Draft Copy

A
Hand Book
For
Vision Technicians
&
Primary Eye Care Providers

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Kalinga Eye Hospital
nysasdri

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Uses for This Manual

Primary Eye Care Assessment:

1. Measuring visual acuity and screening for ocular dysfunction;
2. Determining which patients have refractive errors and need eyeglasses;
3. Recognizing symptoms of eye diseases;
4. Identifying adult & child with cataract and other operable cases.
5. Promoting eye health; and
6. Making appropriate post treatment follow ups and referrals.

Table of Contents:

Introduction

Blindness has profound human and socioeconomic consequences in all societies. The costs of lost productivity and of rehabilitation and education of the blind constitute a significant economic burden for the individual, the family and society. The economic effects of visual impairment can be divided into direct and indirect costs. The direct costs are those of the treatment of eye diseases, including the relevant proportions of costs for running medical and allied health services, pharmaceuticals, research and administration. The indirect costs include lost earnings of visually impaired people and their caregivers and costs for visual aids, equipment, home modifications, rehabilitation, welfare payments, lost taxation revenue and the pain, suffering and premature death that can result from visualimpairment.

Bringing eye care to the densely forested regions of Odisha is a challenge for health care providers. However, it is a challenge that needs to be surmounted for the benefit of the people who live in these forested regions. Kalinga Eye Hospital (KEH) is working with the Odisha Forestry Sector Development Project to reach the previously unserved (not underserved) populations residing in the forests through the JFM Vision Technician Training program, which trains a member from each village to recognize eye conditions, and these identified people can be brought to a centrally located village and now can be examined by a technical person (saves doc time, community empowered, screening can be done throughout the year continue screening by Animators and updates to Kalinga Eye Hospital, sustainability through involving local community) work with Kalinga Eye Hospital to bring a doctor to these regions to treat these conditions.

Blindness affects people in a very negative way the world over. Blindness can cause people to lose their jobs and social standing, miss out on education, or take away education or job opportunities from a family member. However, 80% of blindness 60 % cataracts, 25% refractive error easily be tackled in Odisha is preventable, and the negative impacts brought by blindness can be reversed when the patient is restored his or her sight. A simple procedure such as cataract surgery

or prescribing glasses or medication can restore someone's sight. A survey among patients at Aravind Eye Hospital in Madurai, India, found that 85% of males and 58% of females who had lost their jobs as a result of blindness regained those jobs following cataract surgery. Some of those who did not return to work relieved other family members from caring for the patient or covering their household duties, allowing these other family members to return to work. 88% of male patients and 93% of female patients who reported having lost authority within their family and their community stated that they had regained their social standing following surgery. The results also demonstrated that the average individual who regained functional vision through cataract surgery generated 1,500 percent of the cost of surgery in increased economic productivity during the first year following surgery. (Statistics on forested regions: population, population of average village, number of people with eye problems.)

Odisha is a state known for its unspoiled forests; however, bringing medical care to the people living in these forests has proven a challenge. The Odisha Forestry Sector Development Project (OFSDP) today protects and cares for many of these forests, and strives to improve life for the people residing in the forests. (Other livelihood projects OFSDP has taken on?) 35% of the state is densely forested and communication facilities to these jungles are unreliable; as a result the health service delivery mechanisms for these areas are often inaccessible (or have other problems?) Kalinga Eye Hospital (KEH) wishes to make eye care available, accessible, and affordable for communities residing in these forested areas, and strives to do this by collaborating with OFSDP. Because blindness is largely preventable with basic information and procedures, KEH and OFSDP seek to bring the necessary tools to the people in eight project divisions in Odisha to help restore vision to those affected and prevent future cases of blindness.

However, there are numerous challenges to providing care to populations in rural and isolated areas. The population of these districts is quite large, over six million people. Percentage of state population in forest areas. Among this population there are limited people with the technical skills required to treat and prevent blindness. Given the large

population and small number of people with the correct technical skills, it would be difficult for the technical personnel to evaluate all of the adults and children within a reasonable timeframe. The isolation of the villages and poverty of the residents of those villages also added to the difficulties of providing eye care to the people living in the forests. Many people cannot afford the cost of transportation to a clinic, or they cannot afford to miss work to travel to the clinic. Some do not know that a treatment exists for their ailment, or are wary of available treatments. There exists an unequal distribution of services needed to prevent and cure blindness, and gross under-utilization of what was available.

To address these problems, KEH and OFSDP partnered together to train empower Animators to do basic eye screenings. Animators already work with the Forestry Sector to keep track of the health of the forests around their villages, and now they are able to track eye health too. Animators will be empowered how to conduct a basic eye exam, and provided them with a toolkit that would allow them to carry out exams.

At the end of Vision Technician Training, screeners receive a packet with different materials that can be used to screen the eye health of various populations. All that the screener needs to identify if someone has an eye problem, and recommend that they see a visiting doctor. Collecting people to see the camps, but also recommending people to visit local hospital in emergency cases. There are also instructions in the local language to remind the screener of the processes, in case they forget. The responsibilities of the screener are great: they have to screen every member of their village, record everyone that has been screened and record those with eye problems. Without these crucial elements, the program would not work.

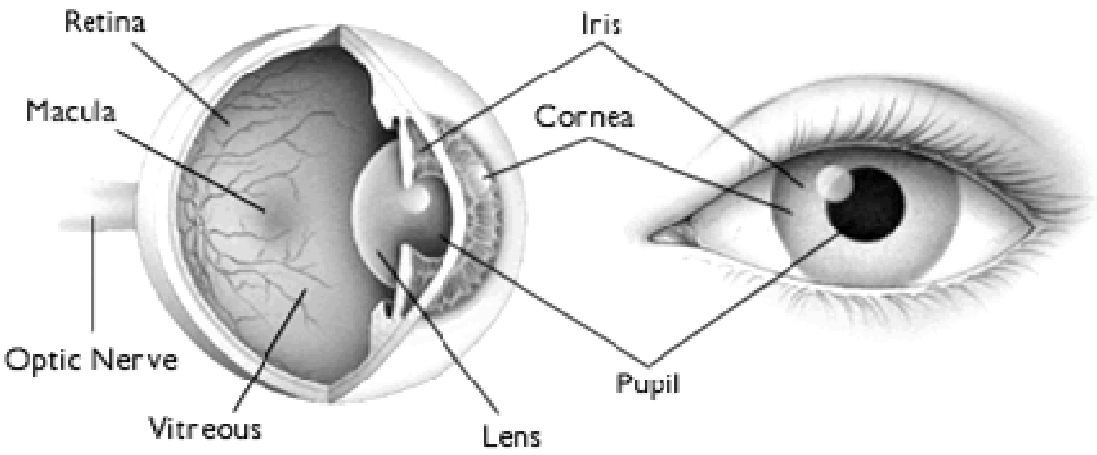
CHAPTER-1

How does the Eye work?

Eye Anatomy consists of many intricate parts of the eye. It involves parts that allow light refraction, maintaining the shape of the eye, light conversion and much more. Although we will not list all of the parts we will try to explain some of them and their function.

We have a pair of Eye balls the size of ping-pong balls lodged in two bony cavities called the Orbit in the skull. The Orbit provides a bony protection to the eyes and act like a helmet, safeguarding the soft, delicate eye balls. On the outer surface, the eye balls protected by two curtains of skin and connective tissue called the Eye lids. They can be broadly divided into two parts: the anterior and the posterior part.

Anterior Part:

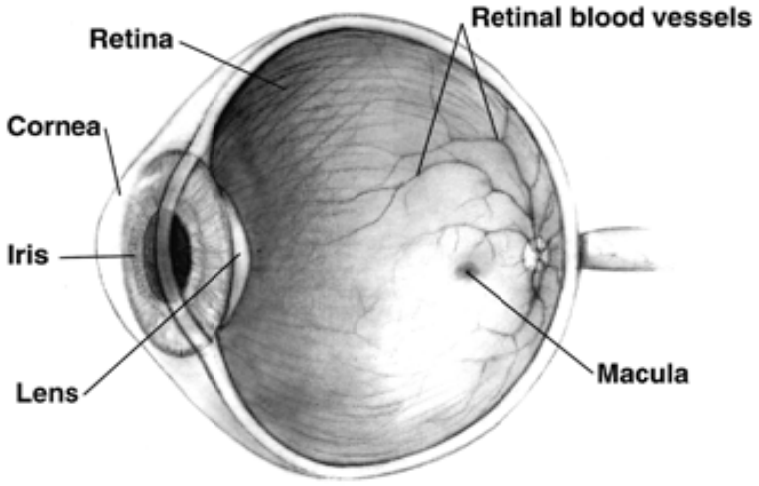


This is the portion of the ye in front of the lens. It includes the followings

- The conjunctiva
- Cornea’
- Sclera
- Iris
- Lens

ANTERIOR PART	
Conjunctiva	This is the portion of the eye in front of the lens. It includes the Conjunctiva, cornea, sclera, iris and the lens. Covering the anterior part of the eye is a thin, transparent membrane called the conjunctiva.
Sclera	The Sclera is the outer white part of the eye that you can see. It provides protection and structure for the inner parts of the eye.
Cornea	The transparent curved part of the outer layer of the eye is called the Cornea. The corena is actually Colourless and transparent and it is look black, blue or green because of the underlying colour of a pigmented tissue called IRIS
Iris	The Iris acts as a pigmented curtain, filtering off the excess light.
Pupil	In the center of the Iris lies an aperture called the pupil, which allows the light to pass through.
Natural Lens	The lens is a crystalline, bio convex structure in the eye which focuses light from images on to the Retina.
Aqueous Humour	The Aqueous Humor is the watery region in the from of the eye ball. It is separated into two regions, the anterior chamber in front of the iris and the posterior chamber behind it.

Posterior Part:



This is the portion of the eye that lies behind the lens and holds the followings

- Retina
- Macula
- Vitreous Humour

POSTERIOR PART	
Retina	The retina is the inner most layer of sensitive tissue. When light is transmitted here images can clearly be transmitted to the brain. The retina consists of many layers including layers of rods and cones. Many cells in the retina transform light into chemical and electrical energy that is transferred to optic nerves.
Macula	The central portion of the retina, on which all the central images are focused, is called the Macula. The Macula is a highly sensitive part of the retina. It is responsible for our detailed vision. The center of the macula is called the**fovea** which has a major role in detailed perception. When there is damage to the macula, we are unable to see finer details.
Vitreous Humour	The vitreous Humour is a gel like substance that occupies the posterior segment and supports the maintenance of ocular integrity.

CHAPTER-2

Measuring Visual Acuity

The Vision chart is printed with eight lines of block letters. The first line consists of one very large letter, which may be one of several letters, for example E, H, or N. Subsequent rows have increasing numbers of letters that decrease in size. A person taking the test covers one eye, and reads aloud the letters of each row, beginning at the top. The smallest row that can be read accurately indicates the visual acuity in that eye.

The symbols on an acuity chart are formally known as optotypes. In the case of the vision chart, the optotypes have the appearance of block letters, and are intended to be seen and read as letters. They are not, however, letters from any ordinary typographer's font. They have a particular, simple geometry in which: the thickness of the lines equals the thickness of the white spaces between lines and the thickness of the gap in the letter "C", the height and width of the optotype (letter) is five times the thickness of the line.

Only the ten Sloan letters C, D, E, F, L, N, O, P, T, Z are used in the vision chart. The perception of five out of six letters (or similar ratio) is judged to be the Snellen fraction.

In the most familiar acuity test, a Vision chart is placed at a standard distance 20 ft or 6 metres. At this distance, the symbols on the line representing "normal" acuity subtend an angle of five minutes of arc, and the thickness of the lines and of the spaces between the lines subtends one minute of arc. This line, designated 20/20 or 6/6, is the smallest line that a person with normal acuity can read at a distance of 20 ft. But in some of the Hospitals, due to shortage of space, a mirror is usually placed at a distance of 10 feet from the patient, so that the patient see the chart through the mirror and it covers 20 feet.

CHAPTER-3

Refractive Errors and Their Corrective Measures

To recapitulate from the previous chapter, the human eye functions as a specialized camera that focuses light rays from objects as images on the light sensitive film – the *retina*. The focusing mechanism of the eye consists of a pliable crystalline lens, the cornea and the refracting media inside the eyeball. The various parts of the refracting system of the eye work together to act as a single lens. The eye can be compared to a camera in many ways.

In a camera, the focusing mechanism moves the lens forward or backwards to focus the image clearly. In the eye, the crystalline lens does this job by swelling up or thinning out. The thinned out lens focuses distant objects, while the swollen, thick lens focuses near objects. This process is called *accommodation*. Similarly, the pupil works like the shutter of the camera by changing its size to optimize the entry of light. An inability to focus images clearly on the retina, resulting in the formation of blurred images, is called a *refractive error*. Refractive errors are a group of disorders in which a precise image does not get focused on the retina.

An easily detectable and correctable problem like a refractive error still remains a significant cause of avoidable visual disability in our world.

Types of Refractive Errors

There are four common types of refractive errors:

- Myopia or short sightedness or near sightedness
- Hypermetropia or long sightedness or far sightedness
- Astigmatism
- Presbyopia

Myopia and hypermetropia are caused by one or more of the following anomalies:

- *Abnormality in the size of the eyeball* – The normal antero-posterior (front to back) length of the eyeball is around 24 mm. The eyeball is too long in myopia and too small in hypermetropia.

- *Abnormality in the curvature of the cornea* – The curvature of the cornea is too steep in myopia and too flat in hypermetropia. In addition, irregularity of the corneal surface may give rise to astigmatism.
- *Abnormality in the refractive index* – As mentioned earlier, light passes through the major refracting surfaces of the cornea and lens before falling on the retina. The refractive index of these surfaces is their ability to bend light when it passes through them. A high refractive index may cause myopia, while a low refractive index may cause hypermetropia.

Of all these factors, an abnormality in the size of the eyeball is the most common cause of refractive errors especially in children and young adults. Each of the types of refractive errors is now discussed in detail.

Myopia

Myopia is a condition in which the person is unable to see distant objects clearly, but can see near objects well. This condition is caused when rays of light are focused in the front of the retina instead of on it. As mentioned earlier, this happens when the eyeball is more elongated than normal or if the curvature of the cornea is very steep. Myopia is the commonest type of refractive error, and it usually develops at a young age.

The main complaint of a person with myopia is that he cannot see distant objects clearly. Other symptoms of the defect are headache, watering from the eyes and constant itching of the eyes. All these symptoms are a result of eye straining induced by the refractive error. A child who is unable to articulate his complaints would tend to read his book by holding it very close to his face and sit closer to the blackboard or the TV.

The progression of myopia happens most often during the growing phase of a person's life. Maximum growth occurs between the ages of 12 and 20. Frequent changes of spectacles may be required during these years but the myopic error usually stabilizes after the age of 20. Hence permanent surgical procedures like laser surgery should be performed only after documented stabilization of the myopia.

There are two types of myopia. *Simple myopia* is a variant of the usual condition and does not pose a serious threat to vision. The power of the lens is expressed in dioptres. In simple myopia, the power is usually less than 6 dioptres. Apart from the refractive error, no anatomical or functional complications of the ocular structures are encountered in this type of myopia.

Pathological (or progressive) myopia, as the name suggests, is of a more serious nature. In this type of myopia, the retina becomes very thin and is stretched at the periphery to cover the elongated eyeball and is hence more likely to develop tears or separating from its base, a condition termed *retinal detachment*. Alternatively, progressive scarring of the retina and its underlying layers, called *chorioretinal atrophy,* can cause a chronic diminution of vision. If not diagnosed early and followed up regularly, pathological myopia can result in the permanent loss of vision.

Myopia can be corrected using lenses that bend light outward, that is, divergent or concave lenses. They are denoted by a minus '-' sign in the spectacle prescription.

Hypermetropia

Hypermetropia is a condition in which the person is unable to see both near and distant objects well. In this condition, rhea light rays are focused behind the retina instead of on it. Headache and eye straining following any prolonged near work may be encountered at desk jobs or while sewing can be symptoms. These symptoms are collectively termed *asthenopia*. Although hypermetropia can be detected at any age, it generally becomes apparent with increasing age.

This condition can be corrected by using lenses which bend light inwards to fall on the retina, that is converging or convex lens, denoted by a plus '+' sign in the spectacle prescription.

Astigmatism

A precise, single point of focus on the retina is a prerequisite for clear vision. However, in astigmatism, two or more foci of light are focused on the retina due to abnormalities of the refracting surface, thus causing problems with vision. A person with astigmatism is likely to complain of headache or eye straining along with blurry vision.

Astigmatism can be corrected by using cylindrical lens that rectify the error in one particular meridian only.

Presbyopia

In this condition, the eye is unable to focus near objects. The problem is caused by the aging of the lens and the accommodating system, which fail to focus near objects on the retina. Hence, it is a disorder of aging. This is a physiological phenomenon which happens to almost everybody and starts during the fourth decade of a person's life.

People with presbyopia find it increasingly difficult to read the newspaper at their usual working distance in dim light and tend to keep it at a distance to make out the letters. Simple tasks like threading a needle, signing a document or making out the fine print on a visiting card become increasingly difficult and sometimes embarrassing.

In an adult, the uncorrected disability hampers a person's financial productivity and compromises his occupational skills. Headaches and eye straining may occur after long hours of near work. Left uncorrected, the person loses interest in performing near work like reading and writing, leading to a compromise in the quality of life.

Presbyopia is corrected using convex lenses, which can be used for reading and near work.

Correction of Refractive Errors

Refractive errors can be corrected through several means. Some methods offer a permanent cure while others need to be adhered to life-long. Treatment can be in the form of spectacles, contact lens or surgery. Contact lens and surgery will be described in detail.

Contact Lenses

An attractive alternative to spectacles for correcting refractive errors, contact lens are also used for various therapeutic, pharmacological and cosmetic procedures.

A *contact lens* is an optical device that is placed directly over the corneal and scleral surfaces of the eye. Modern contact lenses are polymers that are relatively safe, on-toxic and on-allergic. Since the cornea derives its oxygen requirement mainly from the atmosphere, placing a lens on the

corneal surface can impede the oxygen supply to the cornea. Newer types of lenses, however, allow oxygen to pass through them to the cornea.

Types of Contact Lenses

There are three types of contact lenses: soft, semi-soft and hard.

- *Soft contact lenses*: These are very flexible lenses made of a polymer called hydroxyl ethyl metha acrylate (HEMA). They are very comfortable to wear and permit oxygen to reach the cornea.
- *Semi-soft lenses or rigid gas permeable lenses*: These lenses are made from special materials like cellulose or silicon acrylate. They are less flexible than soft contact lens but allow some oxygen to pass through to the cornea. Thought less comfortable than soft lenses, they can be used to correct steep corneas and high stigmatism.
- *Hard contact lens*: Made of a polymer called poly methyl metha acrylate (PMMA), hard lens are the least flexible of all lenses and permit almost no oxygen to pass through to the cornea. However, the advantage of a hard contact lens is its durability.

Advantages of Contact Lenses

- Contact lenses provide a larger field of vision than spectacles and a better range of mobility. Hence, they are ideally suited for sportspersons and people engaged in outdoor physical activities.
- In people with uniocular refractive error (power difference of more than 3 dioptres between the eyes), spectacles will produce double vision due to the discrepancy in the size of the image. Contact lens can be used in such cases.
- Cosmetically, they offer an advantage over spectacles.
- Apart from correcting refractive errors, contact lens are also used to deliver drugs to the eyes and treat corneal diseases
- Nowadays, contact lenses are available in various colors and can even be used by people with normal vision for cosmetic purposes.

Precautions

With all these advantages, there are also some precautions to be taken before opting for contact lenses:

- An ophthalmologist should examine the eyes to rule out infections and other disorders of the eye
- Only a qualified contact lens specialist should fit the lens. The tests include measuring the corneal curvature and diameter and issuing a suitable pair of contact lens. After wearing them, the specialist examines the eyes to check for a good, comfortable fit.
- Hand-washing with soap before inserting and removing the contact lens from the eye is mandatory.
- Proper maintenance of the contact lens by cleansing it with the appropriate lens fluid is necessary.
- If the eyes are red or there is a white discharge from the eyes, the contact lens should not be used and the eye care professional should be contacted for further instructions.
- One should not sleep overnight with the contact lenses on. The oxygen supply to the cornea is totally cut off by the contact lenses during sleep. The oxygen deprived cornea becomes vulnerable to damage and ulceration.
- The eyes should be periodically examined by an eye care professional to check for an infections or corneal damage due to contact lens wear.

The latest innovation in the field is *extended wear contact lenses* which can be used over a longer period of time. These lenses allow the free passage of oxygen to the cornea, but even they must be used with care.

Contact lenses offer a lot of advantages but they can also cause serious complications if not handled properly. A little care and attention will go a long way in enabling a person to enjoy the benefits and avoid the problems.

CHAPTER-4

Cataract

Cataract is the biggest cause of blindness worldwide and cataract surgery is the most frequently performed eye surgery. The exact cause of cataracts in the elderly populations is still unknown. Since it is more prevalent in tropical climates, ultraviolet rays are thought to play a role in inducing cataracts. Certain races like Indians are also thought to be genetically predisposed to develop cataracts. Of interest is the fact that the second generation adults born and brought up in the United Kingdom to Indian parents are at higher risk of developing cataract than a European of the same age. In general, Indians develop cataracts at least a decade earlier than those in the West.

The number of cataract cases is also increasing rapidly because of population growth, increasing longevity of life and the growing desire of the afflicted persons to seek surgery in the early stages of visual disability.

As we already know, light rays are refracted through the cornea and the lens to focus on the retina. When the lens starts to become opacified, subtle problems in the quality of vision such as difficulty in recognizing distant objects and faces and difficulty in differentiating colors occur. As the cataract progresses, the visual disturbances also increase, ending finally in blindness.

Types of Cataracts

It is most often thought that cataracts occur in the elderly. Even though this is largely true, in rare cases, children can be born with cataract (Congenital cataract) or they may develop a cataract during the early stages of their life (developmental cataract). Children with congenital cataracts have to undergo immediate cataract surgery to prevent permanent blindness.

Age-related cataracts are divided into three main types depending on the anatomical area of involvement of the lens:

- Nuclear cataracts
- Cortical cataracts

- Posterior subcapsular cataracts
- Posterior subcapsular cataracts

An interesting analogy would be to compare the human lens with a mango. Like the central hard seed of the mango, the innermost part of the lens is a hardened mass called the *nucleus*. Surrounding the nucleus is the softer lens matter called the *cortex*, which can be likened to the pulp of the mango. Enveloping the nucleus and cortex is the *capsule*, which is akin to the skin of the mango. The cataract can start in any of these anatomical layers and progress to involve the whole lens over a period of time.

In a *nuclear cataract*, as the name indicates, the central nucleus starts to become less transparent and the lens takes on a yellowish brown hue with advancing age. It progresses slowly and usually involves both the eyes. In the early stages, progressive hardening of the lens nucleus enables people with presbyopia (people above 40 years of age who use reading glasses) to read without spectacles. This is referred to as *second sight*. In advanced cases, the lens nucleus becomes opaque and brown and there is a significant deterioration in vision.

Nuclear cataracts progress very slowly when compared to cortical cataracts. Indeed, around 30 percent of these cataracts do not progress beyond a certain period and some persons may not require surgery.

In a *cortical cataract*, the cortex of the lens starts to opacify. The opacification begins at the periphery of the lens and progresses inwards. Some opacities remain unchanged for long periods, while others progress rapidly. Their effect on visual function varies greatly depending on the location of the opacity. The more central the opacity, the worse the visual handicap. When the entire lens becomes white and opaque, the cataract is said to be *mature*.

A *posterior subcapsular cataract* (PSC) is seen in people younger than those who develop nuclear or cortical cataracts. Even though the cause cannot be ascertained in all cases, this type of cataract can generally be attributed to age, injury or the prolonged intake of corticosteroids (either through eye drops, tablets or injections). The main complaints of this type of cataract are glare and reduced near vision. This type is often

more visually dehabilitating than a nuclear or cortical cataract and persons with PSC seek early surgery.

Other Causes of Cataract

Though most of the cataracts are age-related and do not have a causes, some cataracts are secondary to certain causative agents. These agents are:

- Trauma
- Systemic diseases
- Ocular disorders
- Drugs

Trauma (Injury)

Traumatic lens damage can be caused by three types of injuries: mechanical, physical and chemical. Mechanical injuries include blunt injuries (caused by blunt objects like a ball or a fist) and penetrating injuries (caused by a sharp object like a knife, compass, etc.). Exposure to radiation and electric current may produce physical injuries to the lens while acids, alkalis and metals are the causes of chemical injuries.

Mechanical Injury

A blunt injury may causes lens opacification either immediately or after some time and can be either localized (involving only a part of the lens) or generalized (involving the entire lens). An associated partial or total displacement of the lens from the visual axis due to damage to its supporting structures can also occur, making the surgery for cataract more complicated.

A penetrating injury results in opacification of the lens at the site of injury and it progresses to complete opacifcation. This often requires immediate surgery.

Physical Injury

The lens is extremely sensitive to ionizing radiation, for example, gamma rays, UV rays, etc., especially on long-term exposure to these agents. Cataract induced by electrical injury may regress, remain stationary or

mature to complete cataract over a period of months or years. Microwave radiation does not have much effect on the lens.

Chemical Injury

Alkali injuries are more likely to cause cataract than acid injuries. Small pieces of metal, especially iron and copper, which fall accidentally in the eye can also cause cataract by virtue of their chemical dissolution to ions.

Systemic Diseases

Diabetes is the commonest systemic disorder that causes cataract. Diabetic patients have an increased risk of age-related cataract that occurs at a younger than in non-diabetics. When it occurs, it progresses quickly to the mature stage, often called snow flake cataracts.

Ocular disorders

Cataract can occur secondary to an inflammation inside the eye (a condition called *uveitis*). This usually results in a PSC type of cataract.

Drugs

Cataract may develop in persons who use corticosteroids for a long period of time. Corticosteroids are a group of drugs, used mostly for severe asthma, organ transplants (for example, kidney transplants), allergies and miscellaneous purposes. They can be given as tablets or even as sprays or drops. Long term indiscriminate use of steroids may cause PSC.

Evaluation of Cataract in Adults

The mere presence of a cataract is not an indication for surgery. The decisions to perform surgery should be individualized to the patient's visual needs. A person with cataract is evaluated to obtain the following information:

- Does the lens opacity correspond to the degree of visual impairment? This has to be evaluated since there may be associated eye diseases other than the cataract contributing to the visual deterioration

- Does the person's reduced ability to function warrant surgery? The visual needs of people engaged in different occupations can vary and it is important to gauge the individual visual needs.
- Is the cataract age-related or secondary to a systemic or ocular condition? The postoperative period following surgery performed on a complicated cataract can be more unpredictable than that done for a simple age-related cataract. Prior knowledge of the type of cataract helps the surgeon alter the therapeutic requirements of postoperative care.

Symptoms of Cataract

A person with cataract can present a number of complaints pertaining to the effect of the opacity in his vision. These symptoms are described as follows:

Decreased vision: A cataract is clinically relevant if it causes a significant decreased in vision either for distant or near objects. Different types of cataract may have different effects on visual acuity. Nuclear cataracts are associated with good near vision and poor distant vision. Cortical cataracts maintain a good vision till the central portion of the lens is affected, which occurs at an advanced stage in cataract progression. PSCs of even a mild degree can severally reduce visual acuity, especially in bright light.

In general, a PSC causes more qualitative visual disturbances in an individual than a nuclear cataract even though visual acuity may be the same in both. Hence it is important to understand that the decreases in visual acuity alone are not the prime deciding factor.

Glare: Persons with early cataract often complain of increased glare. It may be very significant while driving in the night and facing bright headlights. This is particularly prominent with PSC but it also common with cortical cataracts. Glare is less characteristic of nuclear cataracts.

Other symptoms: Cataract can also cause a decreased in the sense of contrasts, a mild misty vision as if a thin veil is veering the visual area, difficulty in differentiating colors and a sensation of seeing halos around light sources.

If the cataract becomes hypermature and if the contents start leaking, it may also result in redness and severe pain in the eyes.

Non-surgical Management

Several nonsurgical approaches may be temporarily effective in improving visual function in patients with cataracts. Some of these approaches are listed below:

- Careful refraction to increase spectacle correction for distant and near vision may help patients with nuclear cataracts
- Increased ambient illumination is helpful when reading
- Topical eye drops which dilate the pupil may improve vision in person with centrally located opacities

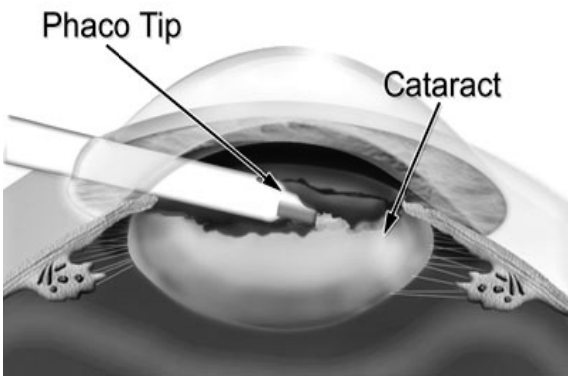
However, these methods may offer only temporary relief and can be suggested for persons who have to wait for surgery or who are not fit to have surgery due to their general health.

Medical management of cataract is under active research. As of now, no commercially available medication has been proved to delay or reverse cataract formation in humans,

Surgical management

There are a number of different surgical techniques used in cataract surgery:

- ***Phacoemulsification*** (Phaco) is the most common technique used by developed countries. It involves the use of a machine with an ultrasonic hand piece equipped with a titanium or steel tip. The tip vibrates at ultrasonic frequency (40,000 Hz) and the lens material is emulsified. A second fine instrument (sometimes called a "cracker" or "chopper") may be used from a side port to facilitate cracking or chopping of the nucleus into smaller pieces. Fragmentation into smaller pieces makes emulsification easier, as



well as the aspiration of cortical material (soft part of the lens around the nucleus). After phacoemulsification of the lens nucleus and cortical material is completed, a dual irrigation-aspiration (I-A) probe or a bimanual I-A system is used to aspirate out the remaining peripheral cortical material.

- ***Manual small incision cataract surgery*** (MSICS): This technique is an evolution of ECCE (see below) where the entire lens is expressed out of the eye through a self-sealing scleral tunnel wound. An appropriately constructed scleral tunnel is watertight and does not require suturing. The "small" in the title refers to the wound being relatively smaller than an ECCE, although it is still markedly larger than a phaco wound. Head to head trials of MSICS vs phaco in dense cataracts have found no different in outcomes, but shorter operating time and significantly lower costs with MSICS.
- ***Extracapsular cataract extraction*** (ECCE): Extracapsular cataract extraction involves the removal of almost the entire natural lens while the elastic lens capsule (posterior capsule) is left intact to allow implantation of an intraocular lens. It involves manual expression of the lens through a large (usually 10–12 mm) incision made in the cornea or sclera. Although it requires a larger incision and the use of stitches, the conventional method may be indicated for patients with very hard cataracts or other situations in which phacoemulsification is problematic.
- ***Intracapsular cataract extraction*** (ICCE) involves the removal of the lens and the surrounding lens capsule in one piece. The procedure has a relatively high rate of complications due to the large incision required and pressure placed on the vitreous body. It has therefore been largely superseded and is rarely performed in countries where operating microscopes and high-technology equipment are readily available After lens removal, an artificial plastic lens (an intraocular lens implant) can be placed in either the anterior chamber or sutured into the sulcus.

Indication for Surgery

The most common indication for cataract surgery is the person's desire for improved visual function. The decisions should not be based on a specific level of visual acuity alone. Once the person has decided to seek improvement of visual function through cataract surgery, the ophthalmologist must determine whether this step is warranted.

A person with bilateral (in both eyes) visually significant cataract is a candidate for surgery on the eye with the more advanced cataract. The decision to proceed must be personalized according to the individual's visual needs and potential. If cataract is seen in both eyes, a reasonable time interval should separate the surgery for the second eye, to ensure the success and safety of the first operation.

Usually two procedures are followed for conducting the Cataract surgeries and one of them is Phacoemulsification that refers to modern cataract surgery in which the eye's internal lens is emulsified with an ultrasonic handpiece and aspirated from the eye. Aspirated fluids are replaced with irrigation of balanced salt solution, thus maintaining the anterior chamber, as well as cooling the handpiece.

Medical Indications for Cataract Surgery

In addition to the restoration of visual acuity, medical indications for surgery include:

- A leaking lens or a swollen lens (rupture of the hypermature cataract) causing an increase in eye pressure called secondary glaucoma
- An opaque lens that obscures the view of the fundus, preventing necessary treatment of the retina such as laser for co-existing diabetic retinopathy
- A lens displaced from its normal position, usually seen after injuries to the eye

Contraindications for Cataract Surgery

Surgery is not performed in the following conditions:

- The patient does not want surgery

- Spectacles/Visual aids provide satisfactory vision
- The person's lifestyle is not compromised
- The person is medically unfit

Preoperative evaluation

Before performing cataract surgery, the following information should be obtained from the person undergoing surgery.

General health of the Patient

A complete medical history is obtained from the patient to rule out medical problems like diabetes, heart disease, lung disease, bleeding disorders, renal dysfunction and any drug allergies. If there are positive responses to any of these problems, the patient can be evaluated with the help of a general physician.

Pertinent Ocular History

History of eye trauma, inflammation, eye pressure or retinal diseases should be obtained as any of these, if present, can affect the visual prognosis of the person after surgery. If the person has had cataract surgery in the other eye, it is important to obtain information about the operative and postoperative course of that eye.

If the person has had corneal surgery like LASIK for correcting refractive errors, information about the type of procedure used is helpful in predicting the intraocular lens power and in determining the surgical approach.

If the patient is a long-term diabetic, the possibility of co-existing diabetic retinopathy, which may be masked by the cataract, should be explained.

Investigations

Since 80 per cent of cataract patients are otherwise healthy, they do not require a battery of extensive and expensive system tests before undergoing cataract surgery.

Two basic tests that a universally agreed upon are screening for diabetes and hypertension. Routine blood sugar estimation and measurement of blood pressure is mandatory before scheduling the patient for surgery.

Ocular Investigations

The following ocular investigations are performed as part of the preoperative evolution:

- Visual acuity of the patient is recorded
- The eyelids and the tear drainage systems are examined for any infection. If the infection is present, appropriate measures are taken and cataract surgery is postponed till it subsides.
- All the anterior segment structures are examined with a slit-lamp with special reference to the density of the nature of the cataract
- Retinal examination is a perquisite for all patients undergoing cataract surgery. If the fundus is not seen or if the retinal function is found to be defective, the visual prognosis should be explained to the patient.
- An ultrasonogram can be used to assess the health of the retina, when the cataract us not age-related.
- Intraocular pressure is recorded to rule-out co-existing glaucoma.
- The power of the intraocular lens to be implanted (which is different for each individual) should be measured using an instrument called A Scan

Complications of Cataract Surgery

Modern cataract surgery is remarkably successful in improving sight and restoring visual function to the afflicted people. However, complications can occur and the operation should not be regarded as totally risk free. Complications due to cataract surgery can appear any time in the postoperative period and they are mostly treatable. Therefore, it is necessary to observe a person who has had cataract surgery at periodic intervals.

Opacification of the posterior lens capsule is the most common but relatively less serious complication. A dreaded complication is *endophthalmitis* or wound infection. Other complications include displacement of the lens, retinal detachment, macular edema and corneal damage.

Posterior Capsule Opacifcation (PCO) or After Cataract

PCO is one of the inherent complications of modern cataract surgery. The posterior capsule is the part of the original cataractous lens, which acts as the support for the IOL. The posterior capsule may opacify over time and this is referred to as after cataract. Fortunately this is amenable to a simple treatment by means of a laser, a procedure called Nd:YAG laser posterior capsulotomy.

Factors influencing PCO include:

- Age of the person; the younger the patient, the more chances of PCO
- History of intraocular inflammations like uveitis increases the chances of PCO
- IOL; acrylic hydrophobic IOLs have been found to decrease the chance of PCO formatio0n, as compared to PMMA IOLs

CHAPTER-5

Glaucoma

Glaucoma refers to a group of eye diseases where in the optic nerve gets progressively destroyed often due to an increase in the fluid pressure within the eye, resulting in gradual vision loss and eventually blindness. The fluid is called the aqueous humour and the pressure is termed intraocular pressure (IOP).

Mechanism of the Disease:

The nourishment of the eye occurs slightly differently from the other organs of the body. Instead of blood, a special filtrate from the blood is secreted within the eyes, which then transverse through the parts of the optical apparatus. This fluid is called the aqueous humour , constantly produced and circulated, and eventually excreted through the drainage channels called the ANGLE of the anterior chamber. Increased production or more commonly, impediments in the flow of aqueous humour results in a build up pressure within the eye which then damage the optic nerve.

The optic nerve is made up of over one million nerve cells. When the pressure in theye builds up, the nerve cells become compressed, causing them to become damaged and to eventually die, which results in permanent vision loss.

Once a significant number of cells are destroyed, defective vision usually develops. A characteristic glaucoma is that it affects the peripheral field of vision first. The peripheral field of vision is essential for various purposes; especially navigation. In later stage, the central vision also get affected, causing blindness. It is at this stage that a person realise his disability. This factor emphasizes the need for routine comprehensive eye examination, which will help detect the disease at an early stage.

Once the vision loss occurs, it is irreversible because once the nerve cells die, they can never be restored.

Treatment:

After the age of 40, a routine examination of the eye for presbyopic spectacles alone is insufficient. The eye pressure should also be recorded along with it.

The goal of treatment is to preserve the existing vision of the person and prevent further loss. Taking medications regularly, as prescribed is crucial to prevent vision-threatening damage.

Glaucoma can be treated with;

- Medications
- Laser
- Surgery
- Combinations of the above method

Normal Vision

Vision with Glaucoma

CHAPTER-6

Diabetic Eye Disease.

Even though Diabetes can affect all the organs in the body, the eye is at increased risk. The retina consumes oxygen and blood glucose at higher rates than any other tissue in the body. As these substances are supplied by the circulatory system, any disorder that interferes with the blood supply can do severe damage to the retina.

The Diabetic Eye Disease also known as the Diabetic Retinopathy is a condition caused by damage to the blood vessels of the retina due to diabetes. The various stages of diabetes retinopathy are described below;

Nonproliferative Diabetic Retinopathy (NPDR):

This is the earliest form of diabetic retinopathy. Normally, the blood vessels in the retina do not leak, the retinal blood vessels can develop tiny leaks, which then cause fluid or blood to seep into the retina. The retina becomes edematous (wet & swollen) and can't function properly. This is called nonproliferative diabetic retinopathy.

Proliferative Diabetic Retinopathy (PDR):

This is more advanced and serious from of diabetic retinopathy in which the diseased retina blood vessels can close, cutting off nutrition to the retina. This mechanism stimulates the formation of new immature vessels. These new vessels are weak and are easily ruptured casuing heavy bleeding inside the eye.

Diabetic Maculopathy:

When fluid leaks in the macular area, causing swelling in the macula, the condition is called Macular Edema. Since the prime function of the macula is central visual acuity, people with maculopathy complain loss of central vision.

Complications of Diabetic Retinopathy:

The visual problem caused by diabetes does not end with NPDR or PDR. There are two major sight threatening complications. The new blood vessels can bleed into the vitreous cavity, a condition called

vitreous haemorrhage. It results in a sudden and total loss of vision, which maytake months to resolve and may even require surgery. The second problem is the growth of the scar tissue on the retina of the wall of the eye. This condition is called tractional retinal detachment and cause a sudden drop in vision that requires immediate surgical intervention.

CHAPTER-7

Eye Problems of Childhood

Childhood blindness is a devastating social and economic problem. When a child is born blind or becomes blind, the loss of considerable man years of productivity compounds the magnitude of the economic loss, even surpassing the man years lost due to age-related cataract.

The Child's Eye

Of all human organs, the eye is the most fully developed one at birth. Though many changes occur with maturity, the absolute dimensions of the eye are closer to adult size than nearly any other organ of the body.

The human eye grows rapidly during the first year of life. During the first six weeks of life the cornea flattens, the axial length increases and the power of the lens decreases.

The Normal Visual Milestones

A child can start fixing (focusing on an object) a week after birth. However, fixation is fully developed by around 6 to 8 weeks. By around 4 months, the fovea in the retina is completely developed. By 6 months of age, visual acuity develops to a normal adult level of 6/6. At around 3 years of age, contrast sensitivity is well developed while depth perception is fully developed around 6 years of age.

Obviously the visual acuity in very young children cannot be measured using a regular vision chart. There are special methods like play charts and identification of colorful objects to record the vision.

Eye Diseases of Children

The various sight threatening conditions of childhood are as follows:

Cataract in Children

The word cataract is often associated with old age. However, children can be born with cataract (congenital cataract) or may develop the disease during their first few years of life (developmental cataract). The reasons for this development of cataract in children can be ascertained in about half the number of cases and include:

- Congenital rubella
- Malnutrition
- Hereditary diseases, for example, *galactosemia*, an inborn disease of milk intolerance
- Chromosomal anomalies
- Trauma

Of these, congenital rubella deserves special mention.

Congenital Rubella

An estimated 238,000 children in developing countries are born with congenital rubella syndrome (CRS) every year. In a hospital-based study performed at Aravind Eye Hospital, 25 per cent of infantile cataracts were found to be associated with congenital rubella.

Rubella cataract is a part of a highly destructive congenital syndrome caused by maternal infection by the rubella virus (commonly called German measles) contracted during the first or early second trimester of pregnancy. The syndrome includes malformations of the heart, deafness, mental retardation, dental defects and ocular disturbances such as cataracts (which are bilateral in 75 per cent of the cases), congenital glaucoma, retinal disease and abnormally small eyes. The cataract is obvious at birth as white opacities in the pupil. These white opacities are called *leukocoria* or cat's eye reflex.

Management of Congenital Cataract

The treatment of congenital cataract depends on three major factors:

- Laterality
- The presence of associated ocular abnormalities
- Whether the cataract is total or partial

Unilateral or one-sided cataracts often carry a poor prognosis because of complications like severe amblyopic (described later) and associated squint of the involved eye. This type of cataract can be removed by surgery.

Bilateral complete cataracts have a more favorable prognosis. The treatment entails prompt surgical removal of the cataracts and rehabilitation of the residual errors with spectacles or intraocular lenses.

Since the child cannot perceive its problem, the cataract must first be recognized by someone else, usually a member of the family, sometimes a teacher or a trained health worker. Cataract in children is very different from cataract in adults. The surgery is more complex and the postoperative follow-up care much more demanding.

Children's eyes react differently from adult eyes after cataract surgery. Sever intraocular inflammation and posterior capsular opacification are more common. The eye grows until the child is two years old. This leads to frequent changes in the refractive state of the eye.

Surgery

In children above two years of age, an extracapsular cataract extraction is done and an IOL implanted. Below two years of age, it is better not to insert an IOL for the following reasons:

- The eyeball grows in the first two years of life and since the eye is increasing in size the power may change after a few years
- The IOL is of a particular size and may become unstable due to the increased space available with the growth of the eye

If an IOL is not implanted, the eye is said to be *aphakic*. This condition can be corrected by means of spectacles or contact lenses.

Spectacles

Spectacles can be used following bilateral cataract surgery but are not very useful for uniocular aphakia because of the discrepancy in image size between the two eyes. This causes intolerable double vision.

Contact Lenses

Contact lenses are useful for compliant children who can handle them. They cause less distortion of images when compared to spectacles and are more effective in combating amblyopia. The major problems with contact lenses are cleanliness and hygiene. A dry and dusty environment is not suitable for contact lens. In addition, wearing them

and taking them out can be a problem for very young children. Although tolerance is much better with the newer lenses, allergy, itching and discomfort are common in children.

Intraocular Lenses

They are the best solution to aphakia. A few important features, however, are to be considered:

- IOL surgery should be done by an experienced surgeon since the chances of postoperative inflammation are high.
- The power of IOL is to be individualized as the eye is still in the growing phase.
- The commitment is for a longer period because of the postoperative care involved.

Amblyopia is to be treated aggressively.

If IOL has not been done in the primary setting, the surgeon has to do it in a secondary sitting.

People with congenital cataracts develop posterior capsular opacification within a few months, and so a second surgery for membranectomy has to be considered.

Refractive Errors

Refractive error is the most common complaint for which a child is brought to the ophthalmologist. Since children have a strong tendency to accommodate, refraction should be performed after dilating the pupil fully.

There is a general perception that refractive errors and wearing spectacles are becoming more common in recent times. Actually, demanding visual needs and awareness in seeking eye care may have played a major part in this apparent increase.

A child with an uncorrected refractive error is restricted to the limits of his vision. The frustrated child becomes an introvert, keeping away from the other children of his age, and avoids outdoor activities.

Incidentally, the child may not be aware of this problem and it is usually the parent or the observant class teachers who refer the problem to the eye doctor. Hence, it is very important that visual acuity testing should be performed for all children and each eye should be tested individually. This is particularly important since, in some instances, refractive errors can be present only in one eye, and if we do not check each eye individually, we may not be able to detect unilateral refractive errors. Failure to do so may cause one eye to dominate the other, resulting in a condition called *amblyopia*, which is also termed lazy eye.

Amblyopia

With normal binocular vision, both eyes are aimed at the same target. The visual portion of the brain fuses the two pictures into a single three-dimensional image. When one eye is misaligned, as in strabismus, or in uncorrected unilateral refractive error, two different pictures are sent to the brain. In a young child, the brain learns to ignore the image of the misaligned eye and sees only the image from the straight or better-seeing eye. This causes loss of depth perception and binocular vision. The misaligned eye becomes lazy or it is said to develop amblyopia. Any condition which causes a significant difference in the visual power of the two eyes can result in amblyopia of the weaker eye.

The controlling visual area of the right eye is present in the left side of the brain and vice versa. When normal vision is present in both eyes, the brain centers on both sides are equally stimulated and hence equally developed. When the image of one eye is unclear, the brain starts suppressing that eye's image and gradually it leads to permanent uniocular loss of vision.

When vision is impaired in both eyes, the child may get amblyopia, that is, decreased vision in both the eyes, if spectacles are not prescribed. Amblyopia is a significant problem and cab be averted by screening all children for refractive errors. This is possible by recruiting the efforts of public institutions like schools to screen their students systematically and periodically.

Management

Amblyopia can be treated by patching (obstructing the view) of the better eye to strengthen and improve the vision in the weaker eye. If amblyopia is detected in the first few years of life, treatment is often successful. As a rule, the earlier the amblyopia is treated, the better the visual result, because the child will be able to develop binocular vision and depth perception.

Strabismus

Strabismus is commonly called squint or cross-eye. In this condition, the eyes are not aligned to the centre and may point in different directions. Inward turning of the eye is called *esotropia* and outward turning of the eye is called *exotropia*. Often, the squinting is constant. Sometimes, squinting can be noticed, when the child is tired and fatigued. Treatment of this condition should be initiated as soon as possible to prevent amblyopia. If surgery is delayed, only the cosmetic benefit will be obtained.

Management

The treatment goals for strabismus are to preserve vision, to straighten the eyes and to restore binocular vision. Depending on the cause, the treatment may involve repositioning of the eye, removing a cataract or correcting other conditions which are causing the eyes to turn.

In accommodative esotropia, spectacles reduce the focusing effort and can straighten the eyes. Sometimes bifocals are necessary for close work. Eye drops, ointments or special lenses called *prisms* can also be used to straighten the eyes. People with strabismus should be checked for refractive errors and the power should be recorded.

Strabismus surgery involves making a small incision in the tissue covering the eye and repositioning the muscles.

Retinopathy of Prematurity (ROP)

Retinopathy of prematurity (ROP) occurs in preterm babies that may have received intensive neonatal care. The blood vessels in the retina are not fully developed at birth and are susceptible to damage due to outside agents including excess oxygen.

The ‘first epidemic’ of ROP occurred in the West during the 1940s and 1950s and was the single commonest cause of blindness in many industrialized countries. These countries are now witnessing a ‘second epidemic’ of blindness in children due to ROP. The re-emergence of the condition has come about paradoxically in the survival of extremely premature, low birth weight babies.

It is important that a qualified vitreo-retinal surgeon screens all preterm or low birth weight babies that have received intensive care immediately after delivery.

Pediatric Glaucoma

Glaucoma is a condition where the optic nerve is progressively damaged because of various causes, chief among them being increased intraocular pressure. It is mainly a disease of the aged but it can also occur in pediatric patients. Its incidence is 1 in 10,000 live births. It has been classified into congenital, infantile and juvenile glaucoma.

Congenital glaucoma (up to 1 year of age): In addition to optic nerve damage, the eyeball enlarges because the sclera in the eye of the baby is distensible. The corneas of these babies are, therefore, large. The layers of the cornea, which are not elastic, may get torn, resulting in opacification. Diagnostic features are tearing, *photophobia* (avoidance of light) and enlarged eyes.

Infantile glaucoma (between 1-3 years of age) and *juvenile glaucoma* (between 3-16 years of age): The eyes are not enlarged and symptoms like watering and corneal enlargement are absent. These types of glaucoma are diagnosed during routine screening or when the child is examined because of a family history of glaucoma.

The treatment of congenital glaucoma is mainly surgical and involves creating a new drainage channel for a free outflow of aqueous humour.

Some other information for Child Eye Care:

Precautionary Measures

- Children should wear protective goggles when participating in science labs.
- Prevent children from playing dangerous games like Bow & arrow and Gulli Danda, which poses risk of serious eye injury
- Avoid playing with fire crackers, Holi etc.
- Provide adequate supervision and instruction when children are handing Pencils
- Scissors, they should be held away from the eye
- When playing children should not throw stones at other

CHAPTER-8

Low Vision

Low vision indicates that the person is not blind and that the vision is less than normal. These individuals are best helped with low vision devices such as large print, magnifiers, and illumination. In addition, the following aspects should be considered when defining low vision: Low vision may result from many different ophthalmologic and neurological disorders and may cover a wide range. Low vision is a visual impairment that may interfere with a person's ability to carry out daily living and leisure activities, as well as performing work.

The WHO working /Functional Definition of Low Vision (WHO, 1992) is defined as A person with low vision, who has impairment of visual functioning even after treatment, and/or standard refractive correction, and has a visual acuity of less than 6/18 to light perception or a visual field of less than 10 degrees from the point of fixation, but who uses, or is potentially able to use, vision for the planning and/or execution of a task." The use of the functional definition ensures that people who have vision less than 3/60 are included for the low vision services to help them to utilize their useful residual vision to its maximum potential.

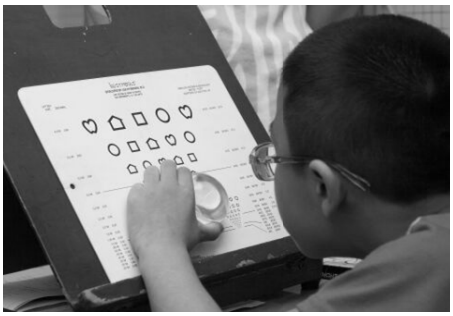
'Low-vision' refers to a condition in which a person has any of the following conditions, namely:

a. Visual acuity not exceeding 6/18 or 20/60 and less than 6/60 or 20/200 (Snellen) in the better eye with correcting lenses; or

b. Limitation of the field of vision subtending an angle of more than 20 degree and up to 40 degree.

A recent population-based study has shown the prevalence of low vision to be 1.05% in India.

Causes of Low Vision:



Children and adults get low vision due to any eye disease, hereditary conditions, or trauma. They experience severe visual impairment that either reduces or restricts their ability to use vision to carry out

everyday functions, with a negative impact on their quality of life, (e.g., employment, independent living, orientation, experiences, education). Partial vision loss that cannot be corrected causes a vision impairment known as low vision.

There are many different conditions that can cause low vision, and each condition affects sight in a different way. In order to gain a better understanding of the nature of residual vision we need to examine the causes of low vision

The common diseases which give rise to low vision are as follows,

Causes of blindness in adults over age 50 as per National survey 2001

Cataract	62.6%
Refractive errors	19.7%
Glaucoma	5.8%
Posterior segment disorder	4.7%
Corneal opacity	0.9%
Others	6.2%
In children	
Refractive error	33.3%
Congenital eye anomalies	25%
Retinal degeneration	16.7%
Vitamin A deficiency	8.3%
Others	16.6%

Vision with Low Vision

Normal View

Peripheral Field Loss

Central Field Loss

Cloudy Media

The disease follows a pattern and accordingly affects the person's ability to perform. It starts as showing anatomical changes to affecting patients vision to giving rise to visual disability to handicap state for the low vision client.

Effects of Low Vision:

Low vision can affect normal development and education of children and all areas of daily living, work and leisure for adults. The broad areas that low vision impacts on participation is in

- Education, work and leisure
- Social and consumer interactions
- Mobility
- Emotional reaction to vision loss
- Household and personal care.

Tools for Low Vision Assessment:

Following is the routine for a low vision examination.

a) **OBSERVATION:** Patients can be observed as they enter the room to see whether they walk unaided or are supported, whether they feel for a handrail or easily recognize open doorways. Wearing dark spectacle lenses or holding the head down may imply sensitivity to light, although this head position could be due to arthritis. Other signs to look for are difficulty in holding things or, tremor. Many elderly low vision patients may attend with a care taker or relative. To summarize observe the following,

1. Mobility
2. Fixation
3. Posture

b) **INTERVIEW AND HISTORY TAKING:** Interviewing is important in order to understand the emotional status and individual needs of the client. The interview also works as a platform for developing a rapport between the examiner and the client. The interview starts with the case history with emphasis on the visual problem. This is followed by the individual's personal history that includes occupation, education, living status and specific functional aspects, like independence, orientation, mobility and activities of daily routine.

c) The daily routine of the client can identify the needs of the individual and areas where help may be needed. Bringing to focus activities that may be possible can help in narrowing down the objectives of the client. All the data from the interview has to be recorded in an organized manner so it could be used effectively in finding the solutions.

d) **VISUAL ACUITY:** Measurement of visual acuity is one component of the evaluation that allows one to quantify the degree of high-contrast vision loss and, in many cases, clearly identifies the patient's visual impairment as it relates to the chief complaint.

e) **VISUAL ACUITY ASSESSMENT (DISTANCE):** The visual acuity assessment begins with determining the distance acuity of the patient. The procedure involves showing the patient large size numbers on sheets from a particular distance and asking him or her to identify them. Optotypes, single-letter chart gratings and crowded letters of different sizes may be shown to the patient alternatively.

f) **NEAR ACUITY ASSESMENT: In** this step the patient identifies or reads certain typeset of a smaller size from a nearer distance. The distance is accurately recorded.

g) **ASSESSMENT OF VISUAL FIELDS:** Visual Field testing is an important diagnostic and screening tool for patients with Glaucoma, Retinitis Pigmentosa, and much neurologic disease, to determine the presence of any functional field loss. Confrontation test is the most commonly screening test done to evaluate the peripheral visual field losses in different quadrants .The examiner compares the examinee's visual fields with his or her own visual field size.

h) **CONTRAST SENSITIVITY ASSESSMENT:** Sensitivity to contrast is the ability of the eye to perceive the smallest difference in luminance and thus to appreciate the niceties of shading and slightest nuances of brightness which are decisive for the forms and shapes. In order to measure contrast sensitivity, a procedure is used in which the subject compares the luminance of standardized target with its surroundings.

i) **COLOUR VISION TESTING:** Colour vision anomalies, which can significantly affect educational, vocational, daily living, and mobility needs, can be diagnostic of specific diseases.

Low Vision Devices:

Once a complete history is taken and diagnosis is made, a clinical low vision assessment is done. A meticulous refraction is performed, following which trial of devices for distance and near is done. Often a simple spectacle prescription improves vision substantially. Patients are required to be counselled to wear spectacles and use devices along with it. All optical devices prescribed and accepted by the patient need thorough training in its use which can be imparted by low vision professionals, special educators, school teachers, parents and other care givers.

Low Vision devices are of two types

1.Optical

2.Non Optical

OPTICAL DEVICES

Low vision is a condition when vision cannot be improved further with the help of traditional

spectacle lenses, medication and/or surgery. Persons with low vision often rely on the use of a number of different instruments, called low vision devices and tailored equipment to make

maximum use of their residual vision. Low vision devices are categorized as either optical or nonoptical devices and help to improve visual ability for millions of people every day. Optical devices are those which magnify the object with the help of lenses.

How do they help?

Low Vision devices make things appear larger, make things brighter or clearer and even improve Contrast. They work on the following five strategies:

- Enlargement of object
- Contrast enhancement
- Selective fixation
- Optical magnification
- Electronic magnification

Popularly used acronyms in low vision are 3 Bs – Bigger, Brighter and Bolder and 3 Cs, Closer, Coarser and Contrast.

Spectacles, Contact lenses and different types of Telescope (such as Hand held- Monocular, binocular, Spectacle mounted, Clip on spectacles, Bioptics and toy telescope) are been used as devices treating cases for low vision distance problems. Spectacle magnifiers, hand magnifiers, stand magnifiers, spectacle mounted telescope for near work, telemicroscope and electronic maginificationers are used for treating patient with near problems in low vision. Similarly prism-fresnel prism, reverse telescope, convex mirror and mirrors are used to manage glare and photophobia in Low vision cases.

CHAPTER-9

Common Infections of the Eye

This chapter describes some of the common infection of the eye: conjunctivitis, stye, chalazion, dacryocystitis and corneal ulcer.

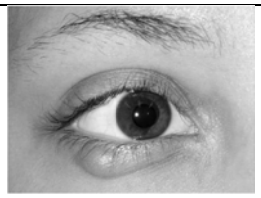
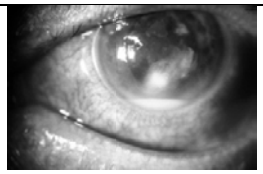
Conjunctivitis

Commonly known as 'Madras eye', **conjunctivitis** is an infection of the mucous covering layer of the eye—the **conjunctiva**. It can be caused by bacteria and viruses or it can sometimes present itself as a manifestation of an allergic reaction. The eye become red and produce a lot of tears, and a thick discharge may cause the eyelids to stick to each other. Increased sensitivity to light may cause discomfort. **Allergic conjunctivitis** will usually cause itching and redness.

Conjunctivitis is not spread by looking at an infected person's eye. It is transmitted by the tears and discharge which are laden with microbes. The infection spreads when people come in contact with towels, handkerchiefs, door handles, etc. which have been used by infected persons.

Rest, antibiotic eye drops and frequent cleaning of the eye are some of the treatment options used for conjunctivitis. Dark glasses are advised to prevent discomfort caused by light sensitivity. Some types of conjunctivitis may present with more severe symptoms which require aggressive management.

Stye		A **stye** is an infection of the hair follicle gland in the eye lashes. It is painful and feels warm to the touch and can usually be seen on the margin of the lid. Styes are treated using antibiotics and warm fomentation and by removing the eye lash that is infected.

Chalazion		A **chalazion** is a chronic inflammatory swelling of the glands of the eyelid. Unlike a stye, it is not painful and only causes cosmetic disfigurement. It can be treated with antibiotics and by making a small incision over it to remove the contents of the swelling. A recurrent chalazion must, however, be investigated to rule out uncontrolled diabetes, uncorrected refractive errors or cancer of the lid glands.
Dacryocystitis		**Dacryocystitis** is an infection of the tear drainage system which causes chronic watering and discharge from the eyes. This infection is treated with antibiotics in the initial states and with surgery either to remove the infected tissue or to make an alternative connection between the drainage system and the nose, in the advanced stages of the infection.
Corneal Ulcer		A **corneal ulcer** is a breach in the continuity of the layers of the cornea which may get infected by bacteria, fungi, viruses or parasites.

Corneal trauma and subsequent infection account for 5 percent of all blinding conditions in the world and 20-30 percent of all blindness in developing countries. Corneal ulcers are very common in Africa and Asia, where agricultural work is a major cause of ocular trauma leading to corneal ulceration and blindness. In a study performed at Aravind Eye Hospital, it was found that the annual incidence of corneal ulceration in

the Madurai district was 11.3 in a population of 10,000 which is ten times more than that in the US.

The risk factors for corneal ulcer are as follows:

- Trauma is the commonest risk factor. It could be caused by vegetable matter in the agricultural field or small metallic objects falling in the eye. It could also be due to prolonged and careless use of contact lenses.
- Lid infection or infections of the tear drainage system.
- Vitamin A deficiency.
- Dry eyes due to deficiency of tears.
- Incomplete closure of the eyes due to nerve paralysis.

The human eye has some features that protect the eye from infections:

- The eyelids instinctively close to block the entry of foreign organisms into the eye.
- Tears play a major role in protection. Apart from flushing the dust and debris out of the eye, they also contain some antibacterial enzymes that fight microbes.
- The intact cornea is a very resilient structure which resists organisms from lodging into it. However, it is vulnerable to infection if there are any abrasions which may peel the covering surface (called the **epithelium**).

Each infectious agent has a few distinctive characteristics which help in identifying them.

These characteristics are listed below:

- **Bacterial ulcers** occur when local defense mechanisms are compromised or systemic resistance is low. The bacteria can be introduced into the cornea through foreign bodies or as a result of decreased eye hygiene.
- **Fungal ulcers** are more common in warmer climates like that in India. Its incidence increases during the harvesting season when

farmers are exposed to plants, leaves, thorns or grains that may cause ocular injuries.

- **Parasites** are found in all water sources like swimming pools, contact lens solutions, drinking water tanks, etc. They can infect the eye of contact lens users.

The symptoms of corneal ulcer are:

- Sever pain in the eyes
- Redness
- Discharge from the eyes—could be thick or watery
- Diminished vision

Diagnosis of a corneal ulcer is made after the history is elicited from the patient and the affected eye is examined. A scraping of the edge of the ulcer is taken and examined under the microscope to determine the causative agent. A portion of the scraping is grown on different culture media to isolate the organism and identify it.

Treatment of corneal ulcers is initiated after the causative organism has been identified. It comprises frequent application of antibacterial, antifungal or antiviral drugs (depending on the microbial organisms) in the eye. The pain is alleviated using painkillers and cycloplegics. Good eye hygiene and cleaning of the discharge from the eye are supportive measures in healing the ulcer. If the ulcer does not heal in response to medications, corneal transplantation should be performed.

A common problem in rural areas is the use of traditional medicines for corneal ulcers. Anything from human breast milk and leaf extracts to hen's blood and vegetable oil is poured in to the eye by village quacks. This practice should be strongly discouraged and immediate treatment by a qualified eye care professional should be sought.

Prevention

Good eye and hand hygiene are important for the protection of eye infections. Protective shields or glasses can be used by workers to avoid injury to the eyes. People who wear contact lenses should be educated

about the risk of infection due to its overuse and inadequate attention paid to cleaning the lenses.

Corneal Transplants and Eye Donation

The **cornea** is a multi-layered, transparent tissue in the anterior portion of the eye. When the transparency of this tissue is lost, it needs to be replaced by performing a procedure known as corneal transplantation. This surgery is called **keratoplasty**. It has to be understood that the whole eye is not replaced—only the cornea is transplanted. Hence this procedure is useful only in instances where corneal disorders are the cause of visual disability.

Unlike cataract surgery, where an artificial lens is used to replace the opaque lens, the only substitute that is available to treat a defective cornea is by transplanting a cornea form the eye of a dead person. The cornea from the donor's eye is used in keratoplasty, while the other parts of the donor's eye like the sclera and the lens can be used for other surgical procedures or research.

The main reasons for the loss of transparency of the cornea are as follows:

- **Corneal injuries:**Usually sustained during work; subsequent ulceration opacifies the cornea.
- **Corneal dystrophy:** A person is born with or develops an abnormal cornea, usually due to genetic defects.
- **Postoperative decompensation:** Sometimes the cornea can lose its transparency due to complications of cataract surgery.

In India, the demand for corneas far exceeds the available supply. The National Programme for the Control of Blindness estimates that around 100,000 corneal blind people require corneal transplants at any given time. Against this need, the present collection of eyes is around 22,000 in a year. The majority of these eyes is collected by three states, namely, Gujarat, Tamilnadu and Maharashtra. The guidelines for eye donation are as follows:

1. Any person of any age or sex can donate his eye after death.

2. Wearing spectacles or having diabetes or hypertension are not contraindications for eye donation.
3. Those who have undergone eye surgeries can also donate their eyes.

However, with the increasing prevalence of infectious diseases, it has now become important for the eye bank to restrict donations in the following cases in order to prevent disease transmission:

- Death due to rabies
- Death due to jaundice
- Death due to AIDS and syphilis
- Death due to septicemia
- Death due to viral diseases
- Death of unknown cause
- Acute viral hepatitis
- Creutzfeldt-Jakob disease
- Congenital rubella
- Cancer in the eye

Since actual eye donation is effected after death, the family members, respecting the wishes of the deceased, should contact the nearest eye bank to offer the eyes. The dead individual need not be a registered donor with the eye banks. The removal of the eyes (**enucleation**) is a simple procedure and takes about 30 minutes to perform. It does not cause any disfigurement. To rule out blood-borne infection, 5 ml of blood is collected from the deceased donor.

The donated eyeball is processed in the eye bank. After evaluation, the cornea is excised from the eyeball and stored in a preservative medium for up to a maximum period of 10 days. The collected donor blood is tested for the AIDS and Hepatitis B viruses. After determining the suitability of the cornea, it is distributed to the eye hospitals to be used for transplantation.

Corneal transplant surgery, which replaces the disc-shaped segment of the diseased cornea with a similarly shaped piece of a healthy one, the **corneal button**, can be performed either under local or general anesthesia. The donor corneal button is placed and is sutured with a very fine thread, often finer than a human hair.

Following the corneal transplantation, periodic follow-ups with the eye specialist are mandatory. The donor cornea, like any foreign tissue, is likely to undergo rejection and hence, adequate attention should be paid to postoperative care.

Another major goal of the eye bank is to create awareness among the public regarding eye donation. This may be accomplished by several means:

- Displaying posters about eye donation in prominent public places.
- Displaying messages on television, radio and other media.
- Conducting awareness lectures in schools, colleges and industries
- Publishing success stories of corneal transplants in newspapers
- Networking with voluntary organizations like the Lions and Rotary clubs to spread the message of eye donation.

CHAPTER-10
Injuries to the Eye

Trauma refers to any injury to the eye either accidental or intentional. It remains a major cause of blindness and morbidity to the eye worldwide. Though trauma can occur due to various types of injuries sustained during birth, domestic work and in sports, the most common type is occupational injury, either agricultural or industrial

Types of Injuries

The types of injuries are classified by the nature of the traumatic agent as follows:

Mechanical

- Blunt injury, for example, caused by a fist or ball
- Perforating/Penetrating injury caused by sharp instruments
- Explosive injury; for example, a gunshot injury

Physical

- Thermal injury

  Flame burns

  Scalds due to hot liquids
- Radiation injury
- Electrical Injury

Chemical

- Acid burns
- Alkali burns

The eye is normally well protected by the bony cavity called the **orbit** and the eyelids. An injury can affect any part of the eye and the orbit in the following ways:

- The orbital wall can fracture; the wall nearer to the nose is the weakest and most likely to give way. The inferior wall can fracture, trapping the eyeball below.

- The eyelids may tear. Blood may collect around the eyelids forming a so-called 'raccoon eye'.
- The conjunctiva may tear or blood may collect under it forming a subconjunctival hemorrhage.
- The cornea may collet in the anterior chamber and this condition is called **hyphema**.
- The iris may get damaged or torn form the root.
- The lens may get damaged and develop a cataract either immediately or over a period of time. Sometimes the lens can be knocked out of its position—called **dislocation**.
- There may be bleeding in the vitreous cavity.
- The retina may get damaged resulting in tears, inflammation or retinal detachment.
- Damage to the optic nerve may permanently disable vision

Management of Eye Injuries

The first step in the management of eye injuries is to remove the person from the source of the injury to a relatively safe place. If the person is unconscious, stabilization of his general status takes priority over looking for eye injuries.

There should not be any undue pressure over the eyeball. In cases of dust or chemicals falling in the eye, the eye must be washed with plenty of water. If there is bleeding from the eye, gentle pressure is applied with a clean, wet piece of cloth and the person should be taken to an eye care professional quickly.

All forms of ocular trauma require an ophthalmologist to look for immediate and delayed ocular complications. The injured person may require x-rays, CT scan or MRI to identify damage to bones and soft tissue. An ultrasound scan may be needed to see the state of the retina or to locate foreign bodies if the media is not clear.

Foreign bodies on fete corneal surface have to be removed with a needle or cotton spud after anesthetizing the eye with eye drops.

A corneal tear needs to be sutured if there is any leakage of aqueous humour through it. Traumatic cataract may need surgery to restore vision depending on the location and density of the opacity. More serious complications like retinal detachment or vitreous hemorrhage may need surgery to reposition the retina or remove the blood. Foreign bodies lodged inside the eye may also require surgical removal. Conditions like subconjunctival hemorrhage require only an antibiotic and observation as they resolve on their own, in a matter of weeks.

Prevention

Most work-related trauma is preventable and every effort should be made to prevent them. Precautions and adequate safety measures are compulsory especially in high risk areas like industries and sports. Some of these preventive measures are listed below:

- Wearing a protective glass shield or visor, a helmet and spectacles are some simple measures which can prevent most accidents.
- Education and training workshops for industrial workers and agriculturists to teach them the right way of handling ocular injuries is the need of the hour.
- Even minor injuries should be investigated, and an ophthalmologist's role in ocular trauma cannot be over emphasized.

What to do in Injury:

- Do not allow rubbing of the eyes.
- In case of fall of dusts, mud, chemicals etc., immediately one should pour lot of clean water into the affected eye for few minutes.
- Put a soft patch in the eye.
- Do not neglect any form of eye injuries, bring the child to the doctor as early as possible.

For Holi:

- The commonly used synthetic colours are actually chemicals. They contain heavy metals like lead, which is harmful to the eyes and skin.
- The particles in colour powders (shining mica particles in gulal) can cause damage to the cornea.

- The balloons used by children during Holi are most dangerous and can cause blunt eye injury. There can be bleeding within the eye, lens subluxation, macular edema or retinal detachment. All these can lead to the loss of vision or loss of the eye

Safety tips for Holi:

- Avoid synthetic colours and use home-made colours
- Water-colour balloons should not be used at all
- If any colour goes in the eye, splash a lot of tap water in it
- Avoid self-medication in case of eye-injury. Rush to your eye-specialist. Ensure that your eyes remain protected at all times. Use sunglasses to protect your eyes from coloured water.
- While washing off the colour, use lukewarm water and keep your eyes tightly closed.

Prevention in DIWALI:

- Adults must supervise children at all times
- Do not use unfamiliar fire crackers
- Wear protective eye wear
- Practise safety while lighting crackers do not try to be foolishly daring

Diwali: First Aid for Injuries

- **EYE INJURY:**
  - Do **not rub** your eyes.
  - Use the corner of a soft clean cloth to draw particles out, or hold the eyelids open and flush the eyes continuously with water.
  - If a particle is large or stuck in the eye, **do not attempt to remove it**.
  - Keep eyes closed and go to the eye doctor immediately. If there is any chemical that has entered the eyes, immediately **irrigate the eyes** and under the eyelids, with water, for 30 minutes.
  - Seek an **eye doctor immediately.**

- **BURNS:**
  - **Rinse the burnt area, without scrubbing it**, and immerse it in cold water; do not use ice water.
  - **Blot the area** dry and cover it using sterile gauze or a clean cloth.
  - If chemical burn then **flush** the exposed area with cool water immediately for 15 to 20 minutes

CHAPTER-11

Nutrition and the Eye

Good food and nourishment are vital for the effective functioning of the organs of sight. The various mechanisms active in the eye are dependent on a continuous supply of nutrients. Among these the most important is Vitamin A. The other important nutrients are Vitamins B, C and E and minerals like zinc and selenium

Vitamin A

Vitamin A is essential for the proper functioning of the covering surface of the eye—the cornea and conjunctiva—and for the formation of a pigment in the retina which helps us to view objects in dim light. It is also important for the body's immunity.

Vitamin A deficiency is one of the leading causes of childhood blindness in the world. It may occur due to inadequate dietary intake, liver disease or gastrointestinal problems. This deficiency may result in:

- Conjuncvtival and corneal drying, called **xerosis**. This condition may present itself with the appearance of scales resembling those on a fish on the conjunctiva over the white portion of the eye.
- Corneal ulceration and melting.
- Night blindness.

Vitamin A deficiency is termed **xerophthalmia** and is a serious vision-threatening disorder.

These conditions can be treated by supplementing Vitamin A itself, either in the form of oral medicines or as injections. A Vitamin A-rich diet can keep children free from these complications. This vitamin is found in green leafy vegetables, yellow and orange colored fruits and in dairy products. Animal sources include liver, fish and eggs. *An average sized carrot contains twice the recommended daily requirement of Vitamin A.*

In infants, breast milk provides the main source of nourishment. Vitamin A-deficient mothers have low vitamin stores and supply little to their babies. These babies have an increases susceptibility to infections and Vitamin A deficiency. Hence the need to breast-feed infants cannot be

belittled. Adequate and timely control of infections such as diarrhea is also essential to prevent Vitamin A deficiency.

Other Nutrients

Vitamins A, C and E are antioxidants that protect against toxic damage to the eye. **Vitamin B** is necessary for normal optic nerve function.

Zinc plays an important role in retinal and lens metabolism. **Selenium** has some antioxidant properties. **Carotenoids** are substances present in red, yellow and orange colored fruits, which are found to have antioxidant properties. They are used to combat age-related retinal diseases.

In general, a well-balanced diet with a generous supply of fruits and vegetables is an essential requirement for healthy eyes in a healthy body.

CHAPTER-12

Suggested Routine Check-Up Timeline

The following table list the suggested timeline for getting a routine eye check-up.

Age	Eye Examination
0-3 Years	In case of obvious squint (Cross-eye) or premature birth, or if the child is not focusing or following objects, the child should be taken to an ophthalmologist
3-5 years	At this point of time, the visual acuity of each eye should be checked by taking the child to an ophthalmologist. If refractive error is detected, the child should undergo eye examination every six months. If the eye check-ups are normal, the child can be evaluated around 10-12 years of age.
12-14Years	This is the common age group for development of myopia. If refractive error is detected, the child is followed up at 6-monthly intervals. It has to be mentioned that the maximum increase in refractive errors occurs between 12-18years of age, corresponding to overall growth of the body.
40 Years	One should undergo a comprehensive eye examination for the followings; ▪ Correction for near vision defects ▪ Checking for intra ocular pressure ▪ Checking the status of the retina and optic nerve (fundus evaluation)

CHAPTER-13

General Dos and Don'ts

Dos

- Fresh leafy vegetables and fruits have naturally occurring antioxidants and vitamin supplements. Adequate intake protects against Vitamin A deficiency and age-related macular degeneration.
- A school eye-health examination is very helpful in detecting underlying ocular disorders, and the early treatment of these conditions prevents the eyes becoming lazy.
- Have a comprehensive eye examination by a qualified ophthalmologist in the timelines mentioned earlier.
- Always wear protective eye wear while driving two-wheelers and while engaged in hazardous occupational work.
- Follow postoperative instructions carefully to avoid vision-threatening infections.
- In case of foreign body injury or chemical injury, wash the eyes copiously with clean water before taking the injured person to the eye doctor.

Don'ts

- Smoking and excessive consumption of alcohol are known to cause increased progression of cataracts and optic nerve disorders, and hence it is advisable not to smoke or to consume alcohol in excess.
- Do not apply native eye medicines (hen's blood, castor oil, breast milk, etc.) to the eye.
- Do not allow children to play with sharp objects (like compasses, syringes, and needles) or with chemicals like lime. Playing with packets of lime and the resultant accidental spillage of lime in the eye has resulted in visual loss in many instances.

CHAPTER-14

The Innovative Eye Screening KIT

Eye Screening Charts for Community Workers

These charts are used for the purpose of testing visual acuity and detecting potential problems that the patient may not be aware of.

Measuring Tape

During visual acuity testing, individuals attempting to read the “E-Chart”, “Pictorial Chart” should be standing 20 feet away from the chart in a well-lit area. This item is used to identify the point 20 feet away from the chart and thus where the individual should be standing.

Eye Care Educational Materials

This material contains information regarding the identification of common eye problems (written in the local language) with visual aids to complement the written descriptions. Instructions on proper hygiene and preventative measures are also included. Special educational material such as “*did you know”*; that covers different eye diseases with picture, the affected part of the eye, cause, signs and the treatment.

Register / Pen

The register allows the tester to record cases where an individual that is suffering from a problem that requires further treatment.

Referral Slip

In the event that an individual is suffering from an ailment that requires further treatment, a referral slip is to be filled out by the tester detailing the problem and turned over to the patient or their guardian. In the event that a patient is suffering from cataracts, if they are able to travel to Kalinga Eye Hospital and present a valid Referral Slip they will be eligible for cataract surgery free of charge.

Screening Process Guidelines

This item provides a quick reference for the tester regarding best practices and standard operating procedures for vision screening activities.

Below are the methods the animators will be using for identifying the eye diseases during the eye screening program at the community level.

1. Questioning
2. Torch Light Examination
3. Eye Movement Test
4. Vision test using the Chart

1. Questioning:

Before conducting the examination, animator will have a discussion with the patient, his parents, attendants, concern school teacher / anganwadi worker, asking them if s/he is suffering with any types of eye disease to his /her knowledge and though this discussion the animator may bale to identify the following eye diseases,

- Poor night vision,
- Refractive Error
- Pain in eye,
- Black patches,
- Double Vision
- Floaters- flashes
- Continuous itching.

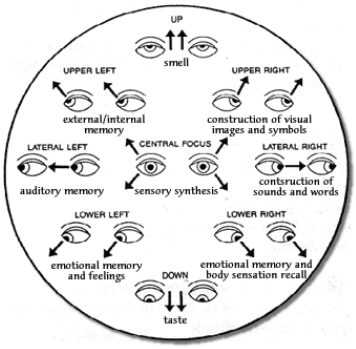
2. Torch Light Examination:

Some Eye diseases can be identified by conducting the torch light examination and with this examination the following eye ailments may be identified.

- Ptosis
- Stye
- Pterygium
- Corneal Scar
- Corneal Ulcer
- Dacryocystitis

- Pterygium
- Conjunctivities
- Xerosys
- Cataract
- Strabismus
- Eye Injury

3. Eye Movement Test:



Eye movement test is an examination of the function of the eye muscles. Usually we observe the movement of the eyes in eight specific directions. Here the patient is asked to sit or stand with their head erect and a forward gaze. The animator will hold a torch light or other object 12 inches in front to the patient's face. He or she will then move the object in eight different directions and the patient will be asked to follow it with their eyes, without moving their head.

4. Vision test using the Chart:

Different type of Vision Screening charts are provided with the KIT and each chart should be kept in a well lighted area and at a 20 feet distance from the patient. Then the patients are asked to closed one of their eye with their palm and try to read / recognize the letters/ pictures in the chart and s/he will continue the examination for the other eye also

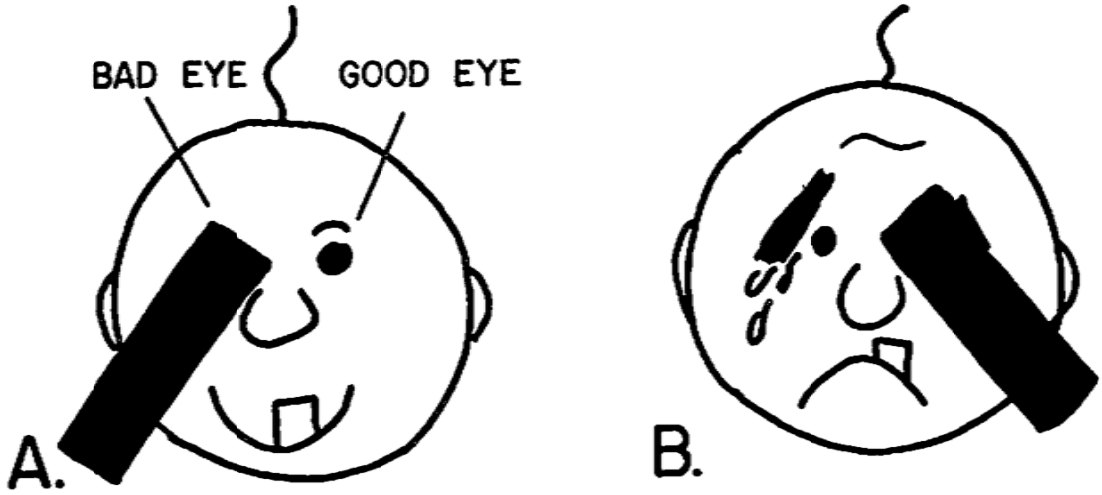
Age Group	Questioning	Torch Light Exam	Eye Movement Test	Vision Test by using the Chart	Data Record
0 to 2 Year	Question to the Mother	Find out gross abnormalities	Examination for Ocular movement to the Eight Directions	Just do the Cover Test	Record the detail in the register
3 to 5 Year	Question to the Mother / the Agnganwadi Teacher and the child	Find out gross abnormalities	Examination for Ocular movement to the Eight Directions	Use the Pictorial Chart Test	Record the detail in the register
6 to 16 Year	Question to the School Teacher and the Child	Find out gross abnormalities	Examination for Ocular movement to the Eight Directions	Use the 6/9- E-Chart Test	Record the detail in the register
School Drop Outs	Question to the Parents and the Child	Find out gross abnormalities	Examination for Ocular movement to the Eight Directions	Use the 6/9- E-Chart Test	Record the detail in the register
45+ years	Question to the Patient or the attendant	Find out gross abnormalities.	Examination for Ocular movement to the Eight Directions	Use the 6/36- E-Chart Test	Record the detail in the register

Screening of 0-2 year Children & the School Drop Out children:

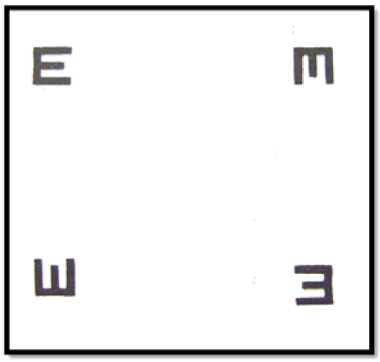
The animators will be trained and provided with a special eye screening kit containing an attractive noisy toy, a pen torch / torch light, educational materials on Pediatric Eye care, Register and a referral slip. As the children under this age group can't read, they will be only examined by torch light for any congenital ophthalmic problems, conjunctivitis, examination of the ocular structure, tearing, cataract, strabismus or any other ophthalmic problem which can be identified easily.

Young children, up to two years old (usually this group of children can be found in home), cannot respond to the requests of the screener, so in order to check their eyesight, the screener uses the natural reactions of small children. The screener will go to each house with a small child, and ask the mother or grandmother to bring the child to the door and hold him or her. The first step is to ask the caretaker if they have noticed any eye problems with the child, and then to use a torchlight to examine the child's eyes. The torch can also be shined on baby's eyes while he or she is sleeping, to see if he or she reacts by squinting. The screener then uses a noisy toy to test the child's ocular movement. Since the screener cannot ask a baby to follow a point with just their eyes, a noisy toy is used to pull the baby's attention in different directions to track the movement of his or her eyes. The mother then can cover each of the baby's eyes individually, and see if there is a stronger reaction when one eye is covered compared to the other eye. If the baby fusses when one eye is covered, but not the other eye, then that is a sign that one eye has problems. Another test can be done for children over a year old using medium sized sugar grains. The child is fed a sugar grain – and discovers that they are tasty. Several grains are then laid out across a

piece of paper, and the screener sees if the child can find these grains with one eye or the other covered. Similarly the school dropout children can be screened at home or by taking assistance of the ASHA workers, working under the NRHM Program.



Also, the animator will conduct the cover test, through which they will close one eye of the child with thumb/palm and will try to draw attention of the child towards an object. If the Child cries (resist)/does not allow to close, then poor vision is suspected, and the child is referred to an ophthalmologist. This test will be conducted on both the eyes of the child.

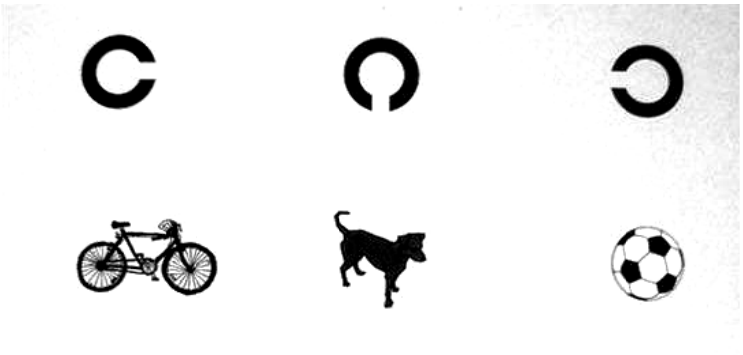


6/9- E-Chart for Children

For screening of the school drop-out children's the animators are provided with a specially designed chart holding only one English alphabet "E" of the size of 6/9 (instead of providing the workers a total Snellen's Chart, Kalinga Eye Hospital has designed a new chart that contains only 4 Es of size 6/9.

There are two reasons of designing this chart: a) going through Snellen's Chart during community eye screening will take a lot of time, so only 6/9 letter is used; if the child cannot read this letter, s/he has some ophthalmic problems and is referred to an optometrist or ophthalmologist for further investigation; b) considering the poor literacy level of the community, the letter “E” facing different directions is selected, so during screening children only have to show the direction of the three pillars of the letter “E”. Children identified.

Screening of 3-5years: Screening children aged three to five follows similar steps, but differs in that the screener can request actions of the child. Screenings take place at Anganwadi, the local play school or preschool, or at a central location that mothers are asked to bring their children to. Mothers and Anganwadi workers are asked if they have noticed eye problems in their children, and since the children are older, it is possible for the screener to ask them if they have eye problems. The torchlight can be used not only to examine their eyes but also for the ocular movement test. For this age group, an eye chart is used to measure visual acuity. The screener is provided with a 6/9 broken ring cum pictorial chart, which has pictures on it for those who cannot understand the broken rings. The kit includes a tape measure which is used to measure twenty feet from the chart, and then draw a box for a person to stand in while their vision is measured. The child covers one eye with their palm (not their fingers – using their fingers could put pressure on the eyeball, which would cause their vision to be blurry, and they could also peek through their fingers) and tries to figure out the way out of the ring or what object the pictures represent.



Pictorial Chart for the screening of 3-5 years

Screening of 6-16years: For children aged six to sixteen, eye exams are carried out in school, during the daily game period. This means that the exams are not taking away time from regular classes, and they are also treated like a game, to make them fun and make children more likely to show up. The procedure is rather similar – the screener will ask the teacher, then the children, if they notice any problems with their eyes, and use a torchlight to examine their eyes and conduct an ocular movement test. A different chart is used to assess children and adults, though. This chart is known as an E chart, and it features figures that look like the letter E rotated in different directions. The child stands twenty feet away from the chart, covers one eye at a time with their palm, and points in the direction that the sticks on the E are facing. This chart is a 6/9 chart, and the smaller size of figures allows the screener to quickly tell if the child is having vision problems. Using one line of the Snell's chart rather than the whole chart makes it faster and easier to screen people. The screener need not go through every line of every chart with every patient; rather, he or she can assume that if the person cannot read the line provided, that they are having trouble seeing. If the screener thinks that the child has memorized the order of the figures, then the screener can point to random figures, to keep the child guessing.

School eye screening camp is an effective way to provide eye care to children in remote places. They are also made aware of some of the sign & symptoms of eye problems, like wandering eye or the eye, tilt head, constant rubbing of eye, tumbling, droopy eye lid etc. Additionally, the animators is also oriented on concept of prevention of eye injuries, first aid emergency care, prevention of common eye problems, classroom illumination, and role of nutrition in maintenance of lifelong good vision.

The team at Kalinga Eye Hospital found that that many school children needing glasses don't get them because of their refractive errors are not detected, which hampers children's physical, cognitive and psychological development and future employability and earning potential. More over if refractive error is detected late, the child can suffer from amblyopia- a condition where vision remains low even wearing the glasses. The condition can only be treated only till 7-8 years of age, hence the importance of early detection. While selecting school teachers, importance will be given to female teachers with science

education background, any teacher that wears glasses so that s/he could understand the problem of low vision.

Here are some other signs that can help detecting children with ophthalmic aliments

- If the child holds books or small objects close to eyes.
- Is unduly sensitive to light.
- Is unable to see black board or has double vision.
- Is unable to participate in games requiring distant vision.
- Is irritable and has difficulty while reading.
- Rubs his eyes frequently, blinks often.
- Expressively tilts or thrusts or thrusts head forward when looking at near objects or narrows eyelids while looking at distance.
- Has burning sensation in eyes.
- Poor academic performances.
- Squinting eyes

Screening of the Adults:

For adults, aged sixteen to forty-five, the same procedures are used. One technique that can also be used is the pen touching test. A person holds a pen in each hand, with the tips of the pens facing inward. The person then moves the tips of the pens together and tries to touch them, first with both eyes open and then with one closed. This exercise also shows people the importance of both eyes for judging distance. The pen test is an interesting way to show people that vision in both eyes is important, but this test is not used with every patient. For patients aged forty-five and older, a different chart is used. This E chart has figures that are 6/36, meaning that they are larger.

Under this category, the animators are provided with specially designed E- Chart, measuring tap to measure the 20 feet distance. This specially designed chart holding only one English alphabet “E” of the size of 6/36, will help identifying the people affected with poor vision due to any ophthalmic diseases.

6/36- E- Chart for the Adults

During the screening of the adults, the animators will ask different types of question to find out the people facing any type of ophthalmic problems (poor night vision, hazy vision, pain in eye, black patches, Floaters-flashes, etc) or problem with near vision work, so that the people affected with presbyopia can also be identified.

Post Screening activities:

Patients with any Adnexal abnormalities will be registered in the register, a copy of the register will be submitted to the DFOs and at the other hand the patients will be asked to attend the confirmatory eye screening camps. Patient in need of emergency care need to be referred to the nearby Hospital or to Kalinga Eye Hospital (The date & Place for this confirmatory eye screening camp will be intimated to the animators by the OFSDP in consultation with the Kalinga Eye Hospital, where the team of ophthalmic technicians will attend the camp organized in a central location for 10-15 villages.)

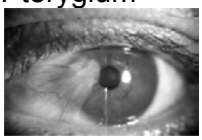
The animators will screen the population of their area in each six months. The animators will also make follow up of the treated patients, such as surgical cases, refractive error cases and other cases, if they came across any cases having post treatment complication, or a child has lost his/her refractive corrected glasses or s/he is having problem using the refractive corrected glasses, should register them and intimate to their concern department for further action.

ANNEXURE

DID YOU KNOW

Different Eye Diseases	Affected Part of the Eye	Cause	Signs	Treatment.
Cataract	Natural Lens	Trauma, Congenital, Biological aging	Blurry Vision, Fog like curtain over the front of eye.	Surgery
Strabismus	Extra Ocular Muscle	By Birth Weak Eye Muscle Problem in Nerve Trauma	Eyes are not properly aligned with each other. Delay in treatment lead to Amblyopia and poor vision	With refractive corrected glasses or Surgery
Refractive Error		If the light that goes inside the eye doesn't focus on the right part of the posterior part of the eye	Can't able to see near or distance objectives (Near slightness, Far slightness, Cylindrical vision)	Refractive Corrected Glasses LASIK surgery
White Spots in white part of the eye (Xer-Ophthalmia)	Cornea, Retina	Caused by a severe vitamin A deficiency. Pathologic dryne ss of the conjunctiva and cornea. The conjunctiva b ecomes dry, thick and wrinkled. If untreated, it can lead to corneal ulceration and ultimately to blindness as a result of corneal damage.	White Spots in white part of the eye near to Cornea	Rich Vitamin-A food. Medication.
White mark, marks on the Cornea (Cornel Ulcer)	Cornea	Trauma or infection	White mark, scars on the Cornea.	Medication, Surgery.
Lazy Eye (Amblyopia)		Visual stimulation either fails to transmit or is poorly transmitted	Blurry Vision or Poor Vision	Refractive Corrected Glass, Eye Exercise or Patching.

		through the optic nerve to the brain for a continuous period of time. It can also occur when the brain "turns off" the visual processing of one eye to prevent double-vision, for example in strabismus (crossed-eyes).		
Dropped Eye Lid (Ptosis) 	Upper Eye Lid	Caused by a number of factors that affect the muscles, nerves, or skin of the eyelids	Drooping eyelid. It is not a disease, but a symptom of another condition that must be treated	Surgery
Red Eye (Conjunctivitis)		Caused by some bacteria and viruses can spread easily from person to person	The symptoms differ based on the cause of the inflammation, but may include: Redness in the white of the eye or inner eyelid, Increased amount of tears, thick yellow discharge that crusts over the eyelashes, especially after sleep, green or white discharge from the eye, Itchy eyes, burning eyes, blurred vision and increased sensitivity to light.	
Watery Eye	Tear duct.	Weather conditions, Strain, common cold, sinus, Blocked tear ducts, dust, wind, allergies,	Tears continuously flows out of the eye, overwhelm the tear ducts makes watery eyes.	Exercise, Surgery

		infection, and injury causes watery eyes		
Pterygium 	Conjunctiva , Corena	Too much exposure to ultraviolet (UV) lights and heat can lead to these growths. Exposures to certain elements like pollen, sand, smoke, or wind on a regular basis have a higher risk of developing this condition	Growth of muscle from conjunctiva to Cornea.	Surgery

SAMPLE REPORTING FORMAT

Name of the V.T		Male	Female	Total
Address.	Village Population			
	V.T Examined			
Telephone Number.	Identified by V.T			

Sl No	Name of the Person with Eye Problem	Age	Sex	Affected Eye		Detected Eye disease
				Right	Left	
1						
2						
3						
4						
5						

Included in a kit is a form to record people screened that are found to have eye problems. The form includes space for the name of the patient, their age and sex, which eye is troubling them, and a small description of the problem with the eye. This description should be in the local

language, not in medical terms, but in the screener's own simple words. There is also a spot for how many women were found to have eye problems, how many men, and how many total people that have eye problems. This information is then submitted to the ranger, who passes it on to KEH, who then plans an outreach trip to bring a doctor to the village to see the people with eye problems.

Referral SLIP

REFERAL CARD			
Details of the Referee		Details of the Patient	
Name of the referee		Name of the Patient	
Village		Village	
Name of the Range		Disease Affected with	
District		Affected Eye	
Date:	Signature	Remark	

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