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Original Research Article

Study of Myopia in Pre-Senile Age Group Patients and Clinical Evaluation of Ocular Manifestations

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Abstract

Aim: To analyze visual and biometric parameters, and to determine the prevalence of retinal degenerations, retinal detachment and other ocular associations in pre-senile (18–50 years) myopic patients presenting to a tertiary eye OPD.

Methods: Hospital-based cross-sectional study carried out at ESIC Model Hospital, Noida between July 2023–June 2024. A total of 154 myopic patients (308 eyes) aged 18–50 years were enrolled. Patients were classified as simple myopia (≤ −6.00 D) or pathological myopia (> −6.00 D). Demographic data, family history, occupation, uncorrected and best-corrected visual acuity (UCVA, BCVA), refraction, axial length (A-scan), keratometry, intraocular pressure (Schiotz), slit lamp and dilated fundus examination (indirect ophthalmoscopy), fundus photography, B-scan and FFA/OCT when indicated were recorded. Data were analyzed using SPSS v24; chi-square/Fisher's exact tests used; $p < 0.05$ considered significant.

Results: Of 154 patients, 100 (200 eyes) had simple myopia and 54 (108 eyes) had pathological myopia. The commonest age group was 21–30 years. Females were slightly predominant. Family history was significantly more common in pathological myopia (35.2% vs 14%, p=0.010). Pathological myopia eyes had worse UCVA and BCVA (p=0.002), greater axial length (majority 25.01–27 mm; p<0.001), and more peripheral and posterior pole degenerative changes including posterior staphyloma (10.2% vs 1%, p=0.022), chorioretinal atrophic patches (26.9% vs 6%, p<0.001), lattice degeneration (13.9% vs 6%, p=0.030) and higher rates of retinal detachment (9.26% vs 2%, p=0.032). Vitreous degeneration and PVD were also significantly more frequent in pathological myopia (p=0.024).

Conclusion: Pathological myopia in the pre-senile age group is associated with greater axial elongation, worse vision and a higher prevalence of sight-threatening posterior segment degenerations including retinal detachment and chorioretinal atrophy. Early detection, regular monitoring and patient education are essential to prevent irreversible vision loss.

Keywords: Myopia, Pathological Myopia, Axial Length, Retinal Degeneration, Pre-Senile.

Introduction

Myopia, or nearsightedness, has emerged as a major global public health challenge, with an escalating prevalence across both developed and developing nations. It is estimated that by 2050, nearly half of the world's population will be myopic, with a significant proportion progressing to high or pathological myopia [1,2].

Pathological myopia, often defined as a refractive error worse than −6.00 diopters or axial length greater than 26 mm, predisposes individuals to a range of irreversible, vision-threatening ocular complications including posterior staphyloma, lacquer cracks, myopic macular degeneration, chorioretinal atrophy, and choroidal neovascularization [3,4]. These degenerative changes may manifest early in life, making the pre-senile age group particularly vulnerable.

Both environmental and hereditary factors contribute significantly to myopia onset and progression. Increased near-work activities, prolonged screen usage, reduced outdoor exposure and higher educational demands have been strongly implicated in younger adults [5,6]. Genetic predisposition also plays an important role, with individuals having a positive family history showing a higher risk of developing high or pathological myopia [7].

In India, although several studies highlight the increasing burden of childhood myopia, data focusing specifically on pre-senile adults (18–50 years) remain limited [8]. This age group is crucial, as degenerative and sight-threatening complications of myopia begin to surface yet often remain unnoticed due to lack of awareness and delayed ophthalmic evaluation.

The present study aims to address this gap by evaluating the visual profile, refractive and biometric characteristics, and the spectrum of ocular manifestations among pre-senile myopic patients [9]. A better understanding of these patterns is essential for timely identification, monitoring and prevention of irreversible complications associated with pathological myopia.

Materials and Methods

Study Design and Setting: This was a hospital-based cross-sectional observational study conducted in the Department of Ophthalmology, ESIC Model Hospital, Noida, Uttar Pradesh, from July 2023 to June 2024. Ethical approval was obtained from the Institutional Ethics Committee, and written informed consent was taken from all participants.

Participants and Data Collection: 154 Patients aged 18–50 years diagnosed with myopia in one or both eyes were included. Exclusion criteria were curvature myopia due to corneal pathology (e.g., keratoconus), corneal degenerations, microphthalmia, history of trauma, syndromic myopia, or other ocular conditions interfering with evaluation. A structured proforma was used to collect demographic data, duration of spectacle use, age at onset, family history, and occupation. All subjects underwent detailed ophthalmic examination including uncorrected and best-corrected visual acuity (Snellen chart), slit-lamp examination, intraocular pressure measurement (Schiotz tonometry), autorefractometry and subjective refraction, keratometry, and axial length measurement by A-scan biometry. Dilated fundus examination was performed using indirect ophthalmoscopy and slit-lamp biomicroscopy with a 90D lens. Ancillary tests such as fundus photography, B-scan ultrasonography, and FFA/OCT were done when indicated.

Myopia was categorized as simple myopia (≤ -6.00 D) and pathological myopia (> -6.00 D with or without degenerative fundus changes). Axial length, refractive error, vitreous changes, posterior pole lesions, and peripheral retinal degenerations were recorded.

Statistical Analysis: Data were entered in Microsoft Excel and analyzed using SPSS version 24. Descriptive statistics were presented as frequencies and percentages. Chi-square and Fisher's exact tests were applied to compare findings between simple and pathological myopia groups. A p-value < 0.05 was considered statistically significant.

Observation &Results

Demographic and Baseline Characteristics: A total of 154 myopic patients (308 eyes) were included, of which 100 patients (200 eyes) had simple myopia and 54 patients (108 eyes) had pathological myopia. The majority belonged to the 21–30-year age group. Females were slightly more represented in both groups. Family history of myopia was significantly higher in pathological myopia (35.2%) compared to simple myopia (14%) (Table 1).

Table 1: Demographic Profile of Study Population

Parameter	Simple Myopia (n=100)	Pathological Myopia (n=54)	p-value
Age Group 18–20	18 (18%)	4 (7.4%)	
Age Group 21–30	41 (41%)	25 (46.3%)	
Female (%)	54 (54%)	31 (57.4%)	0.15
Family History of Myopia (%)	14 (14%)	19 (35.2%)	0.010*

Visual Acuity and Refractive Error: Simple myopia eyes showed milder UCVA reduction (6/12–6/36), while pathological myopia showed poorer UCVA (commonly 6/60 to PL). BCVA improved significantly after correction in simple myopia, while pathological myopia maintained poorer BCVA due to structural retinal changes (table 2).

Table 2: Comparison of Best Corrected Visual Acuity between Groups

BCVA	Simple Myopia		Pathological Myopia		p value
	Number of eyes involved (n=200)	%	Number of eyes involved (n=108)	%	
6/6 – 6/12	134	67	19	17.59	0.002
6/18 – 6/24	48	24	39	36.11	
6/36 -6/60	15	7.50	26	24.07	
4/60 – 1/60	3	1.50	9	8.34	
< 1/60	0	0	15	13.89	

Refractive error distribution showed the majority of simple myopia eyes < −3.00 D, whereas pathological myopia clustered between −6.00 to −13.00 D.

Biometric Parameters: Axial length was significantly higher in pathological myopia. Simple myopia showed axial lengths mostly between 21–23 mm, whereas pathological myopia commonly ranged from 25–29 mm. Keratometry values were flatter in pathological myopia.

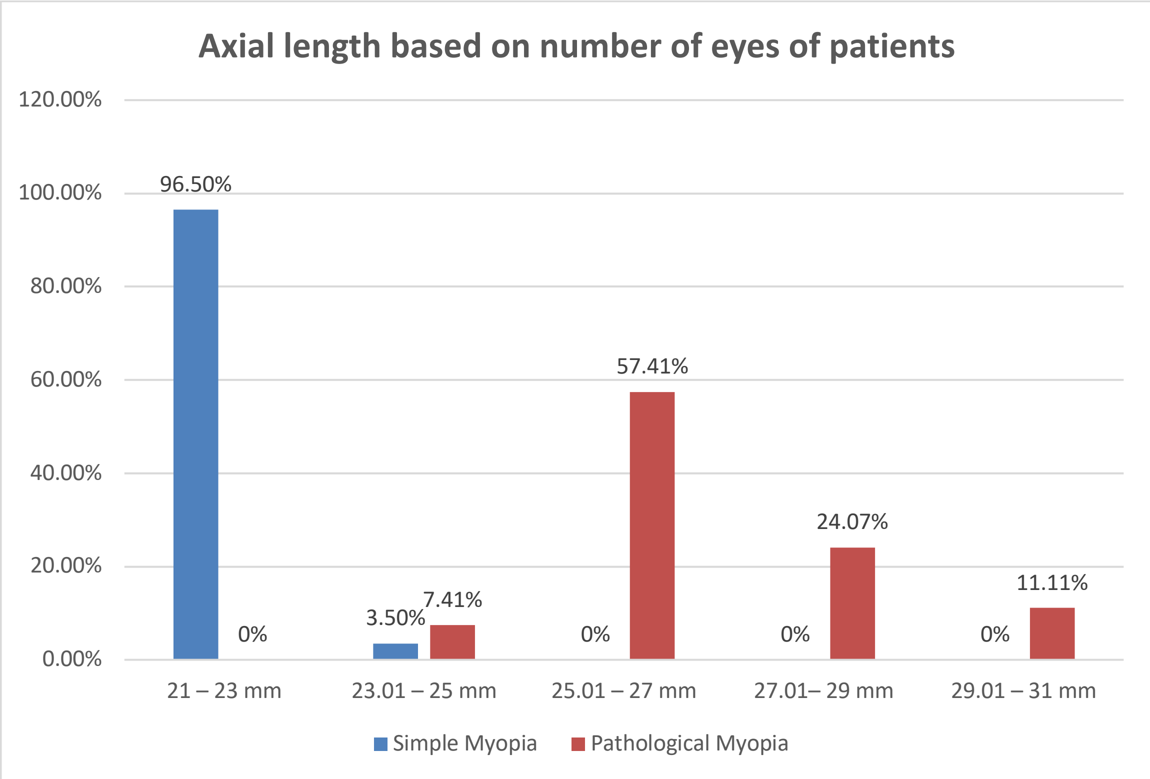

Figure 1: Axial length based on number of eyes of patients

Posterior Segment Findings: Posterior staphyloma, peripapillary atrophy, chorioretinal atrophy, lattice degeneration, and vitreous degeneration were significantly more frequent in pathological myopia. Retinal detachment was observed in 9.26% of pathological myopia eyes vs 2% in simple myopia.

Table 3: Posterior Segment and Peripheral Retina Findings

Finding	Simple Myopia (%)	Pathological Myopia (%)	p-value
Posterior Staphyloma	2 (1%)	11 (10.18%)	0.022*
Peripapillary Atrophy	33 (16.5%)	35 (32.47%)	0.012*
Chorioretinal Atrophy	12 (6%)	29 (26.85%)	<0.001*
Lattice Degeneration	12 (6%)	15 (13.9%)	0.030*
Retinal Detachment	4 (2%)	10 (9.26%)	0.032*

Discussion

The present study provides a comprehensive evaluation of visual, refractive, biometric and fundus characteristics among pre-senile myopic patients, highlighting distinct patterns between simple and pathological myopia. The demographic predominance of young adults aged 21–30 years reflects modern lifestyle influences such as increased digital screen exposure, prolonged near-work, and reduced outdoor activity, factors that have been linked to early-onset myopia in previous literature [5,6].

The significantly higher frequency of positive family history among pathological myopes in this study aligns with evidence demonstrating strong hereditary influence on the development and progression of high myopia [7].

Visual acuity differences between groups were substantial. Pathological myopia was associated with poorer UCVA and limited BCVA improvement due to irreversible structural changes.

These findings correspond with global data indicating that excessive axial elongation leads to progressive macular and retinal alterations, reducing response to refractive correction [2,3].

Axial length showed a clear distinction between groups, with pathological myopes demonstrating significantly greater elongation, supporting the established concept that biomechanical stretching and scleral thinning are central mechanisms in myopic degeneration [3,4].

Posterior segment changes were considerably more common in pathological myopia. Findings such as tessellated fundus, temporal crescents, peripapillary atrophy and posterior staphyloma observed in this study mirror classical descriptions of pathologic myopia in epidemiological and imaging-based studies [2,3,11].

Posterior staphyloma, noted in approximately 10% of pathological myopia eyes, is particularly significant as it is strongly associated with the onset and progression of myopic maculopathy [11]. Similarly, chorioretinal atrophy, detected in over one-fourth of pathological myopes in the present study, reflects structural compromise of the posterior pole that is consistent with global findings on degenerative myopia.

Vitreous alterations, including early posterior vitreous detachment and pronounced vitreous liquefaction, were significantly higher in pathological myopes. These changes have been described as early complications resulting from axial elongation and vitreoretinal interface instability [13]. Peripheral retinal degenerations—particularly lattice degeneration, WWOP, and paving-stone degeneration—were also more prevalent in pathological myopia, consistent with earlier reports linking such degenerations with weakened retina and increased susceptibility to tears [14]. This is important because retinal detachment risk increases substantially in individuals with high myopia and lattice degeneration, as established by classical studies on retinal tear pathophysiology [16].

The detection of myopic choroidal neovascularization (mCNV) in a subset of patients underscores the potential for early central vision loss in pathological myopia. Literature indicates that although mCNV is a vision-threatening complication, early diagnosis and anti-VEGF therapy can significantly improve outcomes [15,18]. A higher prevalence of POAG among pathological myopes, as observed in this study, is also noteworthy. Long axial length, optic disc tilt and peripapillary changes increase the susceptibility of myopic eyes to glaucomatous damage even with normal intraocular pressure, as described in population-based studies [10,12].

Overall, this study reinforces global evidence while highlighting early degenerative changes in pre-senile myopic adults within the Indian population. The results emphasize the importance of routine dilated fundus examinations, periodic monitoring, and prompt management of complications to prevent irreversible visual impairment.

Conclusion

Pathological myopia in the pre-senile age group is associated with significantly greater axial elongation, poorer visual outcomes, and a higher frequency of degenerative posterior segment and peripheral retinal lesions.

These structural changes predispose individuals to serious complications, including myopic macular degeneration, retinal detachment, and choroidal neovascularization. Early detection through regular dilated fundus examinations, timely imaging, and patient education about warning signs is essential to reduce the risk of irreversible visual loss. Community-based screening programs and longitudinal studies are recommended to better understand progression patterns and guide preventive strategies in high-risk populations.

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