Research Article

Prevalence and Clinical Profile of Posterior Vitreous Detachment in Myopia : A Cross:Sectional Study

Vartika Yadav, Sapan Jaiswal*, Tahir Husain

Department of Opthalmology, Rohilkhand Medical College & Hospital, Bareilly, Uttar Pradesh, India.

Abstract

Purpose: To study the prevalence, clinical profile, and association of different grades of posterior vitreous detachment (PVD) in myopia.

Methods: This cross-sectional study was conducted at the Outpatient Department of Ophthalmology, Rohilkhand Medical College & Hospital, Bareilly (Uttar Pradesh), from August 1, 2023, to July 31, 2024, and included 500 patients. A detailed history focusing on presenting complaints, spectacle use, and family history of refractive errors was recorded. Visual acuity was assessed using a Snellen chart, and refraction and slit-lamp examinations were performed to evaluate refractive status and exclude organic causes. Keratometry and applanation tonometry assessed corneal curvature and intraocular pressure, respectively. Axial length was measured using A-scan ultrasonography, averaging the best three readings. Fundus examination with photography documented posterior segment changes, supplemented by B-scan ultrasonography for vitreoretinal evaluation. Optical coherence tomography (OCT) was used to measure macular and choroidal thickness.

Results: PVD was observed in 5.4% of the participants, with a strong association with high myopia (92.6% of PVD cases) and increased axial length (mean 30.01 mm). Retinal degenerations, including lattice degeneration (77.8%) and white with pressure (WWP) degeneration (77.8%), were significantly more common in participants with PVD. Retinal complications, such as retinal breaks (55.6%) and retinal detachment (77.8%), were also more frequent in this group. No significant association was found between PVD and best-corrected visual acuity (BCVA) or gender.

Conclusion: PVD is strongly associated with high myopia, axial elongation, and advanced retinal degeneration, underscoring the importance of routine screening and early detection in high-risk populations to prevent sight-threatening complications. Further research is needed to better understand the progression and management of PVD-related complications.

Keywords: Posterior vitreous detachment, Myopia, Axial length, Retinal degeneration, Lattice degeneration, Retinal detachment.

Introduction

Myopia, or nearsightedness, is a significant global health issue and the second most common cause of vision impairment. It arises primarily due to the elongation of the globe's axial length or the increased refractive power of the anterior segment, with the axial length being the predominant factor.[1] This structural alteration shifts the focal point of light entering the eye in front of the retina, resulting in blurred distance vision. The growing prevalence of myopia and its potential to cause severe visual impairment and blindness underscores its importance as a critical area of study.

Myopia affects all demographic groups and is associated with considerable socioeconomic consequences due to its complications. It accounts for approximately 75% of vision-threatening complications arising from refractive errors, highlighting its impact on public health and the economic burden it places on healthcare systems.[2] Clinically, myopia is categorized into low (<3 diopters), medium (-3–-6 diopters), and high myopia (>6 diopters).[3] Pathological or degenerative myopia is of particular concern due to its association with irreversible visual impairment caused by complications such

Address for correspondence: Sapan Jaiswal,
Department of Opthalmology, Rohilkhand Medical College & Hospital, Bareilly, Uttar Pradesh, India
E-mail: sapanjaiswal554@gmail.com

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as chorioretinal degeneration, posterior staphyloma, and lattice degeneration.

The global prevalence of myopia is increasing alarmingly, particularly in East and Southeast Asia, where urbanization, educational pressures, and reduced outdoor activity contribute to its rise. By 2050, nearly 50% of the world's population is projected to be myopic, with 9.8% experiencing high myopia.[4] Younger individuals are at greater risk of developing complications over a longer duration, increasing their lifetime risk of vision loss.

High myopia is strongly associated with posterior vitreous detachment (PVD), which results from the elongation and stretching of ocular tissues. PVD can lead to complications such as retinal tears, macular holes, retinal detachment, and other sight-threatening conditions.[1] The structural changes in highly myopic eyes weaken the retina and vitreous connections, increasing susceptibility to detachment. PVD often occurs earlier in individuals with high myopia due to vitreous liquefaction and weakening of vitreoretinal adhesions.[5] This condition is frequently accompanied by symptoms such as floaters and flashes of light, which necessitate early clinical attention.

The delayed diagnosis of PVD, particularly in high myopic eyes, is a major concern. Incomplete PVD can lead to advanced complications, including tractional retinal detachment and choroidal neovascularization, resulting in severe vision loss or blindness if untreated. Early detection and timely intervention, such as vitrectomy, can prevent such outcomes and improve prognosis.[6]

In India, the prevalence of high myopia and PVD-related complications is on the rise due to lifestyle changes and increased academic pressures. Despite this, there is a lack of studies focusing on PVD development and progression in the Indian population. Increased awareness, routine eye examinations, and early screening for high-risk groups are vital to mitigating the risks associated with PVD. Given the socioeconomic burden of vision impairment, timely management of PVD can significantly preserve visual function and quality of life.

This study aims to investigate the prevalence, clinical profile, and association of different grades of posterior vitreous detachment in myopic individuals. By analyzing these factors, the study seeks to contribute to the understanding of PVD-related complications and improve the management of myopia-associated vision-threatening conditions.

Materials and Methods

This cross-sectional study was conducted at the outpatient Department of Ophthalmology, Rohilkhand Medical College & Hospital, Bareilly (Uttar Pradesh), from 1st. August (2023) to 31st. July 2024, in a total of 500 patients

Inclusion Criteria

- Patients above 20 years of age,[6] with complaints of painless diminution of distant vision with myopia.
- Patients with axial length (>24 mm)[7]
- Patients giving informed consent.

Exclusion Criteria

- Patients with curvatural/lenticular/index myopia
- Patients with hereditary vitreoretinal dystrophies.
- Patients with vitreoretinal disease
- Patients who had undergone vitrectomy.
- Patients who had a history of blunt trauma.

Methodology

After obtaining approval from the Institutional Ethical Committee (IEC) and Clinical Trials Registry of India (CTRI), the study was conducted by recruiting patients and qualifying the inclusion as well as exclusion criteria. The patients were provided with both written and oral information, as well as a signed written consent was obtained from each patient before enrolment into the study.

A detailed history taken from the patient, was written down. A detailed ocular and general examination was done and recorded on the proforma as well.

A detailed history was taken, focusing on presenting complaints, spectacle use and family history of refractive errors. Visual acuity was assessed using Snellen's chart, with pinhole improvement documented. Refraction and slit-lamp examinations were conducted to determine refractive status and exclude organic causes.

Keratometry and applanation tonometry were performed to assess corneal curvature and intraocular pressure. Axial length was measured using A-scan ultrasonography, averaging the best three readings. Fundus examination and photographs documented posterior segment changes, supported by B-scan ultrasonography for vitreoretinal evaluation. OCT was used to measure macular and choroidal thickness.

Assessment of Parameters

Parameters to be assessed were the dioptric status of myopia, axial length, grading of PVD and age of the patient.

Myopia grades were defined as per the Table 1. Stages of posterior vitreous detachment (PVD) is shown in Table 2.

Table 1: Myopia grades

Myopia category	*Severity range (Diopters)*
Low myopia	Less than 3 diopters (<3 D)
Medium myopia	Between -3 to -6 diopters (-3–-6 D)
High myopia	Greater than 6 diopters (>6 D)

Table 2: Stages of posterior vitreous detachment (PVD)

PVD stage	*Description*
Stage 1	Perifoveal separation with adhesion of the vitreous to the fovea.
Stage 2	Complete separation of the vitreous from the macula.
Stage 3	Extensive vitreous separation with adhesion of the vitreous to the optic disc.
Stage 4	Complete posterior vitreous detachment (PVD).

Results

Table 3 shows a mean age of 53.64 years (SD ± 13.44) and a range of 22 to 70 years, reflecting a predominantly middle-to-older age group.

Table 3: Distribution of age among the study participants

Mean	*53.640*
Median	58.000
Std. Deviation	13.4386
Minimum	22.0
Maximum	70.0

Table 4: Distribution of participants according to age group

Age group	*Frequency*	*Percent*
≤60 years	319	63.8
>60 years	181	36.2
Total	500	100.0

Table 5: Distribution of participants according to PVD

PVD	*Frequency*	*Percent*
No	473	94.6
Yes	27	5.4
Total	500	100.0

Table 6: Distribution of participants according to the severity of PVD (N = 27)

PVD severity	*Frequency*	*Percent*
I	16	59.2
II	6	22.2
III	5	18.5
Total	27	100.0

Table 7: Association of PVD with age

Age	*PVD*				*p-value*
	Yes		*No*		
	Count	*%*	*Count*	*%*	
≤60 years	9	33.3	310	65.5	0.101
>60 years	18	66.7	163	34.5	
Total	27	100.0	473	100.0	

Table 8: Association of PVD with gender

Gender	*PVD*				*p-value*
	Yes		*No*		
	Count	*%*	*Count*	*%*	
Female	15	55.6%	228	48.2%	0.457
Male	12	44.4%	245	51.8%	
Total	27	100.0%	473	100.0%	

Table 9: Association of PVD with BCVA

BCVA	*PVD*				*p-value*
	Yes		*No*		
	Count	*%*	*Count*	*%*	
1/60	3	11.1	35	7.4	0.735
6/12	1	3.7	33	7.0	
6/18	2	7.4	53	11.2	
6/24	7	25.9	86	18.2	
6/36	4	14.8	106	22.4	
6/60	10	37.0	160	33.8	
Total	27	100.0	473	100.0	

Table 10: Association of PVD with myopia grade

Myopia grade	*PVD*				*p-value*
	Yes		*No*		
	Count	*%*	*Count*	*%*	
Mild	0	0.0	34	7.2	0.005
Moderate	2	7.4	146	30.9	
High	25	92.6	293	61.9	
Total	27	100.0	473	100.0	

Table 11: Association of PVD with axial length

Axial length (mm)	PVD				*p-value*
	Yes		No		
	Mean	SD	Mean	SD	
Axial length	30.01	0.87	26.93	1.41	0.0001

Table 4 shows that 63.8% of participants were ≤60 years, and 36.2% were >60 years, enabling analysis of age-related trends. PVD was observed in 5.4% of participants, while 94.6% did not have PVD, highlighting its relative rarity but clinical significance (Table 5).

Among 27 PVD cases, 59.2% had grade I, 22.2% grade II, and 18.5% grade III, with mild PVD being the most common (Table 6). PVD was more common in participants >60 years (66.7%), but the association with age was not statistically significant (p = 0.101) (Table 7). PVD was slightly more common in females (55.6%) than males (44.4%), but the association with gender was not significant (p = 0.457) (Table 8). Table 9 shows BCVA in PVD cases varied, with 37.0% at 6/60, but the association between PVD and BCVA was not significant (p = 0.735).

PVD was significantly associated with high myopia (92.6%, p = 0.005), highlighting severity as a key risk factor (Table 10). Participants with PVD had a significantly greater mean axial length (30.01 *vs.* 26.93 mm, p = 0.0001), linking axial elongation to PVD (Table 11).

Table 12 shows PVD showed significant associations with vitreoretinal findings, including WWP degeneration (77.8 *vs.* 6.8%), WWOP degeneration (66.7 *vs.* 13.5%), lattice

Table 12: Association of PVD with vitreoretinal findings

Findings	PVD				p-value
	Yes		No		
	Count	%	Count	%	
White with pressure (WWP) degeneration	21	77.8	32	6.8	0.0001
White without pressure (WWOP) degeneration	18	66.7	64	13.5	0.0001
Lattice degeneration	21	77.8	63	13.3	0.0001
Snail track degeneration	18	66.7	21	4.4	0.0001
Chorioretinal atrophic changes (CRA)	15	55.6	15	3.2	0.0001
Retinal break	15	55.6	10	2.1	0.0001
Retinal detachments	21	77.8	12	2.5	0.0001
CNV	3	11.1	0	0.0	0.0001

degeneration (77.8 *vs.* 13.3%), snail track degeneration (66.7 vs. 4.4%), CRA changes (55.6 *vs.* 3.2%), retinal breaks (55.6 *vs.* 2.1%), retinal detachment (77.8 *vs.* 2.5%), and CNV (11.1% *vs.* none), all with $p = 0.0001$.

Discussion

The findings of this study provide valuable insights into the association of posterior vitreous detachment (PVD) with various demographic, anatomical, and clinical factors. PVD was observed in 5.4% of the study participants, with the majority being individuals aged >60 years (66.7%). Although PVD was more frequent in the older population, the association between age and PVD was not statistically significant, indicating that factors beyond aging may contribute to its occurrence. Similarly, no significant gender-based difference was observed, with 55.6% of PVD cases occurring in females and 44.4% in males.

A significant association was observed between PVD and myopia severity. Among participants with PVD, 92.6% had high myopia, while none were found in the mild myopia group. This highlights the strong link between axial elongation and the development of PVD, as significant structural changes in the posterior segment characterize high myopia. Axial length further supported this relationship, with participants with PVD having a significantly greater mean axial length (30.01 mm) compared to those without PVD (26.93 mm). This finding underscores axial elongation as a critical risk factor for PVD.

The study also revealed a strong association between PVD and advanced vitreoretinal changes. Participants with PVD had significantly higher rates of retinal degeneration, including white with pressure (WWP) degeneration (77.8%), lattice degeneration (77.8%), and white without pressure (WWOP) degeneration (66.7%). Snail track degeneration and chorioretinal atrophic changes (CRA) were also more frequent in participants with PVD. These findings suggest that PVD may contribute to or coexist with structural degenerations in the retina, potentially leading to complications such as retinal breaks (55.6%) and retinal detachment (77.8%).

Interestingly, choroidal neovascularization (CNV) was observed in 11.1% of participants with PVD, while none were reported in participants without PVD. This highlights the potential of PVD to induce tractional forces and vascular changes in the posterior segment. These associations emphasize the importance of regular monitoring of individuals with PVD, especially those with high myopia, to prevent sight-threatening complications.

Although PVD was not significantly associated with best-corrected visual acuity (BCVA), participants with PVD predominantly had lower visual acuity levels, with 37.0% having a BCVA of 6/60. This may reflect the cumulative impact of retinal and vitreoretinal changes in PVD on visual outcomes. However, the lack of statistical significance suggests that PVD alone may not directly influence BCVA but rather acts through associated complications.

Conclusion

This study demonstrates a strong association between posterior vitreous detachment (PVD) and high myopia, increased axial length, and advanced retinal degeneration. PVD was predominantly observed in individuals with high myopia and greater axial lengths, highlighting axial elongation as a key risk factor. Significant associations were also noted with retinal changes like lattice degeneration, WWP, and retinal detachment. Although no significant link was found between PVD and BCVA or gender, the findings emphasize the importance of early detection and monitoring of PVD in high-risk populations to prevent sight-threatening complications. Further research is needed to explore its progression and improve management strategies.

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