INFLUENCE OF AGE ON TEAR FILM STUDY

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ABSTRACT

Aim: To study the influence of age on tear production in adults. Material and methods: 900 normal people with equal distribution among males and females were studied. It is a prospective observational case series studied between June 2016 and June 2017. The tear film studies include Schirmer's Test and Break up time of tears (BUT). Results: Decreased levels of tears, as seen with decreased Schirmer's readings and reduced BUT, were seen more in females, worsening with age and were found to be statistically significant. Conclusions:1. Tear film production is reduced with increasing age.2.BUT is more sensitive in detection of dry eye rather than Schirmer's test.

Introduction

The tear film coating the eye (precorneal tear film), has three distinct layers, from the most outer surface the Lipid layer, Aqueous layer and the Mucous layer.1 Drainage of tear film: The lacrimal glands secrete lacrimal fluid, which flows through the main excretory ducts into the space between the eyeball and lids. When the eyes blink, the lacrimal fluid is spread across the surface of the eye. Lacrimal fluid gathers in the lacrimal lake, and is drawn into the puncta by capillary action, and then flows through the lacrimal canaliculi at the inner corner of the eyelids entering the lacrimal sac, then on to the nasolacrimal duct, and finally into the nasal cavity. [2]

Dry eye is a disorder characterized by either quantitative decrease or qualitative change in pre corneal tear film resulting in spectrum of pathological changes that may adversely affect the ocular surface resulting in ocular surface disorders often leading to conjunctival squamous metaplasia and punctate epithelial erosion of cornea3,4.Dry eye results in discomfort, visual disturbance and tear instability with potential damage to ocular epithelial surface which is accompanied by increase in tear osmolarity and inflammation.

The International Dry Eye Workshop (DEWS) report in 2017defined dry eye as "a multifactorial disease of the ocular surface characterised by loss of haemostasis of tear film, and accompanied by ocular symptoms in which tear film instability and hyperosmalarity, ocular surface inflammation and damage, neurosensory abnormalities play a etiological role".5,6 Dry eye is more common among elderly and age is supposed to influence it. The dry eye is usually under diagnosed since many patients are asymptomatic. Hence it was decided to investigate the presence of dry eye among asymptomatic normal people of different age groups to know the influence of age on dry eye.

The dry eye is usually evaluated with schirmer's test and tear film break up time (BUT).

AIM: To study the influence of age on tear production in adults.
MATERIALS AND METHODS:
A total of 900 patients above the age of 20 years with equal distribution among males and females were studied. It was a prospective observational case series studied between June 2016 and June 2017 at Department of Ophthalmology, Maharajah's Institute of Medical Sciences, Nellimarla, Vizianagaram.

Inclusion Criteria:
All patients of either sex above the age of 20 years who did not complain of watering or dryness of eye and not suffering from ocular pathology and consented to participate in this study were recruited.

Exclusion Criteria:
Unwilling patients
Age less than 20 years
Patients with excessive lacrimation and dry eye.

Patients with abnormal palpebral fissure height, lid retraction and other ocular comorbid conditions.

The patients underwent visual acuity testing, complete anterior segment evaluation under slit lamp bio- microscopy and tests for tear film evaluation like Schirmer's test and tear film break up time (BUT) with interval of 30 minutes between the two tests. Schirmer's test reading more than 15 mm was taken as normal, 9-14 mm as mild, 4-8 mm as moderate and less than 4 mm as severe dry eye.

Tear film break up time (TBUT) more than 10 seconds was taken as normal, 5-10seconds was taken as subnormal or dry eye, less than to 5 seconds was taken as significant dry eye. The Schirmer's test results and the TBUT in seconds with the corresponding age groups were compared and the statistical analysis were derived using chi-square test.

RESULTS:
Age group 21-30 years: This age group consists of 300 eyes of 75 males and 75 females.

Table1: SCHIRMER'S TEST RESULTS IN 21 – 30 YEARS:

Sl no	SCHIRMER'S TEST	MALES	FEMALES	TOTAL
1	15 mm or above	150	150	300
2	9 – 14 mm	0	0	0
3	4 – 8 mm	0	0	0
4	4 mm or below	0	0	0
		150	150	300

In this age group all the 300 eyes of 150 subjects had normal Schirmer's readings and there was not a single dry eye.

Table2:TBUTin21-30years:

Sl no	TBUT	MALES	FEMALES	TOTAL
1	10 seconds	106	78	184
2	9 seconds	38	67	105
3	8 seconds	6	4	10
4	7 seconds	0	1	1
		150	150	300
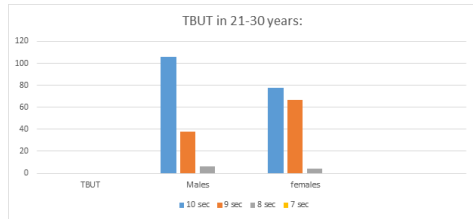
TBUT in 21-30 years:

In males the schirmer's test reading with more than 15 mm was seen in 100% patients and tear film break up time with 10 seconds or more in (70.7%) followed by low BUT in (29.3%). In females schirmer's test reading with more than 15 mm was seen in 100% patients and tear film break up time with 10 seconds or more in (52%) followed low BUT in (48%).

In this age group schirmer's test failed to detect dry eye while BUT showed dryness in 29.3% of males and 48% of females.

AGE GROUP 31 – 40: This age group consists of 300 eyes of 75 males and 75 females each.

Comparison of Schirmer's test between males and females of age group 31 – 40 years.

Table3:Schirmer's test in 31-40 years

Si.no.	SCHIRMER'S TEST	MALES	FEMALES
1	15 mm or above	136	138
2	9-14mm	14	12
3	4-8mm	0	0
4	4or below	0	0
TOTAL		150	150

Table4:TBUT in 31-40 years:

SI no	TBUT in seconds	MALES	FEMALES	TOTAL
1	10 seconds	37	2	39
2	9 seconds	70	47	117
3	8 seconds	17	61	78
4	7 seconds	16	25	41
5	6 seconds	8	11	19
6	5 seconds	2	4	5
7	4 seconds	0	0	1
		150	150	300

TBUT in 31-40 years:
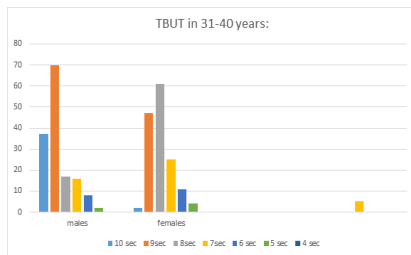
In males the Schirmer's test reading with more than 15 mm was seen in 90.6% patients and tear film break up time being normal in 24.3%, subnormal in 74%, and significantly low in 1.2%. In females Schirmer's test reading with more than 15 mm was seen in 92%patients and tear film break up time being normal only in 1.3%, moderately low in 96% and significantly low in 2.7%.

BUT shows that only 24.3% of males and 1.3% of females in the age group of 31-40 years have normal BUT where as Schirmer's shows that 90.6% males and 92% of females have normal secretions ,thus with Schirmer's test patients with very grossly subnormal tear function were missing .

AGEGROUP41-50:
Consists of 75 normal males and 75 females
Table 5:Schirmer's test in 41 to 50 years:

Table6:TBUT in 41-50 years:

Si.no.	Schirmer's test	Males	females	total
1.	>15mm	116	120	236
2.	9-14mm	34	26	60
3.	4-8mm	0	4	4
4.	<4mm	0	0	0
total		150	150	300

Table6:TBUT in 41-50 years:

| Si.no.	TBUT	males	females	total
1.	10 sec	2	0	2
2.	9 sec	22	37	59
3.	8sec	69	69	138
4.	7 sec	31	24	55
5.	6 sec	24	14	38
6.	5 sec	2	6	8
7.	4 sec	0	0	0
	Total	150	150	300

TBUT in 41-50 years
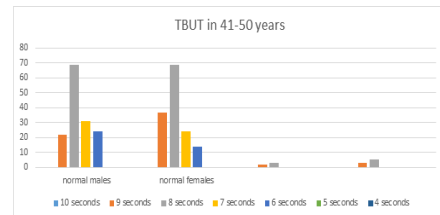
In the present study, patients in the age group of 41-50 years of age group the Schirmer's test results in males was predominantly more than 15 mm in 77.3% and 9-14mm in 22.7% while the TBUT was normal in 1.3%, subnormal in 97.3% and significantly low in 1.3%. In females the Schirmer's test readings was predominantly more than 15 mm in 80% and 9-14 mm in 17.3%. The TBUT was subnormal in 96% and significantly low in 4%.

Table7:Schirmer's test in 51 -60 years:

Si.no.	Schirmer's test	males	females
1.	15 mm or above	75	67
2.	9-14mm	53	56
3.	4-8mm	18	24
4.	4mm or below	4	3
		150	150

Table8:TBUTin 51-60 years:

Si.no.	TBUT	males	females
1.	10 seconds	0	0
2.	9 seconds	0	0
3.	8 seconds	13	7
4.	7 seconds	44	21
5.	6 seconds	56	39
6.	5 seconds	24	40
7.	4 seconds	13	28
8.	3 seconds	0	15
total		150	150

TBUT in 51-60 years:
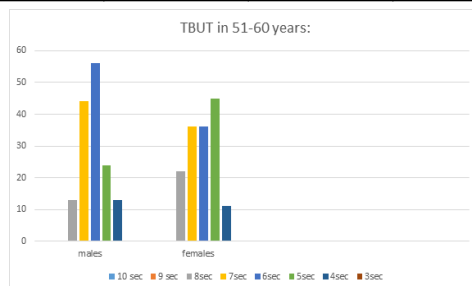
In this age group Schirmer's showed normal readings in 50% of males and 44.6% of females the readings were subnormal in 47.3% of males and 56.1 % of females.
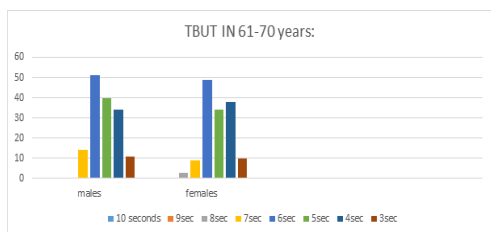
TBUT showed that none of males or females had normal values. It was subnormal in 91.3% of males and 71.3% of females. It was very low in 8.6 % of males and 28 % of females. Tear film abnormalities were more commonly seen in females.

Table 9: Schirmer's test in 61-70 years:

Si.no.	Schirmer's test	males	females
1.	15mm or above	48	46
2.	9-14mm	64	72
3.	4-8mm	30	30
4.	4mm or below	8	2

Table 10: TBUT IN 61-70 years:

Si.no.	TBUT	males	females
1.	10 sec	0	0
2.	9 sec	0	0
3.	8sec	0	3
4.	7sec	14	9
5.	6secs	51	49
6.	5sec	40	34
7.	4sec	34	38
8.	3sec	11	10
total		150	150

TBUT IN 61-70 years:

In this age group Schirmer's showed normal readings in 32% of males and 30.6% of females. The readings were subnormal in 62.6% of males and 68 % of females. Readings were low in 5% of males and 1% of females.
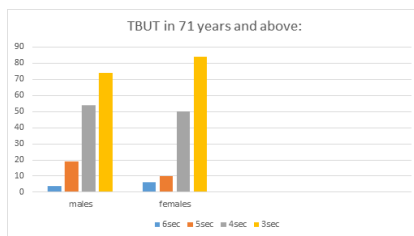
BUT showed that none of males or females had normal values. It was low in 70% of males and 63% of females. It was very low in 30 % of males and 37% of females. Tear film abnormalities were more commonly seen in females.

Table11: Schirmer's test in 70 years and above:

S.No.	Schirmer's	males	females	total
1	15mm or above	13	6	19
2	9-14mm	62	53	115
3	4-8mm	75	91	166
4	<4mm	0	0	0
		150	150	300

Table 12: TBUT in 71 years and above:

S.No.	TBUT	Males	Females	total
1	10 sec	0	0	0
2	9 sec	0	0	0
3	8 sec	0	0	0
4	7 sec	0	0	0
5	6sec	4	6	10
6	5 sec	19	10	29
7	4 sec	54	50	104
8	3 sec	74	84	158

TBUT in 71 years and above:

In this age group Schirmer's showed normal readings in 8.6 % of males and 4 % of females. The readings were subnormal in 91.3% of males and 96% of females. TBUT showed that none of males or females had normal values. It was low in 15.3 % of males and 10.6% of females. It was very low in 85.3 % of males and 89.3 % of females. Tear film abnormalities were more commonly seen in females.

DISCUSSION:
The effect of age on tear film is inversely proportional and it depends on several modifiable and non-modifiable factors ultimately leading to abnormal tear film tests on clinical examination. The present study was carried out on patients who were devoid of any symptoms of dry eye or tear film abnormalities if any. Dry eye is an under-diagnosed ocular disorder. Reduction in the modifiable risk factors of dry eye is essential to reduce its prevalence. In the present study the prevalence of dry eye using clinical tests in normal adult population was 40.9% on Schirmer's test readings and 87.5% on tear film break up time. The prevalence was more common in females compared to males in the study. The present study found a lack of correlation between the symptoms and signs of dry eye. The prevalence of dry eye was found to be greater when objective testing was used and lower when symptoms only were used as diagnostic criteria. Female participants were found to be more likely to have dry eye than males. To avoid possible under-diagnosis, it is advised that objective clinical testing be carried out irrespective of whether the patient is symptomatic or not; this practice will facilitate more accurate and efficient diagnosis of the presence of dry eye.

Shapiro et al[7] examined the precorneal tear film in healthy 440 young students including men and women brought up in the same environmental conditions and concluded that there was no appreciable effect on the schirmer's test and break up time of the tear film which is in accordance with the present study.

Ozdemir M et al[8] studied age and gender related changes in Schirmer's test and concluded there was no statistically significant difference in the Schirmer's test results but found that Schirmer's test values were gradually decreased with advancing age[8] Moss and associates[9] reported a higher incidence of dry eye among females, 16.7% compared to 11.4% in males, but they found that this difference tends to occur only in the older age groups which is comparable to the present study as the patients with decreased Schirmer's test in the present study belong to older age group.

Mishra et al[10] conducted a cross- sectional observational study included 120 normal subjects (60 Male and 60 females) with no ocular symptoms or ocular surface disorders. Schirmer's and tear film break-up time tests were assessed in both eyes of each subject. The study subjects were divided into 4 groups according to their ages (<20 y, 20-40 y, 41-60 y and >60 y) each group was composed of 60 eyes of 30 subjects (15 male and 15 female subjects). Tear function tests did not show statistically significant difference according to gender. This study suggests that the age of subjects should be taken into consideration in the evaluation of tear function test results. It is also revealed that Indian population values are different from Caucasian and Chinese values.

David W. Lamberts et al[11] conducted Schirmer's tests in 265 eyes without instillation of 0.5% Proparacaine hydrochloride and in 466 eyes with Proparacaine showed that topical anaesthesia reduced

mean test values by 40%. Schirmer's test values, ranging from 0 to 3 mm, were obtained in 15% of the normal volunteers when the test was performed after instillation of topical anaesthesia and after blotting of the tear lake from the inferior cul-de-sac where as in the present study Proparacaine was not used.

The above studies clearly show the increase in the prevalence of Dry eye in females and with increase in age.

In the present study the age group of 21 – 30 years the Schirmer's test reading was more than 15 mm and tear film break up time more than 10 seconds which was significantly within normal.

In the present study the age group of 31 – 40 years the Schirmer's test reading was more than 15 mm and tear film break up time is more than 10 seconds which was significantly within normal.

In the present study the subnormal Schirmer's test started in fifth decade and gradually increased with age.

Schirmer's test results in the present study among normal individuals (Males +Females) is found normal with more than 15 mm in 59.1%, 9-14 mm in 24.7, 4-8 mm in 15.1% and less than 4 mm in 0.9%.
The decreased Schirmer's test readings in normal population with Schirmer's test less than 15 mm in the present study was 40.9%.

The Schirmer's test results in males was normal with more than 15 mm in age group of 21-30 years and the predominant results in age group of 71 years and above was 4-8 mm. (p value = 0.000)

The Schirmer's test results in females was normal with more than 15 mm in age group of 21-30 years and the predominant results in age group of 71 years and above was 4-8mm. (p value = 0.000)

CONCLUSIONS:
Dry eye is more common than symptomatic dry eye.
Schirmer's test is less sensitive than TBUT in detecting dry eye.
Dry eye is directly related to increase in age.

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