



ORIGINAL ARTICLE

A Prospective Observational Study on the Prevalence of Dry Eye in Post-Cataract Surgery Patients in a Tertiary Care Hospital in Perambalur, Tamil Nadu

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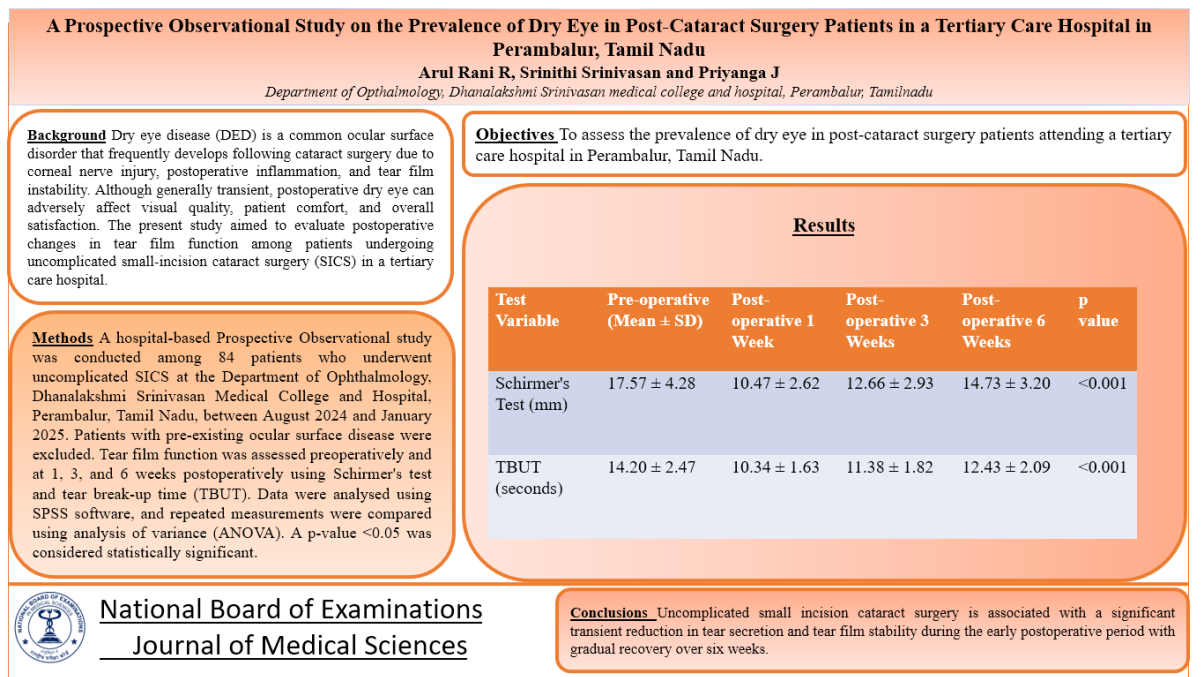
Abstract

Background: Dry eye disease (DED) is a common ocular surface disorder that frequently develops following cataract surgery due to corneal nerve injury, postoperative inflammation, and tear film instability. Although generally transient, postoperative dry eye can adversely affect visual quality, patient comfort, and overall satisfaction. The present study aimed to evaluate postoperative changes in tear film function among patients undergoing uncomplicated small-incision cataract surgery (SICS) in a tertiary care hospital. **Materials and Methods:** A hospital-based Prospective Observational study was conducted among 84 patients who underwent uncomplicated SICS at the Department of Ophthalmology, Dhanalakshmi Srinivasan Medical College and Hospital, Perambalur, Tamil Nadu, between August 2024 and January 2025. Patients with pre-existing ocular surface disease were excluded. Tear film function was assessed preoperatively and at 1, 3, and 6 weeks postoperatively using Schirmer's test and tear break-up time (TBUT). **Results:** The majority of participants belonged to the 56–60-year age group (42.9%), with females constituting 53.6% of the study population. Preoperatively 71.4% of patients had Schirmer's test values >15 mm which declined to 9.5% at one week after surgery before improving to 46.4% at six weeks. Mean Schirmer's test values decreased significantly from 17.57 ± 4.28 mm preoperatively to 10.47 ± 2.62 mm at one week and subsequently improved to 14.73 ± 3.20 mm at six weeks ($p < 0.001$). Similarly, all patients had normal TBUT (>10 seconds) before surgery, whereas only 63.1% maintained normal TBUT at one week. Mean TBUT decreased significantly from 14.20 ± 2.47 seconds preoperatively to 10.34 ± 1.63 seconds at one week and improved to 12.43 ± 2.09 seconds by six weeks ($p < 0.001$). **Conclusion:** Uncomplicated small incision cataract surgery is associated with a significant transient reduction in tear secretion and tear film stability during the early postoperative period with gradual recovery over six weeks. Routine postoperative assessment of tear film function and timely initiation of lubricating therapy may improve patient comfort, ocular surface health, and visual rehabilitation following cataract surgery.

Keywords: Dry eye disease, Cataract surgery, Small-incision cataract surgery, Schirmer's test, Tear break-up time, Tear film stability

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Graphical Abstract



Introduction

Dry eye syndrome (DES) is a common complication after cataract surgery, affecting a significant number of patients [1]. Although cataract surgery is highly successful in restoring vision. It can lead to changes in tear film stability and ocular surface integrity thereby contributing to the development of DES. The reported prevalence of dry eye symptoms post cataract surgery varies considerably among studies based on the diagnostic criteria employed and the population examined [2]. Postoperative dry eye can be caused by intraoperative damage to corneal nerves, alterations in tear film dynamics, and inflammatory responses initiated by the surgical intervention. Pre existing factors such as age related reduction in tear production and meibomian gland dysfunction may also aggravate the condition [3]. Knowledge of the prevalence and associated risk factors of dry eye following cataract surgery is vital in enhancing patient outcomes and directing

perioperative management protocols.(4) Against this background, the present study was undertaken to assess the prevalence of dry eye among patients undergoing cataract surgery at a tertiary care hospital in Perambalur, Tamil Nadu.

Objective

To assess the prevalence of dry eye in post-cataract surgery patients attending a tertiary care hospital in Perambalur, Tamil Nadu.

Materials and Methods

A hospital based Prospective Observational study was conducted among patients attending the Ophthalmology Outpatient Department of Dhanalakshmi Srinivasan Medical College and Hospital, Perambalur, Tamil Nadu over a period of six months from August 2024 to January 2025. The sample size was calculated using the formula $N = Z^2_{1-\alpha/2} \times p \times (1 - p) / d^2$ considering a reported prevalence of postoperative dry eye of 67.7% from a

comparable tertiary care hospital study conducted in Pondicherry [5] with a 95% confidence level ($Z = 1.96$) and an allowable error of 10% yielding a minimum required sample size of 84 participants. Patients were selected using a convenient sampling technique. Individuals undergoing uncomplicated small incision cataract surgery (SICS) at the study centre were included while patients with pre existing ocular diseases were excluded. All participants underwent comprehensive ophthalmic evaluation including best-corrected visual acuity assessment, slit lamp examination of the anterior segment, posterior segment evaluation using indirect ophthalmoscopy and slit lamp biomicroscopy with a 90D lens, colour vision testing, applanation tonometry, Schirmer's test using Whatman filter paper strips and tear break-up time (TBUT) measurement. The collected data were entered into Microsoft Excel for data cleaning and subsequently analysed using SPSS statistical software.

Results

The study included 84 patients who underwent uncomplicated small-incision cataract surgery (SICS). The mean age of the patients was 56 to 60 years (42.9%) and females made up 53.6% of the study population. Demographic characteristics of the study population is given in Table 1.

The most common type of cataract is mature cataract (29.8%). Distribution of type of Cataract is given in Table 2. Descriptive findings of Schirmer's test and Tear Break-UP Time (TBUT) before and after cataract surgery is displayed in Table 3 and Table 4 respectively.

Evaluation of tear film function showed a significant postoperative decrease in both Schirmer's test values and tear break up time (TBUT) with maximum deterioration seen during the first postoperative week. The mean Schirmer's test value decreased significantly from 17.57 ± 4.28 mm preoperatively to 10.47 ± 2.62 mm at one week while the mean TBUT declined from 14.20 ± 2.47 seconds to 10.34 ± 1.63 seconds ($p < 0.001$ for both). Progressive improvement in both parameters was observed at 3 and 6 weeks postoperatively, as shown in Table 5.

Using TBUT < 10 seconds as the diagnostic criterion, the prevalence of postoperative dry eye was 36.9% at one week, which declined to 21.4% at three weeks and 2.4% at six weeks indicating gradual recovery of tear film stability, as shown in Table 6.

Overall the findings demonstrate that postoperative dry eye following uncomplicated SICS is a common but predominantly transient condition that improves substantially within six weeks after surgery.

Table 1. Demographic Characteristics of the Study Participants (N = 84)

Variable	Category	Frequency (n)	Percentage (%)
Age (years)	45–50	5	6.0
	51–55	8	9.5
	56–60	36	42.9
	61–65	24	28.6
	66–70	10	11.9
	70–75	1	1.2
Sex	Male	39	46.4
	Female	45	53.6

Table 2. Distribution of Cataract Types Among the Study Participants (N = 84)

Type of Cataract	Frequency (n)	Percentage (%)
Mature	25	29.8
NS I	18	21.4
NS II with NS I	19	22.6
NS II	5	6.0
NS II–III	9	10.7
NS III	5	6.0
NS III–IV	1	1.2
NS IV	2	2.4
Total	84	100.0

Table 3. Schirmer's Test Findings Before and After Cataract Surgery (N = 84)

Schirmer's Test	Pre-operative n (%)	Post-operative 1 Week n (%)	Post-operative 3 Weeks n (%)	Post-operative 6 Weeks n (%)
>15 mm	60 (71.4)	8 (9.5)	18 (21.4)	39 (46.4)
9–14 mm	24 (28.6)	57 (67.9)	61 (72.6)	45 (53.6)
4–8 mm	0 (0.0)	19 (22.6)	5 (6.0)	0 (0.0)
Total	84 (100.0)	84 (100.0)	84 (100.0)	84 (100.0)

Table 4. Tear Break-Up Time (TBUT) Before and After Cataract Surgery (N = 84)

TBUT	Pre-operative n (%)	Post-operative 1 Week n (%)	Post-operative 3 Weeks n (%)	Post-operative 6 Weeks n (%)
>10 seconds	84 (100.0)	53 (63.1)	66 (78.6)	82 (97.6)
<10 seconds	0 (0.0)	31 (36.9)	18 (21.4)	2 (2.4)
Total	84 (100.0)	84 (100.0)	84 (100.0)	84 (100.0)

Table 5. Comparison of Mean Schirmer's Test and TBUT Values Before and After Cataract Surgery (N = 84)

Test Variable	Pre-operative (Mean $\pm$ SD)	Post- operative 1 Week	Post- operative 3 Weeks	Post- operative 6 Weeks	<i>p</i> value
Schirmer's Test (mm)	17.57 $\pm$ 4.28	10.47 $\pm$ 2.62	12.66 $\pm$ 2.93	14.73 $\pm$ 3.20	<0.001*
TBUT (seconds)	14.20 $\pm$ 2.47	10.34 $\pm$ 1.63	11.38 $\pm$ 1.82	12.43 $\pm$ 2.09	<0.001*

**p* value<0.05-Statistically significant

Table 6. Prevalence of Postoperative Dry Eye Based on TBUT (<10 Seconds) (N = 84)

Follow-up Period	Dry Eye Present n (%)	Dry Eye Absent n (%)
Pre-operative	0 (0.0)	84 (100.0)
1 Week	31 (36.9)	53 (63.1)
3 Weeks	18 (21.4)	66 (78.6)
6 Weeks	2 (2.4)	82 (97.6)

Discussion

Dry eye disease is a well-recognised complication following cataract surgery, primarily resulting from transient disruption of the ocular surface caused by surgical trauma, corneal nerve transection, postoperative inflammation, and instability of the tear film [2, 6, 7]. The present study evaluated postoperative tear film changes in 84 patients undergoing uncomplicated small-incision cataract surgery (SICS)

using Schirmer's test and tear break-up time (TBUT) over a six-week follow-up period.

In the present study, the most common age group of patients was 56–60 years (42.9%), followed by 61–65 years (28.6%), with a slight female preponderance (53.6%). The results are similar to those of Krishna Chaithanya et al, who also observed that cataract surgery was more often performed in the older age group, which is in accordance with the

increasing age-related prevalence of cataracts [5]. Schirmer's test showed a significant decrease in tear secretion after surgery. The value of Schirmer's test above 15 mm was found in 71.4% of patients before surgery, while the value was only 9.5% at 1 week after surgery. However, the value of Schirmer's test between 4 and 8 mm was found in 22.6% of patients, indicating transient postoperative aqueous tear deficiency. Follow up showed gradual improvement with 46.4% of patients having Schirmer's values above 15 mm at six weeks and no patient in severe dry eye category. Mean Schirmer's values showed statistically significant fall from 17.57 ± 4.28 mm preoperatively to 10.47 ± 2.62 mm at one week and gradually improving to 14.73 ± 3.20 mm at six weeks ($p < 0.001$). Our findings are in concordance with studies done by Li et al., Khanal et al., Dasgupta and Gupta, Ishrat et al. and Zamora et al., who have also reported significant postoperative reduction in tear secretion with gradual recovery in subsequent weeks after cataract surgery [2,3,8,9,10]. Similarly, TBUT showed significant postoperative deterioration in the present study. Before surgery, all the patients had normal TBUT (>10 seconds) whereas only 63.1% maintained normal values during the first postoperative week. Decreased TBUT (5–10 seconds) was seen in 36.9% of patients at one week, which gradually decreased to 21.4% at three weeks and only 2.4% at six weeks. Mean TBUT decreased significantly from 14.20 ± 2.47 seconds preoperatively to 10.34 ± 1.63 seconds during the first postoperative week and then improved to 12.43 ± 2.09 seconds by six weeks ($p < 0.001$). These findings are closely similar to those reported by Khanal et al., Dasgupta and Gupta, Ishrat et al., Lu et al., and Miura et al. who have shown that

the instability of the tear film in the postoperative period is maximum in the early period and gradually improves with healing of the cornea [3,8,9,11,12]. The transient deterioration in Schirmer's test and TBUT in this study can be explained by various pathophysiological mechanisms. Surgical incision causes disruption of corneal sub-basal nerve plexus, leading to reduction in corneal sensitivity and impaired reflex tear secretion [3,6]. Further, exposure to microscope light, postoperative topical medications and surgically induced inflammation lead to instability of the tear film and damage to the ocular surface [2,6,7]. Meibomian gland dysfunction following cataract surgery has also been reported to aggravate evaporative dry eye and prolong postoperative symptoms [13,14].

An encouraging finding of the present study was the gradual recovery of both Schirmer's test and TBUT during follow-up. The tear film parameters showed significant deterioration during the first postoperative week with progressive improvement at three and six weeks which indicates that the postoperative dry eye after uncomplicated SICS is largely transient. Similar observations have been reported in systematic reviews and meta-analyses conducted by Lu et al., Miura et al. and Ta et al. which concluded that the dry eye symptoms usually peak during the early postoperative period and progressively improve with corneal nerve regeneration and ocular surface healing [11,12,15]. Overall, the present study confirms that uncomplicated SICS is associated with significant but reversible postoperative changes in tear secretion and tear film stability. These findings emphasize the importance of routine postoperative evaluation of tear film function and early

initiation of ocular lubricants to minimise patient discomfort, improve visual quality, and enhance postoperative satisfaction [7,16,17].

Although the present study assessed postoperative dry eye using objective clinical measures, namely Schirmer's test and tear break-up time (TBUT), it did not include a validated symptom-based questionnaire such as the Ocular Surface Disease Index (OSDI). It is well recognized that objective signs of dry eye do not always correlate with patients' subjective symptoms, as the severity of ocular discomfort may be influenced by several individual and psychosocial factors. Therefore, incorporating both objective clinical tests and validated symptom assessment tools would provide a more comprehensive evaluation of postoperative dry eye and should be considered in future studies.

Limitations

The present study has certain limitations. First, it was conducted at a single tertiary care centre with a relatively small sample size of 84 participants, which may limit the generalisability of the findings. Second, participants were recruited using a convenience sampling technique which may have introduced selection bias and limited the representativeness of the study population. Therefore, the findings should be interpreted with caution when extrapolating to broader populations or different healthcare settings. Third patients were followed only up to six weeks after surgery; therefore, long-term recovery of tear film function could not be evaluated. Fourth, only patients undergoing uncomplicated SICS were included, and comparison with phacoemulsification or femtosecond laser-

assisted cataract surgery was not performed. Finally, potential systemic and ocular risk factors such as diabetes mellitus, meibomian gland dysfunction, and pre-existing ocular surface abnormalities were not analysed in detail, which may have influenced postoperative tear film changes.

Conclusion

The present study demonstrates that dry eye is a common early postoperative ocular surface change after uncomplicated small incision cataract surgery. Significant reductions in Schirmer's test values and TBUT were observed during the first postoperative week suggesting decreased tear secretion and tear film instability. Both parameters improved progressively during further follow-up, with substantial recovery by six weeks, although complete normalization was not seen in all patients. These findings suggest that postoperative dry eye is mostly transient and resolves with ocular surface healing. Routine preoperative assessment of tear film function, meticulous postoperative monitoring and early implementation of lubricating therapy can help minimize postoperative discomfort, enhance tear film stability and improve visual rehabilitation and patient satisfaction after cataract surgery.

Clinical Implications

These findings support incorporating tear film evaluation into routine postoperative cataract follow-up, particularly during the early postoperative period. Patients at higher risk or those reporting persistent ocular discomfort may benefit from individualized ocular surface assessment and appropriate management to optimize postoperative visual rehabilitation and patient satisfaction.

Authors' Contributions

ARR has contributed to the conceptualization and definition of the intellectual content of the manuscript, design of the study and Manuscript preparation. SS contributed to the literature search, manuscript editing, and manuscript review. JP contributed towards data acquisition Statistical analysis, Manuscript review and editing. ARR1 will act as the corresponding author of the manuscript

Data availability statement

The datasets generated and analysed in this study are available from the corresponding author on reasonable request. They are not publicly shared because they contain sensitive information that could indirectly identify participants.

Ethical approval

This study has been approved by the Institution Ethics Committee Ref.No: IECHS/IRCHS/No:579

Informed Consent

Written informed consent was obtained from all participants after explaining the study procedures, potential risks and benefits. Consent covered both participation and publication of anonymised findings, with assurance of confidentiality and data privacy.

Conflicts of interest

The authors declare that they do not have conflict of interest.

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