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Clinical Spectrum and Prevalence of Glaucoma in Pseudoexfoliation Syndrome in Patients Attending BIMS, Belagavi

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Abstract

Background: Pseudoexfoliation glaucoma (PXG) is more aggressive than Primary open angle glaucoma; Intraocular pressure (IOP) is higher, IOP fluctuations are excessive, and there is substantial damage to the optic nerve and visual field. Resistance to medical management, aggressive nature, and increased intraoperative complications of PXG make it distinct entity from primary open angle glaucoma. So, this study was conducted to analyze the prevalence of glaucoma in Pseudoexfoliation syndrome (PXS) and its clinical spectrum. **Methodology:** This was a hospital based, descriptive study done between February 2021 to August 2022, where patients satisfying the inclusion criteria were recruited for the study. Detailed history was taken. Visual acuity, anterior segment examination, IOP, gonioscopy, fundus examination visual field analysis, contrast sensitivity were evaluated. PXG was diagnosed based on pseudoexfoliative material on slit lamp examination, IOP>21 mm Hg, glaucomatous cupping, pigmentation of trabecular meshwork and visual field defects. **Results:** Prevalence of glaucoma in patients with PXS was 35.2%. Prevalence and laterality of PXS increases with increase in age and more common in males. Iris and lens were the most common sites for Pseudoexfoliation (PXF) material. Nuclear cataract was predominant in PXS. Central corneal thickness (CCT) in patients with PXG was found to be thinner that patients with PXS. Mean IOP in PXG was higher than in PXS. High-pressure glaucoma, Open angle glaucoma and unilateral glaucoma was most common type of glaucoma in PXG, which showed increased severity of optic disc damage and advanced field defects. **Interpretation & conclusion:** Thus, in view of high prevalence of glaucoma and aggressive nature of glaucoma in PXS leading to blindness, all elderly patients should be screened for PXS and patients with PXS should undergo complete glaucoma evaluation and follow up and treatment to prevent blindness.

Key Words: Pseudoexfoliation syndrome; Intraocular pressure; Gonioscopy; Glaucomatous cupping; Visual field defects; Pseudoexfoliation glaucoma; PXS; PXG; PXF

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Introduction

Glaucoma is a leading cause of blindness worldwide. [1] Glaucoma is a complex and genetically heterogenous disease characterized by progressive apoptotic death of retinal ganglion cells that leads to excavation of optic nerve head and visual field loss eventually producing blindness. [2]

IOP is the only known modifiable factor that has been shown to delay progression of disease in both ocular hypertensive [3] and glaucoma patients. [4,5] Thus therapeutic interventions for glaucoma are directed at lowering IOP.

Pseudoexfoliation syndrome is a most common identifiable cause of open angle glaucoma worldwide. [6] It is an age-related generalized disorder of extracellular matrix, an elastic microfibrillopathy, characterized by progressive production and deposition of abnormal microfibrillar material in many ocular and extraocular tissues.[7] 5% patient with pseudoexfoliation syndrome and no glaucoma at initial visit may develop raised IOP or glaucoma within 5 years and 15% experience elevated IOP after 10years. It may also be associated with increased systemic risk of cardiovascular disorders. [8] Thus, pseudoexfoliation may be a red flag for development of glaucoma. [9]

Therefore, all the patients with pseudoexfoliation syndrome should be evaluated at regular intervals for the prevention and treatment of glaucoma.

In present study we aimed to study the prevalence of glaucoma in patients with pseudoexfoliation syndrome and to study clinical spectrum of glaucoma in pseudoexfoliation syndrome.

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Inclusion criteria

All patients willing to give informed consent and diagnosed with pseudoexfoliation syndrome visiting outpatient department and in camp patients visiting Belagavi Institute Medical Sciences, Belagavi of age groups more than 40 years and of both the sexes.

Exclusion criteria

1. Family history of glaucoma.
2. Patients with previous history of uveitis or ocular trauma.
3. Patients with history of exposure to intense infrared lights like glass blowing.
4. Patients with known cases of primary open angle glaucoma and angle closure glaucoma who were on medication.
5. Patients with known case of diabetes mellitus and hypertension.

Methods

A total of 88 patients diagnosed with pseudoexfoliation syndrome who attended Out-Patient Department of Ophthalmology in Belagavi Institute of Medical Sciences, Belagavi from February 2021 to August 2022 were recruited for the study. This was a hospital based, descriptive study.

All the patients underwent detailed history, general physical examination, detailed ophthalmologic examination and relevant investigations.

Clinical assessments included –

Detailed history taking, general physical examination, detailed ophthalmic examination of patients presenting with ocular findings suggestive of pseudoexfoliation.

Ocular examination included:

1. Visual acuity: Uncorrected visual acuity and best corrected visual acuity was recorded by Snellen's visual acuity chart.
2. Anterior segment examination by slit lamp biomicroscopy
3. IOP: It was measured using gold standard technique Goldmann applanation tonometer and values were taken after correcting for CCT.
4. Gonioscopy: Status of angles of anterior chamber examined with Goldmann three mirror gonioscope – grading will be done according to Shaffer's criteria and presence of pseudoexfoliation material or pigmentation in angle is recorded.
5. Fundus examination: Detailed fundus examination by using direct ophthalmoscopy – changes in the optic disc, cup disc ratio, retinal nerve fibre layer damage, thinning of neuroretinal rim, shifting of retinal vessels were noted. Findings were confirmed by slit lamp biomicroscopy with + 90 dioptre lens and indirect ophthalmoscopy. Patients with hazy media due to cataract in whom fundus and visual field analysis was not possible underwent cataract surgery with posterior chamber intraocular lens implantation and following uneventful surgery the patients were examined for glaucomatous disc changes and also underwent visual field analysis and the same data was recorded.
6. Central corneal thickness: it was measured using pachymetry.
7. Contrast sensitivity: it was noted using Pelli Robson contrast sensitivity chart.
8. Visual field analysis: it was done using automated perimeter.

Pseudoexfoliation glaucoma was diagnosed on the basis of pseudoexfoliative material on slit lamp examination, IOP >21 mm Hg, glaucomatous cupping on fundus examination, pigmentation of trabecular meshwork on gonioscopy, glaucomatous field defects on perimetry.

Data was collected, entered in MS Excel and analysed by descriptive statistics. Association between different attributes will be seen using chi square test. $P < 0.05$ were considered as significant.

Results

The study included 88 patients, mean age of the patients was 68.8 ± 7.3 years, majority belonged to the age group of 61-70 years i.e., 42 patients (47.7%).

Only 14 patients (16%) belonged to age group of < 60years, and majority of patients i.e., 74 patients (84%) belonged to age group of > 60 years. (Table 1)

Table 1: Age distribution

Age distribution (years)	No. of patients	Percentage
41-50	1	1.1
51-60	13	14.8
61-70	42	47.7
71-80	27	30.7
81-90	5	5.7
Total	88	100

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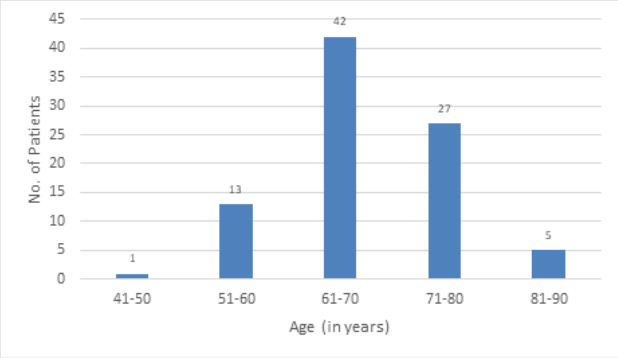

Figure 1: Age distribution

67% males and 33% females were having pseudoexfoliation syndrome. (Table 2)

Table 2: Gender distribution

Gender	No. of patients	Percentage
Male	59	67
Female	29	33
Total	88	100

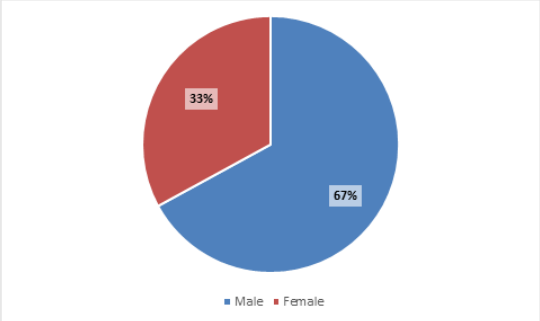

Figure 2: Gender Distrubution

Majority of patients 85% having pseudoexfoliation syndrome were farmers. (Table 3)

Table 3: Occupation Distribution

Occupation	Gender		Total (% out of 88)
	Males	Females	
Farmer	57 (76)	18 (24)	75 (85.2)
Teacher	0 (0)	1 (100)	1 (1.1)
Shopkeeper	2 (100)	0 (0)	2 (2.2)
Housewife	0 (0)	10 (100)	10 (11.4)
Total	59 (67)	29 (33)	88

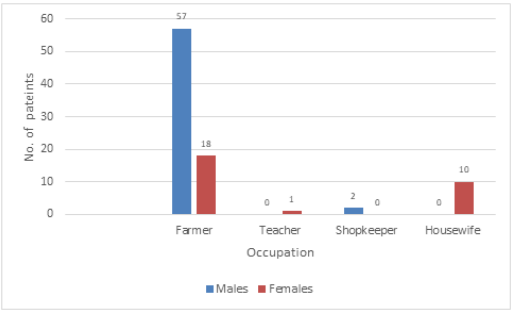

Figure 3: Occupation distribution

15.9% patients had unilateral pseudoexfoliation and 84.1% patients had bilateral pseudoexfoliation material. (Table 4)

Table 4: Laterality of pseudoexfoliation syndrome

Laterality	No. of patients	Percentage
Unilateral	14	15.9

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Bilateral	74	84.1
Total	88	100

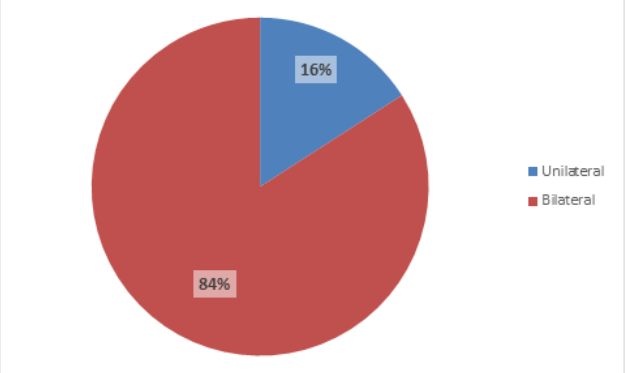

Figure 4: Laterality

Majority presented with pseudoexfoliation material on iris and lens (64.8%) and only few (8%) patients presented with pseudoexfoliation material on all three (iris, lens, and cornea). (Table 5)

Table 5: Distribution of pseudoexfoliation material

Location of pseudoexfoliation material	No. of patients	Percentage
Only on Iris	19	21.5%
Only on Lens	3	3.4%
Only on Cornea	0	0%
On Iris and Lens	57	64.8%
On Iris and Cornea	2	2.3%
On Lens and Cornea	0	0%
On Iris, Lens and Cornea	7	8%
Total	88	100

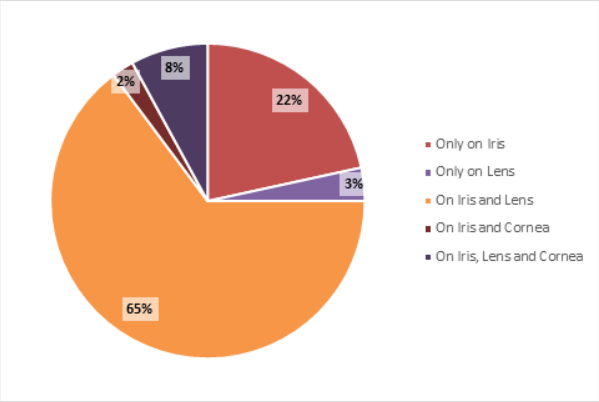

Figure 5: Location of Pseudoexfoliation material

Mean CCT (0.521mm) in patients with pseudoexfoliation glaucoma (Table 7) was less than mean CCT (0.541mm) in patients with pseudoexfoliation syndrome. (Table 6)

Table 6: CCT in eyes with pseudoexfoliation syndrome only

Central corneal thickness (CCT)	Value
Maximum CCT	0.549 mm
Minimum CCT	0.528 mm
Mean CCT	0.541.9 ± 4.1mm

Table 7: CCT in eyes with pseudoexfoliation glaucoma

Central corneal thickness (CCT)	Value
Maximum CCT	0.548mm
Minimum CCT	0.510mm
Mean CCT	0.521.9 ± 9.7mm

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Our study showed high prevalence of nuclear cataract among patients with pseudoexfoliation syndrome.(Table 8)

Table 8: Type of cataract in eyes with pseudoexfoliation syndrome

Type of cataract	No. of eyes	Percentage
Nuclear	81	52.2
Nuclear + PSC	30	19.4
Nuclear + cortical	8	5.2
Nuclear + Cortical + PSC	12	7.7
PPC	1	0.6
Mature	23	14.8
Total	155	100

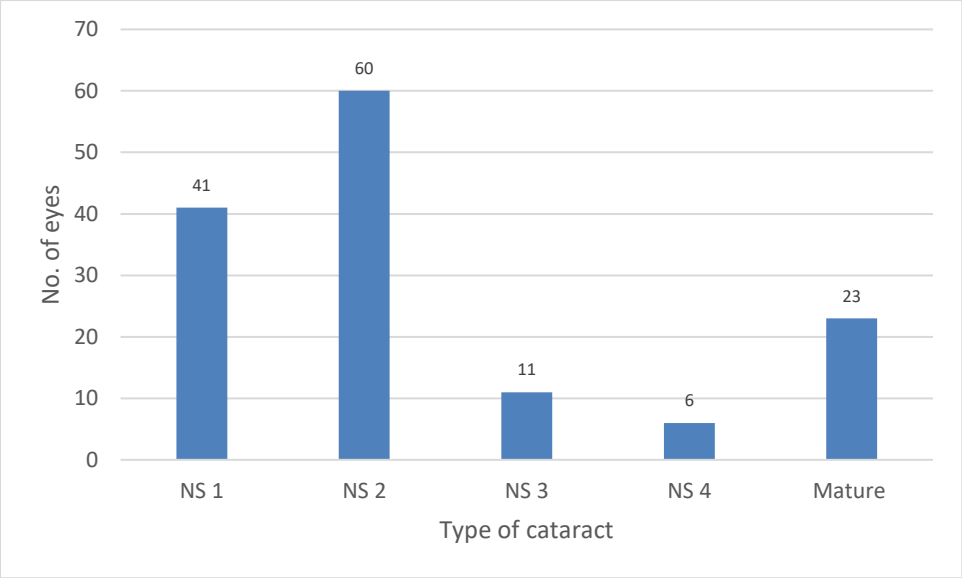

Figure 6: Type of cataract in patients with pseudoexfoliation syndrome

Total 78.6% eyes had open angle glaucoma in which PXF material was observed in 13 eyes in the angle on gonioscopy. 9 (21.4%) eyes had angle closure glaucoma. (Table 9)

Table 9: Type of glaucoma in pseudoexfoliation syndrome

Type of Glaucoma	No. of eyes	Percentage
Open angle glaucoma	33	78.6
Angle closure glaucoma	9	21.4
Total	42	100

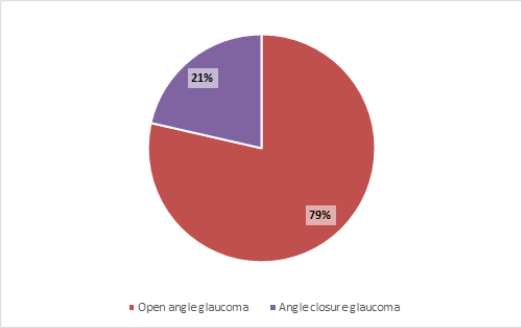

Figure 7: Type of glaucoma in pseudoexfoliation syndrome

143 (81.5%) eyes had IOP less than ≤ 21 mmHg, 16 (9%) eyes had IOP in between 22-30 mmHg and 17 (9.7%) eyes had IOP of more than 30 mmHg. Total 33 (18.7%) eyes presented with high IOP of >21mmHg. (Table 10)

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Table 10: Intraocular pressure

IOP (in mmHg)	No. of eyes	Percentage
≤ 21	143	81.3
22-30	16	9
≥31	17	9.7
Total	176	100

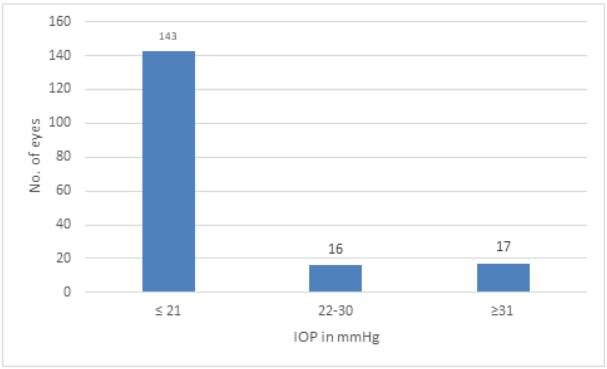

Figure 8: IOP in Pseudoexfoliation syndrome

Total 134 (76.1%) eyes had CDR of 0.3, 12 (6.8%) eyes had CDR of 0.4-0.6, 25 (14.2%) eyes had CDR of more than 0.6 and 5 (2.8%) eyes had glaucomatous optic atrophy. (Table 11)

Table 11: Cup to disc ratio

CDR	No. of eyes	Percentage
0.3	134	76.1
0.4-0.6	12	6.8
> 0.6	25	14.2
Atrophy	5	2.8
Total	176	100

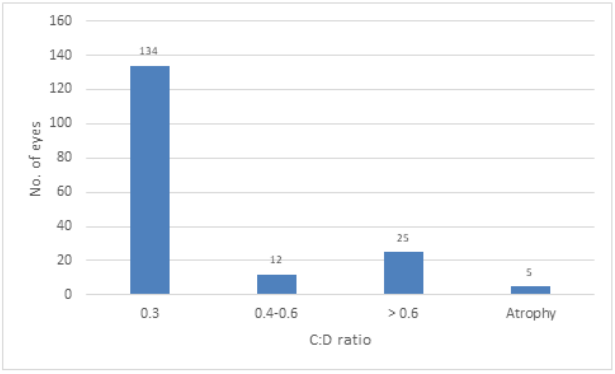

Figure 9: Cup to disc ratio

Total 4 (12.9%) patients with unilateral pseudoexfoliation had unilateral glaucoma, 27 (87.1%) patients with bilateral pseudoexfoliation had unilateral glaucoma in 16 (59.3%) patients and bilateral glaucoma in 11(40.7%) patients. (Table 12)

Table 12: PXF vs Glaucoma

	Number of patients with Unilateral Glaucoma (% out of 20)	Number of patients with Bilateral Glaucoma (% out of 11)	Total Number of patients with Glaucoma (% out of 31)
Unilateral PXF	4 (100)	0 (0)	4 (12.9)
Bilateral PXF	16 (59.3)	11 (40.7)	27 (87.1)
Total	20 (64.5)	11 (35.5)	31(100)
Chi-square=2.53		P value=0.112	

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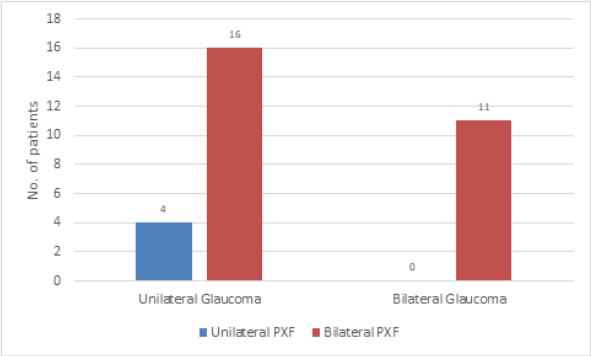

Figure 10: PXF vs Glaucoma

Out of 88 patients in our study, 58 (35.8%) eyes had generalised depression, 12 (7.4%) eyes had arcuate scotoma, 5 (3%) eyes had double arcuate scotoma, 6 (3.7%) eyes had tubular vision, in 5 (3%) eyes the visual field assessment could not be done due to optic atrophy. (Table 13)

Table 13: Visual field defects

Visual field	No. of Eyes	Percentage
Normal	76	47
Generalised depression	58	35.8
Arcuate Scotoma	12	7.4
Double Arcuate Scotoma	5	3
Tubular vision	6	3.7
Not Recordable	5	3
Total	162 eyes	100

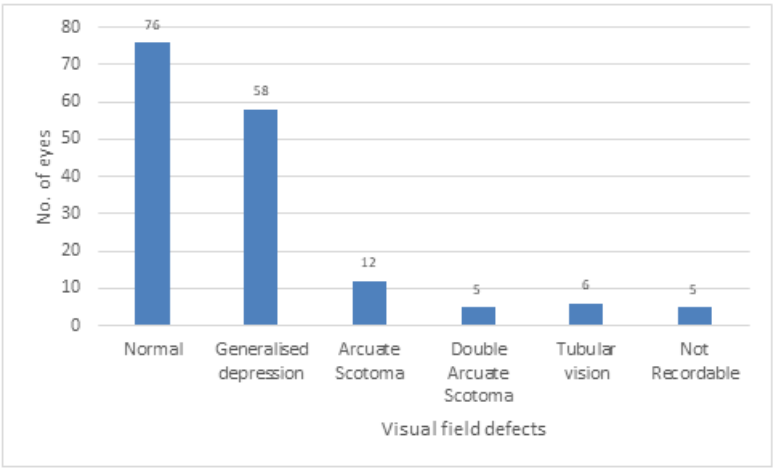

Figure 11: Visual field defects

Contrast sensitivity was significantly reduced in eyes with pseudoexfoliation glaucoma. (Table 14)

Table 14: Contrast sensitivity in eyes with cataract of grade NS1 or less or pseudophakia (PCIOL) with pseudoexfoliative glaucoma

Contrast sensitivity score (in	Number of eyes	Percentage
≥1.5	0	0
1 - 1.4	4	25
<1	2	12.5
Not recordable	10	62.5
Total	16	100

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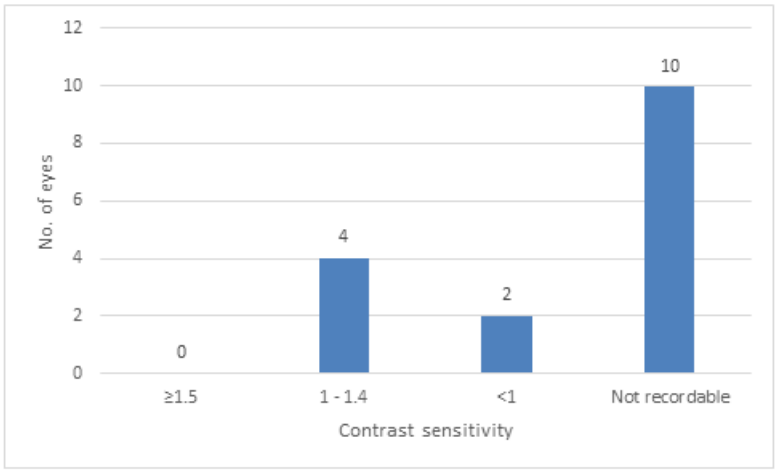

Figure 12: Contrast sensitivity in eyes with cataract of grade NS1 or less or pseudophakia (PCIOL) with pseudoexfoliative glaucoma

Thus, prevalence of glaucoma in our study was seen to increase with increase in age in patients with pseudoexfoliation syndrome, increase in laterality with increase in age in patients with pseudoexfoliation syndrome.
Also showed strong association with open angle glaucoma.

Discussion

Pseudoexfoliation syndrome is a disease of aged and a known cause for development of glaucoma. Glaucoma causes visual field loss eventually producing irreversible blindness. Hence screening and treating patients with pseudoexfoliation syndrome can prevent blindness.
In our study of total 88 patients who presented with pseudoexfoliation syndrome were subjected to detailed ophthalmoscopic evaluation and analysis was done mainly regarding the prevalence of glaucoma in pseudoexfoliation syndrome and clinical spectrum of pseudoexfoliation syndrome.
Thus, our study showed that as age increases there is increase in the prevalence of pseudoexfoliation syndrome.
Similar results were observed in The Blue Mountain Eye Study which concluded that both prevalence and bilaterality of pseudoexfoliation syndrome increased with age.[10]
Males predominated in our study, who were agricultural workers involved more in outdoor activities than females, hence the ultraviolet light exposure is more common in males which may explain the higher prevalence of PXS in males. Iris and lens were most common ocular structure involved in pseudoexfoliation syndrome in our study clinically.
42 eyes (33 eyes with high-pressure glaucoma and 9 eyes with normal tension glaucoma) were diagnosed to have pseudoexfoliation glaucoma and 134 (76.1%) eyes were diagnosed to have no glaucoma
Hence, open angle glaucoma and high-pressure glaucoma was more common type of glaucoma in patients with pseudoexfoliation syndrome in our study.
Nuclear cataract was found to be common, as it is suggested that high levels of epithelial metabolic activity may be beneficial for ion pumps and electrolyte environment of cortical fibers.[11]
In our study prevalence of glaucoma in pseudoexfoliation syndrome was 35.2%.
In our study both prevalence and bilateral presentation of pseudoexfoliation syndrome was higher than unilateral presentation as age increased which is comparable to Blue Mountain Eye Study. Hence unilateral cases must be followed up due to possibility of becoming bilateral later with increase in age.[10]
Although many cases of pseudoexfoliation glaucoma are unilateral at the time of diagnosis, clinically uninvolved eye of unilateral cases have a risk of developing glaucoma.[12]

Conclusion

Pseudoexfoliation syndrome is most common cause of secondary open angle glaucoma worldwide.
The goal of this study was to analyse regarding the prevalence of glaucoma in pseudoexfoliation syndrome and clinical spectrum of pseudoexfoliation syndrome.
Thus, it can be concluded that screening, follow up and early treatment can prevent blindness in patients with pseudoexfoliation syndrome.

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