
Unit - 2 □ Types of Visual Impairment and Common Eye Disorders

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2.1 Introduction

Many people have some type of visual problem at some point in their lives. Some can no longer see objects far away. Others have problems reading small print. These types of conditions are often easily treated with eyeglasses or contact lenses. Visual impairment (vision impairment, vision disability) is defined as a decreased ability to see to a degree that causes problems not fixable by usual means, such as glasses or medication. Visual impairment can be due to disease, trauma, or congenital or degenerative conditions. In the United States, the terms "partially sighted", "low vision", "legally blind" and "totally blind" are used by schools, colleges, and other educational institutions to describe students with visual impairments. Eye disorders which can lead to visual impairments can include retinal degeneration, albinism, cataracts, glaucoma, muscular problems that result in visual disturbances, corneal disorders, diabetic retinopathy, congenital disorders, and infection." Visual impairment can also be caused by brain and nerve disorders, in which case it is usually termed cortical visual impairment (CVI).

2.2 Objectives

After going through this unit the learners will be able to -

- State the definitions of important terms related to visual functioning.
- Describe measure to be used in the assessment of loss of visual acuity and loss of visual field.
- Explain the different refractive errors with illustrations.
- Distinguish between various refractive errors.
- Describe the common eye diseases and influences upon visual functioning
- Enumerate the educational implication of different eye disorders.

2.3 Visual acuity:

Means

- Ability to discriminate high contrast, fine detail at a distance.
- Ability of the eye to see details.
- The power of the eye to distinguish form.
- The sharpness and clarity of vision.

- The visual acuity for distance is measured as the maximum distance at which person can see a certain object, divided by the maximum distance at which a person with normal eye sight can see the same. Thus a visual acuity 6/60 meter means that the person examined cannot see properly at a distance of 6 meters the object, which a person with normal eye sight would be able to see at 60 meters or, visual acuity of 20/200 means that what a normal person can see at a distance of 200 feet a visually impaired child can not see it properly at a distance of 20 feet.

2.3.1 Loss of visual acuity:

- Loss of visual acuity means inability to discriminate high contrast and unable to find detail at a distance.
- Lack of clarity and sharpness of vision.

2.3.2 Estimation of percentage of visual loss:

(Using best correcting spectacle lens). For purpose of calculating visual acuity loss, distance vision and near vision are equally weighted.

Distance (Snellen) vision		Near vision		
Visual acuity		Percentage Loss	Jaeger Test Type	Percentage Loss
English	Metric			
20/20	6/6	0	1	0
20/30	6/9	5	2	0
20/40	6/12	15	3	10
20/50	6/15	25	6	50
20/80	6/20	40	7	60
20/100	6/30	50	11	85
20/200	6/60	80	13	90

Example: If the distance acuity is 20/80 and the subject can read Jaeger 6.

Loss of visual acuity= $40+50/2=45\%$
 Therefore Visual acuity efficiency= 55%
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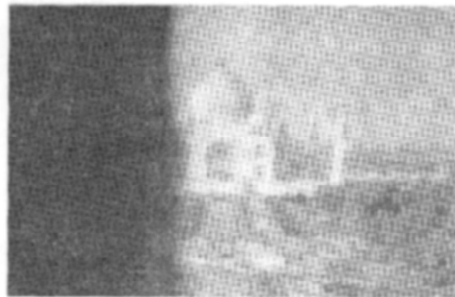
2.4 Visual Field :

Visual field is generally 180 degrees in a normal eye. Normal fields in each eye can approximately see 60 degrees to the nasal side by fixing on a centre point, 90 degree to the temporal side, 50 degree to the superior side that is up the centre and 70 degree inferior side that is down. This is peripheral field. Restrictions in the normal fields of vision may lead the child seeing only small portion of the environment at a time. It is like figuring out the entire puzzle from one piece. The child may not be able to see the objects on the left side or right side or in the centre. These restrictions in the field can be classified in the following way:

Mildfield restrictions: This means loss of peripheral vision and 20-40 degree of central field remains. Not very restricting but mobility problems may be there.

Moderate field restrictions: Central field is 10-20 degree or less. Some special consideration has to be given and the aids are to be prescribed.

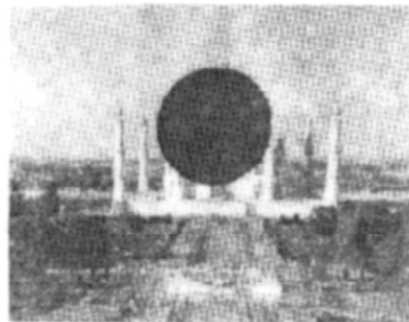
Severe field restriction: When central field is just 10 degrees or less. The field of vision may have restrictions in the central field while the child's peripheral vision may remain.



Marginal field defect



Peripheral field defect



Central field defect

2.4.1 Loss of Visual Field:

Definintion: Loss of visual field means that the field of vision is very much limited or restricted and hence the area which can be seen without shifting eye gaze is narrowed down to a specific limit.

The commonly used tests for assessing field of vision are Lister's perimeter and Bjerrum's screen. A white test object is used in eight mendians as given below. This can be done with a 3mm object at 1/3 Inetre using a perimeter.

Directions	Range of minimal normal Visual Field	Moderate visual field	Severe visual field
Temporally	85degrees	60 degrees	30 degrees
Down and temporally	85 degrees	40 degrees	30 degrees
Down	65 degrees	40 degrees	30 degrees
Down and Nasally	50 degrees	30 degrees	20 degrees
Nasally	60 degrees	40 degrees	30 degrees
Up and Nasally	55 degrees	40 degrees	30 degrees
Up	45 degrees	30 degrees	20 degrees
Up and Temporally	55 degrees	40 degrees	30 degrees
Total	500 degrees	320 degrees	220 degrees

Calculation:

$$\text{Visual field} = 320 \times 100 / 500 = 64\%$$

$$\text{Moderate Loss of visual field} = 100 - 64 = 36\%$$

$$\text{Visual field} = 220 \times 100 / 500 = 44\%$$

$$\text{Severe Loss of visual field} = 100 - 44 = 56\%$$

Therefore, loss of visual field means that the field of vision is very much restricted or limited.

Peripheral field loss: loss of peripheral visron causes a restricted field of vision.

Objects in the centre remain visible. The causes of peripheral field loss include glaucoma and retinitis pigmentosa.

2.5 Colour Vision Defect:

Colour vision defects are present in the community with a greater percentage of boys than girls affected. Red-green problems are the most common. The hereditary colour vision problems are present in the visual impaired persons but these are also some eye conditions that affect colour vision. Colour vision and fine detail are processed by the central part of the retina and any condition affecting this area can cause a colour vision defect.

There is a small percentage of students who have no colour vision and see everything in shades of grey similar to image on a black and white television.

If a colour vision defect is present care should be taken not to use colour cues or direction and when presenting work on the board, some colour will not be seen against the green surface.

2.5.1 Loss of contrast sensitivity:

Due to loss of visual acuity and field of vision, the sensitivity of the optic nerve is not actively interpreted with faculty of the brain. In that case, the relative difference between lightness and darkness of things is not observed clearly.

2.5.2 Role of teacher for low vision children:

The teacher can increase the amount of information available to a student by maximizing contrast. Sharp contrast between an object and its background makes the object more visible to the students. This is essential in reading, writing, drawing, cutting, pasting and physical education-

- Black and white or black and yellow provide the best contrast. Intense blue, green or purple on a buff or light yellow background may be referable if glare is a problem. The student prefers experiment with the colour of paper.
- Keep the chalkboard as clean as possible. The student may have a preference for yellow or white chalk. Large chalk can be purchased. A white board provides good contrast if glare can be eliminated and a dark marker is used.
- Reduce visual distractions around an object.
- Avoid using materials with confusing patterns.

Bold, sharp print provides good contrast. When enlarging print copies, try to achieve clear, non-blurry copies.

2.6 Refractive Errors and Common Eye Diseases

2.6.1. Refractive Errors

Refractive Error is defined as a defect in the eye that prevents light rays from being brought to a single focus exactly on the retina" (Bourgeault. S.E .. 1969). Numerous variables influence upon refraction, e.g. corneal curvature, depth of the anterior chamber, shape of the lens, and length of the eye. Upon entering the eye a ray of light passes through the cornea, the aqueous humour the anterior and posterior surfaces of the lens, and the vitreous to focus upon the retina's fovea.

The refractive power of the eye is determined by the radius of curvature of the cornea and the lens as well as the refractive index of the aqueous and the vitreous. This power can change during life with growth, age. or changes in health or exposure to certain drugs or chemicals. A normal physiological alteration in the ability of the lens to change its convexity occurs at a predictable rate from childhood to a later adult life. The lens of the child is very flexible and can readily change its curvature enabling the eye to focus on a very near object as well as a more distant object.

As the age of the lens increases, it grows in thickness and is less able to change its curvature.

When it loses most of the adjusting mechanism or accommodation, it is termed as presbyopia.

1. Myopia

This is the condition in which the eye is too long and the light is focused in front of the retina. Distant objects are blurred but the near objects are seen clearly. The eye has too much optical power and to correct it the optical power is reduced by either minus glasses or contact lenses, or by surgery.

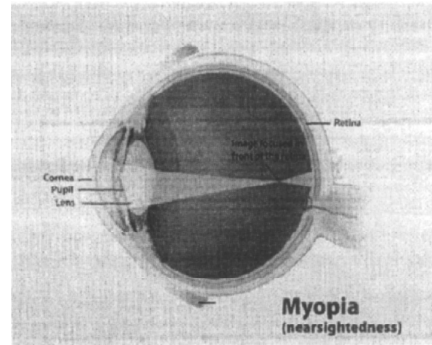
Description - myopic eyes have too much optical power and so focus the image in front of the retina. This arises as a result of the physiological variation in the length of the eye or an excessively curved cornea. This common condition affects about 1 in 4 adults in the UK and tends to manifest itself in adolescence or early adulthood. It is said to be mild (up to 3.0 D), moderate (3.0-6.0 D) or severe/high-degree 3.0-6.0 D). The latter affects about 200,000 British people and can be associated with degenerative fundal changes (Forster-Fuchssspots). It is also associated with an increased risk of retinal detachment, cataract formation and glaucoma.

1. Congenital or developmental

- Child born with elongated eyes
- Refraction may be up to -10.0D
- Typical fundus changes are seen
- Progress is rare.

1 Myopia :

- Commonest clinical type
- Not progress much after the adolescence.
- May be up to -5D, or -6D.
- No degenerative changes are seen in the fundus
- Associated with good vision and good prognosis.

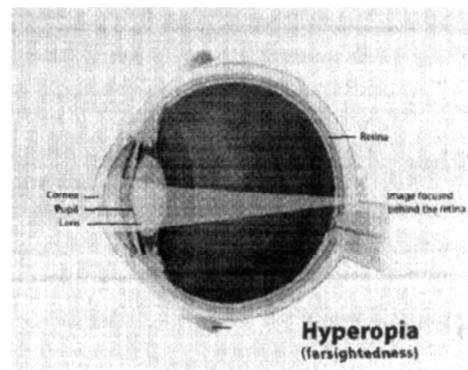


2 Hypermetropia (hyperopia)

This is the condition in which the eye is too short and the light is focused behind the retina. The eye has less optical power than is needed. When young the eye can use the lens within the eye to compensate, but reading glasses are needed at a relatively early age. Later, distance glasses (plus) are needed as well, such that glasses for distance and near are required.

Description - this is the opposite problem to myopia. In this case, the eye does not possess enough optical power for its refractive length and therefore an object is focused behind the retina, so giving rise to a blurred image. Mild hypermetropia is a common finding in babies and very young children and this usually resolves by about 3 years of age. Persistent hypermetropia is associated with an increased risk of glaucoma, squint and amblyopia.

- Physiological in almost all new-borns due to shortness of their globes (approx. +2.5D).
- Pathological: when the retina displaced forward (as in retinal detachment, CSR, orbital tumors and etc..)
- In microphthalmos or nanophthalmos - where the axial length is less than 20.mm



Symptoms:

According to the amount of hypermetropia and the age of the patient.

1. Blurred vision - more for near than for distance
3. Eye strain (accommodative asthenopia)
4. Convergent squint - due to continuous effort of accommodation Excess of convergence dissociation of muscle balance convergent squint.
4. Early onset of presbyopia.

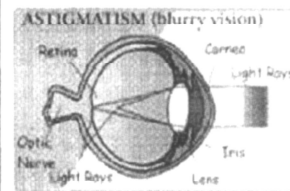
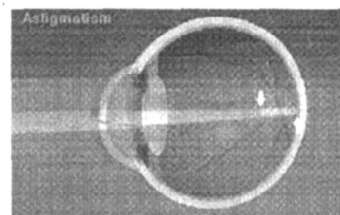
3. Astigmatism

This is the condition where the eye does not focus the light evenly, usually due to the cornea of the eye being more curved in one direction than the other. It may occur on its own or may be associated with myopia or hypermetropia.

Description - not only do light rays have to focus at the level of the retina (as opposed to in front or behind it) but also on a single point. This is achieved through the symmetry of the corneal and lens curvatures around their circumference. In astigmatism, variations in the symmetry of these curvatures (usually corneal) result in rays failing to focus on a single point. The degree of astigmatism is measured in cylinders (cyl). Astigmatism is often present in association with some degree of myopia or hypermetropia. A mild degree of astigmatism is relatively common in childhood and resolves in a number of cases. More severe astigmatism may lead to amblyopia, especially if there is an associated squint.

Causes

- Previous eye surgery
- Previous corneal injury
- Corneal dystrophies
- Congenital cataract
- Optic nerve hypoplasia
- Retinitis pigmentosa



4. Presbyopia

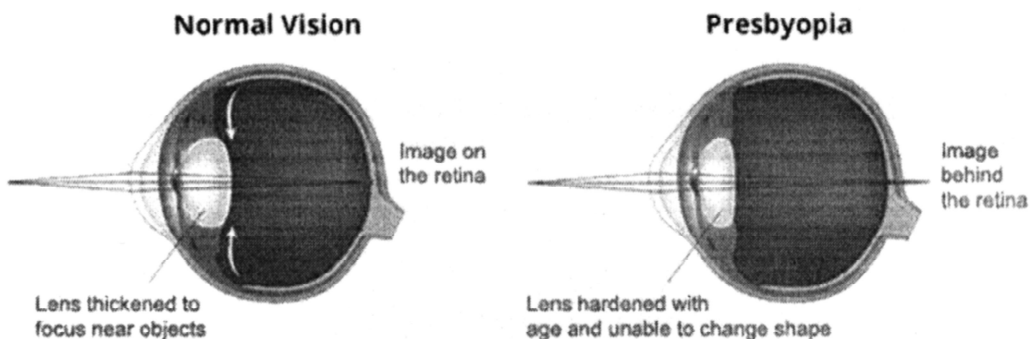
Presbyopia is a condition that occurs as a part of normal aging and is not considered to be an eye disease. The process occurs gradually over a number of years. Symptoms are usually noticeable by age 40-45 and continue to develop until the process stabilizes some 10-20 years later.

Presbyopia occurs without regard to other eye conditions.

Causes and symptoms

In the eye, the crystalline lens is located just behind the iris and the pupil. Tiny ciliary muscles pull and push the lens, adjusting its curvature, and thereby adjusting the eye's focal power to bring objects into focus. As individuals age, the lens becomes less flexible and elastic, and the muscles become less powerful. Because these changes result in inadequate adjustment of the lens of the eye for various distances, objects that are close will appear blurry. The major cause of presbyopia is loss of elasticity of the lens of the eye. Loss of ciliary muscle power, however, is also believed to contribute to the problem.

Symptoms of presbyopia result in the inability to focus on objects close at hand. As the lens hardens, it is unable to focus the rays of light that come from nearby objects. Individuals typically have difficulty reading small print, such as that in telephone directories and newspaper advertisements, and may need to hold reading materials at arm's length. Symptoms include headache and eyestrain when doing close work, blurry vision, and eye fatigue. Symptoms may be worse early in the morning or when individuals are fatigued. Dim lighting may also aggravate the problem.



2.6.2 Common Eye Diseases

Albinism

Lack of pigment in all parts of the body, the skin is white and the hair is pale yellow. Albinism often entails photophobia (acute sensitivity to light) Albinism children will exhibit visual effects such as reduced visual acuity for near and distance vision, astigmatism, nystagmus, very photophobic. A void glare of bright sunlight, reflected light from white or shiny surfaces, wearing tinted glasses or dark sunglasses are suggested for these children as safety measures and use of a barrier sun-cream to avoid sunburn.

Amblyopia/Amblyopia

- Amblyopia is known as lazy eye, It is a disorder of the visual system that is characterized by poor vision or indistinct vision in an eye that is otherwise physically normal or out of proportion to associated structural abnormalities. It has been estimated that 1-5% of the population are affected.

The problem is that no transmission or poor transmission of the visual stimulation through the optic nerve to the brain for a sustained period of dysfunction or during early childhood thus resulting in poor vision or dim vision. Amblyopia is normally affected by one eye, but it is possible to be amblyopic in both eyes if both are similarly deprived of a good or clear visual image. Detecting the condition in early childhood increases the chance of successful treatment.

Symptoms

- Poor deep perception.
- Poor spatial acuity.
- Poor visual image.
- Poor sensitivity to contrast.
- Poor sensitivity to motion.
- Problems of binocular vision, such as limited stereoscopic depth perception.
- Have difficulty seeing the three dimensional images in hidden stereoscopic displays such as auto stereo grams.

Optic atrophy or damaged nerve fibre:

- Complete or partial destruction of the optic nerve that causes the damaged nerve fibres of the optic disc to atrophy. The primary causes of optic atrophy are an injury to the head, retinal disease affecting the nerve itself and a lack of nourishment of the optic nerve. Optic atrophy can be congenital or acquired in later life. Atrophy may be primary due to some diseases of the optic nerve itself, as in neuritis. It may be consecutive from a retinal / lesion such as degeneration of the ganglion cells, as in retinitis pigmentosa. It may also be the result of injury, such as a blow to the eye. The optic nerve is part of the brain and has no capacity for regeneration. Hence, there can be no recovery from optic atrophy.

The range of impairment can be from moderate to total loss of vision, affecting central acuity and fields of vision and colour vision.

Retinitis Pigmentosa (or) Degeneration of Retinal Tissue(RP).

- Retinitis pigmentosa (RP) is a hereditary slow degenerative disease of the retina. The condition affects the peripheral area of retina including rod cells. It may result into night blindness, tunnel vision and inability to see in dark. Though some children are born with poor vision, it begins in childhood. It is progressive and results into blindness in middle or advanced age. Visual acuity is often normal, the field of vision is so poor that the person falls in the category of blindness.

➤ Precaution:

- (i) A close watch by parents & teachers to note any changes in the vision.
- (ii) Sympathetic & proper handling & understanding of socio-psychological & behaviour problems of the individual.
- (iii) Training in visual skills of scanning and reorientation.
- (iv) Training in orientation and mobility.
- (v) Genetic counselling of the individual.

➤ Treatment / Management :

- (i) Treatment by radiation or photo coagulation.
- (ii) Generally surgery is necessary to remove the affected eye.

- (iii) Genetic counselling is desirable.
- (iv) Avoid consanguineous marriage.

Retinal Detachment

- Retinal detachment is disorder of the eye in which the retina peels away from its underlying layer of support tissue. Initial detachment may be localized, but without rapid treatment the entire retina may detach, leading to vision loss and blindness. It is a medical emergency.

The retina is a thin layer of light sensitive tissue on the back wall of the eye. The optical system of the eye focuses light on the retina much like light is focused on the film in a camera. The retina translates that focused image into neural impulses and sends them to the brain via the optic nerve.

Occasionally, posterior vitreous detachment, injury or trauma to the eye or head may cause a small tear in the retina. The tear allows vitreous fluid to seep through it under the retina, and peel it away like a bubble in wallpaper.

It refers to separation of retina from its pigment epithelium layer. From the clinical point of view it is divided into two classes-

- (a) Secondary detachment due to an obvious mechanical cause, subsequent to other happenings in the eye.
- (b) Simple detachment due to development of a hole in the retina.

It is caused by degeneratiye myopia, diabetes, inherited diabetic retinopathy. It leads to painless loss of vision, appearance of flashing light, visual field loss and decreased visual activity.

Symptoms

- A flash of light (photopia).
- A sudden dramatic increase in the number of floaters.
- A slight feeling of heaviness in the eye.
- A dense shadow that starts in the peripheral vision and slowly progresses towards the central vision.
- The impression that a veil or curtain was drawn over the field of vision.
- Central visual loss.

Treatment:

Surgical repair should be performed as soon as possible. It is generally treated by laser surgery and cryosurgery.

Nystagmus:

Nystagmus is an unintentional jittery movement of the eyes. This a condition in which the natural movement of the eye is grossly exaggerated, resulting in uncontrolled eye movements and seriously affects perceptual efficiency. When nystagmus is present, it is likely to be associated with seriously defective vision.

Causes:

Medication and drugs can cause nystagmus. Causes include excessive drinking of alcohol or use of medications such as those given for seizure control.

Diagnosis of Nystagmus

Diagnosis is made clinically based on the medical history and physical examination.

Treatment of Nystagmus:

The reduced vision may be improved with glasses and low vision aids, if the eyes are more stable looking in a certain direction, glasses with prisms or eye muscle surgery may improve the head position and allow better vision.

Vitamin-A deficiency:

Vitamin-A is essential for the build the surface tissues in our body, including parts of eye.

Vitamin-A deficiency may lead to corneal damage, ulceration and blindness particularly in combination with measles or malnutrition. It is also known as xerophthalmia. Keratomalacia is the severe form of xerophthalmia. Night blindness is the earliest symptom of this disease.

Night blindness:

- In this condition the subjects cannot see small objects in dim light.
- Difficulty in reading in dim light is also experienced.

Xerophthalmia :

- In this condition conjunctiva and cornea appear dry due to the keratinisation of epithelial lining.
- The conjunctiva is dry thickened, wrinkled pigmented.

Keratomalacia:

- If xerophthalmia is not treated with vitamin-A, it develops into keratomalacia.
- In this condition, the corneal epithelium becomes opaque, ulceration and bacterial invasion of the cornea bring about its destruction resulting in blindness.

Early diagnosis and treatment will be the best way to check this defect. Due to deficiency of vitamin-A complaint from patient are poor vision, difficulty seeing in dim light, eyes become sensitive to bright light.

Symptoms:

- Thick white spots on both sides of the cornea.
- Spots on the conjunctiva.
- Conjunctiva becomes wrinkled.
- Cornea erupts.

Suggestions:

- It is necessary to teach the public to eat dark green vegetables which are rich in vitamin-A.
- This is particularly important for pregnant woman, weaning children, growing infants and adults.

Corneal ulcer:

The cornea is the front part of the eye through which the light ray passes prior to forming the visual image in the retina.

Two groups of corneal disorders are :-

1. Inflammation of the cornea.
2. Many abnormal growths are appearing at birth or at times later in life.

Corneal inflammations may be divided into three types :-

- (a) Superficial keratitis.
- (b) Deep dermatitis.
- (c) Corneal ulcer.

Causes :

A foreign body is the cause for most common corneal disorders and ulcers frequently occur as complications of corneal abrasions or foreign body. When the foreign body stays in the cornea, it may lead to ulcer which in turn reduces the vision from mere blurring to total blindness. Due to indiscriminate use and abuse of antibiotics and steroids, the corneal ulcer is formed. Some specific viruses such as herpes simplex. etc. may also cause corneal ulcer.

Precaution:

The eyes should be washed with clean water when the foreign body stays in the eye and on any account the eye should not be rubbed.

Trachoma:

Trachoma is a chronic contagious disease of the conjunctiva and cornea. It is one of the oldest infection diseases known to mankind. It is caused by chlamydia trachomatis a micro-organism which spreads through contact with eye discharge from the infected person (on towels, handkerchiefs, fingers etc.) and through transmission by eye seeking flies. The primary infection affects conjunctiva follicles and corneal involvement cause ulcers. Basically, trachoma is a socio economic rather than a medical disease. It is found in those areas where living conditions are bad and where people are poor, dirty, ill nourished ignorant.

Trachoma goes through four stages:

- 1-3 weeks the early sign is that the conjunctiva of the upper eyelid becomes red;
- Small pink bumps appear on the conjunctiva of the upper eyelid, the upper part of the cornea becomes infected and inflamed;
- Healing now starts with formation of scar tissue on the eyelids, the conjunctiva and the cornea;
- The disease is, no longer, infections leaving scarring of the eyelids, the

conjunctiva and the cornea, together with the turning in of the eyelids and the scratching of the eye lashes against the cornea; leading to a loss of vision and possible blindness.

Causes:

- Caused by an organism chlamydia trachomatis.
- Spreads by contact from one person to another through dirty hands, contaminated handkerchiefs or towels.
- Flourishes among people whose surroundings are unhygienic and who are crowded together in an unhealthy environment where there is : lot of dust, poor sanitation, many flies, scarcity of water, open and dirty latrines, open drainage system.

Symptoms:

- ~ Redness
- ~ Itching
- ~ Tearing
- ~ Irritations.

Treatment:

- Clean the eyes if there is discharge.
- Sulphacetamide eye drops 10% or 20% instilled at least four times a day for 6 weeks.
- Advice on personal hygiene and daily washing of face.
- Check other member of the family for trachoma.

Glaucoma or increased intraocular pressure:

Glaucoma is very dangerous and it occurs due to the increase in the intra ocular pressure. Glaucoma is not a disease but rather a complex of ocular disorders. The normal pressure level in the eye is 15 to 20 mm Hg. In glaucoma the pressure may be up to twice the normal. Normally the aqueous humour fills the anterior posterior chambers and permeates the vitreous humour. Aqueous humour is produced by the ciliary body.

The intraocular pressure is determined by the rate of aqueous humour production and the resistance to out flow aqueous humour from the eye. Normally a constant balance is maintained between the rate of formation and the rate of absorption of aqueous humour. The resulting increase in intra ocular pressure can damage the optic nerve. Glaucoma can occur at birth or develop later in childhood or adulthood.

Types:

- (i) Chronic (open angle) glaucoma.
- (ii) Acute (narrow angle) glaucoma.
- (iii) Secondary glaucoma.
- (iv) Childhood glaucoma.

Treatment of glaucoma can only prevent further loss of vision, it cannot bring back sight already lost. There are three types of treatment:

- Medical-open angle
- Surgical-open angle
- Medical and surgical- angle closure

Symptoms :

- (i) An occasional vague headache or itching about the eyes.
- (ii) An occasional blurring or cloudiness of vision.
- (iii) An occasional watering of eye.
- (iv) Diminished side vision.
- (v) Frequent and unsatisfactory changes of glasses.
- (vi) Occasional difficulty in the night vision.
- (vii) Haloes (rainbow ring around bulbs) appear towards evening.

Cataract:

Opacity of a lens or its capsule is called "cataract". The clouding may be through out the entire lens or may involve a small localized area. If it is confined to the periphery, the vision may be normal or only slightly reduced. If it is centrally located in the direct line of vision it can distort the sight at an early stage of formation.

The greatest loss that can be sustained by a contract is a restriction of the ability to perceive light. The vision is lost because the normal clarity of the lens is reduced and the lens cannot focus the rays of light into an image on the retina. Cataracts may be associated with injury, infection, metabolic disorder or toxic condition. Bilateral cataracts in children are often associated with nystagmus and retinal disease. Children with congenital cataracts can be improved by glasses (bi-focal), contact lenses and low vision aids. Cataract surgery involves removing to cloudy lens from the eye replacing it with glasses, a contact lens or a plastic lens. Without effective treatments cataract account for as much as 50% of the world's mass blindness and it is one of the world's leading causes of blindness.

Common symptoms

- Diminished vision
- Double vision
- Decrease insensitivity to colour
- Poor vision in bright light and improved vision in dim light
- Newly acquired ability to read without glasses.

Causes:

- Aging
- Long duration of diabetes
- Dehydration
- Low levels of calcium
- Cigarette smoking.
- Congenital
- Other eye diseases
- Diabetes; certain drugs especially cortico-steroids.
- Injuries to the eye

In hot countries there are additional causes:

- Solar and heat radiation in desert areas
- Diarrhea in early life
- Poor nutrition

Measures to prevent cataracts:

- Increased awareness of the need eye for eye safety.
- Taking of safety measures in certain dangerous jobs.
- Ensuring the prompt surgical and medical treatment of eyes injures.
- Early detection of other eye diseases which may lead to cataracts.
- Monitoring of people taking those drugs which might form cataracts.
- Control of diabetes.

Cortical visual impairment:

Cortical visual impairment is the total or partial loss of vision in a normal appearing eye caused by damage to the visual area in the brains occipital cortex. This type of damage is most often caused by loss of blood flow to the occipital cortex from either unilateral or bilateral. Posterior cerebral artery blockage. A patient with critical visual impairment often has little or no insight that they have lost vision, a phenomenon known as Anton's syndrome or Anton Babinski syndrome.

Causes

The most common causes of cortical visual impairment is oxygen starvation to the occipital lobe caused by blockage to one or both of the posterior cerebral arteries however, other conditions have also been known to cause cortical blindness, including: Bilateral lesions of the primary visual cortex. Side effect of some anti-epilepsy drug.

Cortical visual impairment can be associated with visual hallucination, denial of visual loss, and the ability to perceive moving but not static objects.

Macular Degeneration:

This is a disease of the eye that results in central vision loss. It is more common among older individuals and is often hereditary. Macular degeneration is one of the more common causes of partial blindness in older individuals.

The destruction or poor development is the macular (central) portion of the retina. Often undetected in young, its consequence is extremely poor central vision.

Age related macular degeneration is one of the leading causes of visual impairment in the world and it presents as two forms.

- Dry or atrophic.
- Wet or exudative.

The atrophic form is more common than exudative, with about 90% of patients being diagnosed with atrophic age related macular degeneration.

The exudative form of disease usually leads to more serious vision loss. It is more common in people over 65years of age and female.

Causes:

Hereditary factors, age, nutrition, smoking, hypertension are all risk factors. But the exact causes of age related macular degeneration are still unknown.

The atrophic form the thinning of macular tissues, amorphous deposits and pigmentation in macula.

Exudative macular degeneration occurs when new vessels from a choroidal neovascular membrane to improve the blood supply to oxygen to deprive retinal tissue. These new vessels leak blood and fluid causing damage to the surrounding tissues.

Symptoms:

- Gradual diminution of vision.
- There may be shadowed area in the central visual field causing difficulty in reading.

Treatment:

- Zinc supplement and antioxidant vitamins may help to lower the progression of age related macular degeneration.
- Laser photo coagulation is effective in sealing leaking in eyes with "wet" macular degeneration.

Management:

Patient with central vision loss may benefit from the use of low vision aids.

2.7 Educational implication of different eye Disorders:

Albinism :

- i) Environmental concerns such as glare from the windows and light in a classroom must be addressed, since they may cause sensitivity and pain.
- ii) It is important to consider magnification aids and enhanced print for student such as longer font size and making text bold.
- iii) Teachers should consider minimizing in small clutter on maps and other diagrams.
- iv) The role of the orientation and mobility instructor is important in helping to familiarize the student with new areas particularly those which are subject to changing light.

Amblyopia (lazy eye):

Students with one damaged eye and one healthy one may require the good eye to be patched for a number of hour everyday to encourage development of the pathways from the weaker eye.

Cataract:

- Problems in near and distant tasks.
- Poor colour vision.
- Unable to read and write
- High illumination needs for peripheral loss.
- Low illumination needs for central loss
- Difficult to read glare materials.
- Mobility is restricted
- Unable to perform in the daily living
- Also students will need time for adaptation activities to light change.

Glaucoma:

- Adaptations to accommodate reduced Visual acuity or field of Vision, both factors would need to be considered, the student with reduced Visual acuity

may need to sit close to the front of the class to see board, low vision Aids as large print may be recommended.

- Able to read print to a limited extent.
- Extreme difficulty in travel.
- Unable or difficulty in reading at night
- Difficulty in seeing at night.
- Difficulties in scanning & tracking.
- Avoid vigorous activities.
- Reduced Peripheral Vision would have an impact on student's mobility in the classroom.
- Frequent hospital appointments may interfere with Schooling.
- Cataracts can affect student's visual acuity and cause decreased reading efficiency and problems seeing the board due to a cloudy Lens.

Hypermetropia:

- Difficulty in reading and other near Vision activities.
- Eye strain / Fatigue due to excessive accommodation.
- Learning impacted by reduced or difficult concentration.
- Interaction with others may be affected by lack of ability to recognize facial expressions and body language.
- Low Vision aids and text enlargement may assist with the reading of curricular and instructional materials.

Myopia (Nearsightedness):

- The use of eye glasses, contact lenses or low vision aids has proven particularly helpful in viewing distant objects.
- Learning may be infected by reduced or difficulty with concentration.
- Students may experience visual fatigue when asked to do a lot of reading.
- Inability to see black board, objects at a distance.

- Lack of interest in outdoor games and recreational activities.

Nystagmus:

- Students with nystagmus will often require environment support with lighting.
- Colour contrast test and other magnification tool will often be required helpful.
- Tasks such as copying from the board will be difficult as it involves frequent changes of focus, providing student with own copy of work to be copied would be preferable.
- A student with Nystagmus often suffers from vision fatigue especially when expected to do a lot of reading.
- Stress also affects the student and has been seen to increase the involuntary movement of the eyes.

Optic Atrophy:

- Problems in reading, if reading into the blind field area.
- Problems in mobility
- Good task lighting and high contrast materials (black & White) may improve readings speed.

Retinal Detachment:

- Where students have field loss it is important to recognize what part of their vision is missing and avoid placing objects in these areas.
- Inability to concentrate
- Bumping into objects,
- Students with tendency to develop retinal detachment should avoid blows to the head in physical activity; if this occurs then parents should be notified immediately.

Retinitis Pigmentosa (RP):

- The student will benefit from preferential seating and may exhibit eccentric viewing or frequent head turning to compensate for the reduced visual field.

- Due to reduced vision in low light the student will benefit from good, even lighting.
- Mobility may also be affected due to reduced visual field.

Retinopathy of Prematurity:

- Depending on the severity of the visual impairment which may vary from low vision to blindness the student will require either large print or Braille. If the student is not a Braille user, he will likely need low vision aids used as magnifiers or a monocular.
- It is important to be aware of proper illumination for the student while trying to avoid glare.
- Orientation and mobility training is essential.

2.8 “Check your progress”

1. What is legal blindness?

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2. What is visual acuity?

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3. What is visual field?

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6. How can the visual loss be calculated?

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7. How can you estimate percentage of visual loss?

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8. How can you calculate loss of visual field?

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9. The Normal visual acuity of eye is

- a) 6/60
- b) 6/18
- c) 6/6
- d) 6/21

8. Normal field of vision is

- a) 900°
- b) 1800°
- c) 2700°
- d) 3600°

9. What represented by a fraction relating to the distance of objects seen by an individual ?

- a) Fusion
- b) Visual acuity

- c) Refraction
 - d) Depth perception
10. Nearsightedness refers to
- a) Myopia
 - b) Hyperopia
 - c) Presbyopia
 - d) Astigmatism
11. Myopic eyes are corrected by
- a) Concave lens
 - b) Convex lens
 - c) Bifocal lens
 - d) Prism
12. Cataract means
- a) Defective Lens
 - b) Dislocation of the lens
 - c) Development of the thin membrane over the lens
 - d) Opacity of the lens

2.9 Let us Sum Up

- Visual acuity refers to sharpness of vision.
- Visual field refers to the entire area which can be seen without shifting the gaze.
- Markedly reduced functional vision is called as low vision
- Refractive error is a defect in the eye that prevents light rays from being brought to a single focus exactly on the retina can corrected with lenses.
- Myopia is the condition in which the eye ball is excessively long and focuses light in front of retina; nearsightedness.
- Hyperopia is the condition characterized; refractive problem in which the

eyeball is excessively short and light rays are focused beyond the retina; farsightedness.

- Presbyopia is a normal and gradual decrease in power accommodation in the eye due to physiological change that starts in the middle age.
- Common causes of blindness are cataract, glaucoma, corneal ulcer, conjunctivitis, Trachoma etc.
- Visual impairment may also result from other eye disorder like retinal detachment, Albinism, astigmatism, Nystagmus, optic atrophy, retinitis pigmentosa etc.
- Glaucoma is the condition characterized by high pressure inside the eyeball.
- Trachoma is an infection caused by a specific virus which produces severe scarring of the eyelids and cornea.
- Corneal ulcer is developed due to bacteria, viral infection, fungus, vitamin deficiency etc.
- Cataract is the condition characterized by the eye lens becoming opaque and cloudy.

2.10 References

1. Fernandez, G. Koenig. C., Mani. M. N. G, and Tesni, S. (1999) . See with the Blind Bangalore: Books for change and CBM International.
2. Jangira, N.K Mukhopadhyay, M ., Mani, M.N.G., & Roychoudary. M Source book for the teaching of visually Disabled Children. New Delhi: NCERT, World Health Organization.
3. Lowenfeld, B., (Ed.) The Visually Handicapped Child in school. New York: John Day. 1973.
4. Mani, M.N.G., Status Report on Visual impairment. Rehabilitation Council Of India: New Delhi.
5. Mani, M.N.G. Techniques of teaching of Blind Children, New Delhi: Sterling Publishers. 1992.
6. Punani, B. and Rawal, N. Visual Impairment Handbook, NAB, Ahmedabad. Bishop, V.E., Teaching the Visually limited child. Springfield, IL: Charles C. Thomas, 197.