Sickle cell anemia:

Sickle cell disease is a group of hemoglobin disorders in which the sickle β-globin's Gene is inherited.

The sickle β-globin's abnormality is caused by substitutions of valine for glutamic acid in position 6 in the β- chain.
It inherited as an autosomal recessive trait.
Homozygotes only produce abnormal beta chains that make hemoglobin S (Hb S termed SS) and this result in clinical syndrome of sickle-cell anemia.
Heterozygotes produce mixture of normal and abnormal beta chains that make normal HbA and HbS (termed AS)and this caused a symptomatic sickle-cell trait. sickle cell anemia (HbSS) .

Homozygotes disease:

Clinical Features:

Clinical features are of sever hemolytic anemia punctuated by crises.
The symptoms of anemia are often mild in relation to the severity of the anemia because Hb S give up oxygen (O2) to tissues relatively easily compared with Hb A (its O2 dissociation curve being shifted to the right).
The clinical expression of Hb SS is very variable; some patients having an almost normal life, free of crisis but others develop sever crises even as an infant and may die in early childhood or as young adults.
Crises may be of four types:

1. Painful vaso-occlussive crises:

These are the most frequent and are precipitated by such factors as infection, acidosis, dehydration or deoxygenating (e.g. altitude, operation, obstetric delivery, stasis of circulation, violent exercise, etc.).
Infarcts may occur in variety of organs including the bones, lungs, and spleen.
The most serious vaso-occlussive crisis is that of brain (stroke occur in 7% of the patient) or spinal cord.
The hand-foot syndrome (painful ductility's caused by infarction of the small bone) is frequently the first presentation of disease and may lead to digits of varying lengths.

2. Visceral sequestration crises:

These are cause by sickling within organs and pooling of blood, often with a sever exacerbation of anemia.
The acute sickle chest syndrome is feared complication and the most common cause of death after puberty. It presented with chest pain with dyspnea and pulmonary infiltrates in the chest X-ray.

Hepatic and splenic sequestration crisis all may cause severe illness requires exchange transfusion.
Splenic sequestration typically sees in infants and present with an enlarging spleen, decrease hemoglobin and abdominal pain.
In all this cases treatments is with analgesia, oxygen, exchange transfusion and ventilatory support if necessary.

3. Aplastic crises:

These may occurs as a result of infection with parvovirus or folate deficiency and are characterized by sudden fall in hemoglobin, usually requiring transfusion.
They are characterized by a fall in reticulocyte as well as hemoglobin.

4. Hemolytic crises:

These are characterized by an increased rate of hemolysis with fall in hemoglobin but rise in reticulocyte count and usually accompanied painful crises.

Other clinical features include:

-Ulcer of the lower legs is common, as a result of vascular stasis and local ischemia.
- Spleen is enlarged in infancy and childhood but later is often reduced in size as a result of infarcts (auto splenectomy)
- A proliferative retinopathy and priapism are other clinical complications.
- Chronic damage to the liver may occur through microinfarects.
- Pigmented gall stone are frequent.

The kidneys are vulnerable to infarction of the medulla with papillary necrosis.
Failure to concentrated urine aggravated the tendency to dehydration and crisis. and nocturnal enuresis is common.
-Osteomyelitis may also occur, usually from salmonella spp.

Laboratory finding:

1. The hemoglobin is usually 6-9 g/dl. It's low in compares to the symptoms of anemia.
2. Sickle cells and targets cells occur in the blood, features of splenic atrophy e.g. Howell-jolly bodies may be present.
3. Screening test for sickling is positive when the blood is deoxygenated.
4. Hemoglobin electrophoresis: In Hb SS, no Hb A is detected. The amount of Hb F is variable usually between 5-15 %.

Treatment

1. Prophylactic- avoid those factors known to precipitate crises especially dehydration, anoxia, infections, stasis, of the circulation and cooling of the skin surface.
2. Folic acid should be give daily .
3. Good general nutrition and hygiene.
4. Pneumococcal, haemophilus and meningococcal vaccination and regular oral penicillin are effective at reducing infection rate with those organisms.
   Oral penicillin should start at diagnosis and continue at least until puberty.
   Hepatitis B vaccination is also given as transfusion may be needed.
5. Crises-treat by rest, warmth, rehydration, by oral fluids and or intravenous normal saline and antibiotics if infection is present.
   Analgesia at appropriate level should be given.
   Blood transfusion is only give in severe anemia with symptoms.
   Exchange transfusion may need particularly if there is neurological damage.
6. Particular care need in pregnancy and anesthesia.
7. Blood transfusion: The aim is to reduce Hb S production over a period of several months or even years.
8. Hydroxyurea can increase Hb F levels and has been shown to improve the clinical course of patients.
9. Stem cell transplantation and gene therapy Can cure the diseases.

Sickle cell traits:

This is benign condition with no anemia and normal appearance of the red cells on the blood film.

Hematuria is the most common symptoms and is thought to be caused by minor infarcts of the renal papilla.

Hb S varies from 25-45 % of the total hemoglobin.

Care must be taking with anesthesia, pregnancy, and high altitudes.