SNS COLLEGE OF NURSING

SARAVANAMPATTI,COIMBATORE-35

DEPARTMENT OF NURSING

COURSE NAME : BSC (NURSING) I YEAR

SUBJECT : ANATOMY AND PHYSIOLOGY

UNIT III: SENSE ORGANS

TOPIC : EYES

INTRODUCTION

- Sense organs are the specialized organs composed of sensory neurons, which help us to perceive and respond to our surroundings.
- A part of your body (such as your eyes, ears, nose, or tongue) that you use to see, hear, smell, taste, or feel things.

SENSORY ORGANS

EYES

- Eyes are **organs of the visual system**. They provide living organisms with vision, the ability to receive and process visual detail, as well as enabling several photo response functions that are independent of vision.

ACCESSORY STRUCTURE OF EYE

The accessory organs of the eye include the ocular muscles, the fasciæ, the eyebrows, the eyelids, the conjunctiva, and the lacrimal apparatus.

ANATOMICAL PARTS OF EYE

- Iris: the colored part
- Cornea: a clear dome over the iris
- Pupil: the black circular opening in the iris that lets light in
- Sclera: the white of your eye
- Conjunctiva: a thin layer of tissue that covers the entire front of your eye, except for the cornea

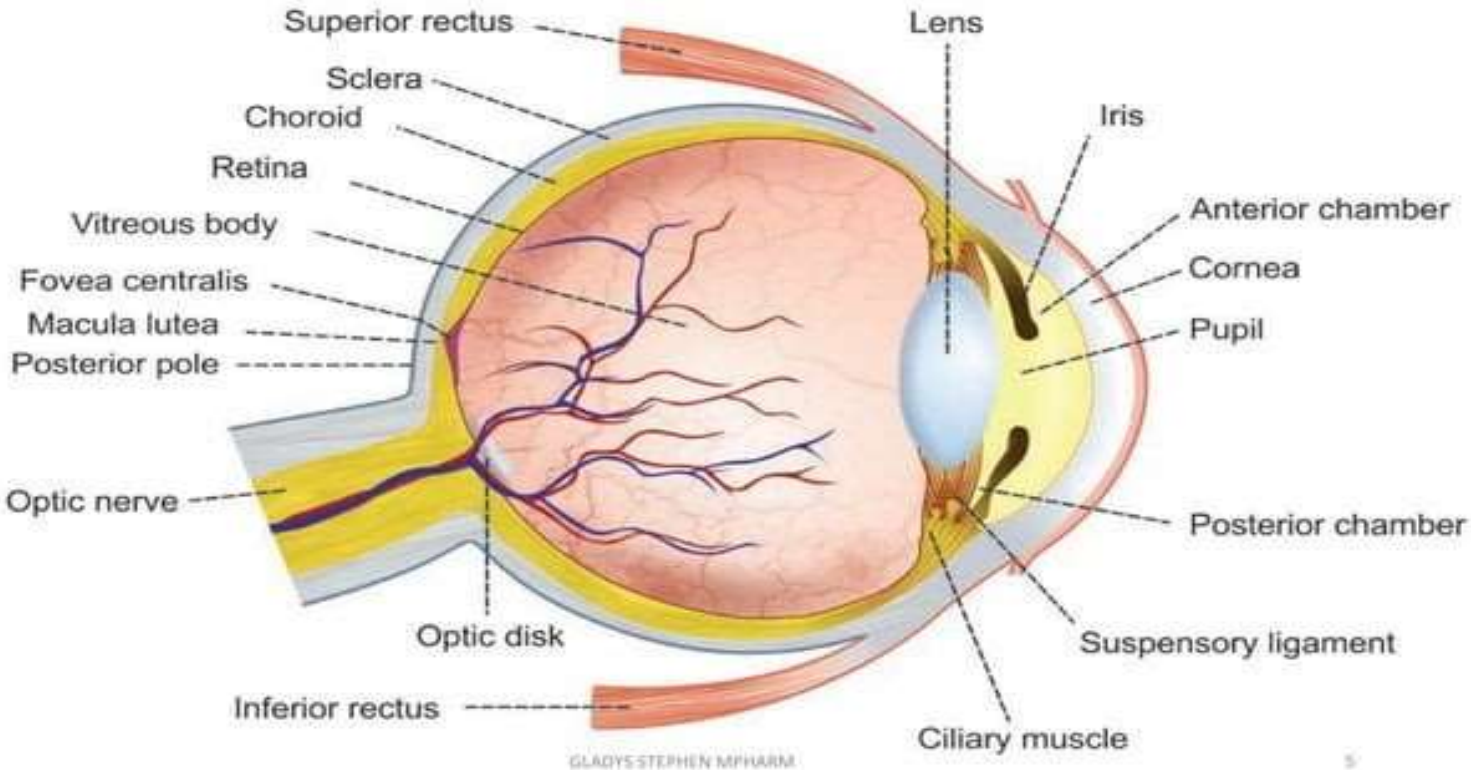
ANATOMICAL PARTS OF EYE

- **Anterior & Posterior Chambers:**The anterior chamber is between the cornea and the iris.The posterior chamber is between the iris and the lens.Contains the aqueous humor
- **Vitreous Humor:**Fills the space between lens and retina.Transparent gelatinous body.Specific viscosity of 1.8 - 2.0 (jelly-like consistency)

ANATOMICAL PARTS OF EYE

- **The Macula:**Covering the fovea is a pigment called the macula. it is thought that the macula serves as a protective filter over the foviea that absorbs blue and ultraviolet radiation.
- **RETINA**:The light-sensitive layers of nerve tissue at the back of the eye that receive images and sends them as electric signals through the optic nerve to the brain.

STRUCTURE OF EYE



PHYSIOLOGY OF VISION

1. Refraction of light entering the eye
2. Focusing of image on the retina by accommodation of lens
3. Convergence of image
4. Photo-chemical activity in retina and conversion into neural impulse
5. Processing in brain and perception

1.REFRACTION OF LIGHT ENTERING THE EYE

- Light wave travels parallel to each other but they bend when passes from one medium to another. This phenomenon is called refraction.
- Before light reach retina it passes through cornea, aqueous humor, lens vitrous humor, so refraction takes place in every medium before it falls on retina.

REFRACTION(cond.,)

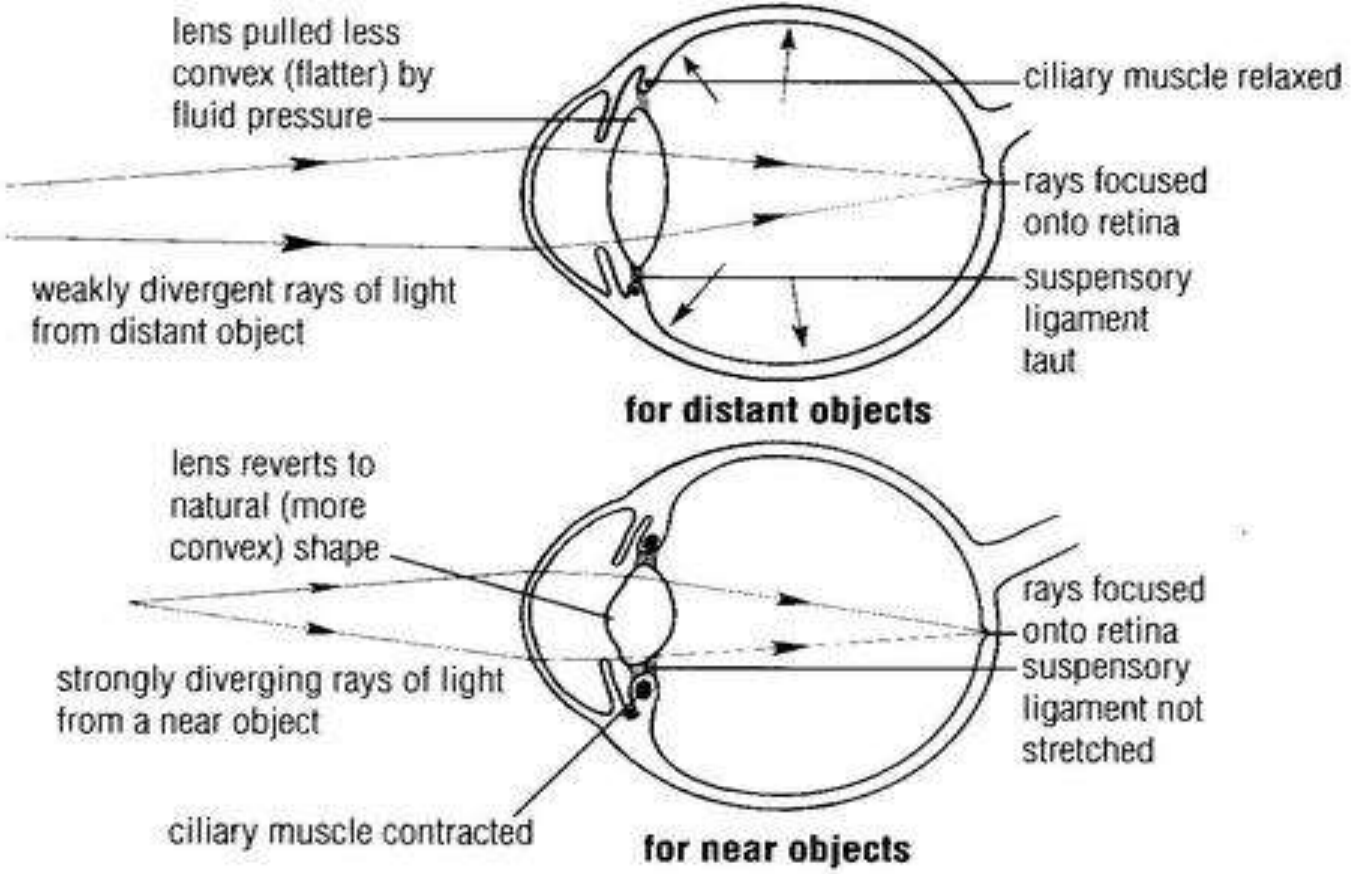
- In normal eye, light wave focused on retina.
- However in myopic eye (short sightedness) light focused in front of retina. So this defect can be treated by using cancave lens.
- In case of far sightedness light focused behind retina, so no image is formed. This defect can be treated by using convex lens.

2.ACCOMMODATION OF LENS

- Accommodation is a reflex process to bring light rays from object into perfect focus on retina by adjusting the lens.
- When an object lying less than 6 meter away is viewed, image formed behind retina.
- For accommodation to view closer object, ciliary muscle contract and lens become thick which causes focus on closer object.

ACCOMMODATION(Cond)

- Similarly, when distant object is viewed, ciliary muscles relaxes, so the tension of ligament become greater which pull lens and lens become thinner, due to which image forms on retina.
- The normal eye is able to accommodate light from object about 25 cm to infinity.


lens pulled less convex (flatter) by fluid pressure
ciliary muscle relaxed
rays focused onto retina
weakly divergent rays of light from distant object
suspensory ligament taut
for distant objects
lens reverts to natural (more convex) shape
rays focused onto retina
strongly diverging rays of light from a near object
suspensory ligament not stretched
ciliary muscle contracted
for near objects

3.COVERENCE OF IMAGE

- Human eye have binocular vision, it means although we have two eye, we perceive single image
- In binocular vision, two eye ball turns slightly inward to focus a close object so that both image falls on corresponding points on retina at same time. This phenomenon is called convergence.

4.PHOTOCHEMICAL ACTIVITY

1. Photochemical activity in rods:

- Each eye contains 125 million rods which are located in neuro-retina.
- Rods contains light sensitive pigment-rhodopsin.
- Rhodopsin is a molecule formed by combination of a protein scotopsin and a light sensitive small molecule retinal (retinene).

PHOTOCHEMICAL ACTIVITY IN RODS

- Retinene (retinal) is a carotenoid molecule and is derivative of vitamin A (retinol).
- The extra cellular fluids surrounding rod cells contains high concentration of Na+ ion and low concentration of K+ ions while concentration of Na+ is low and K+ is high inside rod cells. The concentration is maintained by Na-K pump.

PHOTOCHEMICAL ACTIVITY IN RODS

- In resting phase, K+ tends to move outside the rod cells creating slightly –ve charge inside.
- When light is falls on rod cell, it is absorbed by rhodopsin and it breaks into scotopsin and 11 cis- retinal. The process is known as bleaching.
- 11 cis-retinal absorb photon of light and change into all trans-retinal which inturn activates scotopsin into enzyme.

PHOTOCHEMICAL ACTIVITY IN RODS

- This reaction produces large amount of transducin which activates another enzyme phosphodiesterase.
- Phosphodiesterase hydrolyses cGMP which causes to cease the flow of Na+ ion inside rod cell.
- Bipolar cell, amacrine cell and ganglion cell process the neural signal and generate action potential to transmit to brain via optic nerve.

PHOTOCHEMICAL ACTIVITY IN CONE

- Each eye contains 7 million cone cells.The neural activity in cone cell is similar to that of rod cell but there are three different types of cone cells and each cone cell contains different photo-pigment and are sensitive to red, green and blue.
- Like rod, cone cell contains iodopsin as photo-pigment which is composed of 11 cis-retinal and photopsin.

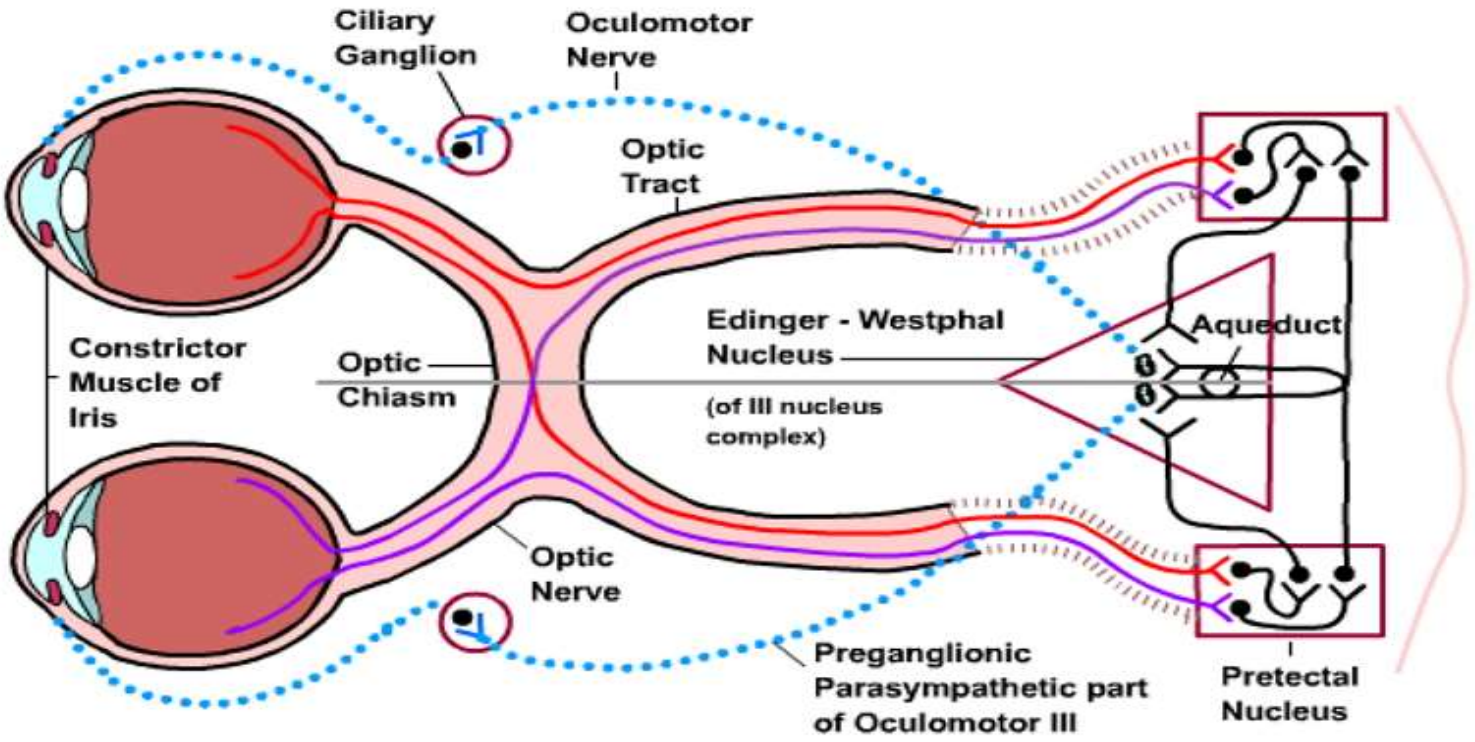
PHOTOCHEMICAL ACTIVITY IN CONE

- The perception of color depends upon which cone are stimulated.
- The final perceived color is combination of all three types of cone cell stimulated depending upon the level of stimulation.
- The proper mix of all three color produce the perception of white and absence of all color produce perception of black.

5.PROCESSING IN BRAIN AND PERCEPTION

- All visual information originates in retina due to stimulation of rods and cones are conveyed to brain.
- Retina contains 5 types of cells and they are interconnected by synapse. These cells are photoreceptor cells (rod and cone), bipolar cell, ganglion cell, horizontal cell and amacrine cell.

PROCESSING(COND,.)



PROCESSING(COND,.)

- Photoreceptor cells, bipolar cells and ganglion cells transmit impulse directly from retina to brain
- The nerve fiber of ganglion cells from both eyes carries impulse along two optic nerve.
- The optic nerves meets at optic chiasma where fibers from nasal half of each retina cross-over but fibers from temporal half of each retina do not cross-over.

PROCESSING(COND,.)

- The optic nerve after crossing the chiasma is called as optic tract.
- Each optic tract continues posteriorly until it synapse with neuron in thalamus called lateral geniculate body which project to primary visual cortex in occipital lobe of cerebrum and image is perceived.

COMMON EYE DISORDERS

1. **Glaucoma:** Glaucoma is caused when the pressure inside your eyes increase, thus damaging your optic nerves. People often inherit this eye condition, and it usually affects them later in their life.
2. **Astigmatism:** In simple words, Astigmatism is the condition when your eyes are not completely round

COMMON EYE DISORDERS

3. **Cataract:**It's the condition when the natural lens of your eyes, located behind the Iris and the Pupil, becomes cloudy.
4. **Corneal Abrasion:**It happens quite often when dirt or sand gets trapped in your eye.
5. **Dry Eyes:**This is a very common condition and occurs when the tears cannot lubricate your eyes properly.

COMMON EYE DISORDERS

6. **Subconjunctival Haemorrhage:**This condition occurs when a tiny blood vessel breaks just below the conjunctiva of your eye.
7. **Retinal Detachment:**This is a serious eye condition. It occurs when your retina located at the back of your eye detaches from the tissue around it.
8. **Diabetic Retinopathy:**The high blood sugar levels damage the blood vessels present in the retina.

COMMON EYE DISORDERS

9. **Age-Related Macular Degeneration (AMD):**This is the deterioration of the macula, the central area of the retina that controls visual acuity.
10. **Uveitis:** The condition mainly affects the Uvea, a part of your eye.
11. **Hyphema:**Hyphema is the condition when blood gets accumulated in the front part of your eye.

COMMON EYE DISORDERS

12. Central Retinal Vascular Occlusion (CRVO): The retina of your eye contains one main artery and one main vein.

13. Scleritis: This is a painful condition where the white part of the eye (called Sclera) swells.

14. Hypertensive Retinopathy: This condition is caused by extremely high blood pressure levels.

COMMON EYE DISORDERS

15. Strabismus: If your eyes are not aligned properly, and both the eyes look at different direction, this condition is called Strabismus or crossed eyes.

16. Corneal Ulcer: This is an open sore in the Cornea and is mainly caused by viral, fungal or bacterial infection, dryness of eye, scratches or tear in the Cornea.

CONCLUSION

The eye is an organ of sight. Eyes enable us To perform daily tasks and teach us about our surroundings. Vision or sight is a rapid process involving simultaneous interaction between the eye, the nervous system, and the brain.

ASSESSMENT

1.Enlist the inner structure of eye

2. Explain about chemical reaction of rods?

3. Enlist the major eye disorders

REFERENCE

- **Atlas of Human Anatomy, Professional Edition, 7th Edition**.
- Ross & Wilson Anatomy and Physiology in Health and Illness, 13th Edition.
- Clinical Anatomy: Applied Anatomy for Nursing Students , 14th Edition.


Thank You