



A CLINICAL STUDY ON PREVALENCE OF PRESBYOPIA WITHOUT REFRACTIVE ERRORS AMONG THE PATIENTS ATTENDING O.P.D. IN A TERTIARY CARE HOSPITAL IN ASSAM

Ophthalmology

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ABSTRACT

Background:- Presbyopia is physiological inadequacy for near vision. Studying Presbyopia in people ≥ 40 years without Refractive Errors is essential because it can enhance Presbyopia management techniques, resulting in more potent visual corrective techniques. **Aims:** To study the Prevalence of Presbyopia without Refractive Errors among the patients attending Ophthalmology O.P.D. in the Assam Medical College & Hospital, Dibrugarh. **Methodology:-** A sample of 1,000 patients ≥ 40 years were included in the study from August, 2020 to November, 2021 and different Ophthalmological examination procedures were done. **Results:-** Out of 1,000 patients studied, 26.6% of patients had only Presbyopia without Refractive Errors. It was found to be high among 40-49 years of age group (52.40%) and among females (26.70%). **Conclusion:-** In our study, we found that prevalence of the Presbyopia without Refractive Errors is higher in adults aging between 40-49 years and also in females more than males.

KEYWORDS

O.P.D., Ophthalmological Examination, Presbyopia.

INTRODUCTION

The human eye is an optical device that is comparable to a camera in the following ways:

- The eyelids function as a shutter of the camera.
- The cornea and crystalline lens acts as a focusing system of the eye.
- The iris regulates the quantity of light that enters the eye by controlling the pupil's size.
- The eye's dark interior is formed in part by the choroid.

The retina works like a light-sensitive plate or film, forming images on it. The optic nerve carries the impulse of the image to the occipital region of the cerebral cortex. The eye's optical system is divided into two parts: the corneal portion and the lens section.

Together, these components make up a homocentric system of lenses that, when activated, provide a powerful system with a small focal length. The total dioptric power of the eye is approximately **+58 D**, out of which the crystalline lens contributes **+15 D** and the cornea contributes around **+43 D**.

In practical terms, the eye's optical system is regarded as perfect. Although the lenticular and corneal surfaces are believed to be spherical, in reality, the eye's optical system is flawed in the following ways:

- 1) The lens and corneal surfaces are aspherical.
- 2) The lens is often tipped and somewhat decentered with respect to the corneal and visual axes of the eye.
- 3) The substance that makes up the crystalline lens is non-homogeneous.

The three Principle axes of the eye are the optical axis, Visual axis and Fixation axis as well and it has three angles namely Alpha, Gamma and Kappa.

- The media of the eye are evenly permeable to light rays between **600 nm. and 390 nm.**
- Rays shorter than **295 nm.** are absorbed by the cornea and only make it to the lens.
- The lens absorbs rays shorter than **350 nm.** Thus, light rays between **600 nm. and 295 nm.** can reach the retina in phakic eyes. The light with a wavelength of **550 nm.**, or yellow-green light, is the most sensitive to the eye. The sensitivity of the eye is lowest for red and violet light, and it declines on both sides.
- The minimum time interval between two subsequent light pulses

that the eye can identify is **0.1 sec**, which is called as persistence.

A refractive state when the parallel rays of light coming from the infinity are focussed on the retina with the accommodation at rest is defined as **Emmetropia** (optically normal eye). A distant object can be clearly seen by an emmetropic eye without the need for internal optics correction. Most of the emmetropic eyes have an axial length of about **24 mm.**² If the optical components of a larger eye are weaker, it can be emmetropic; conversely, if the optical components of a smaller eye are stronger, it can also be emmetropic.¹

The Pathophysiology Of Presbyopia Includes:-

- i) Age-related sclerosis which decrease the elasticity and plasticity of the crystalline lens and thereby decreases in its accommodative power.
- ii) Age-related decline in ciliary muscle strength.

The Symptoms Of Presbyopia Include:-

Difficulty in near vision mainly in the evening, dim-light and later even in good light, and asthenopic symptoms like headache, eye ache, watering, etc. due to ciliary muscle fatigue are also complained after reading or doing any near work.

Causes of Premature presbyopia can be:-

- i) Uncorrected hypermetropia.
- ii) Pre-senile weakness of ciliary muscle due to general debility.
- iii) Premature sclerosis of the crystalline lens.
- iv) Chronic simple glaucoma.

Principles For Presbyopia Correction Are :-

- i) Correct the refractive error for distance if present.
- ii) Determine the correction of presbyopia in each eye independently, then include it in the distance correction.
- iii) The patient's profession should be taken into account when fixing the near point.
- iv) The weakest convex lens that a person may wear comfortably should be suggested as overcorrection will also cause asthenopic symptoms.

DEFINITION.

Ametropia is defined as a refractive state in which the parallel rays of light coming from infinity (with accommodation at rest), are focussed either in front or behind the retina in one or both the meridia; which includes myopia, hypermetropia and astigmatism.³

Myopia or short-sightedness is a refractive error, where parallel rays

of light coming from infinity are focussed in front of the retina when accommodation is at rest.¹ Patients with small degree of myopia may experience asthenopic symptoms. The myopic eyes are often large and prominent, with a deep anterior chamber, a large and sluggishly reacting pupil, a normal fundus, a rare temporal myopic crescent, and an error of no more than 6 to 8 D.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 Patients with hypermetropia may or may not experience asthenopic symptoms. Hypermetropic eyes reveals a short anterior-posterior length of the eyeball as detected by A-scan biometry. It also shows thin cornea, shallow anterior chamber, retinal examination shows papillitis or pseudo-papillitis, and a shot-silk retinal appearance.

Astigmatism is a refractive error wherein the refraction varies in the different meridian.¹ As a result, light rays entering the eye cannot converge at a point focus; instead, they must originate from a focal lens. Astigmatism can be broadly divided into two categories: irregular and regular. Regular astigmatism is frequent shift in uniform from one refractive power meridian to another which includes blurry vision, objects appearing proportionately longer than they actually are, dull eye pain, headaches, early eye fatigue, nausea, and drowsiness. An uneven shift in refractive power in a separate meridian is the hallmark of irregular astigmatism. It involves polyopia, distorted objects, and visual impairments.

Presbyopia, or old age vision (above 40 years) is a condition characterized by a physiological inadequacy of accommodation that results in failed near vision rather than a refractive error.¹ With advancing age, Presbyopia is the most common physiological change that cause near vision impairment.²

MATERIALS AND METHODS.

AIMS AND OBJECTIVES :

- To study the prevalence of presbyopia without refractive error among the patients > 40 years coming with ophthalmic problems.
- Detection of grade of presbyopia without refractive error along with its treatment.
- To find out the visual outcome after correction of the presbyopia without refractive error.

Methodology :

We randomly selected 1,000 patients from the Out-Patient Clinic of the Department of Ophthalmology, Assam Medical College and Hospital; Dibrugarh, Assam.

Type Of Study: A Hospital Based Prospective Observational study.

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

Study Duration: 1 year and 4 months.

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

Screening Of Patients: Individuals of >40 years age groups presenting with the symptoms and signs of Presbyopia like difficulty of near vision, headache, eyeache, blurring of vision, watering, foreign body sensation, tiredness and ocular discomfort were selected.

Inclusion Criteria :

- Presbyopia without refractive error.
- More and equal to 40 years.
- Both the sexes (gender).
- Patients who are giving consent for the study.

Exclusion Criteria :

- Below 40 years.
- Any patient with infective conditions like corneal ulcer, retinal diseases, cataract and ocular injury.
- Any ocular tumours and malignant cases.
- Patient with history of any intraocular and extraocular surgery.

DIAGNOSIS.

Patient history:-

Symptoms:-

- Chief complaints:- Diminution of vision for both distance as well as near, blurring of vision, headache, eye ache, redness, irritation, itching, foreign body sensation, watering and discharge.
- Aggravating conditions:- Prolonged use of compute, laptops and smart phones, watching TV in insufficient light , reading in dim light, close works in insufficient light.
- Past Ocular History:- Any use of topical medications and wearing of contact lens, diplopia, allergic eye diseases, cataract, any history of cataract surgery, refractive surgery, keratoplasty etc.
- Medical History:- Diabetes Mellitus, Hypertension, Eyelid hygiene along with adnexal diseases, any neurological and fundus pathology.
- Educational Status History:- Primary schooling, Secondary schooling, Higher Secondary schooling, Graduation, Post-Graduation and Others.
- Occupational History:- Labourer (Daily wage earner), Cultivator, Homemaker,

Businessman, Teachers, Official workers and executives, Professionals and others.

Examination of Presbyopia without Refractive Errors :

- External Ocular Examination.
- Slit Lamp Examination.
- Snellen's Vision Box.
- Trial Box Containing Different Lenses.
- Trial Frame.
- Retinoscope.
- Astigmatic Fan.
- Jackson's Cross Cylinder.
- Keratometer.
- Computerised Autorefractometer.
- Synaptophore (as required in selective cases).
- Ocular Surface Dye Staining :- Fluorescein, Rose Bengal or Lissamine Green dye to assess the extent of ocular damage.
- I.O.P. by Applanation Tonometer (as required in selective cases).
- Direct and Indirect Ophthalmoscopy
- Mydriatic and Cycloplegic Drugs.

Schirmer Test:-

It is a useful clinical test for the rate of tear formation, given by **Schirmer in 1903**. **Schirmer-I** test is performed by 5 mm. x 35mm. strip of Whatman – 41 filter paper and conjunctival sac is anaesthetised to eliminate reflex tearing and thereby measuring basic tear secretion. **Schirmer-II** test is performed with mechanical irritant to evaluate reflex tearing after stimulating the nasal mucosa. In females aged below 30 years, the rate of secretion is more than that of 30 years.

Stenopaic-

Slit Test is done while checking the correction of astigmatism.

Pin-Hole Test :-

The retina, neural pathways, and central nervous system all contribute to the patient's visual acuity in addition to the dioptric apparatus of the eye. It is performed to differentiate between impairment of vision due to abnormality of the dioptric apparatus and impairment of vision due to retinal or neurological disease. A good standard of illumination has been used while carrying out the test. The test also has therapeutic implications.

Both objective and subjective methods of refraction were carried out during the study. For objective refraction, **Retinoscopy or Skiascopy or Shadow test** was used by the method of neutralization.

EPIDEMIOLOGY.

SCENARIO :

Presbyopia is an age-related accommodation insufficiency of lens that causes difficulty while focusing at near object. It is the most prevalent alteration that occurs in adult eyes which is physiological. Presbyopic people usually experience headache and eye strain, and they usually held objects further away from their eyes for focusing on them.

A concern regarding this field of study is the absence of a commonly accepted definition of presbyopia and a standardized method for assessing it.⁴

The prevalence of presbyopia increased with age. It is seen to be

associated with female sex, rural habitation (rather than urban), myopia, and hyperopia.

Presbyopia may result in loss career prospects, as well as poorer productivity and a lower quality of life.^{7,8} Near vision problem creates pain for affected individuals and their families, as well as economic losses worldwide.⁹

In a presbyopic study in Shahroud, Iran more than **50%** of the people over **45 years**, were presbyopic and **17%** people over **60 years** were free of this condition.¹¹

To determine the prevalence of presbyopia in Durban a cross-sectional community-based survey conducted. It showed the prevalence of presbyopia **77%**, significantly higher in the age group of **50 – 64 years** and **65 – 79 years**. The spectacle coverage for presbyopia was **4.84%**, significantly higher in those who were **65–79 years**.¹

RESULTS AND OBSERVATIONS.

Total of 1,000 patients with Presbyopia were enrolled in our study. 266 (26.60%) patients were found to have Presbyopia without Refractive Errors.

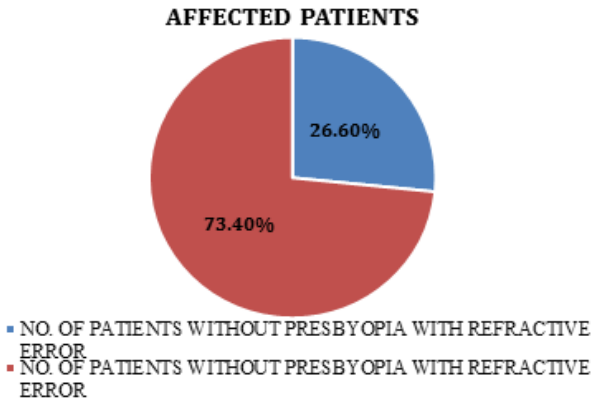


Fig. 1. : Distribution Of Affected Patients Among The Total Patients.

Table 1: Distribution of Age.

Age Group (in Years)	No. Of Total Sample	No. Of Affected Sample	Affected % (percentage)
40-49	458	240	52.40
50-59	300	15	5.00
60-69	167	8	4.79
70-79	70	3	4.28
>80	5	0	0
TOTAL	1,000	266	26.60

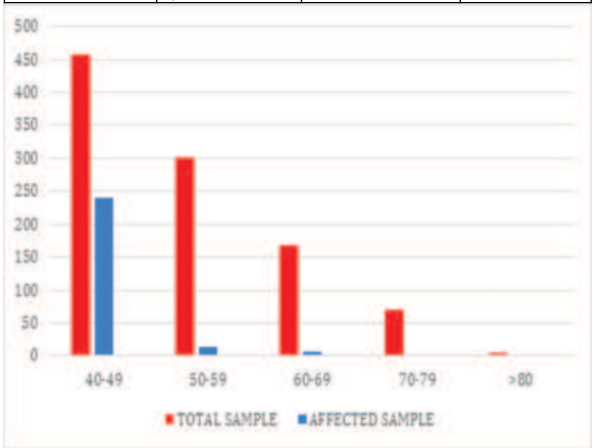


Fig. 2. : Distribution Of Affected Sample Among The Various Age Groups

Among the total patients studied, the maximum percentage **52.40%**, (240 / 458) of patients were in the age range of **40 - 49 years**; followed by **5.00%**, (15 / 300) in the age range of **50 - 59 years**; **4.79%**, (8 / 167) in the age range **60 - 69 years**; **4.28%**, (3 / 70) in the age range of **70 - 79 years** and **0%** (0 / 5) in the age of **>80 years** (in our study).

Table 2: Gender Distribution.

Gender	No. Of Total Sample	No. Of Affected Sample	Affected % (Percentage)	RATIO No. Of Total Sample	M : F No. Of Affected Sample
Males	353	93	26.3	1:1.86	1:1.83
Females	647	173	26.7		
Total	1,000	266	53		

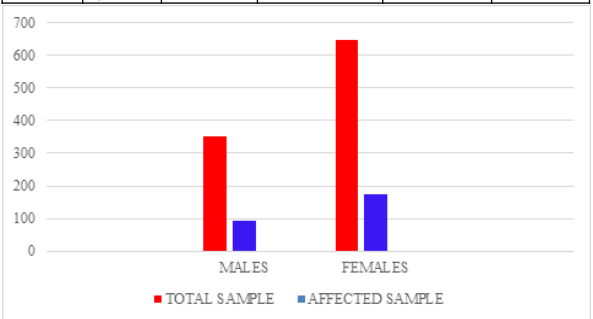


Fig.3. : Gender Distribution Of Study Patients.

Among the study patients, **26.3%** males and **26.7%** females were affected where **M:F = 1:1.83**.

Table 3: Different Symptoms At First Presentation Among The Study Patients At Presentation.

Symptoms At First Presentation	No. Of Total Sample	% (percentage)
Headache	39	3.9
Eyeache	4	0.4
Blurring of vision	14	1.4
Watering	42	4.2
Discharge	2	0.2
Foreign Body sensation	6	0.6
ENT problem	8	0.8

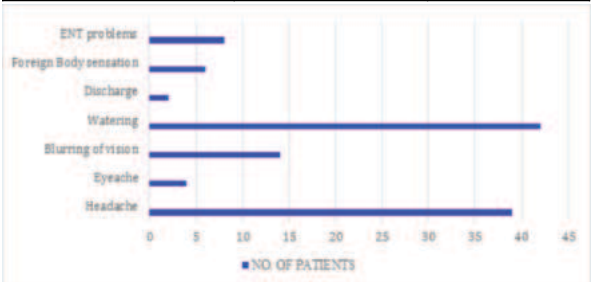


Fig. 4. : Different Symptoms At First Presentation Among The Study Patients At Presentation.

Among the study patients, **39 (3.9 %)** had headache, **4 (0.4 %)** had eye ache, **14 (1.4 %)** blurring of vision, **42 (4.2 %)** watering, **2 (0.2 %)** discharge, **6 (0.6 %)** foreign body sensation, **8 (0.8 %)** E.N.T. problems, etc.

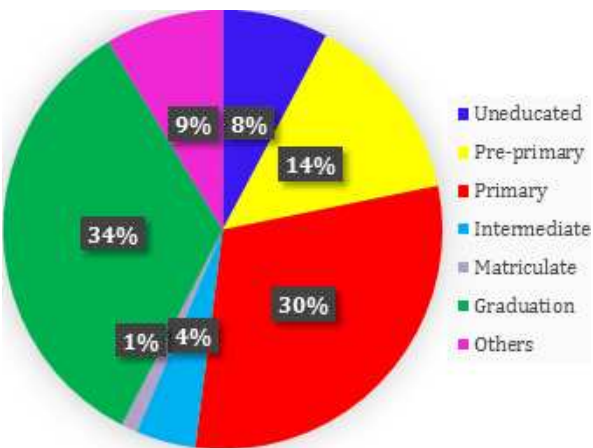


Fig. 5. : Educational Status Among The Study Patients.

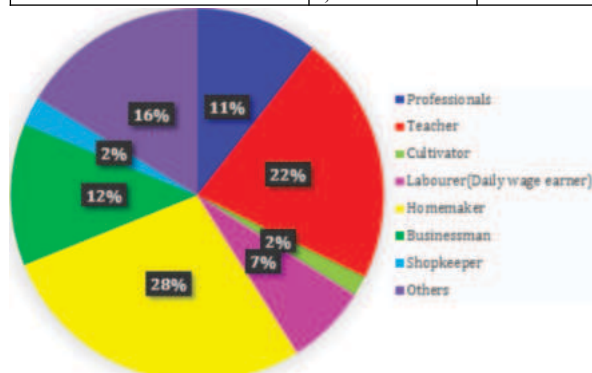
Table 4: Educational Status Among The Study Patients.

Educational Status	No. Of Total Sample	% (Percentage)
Uneducated	78	7.8
Pre-primary	140	14.0
Primary	302	30.2
Intermediate	44	4.40
Matriculate	12	1.2
Graduation	337	33.7
Others	87	8.7
Total	1,000	

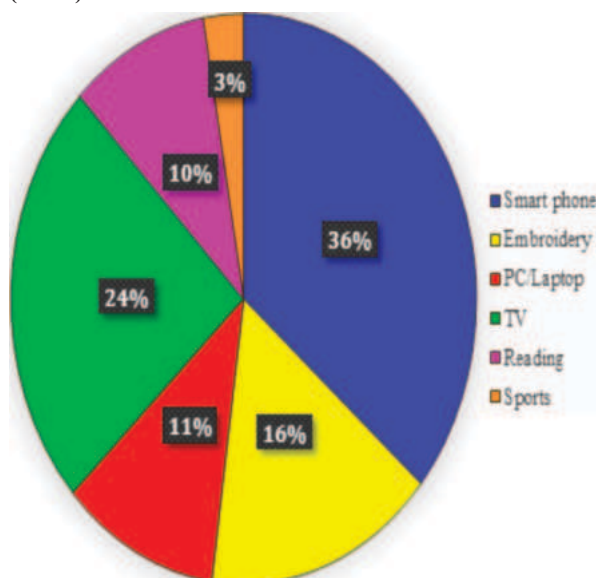
Among the study patients, 33.7% were Graduate, followed by 30.2% had Primary Education, 14.0% had Pre-primary Education, 7.8% were Uneducated, 4.40% had Intermediate Education and 1.2% were Matriculate.

Table 5: Occupational Status Among The Study Patients.

Occupational Status	No. Of Total Sample	% (Percentage)
Professionals	106	10.6
Teacher	216	21.6
Cultivator	18	1.80
Labourer(Daily wage earner)	70	7.00
Homemaker	279	27.9
Businessman	123	12.3
Shopkeeper	25	2.5
Others	163	16.3
Total	1,000	

**Fig. 6. : Occupational Status Among The Study Patients.**

Among the study patients, majority were homemakers (27.9%), followed by Teachers (21.6%), Businessmen (12.3%), Professionals (10.6%), Labourers (7.00%), Shopkeepers (2.5%) and Cultivators (1.80%).

**Fig. 7. : Most Preferred Leisure Time Activities Among The Study Patients.****Table 6. Most Preferred Leisure Time Activities Among The Study Patients.**

Leisure Time Activity	No. Of Total Sample	% (Percentage)
Smart phone	362	36.2 %
PC/Laptop	109	10.9%
TV	245	24.5%
Embroidery	160	16.0%
Reading	96	9.6%
Sports	28	2.8%
Total	1,000	

Among the study patients, (36.2%) preferred the usage of smart phone during their leisure time, followed by TV (24.5%), Embroidery (16.0%) Laptop/PC (10.9%), Reading (9.6%) and Sports (2.8%).

DISCUSSION.

Presbyopia is a physiological condition due to decrease in amplitude of accommodation or loss of accommodative ability with age.¹³ In this study, 26.60% of patients have been found to be presbyopic without refractive errors and also we found that females are more presbyopic than males.

Among the study patients, females (64.7%) were more affected than the males (35.3%) with a M : F ratio of 1:1.86. The most common age group with presbyopia without refractive error was 40-49 years (52.40%) most of whom were homemakers (27.9%). Majority of the patients affected were Graduate (33.7%) who had a history of smart phone usage (36.2%) followed by excessive near work during their leisure time. In our study we have found that frequent use in smart phone use was associated with increased prevalence of Presbyopia.

Apart from symptoms of diminution of vision most of the patients presented with headache. Jain et al conducted a study that showed presbyopia as an important cause of patients presenting with headache, especially in those who does constant near work and have increase screen time.^{17,18,19,20}

In India, it is usually observed that the age of onset of presbyopia is in the fourth decade. An estimated 72 million presbyopia patients are unable to conduct near work, accounting for the 182 million presbyopia patients who do not currently utilize any type of eyeglass correction. Developing human resources with the ability to execute high-quality refraction will be a key task.¹⁴

The accessibility to eye care services, including a mechanism for effective distributing high-quality, reasonably priced eyewear, is another issue that has to be given top priority. A sizable percentage of research participants gave excuses for not seeking care like shortage of money and other necessities. To overcome these obstacles, creative hospital and community-based approaches will be needed to identify community members who are experiencing difficulties and to supply them with reasonably priced, high-quality spectacles at an affordable price.¹⁴

CONCLUSION.

In summary, among the study population, refractive error is a frequent and important cause of visual impairment. The most typical presentation is presbyopia along with refractive error. Presbyopia is a prevalent issue among adults, particularly affecting women. As a result, it could result in reduced quality of life, financial losses, and education loss. It is quite concerning to note that excessive near work or frequent use of mobile phones and other high-tech devices in low light may contribute to the early onset and exacerbation of pre-existing refractive error. It is crucial to identify presbyopia early on, as it has negative effect on day to day activities, carrier, confidence in doing near work, etc.

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