

Comparison of Frequency of Pseudo-Exfoliation Syndrome in Patients Undergoing Cataract Surgery in Different Regional Hospitals of Pakistan

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ABSTRACT

Objective: To compare the frequency of Pseudo-Exfoliation Syndrome (PXS) in patients undergoing cataract surgery in different regional hospitals in Pakistan.

Study Design: Cross-sectional study.

Place and Duration of Study: Three Tertiary Care Hospitals of Karachi, Rawalakot and Skardu Pakistan, from Sep 2017 to May 2020.

Methodology: Patients aged 45 years and more undergoing age-related cataract surgery were evaluated for Pseudo-Exfoliation Syndrome. Initially, each patient underwent a complete outpatient ophthalmological workup. Demographic details like age and gender were noted. All the patients were screened for hypertension and diabetes mellitus. In addition, patients were screened for pseudo-exfoliation syndrome. Congenital, developmental, secondary and traumatic cataracts were excluded.

Results: A total of 1882 patients were included in the study. Pseudo-exfoliation was carried out in 249(13.23%) patients. In Hospital-A, 23(3.23%); in Hospital-B, 145(14.92%) and Hospital-C, 81(40.70%) of the patients had pseudo-exfoliation. The frequency of pseudo-exfoliation syndrome was significantly more in Hospital-C and then in Hospital-B and least in Hospital-A ($p<0.01$).

Conclusion: Pseudo-exfoliation syndrome was significantly more common in Skardu and then in Rawalakot and least in Malir, which in the same order have more latitude away from the equator, have less average annual temperature and are situated at higher altitudes.

Keywords: Cataract, Frequency, Pakistan, Pseudo-exfoliation syndrome, Region.

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INTRODUCTION

Pseudo-exfoliation (PEX) is the most common cause of secondary open-angle glaucoma.^{1,2} The prevalence of PXS increases with age progression.³ There is a tendency to involve both eyes with increasing age, i.e. bilateral cases are more prevalent in older age groups than young.³ The prevalence ranged from 0% to 23% throughout the Northern hemisphere, with increasing prevalence along the latitude.⁴ In Sweden (a country with low average temperature and proximity to the north pole), the chances of having PXS at the age of 87 years is 61%.^{5,6} PXS, cataracts, and various retinal vascular diseases be more common at high altitudes.⁷

In PXS, cataract surgery is riskier. Cataract surgery has been shown to lower the IOP in the eye with PXS.⁸ Still, difficulty in pupillary dilatation, peroperative pupillary constriction, zonular loss and dialysis, vitreous face damage, nucleus and lens luxation even years after surgery, corneal endothelial

cell loss, shrinkage of capsulorhexis and capsular opacification are few of the operative complications.^{4,9} Zonular laxity associated with PXS adds to the risk of cataract surgery.¹ The incidence of PEX glaucoma is 15-30% at the time of diagnosis of PXS; by the 5th year, 60% may need glaucoma treatment.¹⁰

Since all the patients planned for intraocular surgery require a thorough workup, the research was conducted to determine the prevalence of PXS in patients undergoing cataract surgery. The aim was to highlight this potentially important condition with many possible postoperative complications. In order to make our study more useful, we compared the results of different regional hospitals in Pakistan.

METHODOLOGY

The cross-sectional study was conducted from September 2017 to May 2020 at Tertiary Care Hospital Malir Cantt, Karachi, situated in South (latitude 24.9503N, altitude 40m, average annual temp 27.1°C), Tertiary Care Hospital in Rawalakot, situated in North (latitude 33.51°N, altitude 1638m, annual average temp 13.7°C) and Tertiary Care in Skardu, in extreme North (latitude 35.309°N, altitude 2248m, annual average

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temp 10.3°C) of Pakistan. All these hospitals had marked differences in temperature, altitude and latitude. After obtaining approval from the respective Hospital Ethical Review Committees (vide letter no 103/adm/Trg/2017, 11/2020/Trg/Adm, and 1015/Adm/1/2020), informed written consent was obtained from all the participants of the study in addition to routine consent for the cataract surgery. WHO sample size calculator was used to sample size calculation taking a 6.5% prevalence of PXS in Pakistan.² Non-probability consecutive sampling was used for patient selection.

Inclusion Criteria: All patients undergoing planned cataract surgery, aged 45 years and above were included in the study.

Exclusion Criteria: Patients with previous intraocular surgery, cataract of congenital, paediatric/developmental, traumatic or complicated types, rubeosis iridis, uveitis were excluded from the study.

A total of 1882 patients were included in the study. Age, gender, presence of diabetes mellitus (DM) and hypertension were also recorded for all the patients. After thorough evaluation including general and ophthalmic history, all the patients were examined with slit lamp biomicroscope before and after pupillary dilatation (except those found to have a narrow-angle or occlude angle gonioscopically where prophylactic YAG laser iridotomy was performed followed by the postponement of evaluation), IOP was checked with Goldmann applanation tonometer, and other necessary investigations were performed where required. Both eyes were examined following a similar protocol, irrespective of the eye being planned for surgery. PXS was confirmed by typical white and/or greyish granular fluffy material on pupillary margins and/or anterior lens capsule.^{11,12}

SPSS version 20.0 was used for the data analysis. To mention numerical data like age, we used Mean±SD. In contrast, for categorical data, e.g. gender, presence or absence of PXS and presence of comorbid

like hypertension or DM, we used percentages and frequencies. The chi-square test was used for qualitative variables whereas Student’s t-test and ANOVA were used to compare the means of quantitative variables on an indicated basis. The *p*-value of ≤0.05 was considered statistically significant.

RESULTS

Out of 1882 patients, 711 patients were from Hospital-A having 23(3.23%) PXS positive cases, 972 from Hospital-B having 145(14.92%) PXS positive cases and 199 from Hospital-C having 81(40.70%) of PXS positive cases (*p*< 0.01) (Table-I).

Table-I: Demographic Distribution of the Study Population (n=1882)

Variables	Regional Hospital			p-value
	A (Malir) (n=711)	B (Rawalakot) (n=972)	C (Skardu) (n=199)	
Age				
Mean±SD	65.46±8.967	65.31±8.757	64.83±7.691	0.671
Gender n(%)				
Male	366(51.47)	496 (51.02%)	107(53.76%)	0.780
Female	345(48.52)	476(48.97%)	92(46.23)	
Pseudo-exfoliation Syndrome n(%)				
Yes	23(3.23%)	145 (14.92%)	81(40.70%)	<0.01
No	688(96.77)	827 (85.08%)	118(59.30)	

Seventy-seven patients (30.92%) had bilateral PXS. The minimum age of the patient with unilateral PXS and bilateral PXS was 48 and 60 years, respectively. Hypertension was seen in 117(46.9%) patients with PXS compared to 475(29.08%) patients without PXS. In Hospital-A, 11(47.82%) out of 23. In Hospital-B, 69(47.58%) out of 145 patients, and in Hospital-C, 37(45.67%) out of 81 patients with PXS had hypertension (Table-II). DM was seen in 67 (26.90%) of the PXS patients and 322 (19.72%) patients without PXS. In Hospital-A, 5(21.73%) out of 23; in Hospital-B, 39 (26.89%) out of 145 patients and in Hospital-C, 23 (28.39%) out of 81 patients with PXS had DM (Table-II). Intergroup difference for hypertension and DM was statistically significant (*p*<0.001).

Table-II: Frequency of Hypertension and Diabetes Mellitus among the Study Population (n=1882)

Variable	Regional Hospital						p-value	
	Hospital-A (Malir)		Hospital-B (Rawalakot)		Hospital-C (Skardu)			
Hypertension	Pseudo-exfoliation Yes(n=23)	Pseudo-exfoliation No(n=688)	Pseudo-exfoliation Yes(n=145)	Pseudo-exfoliation No(n=827)	Pseudo-exfoliation Yes(n=81)	Pseudo-exfoliation No(n=118)	<0.01	
	Yes	11(47.83%)	192(27.90%)	69(47.58%)	253(30.59%)	37(45.67%)		30(25.43%)
	No	12(52.17%)	496(72.10%)	76(52.42%)	574(69.41%)	44(54.33%)		88(74.57%)
Diabetes Mellitus								
Yes	5(21.74%)	109(15.84%)	39(26.89%)	194(23.45%)	23(28.39%)	19(16.11%)	<0.01	
No	18(78.26%)	579(84.16%)	106(73.11%)	633(76.55%)	58 (71.61%)	99 (83.89%)		

DISCUSSION

Our study showed that 23(3.23%) patients from Hospital-A (Malir) (latitude 24.9503°N) had PXS, 145 (14.92%) from Hospital-B (Rawalakot) (latitude 33.51°N) and 81 (40.70%) from Hospital-C (Skardu) (latitude 35.309°N) had PXS ($p < 0.005$).

A study in Bahawalpur showed that all the patients with PXS had bilateral involvement.² In the Hyderabad study, 76.9% of the patients were found to have bilateral PXS.¹² In a study conducted by Al-Saleh *et al.* in Riyadh, KSA and published in 2015, 37.7% of the patients with Pseudo-exfoliation had bilateral involvement.⁴ Our study showed that 77(30.92%) of the patients with Pseudo-exfoliation had bilateral PXS. Concurrence was found in the fact that bilateral involvement was more common in higher age groups.

Govetto *et al.* focused on the type of cataract and nuclear cataracts that have been found to be harder in PXS patients, which of course, adds to the risk of the surgery.¹³ Among patients with cataracts, PXS was 28.19% in a study conducted by Gabr *et al.* in Southern Saudi Arabia, 39.3% in an Ethiopian study by Teshome *et al.* and 26.32% in various eye camps by Sufi *et al.* in Indian Occupied Jammu and Kashmir (ranging from 4-36.36%).¹⁴⁻¹⁶ In a study conducted by Kanthan *et al.* in the Blue Mountain Region, west of Sydney, Australia, published in 2013, PXS was found to have a greater prevalence of cortical and nuclear cataracts and greater incidence of nuclear cataracts which may in part explain the increasing grade of the hardness of cataract in PXS.¹⁷ A Greek study in 2015 carried out by Andrikopoulos *et al.* showed the prevalence of 27.9% of PXS in patients admitted for senile cataracts.¹⁸ Cataract has been stated as a significantly associated factor for PXS by Vijaya *et al.* in a study conducted in South India published in 2016.¹⁹ Our study showed the overall frequency of 13.25% of PXS patients among all patients planned for cataract surgery. The relative frequencies of various regions have already been mentioned.

Exposure to Low temperature increases the risk of PXS. Lower temperature facilitates nucleation reaction, represented by extracellular deposition of PXS.¹ Reducing temperature has been stated to enhance exfoliative material precipitation from aqueous.¹¹ Jiwani *et al.* in Boston found a 9% reduction in PXS hazard with every 1°C increase in temperature in July.¹¹ We also found a similar pattern of results that showed the increasing frequency of PXS with decreasing average annual temperature, i.e., Malir

(27.1°C), Rawalakot (13.7°C) and Skardu (10.3°C) with statistically significant difference of the frequency of PXS patients ($p < 0.005$). Strangely, Eskimos in the northern part of North America have been found to have 0% PXS. This has been attributed to thicker iris and extra periorbital fat that maintains the higher ocular temperature, thus inhibiting extracellular deposition.²⁰

In a study published in Nepal by Gnyawali *et al.* in 2016, PXS was mentioned to be more common among highlanders.⁸ These were in comparison with our results where the difference among Malir (40m), Rawalakot (1638m) and Skardu (2248m) was statistically significant ($p < 0.005$).

STUDY LIMITATIONS

The limitation of the study was that the migration of the individual to/from other regions, ethnicity (related to genetic predisposition) and the duration of stay in the region of study could not be verified, which limits the scope of our study. However, this study was hospital-based, so that a limited population could be screened. A population-based survey is required to have a more detailed and thorough knowledge of the distribution of PEX syndrome patients.

CONCLUSION

This study is more beneficial if it concentrates on latitudes, altitudes and regional temperature exposure. If environmental factors were consistently found in the studies, some preventive measures could be explored to manage PEX syndrome.

Conflict of Interest: None.

Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

IH & AR: Conception, study design, drafting the manuscript, approval of the final version to be published.

OI & OI: Data acquisition, data analysis, data interpretation, approval of the final version to be published.

FAK & SA: Critical review, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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