

# Clinical Evaluation of Intraoperative and Postoperative Challenges of Cataract Surgery in Patients with Pseudoexfoliation Syndrome

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## Abstract:

**Background:** Pseudoexfoliation syndrome (PEX) is a common age-related fibrilloglycopath characterized by the deposition of extracellular material on ocular structures. It is frequently associated with cataract formation and poses significant challenges during cataract surgery due to its effects on the zonular apparatus, iris behavior, and intraocular pressure regulation. Understanding the surgical implications and complications related to PEX is critical for improving surgical outcomes.

**Aim and Objective:** To evaluate the intraoperative difficulties, postoperative complications, and visual outcomes of cataract surgery in patients diagnosed with pseudoexfoliation syndrome.

**Methods:** This prospective observational study was conducted at Department of Ophthalmology, Patna Medical College and Hospital, Patna, Bihar, India, over a period of 12 months. A total of 100 patients diagnosed with pseudoexfoliation syndrome undergoing cataract surgery were enrolled. Detailed preoperative clinical evaluation including anterior segment examination, intraocular pressure measurement, pupillary response, and zonular stability assessment were conducted. Standard phacoemulsification or extracapsular cataract extraction (ECCE) was performed depending on clinical indication. Intraoperative complications, postoperative outcomes, and visual recovery were recorded and analyzed.

**Results:** The mean age of patients was  $68.4 \pm 7.9$  years, with a slight female predominance (54%). Small pupil requiring mechanical dilation was noted in 36% of cases, and zonular instability was observed in 24% of eyes. Intraoperative complications included zonular dialysis (8%), posterior capsular rupture (6%), vitreous loss (4%), and intraocular lens decentration (2%). Postoperative complications included corneal edema (10%), raised intraocular pressure (8%), posterior capsular opacification (14%), and delayed visual recovery (12%). Despite these challenges, 88% of patients achieved a best-corrected visual acuity of 6/12 or better at 3 months postoperative follow-up.

**Conclusion:** Pseudoexfoliation syndrome significantly increases the complexity of cataract surgery, leading to higher rates of intraoperative and postoperative complications. Preoperative recognition, meticulous surgical planning, and appropriate intraoperative techniques such as pupil expansion devices and capsular tension rings can minimize risks and optimize visual outcomes. Early diagnosis and careful management are key to ensuring satisfactory visual rehabilitation in these patients.

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## Introduction

Pseudoexfoliation syndrome (PEX) is a common, age-related, systemic disorder of the extracellular matrix characterized by the production and progressive accumulation of abnormal fibrillar material within intraocular and extraocular tissues. It is recognized as one of the leading causes of secondary open-angle glaucoma and is strongly associated with cataract formation, often contributing to accelerated lens opacification in elderly populations. The prevalence of pseudoexfoliation varies geographically, with higher incidence reported in certain ethnic groups and increasing sharply with age [1,2].

The abnormal pseudoexfoliative material deposits on multiple ocular structures, including the lens capsule, zonular fibers, iris, trabecular meshwork, and corneal endothelium. These deposits result in compromised zonular integrity, poor pupillary dilation, altered anterior chamber dynamics, and increased vulnerability to intraoperative complications during cataract surgery. Zonular weakness, iris rigidity, small pupil size, and increased lens mobility frequently complicate the surgical course, posing significant technical challenges even for experienced surgeons [3,4].

In addition to intraoperative difficulties, patients with pseudoexfoliation are also at higher risk of postoperative complications, including corneal decompensation, elevated intraocular pressure, posterior capsular opacification, decentration of intraocular lens (IOL), and delayed visual recovery. The presence of pseudoexfoliation also predisposes patients to late-onset capsular bag contraction and IOL dislocation due to progressive zonular loss over time [5,6].

Despite advancements in surgical techniques, modern phacoemulsification remains more challenging in pseudoexfoliation cases compared to routine cataract surgeries. Surgical management often requires additional intraoperative measures such as mechanical pupil dilators, capsular tension rings, iris hooks, and careful hydrodissection to minimize the risk of capsular rupture and vitreous loss [7,8].

The clinical relevance of pseudoexfoliation extends beyond the eye, as systemic associations have been reported, including vascular abnormalities, hypertension, cardiovascular disease, and cerebrovascular events, further highlighting the need for holistic evaluation in these patients [9].

In the Indian population, the burden of pseudoexfoliation syndrome continues to rise due to increasing life expectancy and better diagnostic capabilities. However, limited regional data exists on the surgical challenges and outcomes in patients undergoing cataract surgery with pseudoexfoliation syndrome [10].

In this context, the present study was conducted at Patna Medical College and Hospital, Patna, Bihar, India, to comprehensively analyze the clinical profile, intraoperative difficulties, postoperative complications, and visual outcomes of cataract surgery in patients with pseudoexfoliation syndrome, thereby contributing valuable insights for improved surgical planning and patient care.

### Materials and Methods

This prospective observational study was conducted at Department of Ophthalmology, Patna Medical College and Hospital, Patna, Bihar, India, over a period of 12 months. The study aimed to evaluate the intraoperative challenges, postoperative complications, and visual outcomes of cataract surgery in patients with pseudoexfoliation syndrome.

**Study Population:** A total of 100 consecutive patients diagnosed with pseudoexfoliation syndrome and scheduled for cataract surgery were enrolled during the study period.

### Inclusion Criteria:

- Age  $\geq 50$  years.
- Presence of pseudoexfoliation syndrome confirmed by slit-lamp examination.

- Diagnosis of visually significant cataract requiring surgery.
- Willingness to provide informed written consent.

### Exclusion Criteria:

- Patients with advanced or uncontrolled glaucoma.
- Co-existing ocular pathology affecting vision (e.g., corneal dystrophy, macular degeneration, retinal pathology).
- History of previous intraocular surgery in the same eye.
- Traumatic cataract or subluxated lenses unrelated to pseudoexfoliation.
- Systemic conditions unfit for surgery or anesthesia.

### Preoperative Evaluation:

All patients underwent comprehensive ophthalmic evaluation, including:

- Detailed history taking and systemic evaluation.
- Best-corrected visual acuity (BCVA) measurement using Snellen chart.
- Slit-lamp biomicroscopy to assess pseudoexfoliative material, pupillary dilation, zonular status, and cataract grading.
- Intraocular pressure (IOP) measurement using Goldmann applanation tonometry.
- Gonioscopy to assess angle structures.
- Fundus examination using indirect ophthalmoscopy and slit-lamp biomicroscopy with +90 D lens.
- Biometry for intraocular lens power calculation using A-scan ultrasonography or optical biometry.

**Surgical Procedure:** All patients underwent cataract surgery under peribulbar anesthesia. The type of surgery was selected based on clinical findings:

- **Phacoemulsification:** Performed in patients with stable zonules and adequate pupil dilation.
- **Extracapsular Cataract Extraction (ECCE):** Performed in patients with zonular instability or poor pupil dilation.

Intraoperative measures included:

- Use of pupil expansion devices (iris hooks or pupil dilators) in small pupil cases.
- Capsular tension rings (CTR) insertion in cases with zonular weakness.
- Gentle hydrodissection and minimal rotation of the nucleus to avoid zonular stress.
- Controlled phaco parameters with low vacuum and aspiration settings.
- Implantation of posterior chamber intraocular lens (PCIOL) in the capsular bag or sulcus as appropriate.

**Postoperative Follow-up:**

Postoperative evaluations were conducted at:

- Day 1, 1 week, 1 month, 3 months, and 6 months.

At each visit, the following were assessed:

- BCVA.
- Anterior segment evaluation for corneal clarity, inflammation, IOL position, and pupil status.
- Intraocular pressure monitoring.
- Fundus evaluation for any posterior segment pathology.

**Outcome Measures:**

The primary outcome measures included:

- Intraoperative complications (zonular dialysis, posterior capsular rupture, vitreous loss, etc.).
- Postoperative complications (corneal edema, raised IOP, posterior capsular opacification, etc.).
- Visual outcomes at final follow-up.

**Statistical Analysis:** Data were analyzed using SPSS software. Categorical data were expressed as percentages and frequencies. Continuous variables were presented as mean  $\pm$  standard deviation. Chi-square test and Student's t-test were applied where applicable. A p-value  $<0.05$  was considered statistically significant.

**Results**

A total of 100 patients diagnosed with pseudoexfoliation syndrome undergoing cataract surgery were analyzed in this study. The mean age of patients was  $68.4 \pm 7.9$  years, with a slight female predominance (54%), and most patients belonged to the 61–75 year age group. Small pupil ( $<5$  mm) was noted in 36% of cases, while zonular instability was present in 24% of eyes on preoperative assessment. Elevated intraocular pressure ( $>21$  mmHg) was observed in 18% of patients. Phacoemulsification was performed in 68% of cases, whereas extracapsular cataract extraction (ECCE) was done in 32% due to zonular weakness or poor pupil dilation. Intraoperative complications encountered included zonular dialysis (8%), posterior capsular rupture (6%), vitreous loss (4%), and intraocular lens decentration (2%). Pupil expansion devices and capsular tension rings were used in 22% and 18% of patients respectively to manage intraoperative difficulties. Postoperative complications comprised transient corneal edema (10%), raised intraocular pressure (8%), posterior capsular opacification (14%), anterior chamber reaction (6%), and delayed visual recovery (12%). At three months follow-up, 88% of patients achieved a best-corrected visual acuity of 6/12 or better, while the remaining 12% had suboptimal vision due to underlying glaucoma, posterior capsular opacification, or persistent corneal edema. The study emphasizes the increased surgical complexity and complication risks associated with pseudoexfoliation syndrome, necessitating thorough preoperative planning and tailored intraoperative strategies to achieve optimal visual outcomes.

**Table 1: Demographic Characteristics of Study Population**

| Variables           | Values               |
|---------------------|----------------------|
| Total Patients      | 100                  |
| Age (mean $\pm$ SD) | $68.4 \pm 7.9$ years |
| Age 50–60 years     | 18 (18.0%)           |
| Age 61–75 years     | 64 (64.0%)           |
| Age $>75$ years     | 18 (18.0%)           |
| Gender (Male)       | 46 (46.0%)           |
| Gender (Female)     | 54 (54.0%)           |

**Table 2: Preoperative Ocular Characteristics**

| Parameters             | Number of Patients (%) |
|------------------------|------------------------|
| Small Pupil ( $<5$ mm) | 36 (36.0%)             |
| Zonular Weakness       | 24 (24.0%)             |
| IOP $>21$ mmHg         | 18 (18.0%)             |

**Table 3: Type of Cataract Surgery Performed**

| Surgical Approach        | Number of Patients (%) |
|--------------------------|------------------------|
| Phacoemulsification      | 68 (68.0%)             |
| Extracapsular Extraction | 32 (32.0%)             |

**Table 4: Use of Intraoperative Adjuncts**

| Intraoperative Measures | Number of Patients (%) |
|-------------------------|------------------------|
| Capsular Tension Ring   | 18 (18.0%)             |

|                        |            |
|------------------------|------------|
| Pupil Expansion Device | 22 (22.0%) |
|------------------------|------------|

**Table 5: Intraoperative Complications**

| Complications              | Number of Patients (%) |
|----------------------------|------------------------|
| Zonular Dialysis           | 8 (8.0%)               |
| Posterior Capsular Rupture | 6 (6.0%)               |
| Vitreous Loss              | 4 (4.0%)               |
| IOL Decentration           | 2 (2.0%)               |

**Table 6: Postoperative Complications Observed**

| Complications             | Number of Patients (%) |
|---------------------------|------------------------|
| Corneal Edema             | 10 (10.0%)             |
| Raised IOP                | 8 (8.0%)               |
| Anterior Chamber Reaction | 6 (6.0%)               |
| Delayed Visual Recovery   | 12 (12.0%)             |

**Table 7: Posterior Capsular Opacification During Follow-Up**

| PCO Presence | Number of Patients (%) |
|--------------|------------------------|
| PCO Present  | 14 (14.0%)             |
| No PCO       | 86 (86.0%)             |

**Table 8: Intraoperative Complications in Relation to Zonular Weakness**

| Zonular Status   | Intraoperative Complications (%) | p-value |
|------------------|----------------------------------|---------|
| Zonular Weakness | 10 (41.6%)                       | <0.001  |
| Normal Zonules   | 10 (13.1%)                       |         |

**Table 9: Intraoperative Complications in Relation to Small Pupil**

| Pupil Size          | Intraoperative Complications (%) | p-value |
|---------------------|----------------------------------|---------|
| Small Pupil (<5 mm) | 12 (33.3%)                       | <0.001  |
| Normal Pupil        | 8 (12.5%)                        |         |

**Table 10: Visual Outcome at 3-Month Follow-Up**

| BCVA (Snellen) | Number of Patients (%) |
|----------------|------------------------|
| 6/6 to 6/9     | 60 (60.0%)             |
| 6/12           | 28 (28.0%)             |
| <6/12          | 12 (12.0%)             |

**Table 11: Causes of Suboptimal Visual Outcome**

| Causes                   | Number of Patients (%) |
|--------------------------|------------------------|
| Pre-existing Glaucoma    | 5 (5.0%)               |
| Persistent Corneal Edema | 4 (4.0%)               |
| PCO or Other Causes      | 3 (3.0%)               |

**Table 12: Comparison of Postoperative Complications Between Phaco and ECCE**

| Complication  | Phaco (%) | ECCE (%)  | p-value |
|---------------|-----------|-----------|---------|
| Corneal Edema | 4 (5.9%)  | 6 (18.8%) | 0.045   |
| Raised IOP    | 3 (4.4%)  | 5 (15.6%) | 0.038   |
| PCO           | 7 (10.3%) | 7 (21.9%) | 0.091   |

Table 1 presented the demographic distribution of patients, showing predominance of elderly individuals with slight female majority. Table 2 described preoperative ocular findings, highlighting high incidence of small pupil and zonular instability. Table 3 summarized the type of cataract surgeries performed, with phacoemulsification being more common. Table 4 showed the use of intraoperative ad-

juncts like capsular tension rings and pupil expansion devices. Table 5 detailed the intraoperative complications encountered, including zonular dialysis and posterior capsular rupture. Table 6 presented the spectrum of postoperative complications such as corneal edema, raised intraocular pressure, and anterior chamber reaction. Table 7 illustrated the incidence of posterior capsular opacification during follow-up. Table 8 analyzed the significant association

between zonular weakness and intraoperative complications. Table 9 showed a similar correlation between small pupil size and intraoperative complications. Table 10 summarized visual outcomes at 3 months, with majority achieving good visual acuity. Table 11 outlined the causes for suboptimal visual outcomes such as glaucoma, persistent corneal edema, and posterior capsular opacification. Table 12 compared postoperative complications between phacoemulsification and extracapsular cataract extraction, showing lower complication rates with phacoemulsification.

## Discussion

Pseudoexfoliation syndrome (PEX) presents a unique set of challenges to ophthalmic surgeons, particularly during cataract surgery. The present study provides a detailed evaluation of the intraoperative and postoperative complications encountered in cataract surgeries among patients with pseudoexfoliation syndrome, along with an analysis of the clinical characteristics contributing to surgical complexity and visual outcomes [11,12].

The mean age of patients in this study was 68.4 years, with a slight female predominance. This is consistent with the well-established age-related nature of pseudoexfoliation syndrome and its higher prevalence in elderly populations. The demographic findings are in agreement with previous studies conducted across different regions, which also demonstrated that the incidence of pseudoexfoliation rises sharply with advancing age due to progressive deposition of abnormal fibrillar material in ocular structures [13,14].

Small pupil size and zonular weakness were significant preoperative challenges noted in 36% and 24% of cases, respectively. These findings are in accordance with several studies reporting that the pseudoexfoliative material causes iris sphincter atrophy and zonular fiber weakening, both of which directly contribute to intraoperative complications. Poor pupillary dilation and zonular instability remain two of the most significant risk factors for surgical difficulties in these patients [15].

In the current study, phacoemulsification was the most commonly performed surgical technique, although extracapsular cataract extraction was still required in a substantial proportion of cases due to preoperative instability or intraoperative complications. The use of adjunctive measures such as capsular tension rings (18%) and pupil expansion devices (22%) were critical in stabilizing the surgical field and minimizing intraoperative risks [16].

Despite all precautions, intraoperative complications including zonular dialysis (8%), posterior capsular rupture (6%), vitreous loss (4%), and intraocular lens decentration (2%) were observed. These complication rates are comparable with other studies

which have documented higher rates of intraoperative events in pseudoexfoliation patients compared to age-matched non-PEX controls [17].

Postoperatively, corneal edema, raised intraocular pressure, anterior chamber inflammation, and posterior capsular opacification were among the most frequent complications encountered. These postoperative findings reflect the ongoing instability of the anterior segment structures and compromised ocular healing response in pseudoexfoliation patients. Similar complications have been widely reported in the literature, reinforcing the need for careful postoperative monitoring [18].

Visual outcomes in this study were generally favorable, with 88% of patients achieving best-corrected visual acuity of 6/12 or better at 3 months postoperatively. Suboptimal visual outcomes were primarily attributed to pre-existing glaucoma, persistent corneal edema, and posterior capsular opacification. Multiple studies have reported comparable visual success rates in pseudoexfoliation patients when appropriate intraoperative precautions are taken, though they remain at higher risk of late complications such as capsular phimosis and intraocular lens dislocation [19].

The association of zonular weakness and small pupil size with increased intraoperative complications was found to be statistically significant, further emphasizing the importance of preoperative identification of these risk factors. The comparative analysis between phacoemulsification and extracapsular extraction revealed that phacoemulsification, when feasible, offered a lower complication profile and better visual rehabilitation [20].

While this study provides meaningful data, it is not without limitations. The single-center design, relatively limited sample size, and short-term follow-up restrict the generalizability and long-term applicability of the results. Future multicentric studies with longer follow-up will be valuable in further understanding the late-onset complications and optimizing management protocols for pseudoexfoliation syndrome.

## Conclusion

Pseudoexfoliation syndrome poses significant challenges during cataract surgery due to its characteristic zonular weakness, poor pupillary dilation, and altered anterior segment dynamics. This study highlights the higher intraoperative and postoperative complication rates associated with pseudoexfoliation, including zonular dialysis, posterior capsular rupture, vitreous loss, and postoperative corneal edema, raised intraocular pressure, and posterior capsular opacification. Despite these challenges, favorable visual outcomes can still be achieved in the majority of patients when meticulous surgical plan-

ning, careful intraoperative techniques, and adjunctive devices such as capsular tension rings and pupil expansion devices are appropriately utilized. Preoperative identification of risk factors like small pupil size and zonular instability remains crucial in guiding surgical approach and minimizing complications. Phacoemulsification, when feasible, offers better short-term outcomes compared to extracapsular extraction, although the choice of technique should always be individualized based on preoperative findings. Postoperative monitoring for intraocular pressure changes, capsular bag contraction, and late IOL dislocation remains essential for long-term visual stability. Optimization of patient comorbidities and long-term follow-up are important components of comprehensive care in pseudoexfoliation patients. Larger, multicentric studies with extended follow-up are warranted to validate these findings and refine surgical strategies for this high-risk population.

## References

1. Sangal N, Chen TC. Cataract surgery in pseudoexfoliation syndrome. *Semin Ophthalmol*. 2014 Sep-Nov;29(5-6):403-8. doi: 10.3109/08820538.2014.959189. PMID: 25325866.
2. Belovay GW, Varma DK, Ahmed II. Cataract surgery in pseudoexfoliation syndrome. *Curr Opin Ophthalmol*. 2010 Jan;21(1):25-34. doi: 10.1097/ICU.0b013e328332f814. PMID: 19816175.
3. Drolsum L, Ringvold A, Nicolaissen B. Cataract and glaucoma surgery in pseudoexfoliation syndrome: a review. *Acta Ophthalmol Scand*. 2007 Dec;85(8):810-21. doi: 10.1111/j.1600-0420.2007.00903.x. Epub 2007 Mar 22. PMID: 17376188.
4. Ilveskoski L, Taipale C, Tuuminen R. Anti-inflammatory Medication of Cataract Surgery in Pseudoexfoliation Syndrome - NSAID Is Needed. *Curr Eye Res*. 2020 Jul;45(7):814-819. doi: 10.1080/02713683.2019.1701686. Epub 2019 Dec 12. PMID: 31801388.
5. Ilveskoski L, Taipale C, Holmström EJ, Tuuminen R. Macular edema after cataract surgery in eyes with and without pseudoexfoliation syndrome. *Eur J Ophthalmol*. 2019 Sep;29(5):504-509. doi: 10.1177/1120672118799622. Epub 2018 Sep 12. PMID: 30205708.
6. Crandall AS. Exfoliation Syndrome and Cataract Surgery. *J Glaucoma*. 2018 Jul;27 Suppl 1:S102-S104. doi: 10.1097/IJG.0000000000000925. PMID: 29965904.
7. Sastry PV, Singal AK. Cataract surgery outcome in patients with non-glaucomatous pseudoexfoliation. *Rom J Ophthalmol*. 2017 Jul-Sep;61(3):196-201. doi: 10.22336/rjo.2017.36. PMID: 29450398; PMCID: PMC5710038.
8. Gunes A, Yasar C, Tok L, Tok O. Prevalence of Pseudoexfoliation Syndrome in Turkish Patients with Senile Cataract. *Semin Ophthalmol*. 2017;32(3):297-301. doi: 10.3109/08820538.2015.1068344. Epub 2016 Jan 21. PMID: 26795697.
9. V Tran T, Mansouri K, Mermoud A. Gonioscopy: a new surgical approach combined with cataract surgery to lower intraocular pressure in pseudoexfoliation syndrome. *Int Ophthalmol*. 2021 May;41(5):1563-1571. doi: 10.1007/s10792-020-01459-5. Epub 2020 Jun 26. PMID: 32592126; PMCID: PMC8087560.
10. Tanhehco T, Chen SH. Pseudoexfoliation syndrome and cataract surgery. *Int Ophthalmol Clin*. 2010 Winter;50(1):81-93. doi: 10.1097/IIO.0b013e3181c5719c. PMID: 20057298.
11. Bharathi M, Krishnamurthy R. Pseudoexfoliation after Cataract Surgery. *Ophthalmol Glaucoma*. 2019 Jul-Aug;2(4):231. doi: 10.1016/j.ogla.2019.04.004. PMID: 32672543.
12. Kristianslund O, Østern AE, Råen M, Sandvik GF, Drolsum L. Does cataract surgery reduce the long-term risk of glaucoma in eyes with pseudoexfoliation syndrome? *Acta Ophthalmol*. 2016 May;94(3):261-5. doi: 10.1111/aos.12945. Epub 2016 Jan 9. PMID: 26749122.
13. Kristianslund O, Pathak M, Østern AE, Drolsum L. Corneal endothelial cell loss following cataract surgery in patients with pseudoexfoliation syndrome: a 2-year prospective comparative study. *Acta Ophthalmol*. 2020 Jun;98(4):337-342. doi: 10.1111/aos.14314. Epub 2019 Nov 26. PMID: 31773906.
14. Vazquez-Ferreiro P, Carrera-Hueso FJ, Barreiro-Rodriguez L, Diaz-Rey M, Jornet JEP. Prevalence of cataract complications in patients with pseudoexfoliation syndrome in Northwestern Spain. *Arq Bras Oftalmol*. 2019 Sep 12;82(6):495-500. doi: 10.5935/0004-2749.20190095. PMID: 31531545.
15. Carifi G. Pseudoexfoliation syndrome and cataract surgery. *Eur J Ophthalmol*. 2012 Sep-Oct;22(5):864-5; author reply 865-7. doi: 10.5301/ejo.5000104. PMID: 22287167.
16. Hayashi K, Manabe S, Yoshimura K, Kondo H. Corneal endothelial damage after cataract surgery in eyes with pseudoexfoliation syndrome. *J Cataract Refract Surg*. 2013 Jun;39(6):881-7. doi: 10.1016/j.jcrs.2013.01.032. Epub 2013 Apr 10. PMID: 23582364.
17. Teshome T, Regassa K. Prevalence of pseudoexfoliation syndrome in Ethiopian patients scheduled for cataract surgery. *Acta Ophthalmol Scand*. 2004 Jun;82(3 Pt 1):254-8. doi: 10.1111/j.1365-3113.2004.00311.x. PMID: 15311111.

- 10.1111/j.1395-3907.2004.00263.x. PMID: 15115444.
18. Garweg JG, Zandi S, Gerhardt C, Pfister IB. Isoforms of TGF- $\beta$  in the aqueous humor of patients with pseudoexfoliation syndrome and a possible association with the long-term stability of the capsular bag after cataract surgery. *Graefes Arch Clin Exp Ophthalmol*. 2017 Sep;255(9):1763-1769. doi: 10.1007/s00417-017-3724-8. Epub 2017 Jun 28. PMID: 28660443.
19. Wirbelauer C, Anders N, Pham DT, Wollensak J. Corneal endothelial cell changes in pseudoexfoliation syndrome after cataract surgery. *Arch Ophthalmol*. 1998 Feb;116(2):145-9. doi: 10.1001/archophth.116.2.145. PMID: 9488264.
20. Jawad M, Nadeem AU, Khan Au, Aftab M. Complications of cataract surgery in patients with pseudoexfoliation syndrome. *J Ayub Med Coll Abbottabad*. 2009 Apr-Jun;21(2):33-6. PMID: 20524464.