

A Clinical Study on Prevalence of Presbyopia with Refractive Error 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 Refractive Error with Presbyopia among the patients attending O.P.D. (Out Patient Department) of Assam Medical College, Dibrugarh for ophthalmic problems. Materials & Methods: This is a prospective study conducted on 1,000 patients attending O.P.D. in Assam Medical College & Hospital, Dibrugarh; Assam. The study was done from October, 2016 to April, 2017. The study was conducted based on the Dark-Room Procedure including Retinoscopy, Macular Function Test, Visual Acuity with Snellen's View Box & Snellen's Near Vision Chart & Autorefraction. Results: A total numbers of 1,000 patients were enrolled in the study; out of which 30 (5.50%) were having myopia, 199 (33.50%) having hypermetropia and 240 (42.70%) were found to have astigmatism i.e. Presbyopia with Refractive Error. The incidence of refractive error was found to be high (58.27%) among 40 – 49 years of age group and in female (57.40%). Most common incidence increases with the increasing age group. Conclusion: The prevalence of Presbyopia with Refractive Error is more in females than in males attending to the O.P.D. based study.

Keywords: Dark-room procedure, Presbyopia, Refractive Error, Female, Assam

1. Introduction

Presbyopia (eyesight of old age) is not an error of refraction but condition of physiological insufficiency of accommodation, leading to failing vision for near^[1]. It is the most common physiological change occurring in the adult eye and it is thought to cause universal near vision impairment with advancing age.^[2] The pathophysiology of presbyopia is due to decrease in the accommodative power of crystalline lens with increasing age, leading to presbyopia which occurs due to:- a) decrease in the elasticity and plasticity of the crystalline lens (which results from age-related sclerosis); and b) age related decrease in the power of ciliary muscles.

Causes of premature presbyopia are:- 1) uncorrected hypermetropia, 2) premature sclerosis of the crystalline lens, 3) general debility causing pre-senile weakness of ciliary muscle and 4) chronic simple glaucoma.

The symptoms of presbyopia are :- 1) Difficulty in near vision (to start with in the evening and in dim-light and later even in good light). 2) Asthenopic symptoms due to fatigue of the ciliary muscle are also complained after reading or doing any near work.

Basic Principles for presbyopic correction are :- 1) Always find out refractive error for distance and first correct it. 2) Find out the presbyopic correction needed in each eye separately and add it to the distant correction. 3) Near point should be fixed by taking due consideration for profession of the patient. 4) The weakest convex lens with which an individual can be clearly at the point should be prescribed, since overcorrection will also result in asthenopic symptoms.

Myopia or short-sightedness is a type of refractive error in which parallel rays of light coming from infinity are focussed in front of the retina when accommodation is at rest^[1]. Asthenopic symptoms may occur in patients with small degree of myopia. The majority of cases merely results as variants in the frequency curve of axial length and curvature.^[2] The myopic eyes typically are 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 Diopters; and myopia is confirmed by performing retinoscopy.^[1]

Hypermetropia or long-sightedness is the refractive state of the eye wherein parallel rays of light coming from infinity are focused behind the retina with accommodation being at rest^[1]. It may result from acquired cortical sclerosis, posterior subluxation of 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, 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.^[1]

Astigmatism is a type of refractive error wherein the refraction varies in the different meridian^[1]. 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 cause of the **Refractive Error** is unknown but may run in families. It may be due to the mismatches between the axial length and focusing power of the eye (primarily the cornea and the lens). Hyperopia 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 prescriptions between **- 0.50** and **+ 8.00 Diopters**. **65%** of all the refractive prescriptions are for the **Presbyopes**. Uncorrected distance refractive error is the most common cause of visual impairment and the second most common cause of blindness in the world^[3,4,5,6].

Purpose of Approach to Refractive Error with Presbyopic Patients

To detect refractive error with presbyopia early, so as to improve the patient's discomfort and prevent further visual disturbance and the **BCVA** should be **6/6** for distance and near vision respectively.

Goals of Refractive Error with Presbyopic conditions

- To establish the diagnosis of refractive error with presbyopia and differentiate it from other causes of irritation.
- To establish appropriate treatment by prescribing spectacles and to give relief from discomfort.
- To educate & involve patient in management of these conditions.
- To prevent complications such as loss of visual function.

Epidemiology

Scenerio in India:-There is only 2 published reports on prevalence of refractive error with presbyopia among hospital-based population from South India and the prevalence varies between 63.7% and 70.2%. African studies on prevalence of refractive error with presbyopia is lower than in Asian population and it is in between 10% and 40%.

2. Material and Methods

Aims and Objectives

- To find the prevalence of Refractive Error with Presbyopic patients in between the 40 – 80 years of age group.
- Early detection of Refractive Error with Presbyopia and their treatment.
- To find out the different types of Refractive Error with Presbyopia among the study group.
- To find out the visual outcome after correction of Refractive Error with Presbyopia.

Methodology :- We randomly selected 1,000 patients from the Outpatient Clinic of Assam Medical College & Hospital Dibrugarh; Assam.

Type: A Hospital – Based Prospective Study.

Place: O.P.D.(Out Patient Department) of Ophthalmology, Assam Medical College & Hospital, Dibrugarh ;Assam.

Duration: 7 Months.

Screening of patients:- Individuals of the age group 40-80 years who presented with symptoms and signs of Refractive Error with Presbyopia like difficulty of vision (both distance and near), headache, eyeache, blurring of vision, watering, tiredness and ocular discomfort were selected.

Inclusion criteria

- 1) Presbyopia with Refractive Error.
- 2) Age group of 40 to 80 years.
- 3) Both the sexes.

Exclusion criteria:-

- 1) Below 40 years and above 80 years of age groups.
- 2) Corneal opacity, fundus pathology, eye injury and cataract.
- 3) Any other disease affecting the visual dysfunction including neurological visual impairment.
- 4) Allergic to 1% Atropine, 2% Homatropine, 1% Cyclopentolate, 10% Phenylephrine (elderly patients).

Patient history:-

Symptoms:-

- a) Presenting complaints- Difficulty in vision (distance and near), blurring of vision, diplopia, headache and watering.
- b) Exacerbating conditions- Prolonged working hours in computer, reading, watching TVetc.
- c) Ocular History details-Topical medications used, cataract, allergic eye diseases, prior cataract surgery, refractive surgery, keratoplasty etc.
- d) Medical History Details- Diplopia, Diabetes Mellitus, Hypertension, any neurological and fundus pathology.

Examination of Refractive Error with Presbyopia :-

- 1) External examination.
- 2) Slit lamp examination.
- 3) Snellen's Vision Box.
- 4) Trial Box containing different lens.
- 5) Trial Frame.
- 6) Retinoscope.
- 7) Astigmatic Fan.
- 8) Jackson's Cross Cylinder.
- 9) Computerised Autorefractometer.
- 10) Keratometer.
- 11) Direct and Indirect Ophthalmoscope.
- 12) Mydriatic and Cycloplegic Drugs.

Pin-Hole Test:-It is performed to differentiate an impairment of vision due to an abnormality of the dioptric apparatus and one due to retinal or neurological diseases^[7].When an opaque disc perforated by a small hole is held in front of the eye,only a pencil rays of light passes through the axis of the dioptric system eliminating all other refraction,thus a clear image would be obtained.

Retinoscopy :- Subjective (dry) Retinoscopy and Objective (wet) Retinoscopy.

When the retinoscopy is performed without instilling cycloplegic drugs, it is termed as dry or dynamic retinoscopy and when the retinoscopy is performed after instilling the cycloplegic drugs, it is termed as wet or static retinoscopy.^[8] 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.
- 2) **Homatropine** is used as 2% drops. One drop is often instilled every 10 minutes for 6 times and retinoscopy is performed. It is used for most of the hypermetropic individuals between 5 and 25 years of age.
- 3) **Cyclopentolate** is used as 1% drops in patients between 8 and 20 years of age. One drop is instilled for every 10 – 15 minutes for 3 times and retinoscopy is performed 1 - 1½ hours later, after estimating the residual accommodation which should not exceed 1D.
- 4) Only **mydriatic (10% phenylephrine)** may be needed in elderly patients when the pupil is narrow or media is slightly hazy.

patients were found to have positive Refractive error with Presbyopic screening test.

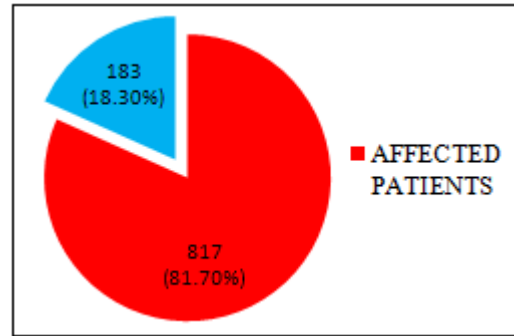


Figure 1: Distribution of affected patients among total patients

Procedure:- It is performed by making the patient sit at 1 m. With the help of retinoscope, light is thrown on to the patient's eye, who is instructed to look at a far point (to relax accommodation). However, when a cycloplegic 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 pupillary area of the patient. Then the retinoscope is moved in horizontal and vertical meridian, keeping a watch on the red reflex. Depending upon the movement of the red reflex (when a plane mirror retinoscope is used), the results are interpreted as follows :-

- 1) No movement of red reflex indicates myopia of 1D.
- 2) The movement of red reflex along with the movement of the retinoscope indicates either emmetropia or hypermetropia or myopia of less than 1D.
- 3) The movement of red reflex against the movement of the retinoscope implies myopia of more than 1D.
- 4) The end point of retinoscopy using a simple plane mirror retinoscope is neutralization of red reflex, i.e. no movement of the reflex in any meridian with the movement of the mirror.

A study was done among 1,000 patients attending OPD having headache, eyeache, watering and difficulty in vision. A detailed clinical history of patient was taken. The demographic data and medical history were taken from each patient including age, gender, occupation, history of trauma, diabetes mellitus etc. Each eye was examined using slit lamp, a trial box, trial frame, Snellen's box, Retinoscope, Bausch and Lomb Keratometer, Duochrome test, Astigmatic fan test, Jackson's cross cylinder, Stenopaic slit test, pin-hole test, direct and indirect ophthalmoscopy with cycloplegic drugs like 1% Atropine, 2% Homatropine, 1% Cyclopentolate and 10% Phenylephrine (elderly patients) and computerised autorefractometer.

The mydriatics should be used with care in adults with shallow anterior chamber due to danger of an attack of narrow angle glaucoma. In older people mydriasis should be counteracted by the use of the miotic drug (2% pilocarpine).

3. Results

Total 1,000 patients having symptoms of Refractive error with Presbyopia were enrolled in our study. 817 (81.75%)

Among them maximum percentage (58.26%; 476 out of 817) of patients were in the age group 40-49 years, followed by 32.68% (267 out of 817) in the age group of 50-59 years, 8.20% (67 out of 817) in the age group of 60-69 years and 0.85% (7 out of 817) in the age group of >70 years and < 80

Table 1: Age Distribution

Age Group	Total Sample	Affected Sample	% (Percentage) Affected
40 - 49 Years	615	476	58.26
50 - 59 Years	302	267	32.68
60 - 69 Years	83	67	8.20
70 + Years	10	7	0.86
Total	1000	817	

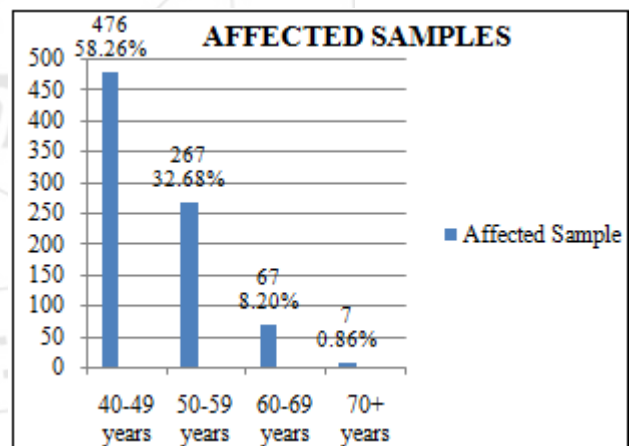


Figure 2: Age wise Distribution of Affected Patients.

Among total patients, 449 patients were male and 551 patients were female (M : F= 1:1.27). Among the affected patients 348 were male and 469 were female (M:F=1:1.34).

Table 2: Sex Distribution

Sex	Total Sample	Affected Sample	%(percentage) of Affected	Ratio M:F	
				Total samples	Affected samples
Male	449	348	42.59	1:1.27	1:1.34
Female	551	469	57.40		
Total	1000	817			

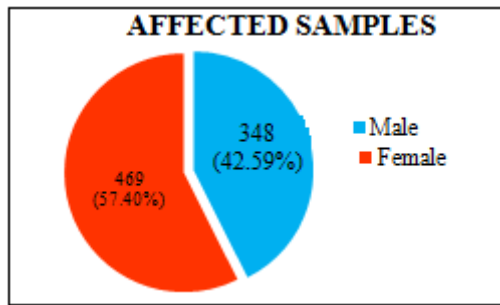


Figure 3: Sex Distribution of affected patients among total patients.

Among total affected patients (817), 418 patients (51.16%) presented with symptoms of diminution of vision, headache (11.75%), eyeache (21.05%), blurring of vision (29.25%), watering (7.83%) and ENT problems (4.65%).

Table 3: Frequency of symptoms among affected population at first presentation

Symptoms	Total numbers	% (Percentage)
Diminution of vision	418	51.16 %
Headache	96	11.75 %
Eyeache	172	21.05 %
Blurring of vision	239	29.25 %
Watering	64	7.83 %
Any E.N.T. problems	38	4.65 %

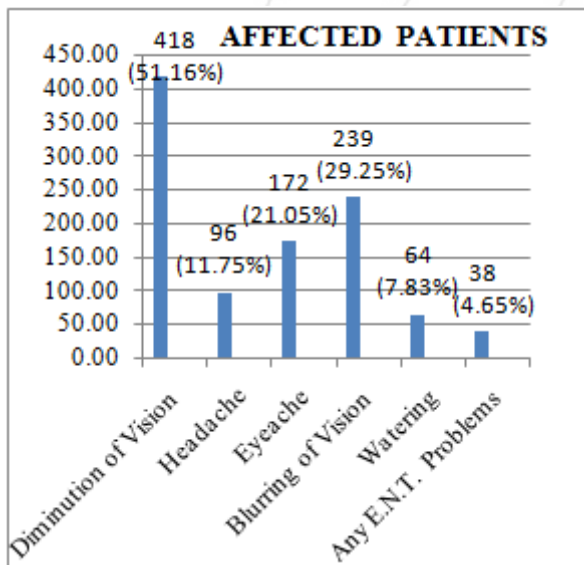


Fig. 4: Distribution of Symptoms among the affected patients.

Table 4: Distribution of Refractive Error with Presbyopia

Type of Refractive Error	Sex		Total % (Percentage)
	Male	Female	
Presbyopia (alone)	101	82	183 (18.3%)
Presbyopia + Myopia	25	30	55 (5.5%)
Presbyopia+Hypermetropia	136	199	335 (33.5%)
Presbyopia+Astigmatism	187	240	427 (42.7%)
Total	449	551	1,000 (100%)

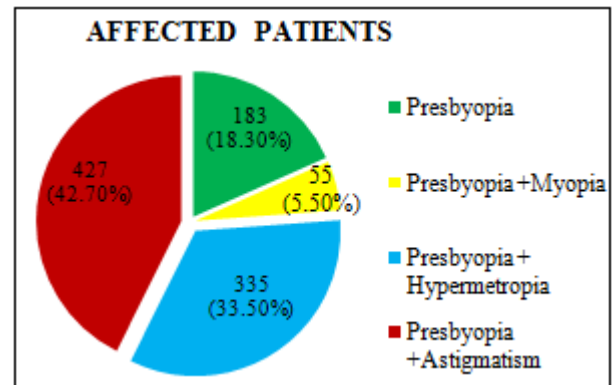


Figure 5: Distribution of Refractive Error with Presbyopia among the affected patients.

4. Discussion

Presbyopia is universal and occurs as a result of age-related physiological changes that occurs in the protein of the crystalline lens of the eye^[9,10]. People are defined as presbyopic if they are unable to read the N8 optotype with distance correction in place if needed, or they are able to read at least one more line with the addition of a plus lens.^[11] It is estimated that there were 1.04 billion people globally with presbyopia in 2005, 517 million of whom had no spectacles or inadequate spectacles.^[12] In our study, the prevalence of the refractive error with presbyopia was 81.70% (817/1000) which is comparable with study done by Srinivas Marmamula et al i.e. 88.1% (96/106)^[13]. A hospital based study in Kano, Nigeria showed that 83% of presbyopic patients above 35 years of age had refractive error which is similar to our study^[14]. The Eye Disease Prevalance Research Group found that approximately one-third of the persons who are 40 years or older in the United States and Western Europe and one-fifth of Australians are having refractive error^[15]. The Andhra Pradesh Eye Study reported that 63.7% of those with refractive error had presbyopia^[16]. In our study there is a relative peak in the refractive error with presbyopia prevalence in the age group of 40-49 years (58.26%) followed by 50-59 years (32.68%) which is consistent with the findings in other refractive error in presbyopic studies. Abdu et al in their study showed that maximum prevalence (48%) of refractive errors were in the age group of 40-49 years^[14]. Claudia Maria Osorio Chaves et al showed that the highest prevalence of refractive error was in the age group of 51- 60 years (43.3%) followed by 51-60 years age group (15.56%)^[17]. In our study 348 males and 469 females were affected by refractive error (M:F=1: 1.34). The higher prevalence of presbyopia in the female gender agrees with previous studies on presbyopia in low- and- middle-income countries (Patel and West, 2007)^[18], study from Brazil, Bangladesh^[19,20]. Abdu et al. also showed in their study that male: female ratio was 1:1.2^[14]. Presbyopia affect females earlier than male^[21]. Increased association of Presbyopia for women is not due to physiologic difference in accommodation but rather due to other sex differences, such as tasks performed and viewing distances. Women used near vision for winnowing grain, sorting rice, sewing, weaving in poor light. But M Ghatak et al in their study showed that male : female ratio was 1.23:1^[22]. In our study astigmatism (42.7%) was found to be the commonest refractive error followed by hypermetropia (33.5%) and myopia (5.5%). This

is comparable with studies done by Abdu et al in Nigeria and Claudia Maria et al in Brazil where the commonest refractive error was found to be Astigmatism i.e. 41% and 49.4% respectively^[14,17]. In our study most frequent presenting symptoms were diminution of vision (51.16%) followed by blurring of vision (29.25%), eyeache (21.05%), headache(11.75%) and watering (7.85%). The presbyope makes excessive effort to see and read at the customary near working distance and this result in eye strain and headache.

5. Conclusion

Our study showed higher amplitude of accommodation among the astigmatism in the age group 40-49 years compared to hypermetropes and myopes. Female are affected more due to ignorance and delay presentation in the clinic. Most of the presbyopic patients requires full refractive correction to ensure that both far and near vision are corrected.

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