

Original Research Article

RATE OF OCCURRENCE OF PSEUDOEXFOLIATION IN DIABETIC PATIENTS WITH SENILE CATARACT IN SOUTH INDIAN RURAL POPULATION

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Received : 02/03/2025
Received in revised form : 11/05/2025
Accepted : 28/05/2025

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DOI: 10.70034/ijmedph.2025.2.365

Source of Support: Nil,
Conflict of Interest: None declared

Int J Med Pub Health
2025; 15 (2); 2034-2037

ABSTRACT

Background: The progressive accumulation of fibrillar, amyloid-like material on various ocular structures, particularly the anterior lens capsule, iris, and ciliary epithelium, is the hallmark of pseudoexfoliation syndrome (PEX), an age-related, multifactorial disorder that is known to be a significant risk factor for complications during cataract surgery as well as the development of secondary glaucoma. The aim & objective is to assess and compare the rate of occurrence of pseudoexfoliation (PEX) in type 2 diabetics with senile cataracts with the prevalence of pseudoexfoliation (PEX) in non- diabetics with senile cataract.

Materials and Methods: A observational cross sectional study was conducted among 146 patients of senile cataract attending cataract screening camps at Kolar, Chikballapur and Chittoor districts.

Results: Among 146 cataract patients, pseudoexfoliation was observed in 10.9% of diabetics and 19.2% of non-diabetics. The mean age was similar across groups. PEX-positive patients had higher intraocular pressure and mild visual acuity loss, though these were less pronounced in diabetics. The difference in PEX prevalence between groups was statistically significant ($p < 0.05$).

Conclusion: In addition to the previously indicated collection of ocular abnormalities, PEX- positive individuals exhibited noticeably higher intraocular pressure and milder visual acuity impairments than controls, demonstrating the severe clinical issues this illness presents. While older age remained a significant risk factor, the research suggested that diabetes may have a protective function in PEX through metabolic pathways impacting extracellular matrix deposition.

Keywords: Pseudoexfoliation, diabetic, Cataract, Outcome.

INTRODUCTION

The progressive accumulation of fibrillar, amyloid-like material on various ocular structures, particularly the anterior lens capsule, iris, and ciliary epithelium, is the hallmark of pseudoexfoliation syndrome (PEX), an age-related, multifactorial disorder that is known to be a significant risk factor for complications during cataract surgery as well as the development of secondary glaucoma.^[1] Pseudoexfoliative material is deposited in the eye as well as in extraocular tissues like the heart, lungs, liver, and kidneys due to the aberrant extracellular matrix metabolism that causes PEX, suggesting that this disorder may have systemic effects.^[2]

Even though the precise cause of PEX is still unknown, mounting data indicates that genetic predispositions—such as single-nucleotide polymorphisms in the LOXL1 gene, which is essential for elastic fiber cross-linking—play a key role in the dysregulation of extracellular matrix homeostasis and the development of aberrant fibrils.^[3] The prevalence of PEX rises with age, with those over 60 being especially vulnerable. This increased prevalence in the elderly population poses serious clinical challenges, especially during cataract surgery when related symptoms like poor mydriasis, zonular weakness, and an elevated risk of intraoperative complications are common.^[4]

At the same time, diabetes mellitus, a chronic metabolic disease marked by persistent hyperglycemia and its associated systemic complications, is known to be a significant risk factor for senile cataract development because of its detrimental effects on lens metabolism, elevated oxidative stress, and microvascular changes.^[5] Although diabetes is recognized to contribute to cataractogenesis, there is still debate and complexity surrounding its relationship to PEX. According to a number of studies, PEX may be less common in diabetic patients than in non-diabetic people. This suggests that hyperglycemia or the metabolic environment of diabetes may change the biochemical pathways involved in extracellular matrix remodeling, which may have a protective effect against the development of pseudoexfoliative material.^[6]

The relationship between DM and PEX is controversial. Suggested biological mechanisms that link the 2 conditions may involve underlying vascular changes, oxidative stress, or IOP fluctuations. Altered systemic vasoregulation and decreased peripheral blood flow seen in DM is also a feature of PEX. Reduced ocular blood flow and trabecular outflow in DM may disrupt exfoliation material clearance mechanisms, potentially contributing to PEX. The increased oxidative stress and reactive oxygen species observed in DM have also been hypothesized to play a role in PEX pathogenesis, as inadequate antioxidant enzyme response has been reported in PEX patients.^[7] High IOP fluctuation may also link DM and PEX; high IOP fluctuation is associated with neuroinflammation and neurodegeneration and is observed in both DM and PEX.^[8] In contrast, a proposed hypothesis for the lower frequency of PEX with DM is the increased amount of advanced glycation end products observed in DM due to hyperglycemia, resulting in the abnormal glycation of basement membrane components that may reduce the deposition of exfoliation material.^[9]

Given the inconclusive relationship between DM and PEX, as well as the increasing prevalence and incidence of DM,^[10] which may be a risk factor for the development and progression of PEX, our aim was to study rate of occurrence & association of PEX in type 2 DM patients. So, present study was conducted.

Aims & Objectives: To assess and compare the rate of occurrence of pseudoexfoliation (PEX) in type 2 diabetics with senile cataracts with the prevalence of pseudoexfoliation (PEX) in non-diabetics with senile cataract.

MATERIALS AND METHODS

A observational cross sectional study was conducted among 146 patients of senile cataract attending cataract screening camps at Kolar, Chikballapur and Chittoor districts.

Both male & female patients age >60 years Diabetics with senile cataract were included in the study. Patients with ischemic heart disease (IHD), chronic kidney disease (CKD), patients with history of previous ocular surgeries were excluded.

A written informed consent from the subjects was obtained prior to the start of study. After a detailed history (demographic details & diabetic history documenting the type, duration, drug history, and family history) following clinical examination was performed:

- Visual acuity by Snellens chart for distant vision.
- Near vision by Jaeger's chart.
- Slit lamp biomicroscopy for Anterior segment evaluation- to detect the presence of pseudoexfoliative material on the pupillary border, the anterior lens capsule, or both, and on the iris, cornea, and angle. Other signs of PEX were also documented, like sphincter atrophy or lens subluxation. The cataract morphology was also assessed – nuclear, cortical, or posterior subcapsular, based on Lens Opacification Classification System II (LOCSII).
- Intraocular Pressure by Goldmann applanation tonometry
- Anterior chamber angle examination using gonioscopy.
- Fundus examination by Direct & Indirect ophthalmoscopy.

Data entry & analysis: Data were entered in MS excel and analyzed using SPSS 22 version software. Qualitative data were presented in the form of Proportions and pie diagrams, bar charts were used to represent graphically. Quantitative data were presented as mean, standard deviation. Z test was the test of significance for quantitative data and chi-square test was the test of significance for qualitative data. P value <0.05 was considered as statistically significant.

RESULTS

Among the study participants of both groups, 28(38.3%) cases belonged to 61-70 years followed by 25(34.2%) cases who were more than 70 years of 10.4 years in diabetic group and 66.8 + 10.3 years in age. The mean age of study participants was 66.1 + non diabetic group. [Table 1] Out of total, 33 cases were males and remaining 40 cases were females in each group of study participants. [Figure 1] The prevalence of pseudoexfoliation syndrome in diabetic patient was 10.9% and in nondiabetic patient was 19.2%. [Table 2].

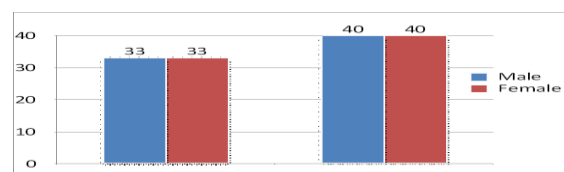


Figure 1: Gender wise distribution

Table 1: Age group wise distribution.

Age group (in years)	Diabetic group	Non diabetic group
31-40	2 (2.7%)	2 (2.7%)
41-50	5 (6.8%)	5 (6.8%)
51-60	13 (17.8%)	13 (17.8%)
61-70	28 (38.3%)	28 (38.3%)
> 70	25 (34.2%)	25 (34.2%)
Mean age	66.1 + 10.4 years	66.8 + 10.3 years

Table 2: Prevalence of Pseudoexfoliation among study participants

Diabetes Mellitus	Pseudoexfoliation present	Pseudoexfoliation Absent
Present	8 (10.9%)	65(89.1%)
Absent	14 (19.2%)	59(80.8%)

DISCUSSION

The present cross-sectional study aimed to evaluate the prevalence of pseudoexfoliation syndrome (PEX) in diabetic versus non-diabetic patients with senile cataract in a rural South Indian population. The findings revealed a notably lower prevalence of PEX among diabetics (10.9%) compared to non-diabetics (19.2%), suggesting a potential inverse association between diabetes mellitus (DM) and the development of pseudoexfoliative material.

These results are consistent with earlier studies, such as those by Manaviat and Rashidi (2010),^[6] which also reported a lower prevalence of PEX in diabetic patients, proposing that the hyperglycemic environment in DM may inhibit the deposition of PEX material through increased glycation of extracellular matrix components. The current findings support this theory, indicating that advanced glycation end products (AGEs) prevalent in diabetes may interfere with the pathogenesis of PEX, possibly by altering the normal assembly or degradation of the extracellular matrix.

Interestingly, despite diabetes being a known risk factor for cataractogenesis due to oxidative stress and lens protein denaturation, it appears to exert a paradoxical protective role against PEX. This could be explained by altered metabolic pathways, such as those involving LOXL1 gene dysregulation, which are central to elastic fiber cross-linking and extracellular matrix stability.^[11] On the contrary, some studies report higher intraocular pressure (IOP) and glaucomatous changes in patients with both PEX and diabetes, raising concerns over compounded ocular risks. However, in the present study, although PEX-positive individuals had higher IOP and slightly reduced visual acuity, these changes were less prominent in diabetic individuals, supporting the view that DM may modulate the clinical severity of PEX.^[12,13]

The study population's age distribution also aligns with the well-documented age-related increase in PEX prevalence, with the majority of cases occurring in individuals over 60 years old. This further reinforces age as a critical risk factor, although diabetes status appeared to independently affect PEX prevalence, as suggested by the significant difference between the groups.

Despite the valuable insights, the study had some limitations. Being cross-sectional in nature, it cannot establish causality. Moreover, a relatively small sample size and region-specific recruitment may limit generalizability. Future longitudinal studies with larger, multi-centric populations and molecular profiling are needed to clarify the protective mechanisms of DM against PEX.

Present study contributes to the growing body of evidence suggesting a potential protective effect of type 2 diabetes mellitus against pseudoexfoliation syndrome, possibly mediated through metabolic alterations affecting extracellular matrix deposition. These findings are clinically significant for risk stratification, surgical planning, and understanding systemic-ocular interactions in elderly cataract patients.

CONCLUSION

In addition to the previously indicated collection of ocular abnormalities, PEX- positive individuals exhibited noticeably higher intraocular pressure and milder visual acuity impairments than controls, demonstrating the severe clinical issues this illness presents. While older age remained a significant risk factor, the research suggested that diabetes may have a protective function in PEX through metabolic pathways impacting extracellular matrix deposition. In addition to offering important clinical insights that can support preoperative evaluation and surgical planning in this population at relatively high risk for botolism, these findings advance our understanding of the interaction between systemic and ocular pathologies in the context of heart surgery.

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