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# Prevalence of Dry Eye in Patients Presenting With Symptoms Suggestive of Dry Eye

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***Abstract:***
***Background:*** *Dry eye disease is a multifactorial disease of the tear film and ocular surface that results in symptoms of discomfort, visual disturbance and tear film instability with potential damage to the ocular surface. DED is a frequent cause of ocular irritation and wide variety of presenting symptoms that makes the patient to visit the ophthalmologist. It is often unrecognized leading cause for significant visual morbidity. It is important to detect the DED early so as to improve the patient comfort and minimize structural damage to ocular surface. There are various studies showing that the prevalence of dry eye disease with different diagnostic criteria is between 18.4% and 40.8%. The purpose of present study is to establish the prevalence of DED in patients presenting with symptoms suggestive of Dry eye.*
***Aims and Objectives:-*** *To determine the prevalence of dry eye in symptomatic patients and to assess the frequency of occurrence of dry eye.*
***Materials and Matters:-*** *Patients presenting with symptoms suggesting dry eye disease were evaluated by complete slit-lamp examination, Tear break-up time (TBUT), Rose Bengal staining and Schirmer's test. Participants were labelled as having dry eye disease if at least two out of these three diagnostic tests were positive.*
***Results:-*** *The study group consists of 1050 patients presenting with symptoms suggesting dry eye attending to the Department of Ophthalmology , SVRRGGH, Tirupati. All study population were subjected to OSDI questionnaire before doing confirmatory diagnostic tests. Patients with postitve symptoms were subjected to Dry Eye tests.*
***Conclusion:-*** *The dry eye evaluation with appropriate and standard questionnaire along with standard tests,helped in diagnosis and effective management of Dry Eye patients.*
***Keywards****: Dry eye disease (DED), Ocular surface disease index(OSDI), Tear film break-up time(TBUT), Rose-Bengal Stain,Meibomian gland dysfunction (MGD),*

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## I. Introduction

Dry eye disease (DED) is a multifactorial disease of the tear film and ocular surface that results in symptoms of discomfort, visual disturbance, and tears film instability with potential damage to the ocular surface. It is accompanied by increased osmolality of tear film and inflammation of the ocular surface.

DED is a frequent cause of ocular irritation that makes the patient visit the ophthalmologist and due to wide variety of presenting symptoms, it is often unrecognized, with delayed presentation leading to significant visual morbidity. There are great advances in the understanding of dry eye disease over the past 10-15 years in the aspects of epidemiology, pathogenesis, clinical manifestation, and possibly in the therapeutic regimen. It is important to detect DED early so as to improve the patients comfort and to minimize further structural damage to ocular surface.

The reported prevalence of DED in the literature is diverse, ranging between 7.8% in one study in western world [1] and 93.2% in one study in Asia [2].This is probably because of two factors: first, the geographical location of the study population and. secondly, there is no standardization of the selected population, dry eye questionnaires, objective tests and dry eye diagnostic criteria[3,4].

It is also widely agreed that Meibomian gland dysfunction (MGD) is the most common cause of evaporative dry eye disease[5,6]. Recent studies showed that the prevalence of Meibomian gland dysfunction (MGD) in general population varies between 30.5% and 54.1%[7,8]

Asian studies on DED showed that the prevalence of dry eye is higher than that in western population and it is between 14.5% and 93.2%[9,10,11].There is no population-based study in relation to dry eye disease in India. There are only three studies from India available in the peer-review journals and two of them from the North and one from Eastern India. With different diagnostic criteria the prevalence of dry eye in these studies was Between 18.4% and 40.8%[12,13,14].One small study from Leh showed a higher prevalence of dry eye of 54% in high altitude[15].The present study aimed at understanding the prevalence of Dry Eye disease with appropriate diagnostic criteria in symptomatic patients attending outpatient department in SVRRGGH.

**AIMS AND OBJECTIVES**

**Aim**:

To determine the prevalence of dry eye in symptomatic patients attending the Ophthalmology OPD, S.V.R.R.G.G.H, Tirupati.

**Objectives:**

1. To assess the frequency of occurrence of dry eye.
2. To correlate dry eye status with their clinical features, diagnostic tests and disease profile.

**MATERIAL AND METHODS**

Patients presenting with symptoms suggestive of dry eye disease attending to the Ophthalmology OPD, S.V.R.R.G.G.H, Tirupathi. during the period between October 2014 to December 2015 were included in this observational study.

INCLUSION CRITERIA patients presenting with complaints of

- ✓ Burning sensations.
- ✓ Sandy gritty feeling.
- ✓ Foreign body sensation.
- ✓ Sensitivity to light,
- ✓ Heavy lids.
- ✓ Stinging.
- ✓ Redness.
- ✓ Poor tearing , matting or crusting of lids ,
- ✓ Intolerance to fan and air conditioning were included in this study

**EXCLUSION CRITERIA:**

- ✓ Patients suffering from acute ocular infections, extensive corneal or conjunctival pathology
- ✓ Chronic dacrocystitis
- ✓ Patients who had undergone ocular surgery in the last six months
- ✓ Patients who were on topical lubricants for the last six months

**STUDY PROTOCOL**

The study was approved by the Institutional Research Approval Committee and Ethical Committee

Written informed consent was taken before enrolling the patients in the study. An OSDI(ocular surface disease index) questionnaire was given to all participants to assess the symptoms of dry eye and correlate them with the signs. A complete slit-lamp examination of the lid margins, tear meniscus, conjunctiva, cornea and tear film was done. Relevant examination of other important ocular structures was done.

Following this, tests to diagnose dry eye were performed. These were tear break up time(TBUT), Rose bengal staining ,Schirmer's Test . Participants were labeled as having dry eye if at least two of these three diagnostic tests were positive. This criteria of two diagnostic tests to diagnose dry eye was adopted in order to increase the detection rate of dry eye and hence arrive at an accurate prevalence.

**DIAGNOSTIC TESTS:**

**1.Schirmer's test 1** : this test was performed before the other tests as it had to be done before instillation of anaesthesia.

Interpretation : Measurements of <10mm were considered to be positive. And >10mm were considered as negative.1

**2.Tear film break up time(TBUT)** : The TBUT is the time in seconds between the last blink and the appearance of the dry spot.

**Interpretation :**
Break up time of less than 10 seconds was considerd positive, indicative of dry eye. Greater than or equal to 10 seconds was considered negative.

**3.Rose Bengal test** : it is a measure of assessing ocular surface damage using the rose bengal dye.

**Procedure –**

One drop of antibiotic solution was put on a sterile, commercially available rose Bengal strip. This drop was allowed to roll into the lower cul de sac of each eye. After 15 seconds, this eye was examined for staining of cornea and conjunctiva.

Staining was based on modified Van Bijsterveld rose Bengal grading map. A quantitative scale of 0 to 3 was used in each area of the conjunctiva of each eye.
Interpretation : An additive score of total 4 or more in the eye constituted a positive test . Less than this value was considered as a negative test

During the period between June 2015 to June 2016 , a total of 1050patients presenting with symptoms suggestive of dry eye disease attending to the Ophthalmology OPD, S.V.R.R.G.G.H, Tirupathi were included in the study.

**1.Baseline charectestics of patients of study population:**

**Table 1-** AGE:

| Age group in years | No of patients (percentage) |
|---|---|
| 21-30 | 130 (12.5% ) |
| 31-40 | 300(28.6%) |
| 41-50 | 180(17.1%) |
| 51-60 | 250(23.8% ) |
| 61-70 | 190(18.1%) |

**2. Sex**
Total study population has 630 female and 420 males.

**3.OSDI score**
All study population were subjected to OSDI questioner before doing confirmatory diagnostic tests**.**

**Table -2:** OSDI Score(Ocular surface disease index) of study population

| **OSDI Score** | **N of patients** |
|---|---|
| 0 | 60 |
| 1-33 | 670 |
| 34-66 | 210 |
| 67-100 | 110 |

**4.Diagnostic tests for dry eye**

**Table-3:** Results of Schirmer test in study population

| **Readings of test** | **No of patients** |
|---|---|
| 0-5 mm | 220 |
| 6-10mm | 240 |
| >10mm | 590 |

**Table-4:** Results of Tear Film Break Up Time (TBUT)

| **RESULT OF TEST** | **N0 0f patients** |
|---|---|
| Positive | 250 |
| Negative | 800 |

**Table-5:** Results of Rose Bengal Test

| **Test result** | **No of patients** |
|---|---|
| Positive | 330 |
| Negative | 720 |

## II. Discussion

**Prevalence of dry eye**

In the present study the prevalence of the Dry Eye was found to be 42.9%.

The Salisbury eye study[17] showed a prevalence of 14.6% based on subjects reporting with symptoms.

In the study conducted by Sahai et al [24] dry eye was present in 18.4% of the subjects studied.

In a population based study in Indonesia, conducted by Lee AJ et al[65] the prevalence of dry eye was 27.5%.

In the study conducted by Moss et al[16] the overall prevalence of dry eye was 14.4%

In the study conducted by Jie Y et al [76] the prevalence was found to be 21% in the adult population in China ,based on symptoms.

In the study conducted by Poonam et al , a hospital based prevalence study in Hubli, Karnataka the prevalence of dry eye was 48.5%.

The prevalence of dry eye varied from 10.8% to 57.1%,there by showing wide disparity.59-63.Comparision of different studies of dry eye with our study is shown in Table 1.

The vast disparity in dry eye prevalence stems mainly from the different dry eye diagnostic criteria employed and different cut-off values for the objective dry eye tests. The high prevalence in some studies is also because objective dry eye tests have been performed in patients with positive symptom score (thereby introducing a selection bias)or in patients in rheumatoid arthritis and Sjogren's syndrome , which have proven dry eye components. Our dry eye prevalence of 42.9% falls within this range.

**Table 1.** comparision of different studies of dry eye with our study

| Authors | Name of the study | Place | Age in years | Sample size | Diagnostic criteria | Prevalence (%) |
|---|---|---|---|---|---|---|
| SCHEIN[17](1997) | SALISBURY EYE EVALUATION STUDY | America | 65-84 | 2420 | 6 item questionnire<br>schirmer test<br>Rose Bengal test | 14.6<br><br>2.2<br>2.0 |
| Sahai [24](2005) | | Jaipur (india) | >20 | 500 | Symptoms+abnormal schirmer or TBUT or filaments | 18.4 |
| Lee[65] (2002) | Riau eye study | Indonesia | >21 | 1058 | 6 items questionnaire | 27.5 |
| Moss[16] (2000) | BAVER DAM EYE STUDY | AMERICA | 48-91 | 3722 | Self reported history of dry eye | 14.4 |
| JIE[76] (2009) | BEIJING EYE STUDY | CHINA | >40 | 1957 | One or more symptoms | 21 |
| Gupta[15] (2008) | | Leh INDIA | >20y | 50 | MCMONNIES and OSDI questionnaire | 54 |
| GUPTA[13] 2010 | | DELHI INDIA, | >40 | 400 | MCMONNIES and OSDI questionnaire | 29.3 |
| Basak[14]( 2012) | | West Bengal INDIA | >30 | 3023 | 6 item questionnire and one positive sign MGD | 40.8<br><br>26.1<br>31.7 |
| POONAM | | HUBLI INDIA | >20 | 70 | OSDI QUESTIONNIRE,TBUT<br>schirmer test<br>Rose Bengal test | 48.5 |
| Present Study | | A.P, INDIA | >20 | 1050 | OSDI QUESTIONNIRE,TBUT<br>schirmer test<br>Rose Bengal test | 42.9 |

**Sex wise distribution of dry eye:**

We found a higher prevalence of dry eye in women compared to men, which corresponds to the findings of other studies .

Moss et al found a prevalence of 16.7% in women compared to 11.4% in men. These were the prevalence rates obtained after adjusting for age .

Sahai et al found prevalence of 22.8% in women compared to 14.9% in men in his study on hospital based population.

**Table 2:** Comparition of Dry eye prevalence in other studies in sex distribution

| Study | Female% | Male% |
|---|---|---|
| Moss etal | 16.7 | 11.4 |
| Sahai et al | 22.8 | 14.9 |
| Basak et al | 51.9 | 48.1 |
| Poonam et al | 50.8 | 38.4 |
| Present study | 49.2 | 33.3 |

**OSDI score:**

It has been proposed that there is a poor correlation between subjective symptoms and objective signs of dry eye, thus emphasizing the need for objective testing in all patients at risk for developing dry eye .The OSDI score system was used in our study as it can classify the dry eye in to mild ,moderate and severe varieties.(Table9) An OSDI scoring of 67-100 which corresponds to severe dry eye, was found to correlate significantly with objective tests of dry eye. Similar findings were noted by Ozcura et al [73] who evaluated the OSDI questionaire for diagnosis of dry eye and found a significant inverse correlation between OSDI and TBUT scores.

Simpson TL et al have found that this scoring system is highly sensitive in differentiating symptomatic & asymptomatic subjects of dry eye. Srinivasan et al used the OSDI score system to separate post menopausal women who demonstrate clinical signs of ocular dryness.

We also were able to demonstrate that a large number of patients with dry eye do show symptoms and the symptoms correlate well with signs of severe dry eye though not much in cases of moderate dry eye .Another reason for the low symptoms may be that ,most of the patients in our study were from low socioeconomic status with lower literacy rates. These patients were more worried about systemic symptoms and tend to undermine their ocular symptoms.

**Tests performed for detection of dry eye**

3 diagnostic tests were performed on all patients .If two test are positive then the patients are labeled as dry eye. As mentioned earlier, this criteria was adopted for diagnosis in order to increase the detection rate and hence to arrive at an accurate prevalence. Among all the tests,Schirmer test showed a high sensitivity,specificity and predictive values. Apart from being one of the most frequent tests used in dry eye clinical practice, other studies have also shown it to have a sensitivity and specificity of up to 85% which correspond to the results of our study. Rose Bengal test was the next best test of sensitivity and specificity .The characteristic staining of the interpalpebral area in wing shaped manner ,was noted in most of the cases who tested positive.

On comparing the results of Schirmer test and Rose Bengal test,it was found that,270 patients showed positive results for both the tests.30 patients were positive with Rose Bengal test but negative with Schirmer test.140 were positive with Schirmer test but negative with Rose Bengal test.(Table 13,14,15)

TBUT is found tobe positive (<10 seconds) in 250 eyes.TBUT was found to have a sensitivity of 46.4% and specificity of 100%.

## III. Conclusion

- Dry eye is often an under –diagnosed ocular disorder . Because diagnosis and assessment of dry eye are complicated by considerable variation in disease symptoms , signs and lack of definitive diagnostic tests.
- Dry Eye is more common in elderly population.
- While considering a diagnosis of dry eye, attention should also be paid to other factors such as gender, presence of refractive error, associated systemic diseases like rheumatoid arthritis, as dry eye has positive correlation with these factors.
- Dry eye evaluation with an appropriate and standard questionnaire along with standard tests for dry eye helps in diagnosis and treatment .This will go a long way in the effective and successful management of patients with dry eye
- The most important aspect of caring for patient with dry eye are to educate them about the chronic nature of the disease process and to provide specific instructions for therapeutic regimens.
- It is helpful to reassess periodically the patient's compliance and understanding of the disease, the risks for associated structural changes and to re-inform the patient as necessary.

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