A Comparative Study on Awareness and Knowledge Regarding Eye Diseases AmongEmployed Populationsof Bangladesh

A Project Report to be submitted in the Department of Pharmacy for the Partial Fulfillment of the Degree of Masters of Pharmacy (M. Pharm)

Submitted By

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DECLARATION BY THE RESEARCH CANDIDATE

I, Sadia Sharmeen Awal, hereby declare that, **"A Comparative Study on Awareness and Knowledge Regarding Eye Diseases Among Employed Populations of Bangladesh''—**submitted to the Department of Pharmacy, East West University, in the partial fulfillment of the requirement for the degree of Masters of Pharmacy (M.Pharm) is a genuine & authentic research work carried out by me. The contents of this dissertation, in full or in parts, have not been submitted to any other institute or University for the award of any degree or Diploma of Fellowship.

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This is to certify that the entitled **—"A Comparative Study on Awareness and Knowledge Regarding Eye Diseases Among Employed Populations of Bangladesh''** is a genuine research work carried out by Sadia Sharmeen Awal, (ID: 2015-1-79-021) under the supervision of **Nishat Nasrin**, Assistant Professor, in the partial fulfillment of the requirement for the degree of Masters of Pharmacy (M.Pharm).

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DEDICATION

This research paper is dedicated to my beloved Parents, Brother and Teachers for their unconditional support.

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List of Abbreviations

CSC	Cataract surgical coverage
CSR	Central Serous Retinopathy
DCCT	Diabetic Control and Complications Center
DHA	Docosahexaenoic Acid
DME	Diabetic Macular Edema
ECCE	Extracapsular cataract extraction
HNPSP	Health, Nutrition and Population Sector Program
HPSP	Health and Population Sector Plan
ICCE	Intracapsular cataract extraction
IOL	Intra Ocular Lens
IOP	Intra Ocular Pressure
GP	General Practitioner
MSICS	Manual small incision cataract surgery
NEI	National Eye Institute
NIO	National Institute of Ophthalmology
NTG	normal-tension glaucoma
OCT	Optical Coherence Tomography
OAG	Open-angle glaucoma
PDR	Proliferative Diabetic Retinopathy
POAG	Primary open-angle glaucoma
YAG	Yttrium Aluminum Garnet; Nd:Y3Al5O12
VAD	Vitamin A Deficiency

Abstract

Awareness and knowledge of common eye diseases play an important role in encouraging people to seek treatment for eye problems. This further helps in reducing the burden of visual impairment among the population in a society. In Bangladesh Cataract and Night Blindness are two major eye conditions to look at due to lack of proper education and awareness. The aim of the study was to assess the comparative knowledge of common eye conditions namely Cataract, Glaucoma, Diabetic Retinopathy and Night blindness in our country. A total of 462 employed workers, 237 White Collar and 225 Blue Collar Workers were participated in the study. The knowledge about all the above common eye diseases was moderate, except Diabetic Retinopathy. The awareness of the Cataract of the white collar employee was 94.5%, Night Blindness 95.36%, Diabetic retinopathy 58.3%, and Glaucoma 47.6% whereas the awareness of blue collar employee is 88% Cataract, Night Blindness 96.9%, Diabetic retinopathy 22.78%, and Glaucoma 29.78%. The respondents were knowledgeable about Cataract surgery but 47.68% of white collar employee & only 29.78% of blue collar employee knew about Intra Ocular Lens Implantation. Most of the employee had minimal knowledge about the right treatment of glaucoma and diabetic retinopathy. In Diabetic Retinopathy, white collar employee (44.97%) have more knowledge than blue collar employee (64.6%). And the most shocking part is that only 3% of White Collar Employee & 0.9% of Blue Collar Employee knew about right treatment. From the result it was seen that the knowledge of the eye conditions were was not at satisfactory level among the employed population of the country. Increasing the awareness and knowledge of common eye diseases could lead to an increase in understanding and acceptance of the importance of routine eye examination for early detection and treatment of such conditions, thereby reducing visual impairment and cost of eye care.

Keywords- *Eye Disease, Cataract, Glaucoma, Diabetic Retinopathy, Night Blindness,IOL., White Collar Worker, Blue Collar Worker, Epidemiology in Bangladesh.*

Chapter 1

Introduction

1.1 Introduction

Eyes are organs of the visual system. They provide organismsvision, the ability to process visual detail, as well as enabling several photo response functions that are independent of vision. Eyes detect light and convert it into electro-chemical impulses in neurons. In higher organisms, the eye is a complex optical system which collects light from the surrounding environment, regulates its intensity through a diaphragm, focuses it through an adjustable assembly of lenses to form an image, converts this image into a set of electrical signals, and transmits these signals to the brain through complex neural pathways that connect the eye via the optic nerve to the visual cortex and other areas of the brain. Eyes with resolving power have come in ten fundamentally different forms, and 96% of animal species possess a complex optical system. Image-resolving eyes are present in molluscs, chordates and arthropods (WHO, 2016).

1.2 Blue-Collar Worker and White-Collar Employee

In an organization, there can be many groups of workers; that can be distinguished by the color of the dress worn by them. The color of their uniform specifies the job performed by them in the organization. Blue collar jobs are the jobs whereby the person performing the job does manual labor and gets an hourly wage. The second kind of jobs are the white collar jobs, in which the employee does clerical work and draws a salary at a fixed rate (Shurvi, 2014).

1.2.1 Blue Collar Worker

Blue Collar is a term used for the people of the working class, who performs manual labor for an organization and get paid wages on an hourly basis. The workers are supposed to wear a blue uniform during working hours. The job is highly laborious that requires physical strain, but the workers are not paid well. The clothing of the workers is blue attire, the fact behind using such a color is that if a worker uses light colored clothes he will get soiled easily, and that will appear in his clothes. In blue color, the spots of oil & grease, dirt and dust are not shown so easily, and that helps them to look cleaner. Blue collar jobs do not require very higher education. However, a worker should be skilled enough in a specialized field to perform the work. The jobs may include manufacturing, mining, construction, repairs and maintenance, installation of machinery and so on (Shurvi, 2014).

1.2.2 White Collar Worker

The term white collar refers to the jobs of officials, who performs managerial or professional work for the organization and get a fixed amount of salary as remuneration at the end of each month. The officials are supposed to wear white colored formal clothes, i.e. shirt, trousers, and tie. The employees do not have to perform any manual labor as well as their work is completely knowledge oriented. White collar jobs require high educational qualification, mental sharpness, good knowledge and expertise in a particular area. As the officials work in offices, the place is clean and calm, so their dress code is white formals. The workers of white collar jobs are paid well and the basis of their pay is their performance.

The management jobs, engineering, medical and administration jobs are some examples of white collar jobs (Shurvi, 2014).

1.3 Human Eye

The human eye is an organ which reacts to light and pressure. As a sense organ, the mammalian eye allows vision. Human eyes help provide a three dimensional, moving image, normally coloured in daylight. Rod and cone cells in the retina allow conscious light perception and vision including color differentiation and the perception of depth. The human eye can distinguish about 10 million colorsand is possibly capable of detecting a single photon.

Similar to the eyes of other mammals, the human eye's non-image-forming photosensitive ganglion cells in the retina receive light signals which affect adjustment of the size of the pupil, regulation and suppression of the hormone melatonin and entrainment of the body clock.

1.3.1 How The Eye Works

In a number of ways, the human eye works much like a digital camera:

Light is focused primarily by the cornea — the clear front surface of the eye, which acts like a camera lens.

The iris of the eye functions like the diaphragm of a camera, controlling the amount of light reaching the back of the eye by automatically adjusting the size of the pupil (aperture).

The eye's crystalline lens is located directly behind the pupil and further focuses light. Through a process called accommodation, this lens helps the eye automatically focus on near and approaching objects, like an autofocus camera lens.

Light focused by the cornea and crystalline lens (and limited by the iris and pupil) then reaches the retina — the light-sensitive inner lining of the back of the eye. The retina acts like an electronic image sensor of a digital camera, converting optical images into electronic signals. The optic nerve then transmits these signals to the visual cortex — the part of the brain that controls our sense of sight. **(** Liz Segre, 2016)

1.4 Anatomy of the Eyeball

The eye consists of a retinal-lined fibro vascular sphere which contains the aqueous humor, the lens and the vitreous body as illustrated in Figure 1.1. The retina is the essential component of the eye and serves the primary purpose of photoreception. All other structures of the eye are subsidiary and act to focus images on the retina, to regulate the amount of light entering the eye or to provide nutrition, protection or motion. The retina may be considered as an outlying island of the central nervous system, to which it is connected by a tract of nerve fibers, the optic nerve. As in the case of the brain and the spinal cord, the retina is within two coats of tissue which contribute protection and nourishment. On the outside of the sphere, corresponding to the durameter, a layer composed of dense fibrous tissue serves as a protective envelope, the fibrous tunic. The posterior part of the fibrous tunic, the sclera, is white and opaque. Although it retains its protective function, the anterior portion, the cornea, is clear and transparent. Immediately internal to the sclera, and between it and the retina, lies the uvea, a vascular tunic analogous to the pia-arachnoid of the central nervous system. Primarily, the uvea provides nutrients to the eye.

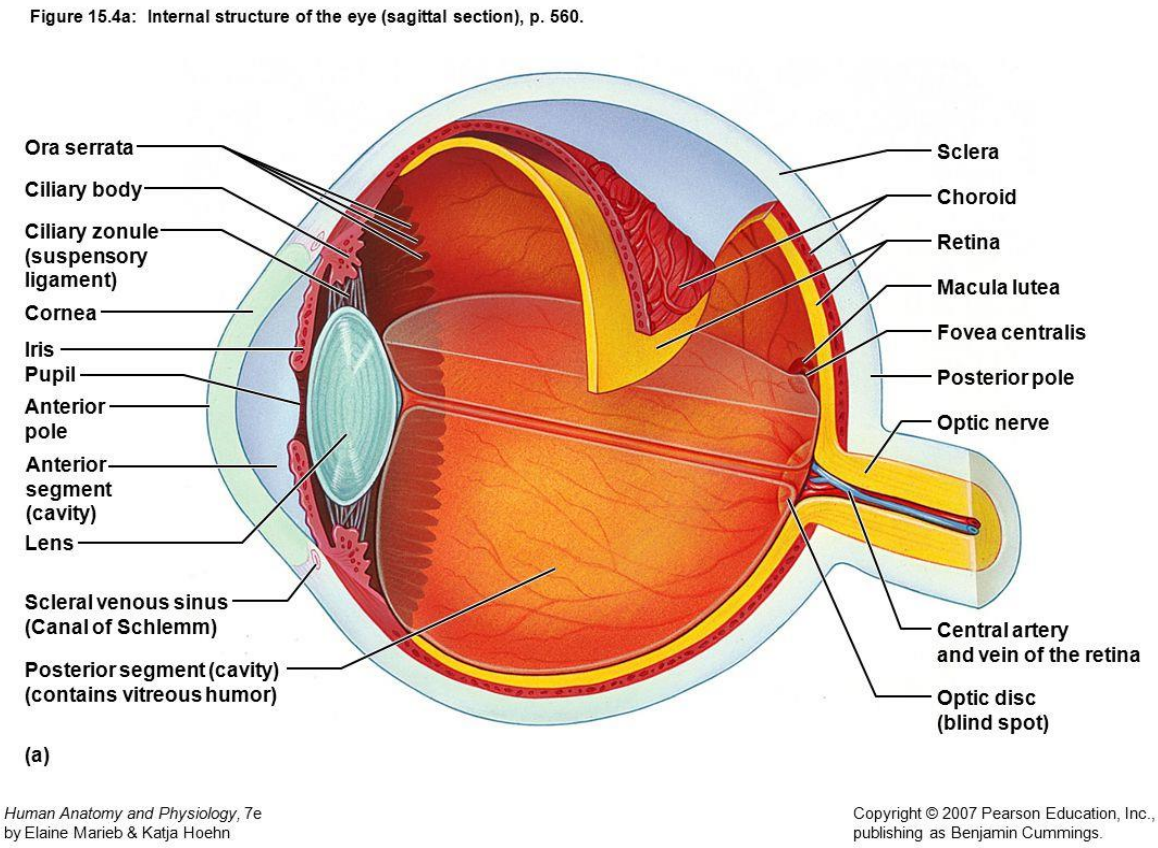


Fig 1.1: Anatomy of the Eyeball (Healthline.com, 2013)

The posterior portion of the uvea is the choroid, a tissue composed almost entirely of blood vessels. A second portion of the uvea, the ciliary body, lies just anterior to the choroid and posterior to the corneoscleral margin and provides nutrients by forming intraocular fluid, the aqueous humor. In addition, the ciliary body contains muscles which provide a supporting and focusing mechanism for the lens. The most anterior portion of the uveal tract, the iris, is deflected into the interior of the eye. The iris acts as a diaphragm with a central rounded opening, the pupil, which dilates to allow more light to the retina in dim lighting and constricts in bright lighting. The iris also has some degree of nutritive function, since it acts to help regulate the fluid flow in the eye. The lens, the focusing mechanism of the eye, is located immediately behind the iris and is supported from the ciliary body by a suspensory ligament, the zonule. The space between the iris and the lens is called the posterior chamber (McCaa, 1982).

1.4.1 Tear Layer

The Tear Layer (The Lacrimal System). This is the first layer of the eye that light strikes. It is clear, moist, and salty. It's purpose is to keep the eye smooth and moist.

1.4.2 Cornea

The eye is enclosed by a tough white sac, the sclera. The cornea is the transparent window in this white sac which allows the objects you are looking at to be carried in the form of light waves into the interior of the eye. The surface of the cornea is where light begins its journey into the eye. The cornea's mission is to gather and focus visual images.(McCaa, 1982)

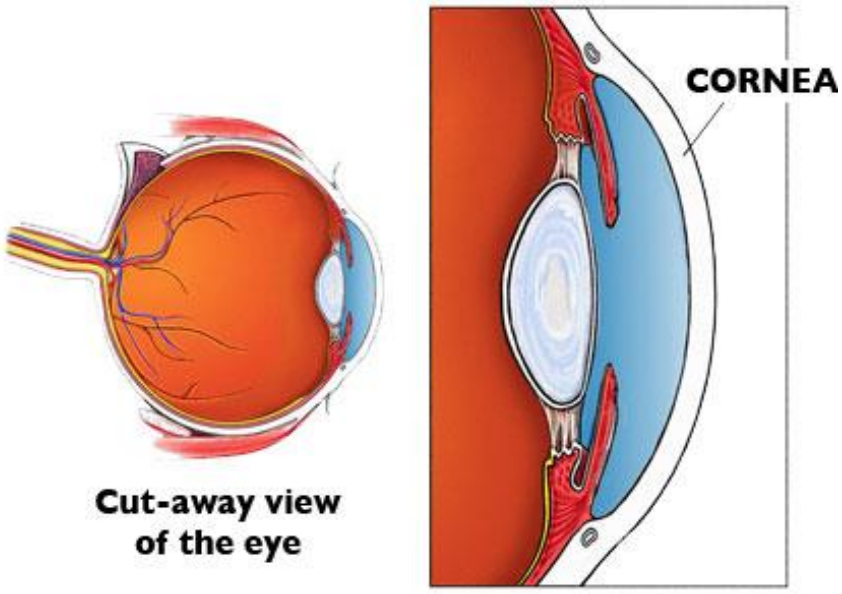


Fig 1.2: Cornea (Healthline.com, 2013)

1.4.3 Corneal layer

The tear film is made up of four layers. The portion immediately next to the epithelium is rich in glycoprotein produced by the goblet cells of the conjunctival epithelium; a middle, watery layer is secreted by the lacrimal glands; an outside oily layer is produced by the meibomian glands and the glands of Moll and Zeis of the lid. The tear film is essential for the maintenance of the 2

proper optical qualities of the cornea and its deficiency may result in corneal damage (McCaa, 1982).

Corneal Epithelium: The corneal epithelium consists of five or six layers of cells which rest on a basement membrane. It is replaced by growth from it basal cells with perhaps greater rapidity than any other stratified epithelium.

Bowman's Membrane: Bowman's membrane is not a true basement membrane but is a clear acellular layer which is a modified portion of the superficial stroma. It is a homogenous layer without cells and has no capacity to regenerate if injured.

Corneal Stroma: The stroma makes up approximately 90% of the thickness of the cornea. It consists of alternating lamellae of collagenous tissue parallel to the surface of the cornea. The corneal cells, or keratocytes, are relatively few and lie within the collagen lamellae.

Descemet's Membrane: Descemet's membrane is a strong, homogeneous true basement membrane. It is produced by the endothelial cells and can be regenerated if injured (McCaa, 1982).

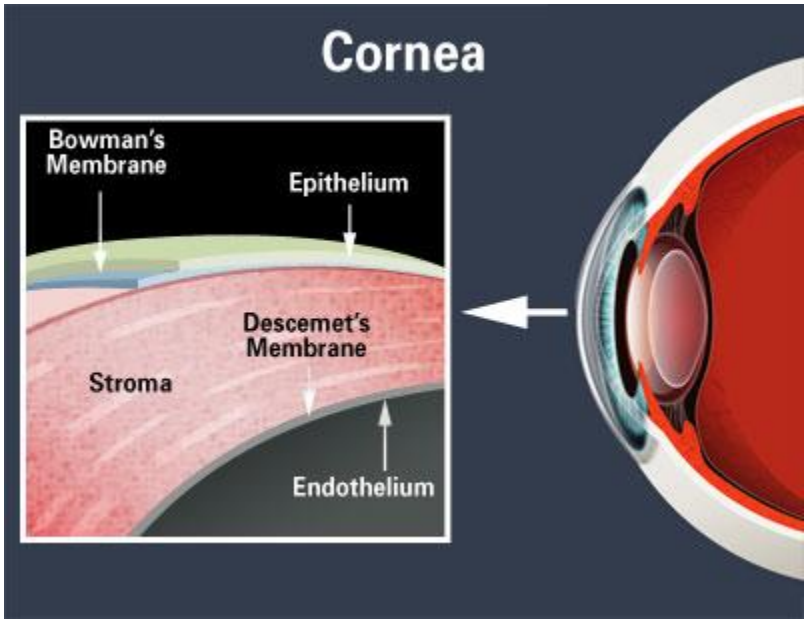


Fig 1.3: Cornea Layers (Batchelor, 1995)

1.4.4 Anterior Chamber

The Anterior Chamber is filled with Aqueous Humor. Aqueous Humor is a clear, watery fluid that fills the space between the back surface of the cornea and the front surface of the vitreous, bathing the lens (The anterior and posterior chambers. Both are located in the front part of the eye, in front of the lens). The eye receives oxygen through the aqueous. It's function is to nourish the cornea, iris, and lens by carrying nutrients, it removes waste products excreted from the lens, and maintain intraocular pressure and thus maintains the shape of the eye. This gives the eye it's shape. It must be clear to function properly (Healthline.com, 2013)

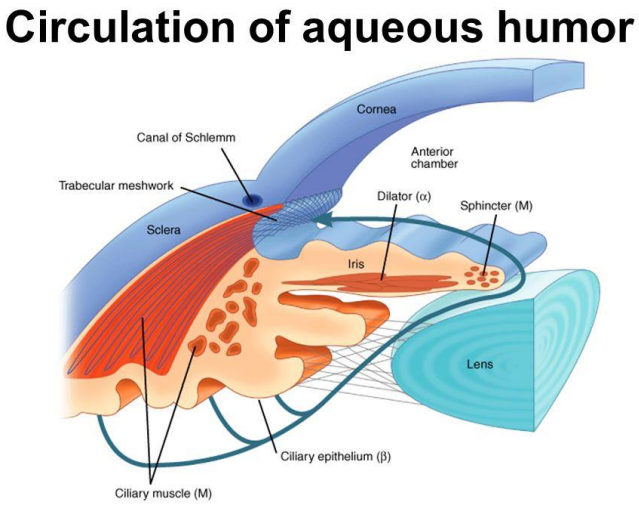


Fig 1.4: Aqueous Humour (Martin, 2015)

1.4.5 Iris

The iris is the pigmented tissue lying behind the cornea that gives color to the eye and controls the amount of light entering the eye by varying the size of the papillary opening. It functions like a camera. The color of the iris affects how much light gets in. The iris controls light constantly, adapts to lighting changes, and is responsible for near point reading (to see close, pupils must constrict).

Pupil It is a variable-sized black circular opening in the center of the iris that regulates the amount of light that enters the eye. The pupil needs to be round in order to constrict.

Constricted A constricted pupil occurs when the pupil size is reduced to constriction of the iris or relaxation of the iris dilator muscle. The iris constricts with bright illumination, with certain drugs, and can be a consequence of ocular inflammation. Dilated A dilated pupil is an enlarged pupil, resulting from contraction of the dilator muscle or relaxation of the iris sphincter. It occurs normally in dim illumination, or may be produced by certain drugs (mydriatics) or result from blunt trauma (Healthline.com, 2013).

1.4.6 Lens

The lens is the natural lens of the eye (chrystaline lens). Transparent, biconvex intraocular tissue that helps bring rays of light to focus on the retina (It bends light, but not as much as the cornea). Suspended by fine ligaments (zonules) attached between ciliary processes. It has to be clear, has to have a power of about +16, and has to be pliable so it can control refraction (This becomes less pliable as you age leading to presbiopia) (Canning, 1999).

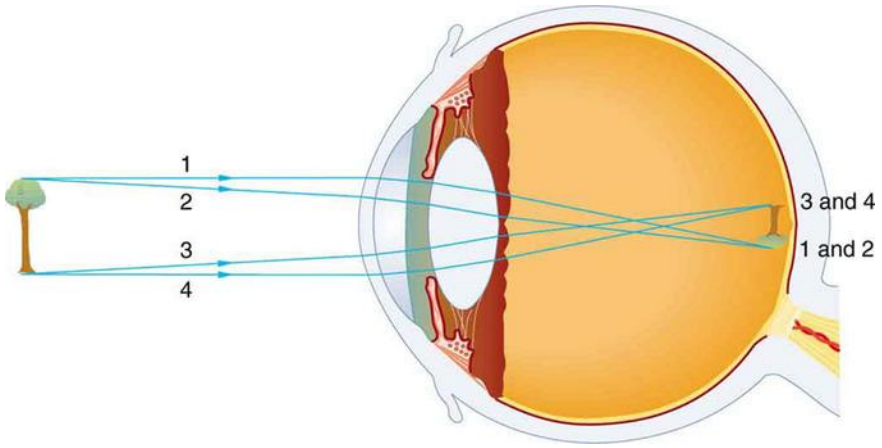


Fig 1.5: The Mechanism of the Lens (Gauger and Shon, 2012)

1.4.6.1Function of the Lens

The lens acts to focus light rays upon the retina. To focus light from a near object, the ciliary muscle contracts, pulling the choroid forward and releasing the tension on the zonules. The elastic lens capsule then molds the pliable lens into a more spherical shape with greater refractive power. This process is known as accommodation (McCaa, 1982).

Ciliary Body The circumferential tissue (a ring of tissue between the end of the choroids and the beginning of the iris) inside the eye composed of the ciliary muscle (involved in lens accommodation and control of intraocular pressure and thus the shape of the lens) and 70 ciliary processes that produce aqueous fluid (McCaa,1982).

1.4.7 Vitreous Humour (Chamber)

Vitreous Humour (Chamber). It is the transparent, colorless gelatinous mass that fills rear two-thirds of the eyeball, between the lens and the retina. It has to be clear so light can pass through it and it has to be there or eye would collapse (McCaa,1982).

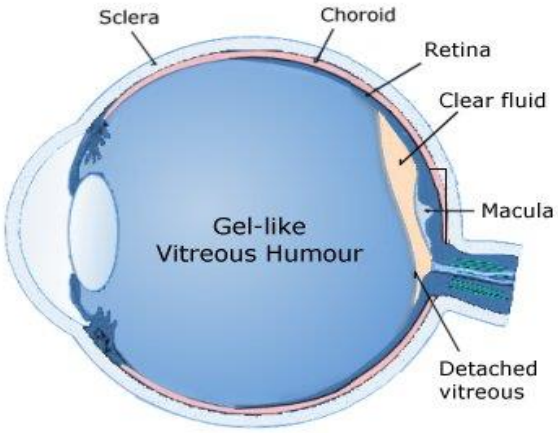


Fig 1.6: The Vitreous (Healthline.com, 2013)

1.4.8 Retina

The retina is the light sensitive nerve tissue in the eye that converts images from the eye's optical system into electrical impulses that are sent along the optic nerve to the brain, to interpret as vision. Forms a thin membranous lining of the rear two-thirds of the globe; consists of layers that include two types of cells: rods and cones.

It is caused by absence of light sensitive photoreceptors where the optic nerve enters the eye.) (Schuman andMeyers, 1968).

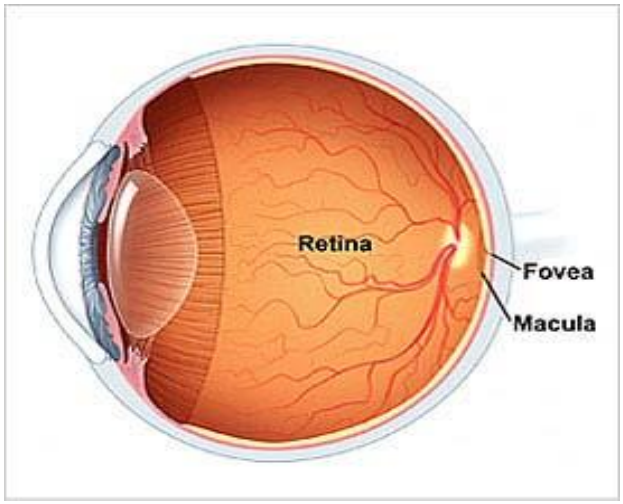


Fig 1.7: Retina of the Eye (Healthline.com, 2013)

Cones The cones are the light-sensitive retinal receptor cell that provides the sharp visual acuity (detail vision) and color discrimination; most numerous in macular area. Function under bright lighting.

Rods The light-sensitive, specialized retinal receptor cell that works at low light levels (night vision). The rods function with movement and provide light/dark contrast. It makes up peripheralvision.

Macula It is the "yellow spot" in the small (3 °) central area of the retina surrounding the fovea. It is the area of acute central vision (used for reading and discriminating fine detail and color). Within this area is the largest concentration of cones

Fovea The fovea is the central pit in the macula that produces the sharpest vision. It contains a high concentration of cones within the macula and no retinal blood vessels.(Schuman and Meyers, 1968)

1.4.9 Choroid

The vascular (major blood vessel), central layer of the eye lying between the retina and sclera.It's function is to provide nourishment to the outer layers of the retina through blood vessels. It is part of the uveal tract (Martin, 2015).

1.4.10 Sclera

The sclera is the opaque, fibrous, tough, protective outer layer of the eye ("white of the eye") that is directly continuous with the cornea in front and with the sheath covering the optic nerve behind. The sclera provides protection and form (Wolff and Last, 1968).

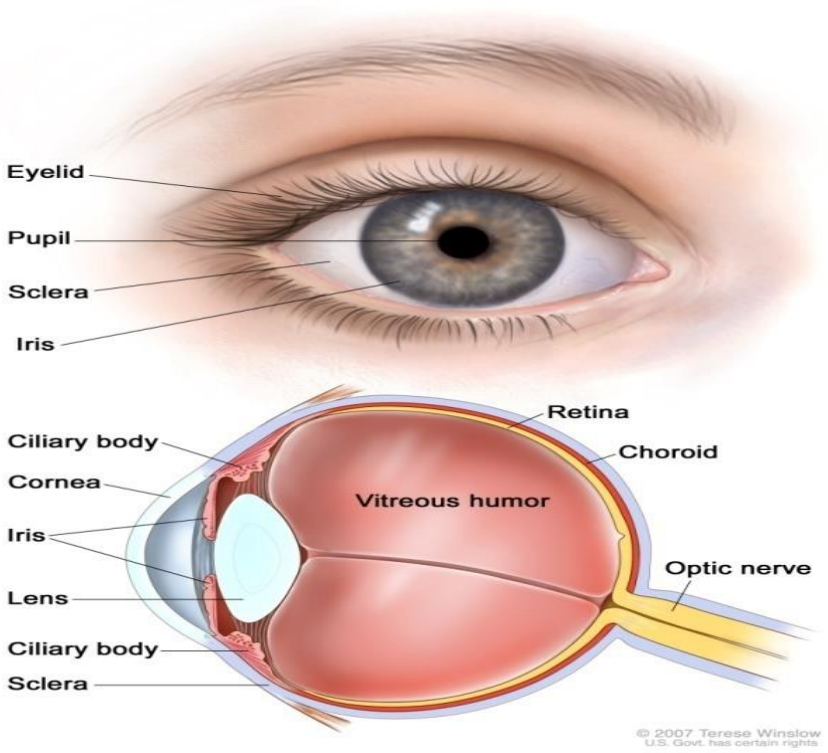


Fig 1.8: The Sclera (Canning, 1999)

1.4.11 Optic Nerve

The Optic Nerve is the largest sensory nerve of the eye. It carries impulses for sight from the retina to the brain. Composed of retinal nerve fibers that exit the eyeball through the optic disc, traverse the orbit, pass through the optic foramen into the cranial cavity, where they meet fibers from the other optic nerve at the optic chiasm.

1.4.12 Extraocular Muscles

There are six extra ocular muscles in each eye:

Rectus Muscles There are four Rectus muscles that are responsible for straight movements:

Superior (upward), Inferior (lower), Lateral (toward the outside, or away from the nose), and Medial (toward the inside, or toward the nose).

Oblique Muscles There are two Oblique muscles that are responsible for angled movements. The superioroblique muscles control angled movements upward toward the right or left. Inferior oblique muscles control angled movements downward toward the right or left. (Carmen Wilings,2016)

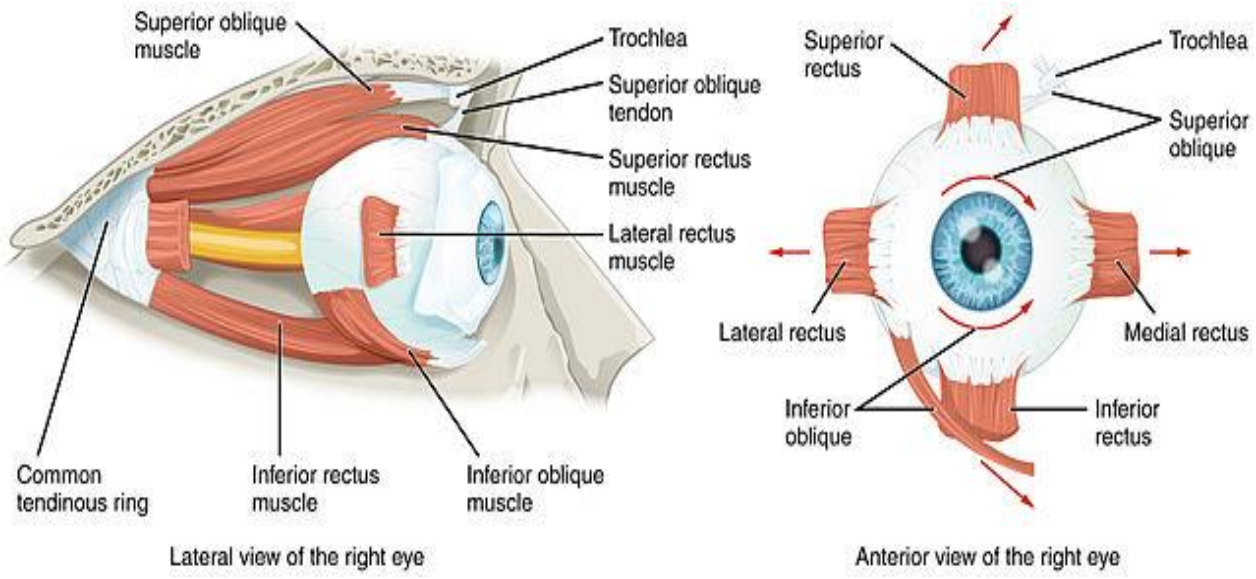


Fig 1.9 :Extraocular Muscles of Human Eye.

1.5 Cataract

A cataract is a clouding of the lens in the eye that affects vision. Most cataracts are related to aging. Cataracts are very common in older people. By age 80, more than half of all Americans either have a cataract or have had cataract surgery. A cataract can occur in either or both eyes. It cannot spread from one eye to the other. (Jacobsen, 2008)

The lens is a clear part of the eye that helps to focus light, or an image, on the retina. The retina is the light-sensitive tissue at the back of the eye. In a normal eye, light passes through the transparent lens to the retina. Once it reaches the retina, light is changed into nerve signals that are sent to the brain.The lens must be clear for the retina to receive a sharp image. If the lens is cloudy from a cataract, the image patient see will be blurred.(Jacobsen, 2008)

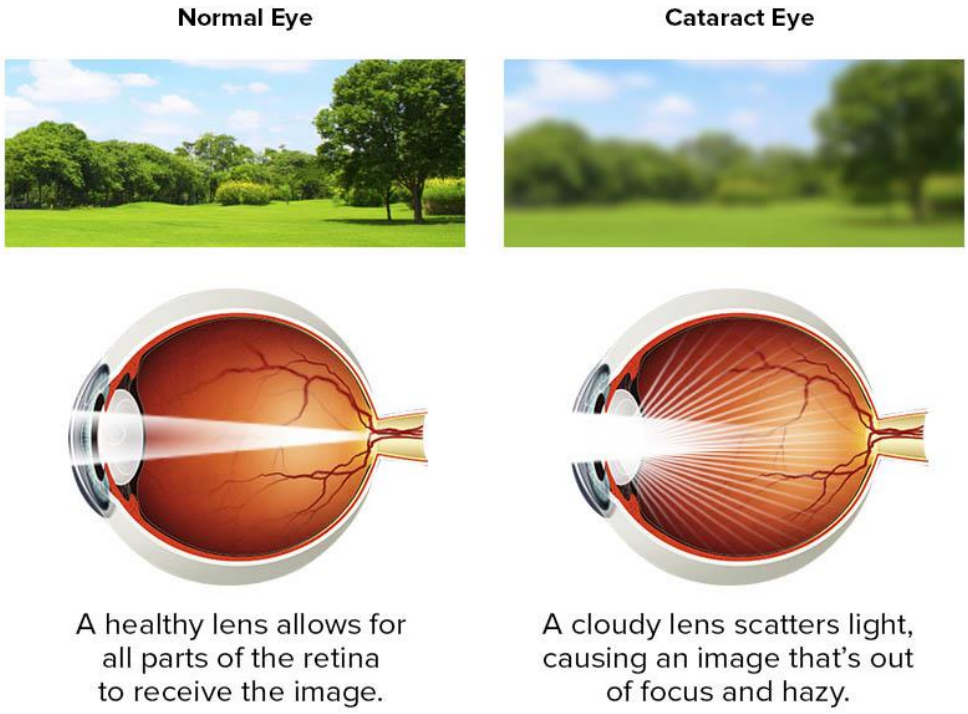


Fig 1.10: Vision in Cataract(National Eye Institute, 2009)

1.5.1 Cause of Cataract

The lens lies behind the iris and the pupil. It works much like a camera lens. It focuses light onto the retina at the back of the eye, where an image is recorded. The lens also adjusts the eye's

focus, letting us see things clearly both up close and far away. The lens is made of mostly water and protein. The protein is arranged in a precise way that keeps the lens clear and lets light pass through it.

But as we age, some of the protein may clump together and start to cloud a small area of the lens. This is a cataract. Over time, the cataract may grow larger and cloud more of the lens, making it harder to see.

Researchers suspect that there are several causes of cataract, such as smoking and diabetes. Or, it may be that the protein in the lens just changes from the wear and tear it takes over the years (National Eye Institute, 2015).

1.5.2 Types of cataract

Although most cataracts are related to aging, there are other types of cataract:

Secondary cataract. Cataracts can form after surgery for other eye problems, such as glaucoma. Cataracts also can develop in people who have other health problems, such as diabetes. Cataracts are sometimes linked to steroid use.

Traumatic cataract. Cataracts can develop after an eye injury, sometimes years later.

Congenital cataract. Some babies are born with cataracts or develop them in childhood, often in both eyes. These cataracts may be so small that they do not affect vision. If they do, the lenses may need to be removed.

Radiation cataract. Cataracts can develop after exposure to some types of radiation.(National Eye Institute, 2015)

1.5.3 How Cataracts Affect the Vision

Age-related cataracts can affect Patient's vision in two ways:

Clumps of protein reduce the sharpness of the image reaching the retina. The lens consists mostly of water and protein. When the protein clumps up, it clouds the lens and reduces the light that reaches the retina. The clouding may become severe enough to cause blurred vision. Most age-related cataracts develop from protein clumpings. When a cataract is small, the cloudiness

affects only a small part of the lens. Patient's may not notice any changes in Patient's vision. Cataracts tend to "grow" slowly, so vision gets worse gradually. Over time, the cloudy area in the lens may get larger, and the cataract may increase in size. Seeing may become more difficult. Patient's vision may get duller or blurrier.

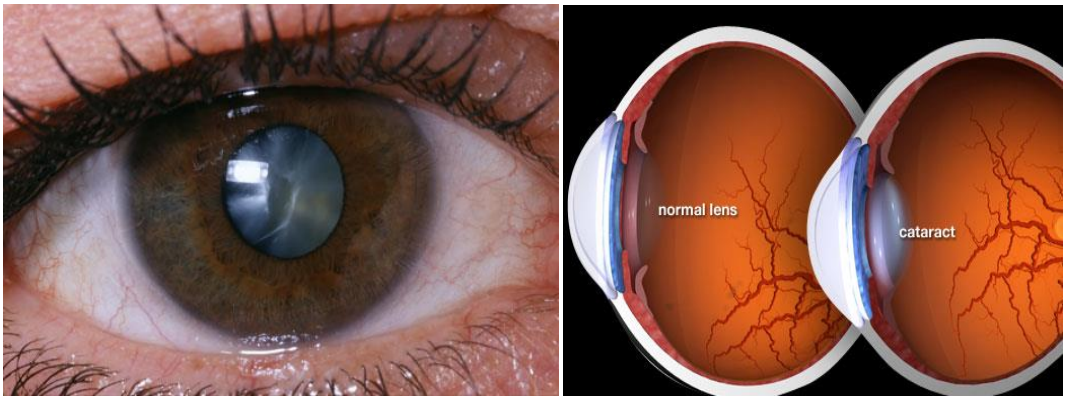


Fig 1.11: Cataract affected Eye (Marazzi, 2016)

The clear lens slowly changes to a yellowish/brownish color, adding a brownish tint to vision.As the clear lens slowly colors with age, Patient's vision gradually may acquire a brownish shade. At first, the amount of tinting may be small and may not cause a vision problem. Over time, increased tinting may make it more difficult to read and perform other routine activities. This gradual change in the amount of tinting does not affect the sharpness of the image transmitted to the retina.If Patient's have advanced lens discoloration, Patient's not be able to identify blues and purples. Patient's may be wearing what you believe to be a pair of black socks, only to find out from friends that Patient's are wearing purple socks.(American Association for Pediatric Ophthalmology and Strabismus, 2014)

1.5.4 Risk factors

The risk of Cataract increases as patient gets older. Other risk factors for Cataract include: Certain diseases such as diabetes. Personal behavior such as smoking and alcohol use.

The environment such as prolonged exposure to sunlight. (National Eye Institute, 2009)

1.5.5 Symptoms

Signs and symptoms vary depending on the type of cataract, though considerable overlap occurs. The most common symptoms of a cataract are:

- Cloudy or blurry vision.
- Colors seem faded.
- Glare. Headlights, lamps, or sunlight may appear too bright. A halo may appear around lights.
- Poor night vision.
- Double vision or multiple images in one eye. (This symptom may clear as the cataract gets larger.)
- Frequent prescription changes in your eyeglasses or contact lenses.

These symptoms also can be a sign of other eye problems. If Patient's have any of these symptoms, check with your eye care professional.(National Eye Institute, 2009)

1.5.6Cataract Detection

Cataract is detected through a comprehensive eye exam that includes:

- **Visual acuity test**. This eye chart test measures how well patient see at various distances.
- **Dilated eye exam**. Drops are placed in Patient's eyes to widen, or dilate, the pupils. Patient's eye care professional uses a special magnifying lens to examine your retina and optic nerve for signs of damage and other eye problems. After the exam, Patient's close-up vision may remain blurred for several hours.
- **Tonometry**. An instrument measures the pressure inside the eye. Numbing drops may be applied to Patient's eye for this test National Eye Institute, 2009)

1.5.7 Treatment

The symptoms of early cataract may be improved with new eyeglasses, brighter lighting, anti-glare sunglasses, or magnifying lenses. If these measures do not help, surgery is the only effective treatment. Surgery involves removing the cloudy lens and replacing it with an artificial lens. A cataract needs to be removed only when vision loss interferes with your

everyday activities, such as driving, reading, or watching TV. Many people consider poor vision an inevitable fact of aging, but cataract surgery is a simple, relatively painless procedure to regain vision.Cataract surgery is very successful in restoring vision. In fact, it is the most frequently performed surgery in the United States, with more than 3 million Americans undergoing cataract surgery each year, according to PBA. Nine out of 10 people who have cataract surgery regain very good vision, somewhere between 20/20 and 20/40.(American Association for Pediatric Ophthalmology and Strabismus, 2014)

1.5.8 Cataract Surgery

Cataract removal is one of the most common operations performed in the United States. It also is one of the safest and most effective types of surgery. In about 90 percent of cases, people who have cataract surgery have better vision afterward.

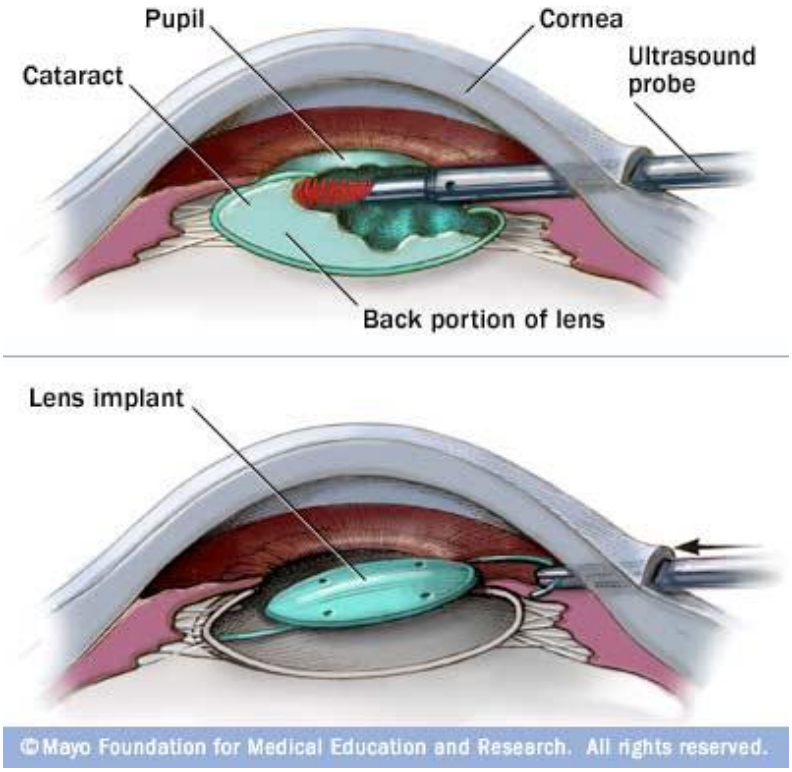


Fig 1.12: Cataract Surgery (Boyd, 2015)

1.5.8.1 The risks of cataract surgery

As with any surgery, cataract surgery poses risks, such as infection and bleeding. Before cataract surgery, Patient's doctor may ask Patient's to temporarily stop taking certain medications that increase the risk of bleeding during surgery. After surgery, Patient's must keep Patient's eye clean, wash Patient's hands before touching Patient's eye, and use the prescribed medications to help minimize the risk of infection. Serious infection can result in loss of vision.

Cataract surgery slightly increases patients risk of retinal detachment. If Patient's notice a sudden increase in floaters or flashes, see an eye care professional immediately. A retinal detachment is a medical emergency. If necessary, go to an emergency service or hospital. Patient's eye must be examined by an eye surgeon as soon as possible. A retinal detachment causes no pain. Early treatment for retinal detachment often can prevent permanent loss of vision.

- Eye infection.
- Bleeding in the eye.
- Ongoing swelling of the front of the eye or inside of the eye.
- Swelling of the retina (the nerve layer at the back of your eye).
- Detached retina (when the retina lifts up from the back of the eye).
- Damage to other parts of your eye.
- Pain that does not get better with over-the-counter medicine.
- Vision loss.

The IOL implant may become dislocated, moving out of position.(Boyd, 2015)

1.5.8.2 Types

Two main types of surgical procedures are in common use throughout the world. The first procedure is Phacoemulsification (phaco) and the second involves two different types of Extracapsular cataract extraction (ECCE).

1.5.8.3 Types of surgery

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 handpiece 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).

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.

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.

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.

Femtosecond laser appears safe but has few benefits over phacoemulsification.

1.5.9 Intraocular Lens Implantation (IOL)

An intraocular lens implant is a synthetic, artificial lens placed inside the eye thatreplaces the focusing power of a natural lens that is surgically removed, usually as partof cataract surgery.(National Eye Institute, 2009)

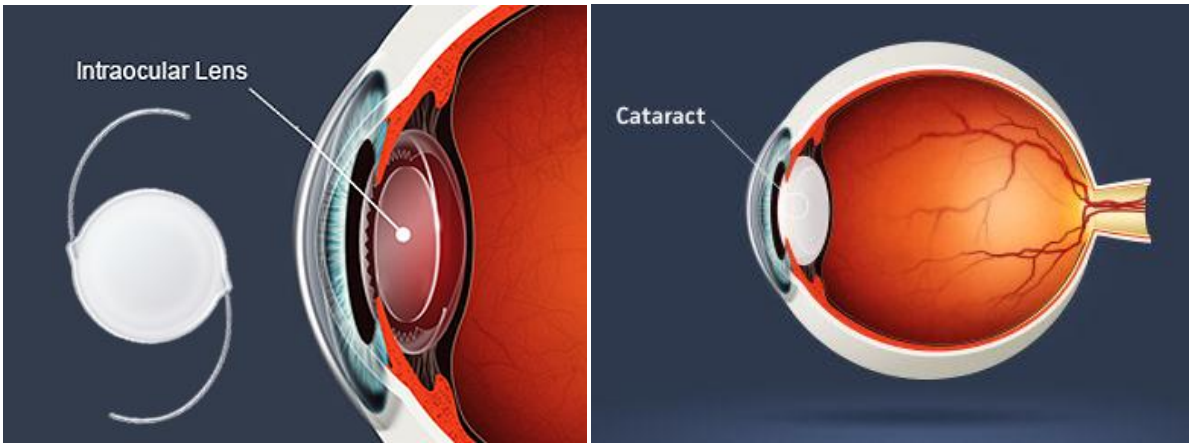


Fig 1.13: Intraocular Lens Implantation(Boyd, 2015)

1.5.9.1 Why Intraocular Lens Implant is Used

When the natural lens is removed, much of the eye's focusing ability is lost. To restore vision, lost focusing power is usually replaced by patient of three methods. The first method is the use of glasses (spectacles). The required lens power is high and the corrective lens quite thick. This option is less desirable for cataract surgery on patient eye since the magnification caused by the patient thick lens may hinder binocularity. The second option is to wear a contact lens. This option can be utilized for cataract surgery on patient or both eyes. However, handling and/or tolerating a contact lens can be difficult for some children. The third option is to place a permanent IOL inside the eye, making compliance less of an issue (National Eye Institute, 2009).

1.4.5.2 Considerations of Cataract Surgery for a Child

In addition to the infrequent risks of any intraocular surgery, (infection, bleeding, inflammation, retinal detachment, etc.) there are special considerations for a child. Children’s eyes can develop inflammation after cataract surgery, especially when an IOL is placed. Inflammation sometimes makes further surgery necessary. Glaucoma also occurs more frequently after cataract surgery in children. Lastly, cataract surgery for a child usually requires general anesthesia (National Eye Institute, 2009).

1.5.9.3 IOL Age Limitations

An IOL is frequently utilized when cataract surgery is performed after the first birthday. The use of an IOL in the first year of life, especially in the first few months of life, is investigational. A national study was recently conducted under the auspices of the FDA and the National Institutes of Health to determine if an IOL is a viable option for infants. This study demonstrated that visual outcomes were similar in infants treated with an IOL compared to those treated with a contact lens. However, there was an increased risk of complications and need for additional surgeries in the IOL group. (Boyd, 2015)

1.5.10 Effectiveness of Cataract Surgery

Cataract removal is patient of the most common operations performed in the eye hospitals. It also is patient of the safest and most effective types of surgery. In about 90 percent of cases, people who have Cataract surgery have better vision afterward (Congdon, 2001).

1.5.11 Preoperative evaluation

An eye examination or pre-operative evaluation by an eye surgeon is necessary to confirm the presence of a cataract and to determine if the patient is a suitable candidate for surgery. The patient must fulfill certain requirements such as:

The degree of reduction of vision due, at least in large part, to the cataract should be evaluated. While the existence of other sight-threatening diseases, such as age-related macular degeneration or glaucoma, does not preclude cataract surgery, less improvement may be expected in their presence.

The eyes should have a normal pressure, or any pre-existing glaucoma should be adequately controlled on medications. In cases of uncontrolled glaucoma, a combined cataract-glaucoma procedure (Phaco-trabeculectomy) can be planned and performed.

The pupil should be adequately dilated using eyedrops; if pharmacologic pupil dilation is inadequate, procedures for mechanical pupillary dilatation may be needed during the surgery.

The patients with retinal detachment may be scheduled for a combined vitreo-retinal procedure, along with PC-IOL implantation.

In addition, it has recently been shown that patients taking tamsulosin (Flomax), a common drug for enlarged prostate, are prone to developing a surgical complication known as intraoperative floppy iris syndrome (IFIS), which must be correctly managed to avoid the complicationposterior capsule rupture; however, prospective studies have shown that the risk is greatly reduced if the surgeon is informed of the patient's history with the drug beforehand, and has appropriate alternative techniques prepared.

A Cochrane Review of three randomized clinical trials including over 21,500 cataract surgeries examined whether routine preoperative medical testing resulted in a reduction of adverse events during surgery. Results showed that performing preoperative medical testing did not result in a reduction of risk of intraoperative or postoperative medical adverse events, compared to surgeries with no or limited preoperative testing. (American Association for Pediatric Ophthalmology and Strabismus, 2014).

1.5.12 Operation procedures

The surgical procedure in phacoemulsification for removal of cataract involves a number of steps. Each step must be carefully and skillfully performed in order to achieve the desired result. The steps may be described as follows:

- Anaesthesia;
- Exposure of the eyeball using an eyelid speculum;
- Entry into the eye through a minimal incision (corneal or scleral);
- Viscoelastic injection to stabilize the anterior chamber and to help maintain the eye pressurization;
- Capsulorhexis;
- Hydrodissection pie;
- Hydro-delineation;
- Ultrasonic destruction or emulsification of the cataract after nuclear cracking or chopping (if needed), careful aspiration of the remaining lens cortex (outer layer of lens) material from the capsular bag, capsular polishing (if needed);
- Implantation of the, usually foldable, intra-ocular lens (IOL);
- Viscoelastic removal;

Wound sealing / hydration (if needed). (American Association for Pediatric Ophthalmology and Strabismus, 2014).

1.5.13 Before surgery

A week or two before surgery, Patient's doctor will do some tests. These tests may include measuring the curve of the cornea and the size and shape of Patient's eye. This information helps Patient's doctor choose the right type of intraocular lens (IOL). Patient may be asked not to eat or drink anything 12 hours before Patient's surgery. (National Eye Institute, 2009).

1.5.14 During surgery

At the hospital or eye clinic, drops will be put into Patient's eye to dilate the pupil. The area around Patient's eye will be washed and cleansed. The operation usually lasts less than one hour and is almost painless. Many people choose to stay awake during surgery. Others may need to be put to sleep for a short time. If Patientare awake, you will have an anesthetic to numb the nerves in and around Patient's eye. After the operation, a patch may be placed over Patient's eye. Patient will rest for a while. Patient's medical team will watch for any problems, such as bleeding. Most people who have cataract surgery can go home the same day. Patient's will need someone to drive Patient home(National Eye Institute, 2009).

1.5.15 After surgery

Itching and mild discomfort are normal after cataract surgery. Some fluid discharge is also common. Patient's eye may be sensitive to light and touch. If Patient have discomfort, Patient's doctor can suggest treatment. After one or two days, moderate discomfort should disappear.

For a few weeks after surgery, Patient's doctor may ask you to use eyedrops to help healing and decrease the risk of infection. Ask Patient's doctor about how to use Patient'seyedrops, how often to use them, and what effects they can have. Patient will need to wear an eye shield or eyeglasses to help protect Patient's eye. Avoid rubbing or pressing on Patient's eye. When Patient are home, try not to bend from the waist to pick up objects on the floor. Do not lift any heavy objects. Patient can walk, climb stairs, and do light household chores. In most cases, healing will be complete within eight weeks. Patient's doctor will schedule exams to check on Patient's progress. (National Eye Institute, 2009).

1.5.16 Complications

- Complications after cataract surgery are relatively uncommon.
- PVD — Posterior vitreous detachment does not directly threaten vision.
- Some people can develop a posterior capsular opacification (PCO, also called an after-cataract).
- Posterior capsular tear may be a complication during cataract surgery. The rate of posterior capsular tear among skilled surgeons is around 2% to 5%.
- Retinal detachment is an uncommon complication of cataract surgery, which may occur weeks, months, or even years later.
- Toxic Anterior Segment Syndrome or TASS is a non-infectious inflammatory condition that may occur following cataract surgery.
- Endophthalmitis is a serious infection of the intraocular tissues, usually following intraocular surgery, or penetrating trauma.
- Swelling or edema of the central part of the retina, called macula, resulting in macular edema, can occur a few days or weeks after surgery.
- Other possible complications include: Swelling or edema of the cornea, sometimes associated with cloudy vision, which may be transient or permanent (pseudophakic bullous keratopathy). Displacement or dislocation of the intraocular lens implant may rarely occur. (American Association for Pediatric Ophthalmology and Strabismus, 2014).

1.6 Glaucoma

Glaucoma is a group of diseases that damage the eye's optic nerve and can result in vision loss and blindness. However, with early detection and treatment, patient can often protect patient`s eyes against serious vision loss. There is no cure for Glaucoma. Vision lost from the disease cannot be restored. Glaucoma is a common condition, but many people won't realise they have it because it doesn't always cause symptoms in the early stages. It can affect people of all ages, including babies and young children, but is most common in adults in their 70s and 80s (National Eye Institute, 2016).

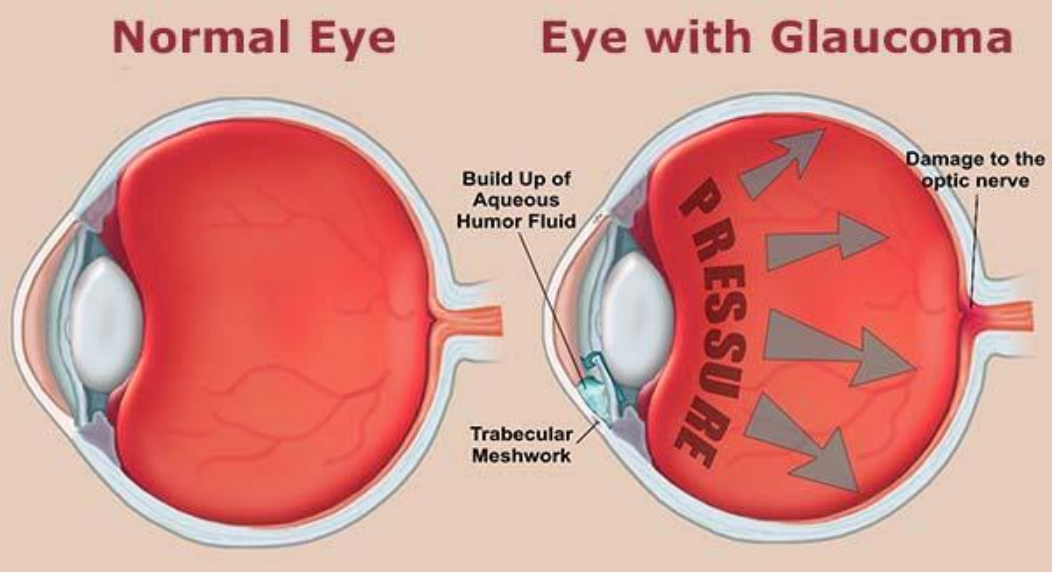


Fig 1.14: Glaucoma Patient Eye (Boyd, 2015)

1.6.1 Symptoms of glaucoma

Glaucoma doesn't usually have any symptoms to begin with and is often only picked up during a routine eye test. Many people don't realize they have it because it develops slowly over many years and tends to cause a loss of peripheral vision (the edge of your vision) at first. Both eyes are usually affected, although it may be worse in one eye. Without treatment, it can eventually lead to blindness. Very occasionally, glaucoma can develop suddenly and cause:

- intense eye pain
- a red eye
- a headache
- tenderness around the eyes
- seeing rings around lights
- blurred vision. (National Eye Institute, 2016)

Fig 1.15: Vision with Glaucoma (National Eye Institute, 2016)

1.6.2 Types of Glaucoma

The two major categories of glaucoma are open-angle glaucoma (OAG) and narrow angle glaucoma.

Primary open-angle glaucoma. This common type of glaucoma gradually reduces your peripheral vision without other symptoms. By the time you notice it, permanent damage already has occurred. If patients IOP remains high, the destruction caused by POAG can progress until tunnel vision develops, and you will be able to see only objects that are straight ahead. Ultimately, all vision can be lost, causing blindness.

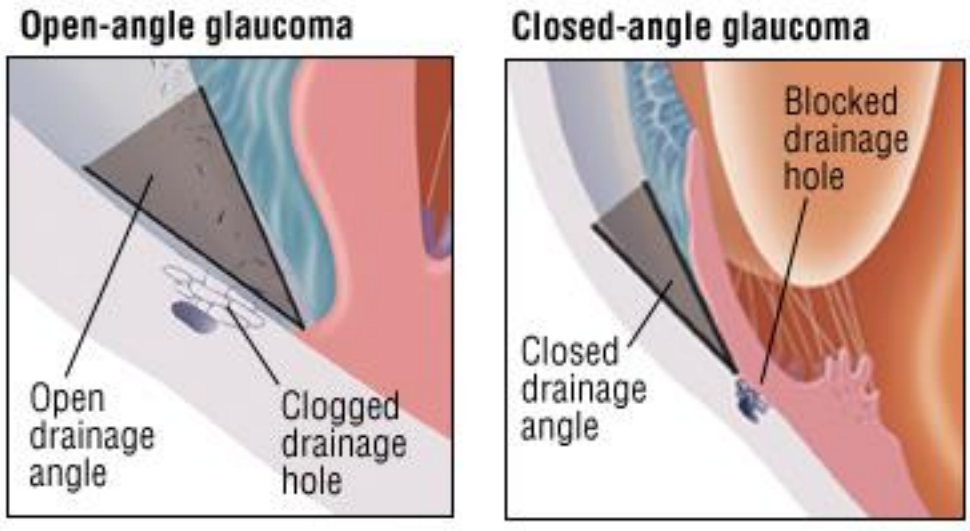


Fig 1.16: Types of Glaucoma (National Eye Institute, 2016)

Acute angle-closure glaucoma. Also called narrow-angle glaucoma, acute angle-closure glaucoma produces sudden symptoms such as eye pain, headaches, halos around lights, dilated pupils, vision loss, red eyes, nausea and vomiting. These signs constitute a medical emergency.

Normal-tension glaucoma. Like POAG, normal-tension glaucoma (also called normal-pressure glaucoma, low-tension glaucoma or low-pressure glaucoma) is a type of open-angle glaucoma that can cause visual field loss due to optic nerve damage.

Pigmentary glaucoma. This rare form of glaucoma is caused by clogging of the drainage angle of the eye by pigment that has broken loose from the iris, reducing the rate of aqueous outflow from the eye. Over time, an inflammatory response to the blocked angle damages the drainage system.

Secondary glaucoma. Symptoms of chronic glaucoma following an eye injury could indicate secondary glaucoma, which also may develop with presence of eye infection, inflammation, a tumor or enlargement of the lens due to a cataract.

Congenital glaucoma. This inherited form of glaucoma is present at birth, with 80 percent of cases diagnosed by age one. These children are born with narrow angles or some other defect in the drainage system of the eye. It's difficult to spot signs of congenital glaucoma, because children are too young to understand what is happening to them (John Berdahl, 2016).

1.6.3 Causes of glaucoma

Things that can increase your risk of developing glaucoma include:

- age – glaucoma becomes more likely as Patient get older; the most common type (primary open angle glaucoma) affects up to 2 in 100 people over 40 and around 10 in 100 people over 75
- ethnic origin – people of African, Afro-Caribbean or Asian origin are at increased risk of developing certain types of glaucoma
- family history – if you have a close relative, such as a parent, brother or sister who has glaucoma, Patient's at increased risk of developing it herself
- other medical conditions – conditions such as short sightedness, long-sightedness and diabetes can increase Patient's risk of glaucoma. (National Eye Institute, 2016)

1.6.4 People at risk for Open-Angle Glaucoma

- Anyone can develop Glaucoma. Some people, listed below, are at higher riskthan others:
- African Americans over age 40
- Everyone over age 60, especially Mexican Americans
- People with a family history of Glaucoma
- A comprehensive dilated eye exam can reveal more risk factors, such as high eyepressure, thinness of the cornea, and abnormal optic nerve anatomy. In some peoplewith certain combinations of these high-risk factors, medicines in the form of eye-drops reduce the risk of developing Glaucoma by about half (Boyd, 2015).

1.6.5 Risk factors

The following factors can increase the risk for developing glaucoma:

Age. People over age 60 are at increased risk for the disease. African Americans, however, are at increased risk after age 40.

Race. African Americans are significantly more likely to get glaucoma than Caucasians, and they are much more likely to suffer permanent vision loss. People of Asian descent and Native Alaskans are at higher risk of angle-closure glaucoma. People of Japanese descent are more likely to develop low-tension glaucoma.

Family history of glaucoma. Having a family history of glaucoma increases the risk of developing glaucoma.

Medical conditions. Some studies indicate that diabetes, high blood pressure and heart disease may increase the risk of developing glaucoma.

Physical injuries to the eye. Severe trauma, such as being hit in the eye, can result in immediate increased eye pressure. Internal damage from such a trauma can also cause future increases in pressure.

Other eye-related risk factors. Certain features of eye anatomy, namely thinner corneas and optic nerve sensitivity, indicate an increased risk for developing glaucoma.

Corticosteroid use. Using corticosteroids (including cortisone, hydrocortisone and prednisone) for prolonged periods of time appears to put some people at risk of getting secondary glaucoma. (Maclain and Bonny, 2006).

1.6.6 How the Optic Nerve Gets Damaged by Open-Angle Glaucoma

Several large studies have shown that eye pressure is a major risk factor for optic nerve damage. In the front of the eye is a space called the anterior chamber. A clear fluid flows continuously in and out of the chamber and nourishes nearby tissues. The fluid leaves the chamber at the open angle where the cornea and iris meet. (See diagram below.) When the fluid reaches the angle, it flows through a spongy meshwork, like a drain, and leaves the eye.

In open-angle Glaucoma, even though the drainage angle is "open", the fluid passes too slowly through the meshwork drain. Since the fluid builds up, the pressure inside the eye rises to a level that may damage the optic nerve. When the optic nerve is damaged from increased pressure, open-angle Glaucoma-and vision loss—may result. That'swhy controlling pressure inside the eye is important. Another risk factor for optic nerve damage relates to blood pressure. (National Eye Institute, 2016).

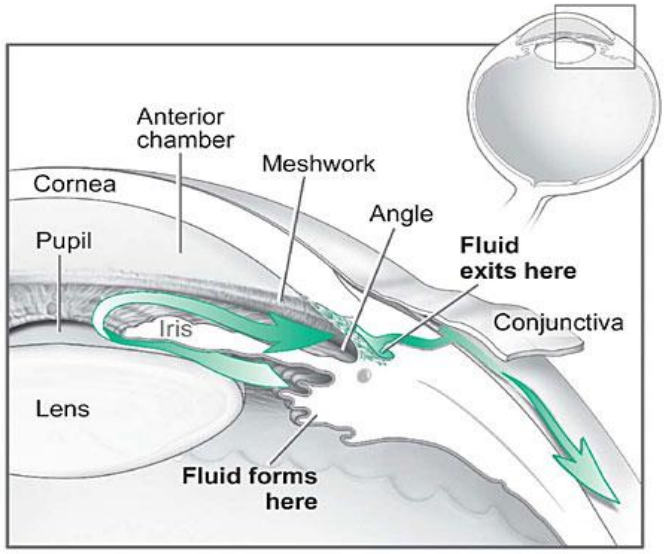


Fig 1.17: Fluid Pathway in Optic Nerve Damage (National Eye Institute, 2016)

1.6.7 Diagnosis

Glaucoma is diagnosed through a comprehensive eye examination. Because glaucoma is a progressive disease, meaning it worsens over time, a change in the appearance of the optic nerve, a loss of nerve tissue, and a corresponding loss of vision confirm the diagnosis (Maclain and Bonny, 2006)

Fig 1.18: Diagnosis of Glaucoma(Maclain and Bonny, 2006)

1.6.7.1 Glaucoma testing includes:

Patient history to determine any symptoms the patient is experiencing and if there are any general health problems and family history that may be contributing to the problem.

Visual acuity measurements to determine if vision is being affected.

Tonometry to measure the pressure inside the eye to detect increased risk factors for glaucoma.

Pachymetry to measure corneal thickness. People with thinner corneas are at an increased risk of developing glaucoma.

Visual field testing, also called perimetry, to check if the field of vision has been affected by glaucoma. This test measures your side (peripheral) vision and central vision by either determining the dimmest amount of light that can be detected in various locations of vision, or by determining sensitivity to targets other than light.

Evaluation of the retina of the eye, which may include photographs or scans of the optic nerve, to monitor any changes over time.

Supplemental testing, which may include gonioscopy. This procedure offers a view of the angle anatomy, which is where eye fluid drainage occurs. Serial tonometry is another possible test (John Berdahl, 2016).

1.6.8 Screening

The United States Preventive Services Task Force as of 2013 states there is insufficient evidence to recommend for or against screening for glaucoma.[50] Therefore, there is no national screening program in the US. Screening, however, is recommended starting at age 40 by the American Academy of Ophthalmology (National Eye Institute, 2016).

1.6.9 Glaucoma Treatments

Immediate treatment for early-stage, open-angle glaucoma can delay progression of the disease. That's why early diagnosis is very important. Glaucoma treatments include medicines, laser trabeculoplasty, conventional surgery, or a combination of any of these. While these treatments may save remaining vision, they do not improve sight already lost from glaucoma.

Medicines. Medicines, in the form of eyedrops or pills, are the most common early treatment for glaucoma. Taken regularly, these eyedrops lower eye pressure. Some medicines cause the eye to make less fluid. Others lower pressure by helping fluid drain from the eye. Before Patient's begin glaucoma treatment, tell Patient's eye careprofessional about other medicines and supplements that Patient's are taking. Sometimes the drops can interfere with the way other medicines work.

Glaucoma medicines need to be taken regularly as directed by your eye care professional. Most people have no problems. However, some medicines can cause headaches or other side effects. For example, drops may cause stinging, burning, and redness in the eyes.

A tonometer measures pressure inside the eye to detect glaucoma.

Make sure Patient's eye care professional shows you how to put the drops into your eye. For tips on using your glaucoma eyedrops, see the inside back cover of this booklet.

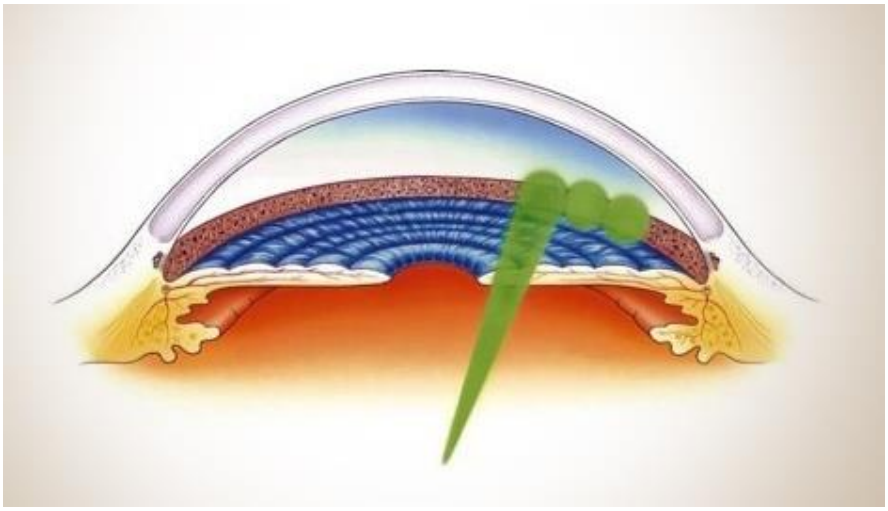


Fig 1.19:Trabeculoplasty. (National Eye Institute, 2016)

Laser trabeculoplasty. Laser trabeculoplasty helps fluid drain out of the eye. Patient's doctor may suggest this step at any time. In many cases, Patient's will need to keep taking glaucoma medicines after this procedure. Laser trabeculoplasty is performed in Patient's doctor's office or eye clinic. Before the surgery, numbing drops are applied to your eye. As Patient's sit facing the laser machine, Patient's r doctor holds a special lens to Patient's eye. A high-intensity beam of light is aimed through the lens and reflected onto the meshwork inside Patient's eye. Patient's may see flashes of bright green or red light. The laser makes several evenly spaced burns that stretch the drainage holes in the meshwork. This allows the fluid to drain better. Like any surgery, laser surgery can cause side effects, such as inflammation. Patient's doctor may give some drops to take home for any soreness or inflammation inside the eye. Patient's will need to make several follow-up visits to have Patient's eye pressure and eye monitored. If Patient have glaucoma in both eyes, usually only one eye will be treated at a time. Laser treatments for each eye will be scheduled several days to several weeks apart.

Conventional surgery. Conventional surgery makes a new opening for the fluid to leave the eye. (See diagram on the next page.) Patient's doctor may suggest this treatment at any time. Conventional surgery often is done after medicines and laser surgery have failed to control pressure. Conventional surgery, called trabeculectomy, is performed in an operating room. Before the surgery, Patient's are given medicine to help Patient relax. Patient's doctor makes small injections around the eye to numb it. A small piece of tissue is removed to create a

new channel for the fluid to drain from the eye. This fluid will drain between the eye tissue layers and create a blister-like “filtration bleb.” For several weeks after the surgery, Patient must put drops in the eye to fight infection and inflammation. These drops will be different from those Patient may have been using before surgery. Conventional surgery is performed on one eye at a time. Usually the operations are four to six weeks apart. Conventional surgery is about 60 to 80 percent effective at lowering eye pressure. If the new drainage opening narrows, a second operation may be needed (National Eye Institute, 2016).

1.6.10 Glaucoma Prevention

According to a recent European study, exercise might do the trick for some people.

Researchers in the U.K. found that higher levels of physical exercise appear to provide a long-term benefit of reducing the incidence of low ocular perfusion pressure (OPP), an important risk factor for glaucoma. OPP is a mathematical value that is calculated using a person's intraocular pressure and his or her blood pressure.

The results showed that study participants who engaged in moderate physical exercise approximately 15 years prior to the study had a 25 percent reduced risk of low OPP that could lead to glaucoma.

"It appears that OPP is largely determined by cardiovascular fitness," said study author Paul J. Foster, MD, PhD, of the University College London Institute of Ophthalmology. "We cannot comment on the cause, but there is certainly an association between a sedentary lifestyle and factors which increase glaucoma risk." (John Berdahl, 2016)

1.6.11 Present Research Condition

Through studies in the laboratory and with patients, NEI is seeking better ways to detect, treat, and prevent vision loss in people with Glaucoma. For example, researchers have discovered genes that could help explain how Glaucoma damages the eye. NEI also is supporting studies to learn more about who is likely to get Glaucoma, when to treat people who have increased eye pressure, and which treatment to use first. (National Eye Institute, 2016).

1.6.12 Responsibilities of Glaucoma Patients

If patient are being treated for Glaucoma, be sure to take patient`s Glaucoma medicine every day. See patient`s eye care professional regularly. Patient also can help protect the vision of family members and friends who may be at high risk for Glaucoma-African Americans over age 40; everyone over age 60 especially Mexican Americans; and people with a family history of the disease. Encourage them to have a comprehensive dilated eye exam at least once every two years. Remember that lowering eye pressure in the early stages of Glaucoma slows progression of the disease and helps save vision. Medicare covers an annual comprehensive dilated eye exam for some people at high risk for Glaucoma. These people include those with diabetes, those with a family history of Glaucoma, and African Americans age 50 and older (American Association for Pediatric Ophthalmology and Strabismus, 2016).

1.6.13 Use of Glaucoma Eye drops

If eye drops have been prescribed for treating patient`s Glaucoma, patient need to use them properly, as instructed by patient`s eye care professional. Proper use of patient`s Glaucoma medication can improve the medicine's effectiveness and reduce patient`s risk of side effects.

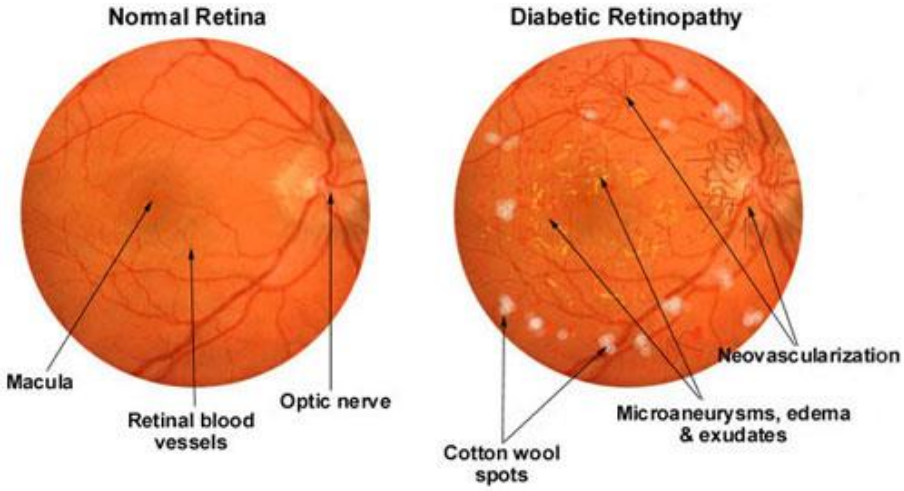
- To properly apply patient`s eye drops, these steps should be followed:
- Wash patient`s hands.
- Hold the bottle upside down.
- Tilt patient`s head back.
- Hold the bottle in patient hand and place it as close as possible to the eye.
- With the other hand, pull down patient`s lower eyelid. This forms a pocket.
- Place the prescribed number of drops into the lower eyelid pocket. If patient are using more than patient eye drop, be sure to wait at least 5 minute before applying the second eye drop.
- Close patient`s eye OR press the lower lid lightly with patient`s finger for at least 1 minute. Either of these steps keeps the drops in the eye and helps prevent the drops from draining into the tear duct, which can increase patient`s risk of side effects (Boyd, 2015).

1.7 Diabetic Retinopathy

Diabetic eye disease is a group of eye conditions that can affect people with diabetes.

Diabetic retinopathy affects blood vessels in the light-sensitive tissue called the retina that lines the back of the eye. It is the most common cause of vision loss among people with diabetes and the leading cause of vision impairment and blindness among working-age adults.

Diabetic macular edema (DME). A consequence of diabetic retinopathy, DME is swelling in an area of the retina called the macula.



All forms of diabetic eye disease have the potential to cause severe vision loss and blindness.

Diabetic Retinopathy: Diabetic retinopathy is a condition that occurs in people who have diabetes. It causes progressive damage to the retina, the light-sensitive lining at the back of the eye. Diabetic retinopathy is a serious sight-threatening complication of diabetes. Diabetes interferes with the body's ability to use and store sugar (glucose). The disease is characterized by too much sugar in the blood, which can cause damage throughout the body, including the eyes. Over time, diabetes damages the blood vessels in the retina. Diabetic retinopathy occurs when these tiny blood vessels leak blood and other fluids. This causes the retinal tissue to swell, resulting in cloudy or blurred vision. The condition usually affects both eyes. The longer a person has diabetes, the more likely they will develop diabetic retinopathy. If left untreated, diabetic retinopathy can cause blindness. (American Optometric Association, 2016).

Fig 1.21: Vision with Diabetic Retinopathy (National Eye Institute, 2015)

1.7.1 Vision with Diabetic Retinopathy

Chronically high blood sugar from diabetes is associated with damage to the tiny blood vessels in the retina, leading to diabetic retinopathy. The retina detects light and converts it to signals sent through the optic nerve to the brain. Diabetic retinopathy can cause blood vessels in the retina to leak fluid or hemorrhage (bleed), distorting vision. In its most advanced stage, new abnormal blood vessels proliferate (increase in number) on the surface of the retina, which can lead to scarring and cell loss in the retina.

Diabetic retinopathy may progress through four stages:

Mild nonproliferative retinopathy. Small areas of balloon-like swelling in the retina's tiny blood vessels, called microaneurysms, occur at this earliest stage of the disease. These microaneurysms may leak fluid into the retina.

Moderate nonproliferative retinopathy. As the disease progresses, blood vessels that nourish the retina may swell and distort. They may also lose their ability to transport blood. Both conditions cause characteristic changes to the appearance of the retina and may contribute to DME.

Severe nonproliferative retinopathy. Many more blood vessels are blocked, depriving blood supply to areas of the retina. These areas secrete growth factors that signal the retina to grow new blood vessels.

Proliferative diabetic retinopathy (PDR). At this advanced stage, growth factors secreted by the retina trigger the proliferation of new blood vessels, which grow along the inside surface of the retina and into the vitreous gel, the fluid that fills the eye (National Eye Institute, 2015)

1.7.2 People at Risk for Diabetic Retinopathy

People with all types of diabetes (type 1, type 2, and gestational) are at risk for Diabetic Retinopathy. Risk increases the longer a person has diabetes. Between 40 and 45 percent of Americans diagnosed with diabetes have some stage of Diabetic Retinopathy, although only about half are aware of it. Women who develop or have diabetes during pregnancy may have rapid onset or worsening of Diabetic Retinopathy (National Eye Institute, 2015)

1.7.3 Risk factors

Risk factors for diabetic retinopathy include:

Diabetes. People with type 1 or type 2 diabetes are at risk for developing diabetic retinopathy. The longer a person has diabetes, the more likely he or she is to develop diabetic retinopathy, particularly if the diabetes is poorly controlled.

Race. Hispanics and African Americans are at greater risk for developing diabetic retinopathy.

Medical conditions. People with other medical conditions, such as high blood pressure and high cholesterol, are at greater risk.

Pregnancy. Pregnant women face a higher risk for developing diabetes and diabetic retinopathy. If a woman develops gestational diabetes, she has a higher risk of developing diabetes as she ages (American Optometric Association, 2016).

1.7.4 Symptoms

- Patient won't usually notice Diabetic Retinopathy in the early stages, as it doesn't tend to have any obvious symptoms until it's more advanced However, early signs of the condition can be picked up by taking photographs of the eyes during Diabetic eye screening.
- Contact patients GP or diabetes care team immediately if patient experience:

- gradually worsening vision
- sudden vision loss
- shapes floating in your field of vision (floaters)
- blurred or patchy vision
- eye pain or redness
- These symptoms don't necessarily mean you have diabetic retinopathy, but it's important to get them checked out. Don't wait until your next screening appointment (National Eye Institute, 2015)

1.7.5 Diabetic eye screening

Everyone with diabetes who is 12 years old or over is invited for eye screening once a year.

Screening is offered because:

- diabetic retinopathy doesn't tend to cause any symptoms in the early stages
- the condition can cause permanent blindness if not diagnosed and treated promptly
- screening can detect problems in your eyes before they start to affect your vision
- if problems are caught early, treatment can help prevent or reduce vision loss

The screening test involves examining the back of the eyes and taking photographs. Depending on patient's result, patient may be advised to return for another appointment a year later, attend more regular appointments, or discuss treatment options with a specialist (American Optometric Association, 2016).

Diabetic retinopathy results from the damage diabetes causes to the small blood vessels located in the retina. These damaged blood vessels can cause vision loss:

Fluid can leak into the macula, the area of the retina responsible for clear central vision. Although small, the macula is the part of the retina that allows us to see colors and fine detail. The fluid causes the macula to swell, resulting in blurred vision.

In an attempt to improve blood circulation in the retina, new blood vessels may form on its surface. These fragile, abnormal blood vessels can leak blood into the back of the eye and block vision (American Optometric Association, 2016)

1.7.6 Types of diabetic retinopathy

Diabetic retinopathy is classified into two types:

Nonproliferative diabetic retinopathy (NPDR) is the earliest stage of diabetic retinopathy. With this condition, damaged blood vessels in the retina begin to leak extra fluid and small amounts of blood into the eye. Sometimes, deposits of cholesterol or other fats from the blood may leak into the retina. NPDR can cause changes in the eye, including:

Microaneurysms: small bulges in blood vessels of the retina that often leak fluid.

Retinal hemorrhages: tiny spots of blood that leak into the retina.

Hard exudates: deposits of cholesterol or other fats from the blood that have leaked into the retina.

Macular edema: swelling or thickening of the macula caused by fluid leaking from the retina's blood vessels. The macula doesn't function properly when it is swollen.

Macular ischemia: small blood vessels (capillaries) close. Patients vision blurs because the macula no longer receives enough blood to work properly.(American Optometric Association, 2016). Many people with diabetes have mild NPDR, which usually does not affect their vision. However, if their vision is affected, it is the result of macular edema and macular ischemia.

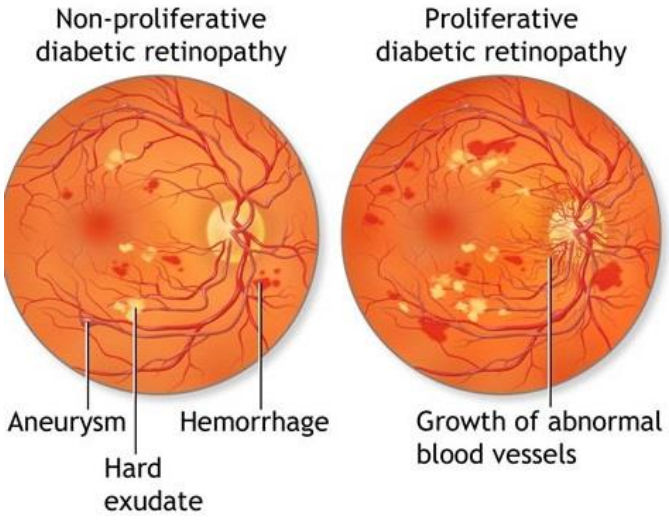


Fig 1.22: Types of Diabetic retinopathy(American Optometric Association, 2016)

Proliferative diabetic retinopathy (PDR) mainly occurs when many of the blood vessels in the retina close, preventing enough blood flow. In an attempt to supply blood to the area where the original vessels closed, the retina responds by growing new blood vessels. This is called neovascularization. However, these new blood vessels are abnormal and do not supply the retina with proper blood flow. The new vessels are also often accompanied by scar tissue that may cause the retina to wrinkle or detach (American Optometric Association, 2016)

1.7.7 Detection

Diabetic retinopathy and DME are detected during a comprehensive dilated eye exam that includes:

Visual acuity testing. This eye chart test measures a person's ability to see at various distances.

Tonometry. This test measures pressure inside the eye.

Pupil dilation. Drops placed on the eye's surface dilate (widen) the pupil, allowing a physician to examine the retina and optic nerve.

Optical coherence tomography (OCT). This technique is similar to ultrasound but uses light waves instead of sound waves to capture images of tissues inside the body. OCT provides detailed images of tissues that can be penetrated by light, such as the eye (National Health Services, 2016)

- A comprehensive dilated eye exam allows the doctor to check the retina for:
- Changes to blood vessels
- Leaking blood vessels or warning signs of leaky blood vessels, such as fatty deposits
- Swelling of the macula (DME)
- Changes in the lens
- Damage to nerve tissue

If DME or severe diabetic retinopathy is suspected, a fluorescein angiogram may be used to look for damaged or leaky blood vessels. In this test, a fluorescent dye is injected into the bloodstream, often into an arm vein. Pictures of the retinal blood vessels are taken as the dye reaches the eye (National Eye Institute, 2015)

1.7.8 Treatments for advanced diabetic retinopathy

For diabetic retinopathy that is threatening or affecting your sight, the main treatments are:

laser treatment – to treat the growth of new blood vessels at the back of the eye (retina) in cases of proliferative diabetic retinopathy, and to stabilise some cases of maculopathy

eye injections – to treat severe maculopathy that's threatening your sight

eye surgery–to remove blood or scar tissue from the eye if laser treatment isn't possible because retinopathy is too advanced (National Health Services, 2016)

1.7.8 . 1Laser treatment

Laser treatment is used to treat new blood vessels at the back of the eyes in the advanced stages of diabetic retinopathy. This is done because the new blood vessels tend to be very weak and often cause bleeding into the eye.

Laser treatment:

- involves shining a laser into patient's eyes – you'll be given local anaesthetic drops to numb patient's eyes; eye drops are used to widen your pupils and special contact lenses are used to hold patient's eyelids open and focus the laser onto patient's retina
- normally takes around 20-40 minutes
- is usually carried out on an outpatient basis, which means you won't need to stay in hospital overnight
- may require more than one visit to a laser treatment clinic
- isn't usually painful, although patient may feel a sharp pricking sensation when certain areas of patient's eye are being treated (National Health Services, 2016)

1.7.8.1.1 Side effects

- After treatment, patient's may have some side effects for a few hours. These can include:
- Blurred vision – patient won't be able to drive until this passes, so patient 'll need to arrange for a friend or relative to drive patient home, or take public transport

- Increased sensitivity to light – it might help to wear sunglasses until patient's eyes have adjusted
- Aching or discomfort – over-the-counter painkillers, such as paracetamol, should help (National Health Services, 2016).

1.7.8.1.2 Possible complications

- Patient should be told about the risks of treatment in advance. Potential complications include:
- Reduced night or peripheral (side) vision – some people may have to stop driving as a result of this
- Bleeding into the eye or objects floating in your vision (floaters)
- Being able to "see" the pattern made by the laser on the back of your eye for a few months
- A small, but permanent, blind spot close to the centre of patients vision

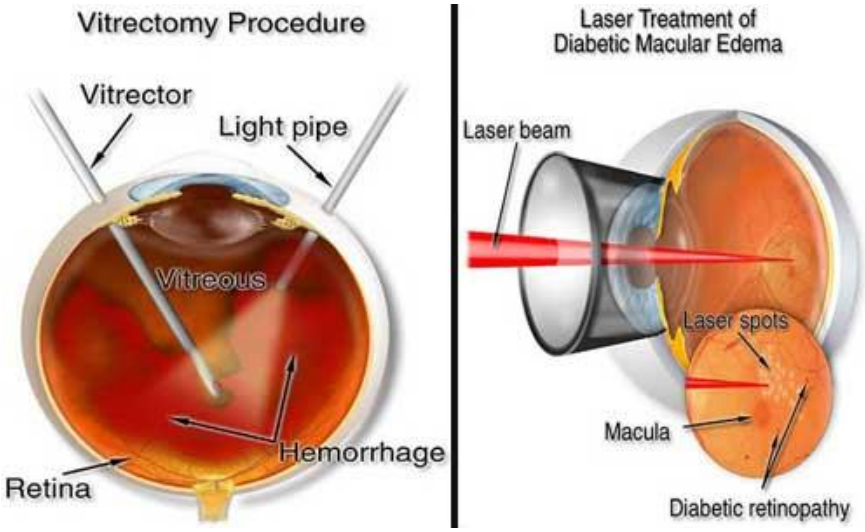


Fig 1.23: Vitrectomy (National Health Services, 2016)

1.7.8.2 Eye injections

In some cases of diabetic maculopathy, injections of a medicine called anti-VEGF may be given directly into patient's eyes to prevent new blood vessels forming at the back of the eyes The main medicines used are called ranibizumab (Lucentis) and aflibercept (Eylea). These can help

stop the problems in patient's eyes getting worse, and may also lead to an improvement in patient's vision (National Health Services, 2016).

During treatment:

- the skin around your eyes will be cleaned and covered with a sheet
- small clips will be used to keep patient's eyes open
- patien'll be given local anaesthetic drops to numb your eyes

a very fine needle is carefully guided into patient's eyeball and the injection is given

The injections are usually given once a month to begin with. Once patient's vision starts to stabilise, they'll be stopped or given less frequently. Injections of steroid medication may sometimes be given instead of anti-VEGF injections, or if the anti-VEGF injections don't help (National Health Services, 2016).

1.7.8.2.1 Risks and side effects

- Possible risks and side effects of anti-VEGF injections include:
- eye irritation or discomfort
- bleeding inside the eye
- floaters or a feeling of having something in patient's eye
- watery or dry, itchy eyes

There's also a risk that the injections could cause blood clots to form, which could lead to a heart attack or stroke. This risk is small, but it should be discussed with patient before patient give patient's consent to treatment. The main risk with steroid injections is increased pressure inside the eye (National Health Services, 2016).

1.7.8.3Eye surgery

Surgery may be carried out to remove some of the vitreous humour from the eye. This is the transparent, jelly-like substance that fills the space behind the lens of the eye.

The operation, known as vitreoretinal surgery, may be needed if:

- a large amount of blood has collected in your eye
- there's extensive scar tissue that's likely to cause, or has already caused, retinal detachment
- During the procedure, the surgeon will make a small incision in patient's eye before removing some of the vitreous humour, removing any scar tissue and using a laser to prevent a further deterioration in patient's vision. Vitreoretinal surgery is usually carried out under local anaesthetic and sedation. This means patient will not experience any pain or have any awareness of the surgery being performed (American Optometric Association, 2016).

1.7.8.3 .1 After the procedure

Patient should be able to go home on the same day or the day after patient's surgery. For the first few days, you may need to wear a patch over patient's eye. This is because activities such as reading and watching television can quickly tire patient's eye to begin with. Patient will probably have blurred vision after the operation. This should improve gradually, although it may take several months for patient's vision to fully return to normal Patient's surgeon will advise you about any activities Patient should avoid during patient's recovery. (National Health Services, 2016)

1.7.8.3 .2 Risks and side effects

- Possible risks of vitreoretinal surgery include:
- developing a cataract
- further bleeding into the eye
- retinal detachment
- fluid build-up in the cornea (outer layer at the front of the eye)
- infection in the eye. (American Optometric Association, 2016)

1.7.8.4 **Vitrectomy surgery**

Vitrectomy is a surgical procedure performed in a hospital or ambulatory surgery center operating room. It is often performed on an outpatient basis or with a short hospital stay. Either a local or general anesthetic may be used. During vitrectomy surgery, an operating microscope and

small surgical instruments are used to remove blood and scar tissue that accompany abnormal vessels in the eye. Removing the vitreous hemorrhage allows light rays to focus on the retina again (National Health Services, 2016)

1.7.9 Prevention and Protection

Vision lost to Diabetic Retinopathy is sometimes irreversible. However, early detectionand treatment can reduce the risk of blindness by 95 percent. Because Diabetic Retinopathy often lacks early symptoms, people with diabetes should get a comprehensive dilated eye exam at least once a year. People with Diabetic Retinopathy may need eye exams more frequently. Women with diabetes who become pregnant should have a comprehensive dilated eye exam as soon as possible. Additional exams during pregnancy may be needed. Studies such as the Diabetes Control and Complications Trial (DCCT) have shown that controlling diabetes slows the onset and worsening of Diabetic Retinopathy. DCCT study participants who kept their blood glucose level as close to normal as possible were significantly less likely than those without optimal glucose control to develop Diabetic Retinopathy, as well as kidney and nerve diseases (National Health Services, 2016).

1.8 Night Blindness

1.8.1 Definition

Night blindness is the inability or reduced ability to see in dim light or darkness. It also refers to the condition in which the time it takes for the eyes to adapt to darkness is prolonged (Lusby, 2016).

1.8.2 Description

Night blindness, also called nyctalopia, is a symptom of several different diseases or conditions. All of the possible causes of night blindness are associated with the way in which the eye receives light rays. Light travels through the cornea and lens and lands on the retina at the back of the eye. The retina is composed of photoreceptors (W. Lusby, 2016).

Fig 1.24: Night Blindness Patient Eye (NasmeeraFirdous, 2012)

There are two types of photoreceptors, rods and cones. There are three million cones and 100 million rods in each eye. The two different photoreceptors are similar in structure, however, rods have a larger outer segment than cones. The outer segments of photoreceptors contain light-sensitive photopigments which change shape whenever light rays strike them. Rods contain the photopigments retinal and rhodopsin, whereas cones contain retinal and three different opsins. Rhodopsin is only able to discriminate between different degrees of light intensity, whereas the opsins of cones distinguish between light wavelengths in the red, blue, and green ranges.

Rods are responsible for vision in dim light, and cones are responsible for vision in bright light. The rods are spread throughout the retina, but the cones are only in the center of the retina. Vision in dim light or darkness is blurry because of the connections between the photoreceptors and the nerve cells which are linked to the brain. Each rod must share this connection to the brain with several other rods so the brain does not know exactly which rod produced the signal. In darkness, rhodopsin is regenerated faster than it can be decomposed. Dark adaptation takes about 15–30 minutes and, when complete, increases light sensitivity by about 100,000 times (Rowland and Frey, 2005).

1.8.3 Causes & symptoms

- Several different conditions and diseases can cause night blindness. These include:
- **Cataracts** . This condition is characterized by a cloudiness of the lens.

- **Congenital night blindness**. This is an inherited, stable disease in which persons suffer from night blindness. Recent advances in gene mapping have identified several mutations responsible for this form of night blindness.
- **Liver conditions**. Reduced night vision can be linked to poor liver functioning, due to a variety of conditions, which impairs vitamin A metabolism.
- **Macular degeneration** . Degeneration of the macula retinae, a specialized region of the retina, can cause night blindness.
- **Retinitis pigmentosa**. This is an inherited eye disease in which there is progressive deterioration of the photopigments of the photoreceptors, eventually resulting in blindness.
- **Vitamin A deficiency**. Night blindness is commonly caused by a deficiency in vitamin A, in fact, it is one of the first indicators of vitamin A deficiency.
- **Xerophthalmia.** This condition is characterized by dryness of the conjunctiva (the membrane that covers the eyelids and exposed surface of the eye) and cornea, light sensitivity, and night blindness. It is caused by vitamin A deficiency.
- **Zinc deficiency**. Zinc is a mineral that is necessary for vitamin A to improve vision (Rowland and Frey, 2005).

1.8.4 Impact

Night blindness has likely caused numerous automobile accidents, although this has been difficult to document. Most accidents occur around sunset, and this may be due to poor contrast vision as well as poor night vision. Generally, even at night in most places, headlights and streetlights provide enough light to see. However, this is not always the case in rural areas. Someone with documented night blindness may be restricted from driving at night.

Night vision is especially important for pilots, both commercial and in the military where vision is routinely checked. Night blindness can be disqualifying in these jobs. A military occupation that particularly relies on night vision is the scout. Although soldiers in most positions in the military depend on night vision, the scout specializes in having good night vision. Night blindness, even if temporary, during times of war can prove to be dangerous or fatal (National Eye Institute, 2012).

1.8.5 Diagnosis

Night blindness can be diagnosed and treated by an ophthalmologist, a physician who specializes in eye disorders. Opticians can only dispense eye glasses but optometrists may be able to diagnose and treat vision problems.

Diagnosis begins with a detailed medical history regarding the night blindness. Questions include: severity of night blindness, when night blindness began, did it occur gradually or suddenly, etc. An eye examination is performed. A slit lamp examination, in which a narrow beam of intense light is used to examine the internal components of the eye, may also be performed. Additional testing may be performed based upon the results of these standard tests (Rowland and Frey, 2005).

1.8.6 Testing

Testing can be done in a clinic or office. It is important to remember that a small amount of dim light is needed in order to see at all. Turning off the lights and holding a few fingers up is all that is needed to test for night blindness. It is important to test at what level of light the patient can see the object. It is equally important to test the amount of time it takes to see the object.

If it is not obvious from the history that the night blindness is due to vitamin A deficiency, ophthalmologist can perform further tests to detect retinal defects and other eye abnormalities (National Eye Institute, 2012).

1.8.7 Treatment

Changes in vision should never be taken lightly. Because night blindness can be a symptom of a serious disease, an ophthalmologist should be consulted before a person embarks on self treatment. Persons who experience night blindness should not drive during the evening or at night. Additional safety precautions should be taken. Alternative remedies may be effective at reducing night blindness, particularly when caused by a vitamin A deficiency (Rowland and Frey, 2005).

1.8.7.1 Food remedies and supplements

Because night blindness can be caused by a vitamin A deficiency, supplementation with vitamin A, or eating foods rich in vitamin A, may help reduce symptoms. Vitamin A was found to slow the progression of retinitis pigmentosa. Foods rich in vitamin A include dairy products, egg yolks, fish liver oil, and liver. Pregnant women should consult a physician before taking vitamin A supplements because of the link between this vitamin and birth defects.

Vitamin A in humans is primarily obtained by conversion of beta-carotene, a pigment found in fruits and vegetables. Food sources for beta-carotene include apricots, asparagus, broccoli, brussel sprouts, cantaloupe, carrots, cherries, kale, lettuce, mango, mustard greens, papaya, peaches, pumpkin, red cabbage, seaweed, spinach, sweet potatoes, watermelon, winter squash, and yams.

Zinc is necessary to transport vitamin A from the liver to the retina, so zinc supplementation (up to 25 mg daily) may help improve night vision. Docosahexaenoic acid (DHA) helps to increase rhodopsin levels and lines the photoreceptor cells of the retina. DHA is converted from omega-3 fatty acids , both of which are found in certain fish oils. The suggested daily dose of DHA (from fish oils) is 500–1000 mg (National Eye Institute, 2012).

Fig 1.25: Food remedies for Night Blindness

1.8.7.2 Herbal remedies

Herbals which may improve night vision include:

- bilberry (*Vacciniummyrtillus*)
- blueberry (*Vaccinium*) juice
- dandelion (*Taraxacumofficinale*)
- eyebright (*Euphrasiaofficinalis*)
- matrimony vine (*Lyciifructus*, kou chi tza) berries
- passionflower (*Passifloraincarnata*)
- Queen Anne's lace (*Daucuscarotasativas*)
- rose (*Rosa* species) flower eye wash
- yellow dock (*Rumexcrispus*) leaves (Rowland and Frey, 2005).

1.8.7.3 Colored light therapy

One researcher found that some persons have reduced levels of photocurrent transmission (transmission of light signals from the eye to the brain) which can cause, among other things, night blindness. Colored light therapy , in which colored light stimulates the brain, can reduce night blindness caused by this photocurrent deficit. In colored light therapy, patients look at a device that cycles through 11 wave bands of color. Treatment involves 25–30 sessions over a period of four to six weeks (Rowland and Frey, 2005).

1.8.7.4 Allopathic treatment

Night blindness caused by vitamin A deficiency will be treated with vitamin A supplements. Night vision devices are available which collect and magnify tiny amounts of light to help persons with night blindness see as well as they can during daylight. Vitamin A supplementation may slow the progress of retinitis pigmentosa. There is no cure for retinitis pigmentosa or macular degeneration, but there are treatments, including laser surgery and the drug thalidomide, which slow down the growth of blood vessels. Cataracts require surgery. (Rowland and Frey, 2005)

1.8.8 Prevention

The best thing one can do if he/she does not suffer from congenital night blindness and wants to prevent the condition from occurring is to have a well-balanced diet, rich in all the essential nutrients, vitamins and minerals. Proper intake of vitamin A is one preventive measure against night blindness. If the problems originates from other medical conditions, it can be prevented only if the specific condition that leads to night blindness is preventable Congenital night blindness, unfortunately, cannot be prevented (Rowland and Frey, 2005).

1.9 Epidemiology in Bangladesh Perspective

The Government of Bangladesh has identified blindness as a critical social and health problem and demonstrated its commitment by forming in 1978 a national apex body the Bangladesh National Council for the Blind (BNCB) with a mandate to formulate, facilitate and monitor the national plan of action to prevent and control blindness. Besides, the Government of Bangladesh has ratified the Vision 2020 program; and is committed to achieving vision 2020 goals.

Bangladesh was one of the first few countries to have a national program for prevention of blindness. The Directorate of Health Services in collaboration with BNCB developed and launched first National Program for Prevention of Visual Impairment and Blindness in Bangladesh in the year 1980. This program was based on eye camp strategy in order to work within limited resources available during the time. Consequent to the paradigm shift in early 1990s that discouraged eye camps, and launched Vision 2020 in 2000, eye care program strategies in Bangladesh were changed and directed towards sustainable development approaches.

The health status of the people of Bangladesh has been steadily improving as evidenced from various indicators. The Life Expectancy at birth was estimated to be 66.8 years in 2008 (Sample Vital Registration System 2008). The estimated under five mortality rate in 2009 was 52 per 1000 live births (World bank website). The government is a major provider of health care in the country along with NGO and private providers. Health care in government facilities are provided

free of cost. The annual health expenditure per capita was US$ 15 as estimated in 2007 (World Bank Website).

The national health policy was officially adopted in 1998 which is now under the process of revision. The national population policy in its draft form has been approved by the cabinet recently. The national drug policy adopted in 1982 is also under the process of revision. The national nutrition plan has been adopted in 1997 and a national nutrition program is under operations. The national maternal health strategy has been adopted in 2001. In context of all these policies and strategies, the health system of the country is currently undergoing a process of reform under a sectoral approach of Health, Nutrition and Population Sector Program (HNPSP) which was preceded by Health and Population Sector Plan (HPSP) which ran from July 1998 to December 2003.

It is in this context BNCB has taken the initiative in response to the decision taken in BNCB full committee meeting chaired by the Health Minister, to review and update the National Eye Care Plan to incorporate in the ongoing Health Care program of the government. Accordingly a National Eye Care Plan Review Sub-Committee of BNCB was formed with selected members. As a methodology, the sub-committee undertook review and research of the existing plan, programs and literature, sought views of stakeholders, and prepared this draft which was widely shared and consulted with cross section of professionals and people including the clients in all the divisions; and finally all the inputs will be synthesized in the national plan through a national level workshop.

The updated National Plan of Action on Eye Care is based on the eye care needs of population. Plan focuses on human resource development, infrastructure and technology, strategies for control of major blinding eye diseases. Advocacy, resource mobilization, community participation; and continuous monitoring of the implementation of the plan through a coordinated mechanism would also be key elements of the national plan.

1.9.1 Strategies of Blindness Prevention Program, Bangladesh

- ✓ Strengthening Advocacy
- ✓ Infrastructure and Technology development
- ✓ Human Resource development

- ✓ Reducing disease burden
- ✓ Improving co ordination and partnership
- ✓ Monitoring and evaluation
- ✓ Eye Care Scenario in Bangladesh

1.9.2.1 Magnitude and Prevalence of Blindness

In a developing country like Bangladesh prevalence of blindness puts an additional burden to our socioeconomic conditions. According to The Bangladesh National Blindness and Low Vision Survey 2000, the age standardized blindness prevalence rate is 1.53% and thus, there are approximately 675,000 blind adult (30 and above age group) in the country (586,880 to 784,000)

The same survey revealed that blindness and low vision (LV) were found to be associated with ageing as both degrees of visual impairment were common among elderly persons, in women as compared with men (1.72% v 1.06% blindness prevalence), in illiterate persons, and, in males, among those who were manual workers when compared with non-manual employees. The study also found that bilateral blindness prevalence was highest in Divisions of Barisal (2.28%) and khulna (1.97%), lower in Chittagong (1.43), Sylhet (1.31%) and Rajshahi (1.21%) and lowest in Dhaka division (1.13%).

Cataract was the predominant (79.6%) cause of bilateral blindness. The cataract surgical coverage (CSC) was notably low over the whole of Bangladesh (32.5%), especially in Barisal division. The level of cataract surgical coverage was found significantly lower for women than men, as was the CSC in rural areas when compared with urban settings.

The same survey also indicated that the prevalence of Low Vision is 0.56% of total population of 30 & above age group. The main causes of low vision, as per above definition, were: retinal diseases (38.4%); corneal diseases (21.5%); glaucoma (15.4%); and optic atrophy (10.8%). Based on the prevalence of 0.56% for low vision, it is estimated that approximately 250,000 adults1 in Bangladesh are in needed of low vision services.

Despite a substantial reduction in the fertility rate in Bangladesh in recent years, overall population growth continues to rise. As such there will be an estimated 175 million people in Bangladesh by the year 2020, with more than half of the population being over the age of 30

years, and one-fifth (34 million) being 50 years of age and older. The survey recommended organizing eye care service delivery in Bangladesh in near future, focusing principally on cataract surgical and refractive error correction services. The recommendation is consistent with the prioritized areas of action for the region as outlined by WHO South East Asia policy document "Vision 2020- The Right to Sight".

Using the WHO global estimate of Childhood blindness prevalence2 of 0.75/1,000 children, there are about 40,000 blind children in Bangladesh. Childhood cataract is the leading cause of childhood blindness in Bangladesh and over 12,000 children are suffering from unnecessary blindness due to un-operated cataract and in need of surgical care from well-developed eye care facilities. Another 10,000 children3 are blind due to corneal scarring which could have been entirely prevented through effective primary health care and primary eye care services in the community. For every million population in Bangladesh, there would be 300 blind children. About a third of them (100 children) are blind from cataract. The provision of 100 (uniocular surgery) to 200 bilateral cataract surgeries per million populations would be needed to restore vision in these children. Community based preventive measures will be required to prevent 25% of all childhood blindness, which is related to Vitamin A Deficiency disorders, diarrheal diseases, malnutrition and measles. Childhood cataract is a major treatable cause of childhood blindness that can be benefited from future intervention strategies in line with the priorities set by the WHO's Vision 2020.

Refractive errors in children aged 5 to 15 years are an important public health problem. Myopia and hypermetropia are the leading causes of refractive error in children in this age group-both of which are visually impairing conditions that can be significantly improved through adequate refractive correction. Population based refractive error studies in children have shown that nearly half of the visual impairment associated with correctable refractive errors in this age group is not receiving attention, especially those children living in disadvantaged social and economic conditions. As such refractive errors remain uncorrected and unnecessary visual impairment persists.

In Bangladesh, assuming a prevalence of 4% of children aged 5 to 15 years to have visual acuity of less than 6/18, it is estimated that there are approximately 1.3 million children having visual impairment due to refractive errors3, the large majority of which are amenable to correction.

1.9.2.2 Current Interventions

The government is the major provider of the health care in the country along with NGOs and private sector. The per capita annual government expenditure on health and family welfare is less than US$3 (Bangladesh Taka 180, Household Expenditure Survey, 2001). The government health sector has a well-organized service delivery network that is extended down to the village level. The focus of the program in the rural areas is primary health care that included essential health and family planning services but does not include eye care.

According to the National Eye Care capacity Assessment conducted by National Institute of Ophthalmology (NIO), ORBIS International and Sight Savers International in 2003, the country presently has about 141 hospitals providing eye care services that include service provision or deemed to have potentials in terms of strategic location and infrastructure for developing eye care services. Of the total hospitals, 71 hospitals representing 50% are from the government, 56 representing 40% from the NGOs and 14 from the private sector representing 10%. The mentioned hospitals include 20 medical colleges, 65 government district hospitals, 53 NGO secondary eye hospitals and 8 private (for profit) hospitals/clinics and 5 tertiary hospitals. Two of the tertiary hospitals belong to the government and the remaining 3 are in NGO sector, Of the medical colleges, 14 are in the government and 6 in the private sector.

There are about 700 ophthalmologists and about 618 Mid Level Eye Care Personnel in the country 70% of the all eye surgeries in Bangladesh4 are cataract surgeries. The productivity of ophthalmologists is affected by the limited availability of ophthalmic nurses and paramedics. There are only about 2,822 hospital beds available for eye patients in the entire country. Facilities at all levels have inadequate ophthalmic equipment and supplies, and often, the existing equipment is non-operational due to inadequate maintenance procedures and/or lack of trained people who can repair ophthalmic equipment.

Eye care services are virtually non-existing at rural community level. Eye care is provided mostly in secondary level hospitals located in the district towns. However, the eye department of the district (government) general hospitals, in most cases, is not equipped with essential diagnostic and microsurgical equipment and adequate human resources, Recently, government has provided equipment for all district hospitals that include one set of slit lamp microscope, one

set of ophthalmic operating microscope, one set of direct ophthalmoscope with spare bulb and 2 sets of instruments for cataract surgery. The government has also arranged for availability of either one senior or junior consultant (eye) for 65 district hospitals. Separate OT arrangement for eye surgeries also been made in these hospitals. So it is expected that all district hospitals from now onwards will be able to provide eye care services.50 upazila hospitals have junior consultant post District hospitals act as secondary referral centre and linked with upazila and below through existing PHC structures. To promote access to primary health care including eye health for the poor government has established community clinics :1 for 6000 population at the village level. Five thousand (5000) primary health care workers have been trained on primary eye care. MSR support provided to District hospitals having cataract surgical teams. Vouchering scheme for IOL (Cash support to poor patients) surgery in District of Manikganj introduced & sustained. Development, Sharing & introduction of monthly & annual reporting format for strengthening of MIS eye health. Cataract Surgical Rate (CSR) increased from 957 (2005) to 1146 in 2009 (population 140 million).

There are a few NGO eye hospitals and private for-profit eye clinics in some old / large district towns but they do not provide sub-specialty care. There are tertiary level government & NGO facilities only in Dhaka & Chittagong which provides sub specialty eye care. The NGO facilities charge a modest or subsidized fee for services. Thus their fee structures and charity motives allow some poor patients in seeking NGO services. Majority population con not afford to pay for private services. District level services include refraction, cataract surgery, treatment of corneal ulcer, treatment of ocular injury and medical treatment of glaucoma. A large number of ophthalmologists are working in the larger tertiary level government & NGO facilities and a few NGO facilities in Dhaka & Chittagong. Services in tertiary facilities include all the district level services and surgical treatment of glaucoma and YAG laser treatment.

There are 4 eye hospitals in the country where a full-fledged pediatric ophthalmic unit has been established. Two eye hospitals have established corneal sub-specialty unit; and only two eye banks are functioning in limited scale. Six vitreo retinal units exist in the country. The development of sub speciality in eye care is gradually picking up which need to be augmented both in Government and Non-Government sector.

1.9.2.3 Program for the Control of Blindness

In Bangladesh, considerable steps have been taken in the last planning period to develop and promote Vision 2020 at the national level. Vision 2020 was officially launched in Bangladesh in 2000 Many of the activities of Vision 2020 have been included within the National Health, Nutrition and Population Sector Program (HNPSP), Planned for July 2003 – June 2006; such as comprehensive district level eye care program run by some NGOs.

1.9.2.4 Vision 2020 disease priorities in Bangladesh :

There are many blinding conditions in the country. However, four key blinding diseases have been identified as priorities cataract, childhood blindness, refractive errors and low vision. The other blinding diseases include: corneal diseases, glaucoma, ocular trauma and diabetic retinopathy.

Cataract

Cataract remains the major cause of avoidable blindness in Bangladesh. The national prevalence survey reveals that there are 4,200 cataract cases per million population and an incidence rate of 840 per million, Current CSR in Bangladesh is considerably below the required level to even manage the incidence. Good quality cataract surgery is essential, not only in terms of benefits to the individual patient, but to increase the uptake of cataract surgery. The cataract surgical rate should be increased to at least 1,500/million population to deal with annual incidence only.

There are 550.000 cataract blind in Bangladesh which can easily be treated with available technology. Implantation of Intra Ocular Lens (IOL) is the best procedure for restoration of sight of a cataract blind person. This requires substantial increase in the CSR to 1500-2000 from existing rate of 957 in next few years. For elimination of cataract backlog a CSR of between 2000 – 2500 is required where as in order to bring cataract blindness under control a CSR between 2500-3000 would be necessary.

Despite the increased cataract surgical intervention the following issues remain:

I. The proportion of IOL surgery is only around 59% across the country. Dhaka and Rajshahi divisions accounted for the major (65%) contribution, while Barisal has the least (less than 1%) followed by Khulna (6.6%).

II. The quality of cataract surgery has to be measured by long-term post-operative visual acuity, which requires significant improvement with regard to the use of technology. Some of this would be addressed by switching over to the IOL surgery there by reducing the need for refractive correction. There is also a need for follow-up for reducing post-operative complications and measuring outcome of the surgery to monitor quality of restored sight. For this standard protocol for service delivery and monitoring quality needs to be developed and agreed by the ophthalmic profession and eye care providers for putting this in to practice. There are several dimensions to these issues:

a) Geographic Coverage: This has very wide variation within the country between various divisions. There is almost 3-fold difference with Sylhet performing over 1,300 surgeries per million populations while the rate in Barisal is slightly higher than 500.

b) Socio-economic: There is a bias for the urban, since, eye care infrastructure is mostly urban based, hence literate and financially affluent population are getting a better coverage of cataract services than the others.

c) Gender Issues: The female and male population ratio is almost 50:50 and it is estimated that the prevalence of cataract amongst both the groups is same. Different service delivery studies conforms that the majority of the female population due to various socio-economic factors do not equally receive the services. Hence, emphasis should be given to the female population to reduce the gaps.

- **Refractive error and low vision**

Refractive errors and low vision, in the past, have not been recognized as significant causes of blindness. The national prevalence survey reveals that the number of refractive errors cases in Bangladesh is 27,250 adults and 9,925 children per million of population. It means there are estimated 3.3 million adult refractive error cases with<6/12 VA and 1.3 Million children

refractive error cases with <6/18 VA. In addition there are 1,950 adults and estimated 120 children, per million of population, that would be expected to benefit from low vision service.

In addition, the total number of population at the age of 40 needs refractive error correction for near works. Refractive error & low vision should be given utmost importance especially for children because delayed intervention can lead them to blindness. However, some of the challenges to address this issue include the lack of adequately trained human resources, availability of glasses and provision of accessible and affordable services. In specific terms, training of Medical Officers of Upazila level in basic ophthalmology especially in refraction, introduction of optometry course in the country, training opportunity for the opticians, and providing incentive to the private sector so that glasses can be made available and accessible at affordable price especially in rural areas need to be organized.

People with permanent low vision who are not treatable with conventional refraction services are referred as low vision patients. Low vision remains a major challenge with even ophthalmic personnel having a low awareness of this condition. The centres that provide low vision services in the country are only few. The capacity to provide service is far less than the potential need.

- **Childhood Blindness**

Childhood blindness is relatively complex and demanding area of work. Though the overall numbers of blind children are low compared to adults, in terms of blindness years, it is second only to cataract. Over the past few years quite a lot of effort has gone into enhancing under standing of this key disease area.

The Childhood Blindness Study in Bangladesh revealed that 31% of the blindness was due to problem with the lens (cataract), and 27% of the blindness was due to problems in the cornea (Vitamin a deficiency). Including glaucoma (4%) and aphakia (5%), 67% of the childhood blindness is thus avoidable (preventable or treatable). The study also found that 90% of the childhood blindness was developed within first 5 years of life. The study indicated that an estimated 40,000 children are blind in Bangladesh.

The national workshop on childhood blindness in 2003 recommended that planning for the control of blindness in children should be based on catchment population of 10 million, rather

than 1 million used for planning control of blindness in adults. A total of 16 pediatric ophthalmology centers need to be established by 2010 out of existing 4. Teams of pediatric ophthalmology need to be developed at different levels with different skills mix. There are needs for countinuing Vitamin A supplementation and its augmentation with pregnant and lactating mothers and in pockets of under performance. Inclusive education of children who are blind or visually impaired needs to be expanded. Most importantly, primary eye care needs to be incorporated in the primary health care system and the identified barriers in availing services need to be removed.

- **Corneal Disease & Ocular Trauma:**

The main area of concern is corneal infections arising out of trauma or other infectious reasons, The issues relate to ensuring that the patient engages in right health behaviour when in need, as well as, to ensure that the providers have skills for making the right diagnosis and the required infrastructure to aid diagnosis and treatment. A lot of the corneal injures happen in the rural areas during peak harvesting seasons i,e; trauma by paddy grains and leaves. Often such injuries are minor when they happen and there is a tendency to ignore it or resort to local harmful practices that invariably lead to the formation of untreatable corneal ulcers. Other important causes of corneal injuries are road traffic accident, social and political violence, industrial hazards, etc. Most of the eye care institutions/facilities are not equipped with appropriate diagnostic and surgical equipment and basic laboratory facilities to identify the organism that causes the corneal infections. Thus there is a need to work both at the community level for prevention of eye injuries and ulcer and at the institutional level for developing skilled manpower and appropriate equipment facilities.

For more advanced cases of corneal infections which have lead to corneal opacity, the only intervention often require is corneal transplantation. Although, there is no specific information on how many corneal patients require corneal transplantation in the country, however, it is evident from hospital based statistics that a huge number of corneal opacity cases require cornea transplantation. The current number of cornea collection in the country is very minimumcompared to the need and not more than 200 corneas per year2. It would be an important step to establish a base line data both in terms of current backlog as well as the new

cases that would require corneal transplant. Thus, there is a strong need of establishment of modern eye banking programs in the country.

Nutritional and infective causes of corneal blindness may be reduced through strengthening vitamin A supplementation. Integration of the primary eye care into the primary health care may control the problem of corneal blindness especially in children to a very major extent.

- **Glaucoma**

Glaucoma affects a significant number of people and is one of the leading causes for permanent blindness. According to the Bangladesh National Blindness and Low Vision Survey 1.2% of all adult blindness is due to glaucoma. In general, more people are affected by glaucoma than the number of actual glaucoma blind.

In a population based epidemiological survey on glaucoma among Bangladeshi adults 3, it was found that 2.8% of the population aged 35 years and above were suffering from open angle glaucoma and another 11.2% were glaucoma suspect. Thus, in Bangladesh there are about one million people having open angle glaucoma.

Management of glaucoma is different than any other eye conditions in terms of complex nature of diagnosis and follow up for long period. Currently, only few eye centres have the appropriate technology and trained human resources to diagnose and treat glaucoma patients. One of the immediate steps that can be taken is to ensure that all the eye care providers are encouraged to have in place a process to examine all the patients who come into the system either in the hospital or in out reach programs for glaucoma screening and initiate necessary treatment or referral. This can help prepare community to become more aware of the disease and the treatment options.

Strategies to improve diagnostic skills through instrumentation and training, opportunistic screening and improvements in surgical skills and research in newer and safer medications can help address the issue of glaucoma.

- **Diabetic Retinopathy**

This is an emerging problem and is likely to get compounded by changing life styles and ageing of the population. The prevalence of diabetic retinopathy among the diabetic patient is 27%. If the condition is diagnosed and treatment initiated early; it can prevent blindness. Available technology with laser treatment can easily help preventing this blinding disease.

The current capacity in the country to diagnose and treat diabetic retinopathy is very limited to few centres only to deal with this huge burden. Therefore, there is a strong need to enhance and develop the capacity for early detection and treatment of diabetic retinopathy.

Chapter 2
Literature Review

2.1 Awareness of Eye Diseases in an Urban Population in Southern India.

A research was conducted by Dandona*et al*. in 1993 to assess the level of awareness of eye diseases in the urban population of Hyderabad in southern India. A total of 2522 subjects of all ages, who were representative of the Hyderabad population, participated in the population-based Andhra Pradesh Eye Disease Study. Of these subjects, 1859 aged >15 years responded to a structured questionnaire on cataract, glaucoma, night blindness and diabetic retinopathy to trained field investigators. Having heard of the eye disease in question was defined as ‘‘awareness’’ and having some understanding of the eye disease was defined as ‘‘knowledge’’. Awareness of cataract (69.8%) and night blindness (60.0%) was moderate but that of diabetic retinopathy (27.0%) was low, while that of glaucoma (2.3%) was very poor. Knowledge of all the eye diseases assessed was poor. Subjects aged 5-30 years were significantly more aware of all eye diseases assessed except night blindness. Multivariate analysis revealed that women were significantly less aware of night blindness. Education played a significant role in awareness of these eye diseases. Study subjects of upper socioeconomic status were significantly more aware of night blindness and those belonging to upper and middle socioeconomic status were significantly more aware of diabetic retinopathy. Muslims were significantly more aware of cataract and less aware of night blindness. The major source of awareness of the eye diseases was a family member/friend/relative suffering from that eye disease. These data suggest that there is a need for health education in this Indian population to increase their level of awareness and knowledge of common eye diseases. Such awareness and knowledge could lead to better understanding and acceptance of the importance of routine eye examinations for the early detection and treatment of eye diseases, thereby reducing visual impairment in this population (Dandona*et al*., 1993).

2.2 Awareness of diabetic eye disease among general practitioners and diabetic patients in Yangon, Myanmar.

A cross sectional study was conducted by Dr James Muecke, *et al.* in2008 to evaluate the awareness of diabetes-related eye disease among GPs and diabetic patients in Yangon, Myanmar. From the Myanmar Medical Association Registry of 978 practicing GPs in Yangon, 200 were randomly selected and a structured questionnaire was sent to each. Each GP was asked to give a separate questionnaire to the first five diabetic patients who attended their practice.One hundred

GPs and 480 patients returned the questionnaires. Although 99% of GPs were aware that diabetes could result in loss of vision, 49% never examined the fundi of their diabetic patients. Of the diabetic patients, 86% were aware that diabetes could damage their eyesight. Although 92% realized they should visit an ophthalmologist regularly, only 57% had seen an ophthalmologist. Patients who never attended school were less likely to visit an ophthalmologist than those with tertiary education (odds ratio 0.24; 95% confidence interval 0.09, 0.66). Patients with diabetes for less than 2 years were less likely to visit an ophthalmologist than those with diabetes for more than 10 years (odds ratio 0.21; 95% confidence interval 0.9, 0.44). There was no association between age, gender or work status and the likelihood of having seen an ophthalmologist. However the conclusions is there exists a need for programmes in Myanmar to induce a behavioural change in diabetic patients with regards to screening examinations. (Dr James Muecke, 2008)

2.3 Knowledge and Awareness of Diabetic Retinopathy amongst Diabetic Patients in Kenyatta National Hospital, Kenya.

The study was conducted by Mwangi and Githinji in 2011 was to find out the knowledge and awareness of diabetic retinopathy among diabetic patients at Kenyatta National Hospital, Diabetic clinic. Diabetic retinopathy usually occurs due to poor of management of diabetes mellitus and lack of knowledge on the complications of diabetes mellitus. Patients were randomly selected and requested to fill questionnaires and for those who were not in a position to fill due to illiteracy or visual disability, the researcher filled the questionnaire for them. Regarding to knowledge and awareness, 83% of the respondents had heard of diabetic eye disease (DED), 60% of those who had heard of DED, knew the relationship between DED and diabetes. Fifty percent of all the respondents went for eye checkups. The results suggest that there is general awareness of diabetic retinopathy amongst a majority of patients (83%); however the results concluded that there is need to increasing awareness amongst diabetic patient (Mwangi and Githinji, 2011)

2.4 Health Literacy of Common Ocular Diseases in Nepal.

Poor health literacy is often a key cause of lack of or delayed uptake of health care services. To assess the health literacy of common ocular diseases, namely cataract, glaucoma, night blindness,

trachoma and diabetic retinopathy in Nepal a cross sectional study was conducted by Shrestha*et al*. in 2014. 1741 participants randomly selected from non-triaged attendants in the outpatient queue at Tilganga Institute of Ophthalmology, a semi urban general population of Bhaktapur district of Kathmandu Valley and patients attending rural outreach clinics. Participants responded to trained enumerators using verbally administered, semi structured questionnaires on their awareness and knowledge of cataract, glaucoma, diabetic retinopathy, night blindness, and trachoma. The awareness of cataract across the entire sample was 49.6%, night blindness was 48.3%, diabetic retinopathy was 29%, glaucoma was 21.3% and trachoma was 6.1%. Patients presenting to rural outreach clinics had poorer awareness of cataract, glaucoma, diabetic retinopathy, night blindness and trachoma compared to those from a semi-urban community and an urban eye hospital , Old age was directly associated with poorer awareness of cataract, glaucoma, night blindness, trachoma and diabetic retinopathy. Female gender was associated with lower awareness of cataract, glaucoma, night blindness and trachoma. Literacy was associated with greater awareness of cataract, glaucoma, diabetic retinopathy, night blindness and trachoma. Higher education was significantly associated with greater awareness of cataract, night blindness and trachoma. Multivariate analysis found that the awareness of common ocular diseases was significantly associated with level of education. Similarly, awareness of cataract, glaucoma, trachoma and night blindness was associated with female gender whereas awareness of cataract, night blindness, trachoma and diabetic retinopathy was associated with age but the awareness glaucoma and diabetic retinopathy was associated with camps. The conclusions that were drawn up from the study was that low awareness of common ocular conditions is associated with factors such as female gender, old age, lower levels of education and rural habitation (Shrestha*et al*., 2014).

2.5 Awareness, Knowledge, and Practice: A survey of Glaucoma in North Indian Rural Residents.

Studies done on the prevalence of glaucoma have reported a high proportion of undiagnosed patients. Late diagnosis is related to increased risk of glaucoma associated with visual disability. Lack of awareness and non-availability of appropriate screening procedures are among the major reasons for non-diagnosis or late diagnosis of glaucoma. The study had been undertaken by Rewri and Kakkar in 2014 to evaluate the level of awareness about glaucoma among the North

Indian rural population. A groupadministered, questionnaire-based survey, involving 5000 rural residents (aged 20 and above) was conducted through random sampling. The questionnaire was structured to evaluate the level of awareness and knowledge about glaucoma and the effect of gender, education status, and glaucoma diagnosis was also studied. The source of awarenessabout glaucoma was also questioned. Of the 5000 individuals enrolled for the survey, responses from 4927 (98.5%) participants, including 3104 males (63%) and 1823 females (37%) were evaluated. A total of 409 (~8.3%) respondents were aware about glaucoma and only 93 (1.89%) were qualified as having knowledge about glaucoma as per the set questionnaire. Education was the only variable significantly correlated with the awareness and knowledge of glaucoma out of the parameters included in this study. Close acquaintance with a glaucoma patient was the most common source of information (Rewri and Kakkar, 2014).

2.6 Awareness and Knowledge of Common Eye Diseases among the Academic Staff (Non-Medical Faculties) of University of Malaya.

A cross sectional study was conducted by Chew, Reddy and Karina in 2004 to assess the level of awareness and knowledge of common eye diseases (cataract, glaucoma, diabetic retinopathy and refractive errors) among 473 academic staff (non-medical faculties) of University Malaya. The awareness of cataract was in 88.2%, diabetic retinopathy in 83.5%, refractive errors in 75.3% and glaucoma in 71.5% of the study population. The knowledge about the entire above common eye diseases was moderate, except presbyopia which was poor. Multivariate analysis revealed that females, older people, and those having family history of eye diseases were significantly more aware and more knowledgeable about the eye diseases. Health education about eye diseases would be beneficial to seek early treatment and prevent visual impairment in the society (Chew,Reddy and Karina, 2004).

2.7 Awareness of Eye Complications and Prevalence of Retinopathy in the First Visit to Eye Clinic among Type 2 Diabetic Patients.

A study was conducted in 2011 by Tajunisah, Wong and Tan to assess the awareness of eye complications and the prevalence of retinopathy, in the first visit to eye clinic, among type 2 diabetic patients attending a tertiary medical center in Kuala Lumpur, Malaysia. An investigator-administered questionnaire was given to 137 patients with diabetes undergoing first time eye

screening in the eye clinic. This was followed by a detailed fundus examination by a senior ophthalmologist to assess for presence of retinopathy. Almost 86% of respondents were aware of diabetic eye complications, especially in patients who had achieved tertiary educational level (96.3%). The majority of the patients (78.8%) were referred by their physicians and only 20.4% came on their own initiative. Many of the patients (43.8%) did not know how frequent they should go for an eye check-up and 72.3% did not know what treatments were available. Lack of understanding on diabetic eye diseases (68.6%) was the main barrier for most patients for not coming for eye screening earlier. Despite a high level of awareness, only 21.9% had recorded HbA1c level of <6.5% while 31.4% were under the erroneous assumption of having a good blood sugar control. A total of 29.2% had diabetic retinopathy in their first visit eye testing (Tajunisah, Wong and Tan, 2011).

2.8 Pattern of Eye Diseases in a Tertiary Hospital in a Suburban Area: A Retrospective Study.

A retrospective study by Murad*et al*. in 2007 carried out in ophthalmology department of International Medical College & Hospital, Gushlia, Tongi, Gazipur for the period of one year from 1st July 2005 to 30th June 2006. Among one thousand seven hundred fifty (n=1750) human subject those who were attended to eye out patient department. This study was carried out to assess the epidemiology of ophthalmology patient served by International Medical College & Hospital (tertiary hospital) in a suburban industrial area. In this retrospective study, total sample size was 1750. Among them male were 52% and female were 48%. The conjunctivitis was 21.94%, Cataract 9.2%, Refractory error 15.2%, Headache 11.09%, Dacryocystitis 6.51% and Blepharitis 3.2% (Murad*etal*., 2007).

2.9 Awareness and Knowledge of Poor Vision among Students in Taif University.

The objective of the study was to assess the level of awareness and knowledge of problem of poor vision in Taif city among the Taif University students. The study was conducted by AbdulhamidAlghadmdi in 2011 with a total of 1132 students were randomly chosen from all colleges of the university to participate in the study. They were 686 males and 446 females, 41.2% of them are students in colleges for medical and none medical sciences and the rest were students in the rest of colleges of Taif University. The participants were good representatives of

the whole university students. They responded to a structured questionnaire on poor vision to trained field investigators (fifth year medical students). Having heard of the eye disease in question was defined as “awareness’ and having some understanding of the eye disease was defined as “knowledge”. Awareness of poor vision (~90%) was good. Knowledge of all the eye diseases assessed was ~70%. Students in colleges of sciences were significantly more aware of the poor vision problem than students from the other colleges. ~35% of female students and 30% of male students answered don’t know when they asked about knowing about poor vision. There is a little difference in knowledge about poor vision among students in different academic years, being more in the last years than in the early years of academic years. The major source of awareness of poor vision was a family member, of the eye diseases was a family member/friend/relative suffering from that eye disease. These data indicated that knowledge of poor vision and its cause and possible prevention is unsatisfactory, and the available data suggest that there was a need for health education in this population to increase their level of awareness and knowledge of common eye diseases. Such awareness and knowledge could lead to better understanding and acceptance of the importance of routine eye examinations for the early detection and treatment of eye diseases, thereby reducing visual impairment in this population (Alghadmdi, 2011).

2.10 Determinants of Glaucoma Awareness and Knowledge in Urban Chennai.

A study was conducted by Ronnie *et al.* in 2009 to assess the awareness and knowledge levels about glaucoma and its determinants in an urban population of Chennai in sout India. Chennai glaucoma study (CGS) was a population based prevalence study to estimate the prevalence of glaucoma in a rural and urban south Indian population. A total of 3850 subjects aged 40 years or above participated in the urban arm of CGS. A systematic random sample of 1926 (50.0%) subjects completed a questionnaire that assesses their awareness and knowledge level of glaucoma. Respondents “having heard of glaucoma” even before they were contacted/recruited for the study were defined as "aware" and respondents having some understanding of the eye disease were defined as "knowledgeable". The results showed that overall 13.5% were aware of glaucoma; the age-gender adjusted rate for awareness was 13.3%. Two clinicians graded knowledge on glaucoma, based on the subject’s knowledge of risk factors, definitions and treatmen aspects of glaucoma. Overall 8.7% had some knowledge about glaucoma. Among those

who had knowledge 0.5% had good knowledge about glaucoma, 4% had fair knowledge and 4.2% had poor knowledge. It was observed that a very good agreement between the clinicians in grading knowledge. Determinants of glaucoma awareness and knowledge were higher levels of education, females, age, religion and family history of glaucoma. The concluded form of study was that Awareness and knowledge about glaucoma was very low among the urban population of Chennai. It was found that younger subjects and men were less aware of glaucoma. Subjects with lower levels of education were less aware and knew less about glaucoma than their counterparts. The study findings stress the need for health education for effective prevention of blindness due to glaucoma (Ronnie *et al.*, 2009).

2.11 Factors Associated with Awareness, Attitudes and Practices Regarding Common Eye Diseases in the General Population in a Rural District in Bangladesh: The Bangladesh Population-based Diabetes and Eye Study (BPDES).

To assess the awareness, attitudes and practices associated with common eye diseases and eye care utilization in a rural district of Bangladesh a study was conducted by Islam *et al*. and published in 2015. Data were collected using a multilevel cluster random sampling technique from 3104 adults aged 30 years from the Banshgram union with a questionnaire assessing the awareness, attitudes and practice about diabetes and common eye diseases, educational attainment, socio-economic status, and medical history. Participants were aged between 30 and 89 years with a mean (SD) age of 51 (12) years and 65% were female. The majority of participants had heard of cataracts (90%), trachoma (86%) and Night blindness (84%), yet only 4% had heard of diabetic retinopathy (DR), 7% of glaucoma and 8% of Age-related macular degeneration (AMD). However, 58% of participants did not know vision loss could be prevented. Factors associated with lower awareness regarding common eye diseases were increasing age, lack of formal schooling, and lower socio-economic status. A lower proportion (57%) of people with no schooling compared to those who had attained at least secondary school certificate education (72%) reported that they knew that vision loss could be prevented. Overall 51% of people had heard of at least six (67%) out of nine items relating to awareness of common eye diseases. This included 41% of participants aged 65 years or older compared to 61% of those aged 30–35 years .Only 4% had an eye check at least once a year and higher education and better SES were associated with higher frequency of eye checks. The results showed a large gap

between public awareness and treatment practices about common eye diseases. Public health promotion should be designed t address these knowledge gaps (Islam *et al.*, 2015)

2.12 Knowledge and Awareness of Age Related Eye Disease among People Over 45 Years of Age in Tehran: A Population-Based Survey.

The purpose of the study conducted by Ziaei*et al.* in 2012 was to determine the general population's knowledge and awareness about cataract, glaucoma and diabetic retinopathy (DR) in Tehran, the most populated and capital city of Iran, in order to assess the need for health education programs. This cross-sectional population-based survey was conducted during 2010 and a structured questionnaire was filled by 5 trained interviewers via telephone conversation for non-institutionalized inhabitants aged 45 years. The phone numbers were selected with a systematic random sampling among different regions of the city after providing sampling frame from the telecommunication center. In each house we only enrolled one person according to the scheduled table with defined sex and age groups. Awareness was defined as having heard about each disease and knowledge was acceptable if participants stated at least a short correct related sentence. Of 1, 084 eligible people including 574 women (53%) and 510 men (47%), 957 subjects completed the interview (response rate=88.3%). Among the participants 60.2% believed visual impairment (VI) has high or very high effect on daily performance. On the contrary, 8.4%, 16.2% and 15.1% said that VI has none, little or moderate effect, respectively. The percentage of awareness for glaucoma, cataract and DR were 46.6, 82.9% and 86.2% respectively, and 19.2% and 57.3% had knowledge about glaucoma and cataract. Only 22.6%, 77.2% and 41.6% knew that glaucoma, cataract and DR are treatable. Although the majority of people over 45 years of age in the capital city had heard of cataract and DR, the total knowledge about all assessed diseases and their treatment was insufficient (Ziaei*et al*., 2012)

2.13 A study on the awareness of cataract disease and treatment options in patients who need surgery in a rural area of Eastern China.

A study was conducted by J.B. ZHOU, H.J. GUAN *et al.* in 2008 To investigate the awareness of cataract disease and treatment and to determine the major barriers for patients who need cataract treatment in a rural area of eastern China. METHODS. A total of 251 cataract patients were selected by means of eye disease screenings throughout Jiangyan County. Questionnaires

were administered after the doctor determined that the patient needed cataract surgery. The patient's awareness questionnaire was developed by Fletcher and clinically validated at the Aravind Eye Hospital in India. RESULTS. A total of 89.6% of patients had been aware of their condition for more than 1 year. Only 49.8% of all patients had known for more than 1 year that their eye disease could be treated. The major barriers for those seeking eye treatment included residual functional vision (49.0%), financial problems (36.7%), no demand for the operation (8.8%), and skepticism about the operation (8.8%). Poor vision function grade and female gender were two significant factors associated with a longer awareness (>3 years) of the existence of cataracts. Patients with a history of eye disease and a longer awareness of eye disease were more likely to have known about the potential treatments for a longer period of time (>1 year). CONCLUSIONS. The patients' awareness of the presence of cataract disease and potential treatment were unbalanced. The main treatment barriers were lower demand for vision improvement and financial problems. It is imperative to educate patients on eye health care and to provide low cost, but high quality, cataract surgery to these patients. (Eur J Ophthalmol 2008; 18: 544-50). (J.B. ZHOU, H.J. GUAN, 2008)

2.14 Demographics and awareness of diabetic retinopathy among diabetic patients attending the vitreo-retinal service at a tertiary eye care center in Nepal.

A hospital-based, cross-sectional study was conducted by R THAPA, G PAUDYAL, N MAHARJAN, PS BERNSTEIN *et al.* in 2012 To investigate the demographic characteristics and awareness of diabetic retinopathy among new cases of diabetes mellitus (DM) attending the vitreo-retinal service of a tertiary eye care centre in Nepal.A total of 210 patients with a mean age of 57 ± 10.4 years were included. Brahmins (34.8 %) and Newars (34.3 %) were the predominant ethnic groups. Housewives (38.6 %) and office workers (18.6 %) were the major groups affected. Two-fifths (37 %) of the cases were unaware of DR and its potential for blindness. Awareness was significantly higher among literate patients (P = 0.006). Fundus evaluation was done for the first time in 48.6 %, although almost four-fifths had a duration of diabetes of five years or more. DR was found in 78 % of the cases, with 16.7 % already at the proliferative stage and about 40 % exhibiting clinically significant diabetic macular edema. The conclusion of this study that there is lack of awareness of DR coupled with a high proportion of

cases already at a sight-threatening stage of retinopathy at their first presentation reflects the need for improved awareness programs to reduce the burden of blindness from DR in Nepal.

3.1 Significance of the Study

Asia is the world's largest continent, with more than half of the world's population where Bangladesh is one of the most populated areas in the continent. Up to 20 million Asians are estimated to be blind by the World Health Organization (WHO). In Western populations, the epidemiology of visual impairment and its major causes have been well described, and summarized in a series of meta-analyses. But there is a lacking in similar data for our country (Wong, 2006).

According to the latest assessment, cataract is responsible for 51% of world blindness, which represents about 20 million people. Although cataracts can be surgically removed, in many countries barriers exist that prevent patients to access surgery. Cataract remains the leading cause of blindness. As people in the world live longer, the number of people with cataract is anticipated to grow. Cataract is also an important cause of low vision in both developed and developing countries (WHO, 2016).

There are important differences over the past few decades in diagnosis, medical care, socioeconomic factors and other risk factors that influence the prevalence and geographic distribution of diabetes and retinopathy as well. It is estimated that in 2014 diabetic retinopathy accounted for about 5% of world blindness, representing almost 5 million blind. As the incidence of diabetes gradually increases, there is the possibility that more individuals will suffer from eye complications which, if not properly managed, may lead to permanent eye damage (WHO, 2016).

Glaucoma is one of the leading causes of irreversible blindness in developing nations. It is estimated to be the second most prevalent cause of blindness worldwide after cataract (Fraser et al., 2001), causing a similar magnitude of blindness to that resulting from trachoma. Worldwide, glaucoma is now increasingly recognized as a major cause of ocular morbidity that requires urgent attention. This dreaded eye ailment is referred to as the "sneak thief of sight". It has been

projected that there will be 60.5 million people with open angle glaucoma (OAG) and angle closure glaucoma (ACG) in 2010, increasing to 79.6 million by 2020, and of these, 74% will have OAG. Glaucoma blindness though known to be medically and surgically irremediable, early detection and treatment can prevent progression of the disease. Some 90% of all glaucoma-related blindness could have been prevented with early and proper treatment. Lack of knowledge and wrong attitude to blindness can cause delay in diagnosis and treatment (Quigley et al, 2006).

Globally, night blindness is estimated to affect 5.2 million preschool-age children and 9.8 million pregnant women which correspond to 0.9% and 7.8% of the population at risk of Vitamin A deficiency, respectively. Low serum retinol concentration (<0.70 μmol/l) affects an estimated 190 million preschool-age children and 19.1 million pregnant women globally. This corresponds to 33.3% of the preschool-age population and 15.3% of pregnant women in populations at risk of VAD, globally. The WHO Regions of Africa and South-East Asia were found to be the most affected by vitamin A deficiency for both population groups (WHO, 2016)

3.1.1 Vision 2020 disease priorities in Bangladesh :

There are many blinding conditions in the country. However, four key blinding diseases have been identified as priorities cataract, childhood blindness, refractive errors and low vision. The other blinding diseases include: corneal diseases, glaucoma, ocular trauma and diabetic retinopathy.

There are several studies conducting and ongoing on awareness and knowledge assessment in different countries around the world like India, Iran, Nepal, Kenya, Malaysia, Mayanmar etc. In our knowledge there is a lower number of significant works in our country regarding this topic. One of the major reasons for choosing this topic for the study was to identify the current state of knowledge and awareness of the different types or worker population regarding priority eye diseases in our country. The study is to quantify how much knowledge is among the population therefore calculating measures that should be taken to create mass awareness.

4.1 Aims and Objective of the Study

The aims and objectives of this study were to:

- To assess the awareness and knowledge levels about Cataract, Glaucoma, Night Blindness and Diabetic Retinopathy.
- To assess the awareness, attitudes, and practices associated with common eye diseases and eye care utilization.

Chapter 3
METHODOLOGY

3.1 Type of the Study

It was a survey based study.

3.2 Study Area

The survey was conducted between white collar and blue collar employed populationinside Dhaka City.Blue collar jobs are the jobs whereby the person performing the job does manual labor and gets an hourly wage. The second kind of jobs are the white collar jobs, in which the employee does clerical work and draws a salary at a fixed rate (Sherrie Scott, 2016).

White-Collar Employee

- ✓ Administrative Officer
- ✓ Manager
- ✓ Executive
- ✓ Accountants
- ✓ Bankers
- ✓ Pharmacist
- ✓ Chemist
- ✓ Engineer
- ✓ Architect
- ✓ Businessmen

Blue-Collar Employee

- ✓ Aircraft mechanics
- ✓ Plumbers
- ✓ Electricians
- ✓ Structural worker
- ✓ Manufacturing worker
- ✓ Mining worker
- ✓ Sanitation worker
- ✓ Oil field worker
- ✓ Construction worker

- ✓ Mechanics
- ✓ Maintenance worker
- ✓ Warehousing worker

3.3 Study Population

In this study, a total number of 462 employee from blue collar & white collar were surveyed with a questionnaire in order to assess the awareness and knowledge regarding eye disease (Cataract, Glaucoma, Night Blindness, Diabetic Retinopathy). Informed consent was obtained from the eligible participants before interviewed and participants who agreed to join the study provided the required information for the studies.

3.4 Study Period

The duration of the study was about seven months starting from April to November in 2016.

3.5 Questionnaire Development

The pre-tested questionnaire was specially designed to collect the simple background data and the needed information. The questionnaire was written in simple English in order to avoid unnecessary semantic misunderstanding. The questionnaire was pilot tested to ensure it was understandable by the participants. Extra space was however, allowed after some questions for the participants' comments; and in most cases, these were used as qualifying remarks which aided considerably in giving answers to specific questions and in providing additional information which assisted the interviewers in drawing up conclusions.

3.6 Sampling Technique

In this study purposive sampling technique was followed.

3.7 Data Analysis

After collecting, the data were checked and analyzed with the help of Microsoft Excel 2010. The result was shown in bar, pie and column chart and calculated the percentage of the awareness and disease regarding eye disease among the students.

3.8 Procedure

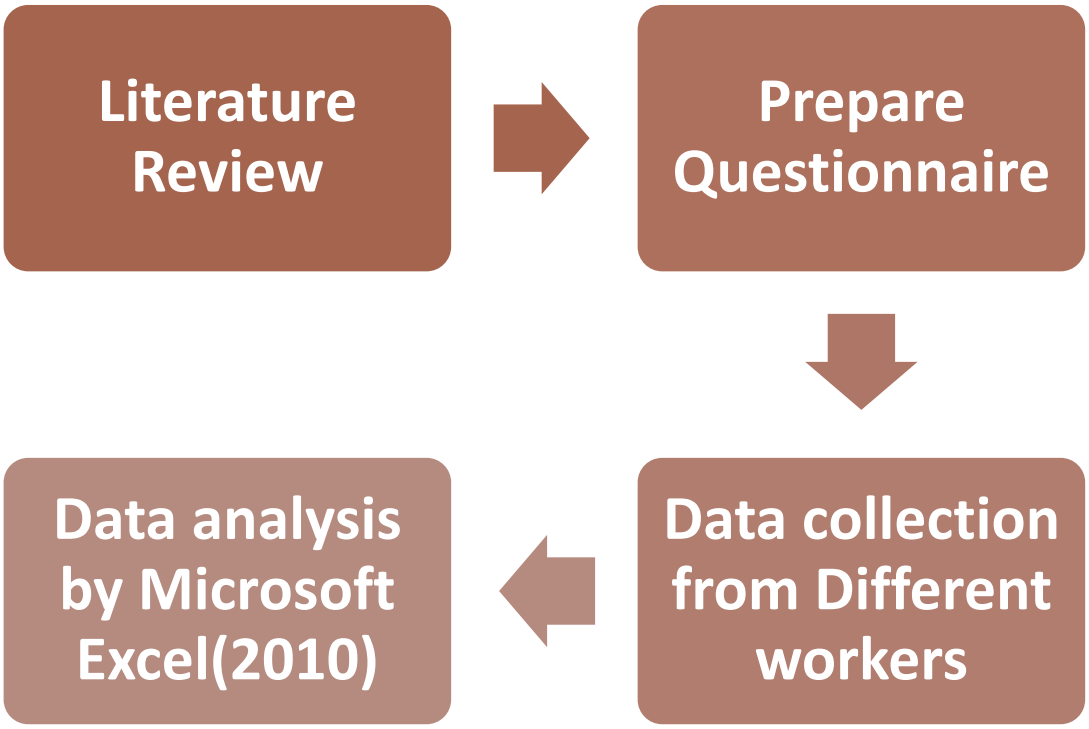


Fig 1.26: Flow Chart of Survey procedure

Chapter 4

Result

4.1 Blue-Collar Worker and White-Collar Worker

In an organization, there can be many groups of workers; that can be distinguished by the color of the dress worn by them. The color of their uniform specifies the job performed by them in the organization. **Blue collar** jobs are the jobs whereby the person performing the job does manual labor and gets an hourly wage. The second kind of jobs are the **white collar** jobs, in which the employee does clerical work and draws a salary at a fixed rate (Shurvi, 2014).

4.1.1 Blue Collar Worker

Blue Collar is a term used for the people of the working class, who performs manual labor for an organization and get paid wages on an hourly basis. The workers are supposed to wear a blue uniform during working hours. The job is highly laborious that requires physical strain, but the workers are not paid well. The clothing of the workers is blue attire, the fact behind using such a color is that if a worker uses light colored clothes he will get soiled easily, and that will appear in his clothes. In blue color, the spots of oil & grease, dirt and dust are not shown so easily, and that helps them to look cleaner. Blue collar jobs do not require very higher education. However, a worker should be skilled enough in a specialized field to perform the work. The jobs may include manufacturing, mining, construction, repairs and maintenance, installation of machinery and so on (Shurvi, 2014).

4.1.2 White Collar Worker

The term white collar refers to the jobs of officials, who performs managerial or professional work for the organization and get a fixed amount of salary as remuneration at the end of each month. The officials are supposed to wear white colored formal clothes, i.e. shirt, trousers, and tie. The employees do not have to perform any manual labor as well as their work is completely knowledge oriented. White collar jobs require high educational qualification, mental sharpness, good knowledge and expertise in a particular area. As the officials work in offices, the place is clean and calm, so their dress code is white formals. The workers of white collar jobs are paid well and the basis of their pay is their performance. The management jobs, engineering, medical and administration jobs are some examples of white collar jobs (Shurvi, 2014).

4.2Employment Status of the Workers

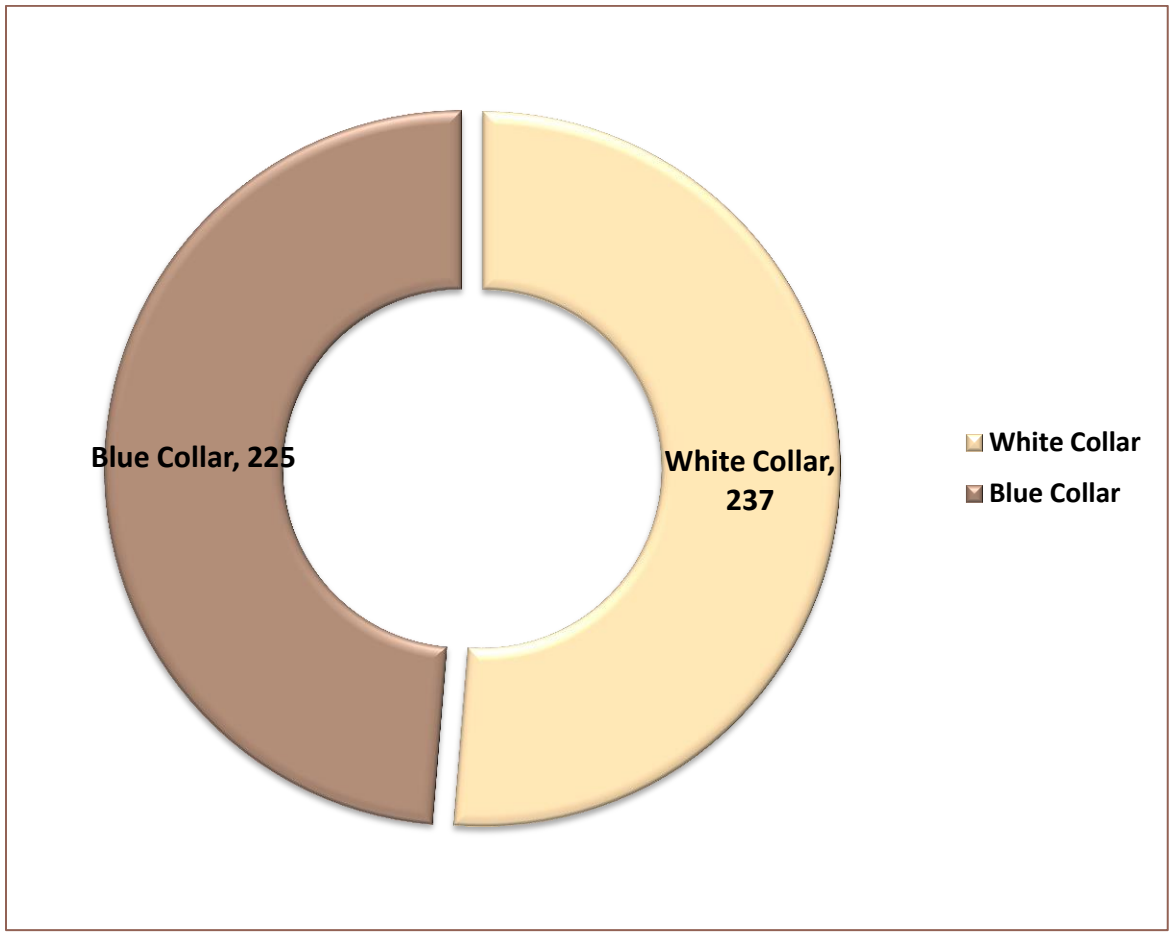


Fig 4.1: Employment Status of the Workers

As the whole research work was conducted onemployed workers. White Collar and Blue Collar workerswere mainly participated in this survey. During this survey **237**White Collar and **225** Blue Collar Workers were participated.

4.3 Age Distribution Amongthe Employee

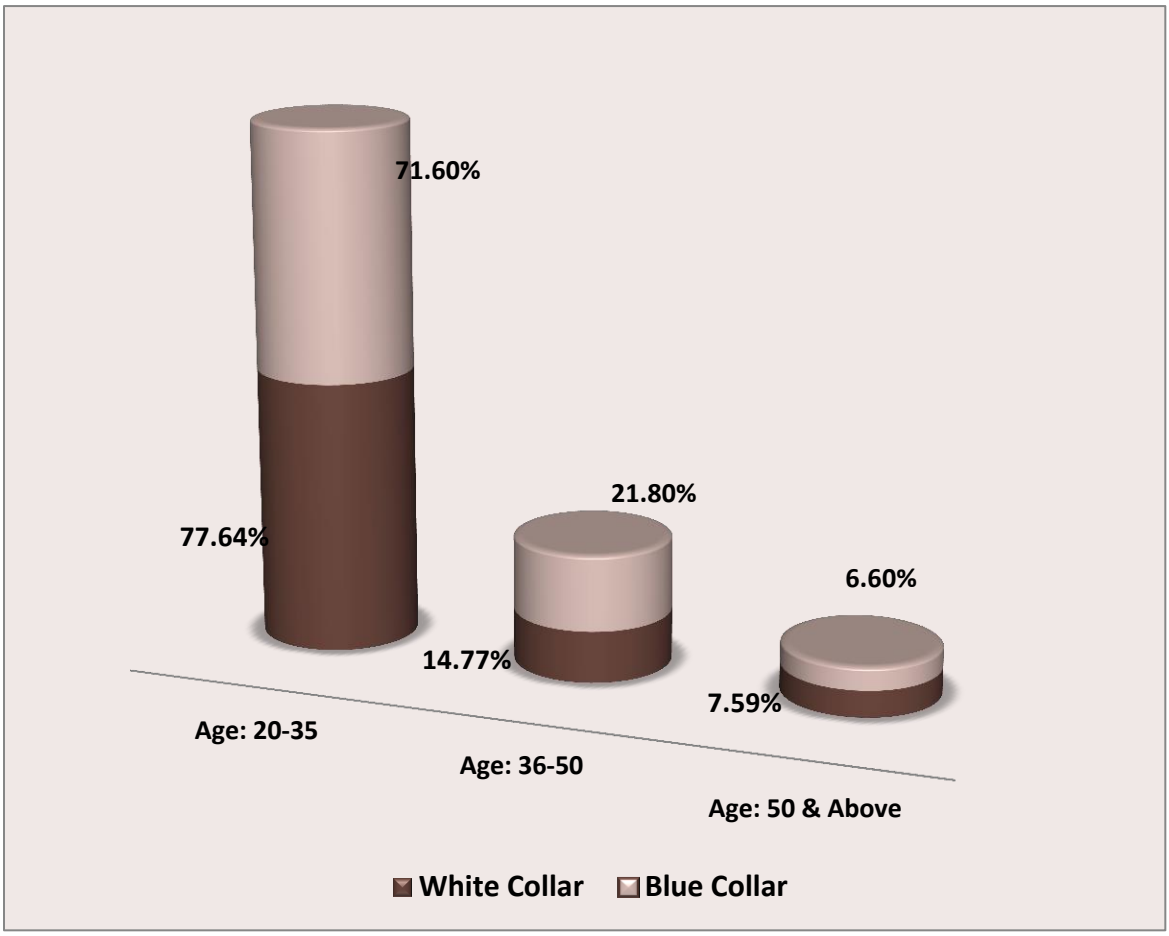


Fig 4.2: Age Distribution of the Workers

During this survey it was found that about 77.64% of white collar &71.6% of blue collar employee were in between 20 to 35 years, whereas, 14.77% of white collar & 21.80% of blue collar employee were in between of 36 to 50 years. However, only 7.49% of white collar &6.60% of blue collar employee were 50 & 50 above years of age.

4.4 Gender Distribution of the Employee

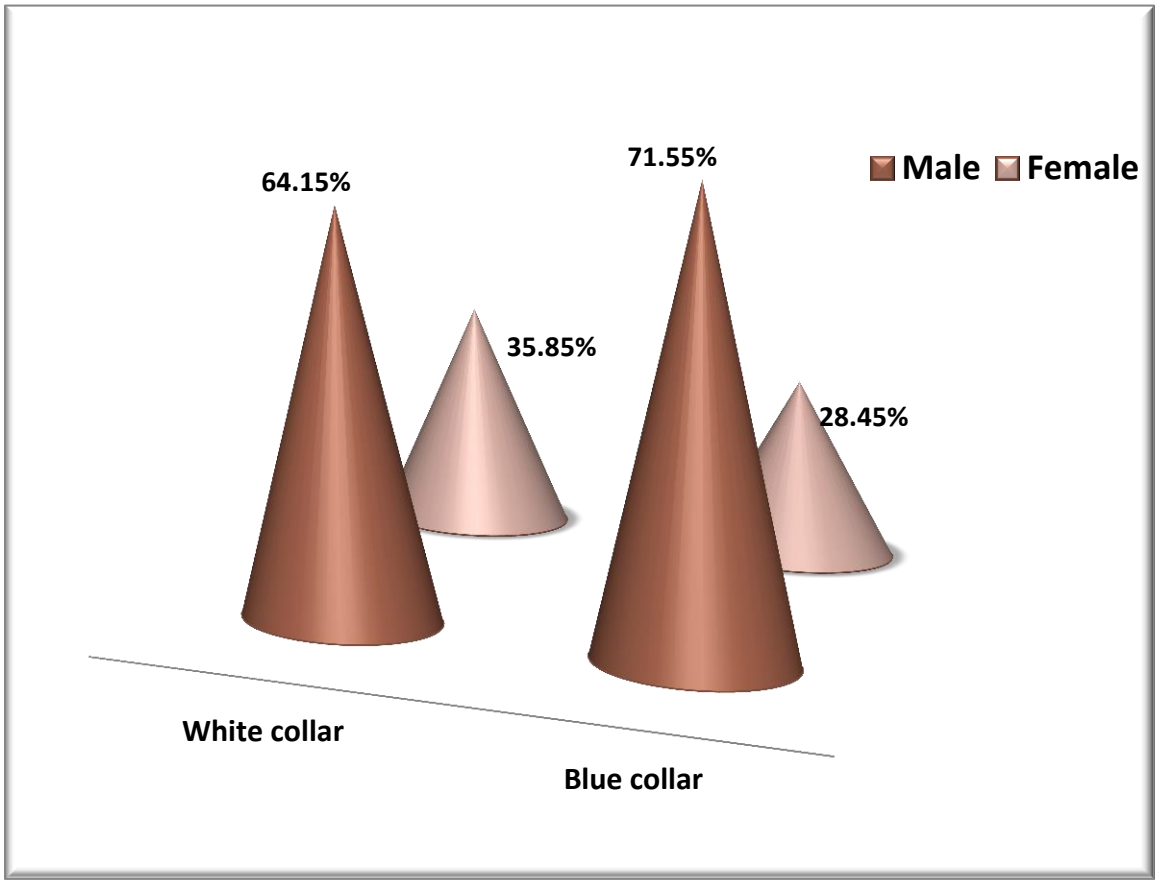


Fig 4.3: Gender Distribution of the Employee

It was observed that major portion of the white & blue collar employees were male (64.15% & 71.55%) On the other hand, 35.85% of white collar & 28.45% of blue collar employee were Female.

4.5 Educational Status of the Employee

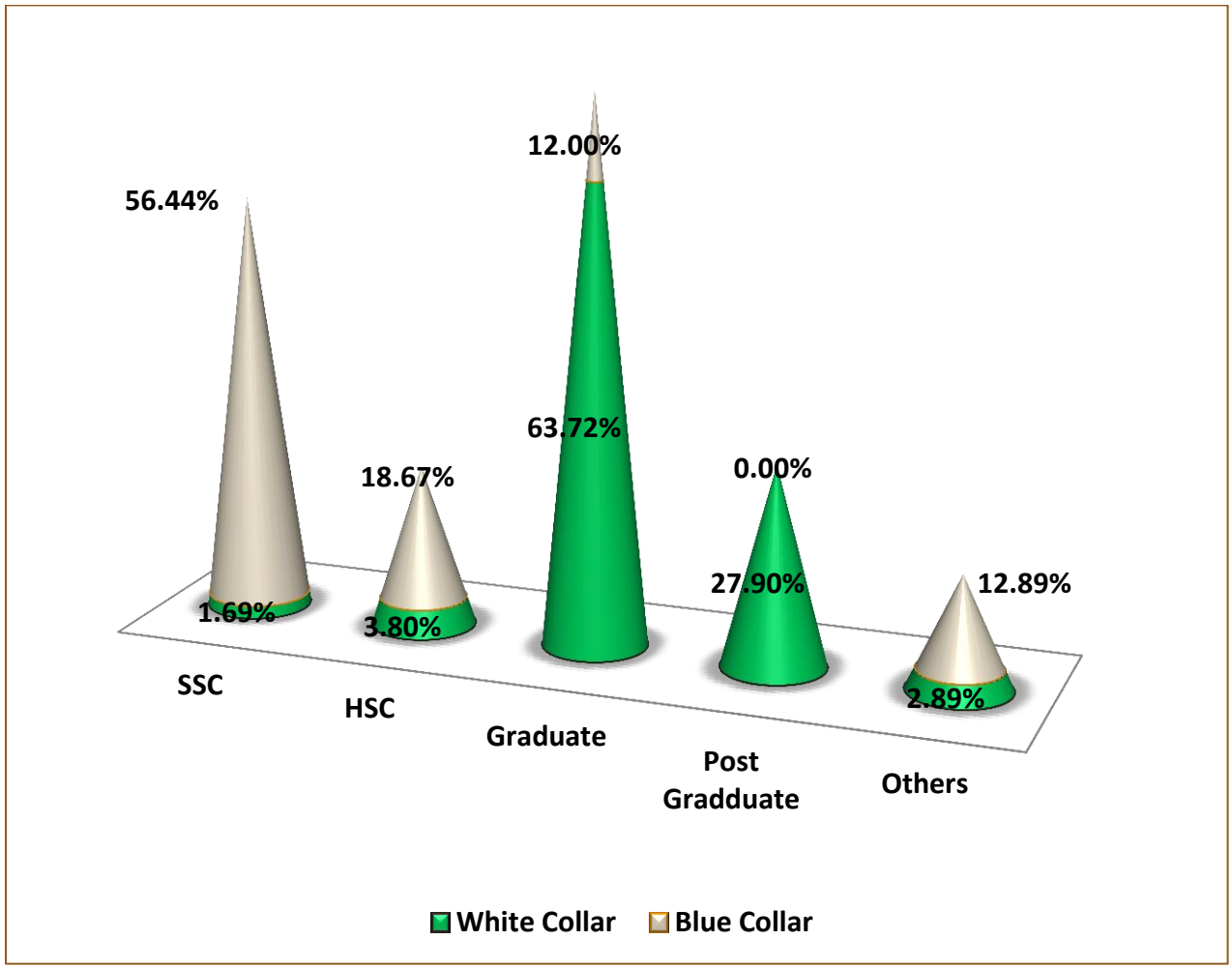


Fig 4.4 Educational Status of the Employee

During this survey it was found that, from the White Collar Employee 63.72% were Graduate, 27.00% were Post graduate, 1.69% were SSC Pass, 3.80% were HSC Pass. Whereas 12.00% of Blue Collar Employee were Graduate. 0.00% were Post graduate. 56.44% SSC Pass. 18.67% were HSC Pass. It was also found 2.89% white collar employee complete their education from some other sources and 12.89% of blue collar employee in our country were from Class 5 to Class 8.

4.6 Socio-Economic Condition of the Employee

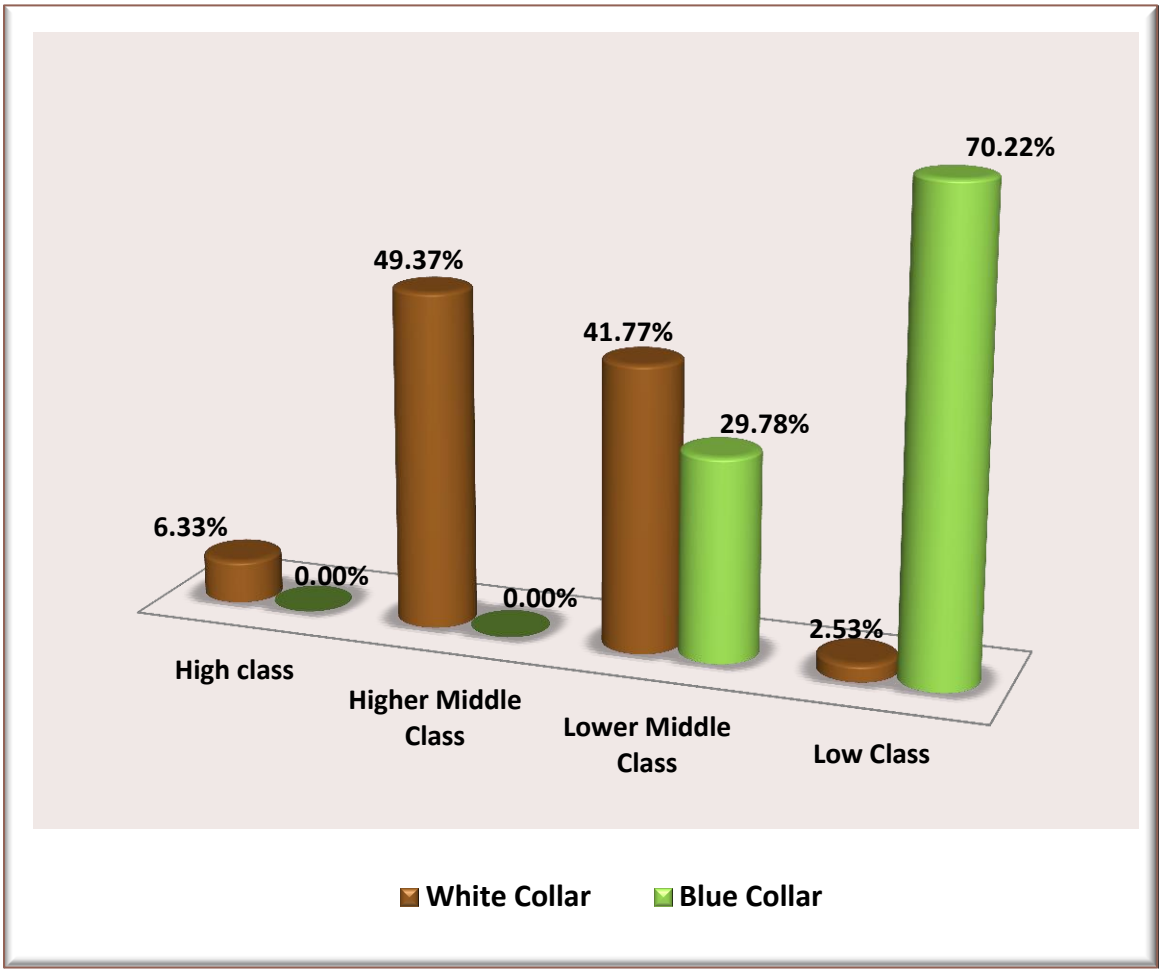


Fig 4.5:Socio-Economic Condition of the Employee

During this survey it was found that only 6.33% White Collar employee were High classand there is no Blue collar employee from high class. Whereas, 49.37% of white collar employee were Higher Middle Class while there is no Blue collar employee from this class also. However 41.77% of white collar & 29.78% of blue collar employee from Lower Middle Class. Whereas, only 2.53% of white collar & 770.22% of blue collar employee ere from Low Class.

4.7 Cataract

4.7.1 Knowledge about Cataract

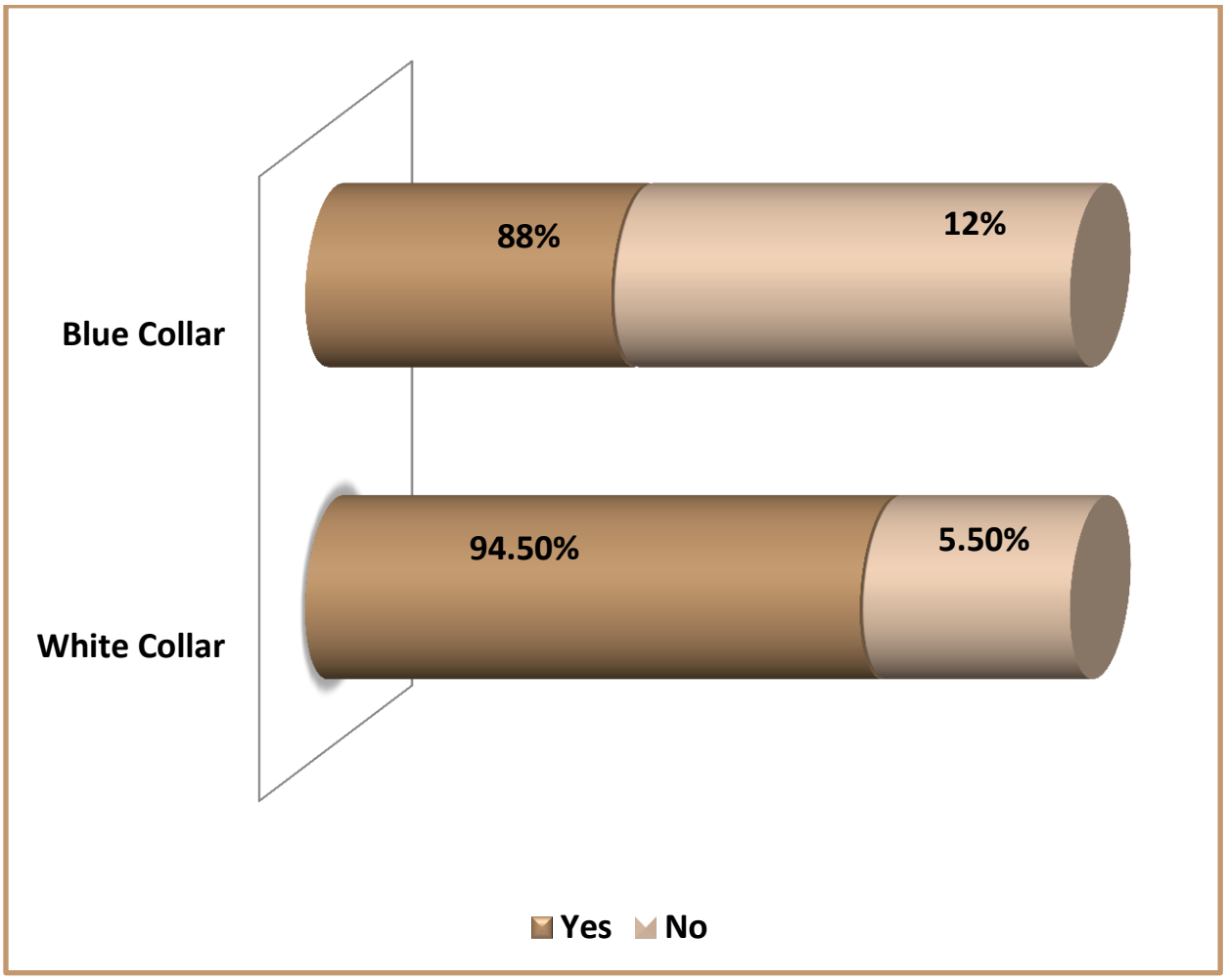


Fig 4.6: Knowledge about Cataract

From the graphical representation above, It was found the, majority of the booth group of employee (94.50% of white collar & 88%of blue collar respectively) answered that they have heard about Cataract and the remaining 5.50% of white collar employee & 12% of blue collar employee answered in the negative.

4.7.2 Knowledge about Definition

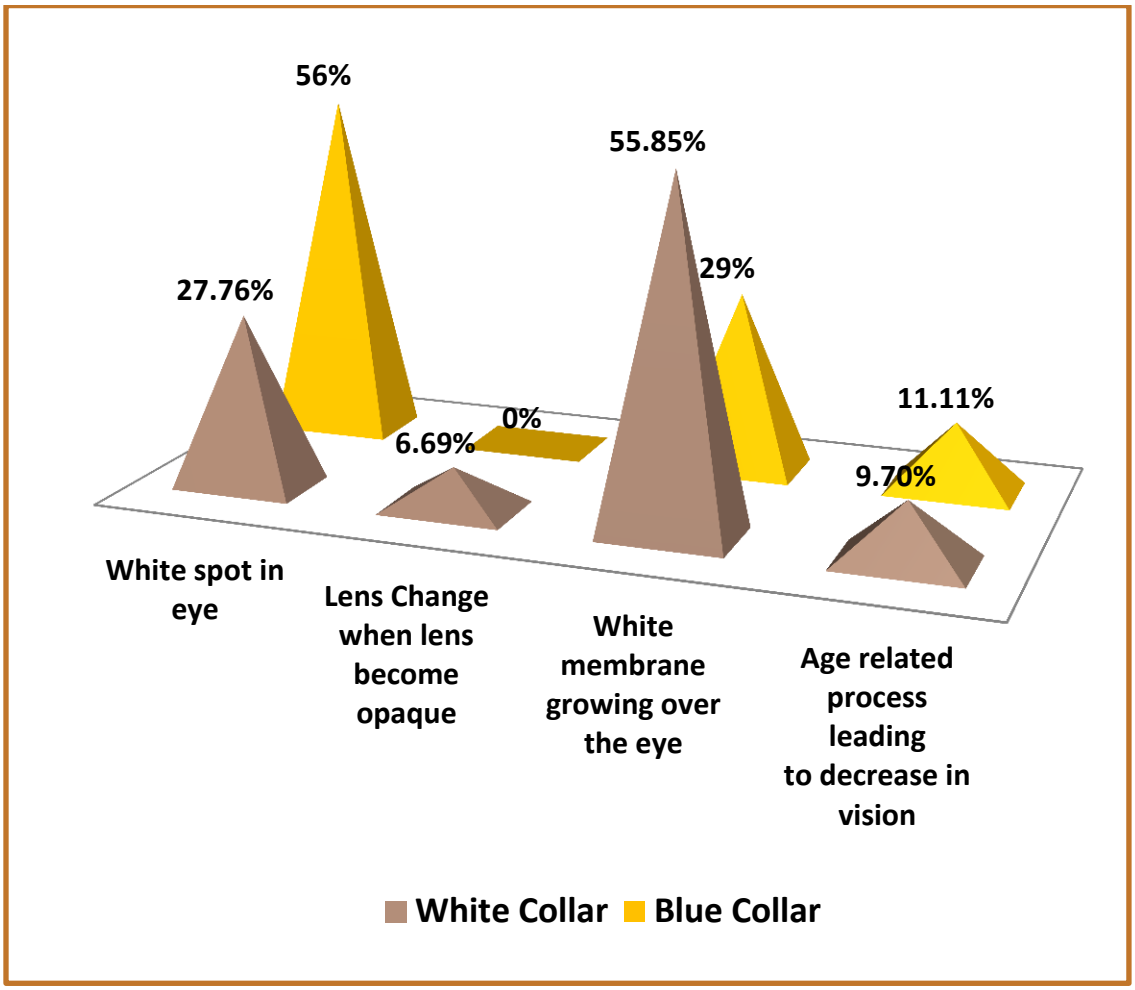


Fig 4.7: Knowledge about Definition

While asking about the definition ofCataract, majority of white collar employee, (55.85%) & 29% of blue collar employee answered that cataract is a white membrane growing over the eye while 27.76%of white collar & majority of blue collar employee, 56% answered that cataract is a white spot in the eye and 9.70% of white collar employee & 11.11% of blue collar employee answeredcataract as an age related process.

4.7.3 Source of Knowledge

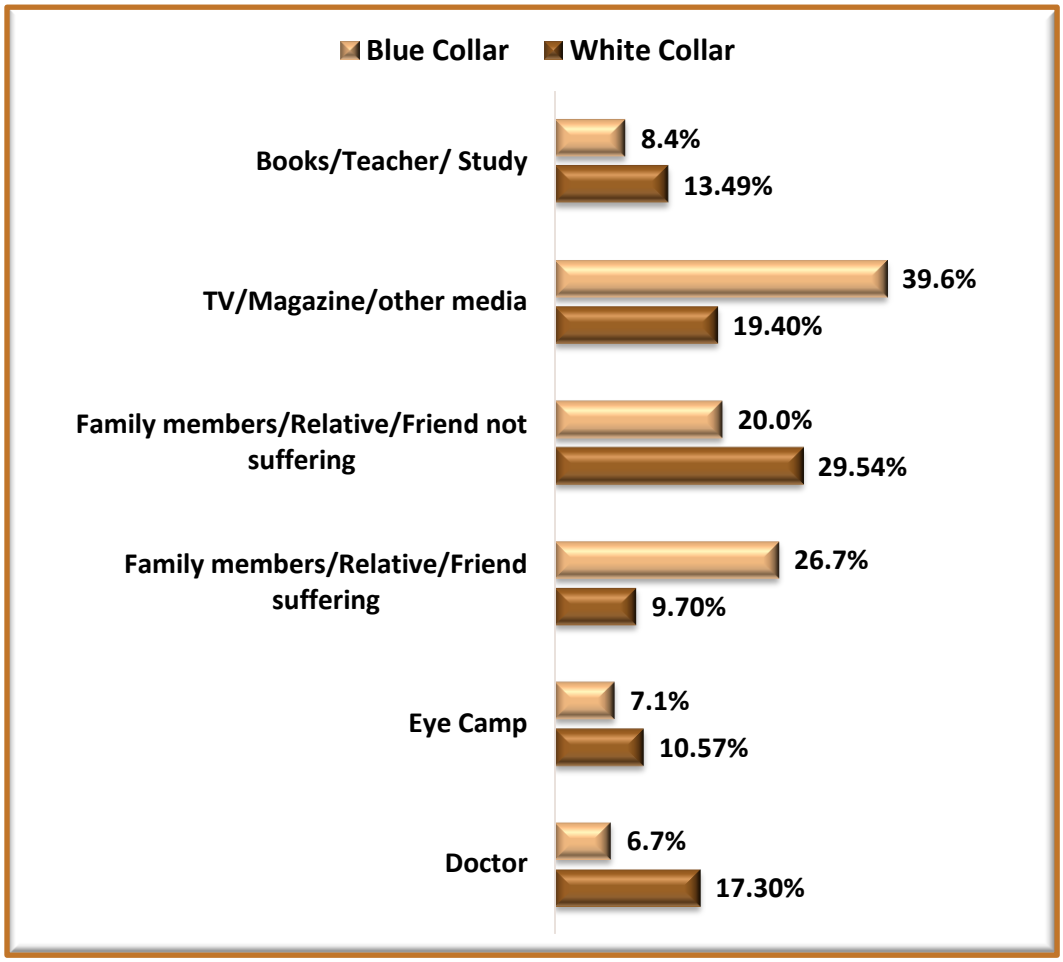


Fig 4.8: Source of Knowledge

According to the white collar employee population, most common source of information were TV/Magazine/Other media (39.6%), 20% from unaffected Family members/Relative/Friends not suffering from it. While 19.40% of blue collar employee knew about Cataract from TV/Magazine/Other media, 29.54% from unaffected Family members/Relative/Friends not suffering from it. Almost 6.7% of blue collar employee & 17.30% of white collar employee answered Doctors as their main source, and 7.1% of blue collar employee & 10.57% of white collar employeeanswered Eye camp as their source of knowledge.And remaining 26.7% of blue collar employee, & 9.70% of white collar employee of them from affected Family members/Relative/Friends suffering from it.

4.7.4 Knowledge about Treatability

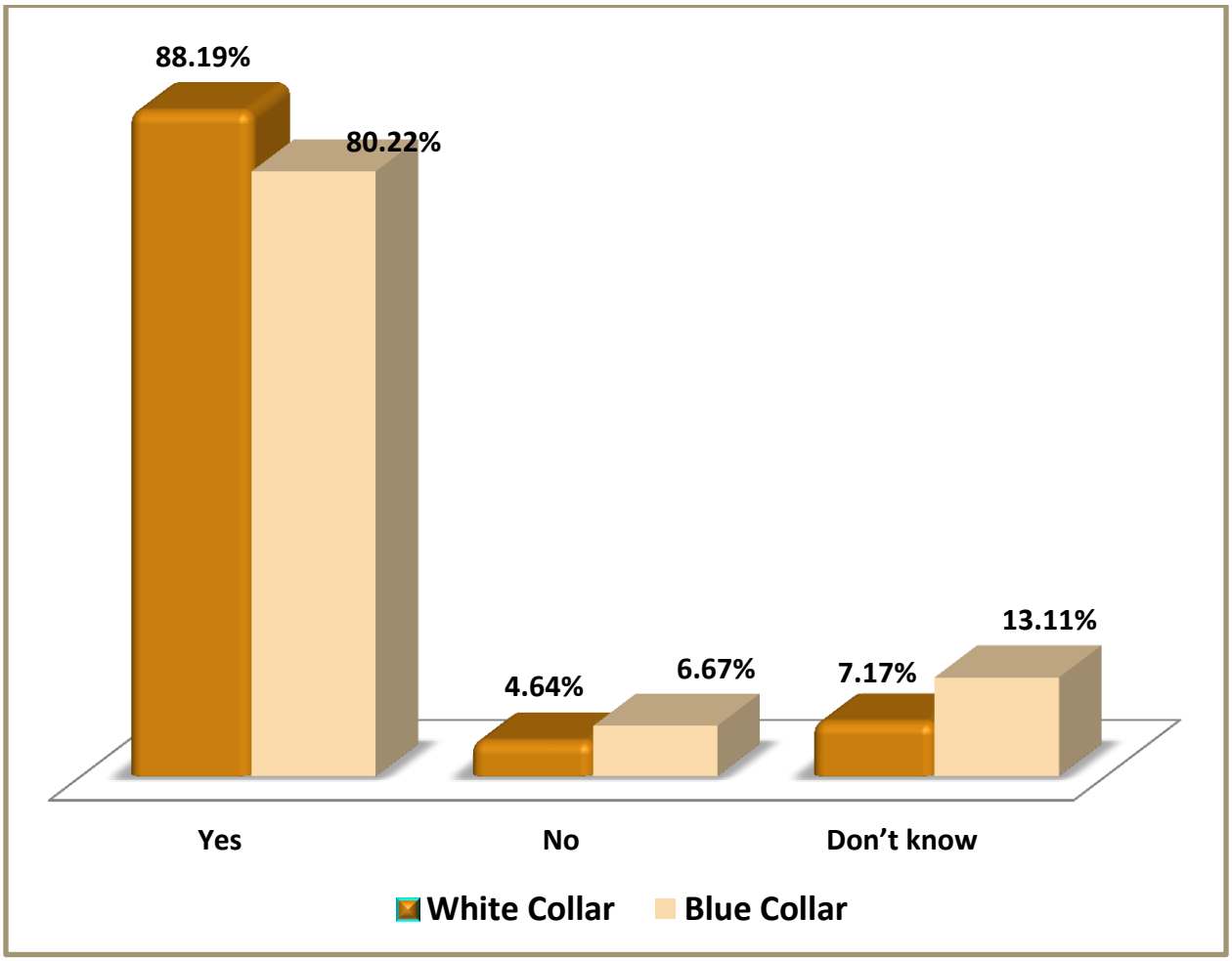


Fig 4.9: Knowledge about Treatability

During this study it was found that 88.19% of white collar employee & 80.22% of blue collar employeewere answered Cataract is treatable and 4.64% of white collar employee & 6.67% of blue collar employeeanswered Cataract is untreatable and the remaining 7.17% of white collar & 13.11% of blue collar employee didn,t have any iea.

4.7.5 Knowledge of Cataract Treatment

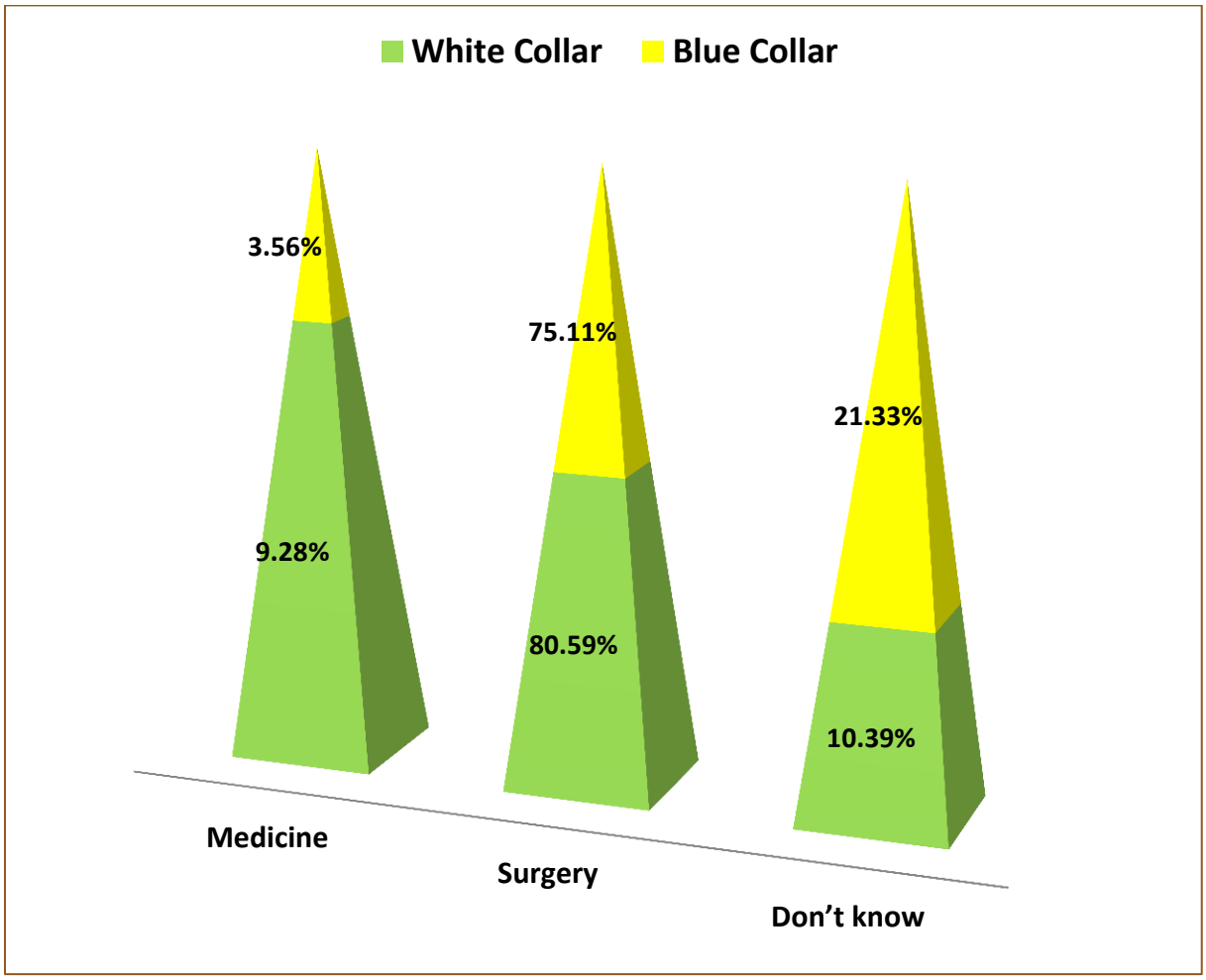


Fig 4.10: Knowledge of Cataract Treatment

When asking about the Cataract treatment procedures, majority employee (80.59%) of white collar & 75.11% of blue collar employee answered surgery was the treatment for the cataract. On the other hand 9.28% of white collar & 3.56% of blue collar employee said that medication was the treatment for Cataract and lastly 10.39%of white collar & 21.33% of blue collar employee answeredthey didn't know anything about it.

4.7.6 Knowledge about Possibility of Getting Vision Back

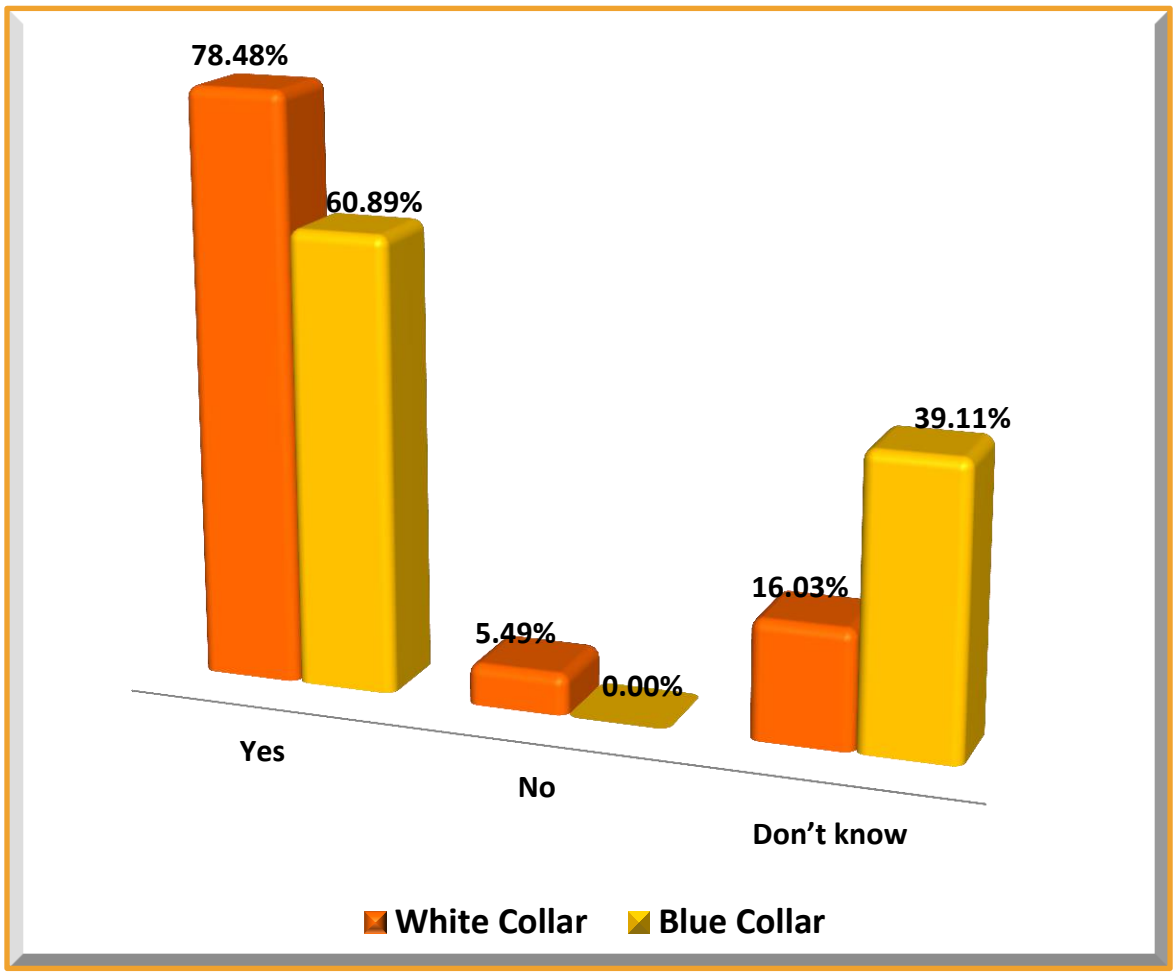


Fig 4.11: Knowledge about Possibility of Getting Vision Back

From this graphical representation it can be summarized that majority employee, (78.48%) of white collar & 21.33% of blue collar employee thought that it was possible to get vision back from Cataract and 5.49%of white collar & 0.00% of blue collar employee thought otherwise. And remaining 16.03%of white collar & 39.11% of blue collar employee said they don't know about it.

4.7.7 Knowledge about Intraocular Lens Implantation (IOL)

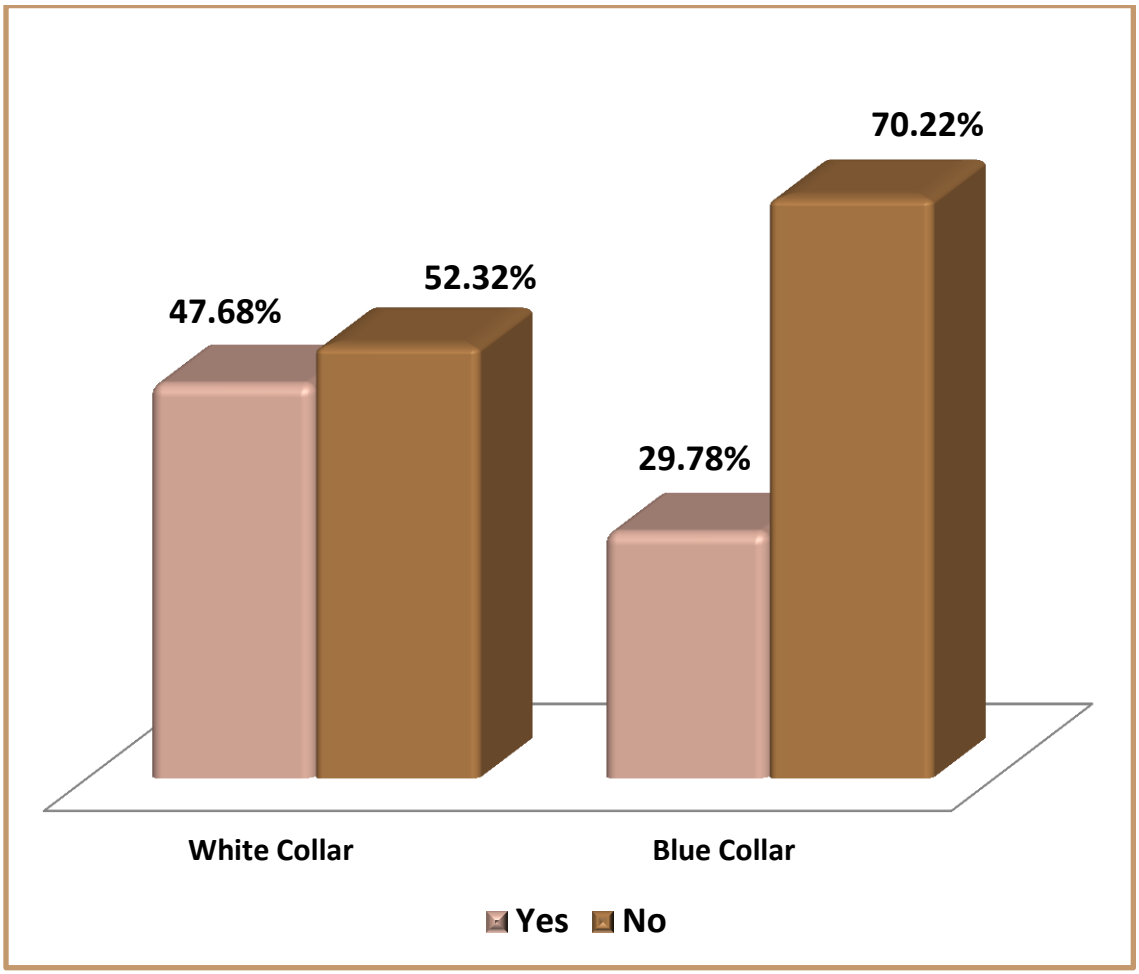


Fig 4.11: Knowledge about Intraocular Lens Implantation (IOL)

During this comparative study it was observed that 47.68% of white collar employee & only 29.78% of blue collar employee know about IOL, whereas the majority employee of both group, (52.32%) of white collar & 70.22% of blue collar employee didn't know about IOL.

4.8 Glaucoma

4.8.1 Knowledge about Glaucoma

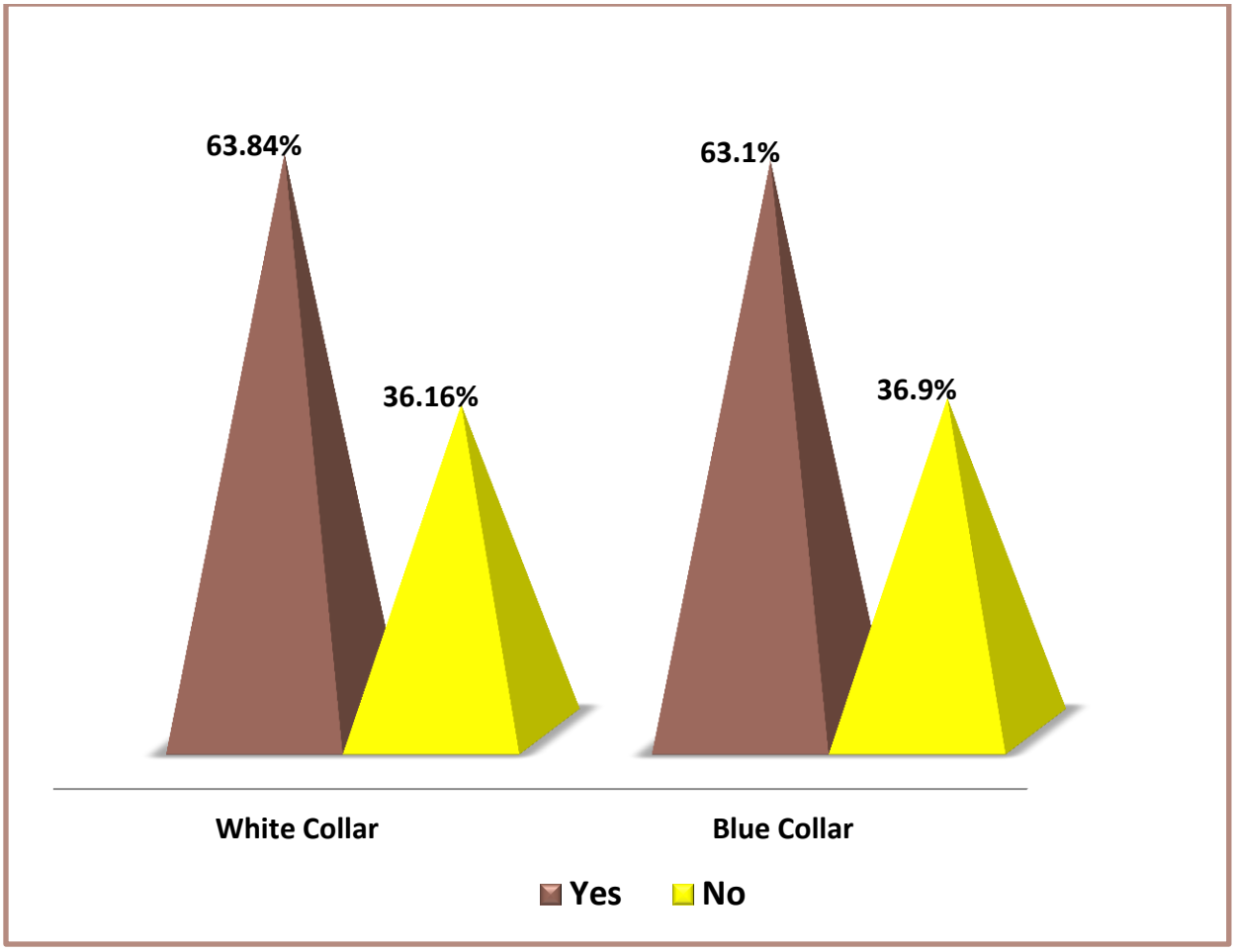


Fig 4.13: Knowledge about Glaucoma

During the study, from the 237 white collar Employee, majority of them (63.84%) said that they have heard about glaucoma and the remaining 36.16% answered that they didn't heard about it. And from the 225 Blue collar Employee, majority of them (63.1%) said that they have heard about glaucoma and the remaining 36.9% answered that they didn't heard about it.

4.8.2 Knowledge about the Definition

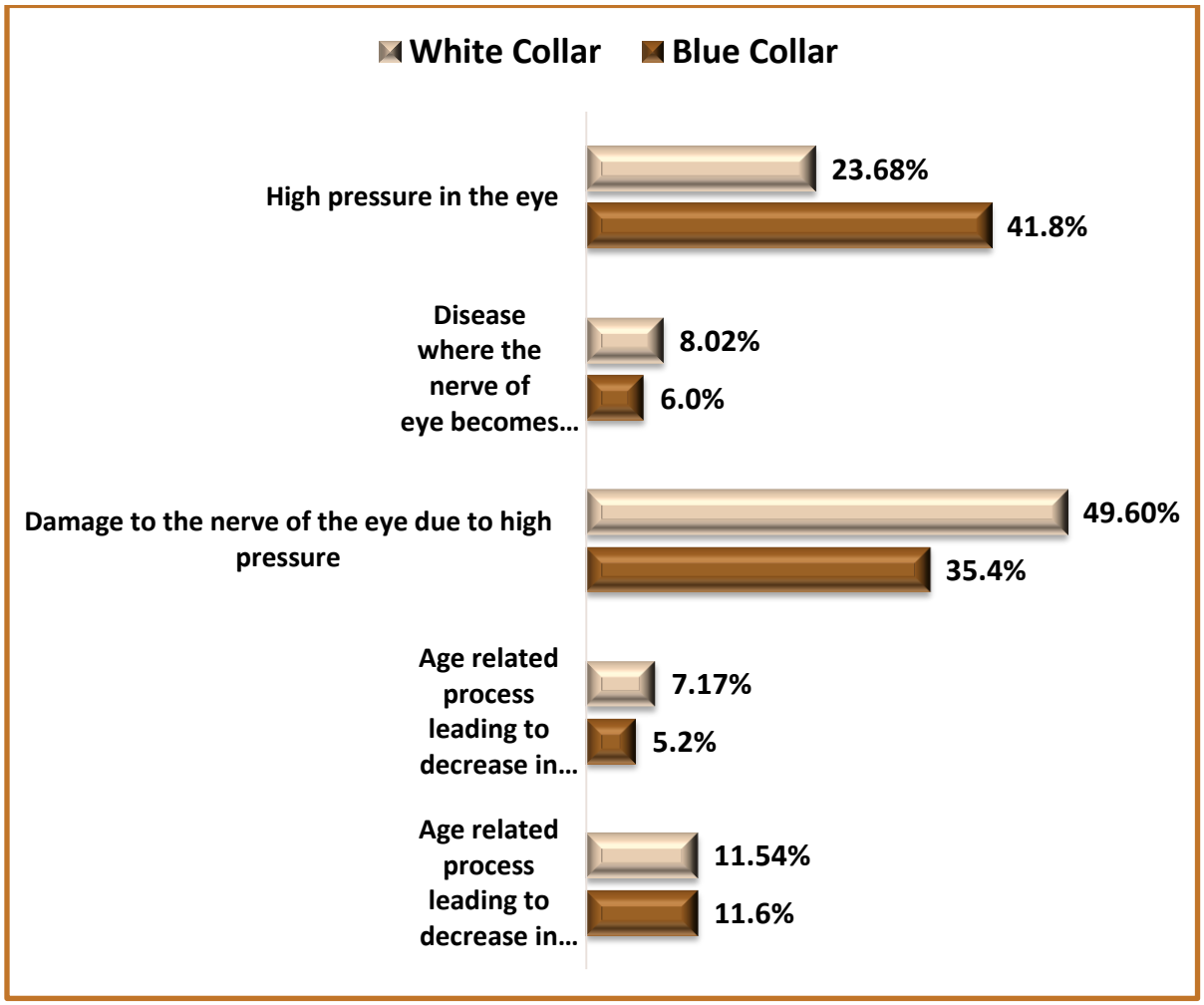


Fig 4.14: Knowledge of Definition

In this comparative survey, While asking about the definition of glaucoma, 49.60% of the of White Collar Employee answered damage to the nerve of the eye due to high pressure, 23.68% said high pressure in the eye and lastly 11.54% said age related process leading to decrease in vision. And 35.4% of the of Blue Collar Employee answered damage to the nerve of the eye due to high pressure, 41.8% said high pressure in the eye and lastly 11.6% said age related process leading to decrease in vision.

4.8.3 Source of Knowledge

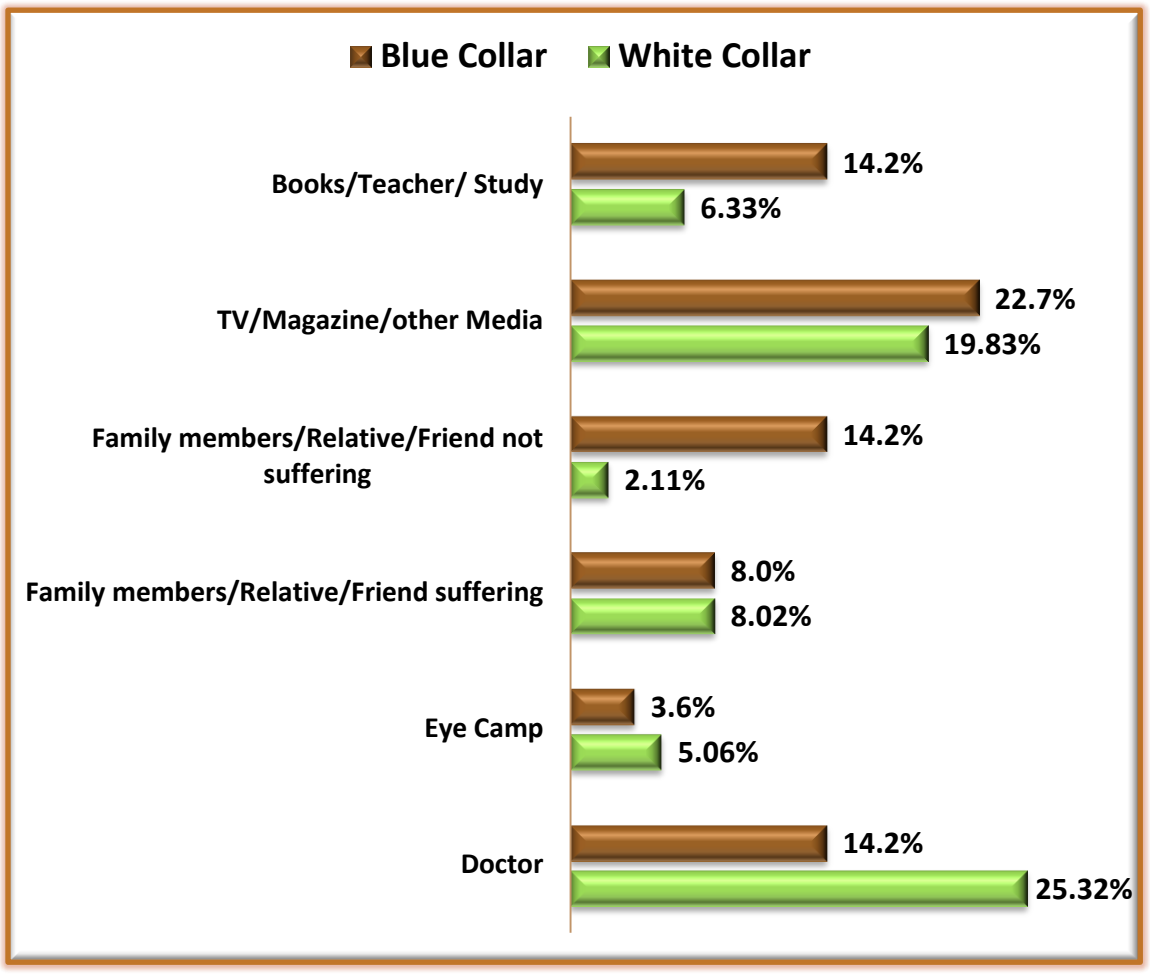


Fig 4.14: Source of Knowledge

From this graphical representation, it was observed that majority portion of employee, (22.7%) of blue collar employee & 19.83% of white collar employee knew about Glaucoma from TV/Magazine/Other media. Again, 14.2% of blue collar employee & 2.11% of white collar employee of them from unaffected Family members/Relative/Friends not suffering from it. Almost 14.2% of blue collar employee & 25.32% of white collar employee answered Doctors as their main source, and 3.6% of blue collar employee & 5.06% of white collar employee answered Eye camp as their source of knowledge.And remaining 8.0% of blue collar employee, & 8.02% of white collar employeeof them from affected Family members/Relative/Friends suffering from it.

4.8.4 Knowledge about Visual Loss being Permanent/Reversible

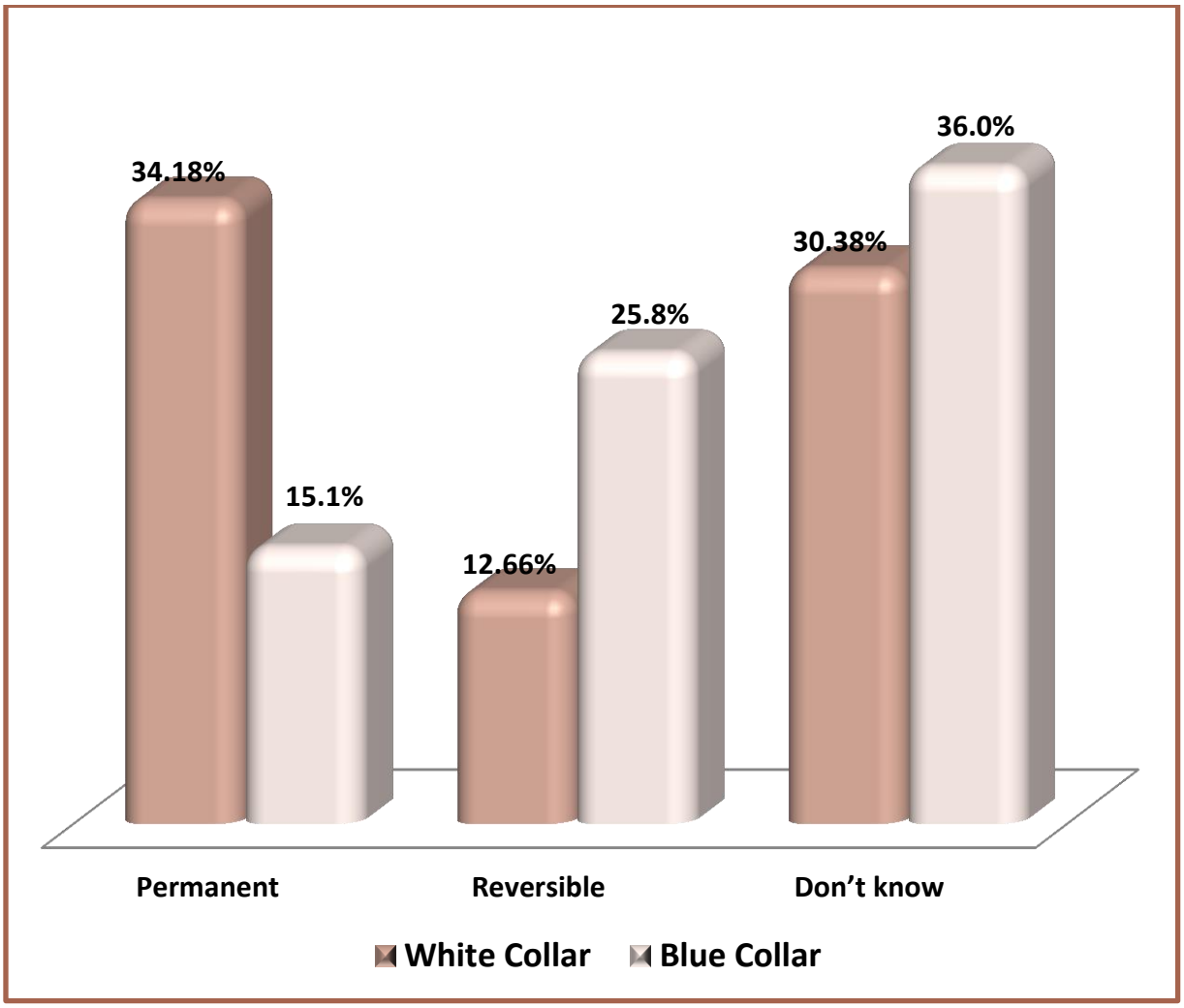


Fig 4.15: Knowledge about Visual Loss being Permanent/Reversible

From the above graphical representation, When asked about visual loss whether reversible or permanent 34.18% of white collar & 15.1% of blue collar employee said that visual loss due to glaucoma was permanent and another 12.66% of white collar & 25.8% of blue collar employee glaucoma as reversible. Whereas 30.38% of white collar & 36.0% of blue collar employee didn't know anything about it.

4.8.5 Knowledge about Glaucoma Treatment

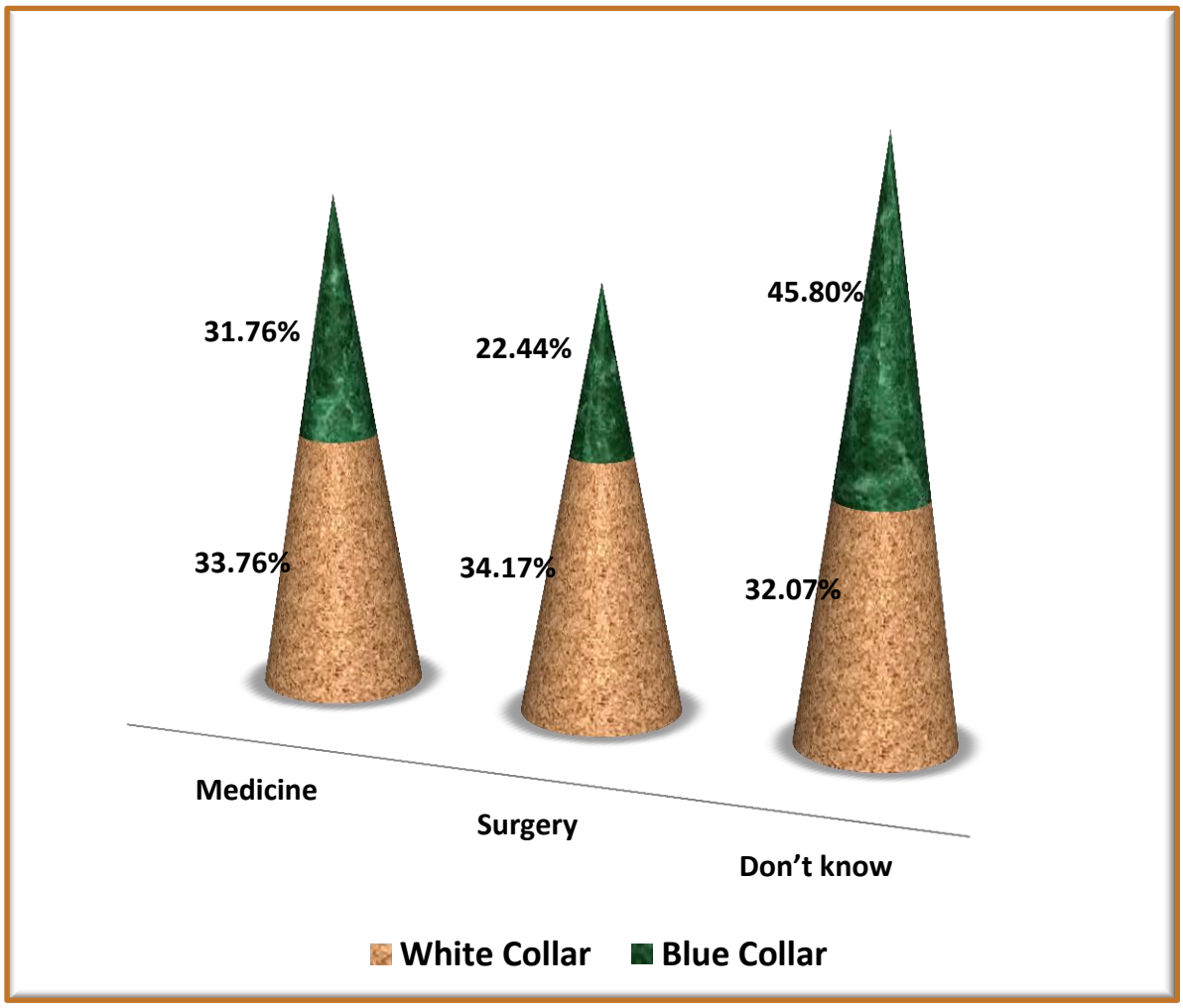


Fig 4.16: Knowledge of Glaucoma Treatment

During the study it was found that 33.76% of white collar & 31.70% of blue collar employee thought medication was the treatment for Glaucoma and 34.07% of white collar & 2244% of blue collar employee thought it was Surgery. On the other hand, 32.07% % of white collar & 45.80% of blue collar employee didn't know anything regarding this topic.

4.8.6 Possibility of Getting Vision Back From Glaucoma Blindness

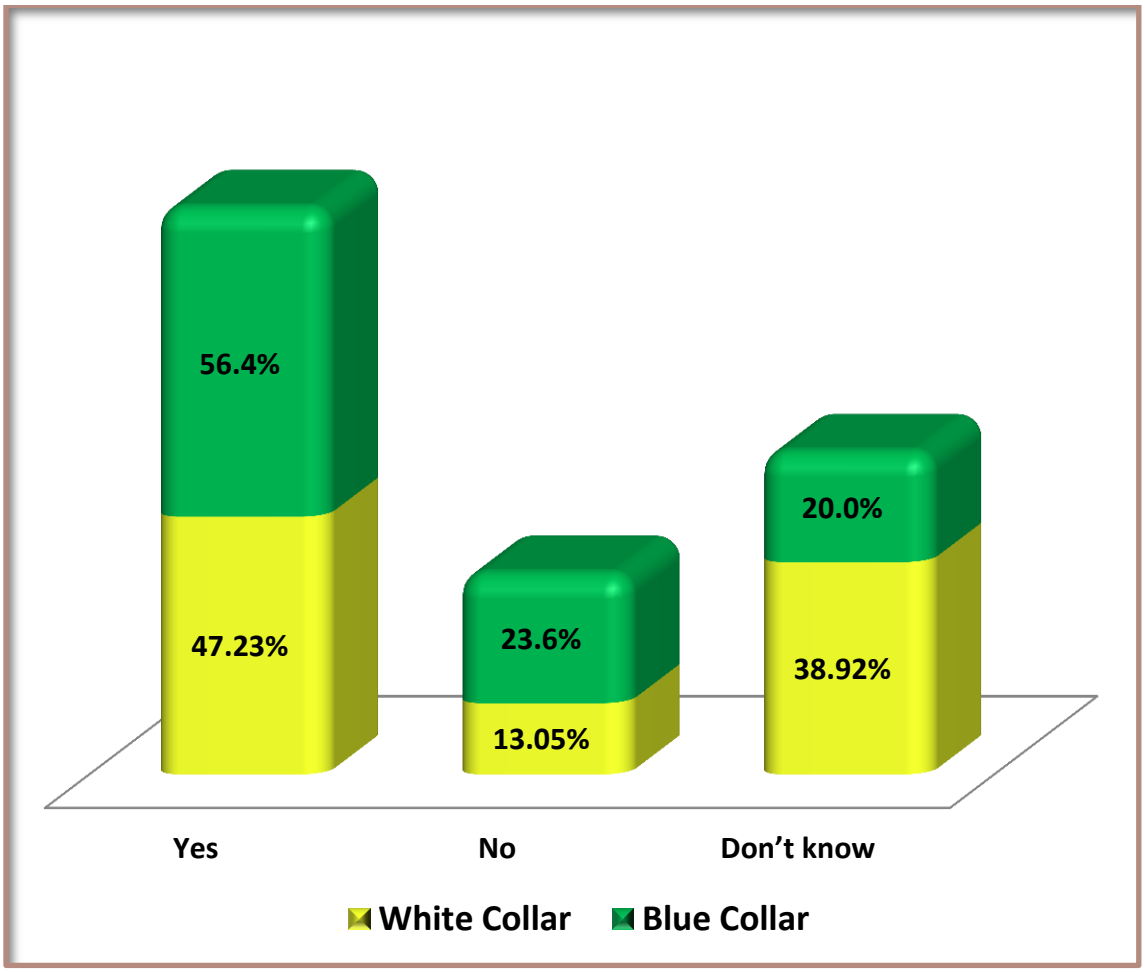


Fig 4.17: Possibility of Getting Vision Back From Glaucoma Blindness

From this graphical representation it can be summarized that majority employee, (42.23%) of white collar & 56.4% of blue collar employee thought that, it was possible to get vision back from Glaucoma and 13.05% of white collar & 23.6% of blue collar employee thought otherwise. And remaining 38.92%of white collar & 20.0% of blue collar employee said they don't know about it.

4.9 Night Blindness

4.9.1 Knowledge about Night Blindness

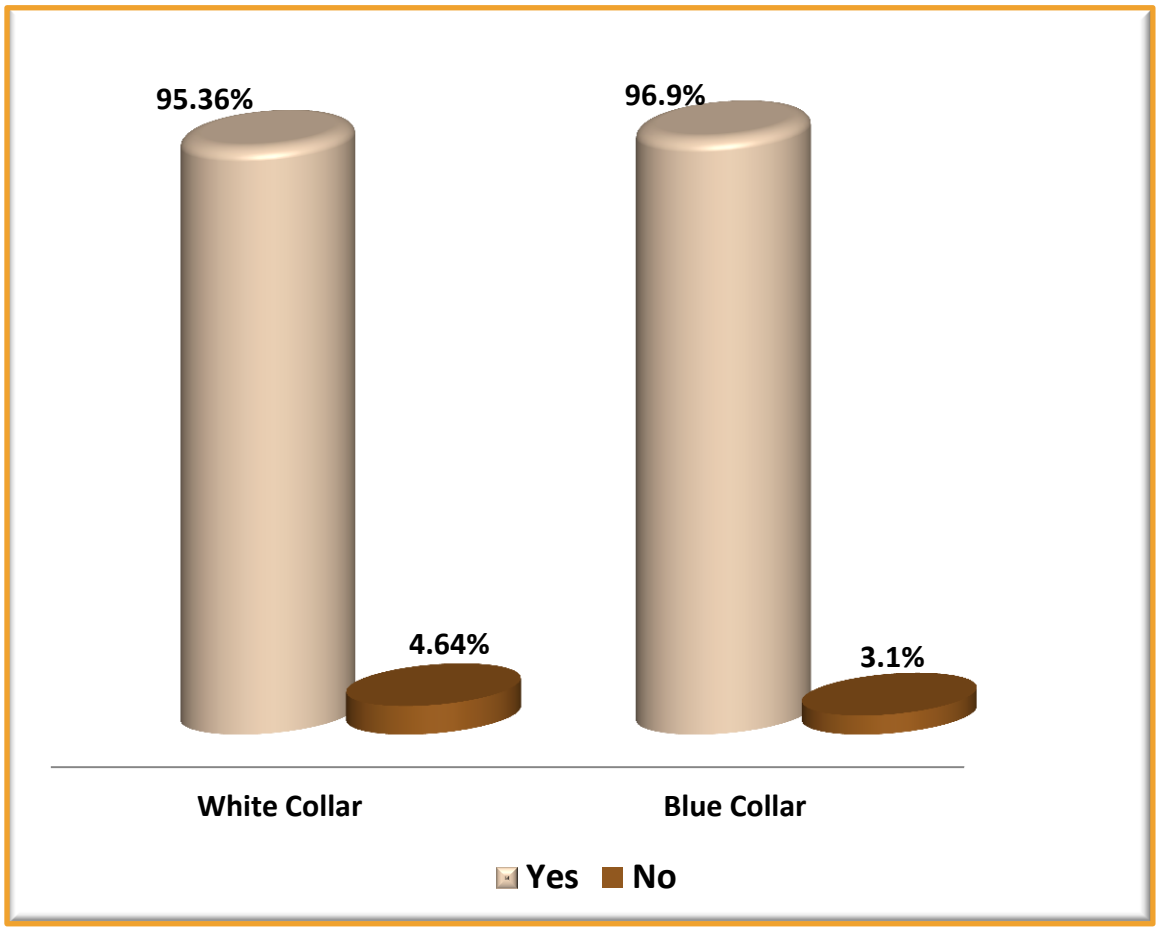


Fig 4.18: Knowledge about Night Blindness

During this study, from the 237 white collar Employee, majority of them (95.36%) said that they have heard about Night Blindness and the remaining only 4.64% answered that they didn't heard about it. And from the 225 Blue collar Employee, majority of them (96.9%) said that they have heard about glaucoma and only3.1% answered that they didn't heard about it

4.9.2 Source of Knowledge

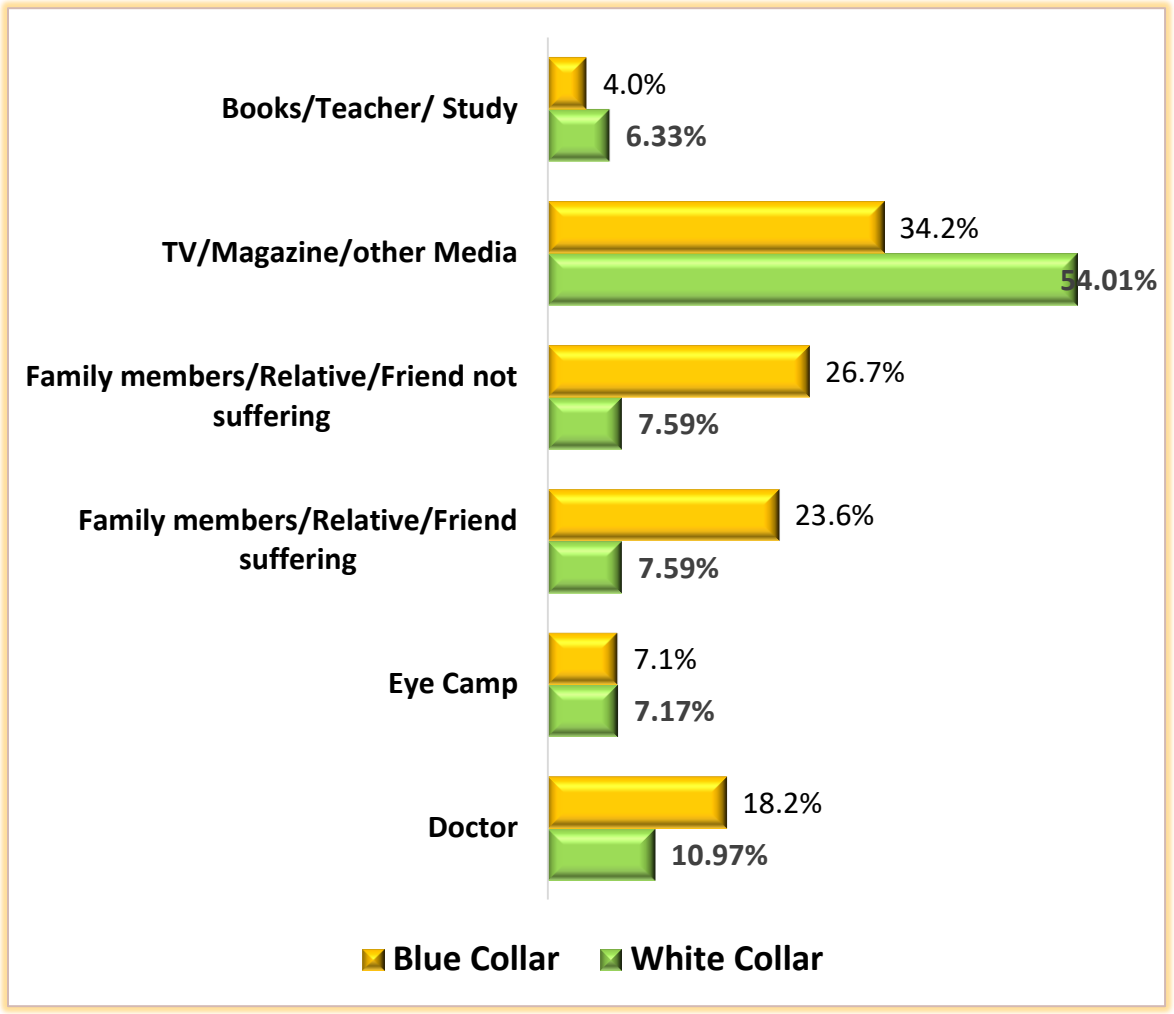


Fig 4.19: Source of Knowledge

From this graphical representation, it was observed that majority portion of both group of employee, (34.2%) of blue collar employee & 54.1% of white collar employee knew about Night Blindness from TV/Magazine/Other media. Again, 26.7% of blue collar employee & 7.59% of white collar employee of them from unaffected Family members/Relative/Friends not suffering from it. Almost 18.2% of blue collar employee & 10.97% of white collar employee answered Doctors as their main source, and 7.1% of blue collar employee & 7.17% of white collar employee answered Eye camp as their source of knowledge.And remaining 23.6% of blue collar employee, & 7.59% of white collar employeeof them from affected Family members/Relative/Friends suffering from it.

4.9.3 Common Cause of Night Blindness

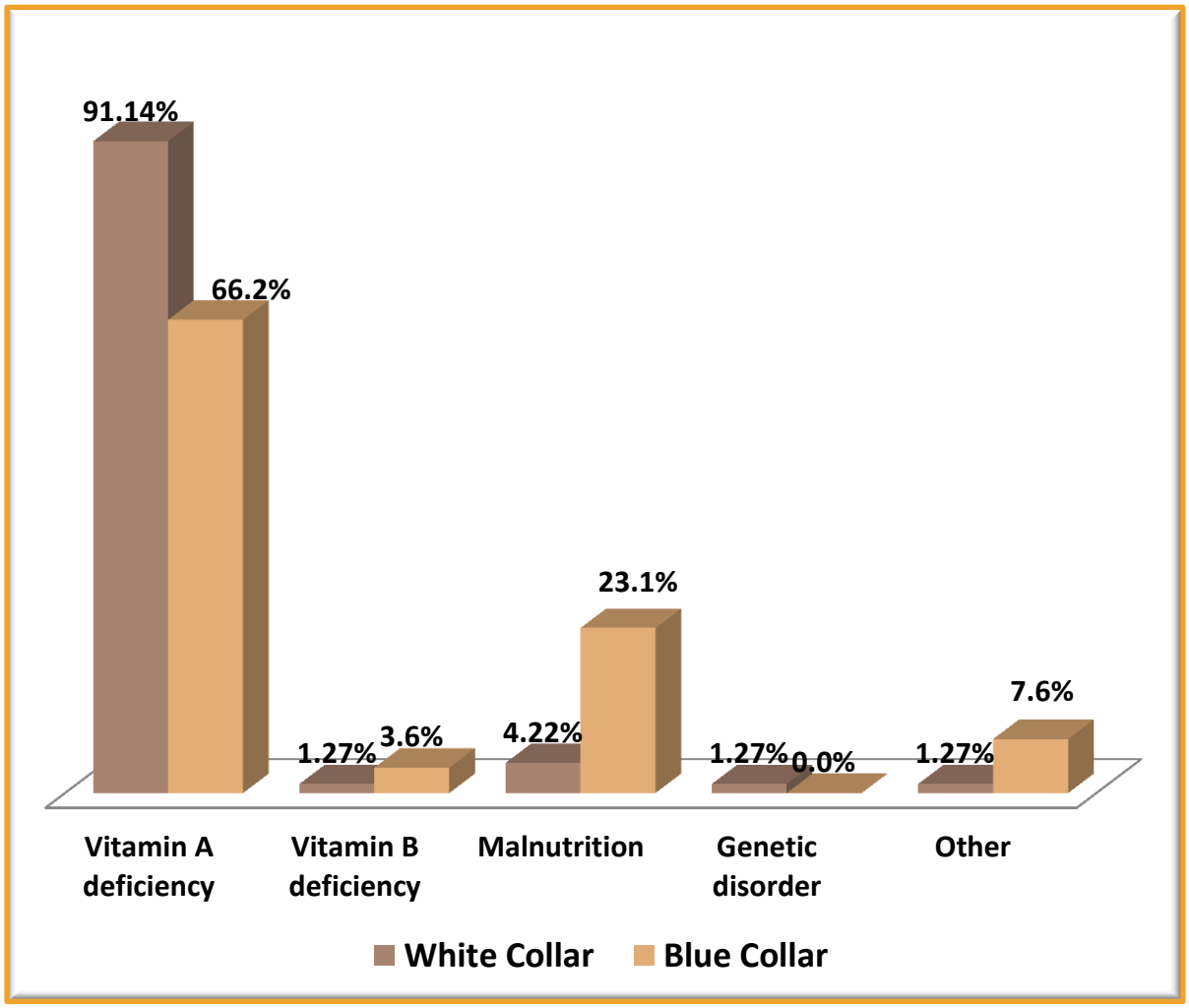


Fig 4.20: Common Cause of Night Blindness

During this study it was conducted that, marked by 91.14% of White Collar Employee & 66.2% of Blue Collar Employee answered that Vitamin A deficiency was the main cause of Night blindness. On the other hand, only 1.27% of White Collar Employee & 3.6% of Blue Collar Employee answered Vitamin B deficiency and 4.22% of White Collar Employee & 23.1% of Blue Collar Employee thought Malnutrition is the main reason behind it. Lastly, 1.27% of White Collar Employee & 0.00% of Blue Collar Employee answered genetic disorder as the root cause.

4.9.4 Possibility of Prevention at Childhood

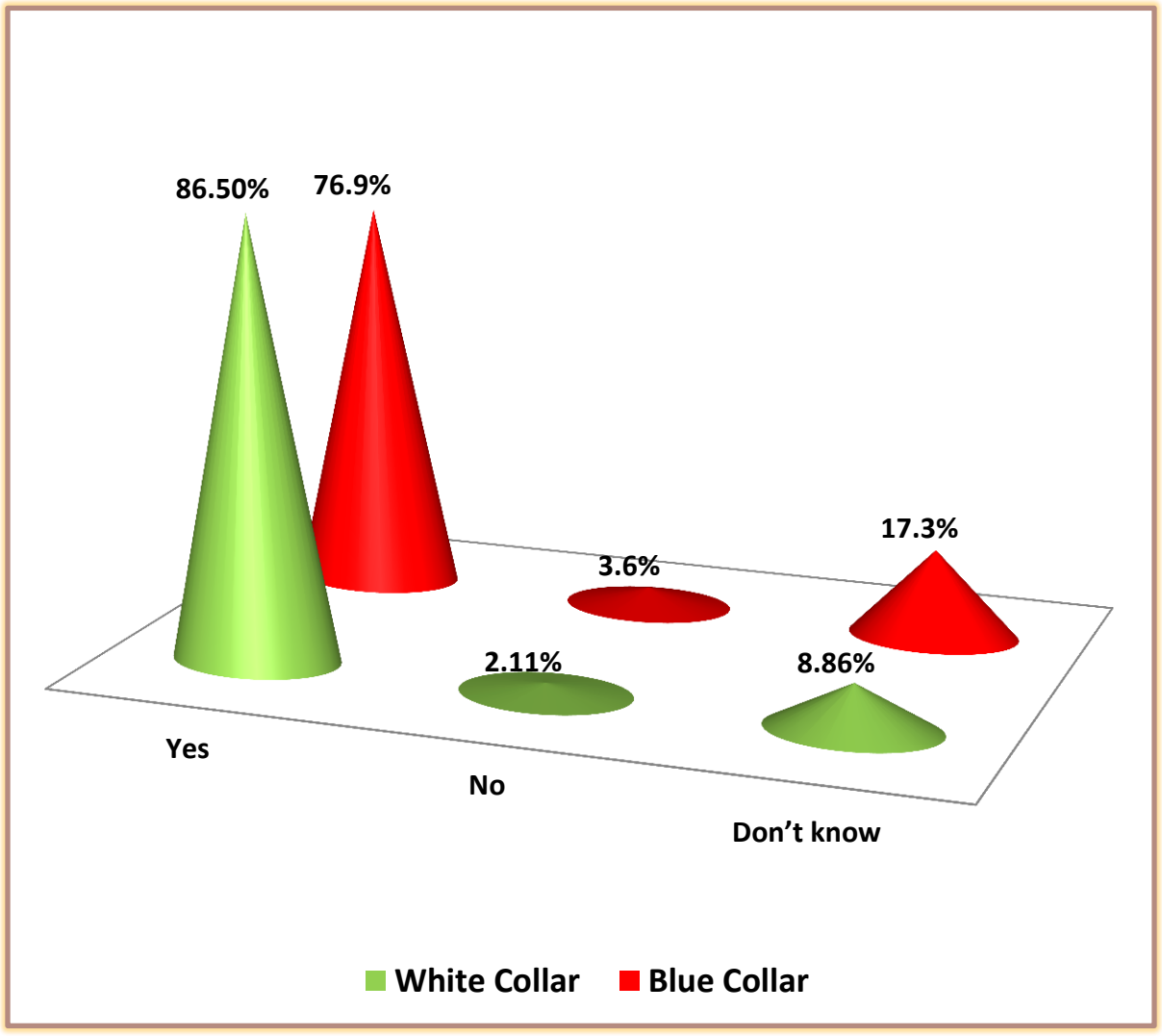


Fig 4.21: Possibility of Prevention at Childhood

From the graphical representation it was found that, majority employee that is, (86.50%) of white collar employee & 76.9% blue collar employee answered that they think that night blindness can be prevented during childhood and only 2.11% of white collar employee & 3.6% blue collar employee thought otherwise.

4.9.5 Knowledge of Preventive Methods

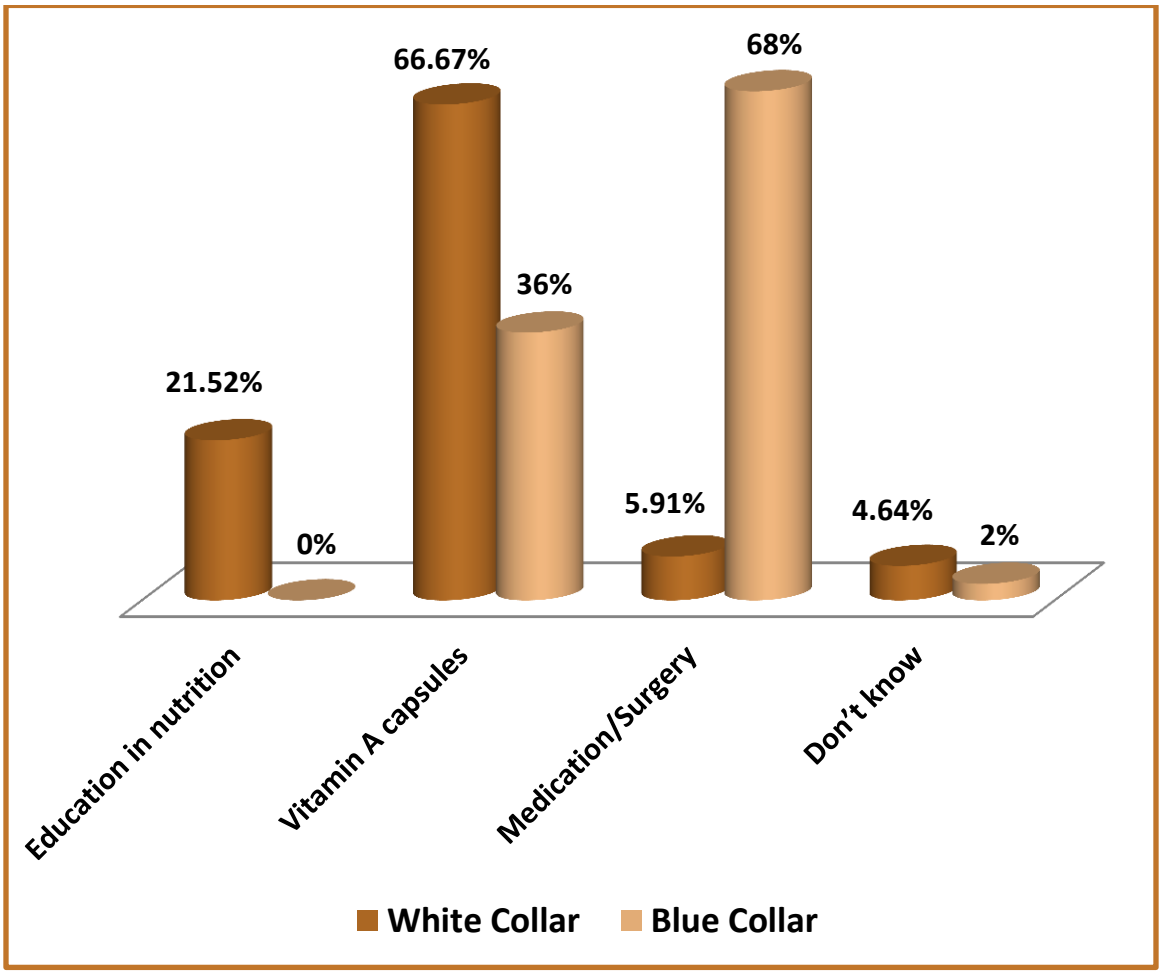


Fig 4.22: Knowledge of Preventive Methods

During this study it was seen that, almost majority employee from both group, (66.67%) of white collar employee & 36% blue collar employee thought Vitamin A capsules as a prominent preventive measure. Education about nutrition as preventive measure was answered by 21.52% of white collar employee who know about night blindness. Only 5.91% of white collar employee & 76.9% blue collar employee which is major portion of blue collar employee thought about medication/surgery.

4.9.6 Possibility of Getting Vision Back from Night Blindness

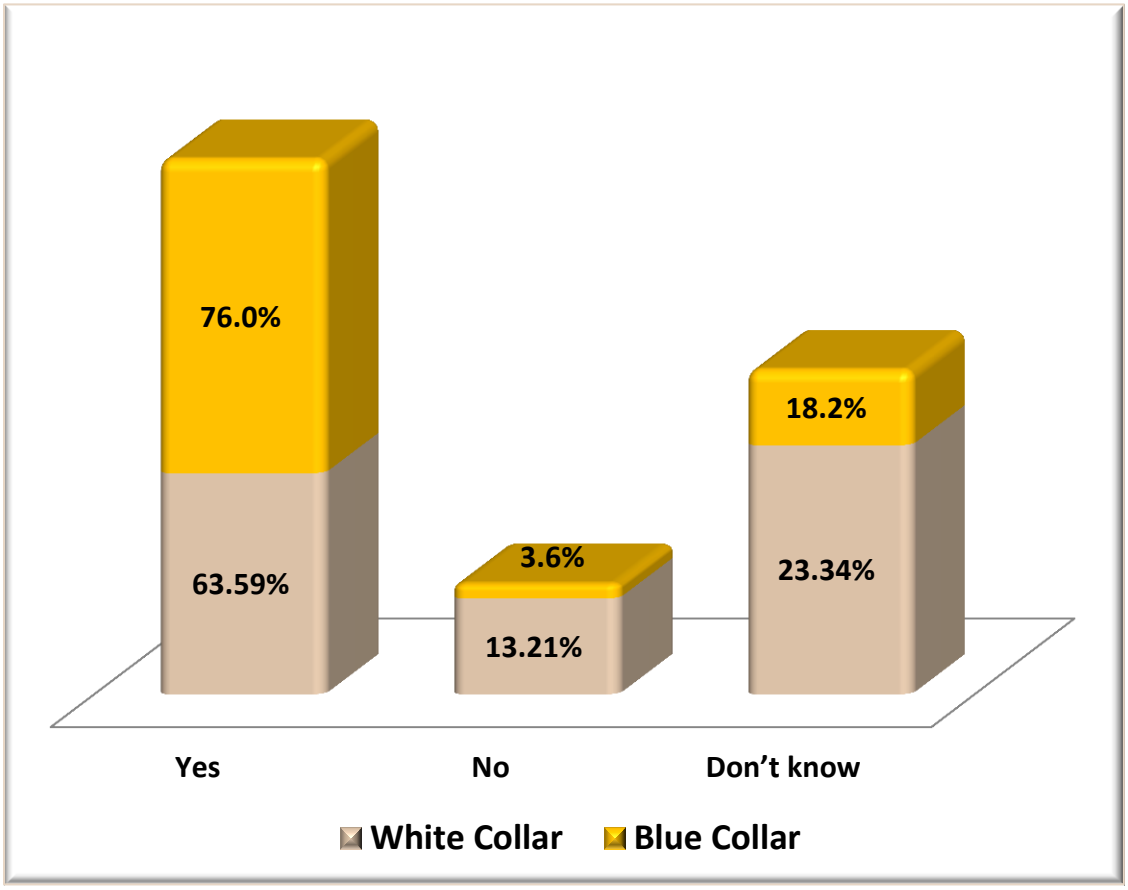


Fig 4.23: Possibility of Getting Vision Back from Night Blindness

From this graphical representation it can be summarized that majority employee, (63.59%) of white collar & 76.0% of blue collar employee think that it was possible to get vision back from Night Blindness, whereas 13.21% of white collar & 3.6% of blue collar employee thought otherwise. And remaining 23.34%of white collar & 18.2% of blue collar employee said they don't know about it.

4.10 Diabetic Retinopathy

4.10.1 Knowledge about Diabetic Retinopathy

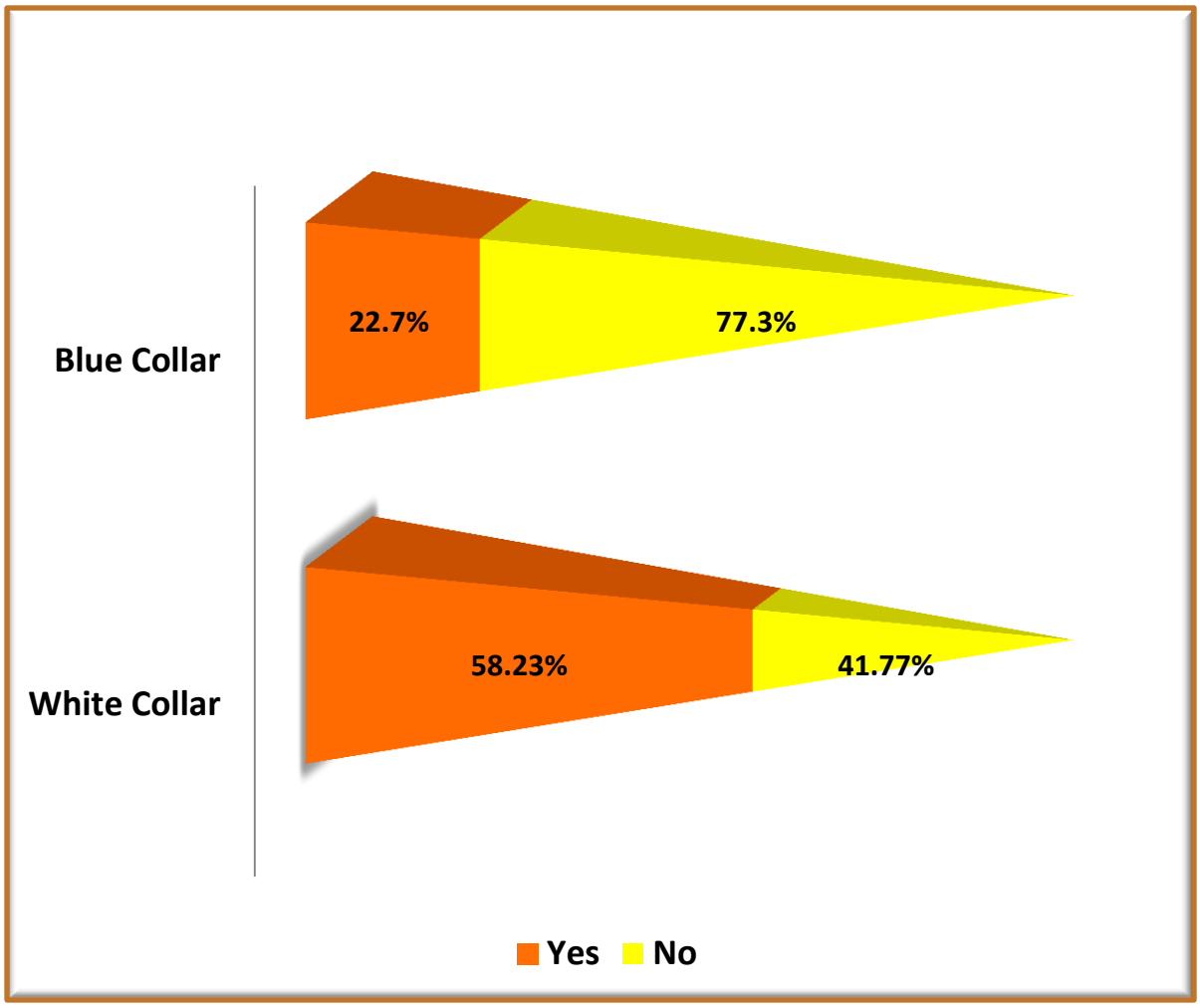


Fig 4.24: Knowledge about Diabetic Retinopathy

During this study, from the 237 white collar Employee, majority of them (59.23%) said that they have heard about Diabetic Retinopathyand the remaining 41.77% answered that they didn't heard about it. And from the 225 Blue collar Employee, only (22.7%) said that they have heardabout glaucoma and the majority 77.3% answered that they didn't heard about it.

4.10.2 Source of Knowledge

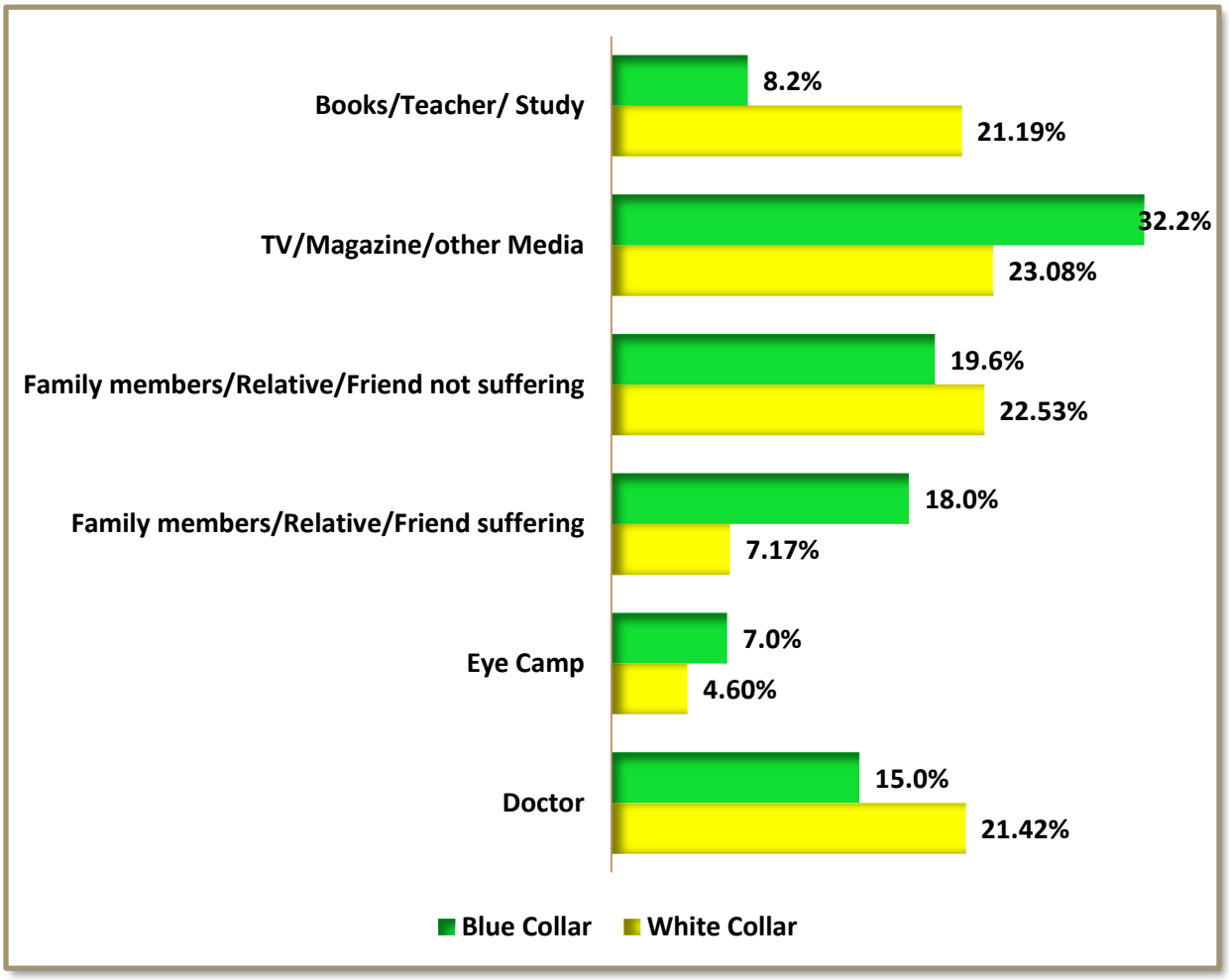


Fig 4.25: Source of Knowledge

During this comparative study, it was observed that majority portion of employee, (32.2%) of blue collar employee & 23.08% of white collar employee knew about Diabetic Retinopathy from TV/Magazine/Other media. Again, 19.6% of blue collar employee & 22.53% of white collar employee of them knew from unaffected Family members/Relative/Friends not suffering from it. Almost 15.00% of blue collar employee & 21.42% of white collar employee answered Doctors as their main source, and 7.00% of blue collar employee & 4.60% of white collar employee answered Eye camp as their source of knowledge.And remaining 18.00% of blue collar employee, & 7.17% of white collar employeeof them from affected Family members/Relative/Friends suffering from it.

4.10.3 Knowledge about Treatability Due to Loss of Vision Level

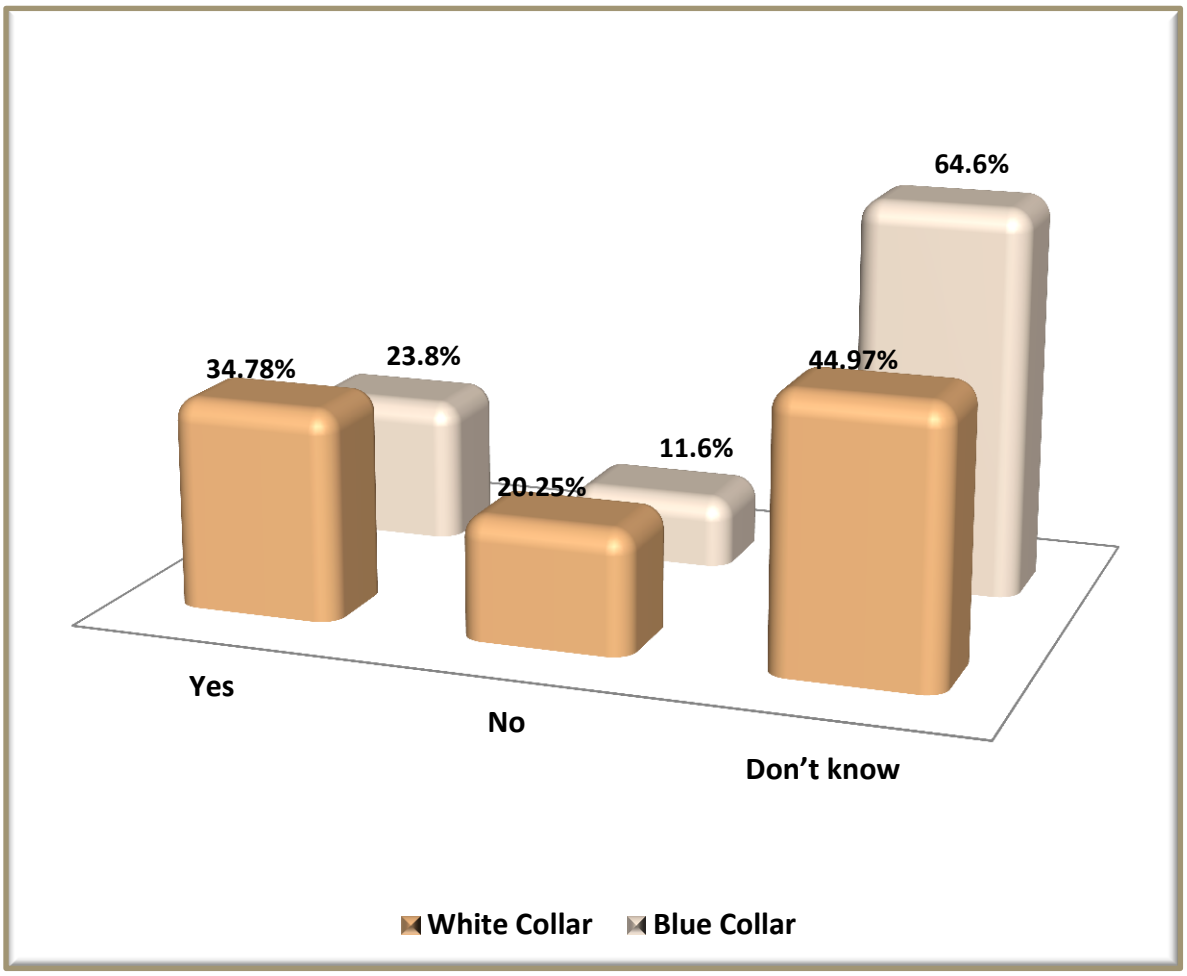


Fig 4.26: Knowledge about Treatability Due to Loss of Vision Level

From the graphical representation it was found that 34.78% of White Collar Employee & 23.8% of Blue Collar Employee had heard about Diabetic retinopathy and that they agree that the decrease in vision due to Diabetics is treatable. While 20.25% of White Collar Employee & 11.6% of Blue Collar Employee answered negatively and the majority employee (44.94%) of White Collar Employee & 64.6% of Blue Collar Employee answered they don't know about it.

4.10.4 Knowledge about Frequency of Eye Checkup

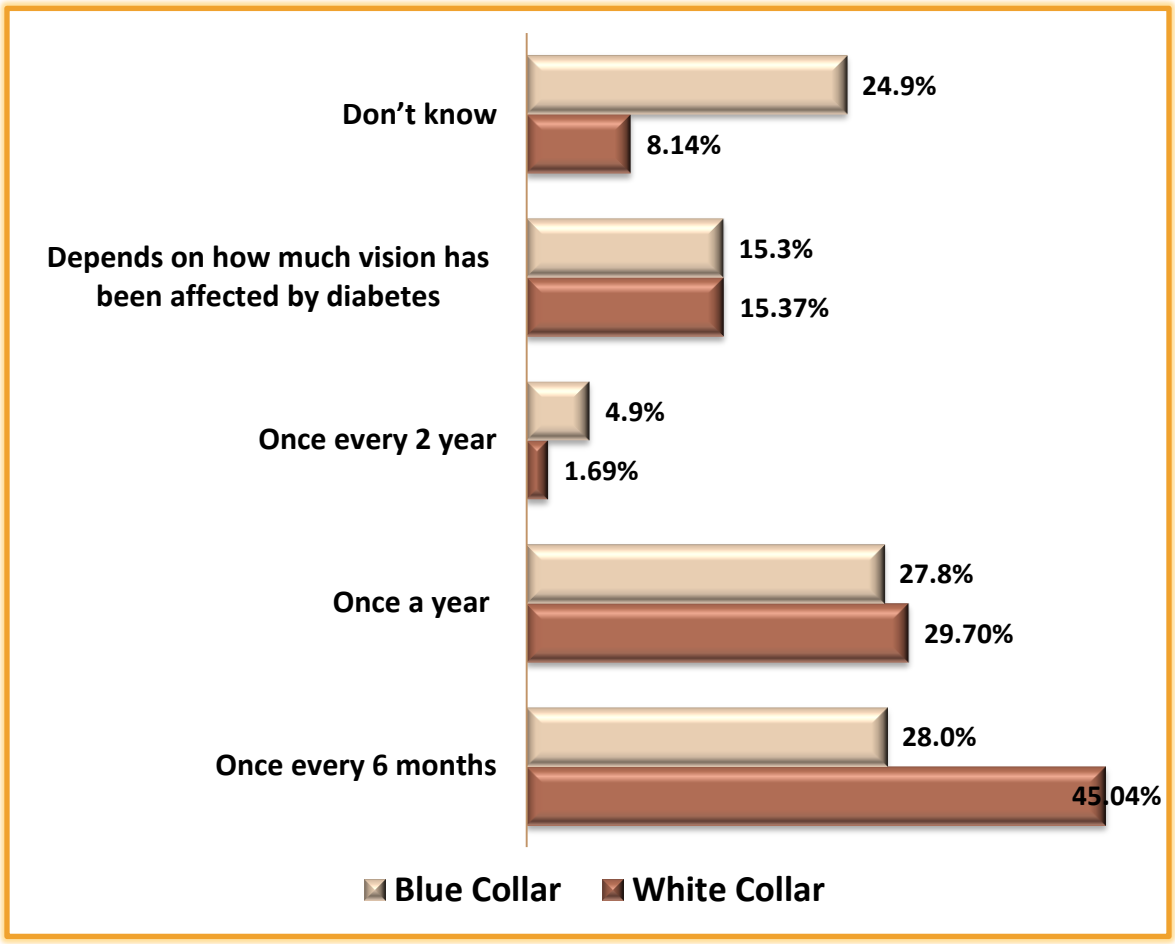


Fig 4.27: Knowledge about Frequency of Eye Checkup

During this study, from the 237 white collar Employee, majority employee that is 45.05% said that once every 6 months the patient should go for checkup. 15.37% thought that it depends on how much vision has been affected it. However, 29.7% thinks that once a years the patient should attend eye checkup and lastly. Even 8.14% employee don't know about it. From the 225 blue collar Employee, 28.0% said that once every 6 months the patient should go for checkup. 15.3% thought that it depends on how much vision has been affected it. However, 27.8% thinks that once a years the patient should attend eye checkup and lastly. Even24.9% employee don't know about it.

4.10.5 Knowledge of People Who Are At Risk at Diabetic Retinopathy

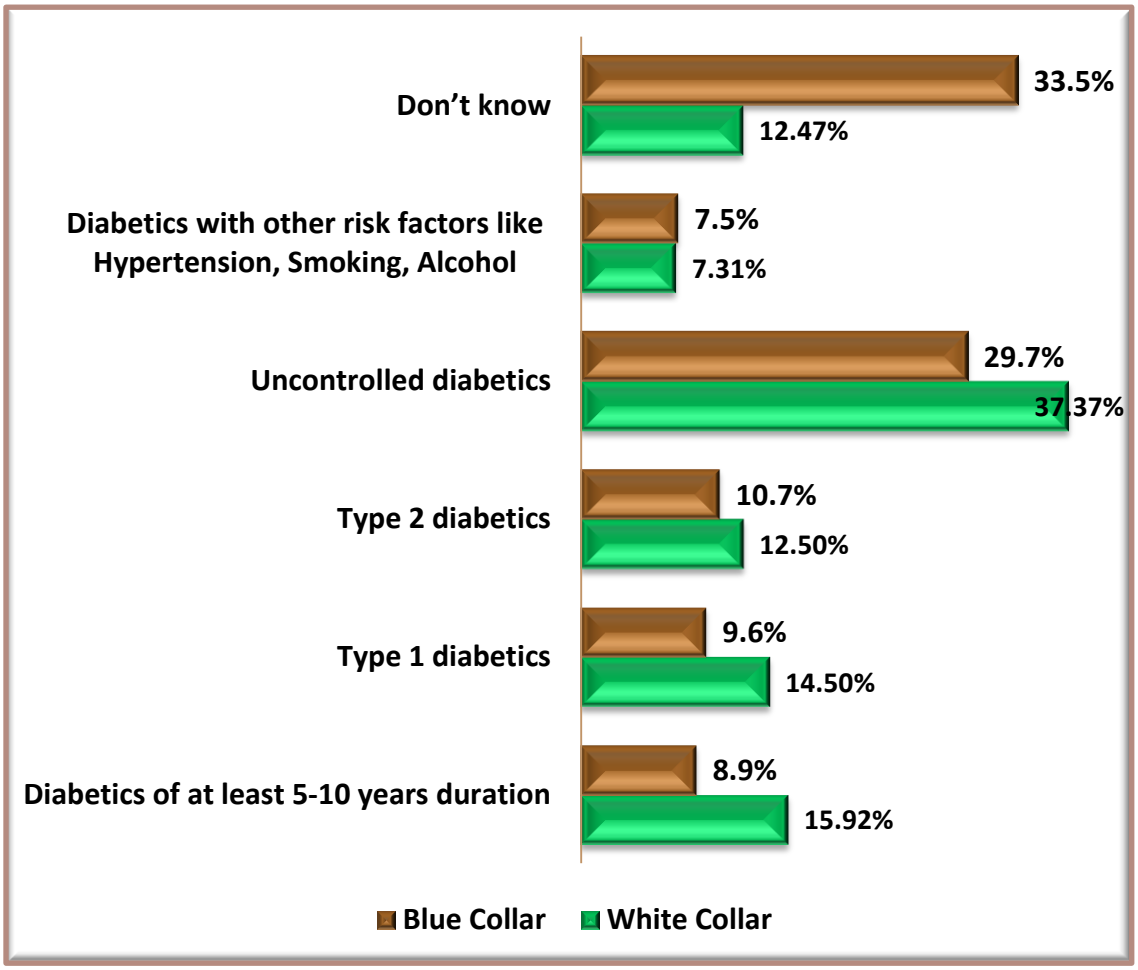


Fig 4.28: Knowledge of People Who Are at Risk for Diabetic Retinopathy

During this survey above from graphical representation it was concluded that, around 12.47% of White Collar Employee & 33.5% of Blue Collar Employee didn't have any knowledge about who are at risk of Diabetic Retinopathy. Only 15.92% of White Collar Employee & 8.9% of Blue Collar Employee answered that those patient who have diabetics for at least 5-10 years were at more risk for Diabetic Retinopathy. 12.5% of White Collar Employee & 10.7% of Blue Collar Employee answered that those patient who have Type 2 diabeticswere at more risk for Diabetic Retinopathy. 14.5% of White Collar Employee & 9.6% of Blue Collar Employee answered that those patient who have Type 1 diabeticswere at more risk for Diabetic Retinopathy.

4.10.6 Knowledge of Diabetic Retinopathy Treatment

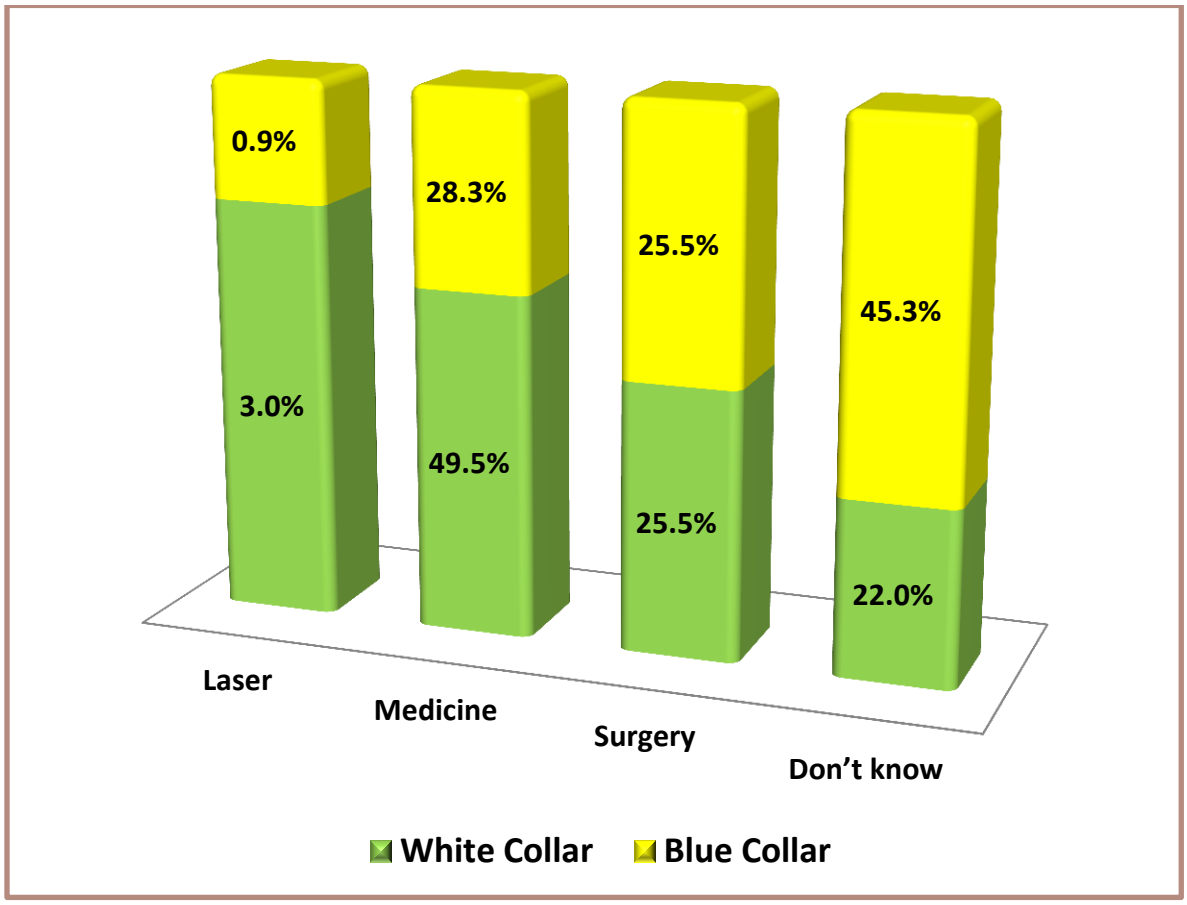


Fig 4.29: Knowledge of Diabetic Retinopathy Treatment

From the answers of the students it was seen that, Majority of White Collar Employee, (49.5%) and 28.3% Blue Collar Employee said that medication was the treatment for the disease and only 3% of White Collar Employee & 0.9% of Blue Collar Employee thought that Laser treatment was the treatment for Diabetic Retinopathy. However, 25.5% of White Collar Employee& 25.5% of Blue Collar Employee answered surgery was the treatment for the disease. But majority of Blue Collar Employee said they didn't know about its treatment.

Chapter 5
Discussion
&
Conclusion

Discussion

Blue Collar is a term used for the people of the working class, who performs manual labor for an organization and get paid wages on an hourly basis. The workers are supposed to wear a blue uniform during working hours. The job is highly laborious that requires physical strain, but the workers are not paid well. The term white collar refers to the jobs of officials, who performs managerial or professional work for the organization and get a fixed amount of salary as remuneration at the end of each month. The officials are supposed to wear white colored formal clothes, i.e. shirt, trousers, and tie. The employees do not have to perform any manual labor as well as their work is completely knowledge oriented (Shurvi, 2014).

In a developing country like Bangladesh prevalence of blindness puts an additional burden to our socioeconomic conditions. In many low & middle-income and industrialized countries, there are three eye conditions have identified as potential threats to the status of sight of their populations. They are Cataract, Glaucoma, Diabetic Retinopathy (WHO, 2016).

Cataract an eye disease known for centuries, remains on the public health agenda due to difficulties in its early diagnosis and frequent necessity of life-long treatment. Glaucoma is one of the leading causes for permanent blindness. Another important eye disease is Diabetic Retinopathy. The increase of diabetes among many population groups has caused diabetic retinopathy to be added to the priority list. For this reason, the main objective of this study is to identify the present condition of knowledge and awareness regarding eye diseases.(WHO, 2016).

This comparative study was conducted over on 462 employed workers. During this survey 237White Collar and 225 Blue Collar Workers were participated. Among that the majority of employee were male and rests of them were female.

Among them, most of the employee were between 20-35 years of old, that is77.64% of white collar &71.6% of blue collar employee were in between 20 to 35 years. 77.64% of white collar &71.6% of blue collar employee were in between 20 to 35 years. Among them majority of white collar employee (49.37%) belonged to higher middle class family and majority of blue collar employee (70.22%) belonged to low class family.

Having heard of disease in question was defines as ‘Awareness’ and having understanding of the eye disease was defined as ‘Knowledge’.

A cataract is a clouding of the lens in the eye that affects vision. Most cataracts are related to aging. Cataracts are very common in older people (National Eye Institute, 2015). During this comparative study it was observed that majority employee from the both group, (94.50%) of white collar & 88% of blue collar worker responded that they were aware of the disease of cataract blindness. The study of Dandona et al., (1993) and study of Chew, Reddy and Karina (2004) also found similar observation but in higher age group. The knowledge of Cataract was found to be 69.8% and 88.2% respectively in case of above of the two studies.

While observing Cataract, it was found that very moderate percentages of employee were aware about Cataract, while 55.85% of white collar employee & 29% of blue collar employee had correct knowledge that it is a white membrane growing over the eye. And majority didn’t have the exact knowledge about what it is. This was also similar with the study of Dandona et al., (1993) and study of Chew, Reddy and Karina (2004) as they assessed poor and moderate knowledge about Cataract respectively.

During this study it was observed that majority of blue collar employee (39.6%) & only 19.40% of white collar employee were knew about cataracts from TV/Magazine/Other media. And the major sources of knowledge of white collar employee were family/friends/relative who were not suffering from the disease is (29.54%) while blue collar employee is 20%.

Approximately 80.59% of white collar & 75.11% of blue collar employee were knowledgeable that surgery was necessary eye treatment for cataract but maximum didn’t know about the type of surgery. Among them 78.48% of white collar & 60.89% of blue collar employee think that it was possible to get vision back from Cataract.

It was concluded by observing that only 47.68% of white collar employee & only 29.78% of blue collar employee knew about Intra Ocular Lens Implantation.

Despite the employee were aware about Glaucoma, comparatively white collar employee (63.84%) were more aware about glaucoma than blue collar employee (36.16%). The study of Ronnie et al., (2009) found 13.5%awareness of Glaucoma. Similar study done by Rewri and Kakkar (2014) found about 8.3 % respondents were aware about Glaucoma.

Glaucoma is a group of diseases that damage the eye's optic nerve and can result in vision loss and blindness. However, with early detection and treatment, you can often protect your eyes against serious vision loss (National Eye Institute, 2016). While observing Glaucoma, it was found that very moderate percentages of sample could correctly know the right definition of Glaucoma. Around 49.60% of the of white collar employee had correct knowledge that it is damage to the nerve of the eye due to high pressure and another had decent idea about it. The major sources of knowledge of blue collar employee, 22.7% were TV media and newspaper while the source of knowledge of white collar employee came from doctors is 25.32%. and another their source of knowledge came from Friends family relative not suffering from it.

Although having knowledge about definition, blue collar employee had very poor percentage rather than white collar employee to know that Glaucoma is permanent and also poor percentage correctly answered about possibility of getting vision back from blindness. Whereas majority of both class employee group, (30.38%) of white collar & 36.0% of blue collar employee didn't know anything about it. This findings is similar with the study of Rewire and Kakkar, 2014 as they found only 1.89 %, 93 out of 4927 were qualified as having knowledge about Glaucoma.

While observing Night blindness, the result was spectacular in the present study. Both group of employee were aware about the disease. 95.36% of white collar employee & 96.9% of blue collar employee were aware about the disease. And comparatively 91.14% of white collar employee correctly knew the right cause of blindness rather than blue collar employee, 66.25%.

The source of knowledge was similar as above two diseases. And the observed study showed that they think of it as a preventive disease in childhood and had nearly correct knowledge of preventive methods.

While observing Diabetic Retinopathy, white collar employee have more knowledge than blue collar employee. Only 22.7% blue collar employee were aware about it. The source of knowledge was similar as above other diseases.

Approximately 44.97% white collar employee were knowledgeable about decrease in vision was treatable but 64.6% of Blue Collar Employee answered they don't know about it. Both group of employee had poor knowledge about the original risk factors of the diabetic retinopathy. And for the knowledge about frequency of eye checkup, 45.05% said that once every 6 months the patient should go for checkup. Blue collar employee had very poor knowledge about the risk of Diabetic retinopathy. Uncontrolled diabetes were marked by 37.37% of white collar employee whereas 29.7% of le collar employee. This is similar with the study of Wang and Tan (2011) where lack of understanding on Diabetic Retinopathy (68%) were the main barrier for most patients for not coming to eye screening.

The awareness of knowledge about Diabetic Retinopathy was good (62%). The study of Mwangi and Gihinjii (2011) found that 83% respondents heard about Diabetic Retinopathy and 60% knew relationship between diabetic eye disease and diabetes. The study of Tajunisah, Wang and Tan (2011), Chew, Reddy and Karina (2004) found in their study about 86 % and 83.5% respectively as their awareness about Diabetic Retinopathy. In Bangladesh a study done on rural districts found that only 4.1% of people knew about Diabetic Retinopathy (Islam et al., 2015).

The study of Tajunisah, Wang and Tan (2011) resulted that 43.8% didn't have learning about how frequent they should go for an eye checkup and 72.3% didn't know about what treatments were available. In the present study it was observed that around 35% didn't know the frequency of eye checkup and only 10.48% knew about right treatment of Diabetic Retinopathy.

Conclusion

Based on all the facts, it can be concluded that knowledge and awareness about Cataract, Glaucoma and Diabetic Retinopathy in blue collar population was very poor compared to the white collar population. Even awareness of eye disease among white collar was not very high also and those who were aware had reasonable knowledge of the disease. Education and socioeconomic status played a significant role in the level of awareness between two group of worker. However due to the minimal exposure in the education system, they don't get as much information as they were supposed to be. Consequently they will suffer from different complications. Adequate access and proper utilization of eye care services can create greater awareness and exposure to information about various eye diseases. Data from our study suggest that a lot of effort is required to increase awareness regarding diabetic retinopathy in this both employed population and to transform this increased awareness to actual utilization of services.. Educational programmes to enhance public awareness may be needed to improve the effectiveness of health promotion and thus prevent unnecessary blindness. It is however need to mention that this research was conducted on randomly chosen employee and in a very small scale so it doesn't reflect the whole idea. Therefore it is suggested that if a conclusive result about the awareness of eye diseases is desired, further large scale researches should be conducted.

Chapter 6
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