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To Study Central Corneal Thickness In Patients With Dry Eye Disease Of Varying Severity

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ABSTRACT

Aim: To Study the Central Corneal Thickness (CCT) in patients with dry eye disease of varying severity.

Introduction: Dry eye is multifactorial disease of the tears and ocular surface that results in symptoms of discomfort, visual disturbance and tear film instability with potential damage to the ocular surface. Diagnostic tools has been developed rapidly, however, both classic dry eye tests (Schirmer test, specular microscopy, a non-invasive and objective device that allows extensive evaluation of the corneal structure and tear film break up time) are essential for an exact Diagnosis.

Method: To calculate the central corneal thickness (CCT) in dry eye patients, Total no. of patients included in the study were120. They were divided into 80 cases and 40 controls.

Result: The maximum percentage of patients with dry eye were found to be aged 40 years and above (69%). The gender distribution for cases showed higher number of dry eye disease in females. The mean Schirmer value of cases (8.4 ± 4.16 mm) was found to be significantly lower than that of controls (31.52 ± 2.85 mm). The mean Tear film break-up time of cases (6.88 ± 3.77 s) was found to be significantly lower than that of controls (23.5 ± 2.43 s).

The p–value was <0.05. The mean CCT in the cases (482.18 ± 17.18 microns) was significantly lower than that of controls (526.67 ± 12.36 microns). The p-value was <0.0001. The mean CCT was 495.59 microns, 483.25 microns and 466.48 microns in the mild, moderate and severe cases respectively. The difference was statistically significant.

KEYWORDS

Central corneal thickness, Dry eye disease, Schirmer test, Specular Microscopy

INTRODUCTION

Dry eye is disorder of the tear film that occurs due to tear deficiency or excessive tear evaporation, that causes damage to the ocular surface and results in symptoms such as redness, foreign body sensation, dryness and pain that reflects ocular discomfort. It is also called keratoconjunctivitis sicca (KCS) keratitis sicca syndrome, dry eye disease (DED) or simply dry eyes. [1]

Therefore, it can mainly be divided into two groups namely,

(1) aqueous production deficient dry eye disease

(2) Evaporative dry eye disease. [2]

Dry eye is a multifactorial disease of the tears and ocular surface that results in discomfort, visual disturbance and tear film instability with potential damage to the ocular surface, often accompanied by hyper osmolality of the tear film and ocular inflammation. The Subcommittee considered that there was considerable clinical utility to adopt a classification of disease based on severity and classified dry eye based on signs and symptoms into mild, moderate and severe.[3]

MATERIAL AND METHODS

- **STUDY DESIGN**: Observational cross-sectional study
- **SAMPLE SIZE**: The study included 120 people (80 cases and 40 controls)
- **INCLUSION CRITERIA**-
  - Untreated cases of dry eyes.
- **EXCLUSION CRITERIA**-
  - Patients who were on lubricating eye drops for 2 weeks be representing to the OPD.
  - Recent intraocular or ocular surface surgery (within 3 months).
  - Ageless than 18years.
  - Lid pathologies like coloboma, ectropion interfering with the study

METHOD OF DATA COLLECTION:

The symptoms in the patients with dry eye were confirmed by tests such as Schirmer test tear, film break-up time (TBUT). The controls (patients without dry eye) were chosen from the OPD itself and they were matched in all aspects with the cases. They mainly included patients who had come for refraction testing and routine eye examination.

Schirmer I test: Without instilling anaesthetic drops (0.5% proparacaine HCl eye drops), the Schirmer strips were inserted into the temporal lower conjunctival sac, avoiding contact with the cornea, and the length of wetting strips was recorded in millimetres after 5 minutes.

(TBUT Tear Film Break-Up time): Fluorescein staining was done after application of fluorescein strips (with1mgfluorescein sodium) to the eye without directly touching the cornea. TBUT was measured on slit-lamp examination as the time interval after the patient's blink to the appearance of the first dry spot in the tear film. Patients were asked not to blink after instillation of fluorescein.

Based on the above two tests, patients were classified into 3 groups based on the DEWS Classification-

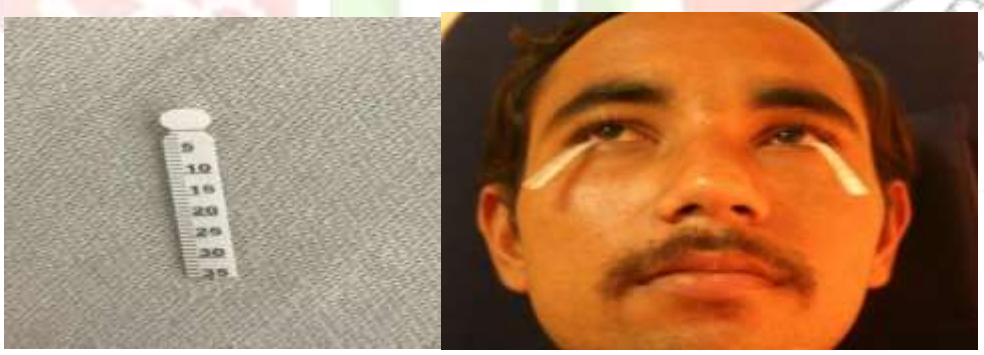
1. Mild dry eye

2. Moderate dry eye

3. Severe dry eye.

SCHIRMER VALUE (in mm)	TEAR FILM BREAK-UP TIME(s)	SEVERITY OF DRY EYE
10-15	10-15	MILD
5-10	5-10	MODERATE
<5	<5	SEVERE

The **Central corneal thickness (CCT)** was calculated with the help of specular microscopy (EM-3000; TOMEY:Version 2A/OJ).The values thus obtained were noted.



STASTICAL ANALYSIS

Categorical variables were presented in number and percentage (%) and continuous variables were Presented as mean ± S D and median. Normality of data was tested by Kolmogorov-Smirnov test. If the normality was rejected then non parametric test was used.

Statistical tests were applied as follows-

1. Quantitative variables were compared using Unpaired t-test/Mann-Whitney Test (when the data sets were not normally distributed) between the two groups and ANOVA/K rusk al Wallis test was used for comparison between three groups.

2. Qualitative variables were correlated using Chi-Squaretest/Fisher'sExacttest.

A p value of <0.05was considered statistically significant.

The data was entered in MS, EXCEL spread sheet and analysis was done using Statistical Package for Social Sciences (SPSS) version 21.0.

OBSERVATIONS AND RESULTS

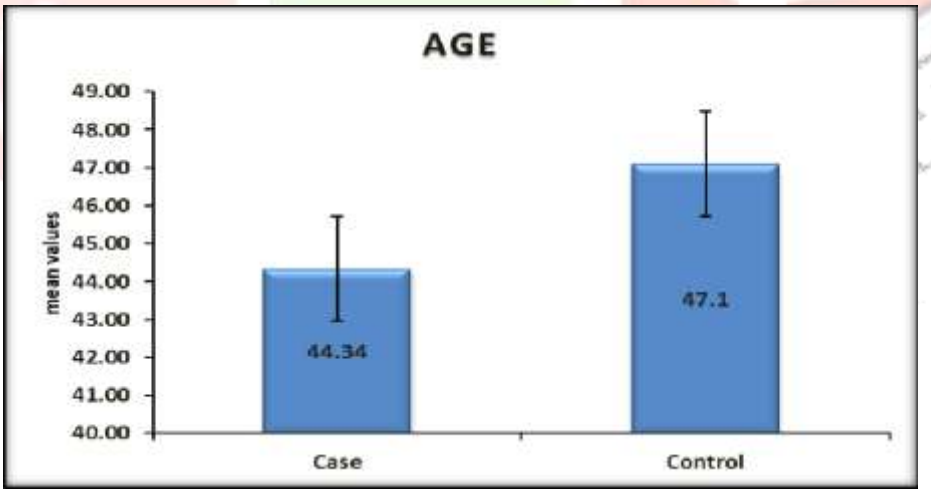
AGE DISTRUBTION

Table 1: Comparison between mean age of cases and controls

GROUP	NUMBER	MEAN	STANDARD DEVIATION	MEDIAN	p-value
CASE	80	44.34	11.99	47	0.676
CONTROL	40	47.1	6.82	46.5	

Test analysis suggests that there is no significant difference in mean age of cases and controls.

The p–value was >0.05.



Graph 1: Bar diagram showing comparison between mean age of cases and controls.

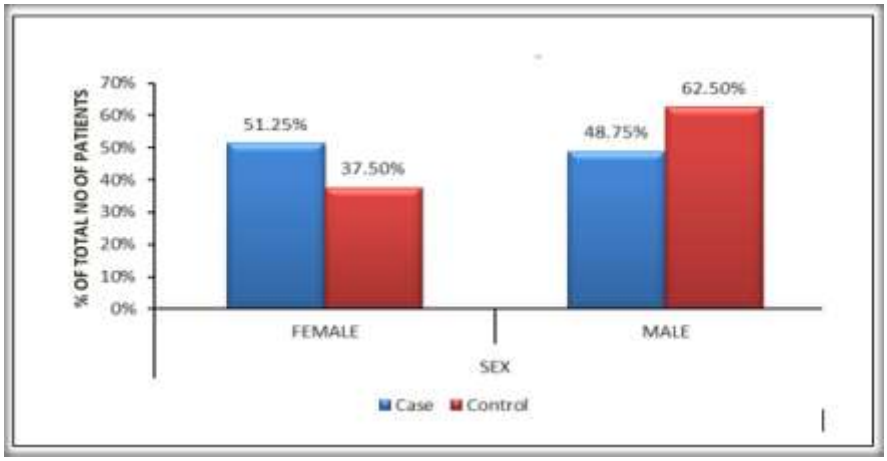
Table2: Table showing age distribution of cases

Age group (years)	Number of cases
18-30	15
31-40	10
41-50	25
51-60	30
Total	80

Table3: Gender distribution of subjects

		GROUP		TOTAL	p-value
		CASES	CONTROLS		
GENDER	FEMALE	41	15	56	0.155
	MALE	39	25	64	
TOTAL		80	40	120	

Chi-square analysis suggests that there is no significant difference in the gender distribution between the cases and controls. The chi-square value was 2.026 and the p value was0.155.



Graph3: Bar diagram showing gender distribution of cases and controls

SCHIRMER TEST

Table4: Comparison of mean Schirmer value (in mm) of right eye between cases and control

GROUP	NUMBER	MEAN (mm)	STANDARD DEVIATION	MEDIAN	p-value
CASE	80	8.3	4.13	8	**<0.0001**
CONTROL	40	31.32	2.8	32	

The mean Schirmer value of cases (8.3mm) was found to be significantly lower than that of controls (31.32 mm). The p–value was<0.05.

DISCUSSION

An observational cross-sectional study was conducted to study the changes in the central corneal thickness (CCT) in patients of dry eye disease of varying severity. The study composed of both cases and controls.

Patients presenting with symptoms of dry eye were taken as the cases. They were assessed for the same with the help of various tests which included Schirmer test and Tear film break-up time (TBUT). They were divided into three groups based on the DEWS classification of dry eye disease.[4]

SCHIRMER VALUE (mm)	FILM BREAK-UP TIME(s)	SEVERITYOFDRYEYE
10-15	10-15	MILD
5-10	5-10	MODERATE
<5	<5	SEVERE

The clinical tests in the cases and controls included assessment of **central corneal thickness (CCT).**

The results obtained were discussed in the light of available literature.

(1) Total no. of patients included in the study were 120. They were divided into 80 cases and 40 controls. The cases were further divided into three groups: mild, moderate and severe based on DEWS classification.[4] In our study, there were 27 mild, 28 moderate and 25 severe patients.

In our study age of the patients ranged from 19 to 60 years. The Mean ± SD ages of cases and controls were 44.34 ± 11.99 and 47.1 ± 6.82 respectively. The maximum percentage of patients with dry eye were found to be aged 40 years and above (69%).

Both the groups were suitably age matched for comparison (p=0.676). A similar age profile of subject was ….

Observed among different studies. A study conducted by Ku r t u l BE most similar result.[23]

(2) The gender distribution for cases showed higher number of dry eye disease in females. Out of 80 cases, 41were female and 39 were male. Further, controls comprised 15femalesand 25 male. The difference of gender distribution between the two groups was statistically insignificant (p=0.155).Various studies showed that dry eye disease was more prevalent in female gender. J i e Y et al studied the prevalence and associations of dry eye symptoms in adult Chinese. They found in their study that dry eye symptoms were significantly associated with female gender.

(3) The mean Schirmer value of cases (8.4 ± 4.16 mm) was found to be significantly lower than that of controls (31.52±2.85mm). The p–value was < 0.05. The mean Schirmer values of left eye of severe cases (3.36 ± 1 mm) was significantly lower than mild (13.33 ± 0.96 mm) and moderate (8.14±0.93mm) cases. Anova studied the correlation of tear fluoresce in clearance and Schirmer test scores with ocular irritation symptoms. Schirmer1 test scores were found to be significantly lower in the people with irritation symptoms associated with dry eye disease as compared to controls (symptomatic 12.6 mm, normal control 22.3 mm, $P < 0.005$).[25]Similar results were found in the Schirmer values of the right eye.

(4) The mean Tear film break-up time of cases (6.88±3.77s) was found to be significantly. The mean Tear film break-up time of cases (6.88 ± 3.77 s) was found to be significantly lower than that of controls (23.5 ± 2.43 s). The p–value was <0.05. The mean TBUT value of severe cases (2 ± 0.65 s) was significantly lower than mild (11.07 ± 0.92 s) and moderate (7.18±0.82s)cases(p<.0001).In a study conducted by Begley c Getal, the relationship between habitual patient-reported symptoms and clinical signs among patients with dry eye of varying severity were assessed. The average TBUT for patients with non-Sjogren Syndrome, ***KeratoconjunctivitisSicca*** was 6.6±5.5 seconds; and forth controls was, 14.4± 19seconds, with a significant difference between the two (Kruskal-Wallis ANOVA, $P<0.0001$;Bonferroni multiple comparisons ,$P<0.001$).[26]

(5) **The mean CCT in the cases (482.18 ± 17.18 microns) was significantly lower than that of controls (526.67 ± 12.36 microns). The p-value was <0.0001**. The mean CCT in controls was within the normal range (520-555 microns). **The mean CCT was 495.59 microns, 483.25 microns and 466.48 microns in the mild, moderate and severe cases respectively. The difference was statistically significant.** (p < 0.0001). The number of people with deranged CCT was almost comparable in cases with mild (32.91%), moderate (35.44%) and severe (31.65%) disease. The difference was not statistically significant (p- value >0.05). In a study conducted by Ali NM et al to assess the effect of dry eye disorder on the central corneal thickness (CCT), it was seen that patients with dry eye syndrome had significantly lower CCT compared to the control group (P<0.01).[19]Ina study conducted by Sanchis- Gimeno JA et al the mean corneal thickness value was significantly decreased in postmenopausal women with dry eye (P < 0.001 at each corneal location). Thecentralcorneahadthethinnestmeanvaluesindryeyesandnormaleyes(533.10±4.74 μm and 547.63 ± 15.11 μm, respectively), whereas superior nasal cornea had thicker mean values in both groups (632.43 ± 6.11 μm and 648.78 ± 14.98 μm in dry eye and normal eyes, respectively).[21]

SUMMARY AND CONCLUSION

- **Dry eye** is a multifactorial disease of the tear film that results in various symptoms like pain, redness, foreign body sensation and **an unstable tear film** with damage to the ocular surface.
- In my study**, more than two thirds of the patients were over 40 years of age**. Though the number of males and females was comparable in the cases and controls, the number of females with dry eye was slightly more than the males.
- **Both Schirmer test and Tear film break up time were found to be significantly lower in the cases as compared to controls** .Thus, these can be used in clinics for diagnosis and classification of dry eye disease.
- **Mean central corneal thickness values were significantly lower in the cases as compared to controls. As the severity of dry eye increased, the CCT also decreased.** This can be attributed to the hyper tonicity of the tear film and the chronic desiccation by the inflammatory mediators in dry eyes. This should be considered while measuring IOP as well as in refractive surgery decision as dry eye can worsen after kerato refractive procedures.
- All the above parameters can be used to decide the plan of action in management of dry eye disease and monitor the course of the disease.

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