ABSTRACT
Phacoemulsification is preferred choice in the management of cataract because of earlier refractive stabilization, reduced astigmatism, and milder postoperative inflammation. After phacoemulsification in diabetic cataract patients, with tear secretion reduction, what worsened in them was worsened dry eye symptoms and predisposed them to ocular damage.

Methods: Pre and post comparative study. Patients were examined preoperatively. A standard phacoemulsification technique was used beginning with clear corneal incision at 12 o'clock position. A foldable posterior chamber intraocular lens was implanted in the capsular bag. Patients were examined on days 1, 7 and 30 postoperatively.

Results: The mean and standard deviation values of TFBUT in the preoperative, postoperative day 1, 1 week, 1 month, were 19.36+/-2.41, 19.91+/-1.81, 16.84+/-3.60, 14.04+/-4.04 respectively in the present study. The mean and standard deviation values of ST in the preoperative, postoperative day 1, 1 week, 1 month, were 17.75+/-2.16, 19.40+/-2.38, 15.18+/-2.12 and 12.10+/-2.25 respectively in the present study.

Conclusion: This study proved that there exists a significant association between tear film of pre and post phacoemulsification in diabetic patients.

KEYWORDS: phacoemulsification, Tear film, diabetes.

INTRODUCTION
Phacoemulsification is preferred choice in the management of cataract because of earlier refractive stabilization, reduced astigmatism, and milder postoperative inflammation.

After phacoemulsification in diabetic cataract patients, with tear secretion reduction, what worsened in them was worsened dry eye symptoms and predisposed them to ocular damage.

Often, tear film dysfunction associated with surgical procedures remains a major source of dissatisfaction, although most patients achieve excellent postoperative visual acuity.¹³

The greater the incision size, slower the recovery of symptoms.²

It has been shown that both incidence and severity of dry eye increases, where there have been many complaints from patients of dry eye and symptoms of irritations after cataract surgery. To be precise, after phacoemulsification, there was documentation of the reduction in tear break up time (TFBUT).³

Diabetes mellitus is condition characterized by increase in blood sugar levels which is chronic disorder and leads top potential disability. These patients were at risk of developing complications including neuropathy, nephropathy and retinopathy. This leads to end stage renal disease, amputation.

The prevalence of diabetes mellitus for all age groups was estimated to be 2.8% in 2000 and may rise up to 4.4% by 2030.⁴

Decrease in tear film production was observed in diabetic patients, and numerous studies showed that prevalence of dry eyes varies from 18 to 54%.%

Decrease in tear film production was characterized by stinging, sensitivity to light, blurriness, and foreign body sensation and burning.

MATERIAL AND METHOD
Study Design and Setting

Study Design: Pre and post Comparative study, Hospital based.

Study Setting: Department of Ophthalmology, Justice K.S. Hegde Charitable Hospital, a unit of K S Hegde Medical Academy affiliated to Nitte (Deemed to be University).

Study population: Cases of diabetes undergoing phacoemulsification cataract surgery in Ophthalmology Department.

Sample size: 80

The minimum sample size was calculated as 40, considering the difference of 86% change in two groups at 95% confidence interval and 80% power of the study using the statcalc tool of EpiInfo software version 7.2.

Considering the higher number of case load and to increase the strength of the study, the obtained sample size was doubled and the final sample size for the study was 80.

Sample selection
Selection method: Consecutive and stratified.

Inclusion criteria: All cataract cases with diabetes mellitus that are undergoing phacoemulsification.

Exclusion criteria:
- Cases of Dry eye syndrome and other systemic disorders like Hypothyroidism, Sjogren's syndrome, Systemic Lupus Erythematosus (SLE), Rheumatoid arthritis (RA).
- Contact lens users.

Study Period: January 2018- June 2019

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A foldable posterior chamber intraocular lens was implanted in the capsular bag.

Patients were examined on days 1, 7 and 30 postoperatively.

The ocular examinations include:
1. Tear film break-up time (TFBUT) measurement:
   - The interval between the last blink and the appearance of the first corneal dry spot was measured using blue cobalt filter under wide light.
On comparison of the mean values of TBUT D1 and TBUT D7 the mean values of TBUT D1 was higher with a difference of 0.55 is statistically significant with a p value of <0.001.

On comparison of the mean values of TBUT D1 and TBUT D30 the mean values of TBUT D1 was higher with a difference of 5.875 is statistically significant with a p value of <0.001.

On comparison of the mean values of TBUT D7 and TBUT D30 the mean values of TBUT D7 was higher with a difference of 2.8 is statistically significant with a p value of <0.001 as shown in table 3.4.

Table 1: Paired ‘t’ test for comparison of the any two time periods of TBUT

<table>
<thead>
<tr>
<th>Pair</th>
<th>N</th>
<th>Mean ± SD</th>
<th>Mean difference ± SD</th>
<th>t</th>
<th>P VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pair 1</td>
<td>80</td>
<td>19.4±2.33</td>
<td>-1.65±1.06</td>
<td>-13.9</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Pair 2</td>
<td>80</td>
<td>19.75±2.16</td>
<td>2.58±1.32</td>
<td>17.45</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Pair 3</td>
<td>80</td>
<td>19.6±2.16</td>
<td>5.65±1.58</td>
<td>31.91</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Pair 4</td>
<td>80</td>
<td>19.4±2.38</td>
<td>4.23±1.59</td>
<td>23.75</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Pair 5</td>
<td>80</td>
<td>19.4±2.38</td>
<td>7.3±1.8</td>
<td>36.22</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Pair 6</td>
<td>80</td>
<td>19.5±2.44</td>
<td>3.08±1.16</td>
<td>23.79</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

COMPARISON OF PRE AND POST PHACOEMULSFICATION SITVALUES

On comparison of the mean values of SIT PRE and SIT D1 the mean values of SIT D1 was higher with a difference of 1.65 is statistically significant with a p value of <0.001.

On comparison of the mean values of SIT PRE and SIT D7 the mean values of SIT PRE was higher with a difference of 2.575 is statistically significant with a p value of <0.001.

On comparison of the mean values of SIT PRE and SIT D30 the mean values of SIT PRE was higher with a difference of 5.65 is statistically significant with a p value of <0.001.

On comparison of the mean values of SIT D1 and SIT D7 the mean values of SIT D1 was higher with a difference of 4.225 is statistically significant with a p value of <0.001.

On comparison of the mean values of SIT D1 and SIT D30 the mean values of SIT D1 was higher with a difference of 7.3 is statistically significant with a p value of <0.001.

On comparison of the mean values of SIT D7 and SIT D30 the mean values of SIT D7 was higher with a difference of 3.0 is statistically significant with a p value of <0.001 as shown in table 3.5.75

Table 2: Paired ‘t’ test for comparison of the any two time periods of SIT

<table>
<thead>
<tr>
<th>Pair</th>
<th>N</th>
<th>Mean ± SD</th>
<th>Mean difference ± SD</th>
<th>t</th>
<th>P VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pair 1</td>
<td>80</td>
<td>19.36±2.41</td>
<td>-0.55±1.25</td>
<td>-3.93</td>
<td>&lt;0.001</td>
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<td>Pair 2</td>
<td>80</td>
<td>19.91±1.81</td>
<td>2.53±2.5</td>
<td>9.03</td>
<td>&lt;0.001</td>
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<tr>
<td>Pair 3</td>
<td>80</td>
<td>19.36±2.41</td>
<td>5.33±2.64</td>
<td>18.06</td>
<td>&lt;0.001</td>
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<tr>
<td>Pair 4</td>
<td>80</td>
<td>19.91±1.81</td>
<td>3.08±2.85</td>
<td>9.64</td>
<td>&lt;0.001</td>
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<tr>
<td>Pair 5</td>
<td>80</td>
<td>19.91±1.81</td>
<td>5.88±3.02</td>
<td>17.42</td>
<td>&lt;0.001</td>
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<td>Pair 6</td>
<td>80</td>
<td>19.84±3.6</td>
<td>2.8±3.03</td>
<td>8.27</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

COMPARISON OF THE CATEGORICAL VARIABLES

In the present study, all patients had clear cornea preoperatively, whereas postoperatively on day 1, 1 week and 1 month corneal fluorescein staining was present in 100%, 5% and 15% of patients respectively.
DISCUSSION
The symptoms of discomfort, visual disturbances, and tear instability with potential damage to the ocular surface were resulted by Dry eye disease which is a multifactorial disease of the tear film and ocular surface. Hence, International Dry Eye Workshop described that increased osmolality of the tear film and inflammation of the ocular surface was accompanied by the dry eye disease.

When the tear film becomes chronically unstable and repeatedly breaks up into spots between blinks, exposing the corneal and conjunctival epithelium to evaporation, Dry eye produces discomfort and reduced vision. Aqueous deficiency or the natures of evaporation are resulted from the multifactorial disease of tears and ocular surfaces.

T BUT interpretation
In our study, preoperatively all of the patients had T BUT values in the higher range whereas postoperatively patients had lower T BUT values compared to the preoperative condition.

In a study done by Mohan S et al, T BUT values were decreased significantly at one week, one month and near normal at three months. Preoperatively the mean ± Standard deviation values of T BUT was 9.48±±3.212 and post operatively at one week, one month and three months the T BUT values were 7.5±2.285, 6.8± 2.188, 7.5±2.675 respectively. In our study the results showed deterioration of T BUT mean value at one month.

In a study by Srinivasan et al there was a reduction in T BUT values after phacoemulsiﬁcation in Pseudohalidic eyes. In a study T BUT was decreased signiﬁcantly in postoperative day 30 . In a study done by Ram et al T BUT values were decreased signiﬁcantly after cataract surgery. In a study by Li XM et al showed decrease in T BUT values after phacoemulsiﬁcation in high percentage of patients. In a study by Oh T et al postoperatively on day 1 T BUT values were decreased signiﬁcantly and it had returned to almost to the preoperative level at one-month post-surgery.

In a study by Sitompul et al, the mean and standard deviation values of T BUT preoperatively, postoperatively at one week, one month, three months, six months were 11.6 ± 2.3, 7.03± 0.97, 7.42± 0.79,11.76±2.12± 2.5 respectively. The T BUT values at one week and one month were decreased signiﬁcantly compared to postoperative T BUT values at three months and six months.

A study of the incidence and the pattern of dry eye were done after the cataract surgery by Ngamjit Kasetsuwan et al. Preoperatively and postoperatively, the mean T BUT values at 1 week, 1 month and 3 months were 12.15 ± 5.9, 5.11 and 5.21 respectively. Interestingly, a marked decrease in the mean T BUT was observed postoperatively.

After evaluation of tear ﬁlm stability and tear secretion after the cataract surgery, Saif MYS et al., found that there was subsequent increase in the mean T BUT value in the 3 months while, the same was decreasing in the 1 week. The mean T BUT values were 12.8/±2.5, 8.9/+2.7, 9.9/+2.8, and 11.15/+2.8 preoperatively and postoperatively respectively.

The mean and standard deviation values of T BUT in the preoperative, postoperative day 1, 1 week, 1 month, were 19.36+/±2.41, 19.91/+/±1.81, 16.84/+/±3.60, 14.04/+/±4.04 respectively in the present study.

Interestingly, the T BUT values had a marked decrease in 1 week and 1 month, while there was a slight decrease shown in the postoperative condition on day 1.

Schirmer’s test interpretation
In our study, preoperatively all the patients had Schirmer’s values in the higher range, whereas postoperatively all patients showed decrease in ST values.

In a study done by Srinivasan R et al, the values of Schirmer’s test showed significant decrease in postoperative cases of cataract cases.

In a study, statistically signiﬁcant deterioration in the ST values in postoperative period. The mean and standard deviation values of ST at preoperative, postoperative 1 month and 3 months were 17.13+/±4.65, 16.54+/±5.23 and 14.54+/±4.53 respectively.

Postoperatively till 4 weeks, signiﬁcant decrease in the ST values were observed by Ram et al, Li et al, Li Zet et al.

In a study by Mohan S et al., there was signiﬁcant decrease in ST values after surgery up to 4 weeks. The mean and standard deviation values of ST in preoperative, postoperative 1 week, 1 month and 3 months were 9.23+/±2.117, 3+/±2.6, 6+/±1.754 and 7.83+/±2.036 respectively. These results of marked fall in mean value at 1 month after surgery was consistent with our study.

In a study, the mean ST values preoperatively, postoperatively at 10 days, 1 month and 3 months were 17.46/+/±6.15, 14.96+/±7.28, 13.06/+/±4.52 and 13.71+/±6.54 respectively. Postoperatively at 1 month, there was marked decrease in ST values. The results were consistent with our study.

In a study by Gharaei et al., the mean and standard deviation of ST values preoperatively, postoperatively at 5 days, 10 days, 1 month and 2 months were 17.56/+/±6.88,10.4/+/±7.5, 8.34/+/±6.99, 9.23+/±6.26 and 12.3+/±5.49 respectively. There was a significant decrease in ST values at 1 month and improvement noted at 2 months.

In a study by Sitompul et al., the mean and standard deviation values of ST preoperatively, postoperatively at one week, one month, three months, six months were 6.39+/±1.42,4.45+/±0.95,4.5+/±1.31,6.46+/±1.28 respectively. There was marked decrease in ST values at 1 week and 1 month, later on attained preoperative value at 3 months and 6 months.

A study of the incidence and the pattern of dry eye were done after the cataract surgery, Saif MYS et al., found that there was subsequent increase in the mean ST value in the 3 months while, the same was decreasing in the 1 week. The mean ST values were 14.05/+/±3.8, 10.2+/+/±3.2, 11.35+/+/±3.6, and 12.8+/+/±3.5 preoperatively and postoperatively respectively.

The mean and standard deviation values of ST in the preoperative, postoperative day 1, 1 week, 1 month, were 17.75+/±2.16,19.40+/±2.58,15.18+/±2.16 and 12.10+/±2.25 respectively in the present study.

Interestingly, the ST values had a marked decrease in 1 week and 1 month, while there was slight decrease shown in the postoperative condition on day 1.

Corneal ﬂuorescein staining interpretation
In the present study, all patients had clear cornea preoperatively, whereas postoperatively on day 1,week and 1 month corneal ﬂuorescein staining was present in 100%, 5% and 15% of patients respectively. In a study, it was shown that the presence of corneal staining in almost all patients postoperatively on day 1, later on it returned to preoperative level by 3 months postoperatively.

Phacoemulsiﬁcation can lead to tear film instability.

REFERENCES
14. Hamid Gharave Dr., MaNaghi Mosavii Dr., Ramin Daneshvar Dr. *, Maryam Hoseini Dr., Shahram Sazande Dr. Effect of Clear Corneal Incision Location on Tear Film following Phacoemulsification Surgery. Iranian journal of ophthalmology 2009, 21(3): 29-34