

# A Hospital Based Study of Prevalence of Dry Eye in Tertiary Care Hospital of Nepal

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## ABSTRACT

### Background

Dry eye is a common disorder of the tear film that results from decreased tear production, excessive tear evaporation, or abnormality in mucin or lipid components of the tear film associated with symptoms of ocular discomfort.

### Objective

To determine the prevalence of dry eye among patients above 40 years attending out-patient department in a Tertiary Care Hospital of Nepal.

### Method

This was a prospective hospital-based study done at the Department of Ophthalmology in Dhulikhel Hospital, Kathmandu University Hospital for a period of six months from September 2016 to February 2017. All the patients above 40 years of age, attending out patients department were screened by ophthalmologist using the Ocular Surface Disease Index (OSDI). Those patients who were diagnosed of dry eye by OSDI were further evaluated by Schirmer's test and Tear film breakup time (TBUT).

### Result

Out of 4470 patients attending Ophthalmology outpatient department 1599 patients were of age above 40 years. The overall prevalence of dry eye according to OSDI questionnaire was 25% (400). The mean age of patient with dry eye was 54 yrs. 169 were males (42.2%) and 231 were females (57.7%). Among them Schirmer's test was positive in 16.7% (67) and TBUT was positive in 85.7% (343) of the patients with dry eye.

### Conclusion

Dry eye is a common condition among patients attending ophthalmology outpatient department in tertiary care center and is leading cause of ocular discomfort. The prevalence of dry eye was higher among indoor workers than in outdoor workers. Further studies are needed to establish association and risk factor of dry eye.

## KEY WORDS

*Dry eye, Ocular surface disorder index questionnaire, Schirmer's test, Tear film break up time*

## INTRODUCTION

Dry eye is a common disorder of the tear film that results from decreased tear production, excessive tear evaporation, or abnormality in mucin or lipid components of the tear film associated with symptoms of ocular discomfort.<sup>1,2</sup> Dry eye is more amongst the elderly, particularly postmenopausal females and in ophthalmology practice dry eye is the most frequent disorder.<sup>3,4</sup> The International Dry Eye Workshop (DEWS) in 2007 revised the definition and classification scheme of dry eye disease (DED). The term dry-eye syndrome according to DEWS has been defined as “a 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. It is accompanied by increased osmolarity of the tear film and inflammation of the ocular surface”.<sup>5</sup>

The prevalence of dry eye in India is 29.25% while it ranges from 5%-35% worldwide based on Ocular Surface Disease Index (OSDI) data.<sup>6</sup> When the symptoms of dry eye occur reduction in quality of life is inevitable.<sup>7</sup> Studies using tests of tear function including Schirmer’s test, tear film break up time, fluorescein staining, or rose bengal staining for detection of dry eye have found generally lower prevalence rates compared to questionnaire-based surveys of dry eye symptoms which included history of contact lens wear, previous treatment for dry eye, frequency of symptoms, sensitivity to provocative stimuli, use of systemic medications, and comorbidity.<sup>8</sup> Dry eye is essentially a clinical diagnosis. No one test is sufficiently specific to permit an absolute diagnosis of dry eye.

The aim of this study is to determine dry eye prevalence, evaluate personal and environmental risk factors attributable to dry eye and find out the association between subjective complaints and objective tests of dry eye in a hospital-based population.<sup>8</sup> A more recent area of study in dry eye is the implications for visual function and its quality.<sup>9</sup>

## METHODS

In this prospective, hospital based cross sectional study 400 patients above 40 years of age presenting with various eye problem in out patient department of Dhulikhel Hospital were screened for dry eye from September 2016 to February 2017. The patient were selected and informed about the study. The ethical approval was obtained from the Institutional Review Committee of Kathmandu University School of Medical Sciences, Dhulikhel. A written informed consent was taken from all the patients.

The patients were screened using the Ocular Surface Disease Index (OSDI). The OSDI developed by the Outcomes Research Group at Allergan (Irvine, California) is a 12 item questionnaire which was designed for rapid assessment of the symptoms of ocular irritation consistent with dry eye

disease and their impact on vision related functioning.<sup>10</sup>

All the patients visited to out patient department with different symptoms of dry eye and later diagnosed to have abnormal tests and signs of dry eye were included. Patients with ocular surface infections, foreign bodies, extensive ocular surface pathologies were excluded. We also excluded those who had undergone an ocular surgeries within 6 months of screening. Patients with systemic illness, precipitating dry eyes such as Sjogren’s syndrome, rheumatoid arthritis, parkinsonism, systemic lupus erythematosus were excluded.

We studied 400 patients who were screened using the OSDI questionnaire. A detailed history of patient’s age, sex, occupational history and place of residence were recorded. The dry eye symptoms included grittiness, burning sensation, blurring of vision, redness. The questionnaires was obtained by a well trained ophthalmologic assistant. All participants underwent a complete ophthalmological examination by ophthalmologist along with Schirmer’s and TBUT. Schirmer’s and TBUT was performed in all participants by a single observer.<sup>9</sup> Visual acuity was assessed by Snellen Vision box with multiple optotype. E chart was used for illiterate patients. Both presenting and best corrected visual acuity was recorded after refraction. Slit lamp examination was performed by using a slit lamp biomicroscope (Haag Streit model BQ-900, Bern, Switzerland) by the same ophthalmologist.

The stability of the precorneal tear film was assessed by using tear film break up time. It is considered to be a reliable and repeatable test for dry eye and is minimally invasive. TBUT was measured at room temperature with fans switched off and all readings were taken by a single observer by applying fluorescein dye in the inferior cul-de-sac followed by evaluating the stability of the precorneal tear film. This test was performed by moistening a fluorescein strip (Fluorescein sodium ophthalmic strip u.s.p of company Fluoro Touch. Each fluorescein sodium contains 1 mg) with sterile normal saline and applying it to the inferior fornix. After several blinks, patient was advised not to blink further. The tear film was examined using a broad beam of the slit lamp with a blue filter.<sup>9</sup> The time interval between the opening of the eyelid and appearance of dry spots on the tear film was recorded using a stop watch. The three readings of TBUT were taken and the average was recorded and considered positive if the average TBUT was less than 10 sec.<sup>11</sup>

The Schirmer’s test was performed after slit lamp examination by using Schirmer’s paper (Whatman’s filter paper no. 41 manufactured by akriti oculoplasty logistics) and the amount of wetting of the paper strip after 5mins was recorded. Measurement of less than 10 mm was considered abnormal.

Statistical analysis was performed using software SPSS. Chi square test was used to compare OSDI scores with different

gender and occupation. A p value < 0.05 was considered statistically significant. Analysis of variance test (ANOVA) was used to compare between OSDI score and with Schirmer’s test and TBUT test.

### RESULTS

A total of 400 patients were screened as dry eye out of 1599 patients with the help of OSDI questionnaire presented to out patient department in ophthalmology.

Among the screened patients, there were 169 males (42.2%) and 231 females (57.8%). The age was 54.4±11.4 (mean+standard deviation) for male and the age was 53.6±10.09 (mean + standard) for female. The largest proportion of respondents contributed was 40 to 50 years old 158 (39.7%). Most of the respondents attended to out patient department was from rural areas (52.4%). We assessed the prevalence of dry eye among various occupation groups. Housewives and indoor workers have the highest prevalence of dry eye, which is 42%. Farmers and those doing outdoor jobs have the least prevalence of dry eye.

**Table 1. Sociodemographic information (n=400)**

Age group	No. of Patients	Percentage (%)
40-50	158	40
50-60	137	34
60-70	58	15
70-80	33	8
≥ 80	14	4
Sex		
Male	169	42.2
Female	231	57.8
Address		
Rural	210	52.5
Urban	190	47.5

The most common symptoms reported in this study among the diagnosed cases of dry eye were blurring of vision (61%) followed by burning sensation (23%), watering (19% ) and redness (10%). The most common sign was pinguecula

**Table 2. Symptoms and signs**

Symptoms	Number of Patients	Percentage
Blurring of vision	245	61
Burning sensation	90	23
Redness	39	10
Watering	74	19
Signs	Number of Patients	Percentage
Meibomian gland dysfunction	36	9
Pterygium	17	4
Pinguecula	56	14
Superficial punctate erosion	16	4

**Table 3. Comparison between Ocular Surface Disease Index Score and Sex (Chi square test)**

Ocular Surface Disease Index Score	Sex		P value
	Male	Female	
Mild	35 (47.9)	38(52.1)	0.281
Mild-mod	66(43.4)	86(56.6)	
Moderate	0(.0)	2(100.0)	
Mod-sev	68(40.0)	102(60.0)	
Severe	0(.0)	3(100.0)	

(14%) followed by meibominitis (9%), pterygium (4%), punctate epithelial erosion (4%).

The OSDI score is a valid and reliable instrument for measuring dry eye disease severity (normal, mild to moderate and severe) and effect on vision-related function. In this study moderate to severe was 170 (42.5%), mild to moderate 152 (38%), mild 73 (18.25%), severe 3(0.75%) and moderate 2 (0.5%).

The Schirmer’s test was 17.64±6.69 mm in the right eye and 18.42 ± 7.36 mm in the left eye. When the average Schirmer’s test result was less than 10 mm, patients were classified as dry eye. Based on this criteria, the prevalence of dry eye with Schirmer’s was 16.7% (67). There was significant relationship between the Schirmer test and OSDI in moderate and moderate to severe group at p < 0.05 level.

**Table 4. Comparison between Ocular Surface Disease Index Score and Occupation (Chi square test)**

Ocular Surface Disease Index Score	Occupation							P value
	Housewife	Farmer	Indoor service	Business	Retired	Public service	Labour	
Mild	25(34.2%)	13(17.8%)	15(20.5%)	12(16.4%)	0(.0%)	3(4.1%)	5(6.8%)	0.565
Mild-mod	72(47.4%)	36(23.7%)	18(11.8%)	12(7.9%)	3(2.0%)	6(3.9%)	5(3.3%)	
Moderate	2(100.0%)	0(.0%)	0(.0%)	0(.0%)	0(.0%)	0(.0%)	0(.0%)	
Mod-sev	71(41.8%)	40(23.5%)	28(16.5%)	16(9.4%)	5(2.9%)	7(4.1%)	3(1.8%)	
Severe	3(100.0%)	0(.0%)	0(.0%)	0(.0%)	0(.0%)	0(.0%)	0(.0%)	
Total	173(43.3%)	89(22.3%)	61(15.3%)	40(10.0%)	8(2.0%)	16(4.0%)	13(3.3%)	

**Table 5. Results of Schirmer's test and Tear film break up time**

Schirmer's test RE	Frequency	Percent
< 10 mm	73	18.3
> 10 mm	327	81.8
Schirmer's test LE		
< 10 mm	62	15.5
> 10 mm	338	84.5
Tear film break up time test RE		
< 10 mm	345	86.3
> 10 mm	55	13.8
Tear film break up time test LE		
< 10 mm	341	85.3
> 10 mm	59	14.8

TBUT test was performed among the dry eye cases to determine the evaporative components. TBUT was detected abnormal when it was less than 10 sec. The abnormal TBUT test was detected in 343 (85.7%) cases. The relationship was significant between the TBUT and the categories of OSDI in mild, mild to moderate, moderate and moderate to severe group at  $p < 0.05$  level.

## DISCUSSION

Dry eye is a common disorder that is on the rise and is responsible for a significant impact on quality of life even in people with good vision and can be considered as a public health problem.<sup>12,13</sup> The majority of patients with dry eye experience chronic ocular discomfort associated with impaired daily visual function and subsequent vision related quality of life disturbance, further impacting health status.<sup>14</sup> In this study, out of 1599 patients screened, 400 were found to be dry eye. In the past studies the prevalence of dry eye varies from 10.8% to 57.1%.<sup>15-17</sup> The vast disparity in dry eye prevalence stems mainly from different dry eye diagnostic criteria employed and different values for objective dry eye tests. The high prevalence in some studies is because objective dry eye test have been performed in patients with different systemic diseases like rheumatoid arthritis, Sjogren's syndrome, thyroid dysfunction which have proven dry eye component.<sup>8</sup> The prevalence of dry eye estimated in this study is around 25% in patients visiting the outpatient department at a tertiary care center. In a survey conducted by the American Academy of Ophthalmology, around 30% of patients seeking treatment from an ophthalmologist have symptoms consistent with dry eye disease.<sup>18</sup> The international DEWS stated that the global prevalence of dry eye is about 17% while several other studies show a higher prevalence of approximately 30% in Asian.<sup>19</sup> Another update conducted in Korea reported a prevalence of 33.2%. A prevalence of 22% was estimated in a retrospective study conducted at Miami and Broward Veterans Affairs eye clinics. The overall prevalence of dry eye among patients of age 40 years and above in our study is 25% which is similar than that found in other similar studies.

Guillon et al. have shown in a study in United Kingdom that the tear film evaporation is significantly higher in subjects above the age of 45 years.<sup>20</sup> An intact and efficient lipid layer in the tear film is required to prevent the evaporative loss of tear film. This lipid layer is thinner and less efficient in older subjects and particularly females. There is destabilization associated with significant changes in the tear lipid layer leading to less protection from evaporation in the older population.<sup>21</sup> These findings are consistent with the previous studies by Moss et al. and Schaumberg et al. which emphasize an increased prevalence of dry eye in the elderly, particularly women.<sup>12,22</sup>

In our study, dry eye prevalence showed a relative peak in the age group 40-50 years. This peak reflects a dry eye state induced by environmental exposure, to which this age group, being the most active occupationally, is exceptionally prone.<sup>23</sup>

Most studies report a higher prevalence of dry eye in females than males.<sup>15,17,24</sup> Our study was no exception; 57.8% females in the present study had dry eye compared to 42.3% males. Menopause causes oestrogen deficiency and a consequent change in the local hormonal milieu of the lacrimal gland. It is thought to decrease tear production and occurrence of dry eye in females. The increased prevalence in females may also have been due to the higher number of females with dry eye symptoms seeking advice for ocular problems.

We noted a higher dry eye prevalence in rural residents than in urban. Anshu Sahai et al. also have shown in a hospital based study the higher prevalence of dry eye in rural residents.<sup>16</sup> In our opinion, the increased rural prevalence in our study population was a direct consequence of the overwhelming exposure of rural residents, largely farmers and manual labourers, to sunlight, high temperature and excessive wind.<sup>23</sup>

In our study about 22.3% of population consisted of farmers working in adverse environmental conditions for long hours. They are exposed to excessive heat, sunlight, dust and wind. Further, their exposure to fertilizers and insecticides cannot be ignored. A poor economic condition as well as lack of awareness in this group of people prevents them from adopting protective equipment during work. Suchi et al. reported about 20% of study population consisted of farmers and laborers.<sup>25</sup> Khurana et al. too reported an increased risk of dry eye among farmers and laborers (32% and 28% respectively of the dry eye patients) probably due to excessive exposure to adverse environment.<sup>26</sup> This emphasizes the need for creating awareness among the farmers to adopt protective measures during work. This might not altogether prevent the incidence of dry eye, but this will help in delaying this condition and decreasing its severity. In this study 43.3% of population were housewives. Kavita et al. mentioned about 81.48% of patient were housewives in their study.<sup>8</sup>

Symptoms of burning sensation, dryness, and stickiness are the most prevalent among dry eye patients. There have been a few cases where the symptoms did not match our findings. In our study the common symptom is blurring of visions (61%) followed by burning sensation (23%). The reason for blurring of vision may be due to enrolling elder patients. Suchi et al. reported the prevalence of dry eye to be 24.1% in asymptomatic patients.<sup>25</sup> Nichols et al. have reported this problem too where there was a lack of correlation between signs and symptoms of dry eye.<sup>27</sup> This probably varies with patients' awareness and sensitivity toward the symptoms.<sup>27</sup> We found the prevalence of dry eye to be 14% in patients with pinguecula followed by blocked meibomian glands (9%). As defined by the international workshop on MGD, MGD is a chronic, diffuse abnormality of the meibomian glands, commonly characterized by terminal duct obstruction and/or qualitative/quantitative changes in the glandular secretion. This may result in alteration of the tear film, symptoms of eye irritation, clinically apparent inflammation, and ocular surface disease.<sup>28</sup> Another study has found MGD as the most common cause of evaporative dry eye.<sup>29</sup>

In this study the prevalence of dry eye with Schirmer's test is 16.7%. Handan Akil et al. found abnormal Schirmer's test in 10%.<sup>30</sup> Tamer et al. and Bekibele et al. found lower Schirmer's test values.<sup>31,32</sup> TBUT test was performed among the dry eye cases to determine the evaporative components. TBUT was detected abnormal when it was less than 10 sec. The abnormal TBUT test was detected in 343 (85.7%) cases in this study. Tamer et al. and Bekibele et al. found lower TBUT values.<sup>31,32</sup> Kavita et al. also found lower TBUT values. It indicates that low TBUT is associated with dry eye syndrome.<sup>8</sup>

In this study we evaluated the association between findings of OSDI and Schirmer's test. Our result showed no statistically significant association between the two. Nichols et al. also reported no association.<sup>27</sup> The authors pointed

out that the possibility of reflex tearing during Schirmer's tests might contribute to the lack of any correlation. Our study demonstrated a lack of correlation even with the possibility of reflex tear minimized. This illustrates that OSDI does not correlate well with clinical tests for dry eye. Nonetheless, the OSDI may contribute to the management of dry eye as a standardized instrument to evaluate and monitor symptoms.

But, in Tukey test there was significant between the Schirmer test and OSDI in moderate and moderate to severe group at  $p < 0.05$  level. The categories of OSDI were not significant when ANOVA test was applied. But, in Tukey test the relationship was significant between the TBUT and the categories of OSDI in mild, mild to moderate, moderate and moderate to severe group at  $p < 0.05$  level.

The limitation of this study is that it lacks other objective dry eye test like rose bengal test, impression cytology test and the use of fluorescein stain for TBUT instead of noninvasive BUT. Fluorescein itself can sometimes be irritating and lead to reflex tearing.

## CONCLUSION

Dry eye is a common condition among the patient attending ophthalmology outpatient department in tertiary care center. It is a multifactorial disease in which both subjective and objective measurements play an equal role in its diagnosis and management. The prevalence of dry eye was higher among indoor workers than in outdoor workers. Further studies are needed to establish association and risk factor of dry eye.

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