A Clinical Study on Prevalence of Refractive Errors without Presbyopia among the Patients Attending O.P.D. in a Tertiary Care Hospital in Assam

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Abstract: *Objectives: To study the Prevalence of the Refractive Errors without Presbyopia among the patients attending O.P.D. (Out Patient Department) of the Assam Medical College& Hospital,Dibrugarh for the Ophthalmic problems.Materials & Methods :- This is a prospective study conducted on 1,000 patients attending O.P.D. of the Department of Ophthalmology in the Assam Medical College & Hospital, Dibrugarh; Assam. The study was done from April, 2017 to January,2018. The study was conducted based on the O.P.D. Procedures including Slit Lamp Examination, Ophthalmoscopicexamination,and Dark-Room Procedures including Retinoscopy, Macular- Function Test, Visual Acuity with Snellen's View Box &Snellen'sNear Vision Chart and Auto -Refraction etc. Schirmer's- I Test and Synaptophoreexamination(for angle of deviation) whenever needed. Results: A total number of 1,000 patients were enrolled in the study, out of which 195 (19.50%) were having myopia, 302 (30.20%) were having myopia with astigmatism, 46 (4.60%) were having hypermetropia, 58 (5.80%) were having combined hypermetropia with astigmatism and 185 (18.50%) were found to have astigmatism only i.e. Refractive Errors without Presbyopia. The incidence of Refractive Errorswas found to be high (41.07%) among 20 to 29 years of age group and in females (56.12%). Most common incidence increases with the increasing age group and mainly associated with the Eye Lid and Adnexal diseases and Squint and Dry Eye Diseases.Conclusion: The prevalence of the Refractive Errors without Presbyopia is more in females than in males and school, college and university going age groups, mainly teenagers, attending to the O.P.D. of the Ophthalmology Department of our Hospital based study.*

Keywords: O.P.D. & Dark-Room procedures, Refractive Errors without Presbyopia, Spectacles, Gender, Education Stream, Assam

1. Introduction

Human eye is an optical instrument which can be compared with a camera as below :-
- Eyelids act as shutter of the camera.
- Cornea and Crystalline lens act as focusing system of the camera.
- Iris acts as diaphragm which regulates the size of the aperture (pupil) and therefore the amount of light entering the eye.
- Choroid helps in forming the darkened interior of the camera.
- Retina acts as light sensitive plate or film on which image is formed.

The functioning of the eye can be considered to be analogous to a closed circuit colour TV system. The optic nerve and its connections convey the details of the image to the occipital region of the cerebral cortex where they are processed before reaching consciousness.

The compound optical system of the eye maybe divided into a corneal portion, including the tear layer which separates air from aqueous humour and lens portion which separates aqueous humour from the vitreous humour. The focusing system of the eye is composed of cornea, aqueous humour, crystalline lens and vitreous humour.

These structures constitute a homocentric system of lenses, which when combined in action from a very strong system of short focal length. The total dioptric power of the eye is about+ **58 D**, out of which about + **43 D** is contributed by the cornea and + **15 D** by the crystalline lens.

For practical purposes of the optical system of the eye is considered perfect and it is assumed that the corneal and lenticular surfaces are spherical and their centres of curvatures lie on a straight line i.e. the optical axis. However, actually the optical system of the eye has got following imperfections :-

1) The refractive surfaces tend to be aspherical.
2) The crystalline lens is usually slightly decentred and tipped with respect to the axis of the cornea and with respect to the visual axis of the eye.
3) The crystalline lens consists of non-homogeneous material.

The eye has three principle axes :- i) The Optical axis, ii) The Visual axis and iii) The Fixation axis; and three visual angles :- i) Angle Alpha, ii) Angle Gamma and iii) Angle Kappa.

- The media of the eye are uniformly permeable to the visible rays between **600 nm**and**390 nm.**
- Cornea absorbs rays shorter than **295 nm,** only can reach the crystalline lens.
- Lens absorbs rays shorter than **350 nm.** so rays between **600** and **350 nm.** can reach the retina in phakic eyes and those between **600 nm**and**295 nm**inaphakic eyes.

- Eye is most sensitive to yellow- green light i.e. light of wavelength **550 nm.** The sensitivity of the eye decreases on both sides of it, so it is minimum for violet and red light.
- Persistence of eye is **0.1 sec.** i.e. if the time interval between two successive light pulses is lesser than **0.1 sec.,** eye cannot distinguish them separately.
- Range of sensitivity :- The human eye can detect energies of a few photons per second upto bright sunlight, a difference in sensitivity of 10^{15}.
- **Fechner's Law** :- The relative sensation of an increase in sensitivity is proportional to the log of the change, so that by increasing the intensity of a lamp from **1** to **10 foot-candles,**the same sensation of change as from **10** to **100 foot-candles** is given. This law applies for four orders of magnitude.
- **Weber's Law :-** The change of brightness necessary to be noticed is proportional to the original brightness, i.e. $\Delta L = KL,$ where ΔL is the least amount of change of intensity noticeable, **K** is a constant, and **L** is the brightness of the light. Therefore, the change necessary before a difference is noticed in a bright light source is larger than a dim one.

Purpose of Approach to Refractive Errors Without Presbyopia Patients:
To detect the refractive errors without presbyopia early, so as to improve the patients discomfort (to give better comfort to the patients) and prevent further visual disturbances and the **BCVA**(Best Corrected Visual Acuity) should be **6/6** for distance and near vision for both the eyesalongwith the asthenopia respectively.

Goals of Refractive Errors Without Presbyopia Study:
- To identify the causes of Refractive Errors Without Presbyopia.
- To establish the diagnosis of Refractive Errors Without Presbyopia and differentiate it from other causes of irritation.
- To establish the appropriate treatment or therapy by prescribing the Spectacles and to give the relieve from the discomfort.
- To establish the most affected groups of the patients.
- To educate and involve the patients in management of these conditions.
- To prevent the complications such as loss of visual functions, infection, structural damage and amblyopia etc.

Etiological Risk Factors:
- School going, College going and University going age groups.
- Female gender.
- Excessive busy work with Smart Phones, Personal Computers; Laptops and closed Television watching.
- Excessively busy in official work.
- Closed work in insufficient light sources.
- Vitamin **A** deficiency diseases.

2. Definition

Emmetropia(optically normal eye) can be defined as a state of refraction, when the parallel rays of light coming from infinity are focussed at the sensitive layer of the retina with the accommodation being at rest. An Emmetropic eye will have a clear image of a distant object without any internal adjustment of its optics. While axial length of most emmetropic eyes approximately is **24 mm.,**a larger eye can be emmetropic eye if its optical components are weaker and a smaller eye can be emmtropic if its optical components are stronger.[3]

Its attainment depends on an exactitude to within a refraction of a millimetre of such measurements as the length of the eye and the shape of the cornea and the lens; and such irregularity and conformity to type as optical perfection would necessitate a mathematical accuracy which is nowhere realised in the constitution of living organisms. Emmetropia maybe optically normal but it is no more biologically normal than would be the universal attainment of a uniform height of **5 feet** to **6 inches.** [4]

Ametropia(a condition of refractive error), is defined as a state of refraction, wherein the parallel rays of light coming from infinity (with accommodation at rest), are focussed either infront or behind the sensitive layer of the retina in one or both the meridia. The ametropia includes myopia, hypermetropia and astigmatism.[3]

Ametropia wherein parallel rays of light are not focussed exactly upon the retina with the eye in a state of rest, is therefore much the more common; such an eye has a refractive error. When the refractive conditions of two eyes are unequal, the condition is known as an isometropia.[4]

Myopia orshort sightedness is a type of refractive error in which parallel rays of light coming from infinity are focussed infront of the retina when accommodation is at rest. The majority of cases merely results as variants in the frequency curve of axial length and curvature. Asthenopicsymptoms may occur in patients with small degree of myopia. The myopic eyes are typically large and prominent, with deep anterior chamber, large and slight sluggishly reacting pupil, with normal fundus, rarely temporal myopic crescent, error does not exceed **6 to 8 Dioptres** and myopia is confirmed by performing retinoscopy.

Hypermetropiaor long sightedness is the refractive state of the eye wherein parallel rays of light coming from infinity are focussed behind the retina with accommodation being at rest. It may result from acquired cortical sclerosis, posterior subluxationof lens, congenital or acquired absence of lens, surgically over-corrected myopia, patients with third nerve palsy and internal ophthalmoplegia. Asthenopic symptoms may or may not occur in patients of hypermetropia. The hypermetropic eyes are small, with small cornea, shallow anterior chamber, fundus showing papillitis or pseudo-papillitis, with shot-silk retinal appearance. A-scan biometry shows short anterior-posterior length of the eyeball.

Astigmatism is a type of refractive error wherein the refraction varies in the different meridians consequently, the rays of light entering in the eye cannot converge to a point focus but from focal lens. Broadly there are two types of astigmatism:- regular and irregular. Regular astigmatism is characterised by regular change of uniform, from one

meridian to another meridian of refractive power. It includes defective vision, blurring of objects, proportionately elongated appearances of objects, along with dull eyeache, headache, early tiredness of eyes, nausea and drowsiness. Irregular astigmatism is characterised by an irregular change of refractive power in different meridian. It includes defective vision, distortion of objects and polyopia.

The causes of Refractive Error is unknown but may run in families. It may be due to the mismatches between the axial length and focussing power of the eye (primarily the cornea and lens). Hypermetropia is at risk for angle-closure glaucoma. Myopia shows oblique optic disc with exposed sclera viewed as a white crescent. The refractive error varies but upto**20%** of patients are myopic and **75%** require prescription between **-0.50** and **+8.00Dioptres**. Mainly single or both the parents are using spectacles due to Refractive error; specially females are avoiding to use spectacles due to some psycho-social problems. Uncorrected distance refractive errors is the most common cause of visual impairement and the second most common cause of blindness in the world.

3. Materials & Methods

Aims and Objectives:
- To study the prevalence of Refractive Errors Without Presbyopia Diseases among the patients seeking attention for the Ophthalmic Problems.
- Early detection of Refractive Errors Without Presbyopia and their treatments.
- To find out the different types of Refractive Errors Without Presbyopia among the study groups.
- To find out the visual outcome after correction of the Refractive Errors Without Presbyopia.
- To suggest recommendations for initiating the correct counter measures.

Methodology:
We randomly selected 1,000 patients from the Out Patient Clinic of the Department of Ophthalmology; Assam Medical College & Hospitals, Dibrugarh; Assam.

Type of Study:-A Hospital-Based Prospective Study.

Place of Study:-Department Of Ophthalmology, Assam Medical College & Hospital; Dibrugarh, Assam.

Study Duration:-10 Months.

Patient Population:-Patients attending O.P.D.(Out Patient Department) or Out-Door of the Ophthalmology Department of the Assam Medical College & Hospital, Dibrugarh; Assam.

Screening Of Patients:- Individuals attheagegroups of **4-39 years** who presented with the Symptoms and Signs of the Refractive Errors without Presbyopia like Headache, Eyeache, Difficulty of vision for both the distance and near, blurring of vision, watering,tiredness,diplopia, irritation, ocular discomfort and foreign body sensation were selected.

Inclusion Criteria
- Different types of Refractive Errors without Presbyopia.
- Patients of in between **4 -39** years of age groups.
- Both the sexes.
- Informed consent.

Exclusion Criteria
- Below 4 years and above39 years of age groups.
- Any patients with corneal ulcers,corneal opacity, fundus pathology,eye injury and cataract.
- Any other diseases affecting visual dysfunctions including neurological visual impairment.
- Any infective conditions.
- Any tumours and malignant cases.
- Patients undergone any intra-ocular and extra ocular surgery.
- Allergic to 1% Atropine, 2% Homatropine, 1% Cyclopentolate etc.

4. Diagnosis

Patient History
Symptoms
a) Presenting Complains :- Difficulty in vision (both distance and near), blurring of vision, headache, eyeache, watering, itching, irritation, redness, discharge, foreign body sensation, burning sensation, diplopia, amblyopia, etc.
b) Exacerbating Conditions :- Prolonged working hours in Computer and Laptops, excessive using of Smart Phones, reading in dimlight, closed television watching in inefficient light, air travel, wind, decreased humidity, closed works in dimlight, etc.
c) Ocular History Details :- Topical medications used, contact lens wear, allergic eye disease, prior cataract surgery, refractive surgery, keratoplasty, etc.
d) Medical History Details :- Diplopia, amblyopia, Diabetes Mellitus, Hypertension, Sjogren's Syndrome, Bell's Palsy, any neurological conditions, tumours, any fundus pathology, eyelid hygiene, along with adnexal diseases.
e) Occupational History Details :- Primary schooling, Secondary schooling, Higher Secondary schooling, Graduation, Post-Graduation and Others.

Examination of Refractive Errors without Presbyopia
1) External Examination.
2) Slit Lamp Examination.
3) Snellen's Vision Box.
4) Trial Box Containing Different Lenses.
5) Trial Frame.
6) Retinoscope.
7) Astigmatic Fan.
8) Jackson's Cross Cylinder.
9) Keratometer.
10) Computerised Autorefractometer.
11) Synaptophore (as required in selective cases).
12) Ocular Surface Dye Staining :- Fluorescein, Rose-Bengal or Lissamine Green dye to assess the extent of ocular damage.
13) I.O.P. by Applanation Tonometer (as required in selective cases).

14) Direct and Indirect Ophthalmoscopy, Examination with + 90 D and + 20 D lenses (IDO).
15) Mydriatic and Cycloplegic Drugs.

Schimer Test
It is a useful clinical test for the rate of tear formation was given by Schimer in **1903**. In <u>Schimer- I test</u>:- It is performed by **5 mm. X 35 mm**. strip of Whatman - **41** filter paper which is folded **5 mm**. from one end and kept in the lower fornix at the junction of lateral one third and medial two thirds of the lower lid, which is left in place for **5 minutes** or until **30 mm.** of the strip becomes wet. The strip is removed from the eye after **5 minutes** and wetting of the filter paper strip from the bend is measured. Wetting of less than **10 mm.** is indicative of an aqueous tear deficiency. If this test is performed after anaesthetizing the conjunctival sac with **4%** lignocaine, only basic secretion test as by anaesthetizing the conjunctiva and the cornea the cause of reflex tearing is eliminated.

A further <u>Schimer- II test</u> is performed to evaluate reflex tearing after stimulating the nasal mucosa with fumes of aromatic spirit of ammonia, a wisp of cotton or any other mechanical irritant.

There is no significant diurnal rhythm for lacrimal secretion. Under the age of 30 the rate of secretion is higher in females and age above **30** it is less. However, the rate of production of tears decreases.

Stenopaeic-Slit Test
This test also helps in checking the correction of astigmatism. The **1 mm.** wide stenopaeic-slit when placed infront of the eye allows clearest vision when it is rotated into the axis of astigmatism and the refraction will then be indicated by the strongest convex lens which allows full vision in this axis and again in the axis perpendicular to it.

Pin-Hole Test
The visual acuity of the patient is not only a function of the dioptric apparatus of the eye but also of the retina, the nerve paths and the central nervous mechanism. The pin-hole test is performed to differentiate between an impairment of vision due to an abnormality of the dioptric apparatus and one due to retinal or neurological disease. When an opaque disc, perforated by a small hole is held in front of the eye, only a small pencil of rays gets through which passes through the axis of the dioptric system and is therefore unaffected by it, following that if the hole were small enough all refraction would be eliminated, and a clear image would be formed in the same manner as in the pin-hole camera.

In evaluating the result of the test, the abnormalities of the dioptric apparatus take two principle forms, firstly refractive errors and secondly organic diseases of the media associated with a greater or less degree of opacity. Improvement of visual acuity with this test is found when refractive errors or minor degrees of opacification of the media are present. No improvement, worsening of vision may be found in retinal or neuro-ophthalmic diseases alongwith substantial opacification of the media. The effect of the pin-hole refractive errors is easily explained on pure optical grounds.

In minor degrees of opacification of the media, its action seems to be to allow the patient to take notice of and indeed perhaps to select a narrow pencil of rays passing through some path which is still optically clear and regular. A good standard of illumination is essential in carrying out the test and the hole in the disc should be opposite the centre of the pupil. The test also has therapeutic implications.

Retinoscopy
The refraction comprises two complimentary methods, the objective and subjective. The most valuable method of estimating the optical state of the eye is the technique of retinoscopy. Retinoscopy, also called Skiascopy or Shadow Test, is an objective method of finding out the error of refraction by the method of neutralization.

Retinoscopy is based on the fact that when light is reflected from mirror into the eye, the direction in which the light will travel across the pupil will depend upon the refractive state of the eye. It is mainly done with a mirror retinoscope which is called Pristley – Smith mirror which consist of a single plane mirror or a combination of plane and concave mirrors.

Procedure of Retinoscopy
The patient is made to sit at a distance of **1 metre**, from the examiner; and a working distance of **2/3 metre** is more convenient. With the help of a retinoscope, light is thrown onto the patient's eye; who is instructed to look at a far point to relax the accommodation. However, when a cycloplegic drug has been used, the patient can look directly into the light and have the refraction assessed along the actual visual axis. Through a hole in the retinoscope's mirror, the examiner observes a red reflex in the papillary area of the patient. Then the retinoscope is moved in horizontal and vertical meridia, keeping a watch on the red reflex which also moves when the retinoscope is moved.

Depending upon the movement of the red reflex when a plane mirror retinoscope is used at a distance of **1 metre,** the results are interpreted as below :-
a) No movement of red reflex indicates myopia of **1 Dioptre**.
b) When the red reflex moves along with the movement of the retinoscope, it indicates either emmetropia or hypermetropia or myopia of less than **1 Dioptre.**
c) A movement of red reflex against the movement of the retinoscope implies myopia of more than **1 Dioptre**.

The end point of retinoscopy using a simple plane mirror retinoscope is neutralization of red reflex in all the meridia i.e. either no movement or just reversal of movement, while using a streak retinoscope at the end point streak disappears and the pupil appears completely illuminated or completely dark.

In the presence of an astigmatic refractive error the examiner has to determine not only the different neutralization points of the two meridia but also the orientation of these. The relationship of the direction of external movement to that of the reflex has an important bearing on determination of axis of the cylindrical error.

Use of common cycloplegics:-Cycloplegics are the drugs which cause paralysis of accommodation and dilate the pupil. These are used for retinoscopy, when the examiner suspects that accommodation is abnormally active and will hinder the exact retinoscopy; such situation is encountered in young children and hypermetropes.

When retinoscopy is performed after instilling cycloplegic drugs it is termed as **"Wet Retinoscopy"** in converse to **"Dry Retinoscopy"** i.e. without cycloplegics.

Commonly employed**Cycloplegic Drugs** are as follows :-
1) **Atropine** is indicated in children below the age of**5 years**. It is used as **1%**ointment thrice daily for **3** consecutive days before performing retinoscopy. Its effect lasts for **10 –20days**.
2) **Homatropine**is used as **2%** drops. One drop is often instilled every **10 minutes** for **6 times** and the retinoscopy is performed after **1 – 2 hours.** Its effect lasts for **48 – 72 hours.** It is used for most of the hypermetropic individuals between **5** and **35 years** of age.
3) **Cyclopentolate**is a short acting cycloplegic. Its effect lasts for **6 – 18 hours.** It is used as **1%** eye drops in patients between **7–35 years.**One drop of cyclopentolate is instilled after every **10 minutes** for **3 times** (Havener's recomended dose) and the retinoscopy is performed**1–1₁/₂ hours** later after estimating the residual accomodation which should not exceed**1 Dioptre.**

The mydriatics should be used with care in adults with shallow anterior chamber, owing to the danger of an attack of narrow angle glaucoma. Mydriasis should be counteracted by the use of the miotic drug (**2% pilocarpine**).

Static retinoscopy refers to the procedure performed without active use of accomodation. Dynamic retinoscopy implies when the procedure is performed for near vision with active use of accomodation by the patient.

The end point of retinoscopy can be and should be verified by following manoeuvres :-
- Overcorrection by **0.25 D** should cause reversal of the movement.
- On altering the working distance i.e. by slight forward movement of the head, the examiner should observe a **"with"** movement and an **"against"** movements by slight backward movement.

Refractometry
The Refractometry (Optometry) is an objective method of finding out the error of refraction by use of an equipment called Refractometer (Optometer). Refractometry utilizes the principles of indirect ophthalmoscopy. Presently, the computerised autorefractometers, both objective as well as subjective modern autorefractometers are available commercially; which are being used increasingly. The computerised, autorefractometer quickly gives information about the refractive error of the patient in terms of sphere, cylinder with axis and interpupillary distance. This method is a good alternative to retinoscopy by busy practice. It is also advantageous for mass screening, research programmes and epidemiological studies. The subjective verification of refraction is a must even after autorefractometry.

A study was done among the **1000** patients attending O.P.D. havingdifficulty in vision (both distance and near), blurring of vision, headache, eyeache, watering, itching, irritation, redness, discharge, foreign body sensation, burning sensation, diplopia, etc. A detailed clinical history of patient was taken. The demographic data and medical history were taken from each patient including age, sex, occupation, history of trauma, diabetes mellitus, hypertension, etc. Each eye was examined using using Slit lamp, a trial frame, a trial box, Snellen's View Box, Retinoscope, Bousch and Lomb Keratometer, Duochrome test, computerized autorefractometer, Astigmatic fan test, Jackson's cross cylinder, Steinopic slit test, Pin-hole test, Direct and Indirect Ophthalmoscopy, Schiotz Tonometer,Synaptophore, with cycloplegic drugs like **1%** atropine, **2%** homatropine, **1%** cyclopentolate.

5. Scenario in India

Refractive error is the most common cause of visual impairment and the second most common cause of blindness in the world. The global estimate of the total number of people of all ages with visual impairment is **253** million, of which **36** million are blind.[5,6] The major causes of visual impairment are uncorrected refractive errors (**43%**) followed by cataract (**33%**). About **217** million people have low vision (severe to moderate visual impairment) in the world.Of those with blindness and MSVI, **124** million people have uncorrected refractive errors and **65** million have cataract- more than **75%** of all blindness and MSVI are avoidable. **55%** of moderate or severly vision impaired people are women.[5,6] Refractive error has been recognized as a public health problem in many countries including India as well as by the **WHO** in its global initiative **VISION 2020** – the right to sight.[6] It may lead to a loss of education and employment opportunities, lower productivity, and impaired quality of life.[7,8]The loss of sight causes enormous human suffering to the affected individuals and their families as well as economic losses globally.[9] The region has a population of more than one fourth of the total globe, and one third of the world's blind people live in this region. Half of the world's **1.5 million** blind children also reside in the region and around **110 million** have low vision and visual impairment.Prevalence of blindness (above **30 years** of age) within the region is higher in Bangladesh, Indonesia and in some states in India (**1.5%**).[31]

With blindness defined as presenting distance visual acuity **<3/60** in the better eye, prevalence of blindness due to refractive error has been reported to as high as **0.20%** in Pakistan and India [10], for all age groups. If blindness is defined as presenting distance visual acuity **<6/60** in the better eye, the prevalence of blindness due to refractive error in an Indian population was reported to be **0.36%,** including **0.06%** from amblyopia resulting from high uncorrected or inadequately corrected refractive error. [10]these data suggest that about **1** of every **280** people in the study population were blind from uncorrected or

inadequately corrected refractive error or from refractive error related amblyopia.

6. Results

Total **1,000** patients having symptoms of Refractive Errors without Presbyopia were enrolled in our study. **784** (**78.40%**) patients were found to have positive Refractive Errors without Presbyopia screening test.
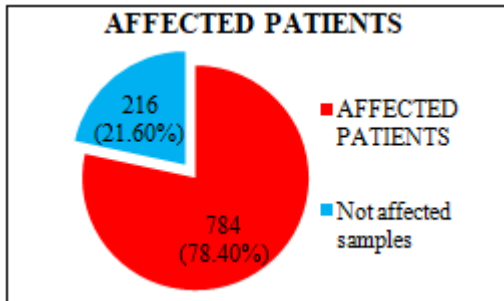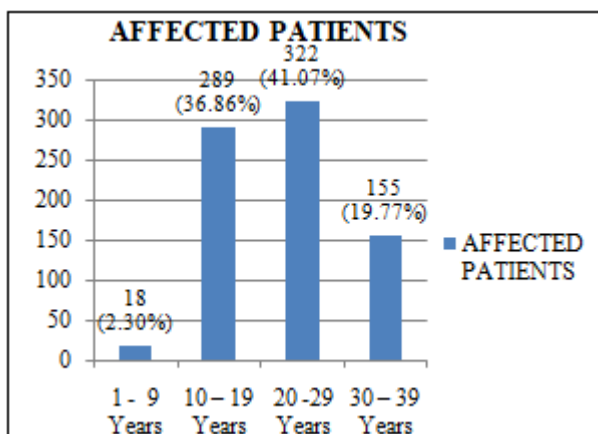

Figure 1: Distribution of Affected Patients among the Total Patients

Among the maximum percentage **41.07**%, (**322** out of **414**) of patients were in the age groupof 20to 29 years; followed by **36.86**%, (**289** out of **371**) in the age group of 10 to 19 years; **19.77**%, (**155** out of **192**) in the age group 30 to 39 years; **2.30**%, (**18** out of **23**) in the age group of 1 to 9 years.

Table 1: Age Distribution

| Age Groups	Total Samples	Affected Samples	%Age (Percentage)Affected
1 - 9 Years	23	18	2.30%
10 – 19 Years	371	289	36.86%
20 - 29 Years	414	322	41.07%
30 – 39 Years	192	155	19.77%
TOTAL	1,000	784	

Figure 2: Age wise distribution of Affected Patients.

Among the total patients, **434** patients were male and **566** patients were female (**M : F = 1 : 1.30**).Among the affected patients, **344** patients were male and **440** patients were female (**M : F = 1 : 1.28**).

Table 2: Sex Distribution.

| Sex	Total Sample	Affected Sample	%AGE (Percentage) Affected	RATIO M:F Total Sample	Affected Sample
Male	434	344	43.88%		
Female	566	440	56.12%	1:1.30	1:1.28
Total	1,000	784			
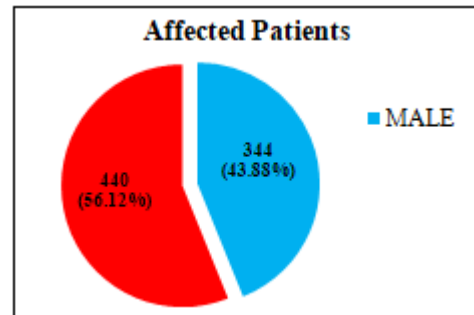
Figure 3: Sex Distribution of Affected Patients.

Among the total patients, **431** (**43.10** %) patients presented with symptoms of diminution of vision, **384** (**38.41** %) headache, **179** (**17.88** %)eyeache, **56** (**5.63** %) blurring of vision, **122** (**12.25** %) watering,**16** (**1.66** %) discharge, **72** (**7.29** %) foreign body sensation, **53** (**5.30** %) any E.N.T. problems, etc.

Table 3: Frequency of Symptoms Among the Affected Population at First Presentation.

| Symptoms	Total Numbers	% Age Percentage
Diminution Of Vision	431	43.10%
Headache	384	38.41%
Eyeache	179	17.88%
Blurring Of Vision	56	5.63%
Watering	122	12.25%
Discharge	16	1.66%
Foreign Body Sensation	72	7.29%
Any E.N.T. Problems	53	5.30%
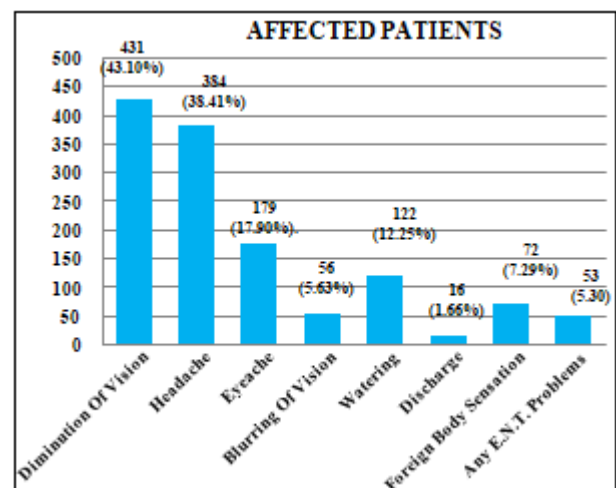
Figure 4: Distribution of Symptoms among the Affected Patients

Among the maximum percentage **21.40** %, (**214** out of **1,000**) of patients were having Emmetropia, followed by **30.20** %, (**302** out of **1,000**) were having Combined Myopia and Astigmatism,**19.50 %** (**195** out of **1,000**) were having Myopia, **4.6** %, (**46** out of **1,000**) were having Hypermetropia, **5.8%** (**58**out of **1,000**) were having

Combined Hypermetropia and Astigmatism and **18.50** % and (**185** out of **1,000**) were having only Astigmatism.

Table 4: Distribution of Refractive Errors Without Presbyopia

| Type of Refractive Errors	Affected Patients		Total % Age (Percentage)
	Male	Female	
Emmetropia	89	125	214 (21.40%)
Myopia	86	109	195(19.50%)
Combined Myopia and Astigmatism	146	155	302(30.20%)
Hypermetropia	16	30	46 (4.6%)
Combined Hypermetropia and Astigmatism	27	31	58 (5.8%)
Astigmatism	69	116	185 (18.5%)
TOTAL	433	567	1,000 (100%)
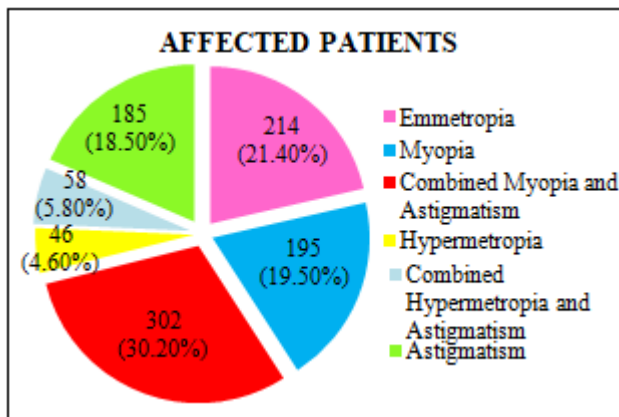
Figure 5: Distribution of Refractive Errors Without Presbyopia among the Affected Patients

Among the maximum percentage **2.3** %, (**23** out of **1,000**) of patients were from Primary school students, followed by **12.10** % (**121** out of **1,000**) were from Secondary school students, **14.70 %** (**147** out of**1,000**) were from Higher Secondary, **21.70** % (**217** out of **1,000**) were Graduation, **15.70**%,(**157** out of **1,000**) were Post- Graduation, **33.50** % and (**335** out of**1,000**) were others.

Table 5: Educational Status Among The Affected Patients

| Educational Status of the Patients	Total Patients	Total% Age Percentage
Primary schooling	23	2.3%
Secondary schooling	121	12.10%
Higher Secondary	147	14.70%
Graduation	217	21.70%
Post- Graduation	157	15.70%
Others	335	33.50%
TOTAL	1,000	
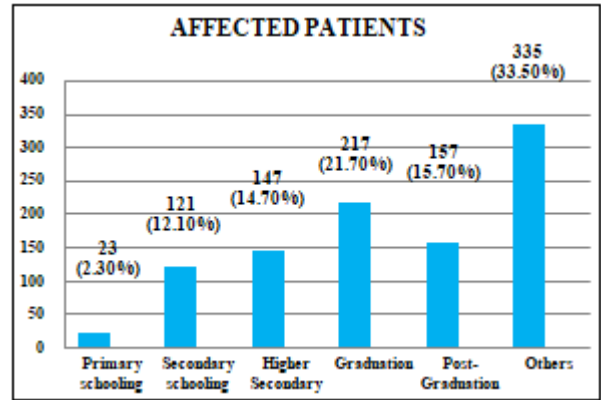
Figure 6: Distribution of Educational Status Among The Affected Patients

Among the maximum percentage **37.90** %, (**379** out of **1,000**) of patients were using Smart phones, followed by **18.70** % (**187** out of **1,000**) were PC and Laptop users, **34.60 %** (**346** out of **1,000**) Watch Television, **24.80** %, (**248** out of **1,000**) were Readers, **13.50** % (**135** out of **1,000**) were involved in Sports, and **5.8** % (**58** out of **1,000**) were Outings.

Table 6: Distribution Of Most Preferred Leisure Time Activities

Activities Most Preferred	Total Patients	Total % Age Percentage
Smart phone use	379	37.90%
PC and Laptop use	187	18.70%
Watching Television	346	34.60%
Reading	248	24.80%
Sports	135	13.50%
Outings	58	5.80%
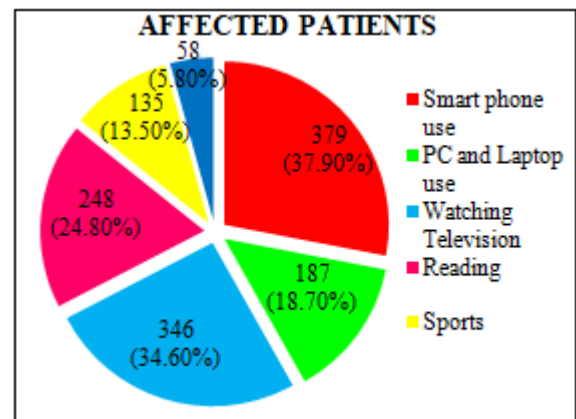
Figure 7: Distribution Of Most Preferred Leisure Time Activities Among Affected Patients.

7. Discussion

There is increasing trend of refractive errors in India. [11-14], in this study we have found **78.40%** of patients with refractive errors without presbyopia. Out of affected patients females (**56.12%**) were higher than the males (**43.88%**). M:F ratio **1:1.28**. Different studies have shown similar results in accordance with our findings.[15,16,17,18,19,30]

The age group most affected was **20-29** years (**41.07%**) most of which were belongs to student community undergoing graduation or post - graduation followed by age

group **10-19** years (**29.90%**) studying in secondary and higher secondary school. Proportion of myopia with combined astigmatism is higher (**30.20%**) followed by myopia (**19.50%**), astigmatism (**18.50%**), hypermetropia combined with astigmatism (**5.80%**) and hypermetropia alone (**4.60%**), which is similar to the findings reported in other studies.[20,21,22,23] Higher prevalence of myopia was reported worldwide, which was between **20-48%.**[20,21,22,23] The proportion of myopia decreased significantly with age. Similar trend of decreasing myopia with increasing age has been reported from certain studies.[24-26]

In this study, gender wise, there is no statistically significant difference found in having refractive errors, but controlled for age in age range **20 – 29** years refractive errors are more common in females than males and in the age group **30-39** years it is exactly opposite. Proportion of Myopic females and astigmatic females are higher in the age range **20-29** years as compared to males, while in the extreme of age groups it is vice-versa. Most patients presented with symptoms of diminution of vision **43.10%** followed by headache (**38.41%**) and eyeache (**17.88%**).

Most preferred leisure time activity of the patients were smart phone use (**37.90%**) followed by watching Television (**34.60%**) and reading (**24.80%**) under insufficient light. Constant near work and use of computers is unavoidable, particularly in (**21-30** age group) young adults, which may be a cause of early onset myopia [27,28,29].

We have observed that most of the female patients avoid using spectacles due to psycho-social factors especially for marriage purpose. They are ignorant about their disease and neglect themselves from taking proper treatment, so most of them present with amblyopia. We have also observed that, as the refractive error has a hereditary factor, most of the patients of school-going age groups are having refractive error as their parents are also having refractive errors (single or both the parents are using spectacles).

8. Conclusion

To conclude, refractive error is a common and significant cause of visual impairment in the study population. Myopia combined with astigmatism is the most common refractive error followed by myopia only and astigmatism respectively. Refractive error, especially myopia, is a common problem in the young people, more so in the student community and females are affected more than males. Thus, it may lead to loss of education, economic losses, and lower quality of life.

Excessive near work or frequent use of high tech gadgets and smart phones in dim light among young generations may be a cause of early appearance of refractive error as well as worsening of already present refractive error, which is of great concern.

Uncorrected refractive error can lead to the development of squint and amblyopia (lazy eye) which are its unwanted complications and are difficult to treat once developed. Therefore, early picking up of problems of refractive errors like diminution of vision and other associated symptoms such as headache and eyeache while studying along with regular examination for vision and refractive errors in school going ages, graduate, post-graduate students and young adults in service and working females should be done for early detection and treatment of refractive error to prevent future blindness.

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