Study on the status of eye health of workers of visually demanding occupation in selected settings of Bangladesh

A Project Report to be submitted in the Department of Pharmacy for the Partial Fulfillment of the Degree of Bachelor of Pharmacy.

Submitted by

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DECLARATION BY THE RESEARCH CANDIDATE

I, Md. Mazharul Islam, Id no 2012-3-70-005, hereby declare that the dissertation entitled **"Study on the status of eye health of the workers of visually demanding occupation in selected setting of Bangladesh''** submitted to the Department of Pharmacy, East West University, in the partial fulfillment of the requirement for the degree of Bachelor of Pharmacy (Honors) 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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CERTIFICATION BY THE SUPERVISOR

This is to certify that the dissertation, entitled **"Study on the status of eye health of the workers of visually demanding occupation in selected setting of Bangladesh"** is a bona fide research work done by Md. Mazharul Islam (ID: 2012-3-70-005) in partial fulfillment of the requirement for the degree of Bachelor of Pharmacy under my supervision.

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ENDORSEMENT BY THE CHAIRPERSON

This is to certify that the dissertation, entitled **"Study on the status of eye health of the workers of visually demanding occupation in selected setting of Bangladesh"** is a bona fide research work done by Md. Mazharul Islam (ID: 2012-3-70-005) in partial fulfillment of the requirement for the degree of Bachelor of Pharmacy under the guidance of **Nishat Nasrin**, Senior Lecturer, in partial fulfillment of the requirement for the degree of Bachelor of Pharmacy.

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DEDICATION

This research paper is dedicated to my parents

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Abstract

In the visually demanding occupations extensive function of eyes are involve. So workers of such professions are prone asthenopia which is known in the medical term eye fatigue. The study was aimed to assess the overall condition of eye health of workers of such professions emphasizing on the prevalence of asthenopia. The survey was conducted on 306 workers of varied visually demanding professions. Among them 87 were garment workers and 219 were general tailors. About 20% of garments worker and 58% of general tailor were found to be asthenopic. Among the symptoms redness of eye (2.94%), excess tearing (3.26%), eye pain (2.94%) were found to be more common. This study shows small fragment of the visually demanding workers of Bangladesh. In order to obtain a more comprehensive knowledge, further studies should be carried out on larger population and on more sorts of professions.

Keywords: Asthenopia , Visually demanding occupation in Bangladesh, Eye health.

CHAPTER -1

INTRODUCTION

1.1 Overview

The eye is the major organ of the human body. The eye is the organ of the sense of sight situated in the orbital cavity and it is supplied by the optic nerve. (Waugh and Grant, 2001)The eye is a highly specialized organ of photoreception for processing light energy from the environment to produce action potentials in specialized nerve cells, which subsequently relayed to the optic nerve and then to the brain where the information is processed and consciously appreciated as vision. In order to perform this basic physiological process, the other structures (Cornea, Lens, Iris, Ciliary body) in the eye are necessary parts of the system for focusing and transmitting the light onto the retina and for nourishing and supporting the tissues of the eye (the choroid, aqueous out flow system, and lacrimal apparatus) (Neard, 2016).

1.2 The anatomy of the eye

The anatomy of the eye is describe below:

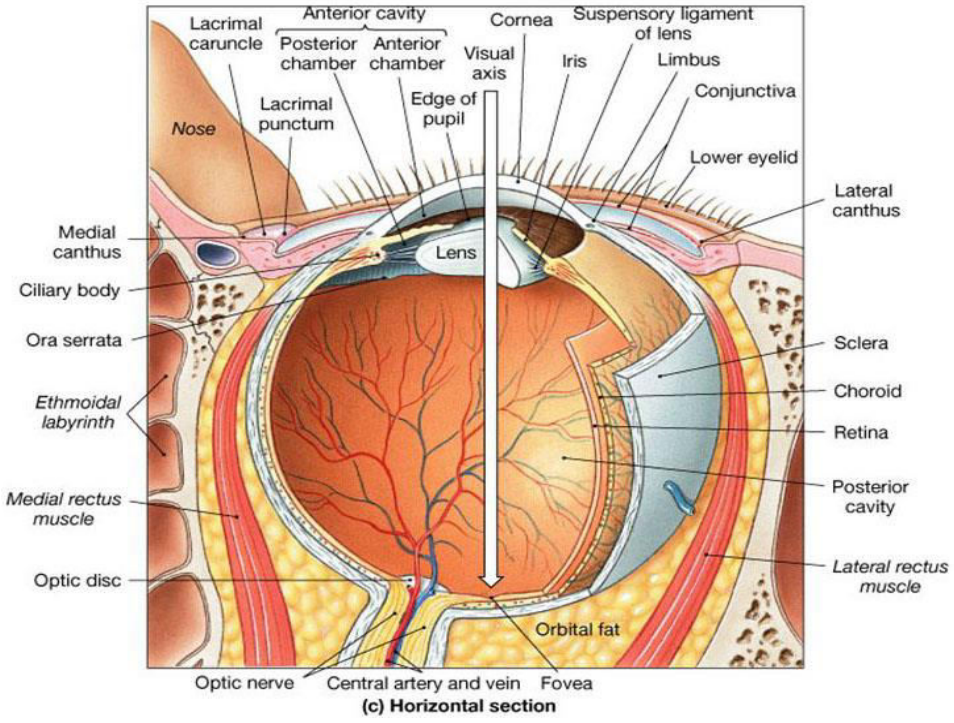

Figure 1.1: Anatomy of Eye figure (Bartholomew *et al.*, 2014)

1.2.1 Structure

There are three layers of tissue in the walls of the eye.

They are:

• The outer fibrous layer: sclera and cornea
• The middle vascular layer or uveal tract: choroid, ciliary body and iris
• The inner nervous tissue layer: retina.

Structures inside the eyeball are the lens, aqueous fluid (humour) and vitreous body (humour).

1.2.2 Sclera and cornea

The sclera, or white of the eye, forms the outermost layer of tissue of the posterior and lateral aspects of the eyeball and is continuous anteriorly with the transparent cornea .It consists of a firm fibrous membrane that maintains the shape of the eye and gives attachment to the extra ocular or extrinsic muscles of the eye .Anteriorly the sclera continues as a clear transparent epithelial membrane, the cornea. Light rays pass through the cornea to reach the retina. The cornea is convex anteriorly and is involved in refracting or Bending light rays to focus them on the retina (Bartholomew *et al*., 2014).

1.2.3 Choroid

The choroid lines the posterior five-sixths of the inner surface of the sclera. It is very rich in blood vessels and is deep chocolate brown in colour. Light enters the eye through the pupil, stimulates the nerve endings in the retina and is then absorbed by the choroid.

1.2.4 Ciliary body

The ciliary body is the anterior continuation of the choroid consisting of ciliary muscle (smooth muscle fibres) and secretory epithelial cells. It gives attachment to the suspensory ligament which, at its other end, is attached to the capsule enclosing the lens. Contraction and relaxation of the ciliary muscle changes the thickness of the lens which bends, or refracts light rays entering the eye to focus them on the retina. The epithelial cells secrete aqueous fluid into the anterior segment of the eye, eg: The space between the lens and the cornea (anterior and posterior chambers).The ciliary body is supplied by parasympathetic branches of the oculomotor nerve (3rd cranial nerve).Stimulation causes contraction of the smooth muscle and accommodation of the eye (Saladin, 2007).

1.2.5 Iris

The iris is the visible coloured part of the eye and extends anteriorly from the ciliary body, lying behind the cornea in front of the lens. It divides the anterior segment of the eye into anterior and posterior chambers which contain aqueous fluid secreted by the ciliary body. It is a circular body composed of pigment cells and two layers of smooth muscle fibres, one circular and the other radiating in the Centre there is an aperture called the pupil. The iris is supplied by parasympathetic and sympathetic nerves. Parasympathetic stimulation constricts the pupil and sympathetic stimulation dilates it the colour of the iris is genetically determined and depends on the number of pigment cells present. Albinos have no pigment cells and people with blue eyes have fewer than those with brown eyes (Waugh and Grant, 2001).

1.2.6 Lens

The lens is a highly elastic circular biconvex body, lying immediately behind the pupil. It consists of fibroses closed within a capsule and it is suspended from the ciliary body by the suspensory ligament. Its thickness is controlled by the ciliary muscle through the suspensory ligament. The lens bends (refracts) light rays reflected by objects in front of the eye. It is the only structure in the eye that can vary its refractory power (Saladin, 2007).

1.2.7 Retina

The retina is the innermost layer of the wall of the eye .It is an extremely delicate structure and is especially adapted for stimulation by light rays. It is composed of several layers of nerve cell bodies and their axons, lying on a pigmented layer of epithelial cells which attach it to the choroid. The layer highly sensitive to light is the layer of sensory receptor cells: rods and cones. The retina lines about three-quarters of the eyeball and is thickest at the back and thins out anteriorly to end just behind the ciliary body. Near the centre of the posterior part is the macula lutea, or yellow spot. In the centre of the area there is a little depression called the fovea centralis, consisting of only cone-shaped cells. Towards the anterior part of the retina there are fewer cone- than rod-shaped cells .The rods and cones contain photosensitive pigments that convert light rays into nerve impulses. About 0.5 cm to the nasal side of the macula lutea all the nerve fibres of the retina converge to form the optic(Waugh and Grant, 2001).

1.2.8 Blood supply to the eye

The eye is supplied with arterial blood by the ciliary arteries and the central retinal artery. These are branches of the ophthalmic artery, one of the branches of the internal carotid artery. Venous drainage is by a number of veins, including the central retinal vein, which eventually empty into a deep venous sinus. The central retinal artery and vein are encased in the optic nerve, entering the eye at the optic disc interior of the eye. The anterior segment of the eye, i.e. the space between the cornea and the lens, is incompletely divided into anterior and posterior chambers by the iris. Both chambers contain a clear aqueous fluid (humour) secreted into the posterior chamber by ciliary glands. It circulates in front of the lens, through the pupil into the anterior chamber and returns to the venous circulation through the sclera venous sinus (canal of Schlemm) in the angle between the iris and cornea. There is continuous production and drainage but the Intra ocular pressure remains fairly constant between 1.3 and 2.6 Pka (10 to 20 mmHg). An increase in this pressure causes glaucoma Aqueous fluid supplies nutrients and removes waste from the transparent structures in the front of the eye that have no blood supply, i.e. the cornea, lens and lens capsule (Bartholomew *et al*., 2014).

1.3 Visual Acuity

Visual acuity is the measurement of the clarity of vision. It is rated with fraction whose numerator is 20. Level of detail seen by a person at a distance of 20 feet is designated by 20/20. The lower is the denominator, the better is the visual acuity, e.g. 20/15 indicates that at 20 feet the person will be able to see as clear as a person with 20/20 will see at a distance of 15 feet. The higher is the denominator, the worse is the visual acuity

1.4 Processes Involved In Seeing

From acquiring optical signals to interpreting it into sensory information, there are various processes involved. The principle processes are described below:

1.4.1 Refraction

The retina has about 130 million photo receptors each monitoring light striking a specific site on the retina. In the human eye, the greatest amount of refraction occurs when light passes from the air into the corneal tissues, which have a density close to that of water. When you open your eyes under water, you cannot see clearly because refraction at the

corneal surface has been largely eliminated; light passes unbent from one watery medium to another. Additional refraction takes place when the light passes from the aqueous humor into the relatively dense lens. The lens provides the extra refraction needed to focus the light rays from an object toward a focal point—a specific point of intersection on the retina. The distance between the center of the lens and its focal point is the focal distance of the lens. Whether in the eye or in a camera, the focal distance is determined by two factors:

1. The Distance of the Object from the Lens. The closer an object is to the lens, the greater the focal distance

2. The Shape of the Lens. The rounder the lens, the more refraction occurs, so a very round lens has a shorter focal distance than a flatter one (Bartholomew *et al.*, 2014).

1.4.2 Accommodation

Accommodation is the automatic adjustment of the eye to give us clear vision During accommodation, the lens becomes rounder to focus the image of a nearby object on the retina; the lens flattens when we focus on a distant object .The lens is held in place by the suspensory ligaments that Originate at the ciliary body. Smooth muscle fibers in the ciliary body act like sphincter muscles. When the ciliary muscle contracts, the ciliary body moves toward the lens, thereby reducing the tension in the suspensory ligaments. The elastic capsule then pulls the lens into a more spherical shape that increases the refractive power of the lens. This enables it to bring light from nearby objects into focus on the retina. When the ciliary muscle relaxes, the suspensory ligaments pull at the circumference of the lens, making the lens flatter.

1.4.3 Image Reversal

We have considered light that originates at a single point, either near or far from the viewer. An object we see is really a complex light source that must be treated as a number of individual points. Light from each point is focused on the retina as in the result is a miniature image of the original, but the image arrives upside down and reversed from left to right (Bartholomew *et al.*, 2014).

1.5 Disorder of eye

1.5.1 Refractive errors

Disorders of the eye can be originated from anomaly of any anatomical structure or any

process involved in viewing. The disorders are described below

1.5.1.1 Emmetropia (normal vision)

In the healthy eye, when the ciliary muscle is relaxed and the lens is flattened, a distant image will be focused on the retina's surface. This condition is called emmetropia.

1.5.1.2 Myopia (nearsightedness)

If the eyeball is too deep or the resting curvature of the lens is too great, the image of a distant object is projected in front of the retina. The person will see distant objects as blurry and out of focus. Vision at close range will be normal because the lens is able to round as needed to focus the image on the retina.

1.5.1.3 Hyperopia (farsightedness)

If the eyeball is too shallow or the lens is too flat, hyperopia results. The ciliary muscle must contract to focus even a distant object on the retina. And at close range the lens cannot provide enough refraction to focus an image on the retina. Older people become farsighted as their lenses lose elasticity, a form of hyperopia called presbyopia(Bartholomew *et al.*, 2014).

1.5.2 Astigmatism

Astigmatism is a refractive error of the eye that causes the visual image in one plane to focus at a different distance from that of the plane at right angles. This most often results from too great a curvature of the cornea in one plane of the eye. An example of an astigmatic lens would be a lens surface like that of an egg lying sidewise to the incoming light. The degree of curvature in the plane through the long axis of the egg is not nearly as great as the degree of curvature in the plane through the short axis.

1.5.2 Cataracts

"Cataracts" are an especially common eye abnormality that occurs mainly in older people. A cataract is a cloudy or opaque area or areas in the lens. In the early stage of cataract formation, the proteins in some of the lens fibers become denatured. Later, these same proteins coagulate to form opaque areas in place of the normal transparent protein fibers. When a cataract has obscured light transmission so greatly that it seriously impairs vision, the condition can be corrected by surgical removal of the lens. When this is done,

the eye loses a large portion of its refractive power, which must be replaced by a powerful convex lens in front of the eye; usually, however, an artificial plastic lens is implanted in the eye in place of the removed lens.

1.5.3 Glaucoma

"Glaucoma," a Principal Cause of Blindness. Glaucoma is one of the most common causes of blindness. It is a disease of the eye in which the intraocular pressure becomes pathologically high, sometimes rising acutely to 60 to 70 mm Hg. Pressures above 25 to 30 mm Hg can cause loss of vision when maintained for long periods. Extremely high pressures can cause blindness within days or even hours(Guyton and Hall, 2006).

1.5.4 Conjunctivitis

Inflammation of the conjunctiva may be caused by irritants, such as smoke, dust, wind, cold or dry air, microbes or antigens. Corneal ulceration is a rare complication.

1.5.5 Microbial infection

In adults this is usually caused by strains of staphylococci, streptococci, pneumococci and haemophilus.

1.5.6 Allergic conjunctivitis

This may be a complication of hay fever or be caused by a wide variety of airborne antigens, e.g. dust, pollen, fungus spores ,animal dander, cosmetics ,hair sprays, soaps. The condition sometimes becomes chronic.

1.5.7 Trachoma

This is a chronic inflammatory condition caused by Chlamydia trachomatis in which fibrous tissue forms in the conjunctiva and cornea, leading to eyelid deformity, and is a common cause of blindness in tropical countries. The microbes are spread by flies, communal use of contaminated washing water, cross-infection between mother and child, contaminated towels and clothing.

1.5.8 Inflammation of the uveal tract (iris, ciliarybody,choroid)

1.5.8.1 Anterior uveitis (iritis, iridocyclitis)

Iridocyclitis (inflammation of iris and ciliary body) is the more be acute or chronic. The infection may have spread from the outer eye but in most cases the cause is unknown. There is usually moderate to severe pain, redness, blurring of vision, lacrimation and photophobia. In severe cases adhesions form between the iris and lens capsule, preventing the circulation of aqueous fluid in the posterior and anterior chambers. This may cause the lens to bulge and sinus. After repeated attacks spontaneous recovery may be incomplete and vision is progressively impaired.

1.5.9 Retinal detachment

This painless condition occurs when a tear or hole in the retina allows fluid to accumulate between the layers of retinal cells or between the retina and choroid. It is usually localised at first but as fluid collects the detachment spreads. There are spots before the eyes, flashing lights due to abnormal stimulation of sensory cells, and progressive loss of vision, sometimes described as a 'shadow' or 'curtain'. In many cases the cause is unknown but it may be associated with trauma to the eye or head, tumors, hemorrhage, cataract surgery when the pressure in the eye is reduced or diabetic retinopathy (Waugh and Grant, 2001).

1.5.10 Macular degeneration (AMD)

Macular degeneration is a common eye condition and a leading cause of vision loss among people age 50 and older. It causes damage to the macula, a small spot near the center of the retina and the part of the eye needed for sharp, central vision, which lets us see objects that are straight ahead.

There are three stages of AMD defined in part by the size and number of drusen under the retina. It is possible to have AMD in one eye only, or to have one eye with a later stage of AMD than the other.

- Early AMD
- Intermediate AMD
- Late AMD

1.5.10.1 Early AMD

Early AMD is diagnosed by the presence of medium-sized drusen, which are about the width of an average human hair. People with early AMD typically do not have vision loss.

1.5.10.2 Intermediate AMD

People with intermediate AMD typically have large drusen, pigment changes in the retina, or both. Again, these changes can only be detected during an eye exam. Intermediate AMD may cause some vision loss, but most people will not experience any symptoms.

1.5.10.3 Late AMD

In addition to drusen, people with late AMD have vision loss from damage to the macula. There are two types of late AMD:

In geographic atrophy (also called dry AMD), there is a gradual breakdown of the light-sensitive cells in the macula that convey visual information to the brain, and of the supporting tissue beneath the macula. These changes cause vision loss.

In neovascular AMD (also called wet AMD), abnormal blood vessels grow underneath the retina. ("Neovascular" literally means "new vessels.") These vessels can leak fluid and blood, which may lead to swelling and damage of the macula. The damage may be rapid and severe, unlike the more gradual course of geographic atrophy. It is possible to have both geographic atrophy and neovascular AMD in the same eye, and either condition can appear first (National Eye Institute, 2016).

1.6. Asthenopia

Asthenopia is a term used to describe a sense of strain and weakness or ocular fatigue set up by the use of the eyes Asthenopia is a common presenting complaint among patients with accommodative and convergence insufficiency, refractive errors and intermittent strabismus. Asthenopic symptoms are less frequent at distance vision than at near vision, because there is less strain on the accommodation and vergence systems. Asthenopic symptoms are becoming more common in modern society where near work at computers require sustained fixation, often for hours, at the same visual distance ,which puts a strain on the system for near vision (Abdi, 2016).

1.6.1 Types of asthenopia

Asthenopia can be divided into two types:

1. Accomodative asthenopia, which is due to strain on ciliary muscles. This is the most common form.

2. Muscular asthenopia, this is caused due to weakness of extra ocular muscles. It is commonly seen in squints and nerve palsies.

Clinically it is easy to differentiate between these two types in most of the cases. In case of a doubt, a simple patch test will help. Patch one eye for several hours, if symptoms persists, It is due to accommodative stress. On resting one eye if the symptoms are relieved, it is due to muscular incompetence.

1.6.2 Causes

1. Uncorrected refractive errors: Mainly seen with hypermetropia & astigmatism. In hyperopes accommodation is already compromised & strainis put on ciliary muscles during prolonged near work.
2. Temporary failure of ciliary muscle leading to blurring of vision.
3. Excessive spasm of accommodation, leading to artificial myopia.
4. In astigmatism, continuous strain is thrown on the accommodation in the attempt to see clearly. This is particularly so in cases of small astigmatic errors, as patient gets clear vision on accommodation & this increases his tendency to further accommodate. Thus the most severe Symptoms come with a visual acuity of 6/6. Of these, most cases are of hypermetropic astigmatism.
5. Uncorrected presbyopia: Computer professionals, tailors, beediworkers, weavers are some of the occupations that lead to a premature presbyopia or at least the need for a mild plus correction to relieve the strain caused by the long hours of near work.
6. Prolonged near work in people with no refractive errors, can also cause some degree of eyestrain. This can be attributed dry eye.
7. Inadequate illumination: This is one major cause asthenopia in children. We have to check if they are reading a well lighted room. Watching computer screens, television sets in decreased background illumination, will increase contrast of visual display.
8. Muscular imbalance, anisekonia
9. Retial problems
10. Using CRT monitorsand Cathod ray monitors (Smitha, 2012).

1.6.3 Measurement of Asthenopic Symptoms

Various questionnaires, classification schemes and scales were used by many researchers to assess the asthenopic symptoms. They are discussed below:

1.6.4 Questionnaires and Classification Schemes

Cooper *et al*. (1983): It contains 8 questions, most of whom have five alternatives and a scale for estimating symptoms due to convergence insufficiency and other binocular vision disorder.

Convergence Insufficiency and Reading Study Group (CIRS): A classification scheme has been developed based on measurements of the asthenopic problems in relation to accommodative insufficiency and convergence insufficiency.

There are other questionnaires and classification schemes such as COVD-QOL (College of Optometrist in Vision Development Quality for Life Checklist) and questionnaire of Borsting *et al*. (1999). But they are complicated, time consuming and difficult.

1.7 Computer Vision Syndrome (CVS)

This is one important cause of asthenopia. This describes a group of eye & vision related problems that result from prolonged computer use. When we concentrate on the computer, we tend to blink less. This is an involuntary action & the eyes tend to get dry. The tear film stability decreases, eyes get itchy & red. Concentrating at a short working distance also tends to cause varying degrees of ciliary spasm. These further increases the eye strain & causes pain in & around the eyes. Improper sitting position during work with bending forwards to get clear screen images, gravates the problems of headache, neck pain & backache. Various factors in the working environment also are responsible for the increased frequency of cases of CVS today. Inadequate lighting in the room Improper angulation of the monitor screen Dust on the screen, causes more glare Increased air conditioning/ direct air blowing from fan Decreased hydration: Busy working hours leads to decreased drinking of water, that increases dry eye (Smitha, 2012).

1.8 Symptoms of Asthenopia

Symptoms range from mild discomfort to severe headaches.

They can be divided as:

a) External- Caused by manually holding open the eyelids. Blinks interfere with acquiring visual information while reading & are thus reduced during use of computers. This leads to,

- Tired, dry eyes
- Watering
- Burning sensation
- Redness, itching

b) Internal- Induced by accommodation & convergence

- Frequent stays
- Pain in & around the eyes
- Headache
- Neck pain
- Twitching around the eye (Myokymia)

1.9 Treatment

1. Corrective spectacles
2. Eye lubrication: Frequent use of tear substitutes advised.
3. Antireflective coating over screens/glasses.
4. Eye exercises: There are a variety of eye exercises that relieve the eye strain.
   - Palming: Warm palms & then cup them over closed eyes, fingers overlapping at forehead, for 2 minutes
   - Near-far focus: Keep thumb or pencil 15cm from nose. Focus on tip of the pencil for some time then change the focus to an object 3meters away. Repeat 10-20times.
   - Close eyes tightly for few seconds in between work.
   - Massage: Circular motions over the eyes with gentle pressure for few minutes with tip of ring finger especially after use of lubricants, gives great relaxation to the eye
5. Medications (Smitha, 2012).

1.10 Measurement of Symptoms

There is a number of diverse one or multi-dimensional instruments to assess the amount of the Intensity and fatigue level of CVS. They are: Visual fatigue meter (VFM): It is a device based on the flicker changes. This device is used to evaluate the visual fatigue changes in ergonomics science.

Subjective visual fatigue questionnaire: Questionnaires converts mental parameters into

objective Parameters. Various questionnaires previously used by researchers are:

- Kuze and Ukai: In 2007, they produced a 28-item questionnaire including a list of visual fatigue symptoms in a scale of 7 and in 5 major areas.
- Lin YT *et al.*: In 2008, they simultaneously assessed visual fatigue with the. Heuer's questionnaire and critical fusion frequency (CFF) index.
- Ogata et al.: They presented a series of visual fatigue symptoms in their questionnaire.
- Yano *et al.*: They assessed the Visual fatigue by a question in a scale of 5. Such one item questionnaires along with other objective methods to assess visual Fatigue simultaneously.
- Rajabi-Vardanjani *et al.*: They have attempted to design a comprehensive questionnaire to cover all those aspects of visual fatigue of the VDT operators using a physiologic parameter (CFF change) as a criterion to determine the cut-off points of visual fatigue (Rajabi-Vardanjani*et al.*, 2014).

1.11 Visually Demanding Occupations

There are several occupation are visually demanding like tailor ,waver ,computer operators ,garments worker ,sewing operators, bartake operators ,quality checker ,helper ,cutter man etc.

1.12 Global Epidemiology

The World Health Organization (WHO) estimated that an estimated 180 million people worldwide are visually impaired, and of these, between 40 and 45 million persons are blind (WHO 2004). It also estimated that about 80% of blindness around the world is avoidable, either resulting from conditions that could have been prevented or controlled if the available knowledge and interventions had been applied earlier (e.g. trichiasis), or successfully treated by restoring sight (e.g. cataract) (WHO 2004).

A recent estimate of internet usage by continent ranged from 77.4% of the population of North America to 10.9% of Africa, with an estimated 1 966 514 816 users worldwide have asthenopia. A recent investigation of over 2000 American children between 8 and 18 years of age reported that in an average day they spend approximately 7.5 h using entertainment media, 4.5 h watching TV, 1.5 h on a computer and over an hour playing video games (Rosen field, 2011).

There is less study on asthenopia but asthenopia is increase day by day.

CHAPTER -2

LITERATURE REVIEW

There has been numerous studies on various aspects of asthenopia and computer vision syndrome in different countries. A number of them are introduced below in order of years:

2.1 Eye discomfort strain or the risk of eye injury in the workplace

This study was conducted by Common wealth of Australia in 2012. It was aimed to clarify the relation between the prevalence of eye strain, dry eyes, headaches, fatigue, blurred vision, and loss of focus in the cvs. According to them there are about 50 000 eye injuries per year in Australia. Eight per cent of workplace injuries are eye injuries and each year about seven in 1000 workers sustain an eye injury (Common wealth australia, 2012).

2.2 A study of computer-related upper limb discomfort and computer vision syndrome

This study was conducted by Sen and Stanley Richardsen. About 150 questionnaires were distributed, and an online version of the questionnaire was put on the web. One hundred forty questionnaires (including the online responses) were returned. One hundred thirty-six PC users were studied, four being rejected, as they met the exclusive criteria for CVS. In the sample, nearly 71% of the respondents were less than 30 years old. The gender distribution revealed that 65 % of the sample was females. Analysis of demographic data revealed that 43% of the samples were Indians, 33% were Chinese and 24% were Malays. The sample population was skewed, as it did not represent the actual ratio of the Malaysians where two-thirds are of Malay origin. Regarding rest pauses it can be seen from Table 1 that many (42.9 %) used computers for a continuous spell of more than 2 hours without taking any breaks of which 20 % were using the computers for 4 to 6 hours per day (5 days a week).In a study in Hong Kong (Szeto, 2003) where computers are fast catching up with day to day activities, amongst high school students, about 11% used computer for 8-14 hours at home per week and 6% for 15-28 hours per week (Sen and Richardson, 2007).

2.3 Evaluation of Vision-Related Problems amongst Computer Users,A Case Study of University of Benin, Nigeria

This study was conducted by Stella C. Chiemeke, Allen E. Akhahowa and Olajire B. Ajayi. One hundred and three (103) completed questionnaires were returned comprising

56 males and 47 females yielding a percentage of 54.4% and 45.6%, respectively. School pupils/children were involved in the study. These children are those who use computers frequently to watch films, play games and listen to instructional lectures. The mean age of the respondents was 26 ± 6.1years. Only a small percentage (32%) of the respondents was aware of preventive measures for visual symptoms, while minority (1%) had former ergonomics guidelines/policies at their workplace. Thus 15hours on the average were lost in the last one month due to visual related symptoms, because respondents said they had to abandon their works running into hours (Stella *et al.*, 2007).

2.4 prevalence of ocular symptoms and signs in professional video display users (VDUs) and non-users in Isfahan

This study was conducted by Alireza Dehghani, Mehdi Tavakoli, Mohamad reza Akhlaghi, Afsaneh Naderi, Fatemeh Eslami. Fifty seven VDUs (34 male and 23 female, age30.7 +6.8) and 56 controls (25 male and 31 female, age 27.6 +7.2) were evaluated. Among VDUs, 45 cases (79%) had burning eyes and tearing, 38 cases (66%) had dry eye, 37 cases (65%) had asthenopia, and 47 cases (82.5%) had musculoskeletal pain but these values for the control group were 24 (42.8%),18 (32.2%), 22(39.3%) and 15 (26.8%) respectively and Schirmer's test was positive in 22 VDUs (Dehghani *et al.*, 2008).

2.5 asthenopia prevalence and associated factors in schoolchildren aged 6–16

This study was conducted by Manuel AP Vilela, Victor D Castagno, rodrigo D Meucci, anaclaudia g Fassa. They found Asthenopia prevalence was 24.7% in a total sample of 964 children. Visual acuity of 20/25 or better in both eyes was found in 92.8% of the children. The stereopsis test was normal in 99.4% of them, and some kind of strabismus was found in 3.5%. About 37.8% had astigmatism, 71.6% had mild hyperopia, 13.6% had moderate hyperopia, and 6.1% were myopic. Near point of convergence was abnormal in 14.0% of the children, and the accommodative convergence/accommodation ratio was found to be altered in 17.1% of them (Vilela *et al.*, 2015).

2.6 Interventional Cohort Study for evaluation of Computer Vison Syndrome among Computer Workers

This study was done on 150 subjects by Gupta *et al.,* in year 2012-13 there was significant association between headache and working distance and posture. In our study asthenopic symptoms were found in 70.9% of participants who adjusted posture as

compared to 91.9% in those who did not adjust their posture while using computer. The incidence of CVS is as high as 50–90% among the employees whose occupation involves computer use. It is estimated that approximately 45 million workers directly use computers, staring into VDTs for hours continuously. Also, a number of investigators have indicated that visual symptoms occur in 75–90% of VDT workers. Our study is comparable with these studies. We observed that pre interventional asthenopia (83.6%) &musculoskeletal complains were decreased after intervention .High prevalence of asthenopic complaints (46.3%) in the computer users was also reported in a similar study done by other investigators (Gupta *et al*, 2014).

2.7 Associations between eyestrain and neck–shoulder symptoms among call center operators

This study was conducted by Clairy Wiholm, Hans Richter, Svend Erik Mathiassen Allan Toomingas. They worked on 1531 employees at 28 different call centers during 2001–2003 and found 21% of the responding participants reported both eyestrain and neck–shoulder symptoms, 46% reported neck–shoulder symptoms only, and 6% reported eye symptoms only; 27% were free from symptoms in these regions. A significant positive association was found between eyestrain and neck–shoulder symptoms. Significant covariates for shoulder–neck disorders were eyestrain and feeling stressed multi-nominal regression analysis, gender (female) were significant predictors of eye–neck symptoms (Clairy *et al*., 2007).

2.8 Visual problems among video display terminal (VDT) users in Nepal

This study was conducted by Gauri Shankar Shrestha Fathimath, Nestha Mohamed Dev Narayan Shah. A total of 76 subjects were enrolled in the study (Mean age of subject s was 25. 8 ± 5 years with 6. 9 ± 2. 6 hours/ day of computer use. Ocular changes were reported in 92. 1 % of the total subject s. The common ocular change was accommodative facility. The most common symptoms ($p < 0.001$) were tired eye and headache (Shrestha *et al*., 2011).

Significance of the Study

The impact of blindness and poor vision on quality of life is particularly alarming for those living in poverty. Approximately 45 million people in the world are blind, and 87% of visually impaired people live in developing countries (World Health Organization, 2016). The economic consequences of blindness are staggering, as 90% of blind individuals cannot work (Cureblindness.org, 2016). Thus, "poverty and blindness are believed to be intimately linked, with poverty predisposing to blindness, and blindness exacerbating poverty by limiting employment opportunities, or by incurring treatment cost."(Kuper *et al.*, 2010) Impoverished people are more likely to become blind due to lack of access to health services. They also tend to be more susceptible to eye infections and diseases, and lack awareness about eye health.

Bangladesh is a developing country. The people of the country have low prevalence of the symptom of asthenopia and computer vision syndrome. Especially the people who are involved in visually demanding occupation like tailor, garments worker, waver, computer operator. Eye diseases decrease job performance, increase error rates and thus decrease productivity quantitatively and qualitatively. At severe stage of diseases, one may have to discontinue their job. So caution should be exercised against eye diseases. Thus obtaining data about their eye health bears importance.

According to our knowledge, no study has been perform yet on the asthenopia and computer vision syndrome so it become important to conduct the study.

Aims of the Study

The aims of this study were to -

- To evaluation the prevelance of the symptom of asthenopia.
- Understanding & Investigate the psychological factor, environmental factor.

CHAPTER -3

METHODOLOGY

3.1 Type of Study

This is a survey based study.

3.2 Study Population

The study population consisted of the workers of visually demanding occupations. The selected occupations and respective numbers of subjects are given below:

General tailors: 219

Garments workers: 87

3.3 Study Area

The study was conducted in three different areas. They are: Siddhirgonj, Narayangonj: Survey on the tailors was conducted here. Jatrabari, Dhaka: several tailor are available in this area.Urdu Road: Survey on general tailors was conducted here. Many tailor shops scattered there where the tailors work. Signboard, Narayangonj: several garments factory and several scattered tailors are there.

3.4 Inclusion Criteria

The only inclusion criteria for the subjects was to be a general tailor, garments worker.

3.5 Exclusion Criteria

The exclusion criteria for the subjects was not being a weaver, general tailor or computer operator.

3.6 Data Collection Tools

The tools used for the survey were a questionnaire, weighing scale, measuring tape, Snellen chart for measuring far vision and near vision acuity.

3.6.1 Questionnaire

The questionnaire comprised of questions regarding demographic information, existing medical conditions, treatment, asthenopic symptoms, lifestyle, work pattern and environment, psychology related factors which could be affecting asthenopia and information related to computer vision syndrome for computer operators.

3.6.2 BMI (Body Mass Index) Measurement

The height and weight was measured with a measuring tape in inches and with a weighing machine in kilograms respectively. The BMI (Bod Mass Index) was measured using the following formula:

BMI = (weight in kilograms) / (height in meters)^2 (WHO, 2015)

3.6.3 Visual Acuity Measurement

Visual acuity is the measurement of a subject's ability to see clearly. Visual acuity was measured for far vision and near vision. The methods are described below:

3.6.3.1 Measuring Far Vision

Snellen chart was used for this purpose. In that chart there were various letters of English alphabet arranged in rows. Each row was denoted by a fraction, whose numerator was the distance from which the chart was viewed, and the denominator was the furthest distance at which the subject could see clearly. The numerator was fixed for all the rows. The topmost row had the highest denominator, which gradually lowered with the descending rows .The subject was asked which rows s/he can read clearly, among which the fraction of the one with the lowest denominator indicated his/her visual acuity. The lower was the denominator of the visual acuity fraction, the further the subject could see clearly (Tsai *et al.*, 2011).

Usually the test is done at a distance of 20 feet or less. For this study, a chart was used for which the test distance to be used was 5 feet, but the chart provided fractions with a numerator of 20. As many of the subjects were supposedly illiterate, the chart had the English letter 'E' tumbled indifferent positions instead of other letters.

3.6.3.2 Measuring Near Vision

The near vision chart used the same principle as the far vision chart, except the test distance being 16 inches.

3.7 Data Analysis

After collecting, the data were checked and analyzed with the help of Microsoft Excel 2013. The result was shown in bar, pie and column chart and different variables were calculated in percentages.

CHAPTER -4

RESULT

4.1 Demographic Distribution of Subjects

4.1.1 Distribution of Professions with Asthenopic Symptoms (N=306)

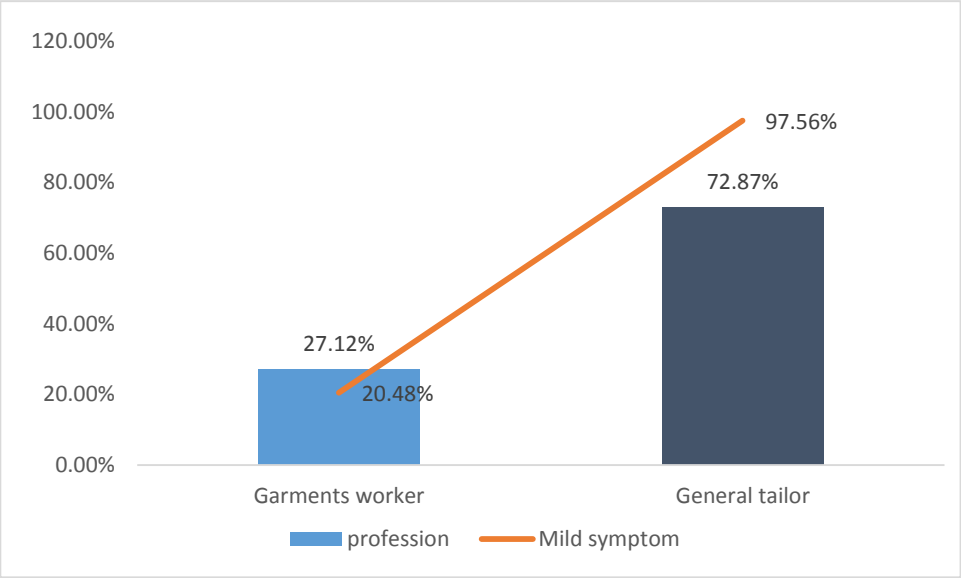

Fig 4.1.1: Distribution of Professions with Asthenopic Symptoms (N=306)

The study was conducted on 306 subjects, among whom garments workers accounted for 27.12%, general tailors accounted for 72.87%. Mild asthenopic symptoms were present in 20.48% of the garments workers, 57.56 % of the general tailors.

4.1.2 Distribution of BMI and Relation with Asthenopic Symptoms (N=306)

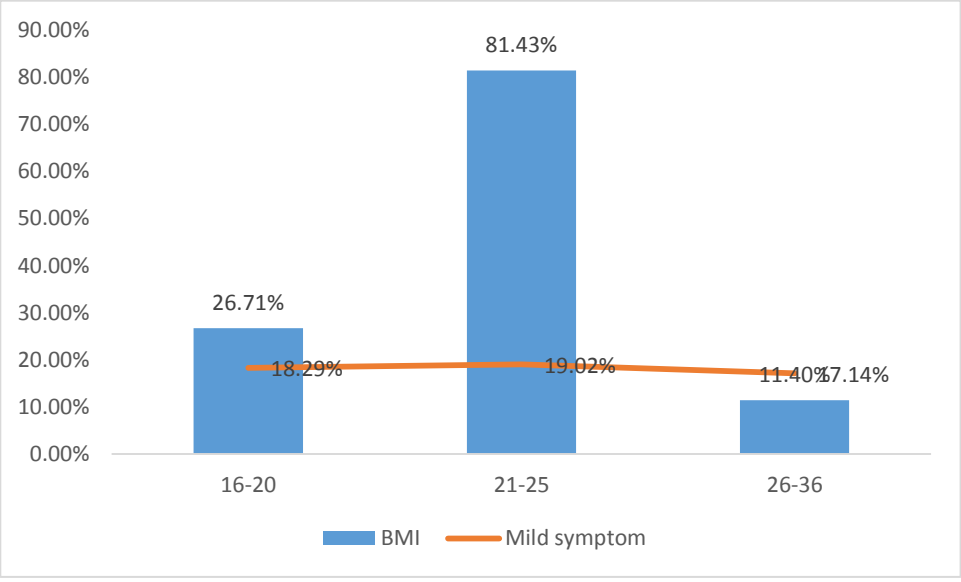

Fig 4.1.2: Distribution of BMI and Relation with Asthenopic Symptoms (N=306)

Subjects with BMI 16-20 accounted for 26.71 % of the total population. Rest of the subjects with BMI's 21-25 accounted for 81.43%, 26-36 accounted for 11.40 % population respectively. Mild asthenopic symptoms were present in 18.29%, 19.02%, and 17.14% of population.

4.2 Distribution of Visual Acuity

4.2.1 Distribution of Visual Acuity of Far Vision (Right) and Relation with Asthenopic Symptoms (N=306)

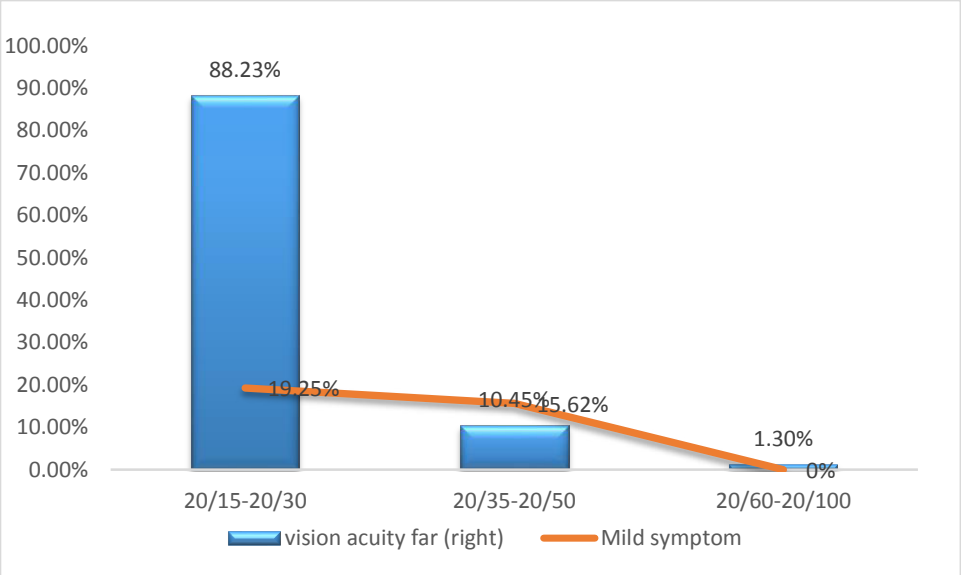

Fig 4.2.1: Distribution of Visual Acuity of Far Vision (Right) and Relation with Asthenopic Symptoms (N=306)

Subjects with far vision visual acuity 20/15to 20/30, 20/30 to 20/50 accounted for 88.23% ,10.45% And 20/50 to 20/100 accounted 0% for right eye .Subjects with mild symptoms accounted for 19.25%, 15.62%, and 0.00% for visual acuity 20/15to 20/30, 20/30 to 20/50 and 20/50 to 20/100 respectively for right eye.

4.2.2 Distribution of Visual Acuity of Far Vision (left) and Relation with Asthenopic Symptoms (N=306)

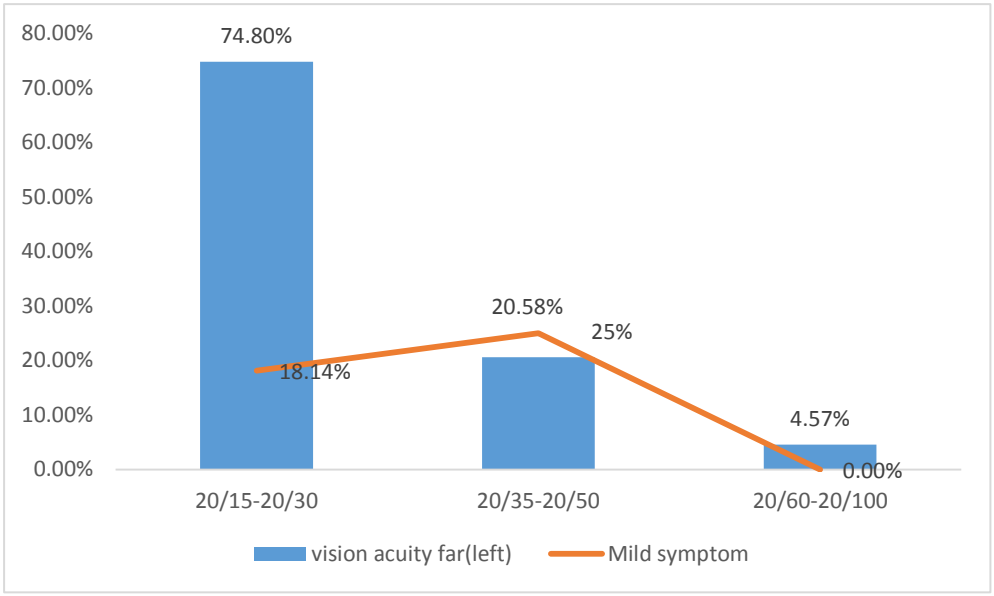

Fig 4.2.2: Distribution of Visual Acuity of Far Vision (left) and Relation with Asthenopic Symptoms (N=306)

Subjects with far vision visual acuity 20/15to 20/30, 20/30 to 20/50 accounted for 74.80%, 20.58% And 20/50 to 20/100 accounted 4.57 % for right eye .Subjects with mild symptoms accounted for 18.14%, 25%, and 0.00% for visual acuity 20/15to 20/30, 20/30 to 20/50 and 20/50 to 20/100 respectively for right eye.

4.2.3 Distribution of Visual Acuity of Near Vision (right) and Relation with Asthenopic Symptoms (N=306)

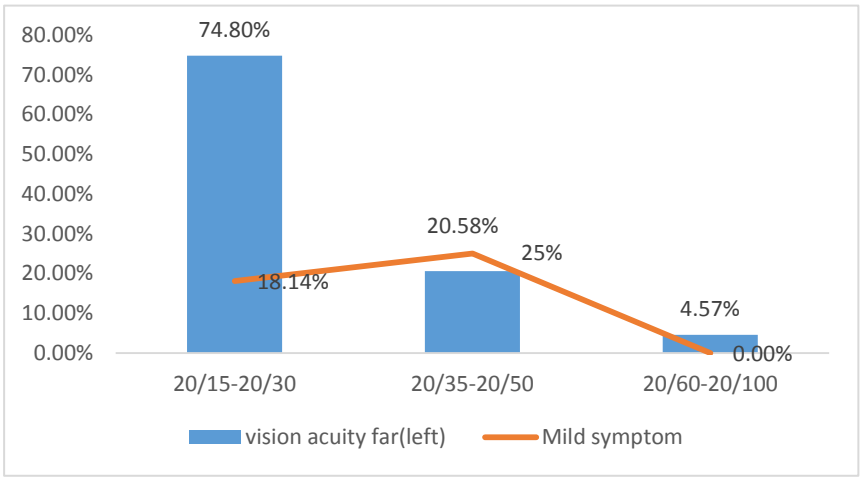

Fig 4.2.3: Distribution of Visual Acuity of Near Vision (Right) and Relation with

Asthenopic Symptoms (N=306)

Subjects with near vision visual acuity 16/16 to 16/24, 16/24 to 16/40 and 16/40 to 16/80 accounted for 7.18%, 80.39 %, 12.41% for right eye .Subjects with mild symptoms accounted for 9.09%, 23.07%, and 0.00% for visual acuity 16/16 to 16/24, 16/24 to 16/40 and 16/40 to 16/80 respectively for right eye.

4.2.4 Distribution of Visual Acuity of Near Vision (left) and Relation with Asthenopic Symptoms (N=306)

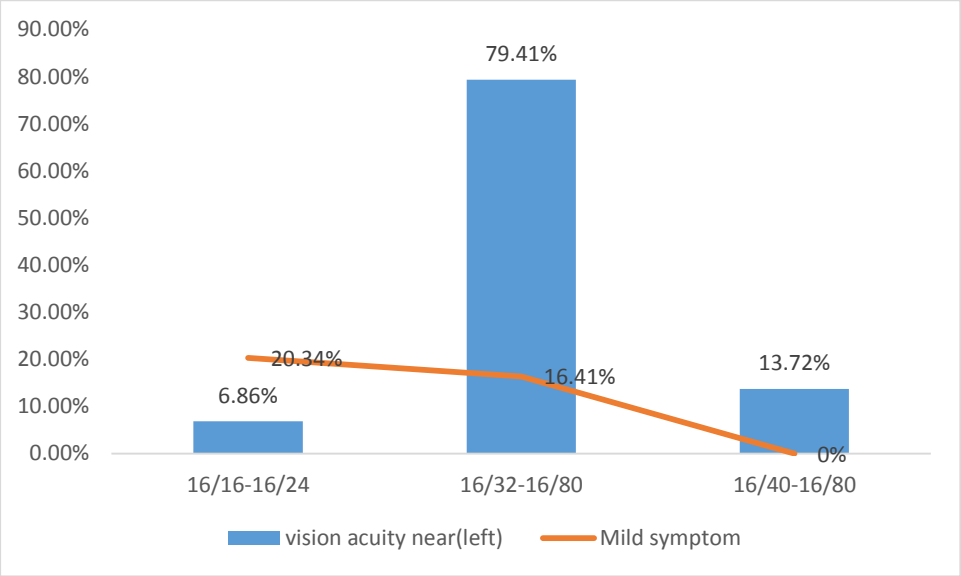

Fig 4.2.4: Distribution of Visual Acuity of Near Vision (left) and Relation with Asthenopic Symptoms (N=306)

Subjects with near vision visual acuity 16/16 to 16/24, 16/24 to 16/40 and 16/40 to 16/80 accounted for 6.86%, 79.41%,13.72% for left eye .Subjects with mild symptoms accounted for 20.34%,16.41% and 0.00% for visual acuity 16/16 to 16/24, 16/24 to 16/40 and 16/40 to 16/80 respectively for left eye.

4.3 Medical related factor

4.3.1 Distribution of Eye Diseases (N=306)

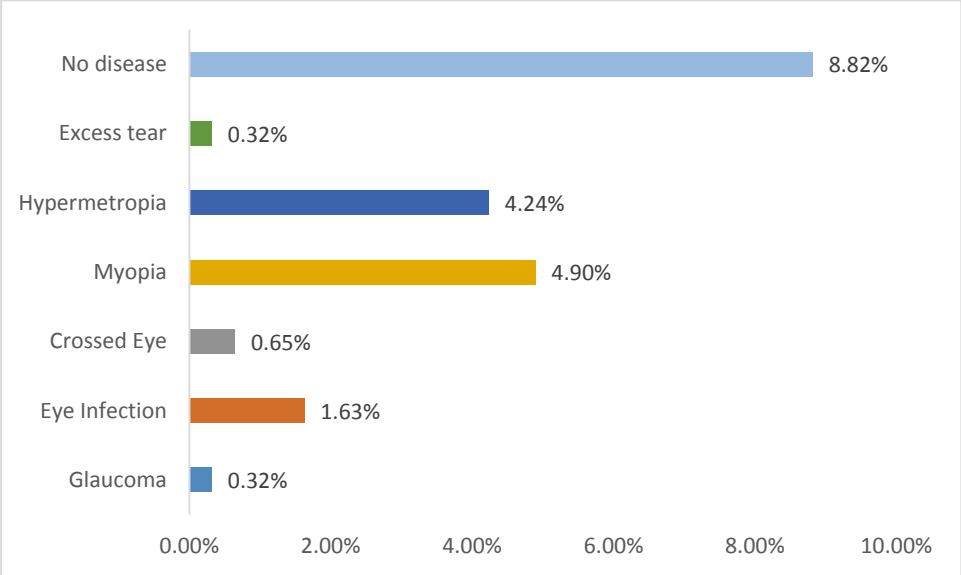

Fig 4.3.1:Distribution of Eye Diseases (N=306)

Subject with glaucoma ,eye infaction ,crossed eye, myopia , hypermetropia, excess tear, accounted for 0.32%,1.63% ,0.65% ,4.90%,4.24%, 0.32% of the total population respectively and 8.82% had no diseases.

4.3.2 Ocular History of Family Members (N=306)

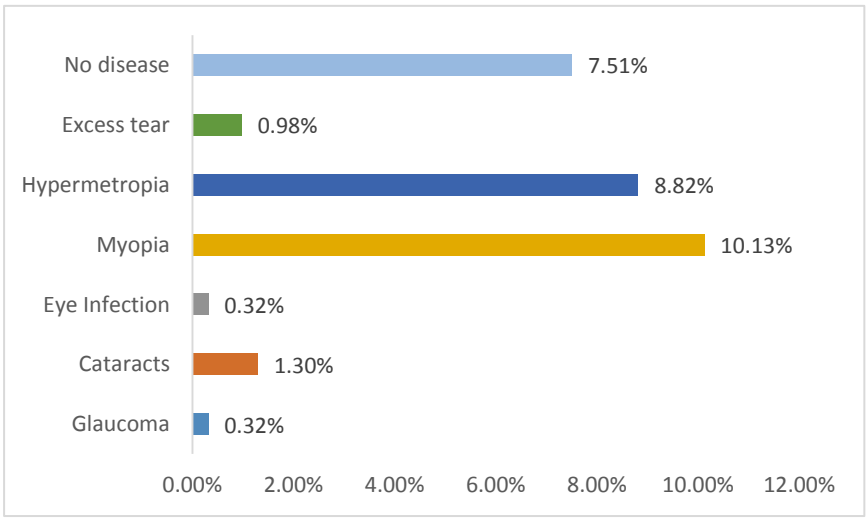

Fig 4.3.2: Distribution of Eye Diseases of Family Members (N=306)

Subjects having family members with

glaucoma, cataracts, eye infaction, myopia ,excess tear Accounted for 0.32%,1.30%,0.32%,10.13%,8.82%,.98% population respectively and 7.51% had no disease

4.3.3 General History

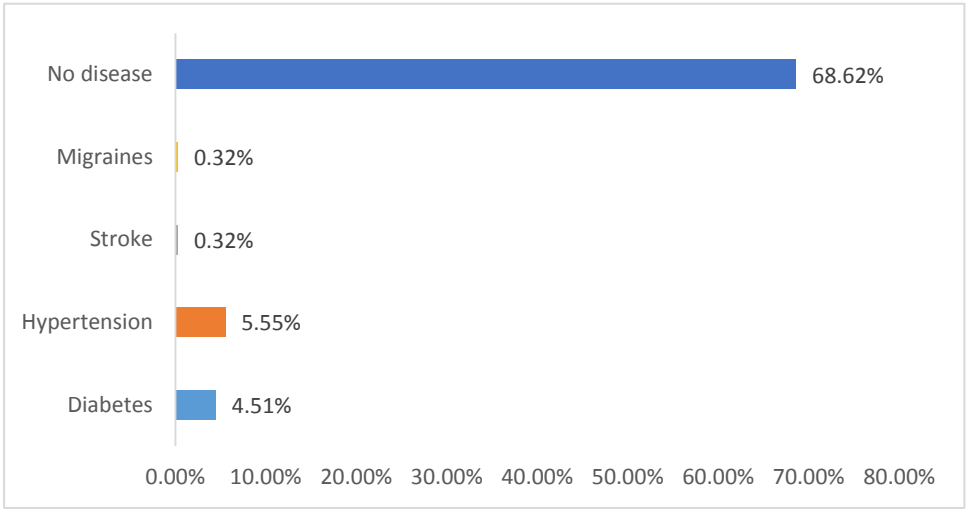

Fig 4.3.3: Distribution of General Diseases (N=306)

Subject with diabetes, hypertension, stroke, migraines are accounted for 4.51%, 5.55%, 0.32% , 68.62% and 68.62% had no disease.

4.3.4 General History of Family Members (N=306)

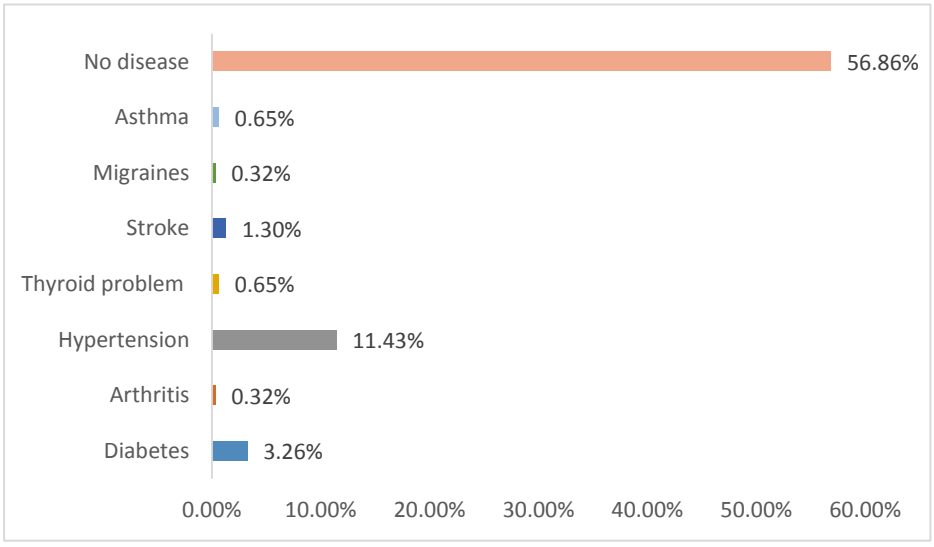

Fig4.3.4: Distribution of General Diseases of Family Members (N=306)

Subject with diabetes, arthritis, hypertension, thyroid problem, stroke migraines, asthma accounted for 3.26% ,0.32% ,11.43% ,0.65% ,1.30%, 0.32%,0.65% and 56.86% had no disease.

4.4.1 Time of Experiencing the Symptoms in the Workdays

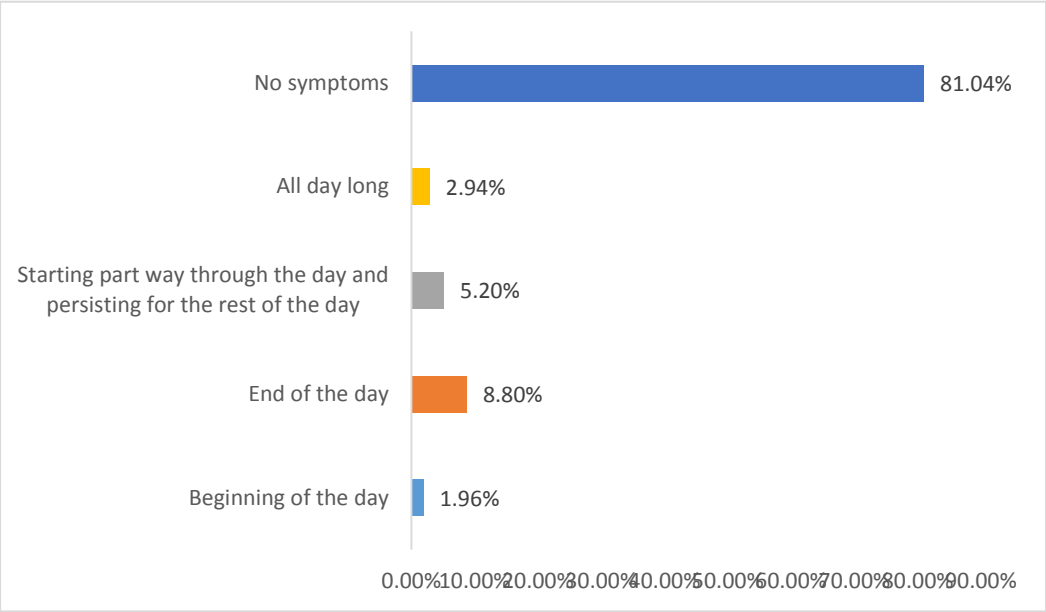

Fig 4.4.1: Time of Experiencing the Symptoms in the Workdays

Among the total population 1.96%, 8.80%,5.20%, 2.94% experienced asthenopic symptoms at the beginning of the day, at the end of the day, starting part way through the day and all day long respectively.

4.4.2 Time Span of Suffering

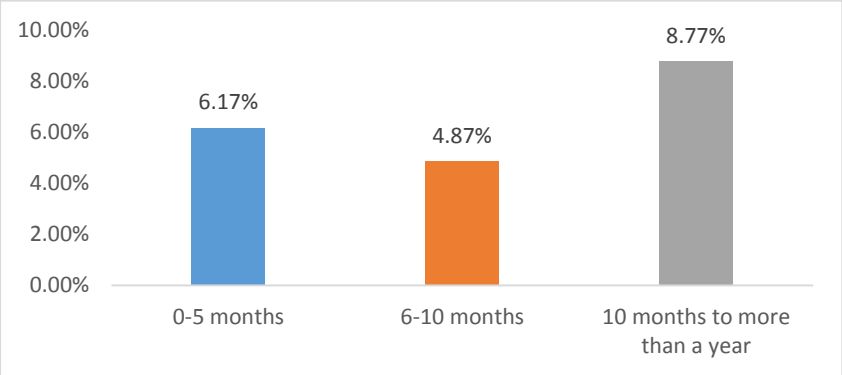

Fig 4.4.2: Time Span of Suffering

Approximately 8.77%, 4.87%, 6.17% were suffering from asthenopic symptoms for more than 10 months, 6-10 months, less than 5 month respectively.

4.4.3 Distribution of Symptoms

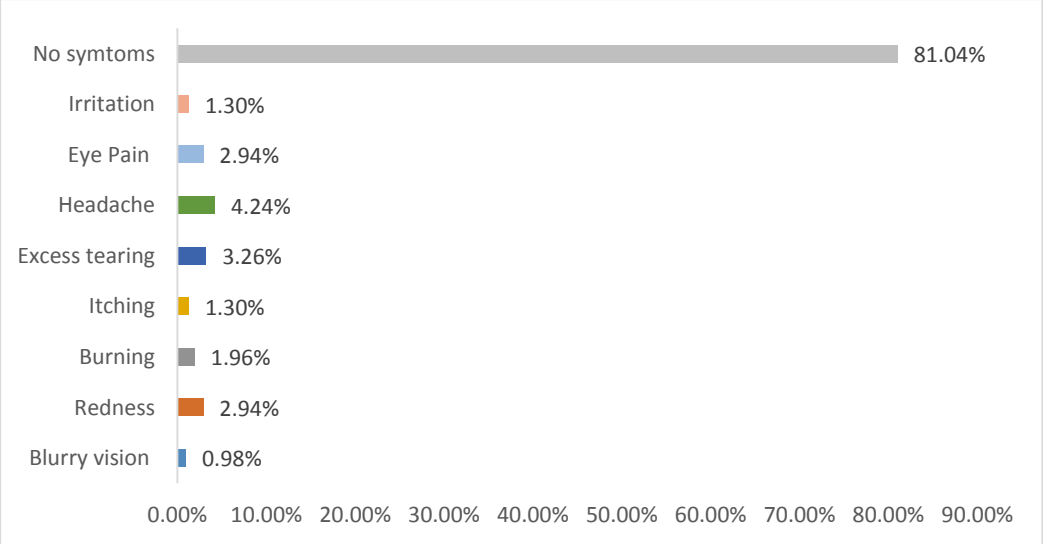

Fig 4.5.4: Distribution of Symptoms

Approximately blurry vision,redness of eye, itching, excess tearing, headache accounted for 0.98%,2.94%,1.96%,1.30%,3.26%,4.24%,2.94%,1.30% respectively and 81.04% had no symptoms.

4.5 Lifestyle Associated Factors

4.5.1 Sleep Related Factors

4.5.1.1 Relation with Sleep Hours and Asthenopic Symptoms (N=306)

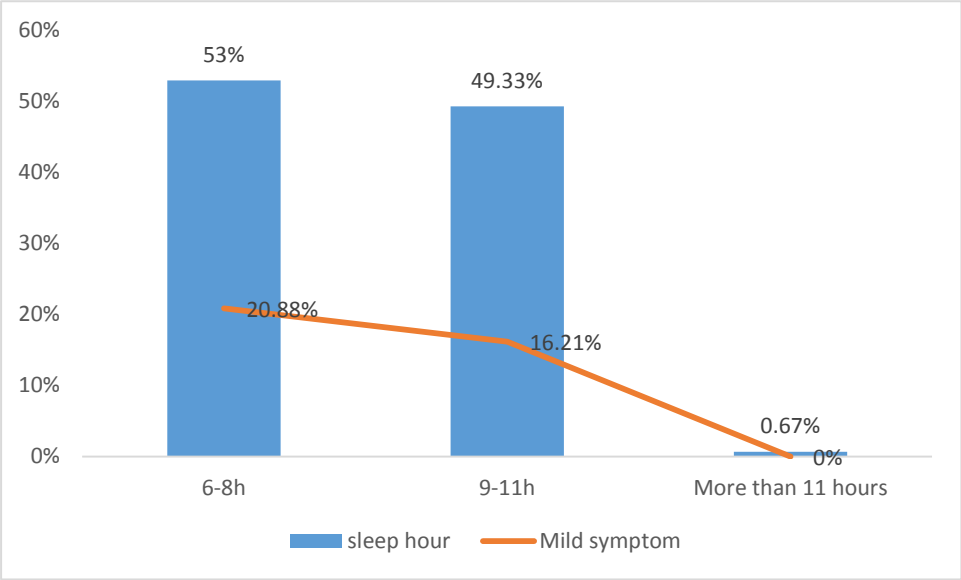

Fig 4.5.1.1: Relation with Sleep Hours and Asthenopic Symptoms (N=306)

Among the total population 53%,49.33% and 0.06% sleeped in the "recommended (6-8 hr)", "may be appropriate(9-11 hr)" and "not recommended(more than 11 hr)" durations respectively. Mild asthenopia was present in 20.88%, 16.21% and 0.00% of subjects sleeping in recommended, may be appropriate and not recommended durations respectively.

4.5.1.2 Relation with Sleep Quality and Asthenopic Symptoms (N=306)

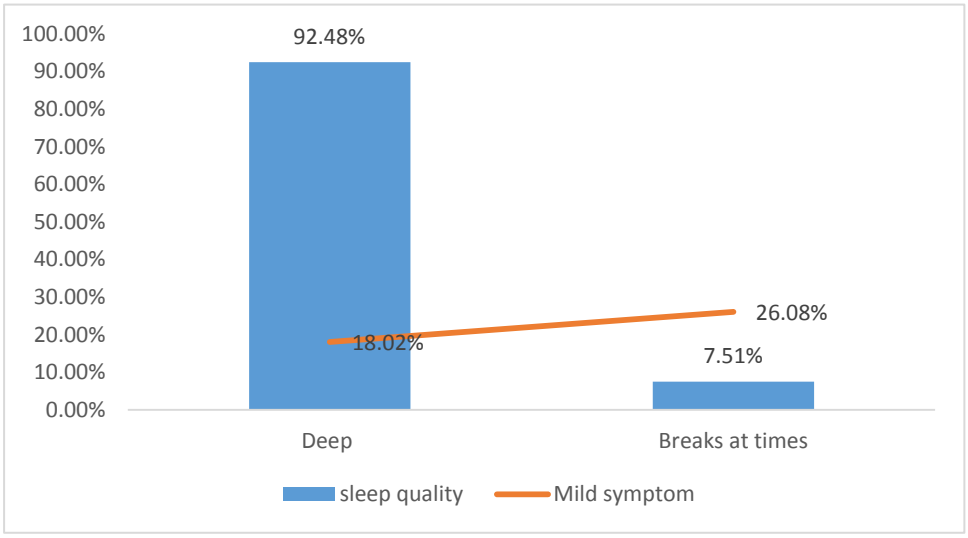

Fig 4.5.1.2: Relation with Sleep Quality and Asthenopic Symptoms (N=306)

Approximately 92.48% and 7.51% subject have deep sleep and break a time. Mild asthenopia was present in 18.02% and 26.08% subjects.

4.5.2 Relation of the Habit of Physical Activity and Asthenopic Symptoms (N=306)

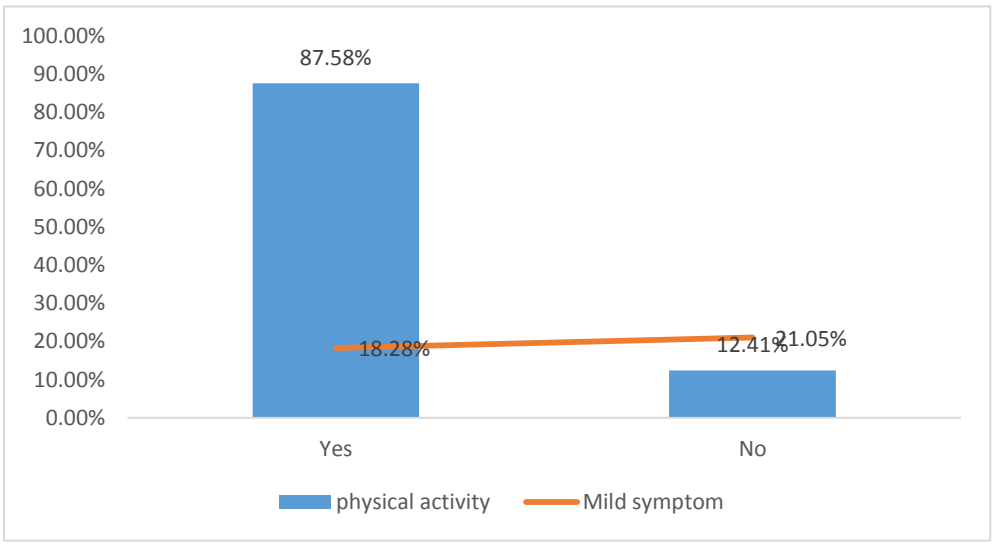

Fig 4.5.2: Relation of the Habit of Physical Activity and Asthenopic Symptoms (N=306)

Approximately 87.58 % and 12.41 % of the subjects had habit of physical activities (exercise or performing household chores) and did not have the habit respectively. Mild symptoms were present in 18.28 % of subjects who did physical activity and 21.05 % of subjects who did not do physical activity.

4.5.3 Relation of Diet and Asthenopic Symptoms (N=306)

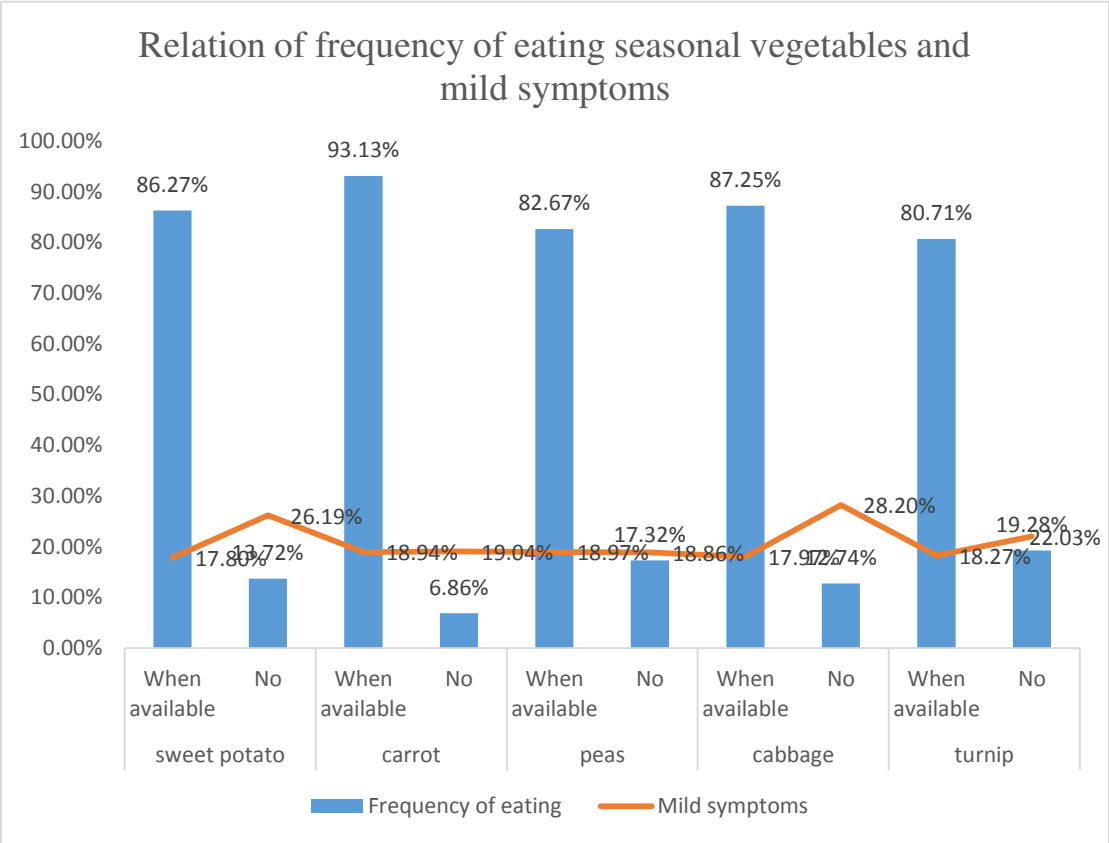

Fig 4.5.3a: Relation of Dietary Habit for Seasonally Available Vegetables and Asthenopic Symptoms (N=306)

Approximately 13.72%, 6.86%, 17.32%, 12.74%, 19.28 of subjects did not eat sweet potatoes, carrots, peas, cabbage and turnip at all respectively. Mild asthenopic symptoms were present in 26.19%, 19.04%, 8.86%, 28.20% 22.03% of these subjects respectively.

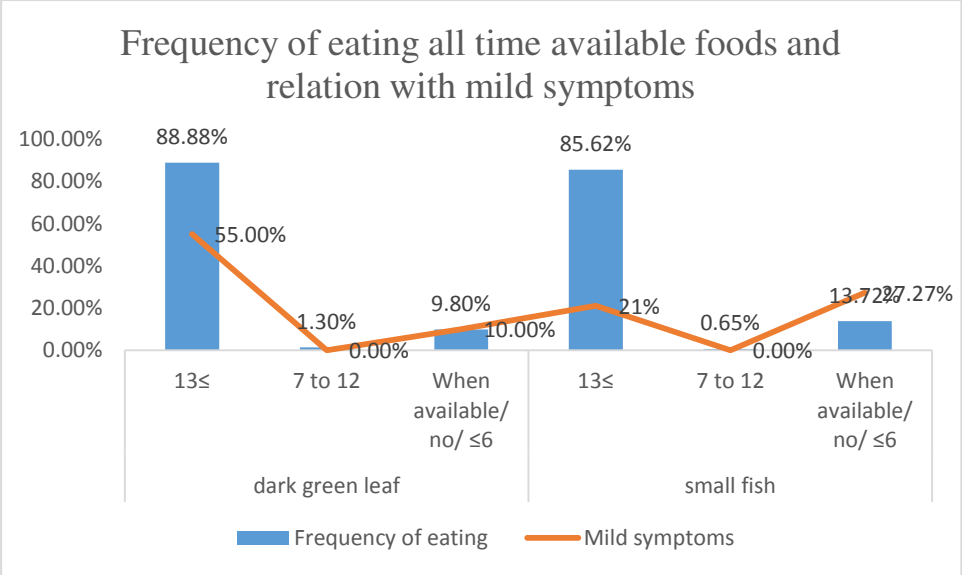

Fig 4.5.3b: Relation of Dietary Habit for Seasonally Available Vegetables and Asthenopic Symptoms (N=306)

Approximately 88.88% and 85.62% of subjects ate dark green leafy vegetables and small fish more than 13 times per month respectively. Mild asthenopic symptoms were present in 55% and 10 % of these subjects respectively. Approximately 1.30 % and 0.65 % of subjects ate dark green leafy vegetables and small fish 7-12 times per month respectively. Mild asthenopic symptoms were present in 0.00% of these subjects respectively. Approximately 9.80 % and 13.72% of subjects ate dark green leafy vegetables and small fish more than 0-6 times per month respectively. Mild asthenopic symptoms were present in 10% and 27.27 % of these subjects respectively.

4.6 Work Associated Factors

4.6.1 Relation of Total Work hours and Asthenopic Symptoms (N=306)

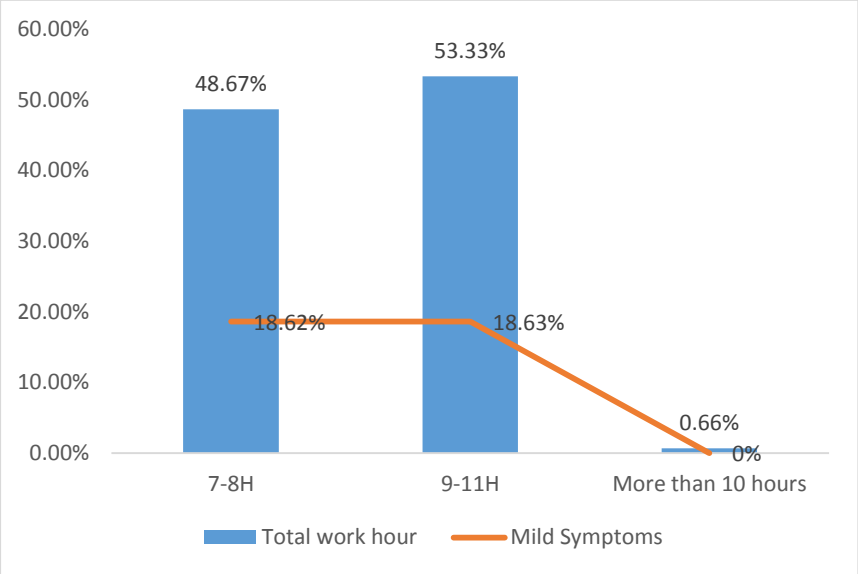

Fig 4.6.1: Relation of Total Work hours and Asthenopic Symptoms (N=306)

Approximately 48.67%, 53.33%, 66% of subjects worked 7-8 hours, 9-11 hours and more than 11 hours respectively. Mild asthenopia was present in 18.62%, 18.63%, 0.00% of the subjects working 6-9 hours, 9-12 hours and 12-15 hours respectively.

4.6.2 Relation of Average Duration of Breaks and Asthenopic Symptoms (N=306)

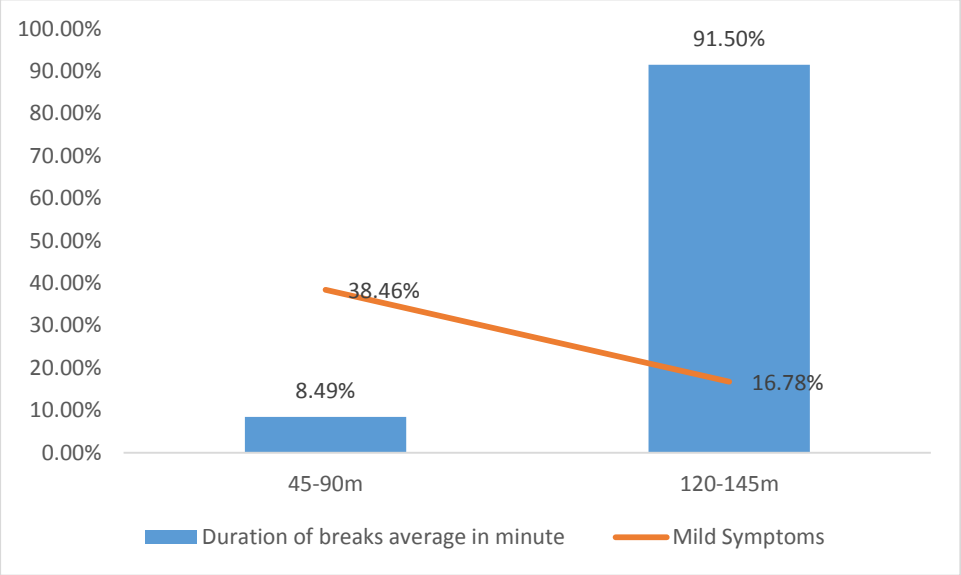

Fig.4.6.2 Relation of Average Duration of Breaks and Asthenopic Symptoms (N=306)

Approximately 8.49%, 91.50% had breaks 49-90 min and 120- 145 min. Mild asthenopia was present in 38.46% and 16.78 % was present in subjects.

4.6.3 Relation of Work Experience and Asthenopic Symptoms (N=306)

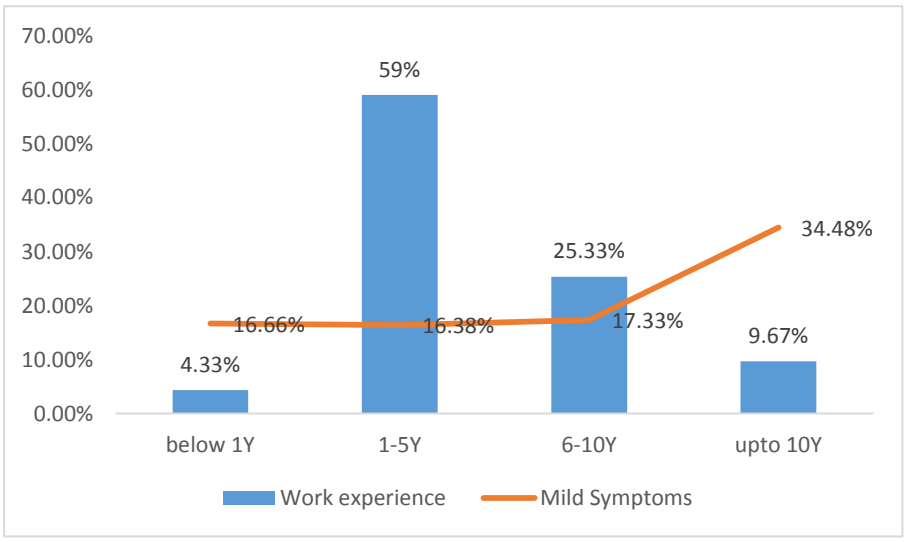

Fig 4.6.3: Relation of Work Experience and Asthenopic Symptoms (N=306)

Approximately 4.33%, 59%, 25.33%, 9.67% had work experience less than a year, 1-5 years, 5.1-10 years, more than 10 years respectively. Mild asthenopia was present in 16.66%, 16.38%, 17.33% and 34.48% in subjects having work experience less than a year, 1-5 years, 5.1-10years, more than 10 years respectively.

4.6.4 Relation of Time Taken for Each Unit and Asthenopic Symptoms (N=306)

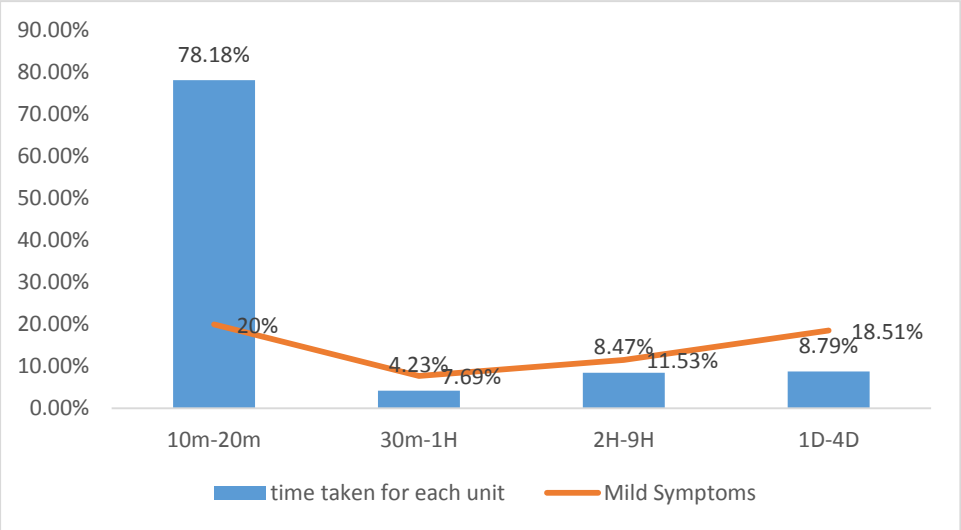

Fig 4.6.4: Relation of Time Taken for Each Unit and Asthenopic Symptoms (N=306))

Approximately 78.18%, 4.23%, 8.47%, 8.79% subjects produced each unit in 10-20 minute, 30 minute to 1 hour, 2 hour to 9 hour and more than a day respectively. Mild asthenopia was present in 20%, 7.69%, 11.53%, 18.51% of subjects producing each unit in 10-20 minute, 30 minute to 1 hour, 2 hour to 9 hour and more than a day respectively.

4.6.5 Relation of Number of Units Produced per Day and Asthenopic Symptoms (N=306)

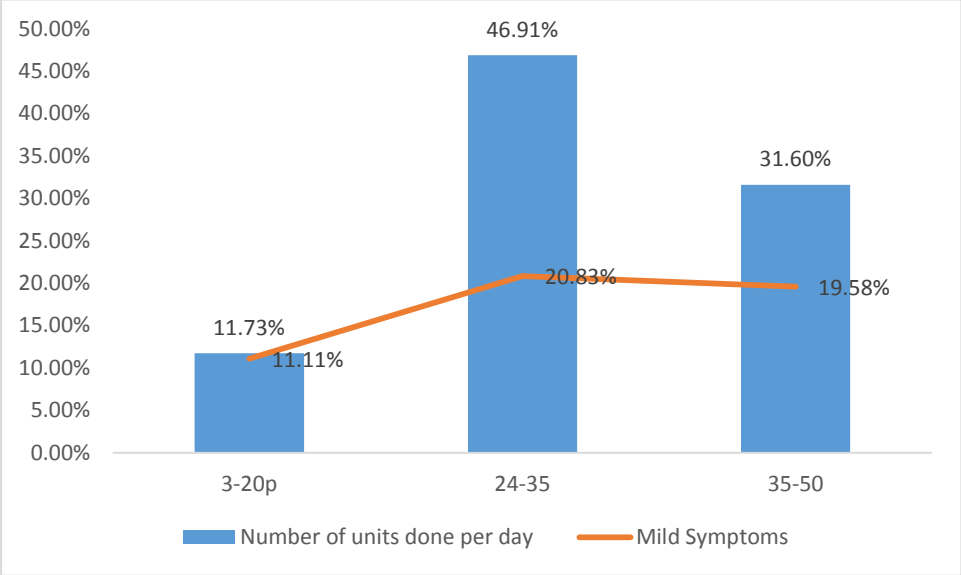

Fig 4.6.5: Relation of Number of Units Produced per Day and Asthenopic Symptoms (N=306)

Approximately 11.73%, 46.91%, 31.60% of subjects produced 3-20, 24-35,more than 35 units per day respectively. Mild asthenopic symptoms were present in 11.11%, 20.83%, 19.58% subjects producing 3-20, 24-35, more than 35 units per day respectively.

4.6.6 Relation of Duration of Working at a Stretch and Asthenopic Symptoms (N=306)

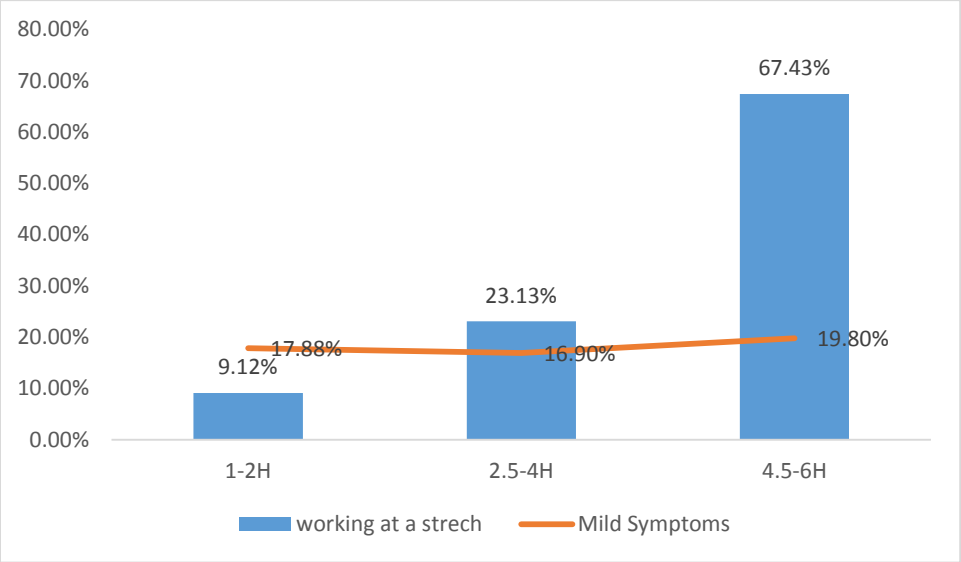

Fig 4.6.6: Relation of Duration of Working at a Stretch and Asthenopic Symptoms (N=306)

Approximately 9.12%, 23.13%, 67.43% could work at a stretch for 1-2 hours, 2.5-4 hours, 4.5-6 hours respectively. Mild symptoms were present in 17.88%, 16.90%, 19.80% subjects who could work at a stretch for 1-2 hours, 2.5-4hours, 4.5-6 hours respectively.

CHAPTER -5

DISCUSSION & CONCLUSION

5.1 Discussion

The survey was based on the knowledge and awareness about the asthenopia in visually demanding occupations. Our study was conducted onto 306 workers of visually demanding occupations .Among them 219 were general tailor and 87 were garments worker.

In the results section, the collected data was plotted in combination graphs where distribution of variables were demonstrated along with their impact on asthenopia.

Mild symptom were most frequent among the garments worker and general tailor (20.48% and 57.56%) but we didn't found the severe problem on them.

Higher body fat percentage and BMI may compete with the retina for uptake of the nutrients (eye-protective nutrients e.g., vitamin A, lutein and zeaxanthin) resulting in less incorporation in the retina and lower macular pigment (Han *et al.*, 2013). For this reason, BMI was taken into consideration. According to WHO, BMI≥25.00 is categorized as overweight. About 11 % of the subjects fall into this category. On the other hand, <18.5 is categorized as underweight (WHO, 2016). 26.71 % of the subjects fell into this category. No relation of the frequency of asthenopia with the increase of BMI was observed but a little in mild symptoms (17.14%, 18.29%) was observed in the obese subjects.

For visual acuity, It was as follows, normal vision >= 0.8, mild vision loss < 0.8 (International Council of Ophthalmology, 2002).Difference in visual acuity between two eyes was not observed much. Mild vision loss was observed in 34.87% in the right eye and 43.14 % in the left eye in term of far vision. No subject was found to be suffering from profound vision loss. A similar scenario was observed for near vision 32.9% for right eye and 36.75% for left eye.

Approximately 9.15 % of the subjects were found to currently having or previously had eye disease. Among the eye diseases frequency of hypermetropia and myopia were the most prominent (4.24%, 4.90%). About 7% had family members with eye diseases. Among the disease myopia and eye infaction was prominent (8.82%, 10.13%).In a study the researcher found that 71.6% had mild hypermetropia, 13.6% had moderate hypermetropia, and 6.1% had myopia problem among the school children in age 6-15 (Vilela *et al.*, 2015).

Diabetes and hypertension can be genetically inherited and create eye complications (Basak,2013). Among the general diseases of family members diabetes and hypertension were the most prominent (3.26% and 11.43 % respectively). So, the respective subjects were at the risk of eye complications. Among the general disease of worker migraines was most common (68.62%).

Majority of the subjects experienced the symptoms part way through the day .Among the asthenopic symptoms eye pain, headache and blurry vision were the most common.

To analyze sleep pattern, sleep guideline of National Sleep Foundation was followed. Majority of the subjects were found to follow the pattern categorized as "Recommended" which suggests 9-11 hours for aged 6-13 years, 8-10 hours for aged 14-17 years and 7-9 hours for aged 18-64 years (Sleepfoundation.org, 2016). Most of the subjects reported to have deep sleep 92.48% (recommended) and 8% subject experienced intermediate awakening during sleep.

No significant relation of asthenopia with physical activity (exercise or carrying out household chores) was observed. Mild symptoms were present in 18.28 % of subjects who did physical activity and 21.05 % of subjects who did not do physical activity.

Eye protective nutrients vitamin A, lutein and zeaxanthin were found in pea, turnip, small fish, dark green leafy vegetables, carrot, turnip etc. (Brown *et al.*, 1998). Small fish and dark green leafy vegetables were found in all seasons. Peas

, turnip, carrot, turnip, sweet potato and cabbage were available in specific seasons only. Mild symptoms were higher in the subjects who did not eat sweet potato, pea, cabbage and turnip than the subjects who eat green leaf vegetable and small fish.

Not having sufficient rest (for mild), frequent stress from family affairs (for mild symptoms) and mild stress of household chores (for mild symptoms) were the psychology related factors observed to have impact on the increase of asthenopia symptoms frequency.

5.2 Conclusion

In visually demanding profession asthenopia is present in a smaller but substantial fraction. Though any permanent damage does not occur for this, it lowers the living standards, job performance etc.

These condition can be decreased easily by simply raising awareness .Adopting postures during working, taking adequate rest in between works and following a suitable pattern of working can easily resolve this.

As there is limited work is done, so further study on asthenopia should be carried out in large population and on more sorts of visually demanding occupations.

CHAPTER -6

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