Original Article

Glaucoma and Ocular Hypertension in Pseudoexfoliation Syndrome

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Pak J Ophthalmol 2015, Vol. 31 No. 2

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Purpose: To assess the frequency of glaucoma and ocular hypertension in pseudoexfoliation syndrome.

Material and Methods: This study was conducted in the Department of Ophthalmology, Liaquat University Eye Hospital, Hyderabad, Pakistan from June 2011 to December 2011. Hundred confirmed cases of pseudoexfoliation syndrome (PXS) were included in the study by non-probability convenience sampling. Tonometry, gonioscopy, ophthalmoscopy and visual field analysis were carried out to determine glaucoma. Data was collected by specially designed proforma and analyzed by using Statistical Program for Social Sciences (SPSS, version 16.0 for Windows). The frequencies and percentage were recorded and any association with predisposing factors was statistically analyzed on chi square test. P-value of <0.001 was considered significant with a confidence interval (CI) of 95%.

Results: Out of the 100 PXS patients, 16% patients were diagnosed with pseudoexfoliation glaucoma (PXG) (CI 95%): 12% with open angle glaucoma and 4% narrow angle glaucoma. Ocular hypertension without glaucomatous changes was detected in 9% (CI 95%) of the patients (P <0.001). PXG was more common after 50 years of age while ocular hypertension occurred earlier i.e. 40 years. Gender (P=0.45), locality (P=0.725) and family history of glaucoma (P=0.95) were statistically insignificant risk factors for development of glaucoma in PXS patients. Increased age, intraocular pressure and cup-disc ratio (16%) were significant risk factors for development of PXG (P <0.001 CI 95%).

Conclusion: Increasing age, intraocular pressure and cup disc ratio are significant risk factors for development of glaucoma in PXS. It is recommended that patients over 50 years should be actively examined for glaucoma particularly those with PXS.

Keywords: Pseudoexfoliation syndrome, Glaucoma, Ocular Hypertension.

Pseudoexfoliation syndrome (PXS) is a complex systemic age-related disorder characterized by the accumulation of an extracellular material in various parts of the body including lungs, skin, liver, heart, kidney, gallbladder, blood vessels, eyes and meninges.[1] In the eye, fibrillar material is deposited all over the anterior segment, particularly over the anterior lens capsule in characteristic double concentric ring pattern with clear zone in between the rings.[1] PXS is the most common cause of secondary open angle glaucoma; pseudoexfoliation glaucoma (PXG), caused by clogging of the trabecular meshwork by pseudoexfoliation material.[2,3]

Cataract is also an important association of PXS particularly cortical and nuclear cataract.[4] PXS may complicate cataract surgery with poor mydriasis, zonular dehiscence, corneal endothelial dysfunction, phacodonesis, vitreous loss and capsular phimosis. [5] Other ocular manifestations of PXS include iris depigmentation, transillumination defects, hyperpigmentation of trabecular meshwork and iridonesis.[2]

The prevalence of PXS in Pakistan is 6.45%, while there is variable prevalence worldwide ranging between 0.5% and 33%, increasing with age.[1,6,7] Glaucoma is present in 14.2% patients of PXS, with up to threefold higher risk of open angle glaucoma.[8] The purpose of this study was to assess the frequency of glaucoma and ocular hypertension in PXS.

MATERIAL AND METHODS

This cross sectional study was carried out at Eye Unit III, Department of Ophthalmology, Liaquat University Eye Hospital, Hyderabad, from June 2011 to December 2011. A total of 100 patients, 40 years and above attending the outpatient department for various ocular problems were screened for Pseudoexfoliation syndrome (PXS). The initial examination consisted of slit lamp biomicroscopy for the evidence of pseudoexfoliation material on the edge of pupil or lens in the undilated state and in those having suspicion of disease, the pupil was dilated and repeat slit lamp examination was performed. The patients having PXS were then further examined in detail according to an examination protocol and all the findings were recorded and entered in specially designed Proforma for this study.

The examination included complete history, general physical and systemic examination and full ocular examination. The ocular examination included visual acuity testing, slit lamp examination of the anterior segment, transillumination, gonioscopy, applanation tonometry and fundus examination. The patients were further divided into glaucoma or ocular hypertension on the basis of raised IOP and visual fields. Written informed consent was taken before proceeding for the recording of information and confidentiality was ensured.

Data was entered and analyzed by using Statistical Program for Social Sciences (SPSS version 16.0 for Windows Software). The frequencies and percentage were recorded and any association with predisposing factors was statistically analyzed on chi square test. The risk factors of PEX glaucoma and ocular hypertension were statistically analayzed and compared using chi square test to compare the significance between the two groups.

Based on intraocular pressure the patients were further divided into subgroups of < 21 mm Hg, 21-25 mm Hg, 26 – 30 mm Hg, 31 – 35 mm Hg and 36 – 40 mm Hg. The characteristics of these groups were compared by the chi square test. P-value of < 0.001 was taken as significant with a confidence interval (CI) of 95%.

RESULTS

In this study 100 consecutive patients of pseudoexfoliation syndrome (PXS) were included. 54% of our patients were males while 46% were females with mean age of 62.6 ± 9.7 years (Table 1). The mean intraocular pressure was 16.3 ± 4.9 mm Hg, ranging from 9 to 38 mm Hg. Table 1 shows the overall characteristics of our patients.

During the initial assessment, majority (71%) of the patients with PXS did not have glaucoma or ocular hypertension (Table 2). Sixteen percent patients were diagnosed with pseudoexfoliation glaucoma (PXG):

Table 1: Patient characteristics (n = 100).

Characteristics	No. of Patients n (%)
Gender	**M:F = 1.1 : 1**
Male	54 (54)
Female	46 (46)
Locality	
Urban	38 (38)
Rural	62 (62)
Age at Presentation (Years)	
Mean ± SD	62.6 ± 9.7
Min - Max	44 - 82
40 - 49	11 (11)
50 - 59	23 (23)
60 - 69	40 (40)
70 - 79	19 (19)
> 79	7 (7)
Intraocular Pressure (mm Hg)	
Mean ± SD	16.3 ± 4.9
Min - Max	9 - 38
< 21	71 (71)
21 - 25	13 (13)
26 - 30	10 (10)
31 - 35	4 (4)
36 - 40	2 (2)
> 40	0 (0)

Table 2: Characteristics of PEX glaucoma Vs. ocular hypertension (N = 100).

Characteristics	None (N = 71)	Undiagnosed (N = 4)	PXG (N = 16)	OHTN (N = 9)	P - Value †
Gender					
Male	40	2	9	3	**0.459****
Female	31	2	7	6	
Locality					
Urban	26	2	5	5	**0.725****
Rural	45	2	11	4	
Age at Presentation (Years)					
Mean ± SD					
Min - Max					
40 - 49	9	0	0	2	**< 0.001***
50 - 59	19	0	1	3	
60 - 69	32	2	3	3	
70 - 79	11	1	6	1	
> 80	0	1	6	0	
Intraocular Pressure (mm Hg)					
Mean ± SD	16.3 ± 4.9				
Min - Max	0 - 38				
< 21	71	0	0	0	**< 0.001***
21 - 25	0	0	9	4	
26 - 30	0	2	4	4	
31 - 35	0	2	2	0	
36 - 40	0	0	1	1	

† By Chi Square Test, *Significant difference, **Insignificant difference
PXG = Pseudoexfoliation Glaucoma **OHTN =** Ocular Hypertension

12% with open angle glaucoma and 4% narrow angle glaucoma. Ocular hypertension without glaucomatous changes was detected in 9% of the patients (P <0.001 CI 95%). 4% patients had raised IOP but could not be classified as PXG or ocular hypertension due to dense cataract (Table 2). PXG was more common in males (9%) after 60 years of age while ocular hypertension occurred frequently in females (6%) and earlier i.e. 40 years (Table 2). Most of the patients had intraocular pressure ranging between 20 – 30 mm Hg in both PXG and ocular hypertension. Increased age and increased intraocular pressure (16%) (IOP) were associated with increased risk of development of glaucoma (P < 0.001 CI 95%) (Fig. 1).

Gender (P = 0.45), locality (P = 0.725) and family history of glaucoma (P = 0.95) were statistically insignificant risk factors for development of glaucoma in PXS patients (Table 3). Increased cup-disc ratio was

Table 3: Characteristics of intraocular pressure (N = 100).

Characteristics	< 21 mm Hg (N = 71)	21 - 25 mm Hg (N = 13)	26 - 30 mm Hg (N = 10)	31 - 35 mm Hg (N = 4)	36 - 40 mm Hg (N = 2)	P-Value †
Family History of Glaucoma 0.935**						
Yes	8	1	0	0	0	
No	63	12	10	4	2	
Corneal Haze 0.02**						
Yes	0	13	10	4	2	
No	71	0	0	0	0	
Gonioscopy		**N = 9**	**N = 4**	**N = 2**	**N = 1**	
Grade 1		0	0	0	0	
Grade 2		1	2	0	1	**0.02****
Grade 3		7	2	2	0	
Grade 4		1	0	0	0	
Cup Disc Ratio						
Mean ± SD < 0.001* 0.3 ± 0.02						
Min - Max 0.2 - 0.9						
Not Visible Due to Cataract	7	0	0	0	0	
0.2	38	0	0	0	0	
0.3	20	0	0	0	0	
0.4	5	1	3	0	0	
0.5	1	4	3	1	1	
0.6	0	0	0	0	0	
0.7	0	1	1	1	0	
0.8	0	4	1	2	0	
0.9	0	3	2	0	1	

a significant risk factor for development of PXG (P <0.001 CI 95%).

DISCUSSION

PXS is of particular importance as it is associated with a wide range of ocular manifestations specifically glaucoma and cataract.[2,4] In addition it also tends to complicate intraocular surgery.[5] There has been a great variability in the prevalence of PXS ranging from 0.5% up to 33%.[1,7] The variability has been defined across different populations like Japanese[9] and South Indian[10] with 3.4% and 3.8% prevalence respectively while the Icelandic and Finnish had greater prevalence (17.7% and 33%).[1,11] Similar variability has been observed in local studies between 1.9% and 6.45%.[6,12] PXS has been more prevalent in females worldwide while males are more affected in the Pakistani

population.[8,13] Similar to our study, increasing age has been universally accepted as a significant risk factor for development of PXS.[8,9]

Fig. 1: Relationship between Intraocular Pressure and different age groups (p-Value < 0.001).

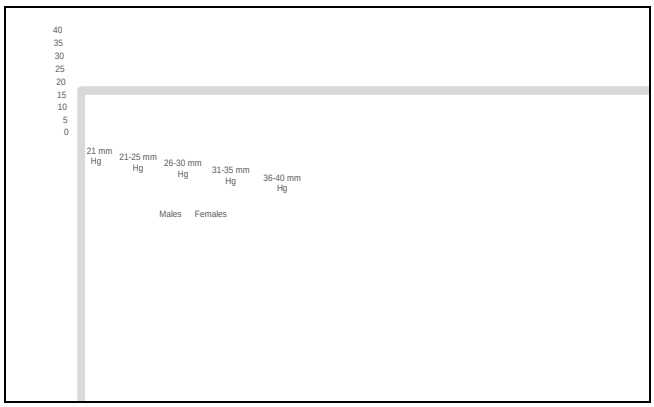

Fig. 2: Relationship between Intraocular Pressure and gender.

PXG has been a hazardous association of PXS, which is difficult to treat. 16% of our patients had PXG which is significantly more than reported in literature.[14,15] The Blue Mountains Eye Study[8] conducted on Australian population reported a prevalence of 13.4% which is comparable to our figures, while the American population had a significantly lower prevalence of 3% and 10%.[14,15] PXS is the most common cause of secondary open angle glaucoma. The risk of developing open angle glaucoma is increased three times in PXS patients,[8] consistent with this open angle glaucoma was more prevalent (12%) in our patients compared to angle closure glaucoma (4%). We found a greater prevalence of ocular hypertension (9%) than reported in literature (3.7%).[16] There was no statistically significant increase with age or gender in the OHTN group.[8,16] It was observed that PXG was more common in males and OHTN was frequently found in females.

Gender, locality and family history did not seem to be a significant risk factor for developing glaucoma in PXS patients.[8] Increasing age, intraocular pressure and cup-disc ratio were significant risk factors for development of glaucoma in PXS.[8,17]

CONCLUSION

Increased age, intraocular pressure and cup disc ratio are significant risk factors for development of glaucoma in PXS. It is recommended that patients over 50 years should be actively examined for glaucoma particularly those with PXS.

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