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## Original Research Article

## Diagnosis of dry eye patients with ocular irritation

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## ABSTRACT

**Introduction:** Dry eye is often an under diagnosed condition of the eye that can cause discomfort, burning sensation and blurred vision. These symptoms are related to the alterations in the layers of tear film, insufficient production or excessive evaporation of tear film.

**Aim:** The primary aim of this study is to diagnose and to find out the incidence of dry eye in patients presenting with symptoms of ocular irritation.

**Materials and Methods:** A total number of 225 patients of both sexes aged between 20 and 80 years with complaints of ocular irritation were included in this study. Detailed history taking, slit lamp examination of the anterior segment, tear film breakup time (TBUT), Schirmer's test, Fluorescein stain score and Rose Bengal stain score was done for all patients. Data was presented only for the worst eye of each patient.

**Results:** Dry eye was found in 46.67% of patients. Among symptomatic patients, 24% had TBUT value < 10 sec. Fluorescein score was  $\geq 1$  in 6.6% of symptomatic patients. RB score  $\geq 3$  was found in 28.4%. Both Schirmer test and TBUT were positive in 22.7% of the symptomatic patients. Only 4.9% of symptomatic patients were positive for all 3 tests including staining.

**Conclusion:** This study firmly concludes that the Schirmer's test, TBUT and staining should be done routinely for patients with ocular irritation for the early diagnosis of dry eye.

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## 1. Introduction

Dry eye is a very common but often under diagnosed condition of the eye that can cause mild discomfort, burning sensation, pain, lacrimation, itching and blurred vision. These symptoms are related to the alterations in the various layers of tear film, insufficient production of tear film or may be due to excessive evaporation. The main function of the tear film is lubrication and helps in preventing the corneal abrasion caused by lid friction. Tear film instability can cause potential damage to the ocular surface. The primary aim of this study is to diagnose and to find out the incidence of dry eye in patients presenting with symptoms of ocular irritation.

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## 2. Materials and Methods

Institutional ethical committee approval was obtained. A total number of 225 patients of both sexes aged between 20 and 80 years with complaints of ocular irritation were included in this study after obtaining proper consent from them. People working with hot furnace, those with history of chemical injury and thermal burns were excluded from the study. Detailed history taking, slit lamp examination of the anterior segment, tear film breakup time (TBUT), Schirmer's test, Fluorescein stain score and Rose Bengal stain score were done for all patients. Data was presented only for the worst eye of each patient.

### 2.1. TBUT

Topical anesthetic was not used. The examiner didn't touch or elevate the lid during the test. The interval between the last blink and the appearance of first corneal dry spot is noted in seconds. TBUT less than 10 seconds is considered abnormal.

### 2.2. Schirmer's I test

The Whatman No.41 filter paper was used. The strip was 5 mm broad and 35 mm long. The 5 mm end was placed in the inferior fornix without touching the cornea. After 5 minutes, the strip was removed and the wetted length was measured. This test was done without topical application. A value less than 5 mm wetting of the paper strip was considered as a positive test and diagnostic of aqueous secretion deficiency.

### 2.3. Fluorescein staining

Inferior fornix was touched with the dry fluorescein strip while patient was looking up. Pattern of fluorescein staining was recorded and graded as Grade 0- No stain, Grade 1- staining < 1/3 of cornea, grade 2- staining  $\frac{1}{2}$  of cornea, grade 3- staining >  $\frac{1}{2}$  of cornea.

### 2.4. Rose bengal staining

Rose Bengal defers from fluorescein stain in that it stains the nucleus and protoplasm of the devitalized or abraded epithelial cells. In the evaluation of dry eye, each eye is divided into 3 zones (medial, corneal and lateral) on a scale of 0-3. A score of 3 or more for one eye was considered abnormal.

### 2.5. Diagnostic criteria for dry eye

In the presence of dry eye symptoms, patients with either positive staining of conjunctiva and cornea with Rose Bengal score of  $\geq 3$  / Fluorescein stain score of  $\geq 1$  or with abnormalities in tear dynamics with TBUT  $\leq 10$  sec / Schirmer's Test  $\leq 5$  mm or with both were diagnosed with dry eye.

## 3. Observations and Results

Dry eye was diagnosed in 105 patients (46.67%); 51 were males and 54 were females. Table 1 summarises the distribution of dry eye according to the age and gender. Most common age group was between 40-60 years. Out of the total test population, 46.67% patients were diagnosed with dry eye as per the Schirmer value  $\leq 5$  mm (Figure 1). TBUT value was found to be  $\leq 10$  sec in 24% of symptomatic patients (Figure 2). Dry eye was diagnosed in 6.6% of symptomatic patients with fluorescein score  $\geq 1$  (Figure 3). RB score  $\geq 3$  was found in 28.4% of symptomatic patients (Figure 4). Table 2 gives the percentage of dry eye patients

who were positive for both Schirmer's I Test and TBUT (22.7% were positive for both). Only 4.9% of symptomatic patients were positive for all 3 tests namely Schirmer's Test, TBUT and Staining Tests (Table 3).

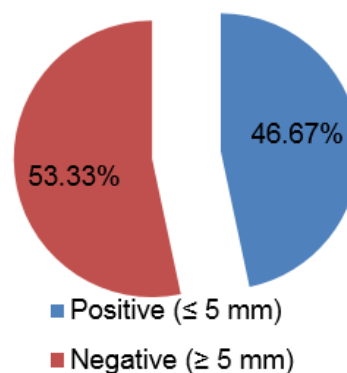


Fig. 1: Incidence of dry eye by schirmer-I test

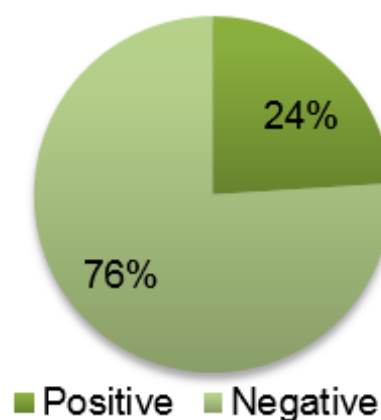


Fig. 2: Incidence of dry eye by TBUT

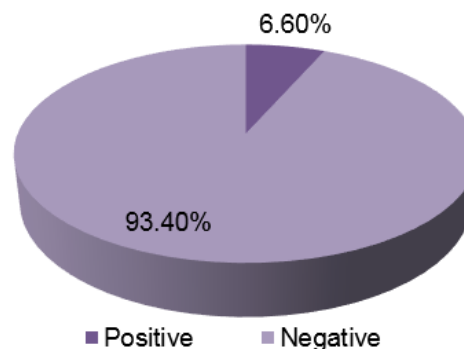


Fig. 3: Incidence of dry eye by fluorescein stain

**Table 1:** Incidence of dry eye by age and gender

Age (Years)	Sex	TBUT ( $\leq 10$ sec)	Schirmer's test ( $\leq 5$ mm)	Fluorescein Stain (score 1-3)	RB Stain (Score 0-9)
< 20	M	0/3	1/3(33%)	1/3(33%)	2/3(66.6%)
	F	0	0	0	0
20-40	M	3/31 (9.6%)	14/31 (45.1%)	2/31 (6.4%)	7/31 (22.5%)
	F	4/19 (21%)	8/19 (42.1%)	0/19 (0%)	6/19 (31.5%)
40-60	M	19/67 (28.3%)	37/67 (55.2%)	10/67 (14.9%)	22/67 (32.8%)
	F	12/42 (28.5%)	20/42 (47.6%)	0/42 (0%)	7/42 (16.6%)
60-80	M	8/29 (27.5%)	10/29 (34.4%)	2/29 (6.8%)	8/29 (27.5%)
	F	8/31 (25.8%)	15/31 (48.3%)	0/31 (0%)	12/31 (38.7%)
> 80	M	1/1 (100%)	1/1 (100%)	0/1 (0%)	0/1 (0%)
	F	0/2 (0%)	0/2 (0%)	0/2 (0%)	0/2 (0%)

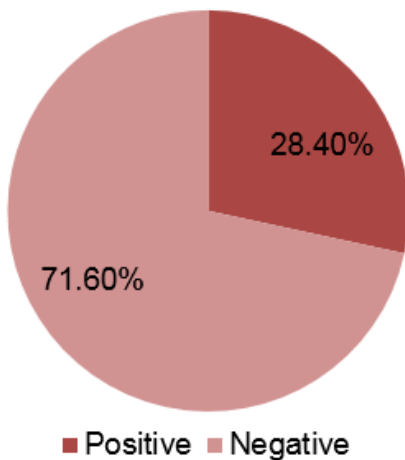
Maximum incidence of dry eye was seen in 40-60 years of age.

**Table 2:** Comparison of symptomatic patients with Schirmer's I Test and TBUT

Both Schirmer's I Test & TBUT	No. of patients	Percentage
Positive	51	22.7%
Negative	174	77.3%

**Table 3:** Comparison of symptomatic patients with Schirmer I, TBUT & Staining tests

Schirmer's I Test, TBUT & Staining Tests	No. of patients	Percentage
Positive	11	4.9%
Negative	214	95.1%

**Fig. 4:** Incidence of dry eye by rose bengal stain.

#### 4. Discussion

The estimated prevalence of dry eye ranges from 5% to 35% in different age groups.<sup>1</sup> The prevalence of dry eye varies from 10.8% to 57.1% thereby showing wide disparity.<sup>2</sup> The overall prevalence of dry eye in this study was 47%. The maximum incidence of dry eye was found in the middle age of 40 to 60 years in this study. There was low incidence of dry eye in extreme age groups. Dry eye disease was found to be more prevalent in postmenopausal females.<sup>3</sup> In Sahai, Anshu et al study conducted in 2005,<sup>4</sup> patients above 70

years of age showed maximum dry eye prevalence (36.1%) followed by patients of 31-40 years.

In Delphi panel study comparing the investigations for dry eye, slit lamp examination and fluorescein staining (100%), followed by TBUT and medical history (94%) was found to be the significant tests for dry eye.<sup>5</sup> Tear film break up time 93% (TBUT), corneal staining (85%), conjunctival staining (74%) and the Schirmer's test (54%) are the most commonly used diagnostic tests for initial assessment of dry eye.<sup>6</sup>

Conflicting information commonly results from the Schirmer's test. It had been reported in the past that Schirmer's test has low sensitivity but high specificity. Korb et al in 2000 did a survey of preferred tests for the diagnosis of dry eye and concluded Schirmer's test as one of their four choices.<sup>7</sup> In this study, Schirmer's I test showed high false positive results (47%) in terms of symptomatology.

TBUT is the only direct evidence and the most useful test for indicating the stability of the tear film. The measurement of tear film stability is fundamental to the diagnosis of dry eye.<sup>8,9</sup> This study showed 46.7% prevalence of dry eye as per the TBUT test. Figure 1 Considering both Schirmer and TBUT tests, 22.6% positivity was observed for dry eye as against the high positivity of 47% with Schirmer's I test alone. Hence it was found that, dry eye detected by Schirmer's test do not always show a proportionate reduction in TBUT values. This indicates that, these two tests examine different aspects of tear physiology.

Noninvasive BUT (NIBUT) can be measured by corneal topography, interferometry, aberrometry and confocal microscopy. These video keratotomy indices enable us to assess the quality of tear film, its breakdown and its effect on image quality.<sup>10</sup>

Rose Bengal test have been shown to have high degree of sensitivity and specificity. Dry eye prevalence was 28.4% in this study based on Rose Bengal staining test and it was 6.6% with fluorescein stain. Fluorescein stain is optimal to study the effect of dryness on corneal surface.<sup>11</sup>

But the ocular surface dessication detected by dye staining is usually preceded by tear film instability. Hence, Schirmer's test and tear film break up time may be used to detect early cases of dry eye and staining tests may be done in chronic and severe cases of dry eye.

Shen suggested that lower tear meniscus height and radius were the best indicators of dry eye with a cut off meniscus height of 1.64 mm and radius of 1.82mm.<sup>12</sup> Among the ocular signs, decrease of tear film meniscus height, debris in tear film, hyperemia of conjunctiva, frothy discharge at the lid margins and canthi, frequent blinking, lack of luster in the conjunctiva, cornea or both surfaces appeared to be the important markers pointing to the diagnosis of dry eye.

Hence for clinical purposes, patients' symptoms will obviously influence the choice of the diagnostic tests to use. Ultimately, the choice of the dry eye test for screening the population must be based on the desired level of sensitivity and specificity balancing with patients' comfort.

## 5. Conclusion

This study firmly concludes that the Schirmer's test, Tear film Breakup Time, Fluorescein score and Rose Bengal test should be done routinely in all warranted cases to enable early detection and timely treatment of dry eyes thus providing lasting relief to the patients and can prevent ocular surface complications also.

## 6. Conflict of Interest

None.

## 7. Source of Funding

None.

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