

# Ocular Surface Odyssey: Navigating Post-Cataract Surgery Landscapes In Diabetic And Non-Diabetic Patients

Juhi Yadav, Dr Ashish Chandra

(Research Scholar Department Of Optometry, Teerthanker Mahaveer University, Moradabad, Uttar Pradesh, India)

(Professor And Head Department Of Optometry, Teerthanker Mahaveer University, Moradabad, Uttar Pradesh, India)

---

## Abstract:

**Background:** Phacoemulsification effectively treats cataracts but often causes post-operative dry eye, impacting recovery and satisfaction. Diabetic patients, with impaired tear function and delayed healing, are more vulnerable to these complications. Limited studies directly compare short-term outcomes between diabetic and non-diabetic patients, warranting further research. The objective of this study was to evaluate and compare the short-term effects of uncomplicated phacoemulsification cataract surgery on the ocular surface in a cohort of diabetic and non-diabetic patients.

**Materials and Methods:** This study included 100 eyes of 100 patients undergoing uncomplicated phacoemulsification. Patients were divided into two groups: diabetic (n=50) and non-diabetic (n=50). Ocular surface parameters, including Ocular Surface Disease Index (OSDI) score, tear break-up time (TBUT) and Schirmer I test were assessed pre-operatively and at 1-week and 1-month post-surgery.

**Results:** Both diabetic and non-diabetic groups showed a transient worsening of ocular surface parameters at 1-week post-surgery, with significant increases in OSDI scores and decreases in TBUT and Schirmer I values (all  $p < 0.05$ ). At one month following surgery, a partial improvement in these parameters was observed in both cohorts; however, several indices, particularly in the diabetic group, had not fully reverted to their preoperative baseline levels. Diabetic patients exhibited significantly worse pre-operative ocular surface parameters compared to non-diabetic patients ( $p < 0.01$  for OSDI, TBUT, Schirmer). Post-operatively, the diabetic group consistently demonstrated more pronounced and prolonged ocular surface dysfunction, with significantly higher OSDI score, and lower TBUT and Schirmer values at both 1-week and 1-month follow-up compared to the non-diabetic group (all  $p < 0.05$ ).

**Conclusion:** Uncomplicated phacoemulsification cataract surgery temporarily exacerbates ocular surface dysfunction in both diabetic and non-diabetic patients. However, diabetic patients experience more severe pre-existing ocular surface disease and a more pronounced, prolonged, and less complete recovery of ocular surface parameters post-operatively. These findings highlight the importance of pre-operative ocular surface optimization and targeted post-operative management, especially in diabetic individuals undergoing cataract surgery.

**Key Word:** Ocular surface disease index, Cataract surgery, Tear breakup time, Schirmer Test.

---

Date of Submission: 05-09-2025

Date of Acceptance: 15-09-2025

---

## I. Introduction

Phacoemulsification cataract surgery is widely recognized as a safe and effective treatment for cataract, the leading cause of reversible visual impairment globally [1]. Despite advances in surgical techniques and outcomes, post-operative dry eye symptoms remain common and can significantly impact visual rehabilitation and patient satisfaction [2]. Cataract surgery can disrupt the ocular surface by altering tear film stability, corneal sensitivity, and epithelial integrity due to factors such as light exposure, irrigation, and use of topical medications [3].

Diabetes mellitus is known to adversely affect the ocular surface. Patients with diabetes often present with compromised tear production, decreased corneal sensitivity, and delayed wound healing, contributing to a higher prevalence of ocular surface disease [4,5]. These factors may increase their susceptibility to post-operative dry eye and delayed recovery following cataract surgery.

While several studies have addressed ocular surface changes after cataract surgery [1-3], only a few have directly compared the short-term post-operative effects between diabetic and non-diabetic patients [6,7].

Understanding these differences is crucial for tailoring perioperative management and improving patient outcomes.

## II. Material And Methods

This prospective study was undertaken at TMU Hospital, Moradabad, following ethical clearance from the Institutional Ethics Committee, and in accordance with the principles outlined in the Declaration of Helsinki. Informed consent was obtained from all participants. A total of 100 eyes from 100 patients scheduled for uneventful phacoemulsification were enrolled and stratified into two groups. The Diabetic Group (n=50) comprised individuals with Type 1 or Type 2 diabetes mellitus, whose glycemic status was controlled either through dietary modifications or pharmacotherapy, with HbA1c levels maintained at or below 8.0%. The Non-Diabetic Group (n=50) included patients with no history of diabetes. Inclusion criteria consisted of age  $\geq 50$  years, the presence of age-related cataract requiring surgical intervention, and a best-corrected visual acuity (BCVA) of  $\leq 20/40$ . Patients were excluded if they had a prior history of ocular trauma or intraocular surgery, severe ocular surface disorders (e.g., Sjögren's syndrome, blepharitis), use of topical ocular medications that could alter tear film dynamics, systemic illnesses affecting the ocular surface (excluding diabetes), or any intraoperative or postoperative complications.

All surgeries were performed by experienced ophthalmic surgeons using a standardized phacoemulsification technique via a 2.2 mm clear corneal incision. A cohesive viscoelastic and balanced salt solution were employed during the procedure, and all patients received routine postoperative care, including topical antibiotics and corticosteroids. Ocular surface assessments were conducted at three key time points: preoperatively, one week postoperatively, and one month postoperatively. Evaluation parameters included the Ocular Surface Disease Index (OSDI), a 12-item questionnaire scored from 0 to 100 to assess subjective symptoms; Tear Film Break-Up Time (TBUT), measured as the interval before the appearance of the first dry spot following fluorescein dye instillation; and the Schirmer I Test, which gauged tear production over a five-minute period without topical anesthesia. These assessments enabled a comprehensive comparison of ocular surface dynamics in diabetic and non-diabetic patients following cataract surgery.

### Statistical Analysis

Data were analysed using Microsoft excel. Mean, standard deviation and independent t-tests were analysed. A p-value  $< 0.05$  was considered statistically significant.

## III. Result

Both groups were comparable at baseline. The mean age was  $68.5 \pm 7.2$  years in the diabetic group and  $67.9 \pm 6.8$  years in the non-diabetic group ( $p = 0.71$ ). Gender distribution was also similar, with a male-to-female ratio of 24:26 in the diabetic group and 27:23 in the non-diabetic group ( $p = 0.60$ ). Pre-operative BCVA showed no significant difference between groups ( $0.62 \pm 0.15$  vs.  $0.59 \pm 0.14$ ,  $p = 0.34$ ) as shown in table 1.

Characteristic	Diabetic Group (n=50)	Non diabetic Group (n=50)	P value
Age (years)	$68.5 \pm 7.2$	$67.9 \pm 6.8$	0.71
Gender (M:F)	24:26	27:23	0.60
Pre-op BCVA	$0.62 \pm 0.15$	$0.59 \pm 0.14$	0.34

Table 1 showing Mean and standard deviation of age, gender and preoperative BCVA in both groups

### Pre-operative Ocular Surface Parameters

The diabetic group had significantly worse baseline ocular surface parameters compared to the non-diabetic group. Mean OSDI scores were  $32.8 \pm 8.5$  in diabetics and  $20.1 \pm 6.3$  in non-diabetics ( $p < 0.001$ ). TBUT was significantly lower in the diabetic group ( $5.8 \pm 1.2$  seconds) than in the non-diabetic group ( $8.9 \pm 1.5$  seconds,  $p < 0.001$ ). Schirmer I values were also reduced in diabetic patients ( $7.1 \pm 1.8$  mm vs.  $11.5 \pm 2.1$  mm,  $p < 0.001$ ). As shown in table 2.

Parameter	Diabetic Group	Non-Diabetic Group	P-value
OSDI	$32.8 \pm 8.5$	$20.1 \pm 6.3$	$< 0.001$
TBUT (s)	$5.8 \pm 1.2$	$8.9 \pm 1.5$	$< 0.001$
Schirmer I (mm)	$7.1 \pm 1.8$	$11.5 \pm 2.1$	$< 0.001$

Table 2 showing preoperative ocular surface parameters

### Post-operative Outcomes

At 1-week post-surgery, both groups exhibited worsened OSDI, TBUT and Schirmer I ( $p < 0.05$ ). At 1-month, partial recovery was noted, but diabetic patients remained significantly more affected than non-diabetics.

### Post-operative Ocular Surface Parameters

At 1-week post-surgery, both groups exhibited a statistically significant worsening in all ocular surface parameters. The diabetic group reported a mean OSDI of  $45.6 \pm 9.2$  compared to  $29.4 \pm 7.8$  in the non-diabetic group ( $p < 0.001$ ). TBUT was significantly lower in diabetics ( $4.2 \pm 1.1$  seconds) than in non-diabetics ( $6.9 \pm 1.4$  seconds,  $p < 0.001$ ). Similarly, Schirmer I values were reduced in diabetics ( $5.1 \pm 1.6$  mm) compared to non-diabetics ( $9.8 \pm 1.9$  mm,  $p < 0.001$ ). As shown in table 3

By 1-month post-surgery, partial recovery was observed in both groups. However, diabetic patients continued to exhibit significantly impaired ocular surface health. OSDI remained higher in diabetics ( $36.2 \pm 7.9$ ) than in non-diabetics ( $23.1 \pm 6.5$ ,  $p < 0.001$ ). TBUT in the diabetic group improved to  $5.3 \pm 1.3$  seconds, but remained significantly lower than  $8.4 \pm 1.3$  seconds in the non-diabetic group ( $p < 0.001$ ). Schirmer, I score were  $6.3 \pm 1.7$  mm in diabetics and  $11.1 \pm 2.0$  mm in non-diabetics ( $p < 0.001$ ).

Parameter	Time Point	Diabetic Group (Mean $\pm$ SD)	Non-Diabetic Group (Mean $\pm$ SD)	P-value
OSDI	1-week	$45.6 \pm 9.2$	$29.4 \pm 7.8$	$<0.001$
	1-month	$36.2 \pm 7.9$	$23.1 \pm 6.5$	$<0.001$
TBUT (seconds)	1-week	$4.2 \pm 1.1$	$6.9 \pm 1.4$	$<0.001$
	1-month	$5.3 \pm 1.3$	$8.4 \pm 1.3$	$<0.001$
Schirmer I (mm)	1-week	$5.1 \pm 1.6$	$9.8 \pm 1.9$	$<0.001$
	1-month	$6.3 \pm 1.7$	$11.1 \pm 2.0$	$<0.001$

Table 3 Showing post operative ocular surface parameters at 1 week and 1 month in both groups

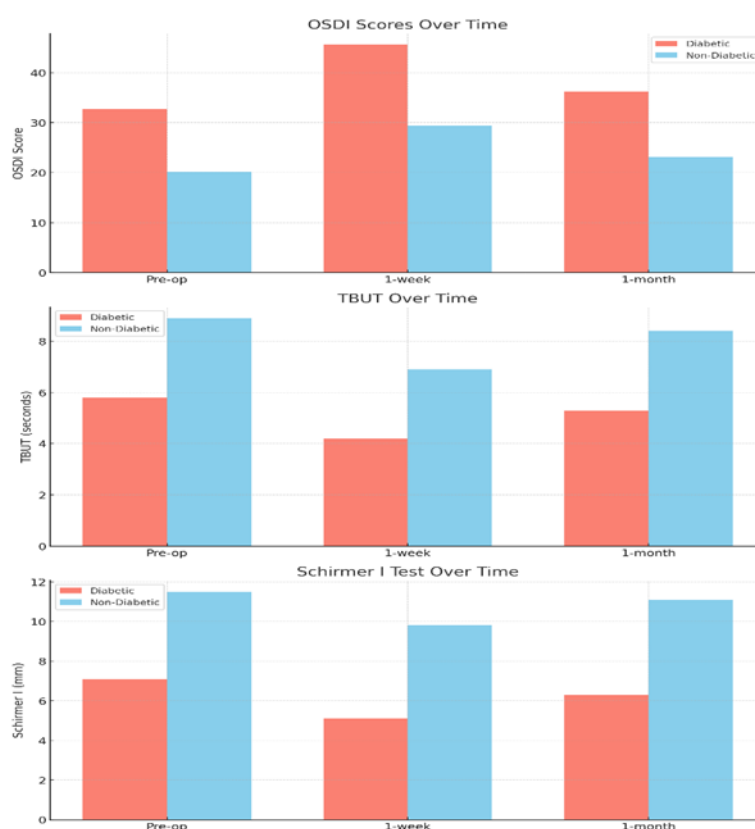


Fig 1: Showing post operative ocular surface parameters at preoperative, 1 week and 1 month in both groups

## IV. Discussion

Our study demonstrates that cataract surgery transiently worsens ocular surface parameters in both diabetic and non-diabetic individuals, consistent with findings by Mian et al. (2014) [1] and Kasetsuwan et al.[2] (2013). The diabetic group showed significantly worse baseline and post-operative outcomes, corroborating results by Zhou et al. [6] (2018) and Yu et al.[7] (2021).

In a comprehensive meta-analysis published by Wang et al.[10] in 2025, encompassing 20 studies and a cumulative sample of 1,694 eyes evaluated between 2010 and 2021, a significant short-term reduction in Tear Film Break-Up Time (TBUT) was reported, with moderate persistence of ocular surface compromise in the medium term. The findings underscore the differential healing trajectories between diabetic and non-diabetic individuals following cataract surgery. Diabetes mellitus is well recognized for its deleterious effects on corneal physiology, including diminished corneal innervation, reduced tear secretion, and impaired epithelial

regeneration—all of which collectively contribute to delayed ocular surface recovery. While non-diabetic patients generally demonstrated near-complete restoration of ocular surface parameters by one month postoperatively, diabetic individuals exhibited ongoing signs of surface instability and dysfunction during the same period.

This underscores the need for pre-operative ocular surface assessment and customized post-operative care, including preservative-free artificial tears and anti-inflammatory therapies for diabetic patients.

Limitations: - This study is limited by its relatively small sample size and single-center design, which may affect the generalizability of the results. The short follow-up period of one month may not fully reflect long-term ocular surface changes, especially in diabetic patients. Glycemic fluctuations, duration of diabetes, and presence of diabetic complications were not assessed, which could influence healing outcomes. Additionally, objective measures like tear osmolarity or confocal microscopy were not utilized, potentially limiting the depth of ocular surface evaluation.

## V. Conclusion

Although uncomplicated phacoemulsification commonly results in transient ocular surface changes, diabetic patients tend to exhibit more pronounced dysfunction and delayed recovery, necessitating heightened perioperative vigilance. While ophthalmologists are generally well-informed of these outcomes, initial symptom management often falls to nursing, optometry, and paramedical personnel. Thus, it is imperative that this knowledge be consistently reinforced through structured medical education and orientation programs, particularly for newly appointed staff, as even minor lapses in care can have significant implications in diabetic cases.

## References

- [1]. Mian SI, Rahman MQ, Jones YJ, Et Al. Ocular Surface Disease After Cataract Surgery: A Prospective, Comparative, 6-Month Study. *J Cataract Refract Surg*. 2014;40(12):2075–2081.
- [2]. Kasetsuwan N, Satitpitakul V, Changul T, Jariyakosol S. Incidence Of Dry Eye After Cataract Surgery. *J Med Assoc Thai*. 2013;96(8):998–1004.
- [3]. Ram J, Gupta A, Brar G, Kaushik S. Postoperative Dry Eye After Phacoemulsification: Incidence, Risk Factors, And Management. *Indian J Ophthalmol*. 2017;65(1):11–17.
- [4]. Kim J, Flach AJ, Jampol LM. The Effects Of Diabetes On The Ocular Surface. *Curr Eye Res*. 2011;36(1):1–10.
- [5]. Reddy P, Vijayalakshmi P, Muralidhar R, Arvind B. Diabetic Keratopathy: A Review. *J Clin Diagn Res*. 2016;10(11):NE01–NE04.
- [6]. Zhou J, Wang J, Yu Y, Et Al. Changes Of Ocular Surface In Diabetic Patients After Phacoemulsification. *Int J Ophthalmol*. 2018;11(10):1618–1623.
- [7]. Yu Y, Wang Y, Fan X, Zhang L. Impact Of Diabetes Mellitus On Ocular Surface Disease After Cataract Surgery. *BMC Ophthalmol*. 2021;21(1):159.
- [8]. Trattler WB, Majmudar PA, Donnenfeld ED, Et Al. The Importance Of Treating Ocular Surface Disease In Cataract Surgery Patients. *Ophthalmol Ther*. 2016;5(1):1–10.
- [9]. Liu Q, Zhang M, Wang Y, Et Al. Ocular Surface Changes And Corneal Epithelial Remodeling After Cataract Surgery In Patients With Type 2 Diabetes: A Case-Control Study. *BMC Ophthalmol*. 2025;25(1):112.
- [10]. Wang X, Chen Y, Li J, Et Al. Dry Eye Post-Cataract Surgery: A Systematic Review And Meta-Analysis. *BMC Ophthalmol*. 2025;25(1):5.