Original Research Article

A study of clinical spectrum of pseudo exfoliation syndrome

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Abstract

Background: Pseudoexfoliation syndrome (PXS) is the most common identifiable cause of secondary glaucoma, the prevalence of which varies considerably among different (PXF) ethnicities. Pseudoexfoliation is a genetically inherited condition. The prevalence of pseudoexfoliation increases with age. It is a common condition in the elderly population. This study aimed to assess the prevalence of and complications in patients with pseudo-exfoliation. **Methods:** This is an observational study performed in a sample of 103 patients (112 eyes) with pseudo-exfoliation for one year from October 2017-September-2018. Patients visiting the Ophthalmology department, NRI General Hospital, Chinakakani were enrolled in this study. Detailed evaluation including ophthalmic and general history, slit lamp biomicroscope, intraocular pressure measurement, gonioscopy and detailed eye examination was performed in all patients. **Results:** A total of 103 patients were analyzed; the major age group was 71-80 (40.78%). Among the Male patients were found to be more (66.02%). Majority of the patients were affected unilaterally (91.26%) and remaining bilaterally (8.24%). On slit-lamp examination degranulation of pupillary ruff and pseudoexfoliation material on the anterior capsule of the lens were present in 59.82% and 52.70% whereas corneal endothelium pigments, iris transillumination defects and pigments on the anterior lens capsule were absent in 82.1%, 91.1% and 68.80% respectively. All the cases were identified with PXF material on pupillary margin of the iris. Majority of the patients (72.32%) had normal intraocular pressure. Glaucoma and ocular hypertension were seen in 20.53% and 7.14% of eyes. On gonioscopy, pseudoexfoliation material in the angle, pigments and sampaolesi's line were identified in 27.7%, 63.4% and 43.80% respectively. Only 8.69% of eyes had 6/24 or better vision, while 8.69% had perception of light (PL) to No perception of light in PXF Glaucoma patients. **Conclusion:** The study concluded the need for early diagnosis and various complications involved in pseudoexfoliation.

Keywords: Pseudoexfoliation syndrome, Complications, Glaucoma, Iris pigmentation, Pupil, Trebeculary meshwork.

Introduction

Pseudoexfoliation syndrome (PXS) characterized by the deposition of distinctive fibrillar extracellular material in the anterior segment of the eye and was first described in 1917 by Lindberg [1]. It is frequently associated with a pen angle glaucoma known as pseudoexfoliation glaucoma. Elevated intraocular pressure, glaucoma, poor mydriasis, zonular weakness, corneal epitheliopathy and high rate of vitreous loss during cataract surgery are the complications in pseudoexfoliation syndrome. Glaucoma is the most severe co-morbidity associated with pseudoexfoliation syndrome. Deposition of pseudoexfoliation material, endothelial pigmentation, loss of pupillary ruff, iris sphincter transillumination defects, sampaolesis line and pigment deposition in the trabecular meshwork are the clinical presentation of pseudoexfoliation syndrome [2]. Failure to dilate the pupil or to examine the lens with the slit lamp after dilation and low index of suspicion on the part of examiner are reasons for the misdiagnosis of pseudoexfoliation syndrome [2].

Pseudoexfoliation syndrome is mostly asymptomatic, and usually the increase in the intraocular pressure is painless. It leads to a delay in the identification of pseudoexfoliation syndrome in most of the patients.Late diagnosis can increase the risk of pseudoexfoliation syndrome. In the population, over the age of 60 years, the prevalence of pseudoexfoliation syndrome varies between 10 to 20% worldwide [3]. In India, it ranges

Manuscript received: 20th August 2019
Reviewed: 30th August 2019
Author Corrected: 8th September 2019
Accepted for Publication: 13th September 2019

from 1.8% to 7.4% over the age of 45 years [4]. The prevalence of pseudoexfoliation syndrome is more in females [5]. Approximately around 25% of open-angle glaucoma is caused due to pseudoexfoliation syndrome [4]. The prevalence of pseudoexfoliation syndrome varies between age, gender, race, ethnicity and population. The incidence of pseudoexfoliation syndrome increases with age. Hence it is common in older people. The present study is conducted to determine the clinical profiles and various complications associated with pseudoexfoliation syndrome. To document the prevalence of ocular clinical profile of pattern and complications in patients with pseudo-exfoliative material attending general ophthalmology outpatient department of a tertiary care hospital.

Materials and Methods

The current study is an observational study conducted over a period of 1year, October 2017 to September 2018 in a sample of 112 eyes (103 subjects) of pseudo-exfoliation who met the below criteria were included.

Sampling methods: Convenience sampling

Sample size calculation: Complete enumeration

Source of data: Patients visiting in Department of Ophthalmology, NRI General Hospital, Chinakakani.

Inclusion Criteria

1. Age more than 45years
2. All eyes with pseudoexfoliative material were included

Exclusion Criteria

1. Previous intraocular surgery.
2. History of trauma, uveitis.
3. Significant corneal opacities obscuring the anterior segment structures.
4. Any ocular pathology that could have led to secondary glaucoma.
5. Those patients who refuse to give consent.

Ethical considerations- After receiving the approval of the Institutional Ethics Committee, a written and informed consent was obtained from patients in his / her vernacular language.

Examination and investigations: A thorough clinical history was taken regarding the chief complaint, duration of disease and any other relevant history. A thorough clinical examination comprises of general and local examination.

Which includes: General examination, Vital data, anemia, icterus, cyanosis, clubbing, pedal edema, lymphadenopathy, Cardiovascular and respiratory system examination.

Ocular examination: Visual acuity of both eyes was recorded unaided and with pinhole. All patients were examined with a slit lamp after mydriasis with phenylephrine. The diagnosis of exfoliation of syndrome was made on the basis of presence of Greyish white dandruff-like flaky deposits on Pupillary margin of iris, Anterior capsule of lens – in papillary, retro-iridal portion, Zonule (wherever visible), Anterior face of vitreous., Pigment dispersion from iris especially the atrophic patches, seen as transillumination defects. Pigment deposits over, Posterior surface of cornea, the anterior capsule of the lens.

Then gonioscopy examination was done with the help of Goldman four mirror gonioscope, in a dark room and with use of short, narrow slit-beam to avoid constricting of pupil and artificially opening the angle. For this cornea was anaesthetized by instilling 0.5% proparacaine eye drops in conjunctival sac. The angle of anterior chamber was examined. The following findings were looked for Pseudo-exfoliation material deposits over different structures in angle, Pigments over trabecular meshwork, Sampaolesi's line, Width of the angle of anterior chamber as per Shaffer grading system is given below (Table 1)

Table-1: Shaffer grading system.

Grade 0	0^0	Irido-corneal contact	Closed-angle
Grade 1	10^0	SL and part of TM visible	Very narrow-angle
Grade 2	10^0-20^0	TM visible	Moderately narrow
Grade 3	20^0-35^0	SS visible	Moderately wide angle
Grade 4	35^0-45^0	CBB visible	Wide angle

Intraocular pressure estimation with Goldman applanation tonometer was done in all patients after anaesthetizing cornea with 0.5% Proparacaine eye drops in the conjunctival sac. The ophthalmoscopic examination was done whenever possible.

Eyes with intraocular pressure greater than 21 mmHg, with glaucomatous cupping and visual field loss, were categorized as glaucoma while those with intraocular pressure greater than 21 mm H but with normal visual fields and optic discs were labelled as ocular hypertension.

Data analysis: Descriptive analysis was carried out by mean and standard deviation for quantitative variables, frequency and proportion for categorical variables. The association between explanatory variables and categorical outcomes was assessed by cross tabulation and comparison of percentages. IBM SPSS version 22 was used for statistical analysis [6].

Result

A total of 103 (112 eyes) subjects were included in the final analysis.

The mean age was 68.47±9.37 years. Among the study population 4 (3.88%) were aged up to 50 years, 17 (16.50%) were aged between 51 to 60 years, 34 (33.01%) were aged between 61 to 70 years, 42 (40.78%) were aged between 71 to 80 years and remaining 6 (5.83%) were aged 81 years and above. Among the study population, 68(66.02%) participants were male and remaining 35 (33.98%) were female. (Table 2)

Table-2: Descriptive analysis of age, gender in study population (N=103).

Parameter	**Summary**
Age Mean ± SD	68.47±9.37
Age group	
Up to 50 years	4 (3.88%)
51 to 60	17 (16.50%)
61 to 70	34 (33.01%)
71 to 80	42 (40.78%)
81 years and above	6 (5.83%)
Gender	
Male	68 (66.02%)
Female	35 (33.98%)

Among the study population, 94 (91.26%) patients had unilateral pseudo explosion while the rest had bilateral 9 (8.24%). On slit-lamp examination, 20 (17.90%) eyes had corneal endothelium pigments. Among the study population all 112 (100%) had PXF material on pupillary margin of the iris, 67 (59.82%) eyes had degranulation of pupillary ruff. 10 (8.90%) eyes had Iris Transillumination defects, 73 (65.13%) eyes had anterior lens capsule PXF in pupil, 59 (52.70%) eyes had anterior lens capsule Retro-iris PXF, 35 (31.30%) had anterior lens capsule pigments., 25 (22.32%) had IMSC lens changes, 5(4.46%) had MC, 55 (49.11%) had NS, 5 (4.46%) had Phacodonesis and 4 (3.57%) had PSCC (Table 3).

Table-3: Descriptive analysis of study population (N=112) eyes.

Parameter	Summary
Laterality	
Unilateral	94 (91.26%)
Bilateral	9 (8.24%)
Slit-lamp examination	
Corneal Endothelium Pigments	
Present	20 (17.90%)
Absent	92 (82.1%)
PXF material on the pupillary margin of IRIS	
Present	112 (100%)
Absent	0 (0%)
Degranulation of pupillary RUFF	
Present	67 (59.82%)
Absent	45 (40.18%)
Iris Transillumination defects	
Present	10 (8.90%)
Absent	102 (91.1%)
Anterior lens capsule PXF In Pupil	
Present	73 (65.13%)
Absent	39 (34.82%)
Anterior lens capsule Retro-iris PXF	
Present	59 (52.70%)
Absent	53 (47.30%)
Anterior lens capsule Pigments	
Present	35 (31.30%)
Absent	77 (68.80%)
Lens Changes	
IMSC	25 (22.32%)
MC	5 (4.46%)
NS	55 (49.11%)
Phacodonesis	5 (4.46%)
PSCC	4 (3.57%)
Absent	18 (16.07%)

The mean IOP was 21.98 ± 12 mm Of Hg. Among the study population,81 (72.32%) had normal IOP, 8 (7.14%) had Ocular hypertension, and 23 (20.53%) had glaucoma. Among the study population,13(11.80%) had Fundus Details hazy,18 (16.10%) had FUNDUS changes. (Table 4)

Table-4: Summary of IOP and fundus changes (N=112).

Parameter	Summary
IOP In mm Of Hg (Mean ± SD)	21.98 ± 12
*Normal	81 (72.32%)
**Ocular hypertension	8 (7.14%)
***Glaucoma	23 (20.53%)
Fundus Changes	
Details hazy	13 (11.80%)
Present	18 (16.10%)
Absent	81 (72.30%)

*IOP <22mm of Hg with no fundus and Visual field changes
**IOP >22mm of Hg with no fundus and Visual field changes
***IOP >22mm of Hg with fundus and Visual field changes

Among the study, population31(27.7%) eyes had a gonioscopy PXF angle. Among the study population 71 (63.4%) eyes had gonioscopy pigments. Among the study population 49 (43.80%) eyes had gonioscopy sampaolesi's line. Among the study population, 67 (59.82%) eyes had GONIOSCOPY Shaffer's Grade IV, 31 (27.68%) eyes had grade III, 9 (8.04%) had grade II and remaining 5 (4.46%) eyes had GONIOSCOPY Shaffer's grade I (Table 5).

Among the study population 2 (8.69%) had no PL, 14 (60.87%) had PL – 3/60, 5 (21.74%) had visual activity 4/ 60-6/36, 5 (21.74%) had visual activity 6/24-6/6 (Table 6).

Table-5: Summary of Gonioscope findings

Gonioscopy PXF in angle	
Present	31 (27.7%)
Absent	81 (72.30%)
Gonioscopy Pigments	
Present	71 (63.4%)
Absent	41 (36.60%)
Gonioscopy Sampaolesi's line	
Present	49 (43.80%)
Absent	63 (56.3%)
Gonioscopy Shaffer's Grade	
GradeIV	67 (59.82%)
GradeIII	31 (27.68%)
GradeII	9 (8.04%)
GradeI	5 (4.46%)

Table-6: Visual status in pseudo-exfoliative glaucoma subjects

Visual Acuity	No. of Eyes	Percentage
No PL	2	8.69%
PL-3/60	14	60.87%
4/60-6/36	5	21.74%
6/24-6/6	2	8.69%
Total	**23**	**20.53%**

Table-7: Prevalence of angle status in glaucomatous, ocular hypertension and normal XFS eyes (N=112)

Angle Status	Glaucomatous Eyes	Ocular Hypertension Eyes	Normal XFS Eyes	Total Eyes
Grade IV	14 (60.87%)	3 (37.5%)	50 (61.73%)	67
Grade III	5 (21.74%)	2 (25.0%)	24 (29.63%)	31
Grade II	3 (13.04%)	2 (25.0%)	4 (4.94%)	9
Grade I	1 (4.35%)	1 (12.5%)	3 (3.70%)	5
Total eyes	23 (100%)	8 (100%)	81 (100%)	112

Among the glaucomatous eyes, 14 (60.87%) had Grade IV angle status, 5 (21.74%) had grade III, 3 (13.04%) had grade II, 1 (4.35%) had grade I angle status. Among the ocular hypertension eyes 3(37.5%) had Grade IV angle status,2 (25.0%) had grade III, 2 (25.0%) had grade II, 1 (12.5%) had grade I angle status. Among the normal XFS eyes 50 (61.73%) had Grade IV angle status,24 (29.63%) had grade III, 4 (4.94%) had grade II, 13 (3.70%) had to grade I angle status (Table 7).

Discussion

Worldwide, pseudoexfoliation is the most common cause of open and closed-angle glaucoma. It is associated with zonular weakness, delayed dislocation of the crystalline and intraocular lens. The prevalence of pseudoex foliation may vary based on the region and the study design. In most of the studies, the prevalence ranges between 0.69- 23%. In Indian population it was about 0.69-3.8% [7]. The presence of pseudoex foliation can increase the complications involved in cataract surgery. In this present study, the prevalence and complication in pseudo exfoliation were determined.

A total of 103 pseudoexfoliation patients were identified during the study period. The Mean ± SD in the study population was 68.47±9.37. Philip, S.S. et al [4], performed a study in 529 participants in which the Mean ± SD was 65.1±8.0. In a study conducted by Arvind, H. et al [8], in a population of 108 subjects in South India the Mean ± SD was 64.7±9.63. The results of the present resembles with Shazly, T.A. et al [9], performed in 320 subjects in which the Mean±SD was 68.15±8.16 years. Pseudoex foliation is an age-related syndrome, so the incidence of pseudoex foliation increases with age.

Among 103 pseudoexfoliation patients, majority of the then were between the age group of 71-80 years of age with 40.78% followed by 61-70 years of age with 33.01%.Itresembles the Sathish, G. et al [10], study conducted in a population of 22 pseudoexfoliation patients in which 53%was belonged to the age group of 71-80 years with 53% followed by the age group of 61-70 years with 27%. The prevalence and mean age of pseudoexfoliation may vary based on age, race and geographic locations.

In the present study, the majority of the patients were males, with 66.02% followed by females with 33.98%.Joshi, R., et al [7], conducted a study in which out of 226 pseudoexfoliation cases, 119 patients were males (52.7%) and 107 were females (47.3%). In most of the studies, the predominance of males was more as compared to females. In a study performed by Hemalatha, B.C. et al [11], out of 50 cases, 32 were male patients, and 18 were female patients. High ultraviolet exposure may be one of the reasons for male predominance in the Indian population. Among 103 cases, majority of the patients was affected with a unilateral pseudoexfoliation with 91.26% and 8.24% with bilateral pseudoexfoliation. Herry, J.C. et al [12], conducted a retrospective study on 347 participants in which 225 cases were identified unilateral whereas 122 with bilateral pseudoexfoliation. The current study result was similar to the Philip, S.S. et al [4], performed in a population of 529 patients in which majority of the patients was identified with the unilateral pseudoexfoliation with 57.8% followed by bilateral with 42%. In some studies, the bilateral cases predominate unilateral cases because patient with unilateral pseudoexfoliation can be progressed to bilateral with the age and duration of the condition. The prevalence can vary based on the clinical profile and optical coherence tomography characteristics.

In the present study on slit-lamp examination, 17.90% of eyes had pigments on the corneal endothelium, and 4.46% had phacodonesis. Sharma, P. et al [13], conducted a study in a population of 93pseudo exfoliation patients in which 49.4% showed pigments on the corneal endothelium and 8.23% have phacodonesis. Presence of the corneal endothelium pigments and phacodonesis helps to identify patients with pseudoexfoliation.

Among 103 cases, 59.82% of patients were presented with degranulation of pupillary ruff. In a retrospective observational study performed by Rao, AD. et al [14], out of 346 patients with pseudoexfoliation, the pupillary ruff atrophy was common in all forms of deposition. Rao, A et al [15], conducted a study in which slit-lamp examination identified 16 patients with pupillary ruff atrophy in 32 unilateral pseudoexfoliation cases and 38 of 59 bilateral cases. The degranulation of pupillary ruff showed by 74.7% of eyes in the study conducted by Sharma, P. et al [13].

In the current study, the pseudoexfoliation material on the pupillary margin was present in all the patients who are similar to the results of Sharma, P. et al [13], study in which 84.7% of patients were identified with the pseudoexfoliation material on the pupillary margin. Among the study population, 65.13% of eyes had anterior lens capsule PXF in pupil. In Sharma, P. et al [13], study performed in a population of 93 patients 91.7% showed pseudoexfoliation material on the anterior capsule of the lens.

The mean intraocular pressure (mmHg) in the present study population was 21.98±12. In a cross-sectional study conducted in a population of 91 subjects by Rao, A. et al [15] in which 18±3.4 was the mean IOP in patients with unilateral pseudoexfoliation while 20±1.2 in the bilateral pseudo exfoliation cases. Thomson, R. et al [16], performed a cross-sectional study in the

southern population of India in which the mean ± SD of intraocular pressure was 24.14±1.4 mmHg. The presence of pseudoexfoliation is associated with increased intraocular pressure in the eyes.

The intraocular pressure was normal in 72.32% of eyes in the study population, 7.14% showed the presence of ocular hypertension and 20.53% were identified with glaucoma. In Sharma, P. et al [13], study intraocular pressure was normal in 79.4% of pseudoex foliation patients. Ocular hypertension and glaucoma were identified in 1.8% and 18.8% of participants respectively. The prevalence of ocular hypertension is more as compared to glaucoma patients. The delay in the diagnosis of pseudo exfoliation can converts ocular hypertension patients to glaucoma.

In the current study, gonioscopy showed pseudo exfoliation angle in 27.7% eyes. Al- Saleh, S.A., et al [2], study the pseudoexfoliation material in the angle showed by 23.9% right eye of the patients and 14.9% of left eye.

In the present study pseudo exfoliation pigmentation was observed in 63.4% of patients which is similar to the Al- Saleh, S.A., et al [2], study conducted in a population of 69 patients in the pseudoexfoliation pigmentation was seen in the right eye of the 58.7% patients whereas 53.3% identified in the left eye.

Among the study population, 43.80% of eyes had gonioscopy sampaolesi's line which resembles the study result of Sharma, P. et al [13], in which 47.5% showed gonioscopy sampaolesi's line.

In the present study 8.69% of pseudoexfoliation eyes had perception of light to Noperception of light, 60.87% had had the perception of light to 3/60, and also only 8.69% of eyes had 6/24 or better vision. In a study conducted by Sharma, P. et al [13], in the Indian population 65.6% had the perception of light to nil vision while 6.3% had 6/24 or better vision.

The prevalence of pseudoexfoliation increases with a decrease in visual activity. Increased intraocular pressure and poor response of the patients to medication can lead to optic nerve and visual fields damage. It can eventually cause poor vision.

Limitations of the study

1. The sample size included in the study was not sufficient
2. Present study results cannot be generalised.

Conclusion

Pseudoexfoliation is a common age-related condition. The prevalence of pseudoexfoliation can vary and is mostly seen in the elderly population. It increases the complications involved in cataract surgery. In the present study population majority of the patients were males with 68.47 ± 9.37 mean ± SD. Most of the cases were identified as unilateral pseudoexfoliation. On slit-lamp examination degranulation of pupillary ruff and pseudoexfoliation material on the anterior capsule of the lens were identified with 59.82% and 52.70% respectively. The corneal endothelium pigments, iris transillumination defects and pigments on the anterior lens capsule were absent in 82.1%, 91.1% and 68.80% cases respectively. All the cases were identified with PXF material on pupillary margin of the iris. Majority of the patients in the present study had normal intraocular pressure. Glaucoma and ocular hypertension were seen in 20.53% and 7.14% of eyes. On gonioscopy examination pseudoexfoliation in the angle, pigments and sampaolesis line were identified in 27.7%, 63.4% and 43.80% of patients. Among the study population 8.69% had no PL, 60.87% had PL – 3 / 60, 21.74% had visual activity 4 / 60 – 6 / 36, 21.74% had visual activity 6 / 24 – 6 / 6.

What the study adds to the existing knowledge?

The present study helps to determine the prevalence and complications involved in pseudoexfoliation. The prevalence and complications of pseudoexfoliation are increasing in the population. It is common in older people hence the need for awareness of pseudoexfoliation is more. Delay in seeking medical attention leads to various comorbidities. The early detection and effective management can reduce the morbidities associated with pseudoexfoliation.

Author's contribution

Dr. Chimata Triveni: Conceptualized the study and played primary role in compiling, analysis and interpretation of the data. All the drafts were prepared, reviewed and final draft was approved.

Dr. Divya, N. Lakshmi and **Dr. G. Sirisha:** Fine tuning of the proposal, contributed in data collection and entry. Reviewed the results and contributed to preparation and review of drafts.

All the authors have read and approved final version of the manuscript. All the authors take complete responsibility for the content of the manuscript.

Acknowledgements: Authors would like to acknowledge the technical support in data entry, analysis and manuscript editing by "Evidencian Research Associates."

Declarations

Funding: Nil, **Conflict of interest**: Nil
Permission from IRB: Yes
Ethical approval: not necessary

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How to cite this article?

Triveni C, Divya, N. Lakshmi, G. Sirisha. A study of clinical spectrum of pseudoexfoliation syndrome. Trop J Ophthalmol Otolaryngol.2019; 4(5):341-348. doi:10.17511/jooo.2019.i05.06