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## INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI: 10.21474/IJAR01/15182

DOI URL: <http://dx.doi.org/10.21474/IJAR01/15182>



### RESEARCH ARTICLE

#### OCULAR PATHOLOGY OF HYPEROPIC PATIENTS PRESENTING TO THE TERTIARY HEALTH CARE CENTRE

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#### Manuscript Info

##### Manuscript History

Received: 06 June 2022

Final Accepted: 10 July 2022

Published: August 2022

##### Key words:-

Strabismus, Amblyopia, Asthenopia, Pseudopapillitis

#### Abstract

**Purpose:** To study the ocular pathology of hyperopic patients presenting to the tertiary health care centre.

**Methods:** This was a retrospective observational study that involved 60 eyes of 30 patients with hypermetropia complaining of diminution of vision with asthenopic symptoms like tiredness of eyes, frontal or frontotemporal headache, watering and mild photophobia. There were three groups based on the criteria of age, i.e. <20 years, 20-40 years, 40-60 years with each group comprising of 10 patients. Complete ophthalmic examination was done in diffuse light followed by direct and indirect ophthalmoscopic examination.

**Results:** There were 15 males and 15 females. The common hypermetropiarelated findings in patients varying between age of 0-20 years was strabismus and amblyopia. Recurrent styes, recurrent blepharitis infection, recurrent chalazion were seen in equal proportions in all age groups. Primary open angle glaucoma and angle closure glaucoma were reported more in adults ranging between 20-40 years and 40-60 years. Fundus examination in high hypermetropic patients revealed a small optic disc with ill defined margins simulating papillitis which is pseudopapillitis because there is no swelling of the disc and the retina shines due to greater brilliance of light reflections giving shot silk appearance of retina.

**Conclusion:** Hyperopia also termed hypermetropia or farsightedness, is a common refractive error in children and adults. Its effect on an individual and the symptoms produced varies greatly, depending on the magnitude of hyperopia, the age of the individual, the status of the accommodative and convergence system, and the demands placed on the visual system. Individuals with uncorrected hyperopia may experience symptoms such as blurred vision, asthenopia (e.g., headaches and eyestrain) while reading, accommodative/binocular dysfunction, amblyopia, and/or strabismus. Furthermore, uncorrected amblyopia in case of adults can lead to various complications like open angle or angle closure glaucoma, uveal effusion syndrome, non arteritic anterior ischemic optic neuropathy, central serous chorioretinopathy, age related macular degeneration, etc.

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### **Introduction:-**

The most common refractive error in childhood is hyperopia.[1] The term hyperopia refers to the refractive condition of the eye where parallel light rays coming from the infinity are focussed behind the neurosensory retina (after refraction through the ocular media) when accommodation is at rest. The spontaneous accommodative effort of the human eye, by increasing the anterior curvature and converging power of the crystalline lens, usually tries to overcome this situation. So, accommodative rest is mandatory to elicit total hyperopia, specifically in young individuals.[2]

By birth, human beings are predominantly hyperopic, and as the age progresses, hyperopic eyeballs grow to become emmetropic or even myopic.[3][4] Positive family history plays a crucial role in the development of hyperopia in the next generations.[5] If left untreated after diagnosis, sequelae such as amblyopia and tropia may develop.[6][7]

Conventionally the hyperopia is etiologically classified into:

#### **Axial hyperopia**

(most common - simple hyperopia): It is due to anterior-posterior axial shortening of the eyeball. Genetic predisposition plays an important role. Retinal edema can cause a hyperopic shift. 1 mm decrease in axial length leads to 3 diopters of hyperopia.[8]

#### **Curvature hyperopia:**

It is due to flattening of the cornea or the lens or both. A radius of curvature increase in 1 mm leads to 6 diopters of hyperopia.

#### **Index hyperopia:**

It is due to the change in the refractive index of the crystalline lens, which occurs in old age or diabetics. The refractory index gradually increases from the center to the periphery.

#### **Positional hyperopia or absence of the lens (aphakia) or ocular pathologic conditions:**

This condition occurs due to malposition or absence of the crystalline lens (congenital or acquired) or intraocular lens owing to the creation of an aphakic zone in refractive media. Post-traumatic or post-surgical aphakia is not an uncommon cause of hyperopia.

Few ocular pathologies, e.g., nanophthalmos, microphthalmos, aniridia, may cause hyperopia.

AR Augsburger, in his book, classified hyperopia into three stages or degrees, which the convention followed to date and also by the American Optometric Association (AOA).

1. Low hyperopia i.e. +2.00 diopters (D) or less.
2. Moderate hyperopia i.e.+2.00 to +5.00 D.
3. High hyperopia i.e.>+5.00 D.

#### **Pathophysiology**

The axial shortening of the eyeball or decreased converging potential of the cornea or crystalline lens due to flattening are common responsible factors for simple hyperopia. Congenital or acquired absence of the crystalline lens resulting in loss of converging capacity leads to the pathological hyperopia. Senile changes in cortical lens fibers lead to change in the refractive index causing index hyperopia. Paralysis of accommodation (by cycloplegic drugs) and loss of accommodation due to complete third nerve palsy or internal ophthalmoplegia cause functional hyperopia.[9][10]

Accommodation is a dynamic factor in controlling the state of refraction, specifically in hyperopia. Depending on the accommodation, manifest hyperopia may subdivide into:

- Absolute hyperopia, which cannot be overcome by accommodative effort.  
When a patient cannot see 20/20 without glasses, absolute hyperopia is denoted by the weakest plus lens with which the patient can see 20/20.
- Facultative hyperopia which can be overcome by accommodation

The manifest hyperopia is the sum of absolute and facultative hyperopia. Clinically, it is measured by the strongest plus (or convex) lens with which the patient can still maintain the maximum vision (20/20).

Latent hyperopia is due to the inherent ciliary muscle tone. Usually, the magnitude of latent hyperopia is 1D, but it is higher at an early age and gradually decreases as age progresses. Cycloplegic agents like atropine unmask this condition. This latent hyperopia causes asthenopic symptoms without dimness of distant vision. Cycloplegia is a must to elicit the amount of latent hyperopia in children.

- Total hyperopia = Latent hyperopia + manifest hyperopia
- Manifest hyperopia = Absolute hyperopia + facultative hyperopia

### **Clinical Features**

#### **Asymptomatic:**

The patient's inherent ciliary muscle tone and accommodative effort can overcome some degree of hyperopia without creating any difficulty.

#### **Symptomatic:**

##### **Deviation of eyes (noted by the parents)[11][12]:**

Parents sometimes note deviation of either or both eyes (simultaneous or alternative) in very young children with hyperopia. The commonest type is an inward deviation (esotropia).

##### **Asthenopia:**

With total accommodative effort, the patient's hyperopia is corrected here. In these cases, asthenopia (i.e., varied amount of tiredness of eyes with localized frontal/frontotemporal headache) is a very common symptom due to prolonged accommodative effort. Sometimes it may be associated with photophobia and watering. Usually, asthenopia increases after near activity of long-duration.

##### **Dimness of vision:**

There will be dimness of vision if existing hyperopia is not corrected with total accommodative effort. Characteristically the defective vision affects near vision more than distant vision. A significant difference in uncorrected hyperopia may predispose the worse eye to develop amblyopia. Uncorrected hyperopia of both the eyes may develop ametropic amblyopia bilaterally.

##### **Sudden blurring of vision (intermittent)[13]:**

Due to prolonged accommodative effort (e.g., during reading), there may be an episode of accommodative spasm leading to a sudden blurring of vision, often termed as pseudomyopia. It is commonly found in teenagers with uncorrected hyperopia.

##### **Recurrent Internal/External Hordeolum or Conjunctivitis:**

The proposed theory is the frequent rubbing of the eyes with unhygienic hands, which leads to recurrent inflammatory episodes. Proper treatment of recurrent inflammation helps to get good best-corrected visual acuity in the future and vice-versa.[14]

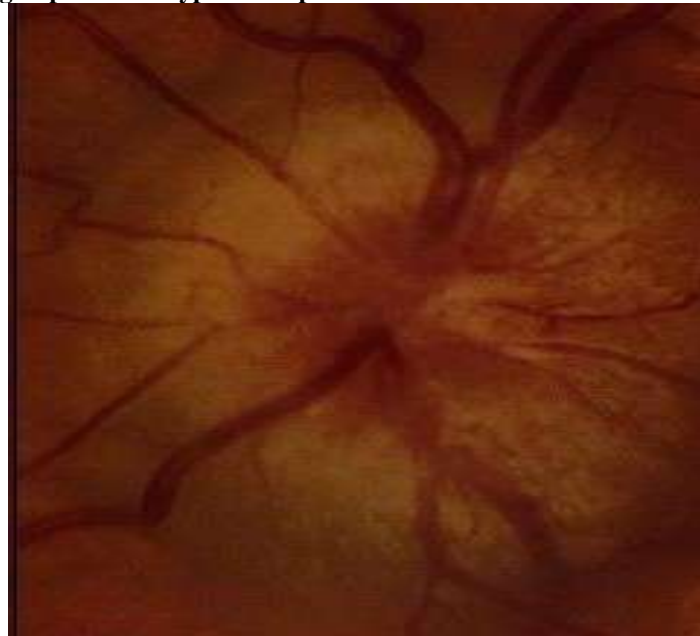
##### **Premature Presbyopia:**

As the age progresses, obvious receding of the near point becomes apparent. It occurs earlier (earlier than the 40s) in hyperope than emmetrope. The progressive accommodation loss with age is more frustrating to the patient as the near vision was already compromised earlier due to hyperopia.

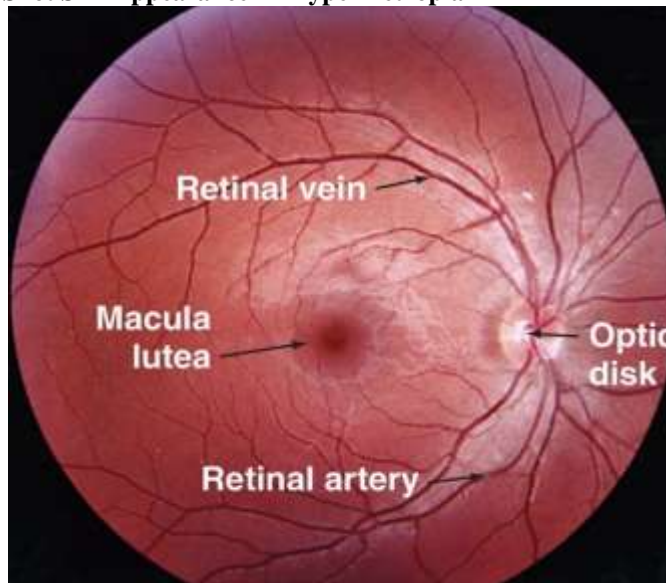
##### **Fundoscopy:**

Fundoscopy reveals a small optic disc with a very small cup. Disc margins become blurred with overcrowding of blood vessels, sometimes termed as "pseudopapillitis" or "pseudo-papilledema" if bilateral. Choroidal folds may be present.[15][16] An increased reflex of retina named as "shot-silk appearance" is seen along with crowding of the nerve fiber layer.[17]

**Fundus Picture Showing Papillitis In Hypermetropia**



**Fundus Picture Showing Shot Silk Appearance In Hypermetropia**



**Method And Material:-**

This was a retrospective observational study that involved 60 eyes of 30 patients with hypermetropia complaining of diminution of vision with asthenopic symptoms like tiredness of eyes, frontal or frontotemporal headache, watering and mild photophobia.

Patients were recruited from the OPD of MLB MEDICAL college, Jhansi,Uttar Pradesh and were followed from 15february 2022– 15 august2022 . It was performed under the Helsinki Declaration of 1975, as revised in 2000. The necessary permission from the Ethical and Research Committee was obtained for the study.

**Inclusion criteria**

All patients who presented to the OPD of MLB medical College Jhansi with the complaint of diminution of vision and diagnosed case of hypermetropia were included.

**Exclusion criteria**

1. Patients with ocular systemic diseases (like hypertension, diabetes) that could affect the retina.
2. Patients with other retinal disorders
3. Patients with recent intraocular surgery
4. Patients with the history of trauma
5. Patients with dense cataract
6. Mentally or physically unfit patients

All patients were subjected to a detailed history taking, refraction using Topcon autorefractometer and best corrected visual acuity (VA) measurement. All patients had complete ophthalmic examination including biomicroscopic slit lamp examination, fundus examination with 90D lens and fundus photography and optical coherence tomography. Optical coherence tomography examination was done through dilated pupils, OCT examination was done through a dilated pupil using commercially available Cirrus HD-OCT Model 4000 - Carl Zeiss Meditec, Inc., Dublin, California, USA or Spectralis OCT Heidelberg Engineering.

**Results:-**

A total of 60 eyes of 30 patients were studied. We included eyes with complaint of diminution of vision. There were 15 males and 15 females and 60% of the studied eyes were the right eye.

**Table1:-** Ophthalmoscopic findings in patients of hypermetropia.

FEATURES	NUMBER OF PATIENTS WITH PERCENTAGE IN EACH AGE GROUP		
	0-20 YEARS	20-40 YEARS	40-60 YEARS
STRABISMUS	5 (50%)	4 (40%)	2 (20%)
AMBLYOPIA	6 (60%)	6 (60%)	5 (50%)
RECURRENT STYES/ RECURRENT BLEPHARITIS/RECURRENT CHALAZION	7 (70%)	5 (50%)	6 (60%)
PRIMARY OPEN ANGLE GLAUCOMA	-	2 (20%)	4 (40%)
PRIMARY ANGLE CLOSURE GLAUCOMA	-	1 (10%)	3 (30%)

**Discussion:-**

Axial hyperopia, being the commonest, is usually present from birth.[3] The prevalence of moderate hyperopia, i.e.,  $\geq +2$  dioptre at 6 and 12 years of age, is 13.2% and 5.0%, respectively, and it is more in White race individuals than in other ethnic groups.[18] The prevalence of hyperopia  $\geq +4$  dioptre was 3.2% in the worse eye, with both eyes involved in 64.4% of cases in a study.[19] For United States participants, non-Hispanic, and Hispanic White races have a significantly higher risk of hyperopia in 6 to 72 months of age group.[19]

In 15 years or less age group, and  $\geq 30$  years age group, hyperopia prevalence was higher in females.[20] A systematic review of refractive error revealed that the prevalence of hyperopia is 4% (less than myopia) in the population with more prevalence in school going boys than girls.[21] In the United States, for the  $\geq 20$  years age group, hyperopia is the least common refractive error while it was the most common refractive error with astigmatism in the  $\geq 60$  years age group.[22] In Polish immigrants in Chicago, a study found that hyperopia is a more common refractive error overall and in the  $>45$  years age group.[23]

In the 6 to 15 years age group in Cameroon, hyperopia is the most common refractive error.[24] Hyperopia is unrelated to posterior subcapsular cataracts but is related to incident nuclear and cortical cataract.[25] The intelligence quotient score in hyperopic patients was lower than that of myopic in a study conducted in the United Kingdom.[26] A higher prevalence of hyperopia is seen in people living in rural areas compared to urban areas.[27] Hyperopia is more prevalent in families with a history of accommodative esotropia and hyperopia, and 20% of the hyperopic individuals in infancy develop strabismus.[5]

**Conclusion:-**

Hyperopia is a very common refractive condition of childhood and adults. Proper assessment and treatment can prevent multiple complications in the future. Adult hyperopia is associated with some complications which must be assessed at regular interval.

Our main aim is to give good vision and optimal binocular vision to the patients. For children with refractive error only, proper refractive correction is indicated. If amblyopia development is suspected, orthoptic exercises and patching of eyes are used.

The development of the visual system is often affected by strabismus and amblyopia, which needs cycloplegic refraction and followups. After proper preparation and counselling, it can be corrected with refractive surgery. Adult with hyperopia needs refractive support along with complication evaluation by gonioscopy and funduscopy.

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