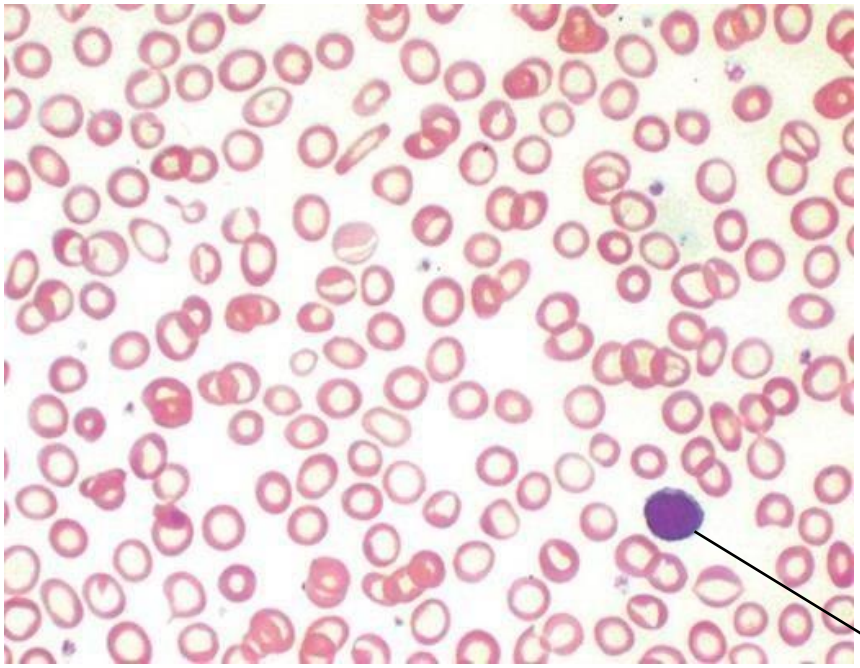
f) **Smear impression :-** - Microcytosis

-Hypochromia

Clinical Conditions:-

i) Iron deficiency anemia

ii) Thalassemia



Microcytic Hypochromic Cell

C) Macrocytic Normochromic Anemia :-

Macrocytic anemia is a blood disorder that happens when your bone marrow produces abnormally large red blood cells. These abnormal blood cells lack nutrients red blood cells need to function normally.

It is known as Vitamin B_{12} or folic acid anemia and megaloblastic anemia.

Causes :-

a) Hepatic disease

b) Antimetabolic drugs

c) Hypothyroidism

d) Hemolytic anemia

e) Multiple myloma

f) Various carcinoma

g) Congestive heart failure

h) Tuberculosis

i) Rheumatoid arthritis

j) Alcoholism

Laboratory Finding :-

a) Reduction in the number of red cells.

b) Low Hb

c) Elevated MCV and MCH

d) Normal MCHC

e) Bilirubin:- Increased (Indirect)

Blood Picture :-

a) Anemia with macrocytosis

b) RBCs show – Howell – Jolly bodies, Cabot rings, Basophilic stiplling

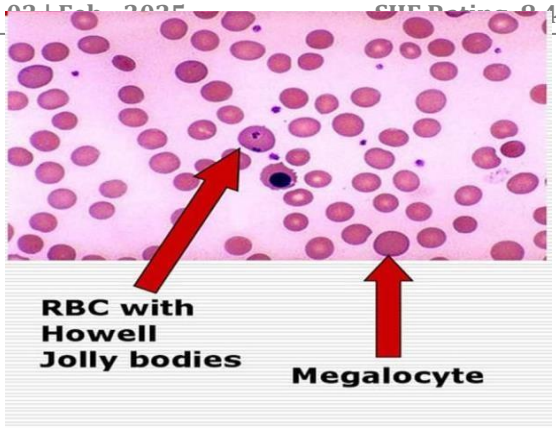
c) Hyperchromia (loss of usual central pallor)

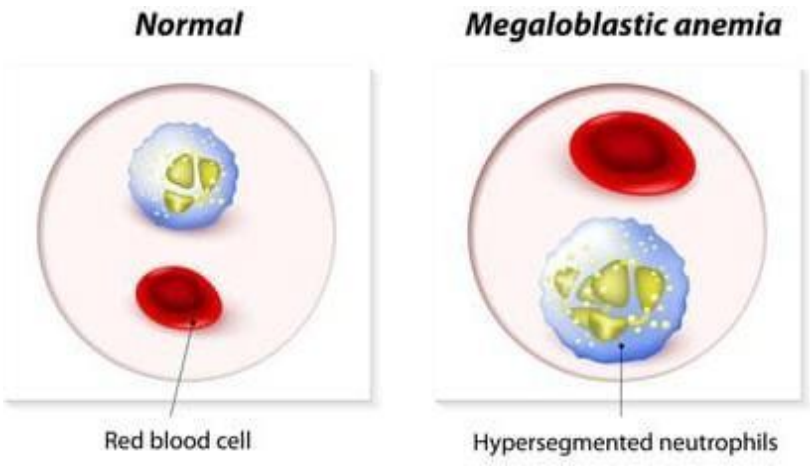
Clinical Conditions :-

a) Pernicious anemia

b) Anemia of folic acid and vitamin B12 deficiency

c) Some cases of aplastic anemia.





D) Macrocytic Hypochromic Anemia :-

It is also known as Iron associated with Vitamin B12 anemia.

Causes:-

It is due to combined deficiency of vitamin B12 , Folic acid and Iron.

Laboratory Finding :-

a) MCV more than 100 cumm (fl)

b) MCHC- Less than 30%

c) Serum Iron level decreased

d) Vitamin B12 or Folic acid level decreased

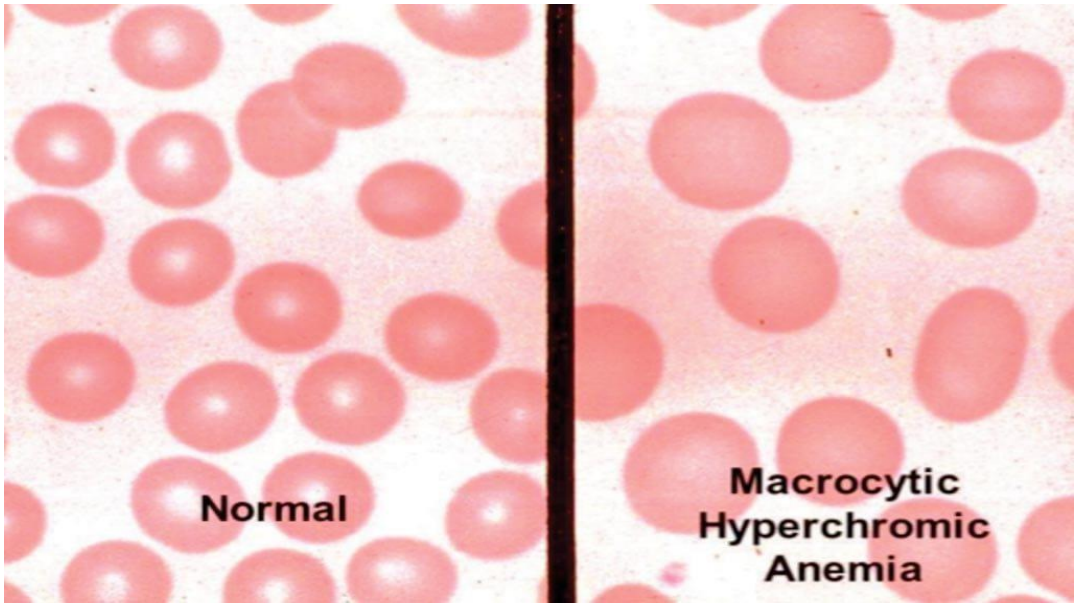
e) Hb decreased

Blood Picture :-

a) Cabot Rings

b) Howell Jolly bodies are seen in RBCs.

c) Pencil shaped target cells are seen in RBCs.



E) Microcytic Normochromic Anemia :- Causes :-

a) Inflammatory conditions

b) Toxic drugs and chemicals

c) Endocrine disorders

Laboratory Findings:-

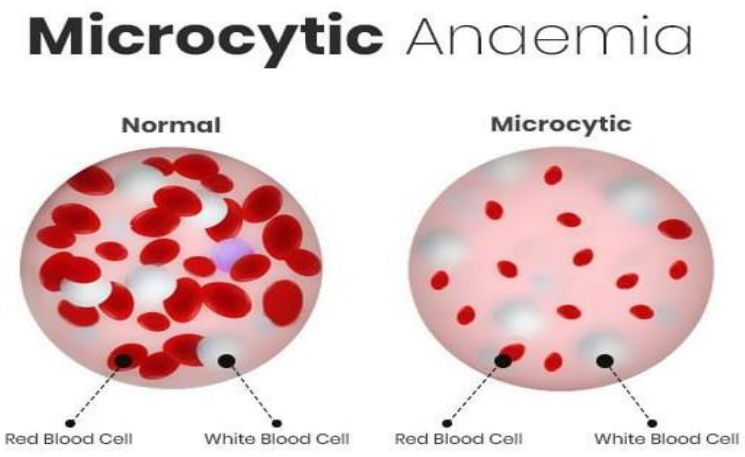
a) Hb Low

b) Reduce MCV, MCH

c) Normal MCHC

Blood smear impression :- Hypochromia

Clinical conditions:- Anemia of chronic infections.



2. Etiological Classification :-

A) Posthemorrhagic anemia :-

a) Acute blood loss due to accidental injury, gastrointestinal bleeding, surgery, hematuria etc.

b) Chronic blood loss due to hookworm infestation, prolonged excessive vaginal bleeding and in bleeding ulcers or gastrointestinal cancer.

B) **Deficient of RBCs production** in the bone marrow.It is due to :-

a) Deficiency of substances such as iron, vitamin $B_{12,}$ Folic acid or pyridoxine which is necessary for red cell maturation and Hb formation.

b) Bone marrow diseases is due to

i) Hypoplasia (reduction in red cells)

ii) Aplastic anemia

C) **Hemolytic anemia:-** It may be defined as there is increased in red cell destruction and it is due to

i) Hereditary spherocytosis

ii) Thalassemia

iii) Sickle cell anemia

iv) Autoimmune hemolytic anemia

v) Hemolytic disease of new born

vi) Malarial parasitic infection

Iron-Deficiency Anaemia:-

IDA is one of the most common type of anaemia in world as well as in India. It is a condition in which there is deficiency of iron in the bloodstream.The normal adult body contains **about 4000mg** of iron in which **about 10%** of this is present in circulating blood.The remaining is stored in the liver and reticuloendothelial cells of bone marrow. Haemoglobin is a protein which is present in RBC which carries oxygen throughout the body. The body needs iron to make haemoglobin. Without enough iron there will be less haemoglobin and fewer RBCs are made which lead to anaemia. Iron plays a very essential role for various functions in human body especially in the synthesis of hemoglobin. Iron deficiency is the most common cause of hypochromic microcytic anemia.

Causes:-

a) Diets low in iron

b) Inability to absorb iron

c) Abnormalities of GIT (Gastrointestinal tract)

d) Internal bleeding

e) Pregnancy, menopause, blood loss due to periods

f) Excessive blood donation

Symptoms :-

a) Tiredness

b) Irritability

c) Breathlessness

d) Headache

e) Palpitation

f) Swollen tongue, altered taste

g) Pregnancy anemia increases the risk of complications

Dietary factors that enhance iron absorption :-

a) Meat

b) Fish

c) Seafood

d) Poultry

e) Gastric acid

f) Malic acid

g) Ascorbic acid

h) Citric acid

Dietary factors that inhibit iron absorption :-

a) Calcium

b) Tea

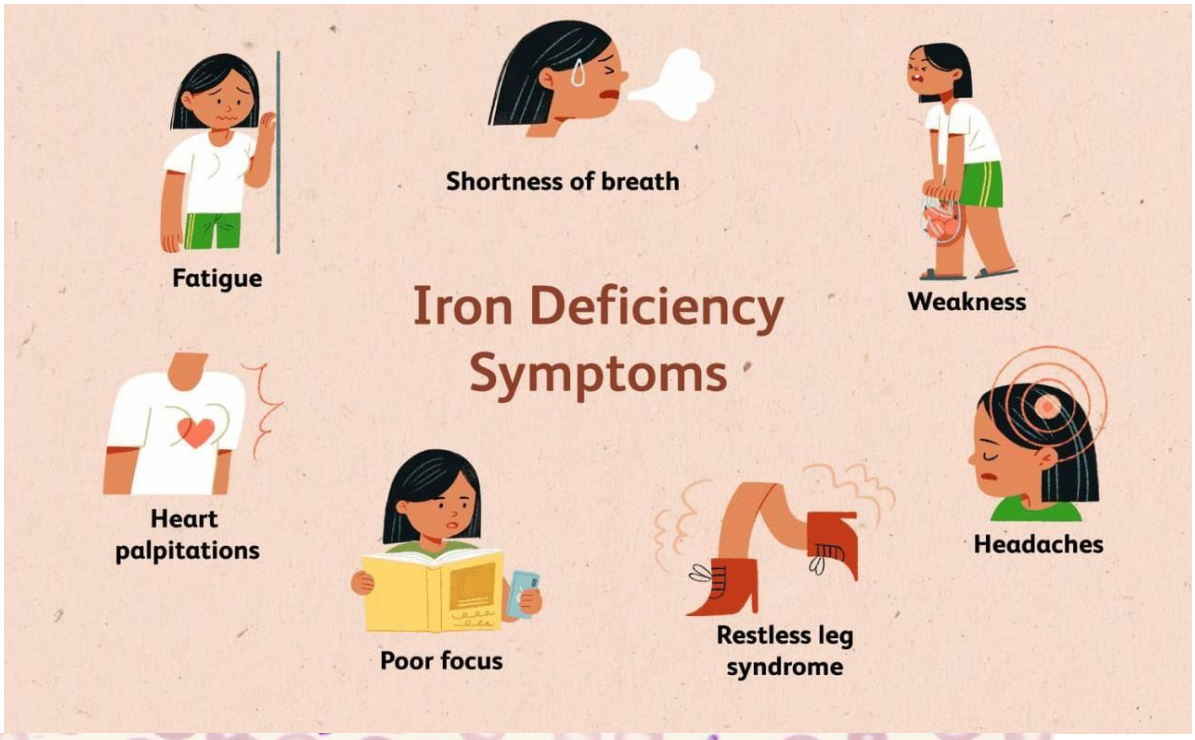
c) Coffee

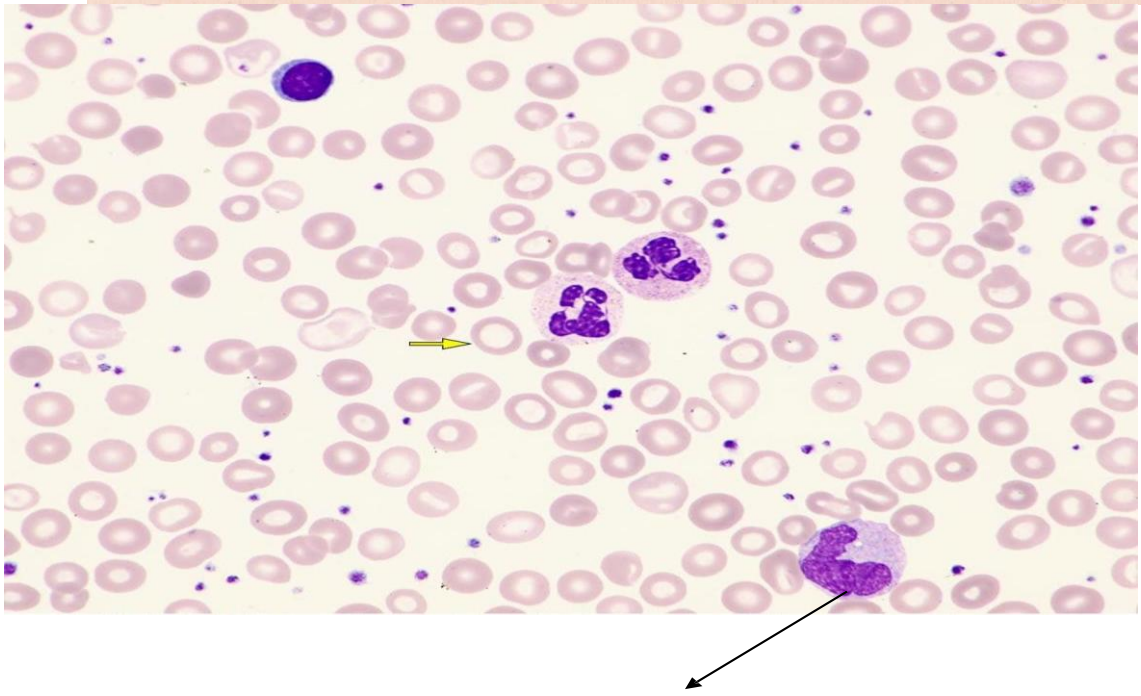
d) Phosphate

e) Soy Protein

f) High doses of minerals

g) Colas





Iron Deficiency Anemic cell

Haemolytic Anaemia:-

Haemolytic anemia may be defined as a disease in which there is increased in red cell destruction. People of all ages, races, and genders are affected by this type of anemia.The hemolytic nature of the anemia is determined from increased hemoglobin breakdown and that of bone marrow regeneration.Sickle cell anemia, Thalassemias and hereditary spherocytosis are all examples of this inherited form of anemia. RBCs can also be damaged by certain diseases and chemicals which has led to the end of haemolytic anemia. The most serious form of haemolytic anemia is caused by receiving a transfusion of red blood cells of the wrong blood type.

Symptoms:-

Symptoms of haemolytic anaemia are

a) Jaundice

b) Fatigue

c) Shortness of breath, dizziness, and headaches are all symptoms of a low RBC count

d) Pale skin

e) Chest pain.

f) Abdominal pain

Treatment :-

Treatment of haemolytic anaemia are due to

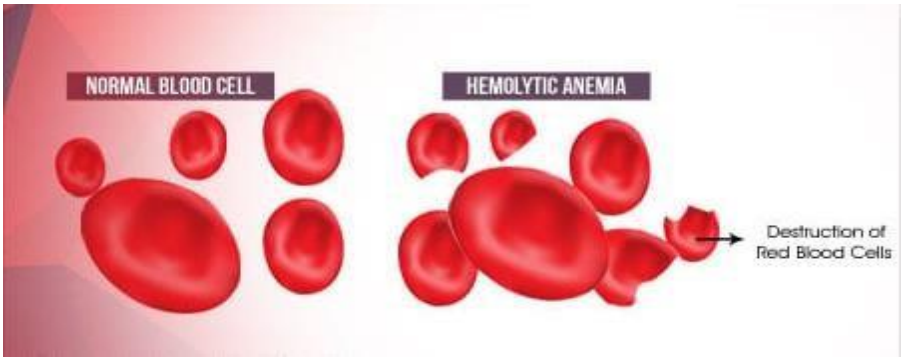
a) Blood transfusions

b) Drugs

c) Blood and bone marrow transplants

d) Lifestyle changes

e) Surgery



Pernicious Anaemia:-

(Pernicious means destructive or injurious)

Pernicious anemia one of the causes of Vitamin B12 deficiency.It is an autoimmune condition that prevents your body from absorbing vitamin B_{12}.

Causes:-

a) Inadequate diet

b) Vitamin B12 deficiency

c) Intrinsic Factor deficiency in the body

d) Gastrointestinal tract infection

Symptoms:-

a) Fatigue

b) Breathlessness

c) Pale skin

d) Chest pain

e) Poor coordination

f) Slow reflexes

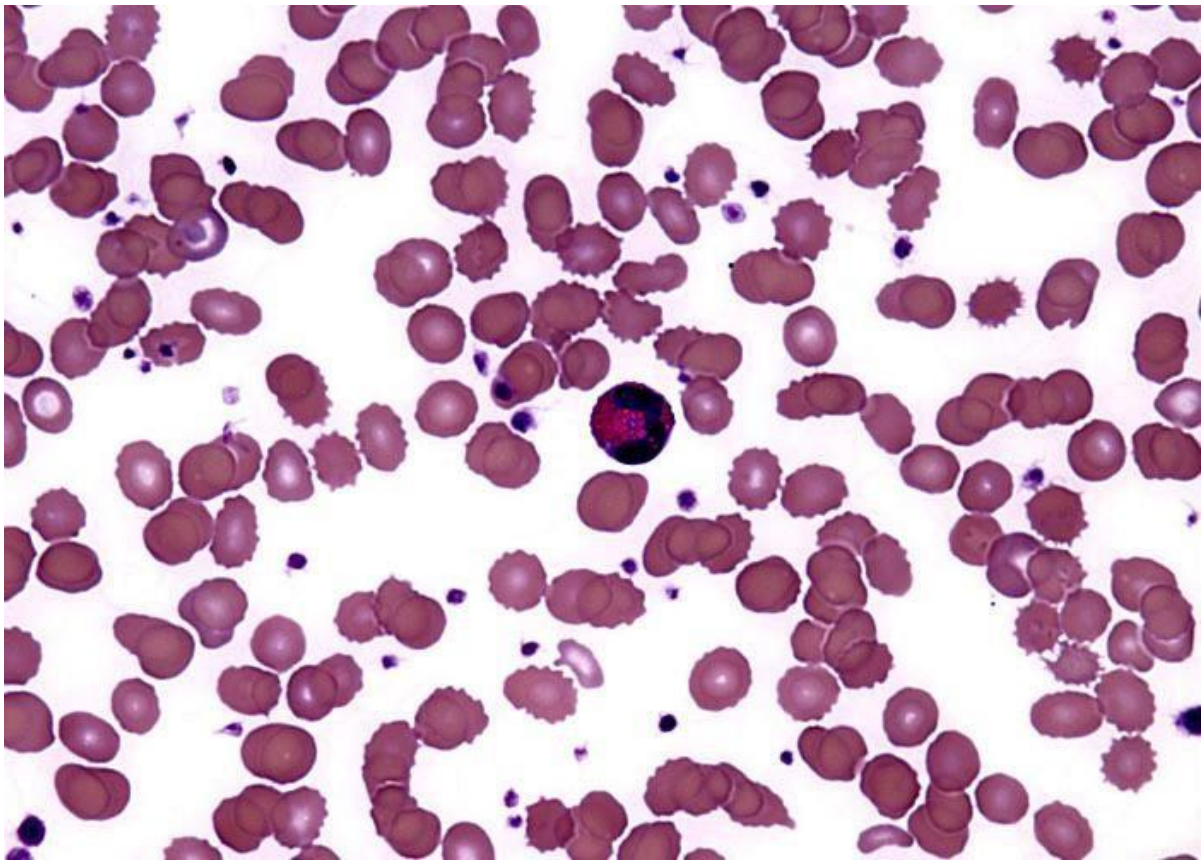
g) Depression Pernicious

Treatment:-

a) Anaemia caused due to inadequate diet can be prevented or treated by having a diet rich in vitamin B-12.

b) Food items like meat, fish, eggs, milk, yoghurt, cheese etc. are rich in Vitamin B-12.

c) Certain medicines are given which increases the absorption of vitamin B-12.Vitamin B-12 injections or B-12 oral supplements can now be used for treatment.



Pernicious anemia cells

Sickle cell Anaemia:-

Sickle Cell Anemia is an autosomal hereditary disorder in which erythrocytes become sickle shaped under oxygen deficiency as during strenuous exercise and at high altitudes.

The RBCs in the body of Sickle Cell Anemia are scissors ("C" - shaped). It contains abnormal hemoglobin called hemoglobin-S which gives it the shape of a scissors and makes it harder to pass through blood vessels. Hemoglobin-S differ from normal hemoglobin-A in only one amino acid

-6th amino acid of beta chain.Glutamic acid is replaced by valine due to substitution of T by A in the second position of the triplet codon (CTC) which is changed to CAC.

Outbreaks appear to be exacerbated during pregnancy and in children. Blocked blood vessels cause pain which can lead to serious infections and damage to organs. Sick cells have a life span of 10 to 20 days and the body cannot produce enough RBCs to replace those that die which lead to blood loss.

Symptoms of Sickle cell anemia is an incurable because this disease is inherited which means it is passed down from generation to generation.

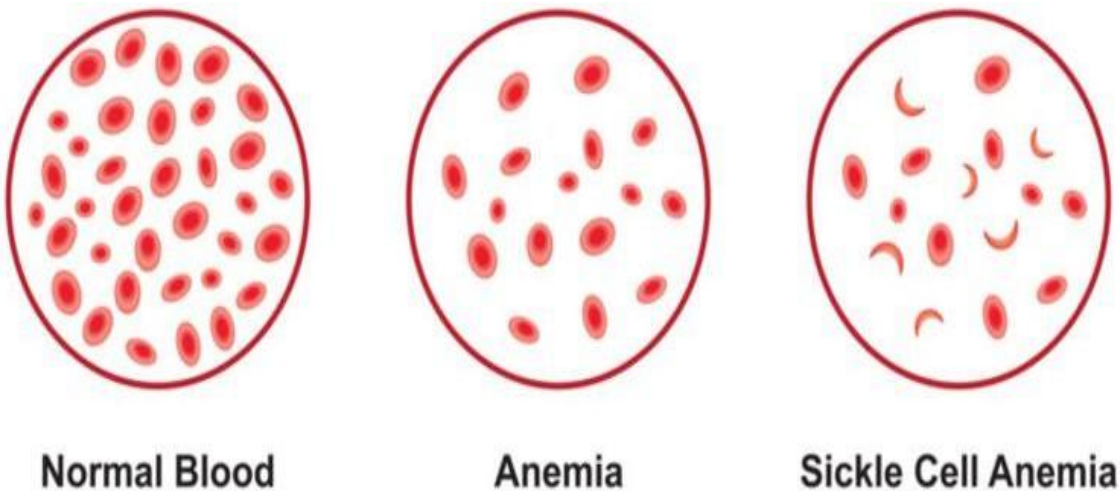
Symptoms:-

a) Gets tired quickly

b) Pale skin

c) Breathlessness

d) Dizziness



Thalassaemia:-

Thalassemia is a autosomal recessive blood disease which appears in children of two unaffected carriers (hererozygous parents).Thalassemia is a blood disorder in which the body produces unhealthy RBCs and low hemoglobin. Men and women alike are affected by thalassaemia which is more common in Italy, Greek, Middle East, Asia, and Africa.

Types:-

a) Alpha thalassemia

b) Beta thalassemia

c) Delta thalassemia

a) **Alpha Thalassemia**:-It is also known as hydrops fetal and it is a moderate form of alpha thalassemia.It is caused by the defective formation of alpha globin.The latter is controlled by two genes present on chromosome 16, HBA1 and HBA2 with a total of four alleles.Person with one defective allele are silent carriers while two defective alleles produce alpha thalassemia major.

b) **Beta Thalassemia**:-This is decreased synthesis of beta globin.The defect is due to alleles of HBB gene present on chromosome

11.Person with one defective allele suffer from thalassemia minor with larger number of microcytic erythrocytes and

lesser amount of haemoglobin.Persons with both the defective alleles suffer from Cooley's anemia or thalassemia major and it is a serious form of beta thalassemia.

c) **Delta Thalassemia**:- It occurs due to defective allele of HBD gene present on chromosome 11 that forms delta chain of of hemoglobin. Adults have about 3% of hemoglobin consisting of alpha and delta chains.So the effect of this thalassemia is minor.

Hemoglobin is made up of two types of protein chains: alpha and beta globin. RBCs do not produce well if your body does not produce enough of these protein chains so you cannot store enough oxygen. The development of hemoglobin chains is controlled by genes. When these genes are absent or altered thalassemia develops. Thalassemia is a genetic disorder that is passed on from generation to generation.

Symptoms:-

a) Mild anemia may occur in people with alpha or beta thalassaemia.

b) Anemia is mild to moderate in people who have beta thalassaemia intermedia.

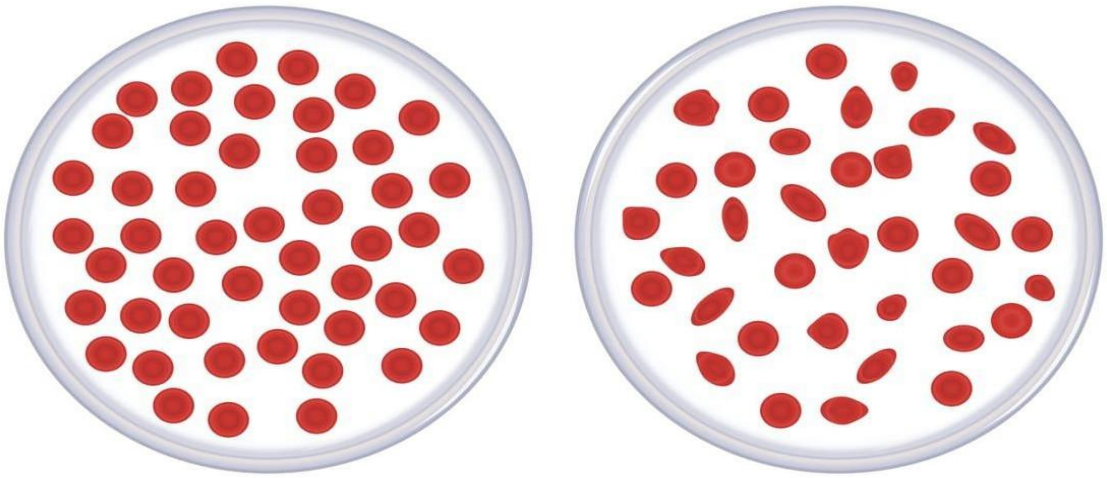
c) Pale skin tone

d) Urine that is dark in color

e) Jaundice, splenomegaly and hepatomegaly are all symptoms of liver disease.

f) Appetite problems

g) Problems with the bones.



Normal blood Thalassemia

CONCLUSION:-

Anemia occurs when a low number of RBCs are circulating in the body. Anemia is a problem of not having enough healthy red blood cells or hemoglobin to carry oxygen to the body tissues. Hemoglobin is a protein found in red cells that carries oxygen from the lungs to all other organs in the body. Anemia is one of the most common blood diseases which can be inherited or caused by our immune system or caused by malnutrition. Anemia should be diagnosed and treated as soon as possible to produce a healthy generation.

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