complications Diabetic eye disease, pathophysiology

- Diabetes is a serious, long-term condition with a major impact on the lives and well-being of individuals, families, and societies worldwide.
- The global diabetes prevalence in 2019 is estimated to be 9.3% (463 million people), rising to 10.2% (578 million) by 2030 and 10.9% (700 million) by 2045.

➢ Diabetic eye disease

- Is a term used to describe the common eye complications seen in people with diabetes. It includes:
  - Cataracts
  - Glaucoma.
  - Diabetic retinopathy (including diabetic macular oedema)

- Diabetes is the leading cause of blindness in working-age adults.1 People with type 1 and (type 2) diabetes are at risk. It's possible to be unaware that you have severe diabetic eye disease and suddenly go blind.

❖ symptoms of diabetic eye disease

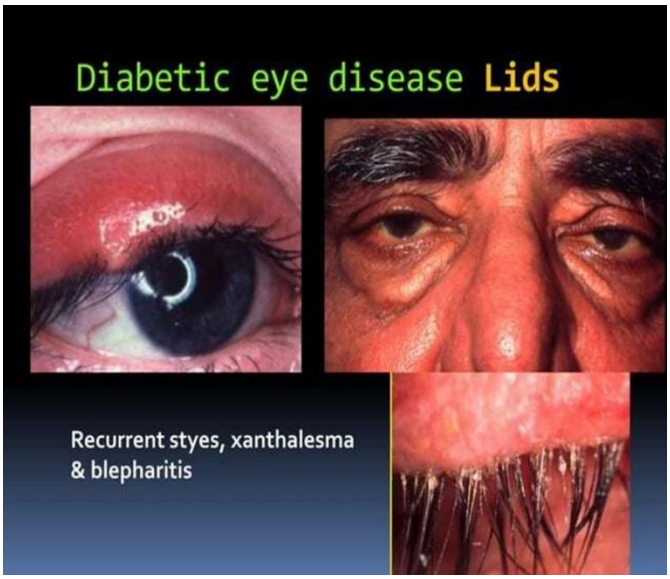
Diabetic eye conditions often have no signs or symptoms, particularly in the early stages. By the time someone with diabetes notices changes in their vision, the condition is quite advanced.

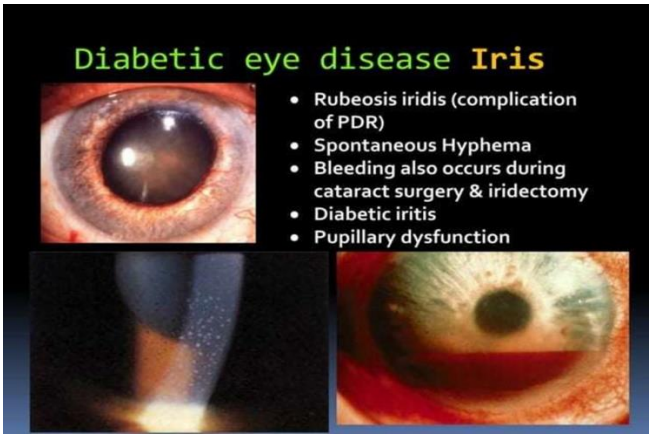
Signs and symptoms may include:

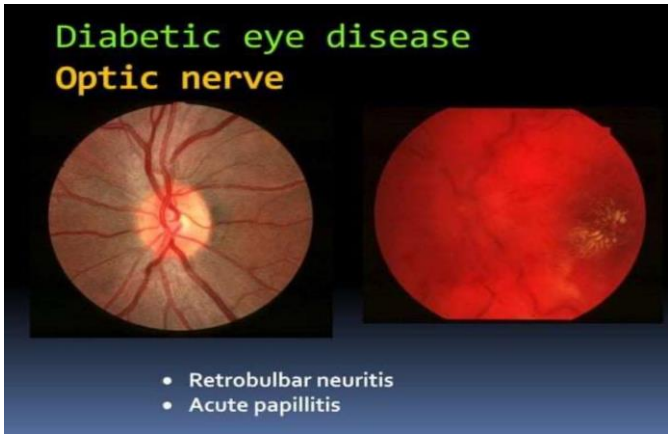
- Blurry, cloudy or dim vision
- Floaters and flashes
- Poor night vision
- Sensitivity to light and glare
- Double vision, seeing halos around lights
- Trouble reading
- Frequent changes in spectacle and contact lens prescriptions
- Eye pain
- Headaches, nausea, vomiting.

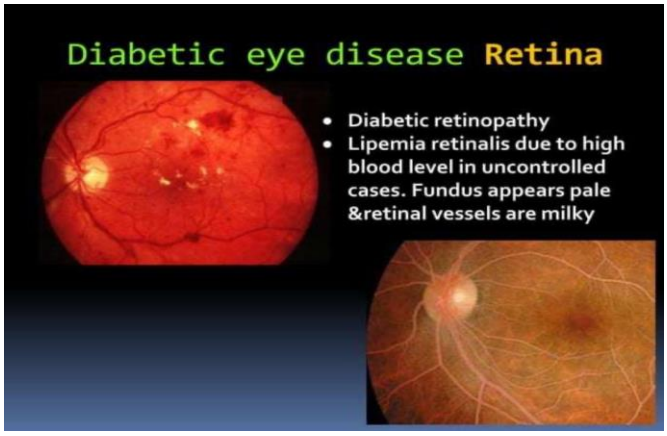
➢ Diabetic Eye Disease Anterior Segment

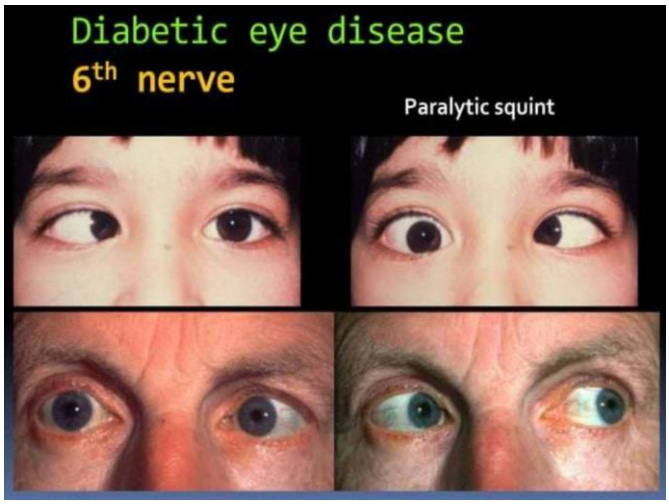
- Manifest refractive changes
  - 1.5x more likely to be myopic
  - Investigate in adult-onset myopia
- Cataract formation
  - More commonly cortical cataract
- Glaucoma
- IIIrd and VIth cranial nerve palsies
  - Resolve in 2-6 months
  - No pupil involvement
- Recurrent corneal epithelial erosions and reduced corneal sensitivity
- Blepharitis, styes and chalazion
- Rubeosis Iridis
  - Sign of advanced diabetic eye disease
  - Growth starts at pupil margin
  - Leads to acute ACG





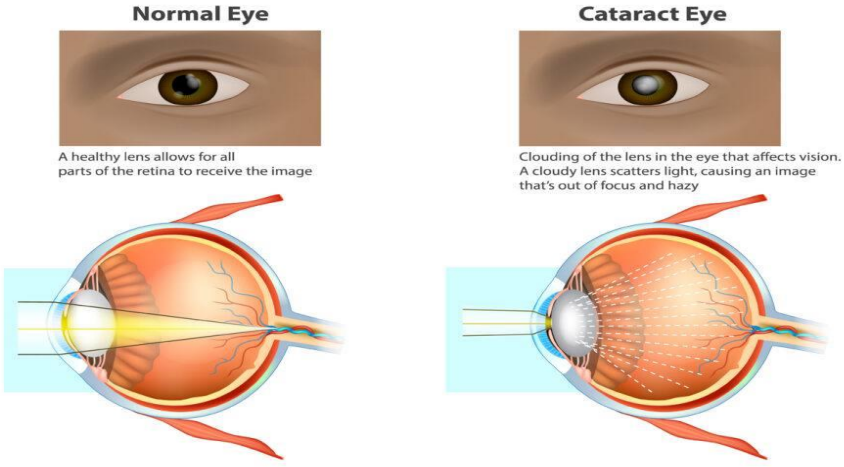






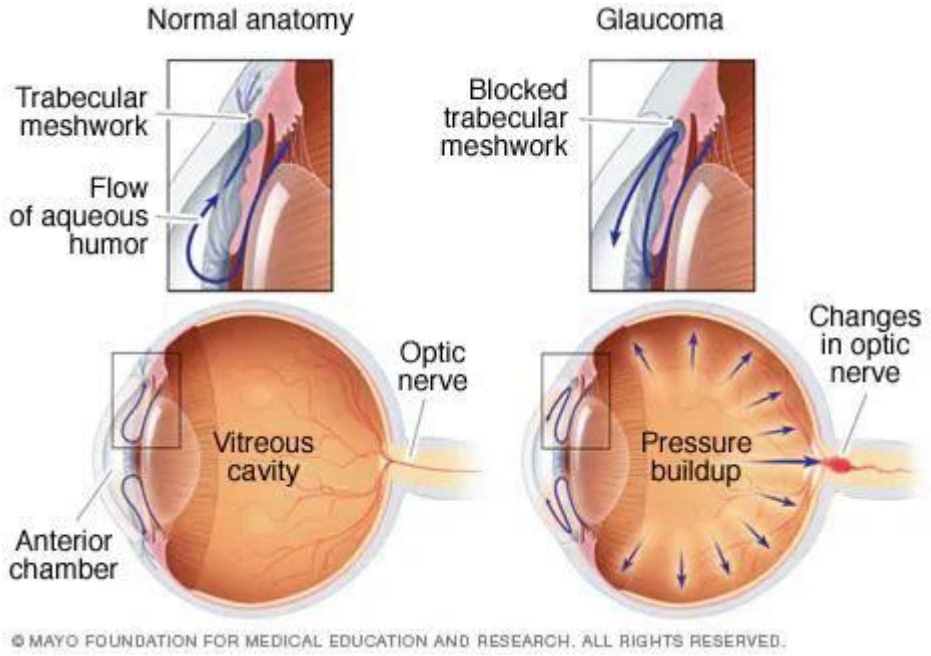
➢ Cataracts

A cataract causes the lens in your eye to become cloudy. Most cataracts are associated with normal changes in your eyes as you age. They are caused by the breakdown of proteins in the lens of your eye. You may experience cloudy or blurry vision, faded colors, halos around lights, difficulty seeing at night or double vision. Cataracts are more common and occur earlier in people with diabetes.



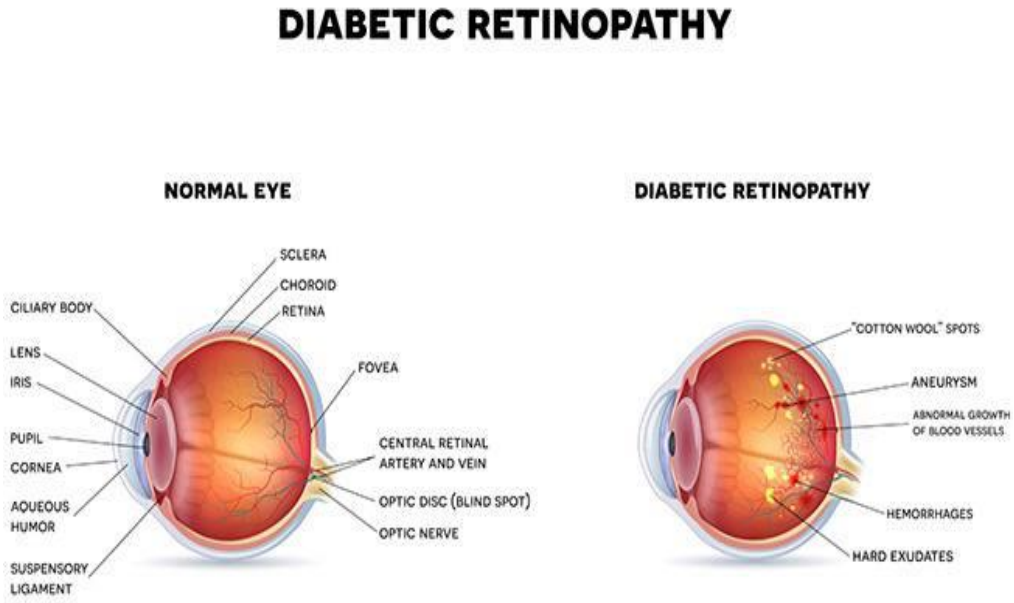
➢ Glaucoma

- People living with diabetes are at higher risk to develop glaucoma. Glaucoma occurs when pressure builds up in the eye. This pressure pinches the blood vessels to the retina and optic nerve, damaging both and resulting in vision loss.
- Experience (headaches, eye pain, watery or red eyes, halos or blurred vision).



➢ Diabetic retinopathy (Diabetic Macular Edema)

- Diabetic Macular Edema occurs when the tiny blood vessels in the retina leak fluid into the macula, which is where focusing occurs. As the macula swells with fluid, vision blurs and colors may appear washed out.



- Diabetic retinopathy is a complication of diabetes and a leading cause of blindness. It occurs when diabetes damages the tiny blood vessels inside the retina, the light-sensitive tissue at the back of the eye.
- It is the "disease of the retina" caused by microangiopathy due to long term effect of diabetes leading to progressive damage of the retina & blindness .
- Most common cause of severe bilateral visual loss in working age group.

❖ There are three main types:

1) **non-proliferative diabetic retinopathy**
   This is the early stage of the disease in which capillary damage results in blood and fluid leaking into the retina, causing it to swell. Depending on the number of vessels affected, there is usually minimal or no effect on vision.

2) **diabetic macular oedema**
   Diabetic macular oedema occurs if swelling extends to the macula, which is the part of the retina responsible for central vision. Diabetic macular oedema (swelling) is the usual cause of vision loss related to diabetes and the level of impairment can be significant.
3) **proliferative diabetic retinopathy**
   Proliferative diabetic retinopathy is the advanced stage of the disease. In an attempt to supply the retina with more oxygenated blood, abnormal blood vessels start to grow, but these are fragile and bleed easily. This can lead to the formation of scar tissue. If these new vessels bleed, the person may see ‘floaters’ or even lose all vision. This requires emergency treatment.

- Risk factors

  - Age at diagnosis of diabetes (Duration of diabetes)
  - Poor metabolic control(Pregnancy)
  - Hypertension
  - Nephropathy
  - Others - smoking, obesity, hyperlipidemia, anemia

- How does diabetic retinopathy cause vision loss?

Blood vessels damaged from diabetic retinopathy can cause vision loss in two ways:

a. Fragile, abnormal blood vessels can develop and leak blood into the center of the eye, blurring vision. This is proliferative retinopathy and is the fourth and most advanced stage of the disease.

b. Fluid can leak into the center of the macula, the part of the eye where sharp, straight-ahead vision occurs. The fluid makes the macula swell, blurring vision. This condition is called macular edema. It can occur at any stage of diabetic retinopathy, although it is more likely to occur as the disease progresses. About half of the people with proliferative retinopathy also have macular edema.

Normal vision

Same scene viewed by a person with diabetic retinopathy

➢ Pathophysiology of diabetic retinopathy

- A disease of the retinal microvasculature causing capillary leakage and occlusion
- Larger retinal vessels are located in the NFL and GCL
- Smaller retinal capillaries are located as deep as the INL
- The RPE and the retinal vasculature form the Blood-Retinal barrier – Tight junctions
- No fenestrations
- Peristyles to control growth and provide support
- Basement membrane

- Abnormal changes to the microvasculature
- Thickening of the basement membrane
- Loss of peristyles
- Endothelial cell changes

- Basement membrane effect is accelerated ageing
- %75peristyle loss removes support and allows bulging of the vessel wall (saccular MA)
- Extra growth of endothelial cells, forming tight loop MAs

- Loss of tight junctions breaks down the blood retinal barrier
- Intra-retinal lipid exudates
  - From leakage of plasma proteins and lipoproteins
  - Located in OPL and form streaks or circles around areas of leakage – Leakage at macula leads to visible edema (focal and diffuse(

- Further leakage causes:
  - Intra-retinal hemorrhages
  - Flame-shaped hemorrhages when from superficial capillary bed – Dot and blot hemorrhages when from deep capillary bed.

Diabetic eye complications

Eye Complications :

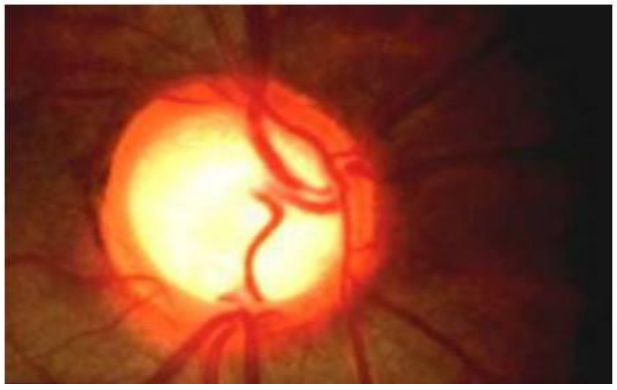
- Complications of diabetes mellitus (DM) are progressive and almost resulting by chronic exposure to high blood levels of glucose caused by impairments in insulin metabolism and biological macromolecules such as carbohydrates, lipids, proteins and nucleic acid.
- DM and its complications are rapidly becoming the world's most significant cause of morbidity and mortality.
- The DM pandemic has expanded speedily in the developed and developing countries. It is expected that DM will reach epidemic proportions within the near future.
- DM can lead to several ocular complications such as diabetic retinopathy, diabetic papillopathy, glaucoma, cataract, and ocular surface diseases. Diabetes related ocular complications are general public health problem.

- Higher risk of blindness.
- Many have minor eye disorders.
- Early treatments critical.

Common ocular complications

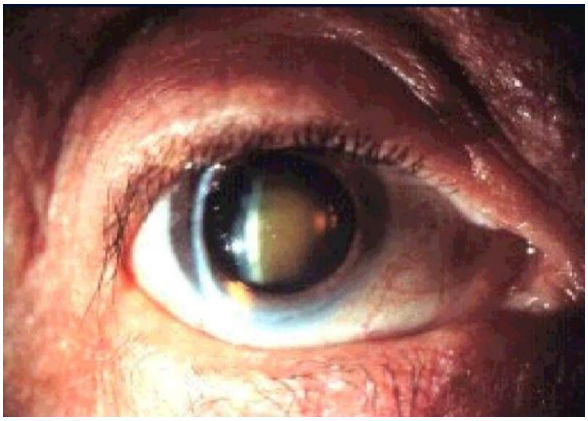
Glaucoma

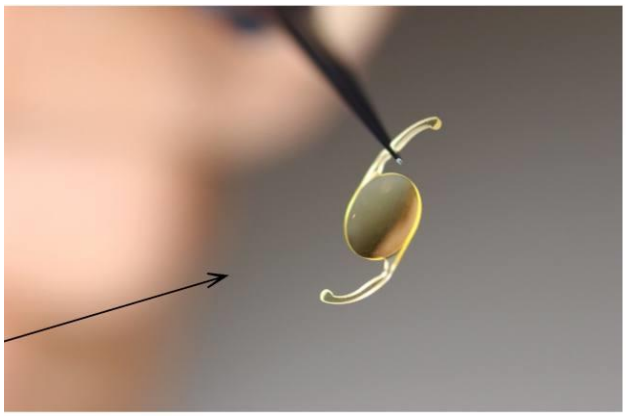
- Pressure build-up in the eye.
- Pinches the blood vessels .
- Damages nerves.
- Vision is gradually lost.
- %40 more likely to suffer from glaucoma.
- Risk increases with age and duration of diabetes.



Cataracts

- The eye's clear lens clouds, blocking light.
  - Wear sunglasses
  - Use glare-control lenses in eyeglasses.
- Damaged lens –
  - Remove.
  - Transplant.
- Individuals with diabetes are:
  - %60more likely to develop cataracts
    - at a younger age
    - faster progression
    - have problems if removal of the lens is necessary due to the beginning stages of glaucoma





Retinopathy

- Diabetic retinopathy is a general term for all disorders of the retina caused by diabetes .
  - There are 2 major types of retinopathy:
  - No proliferative: This is the common, mild form .
  - Proliferative: This form is much more serious

- There are several factors that influence whether you get retinopathy:
  - Blood sugar control
  - Blood pressure levels
  - How long you have had diabetes
  - Genetics

- Almost everyone with type 1 diabetes will eventually develop no proliferative retinopathy.

Normal vision

Vision with diabetic retinopathy