

SCREENING OF DRY EYE DISEASE AMONG AGRICULTURE WORKERS AT A RURAL TERTIARY CARE HOSPITAL

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Abstract

The aim of the study is to investigate the prevalence of dry eye disease and association of its various risk factors among agriculture workers attending outpatient ophthalmology department of a rural tertiary care hospital.

This was a cross-sectional study of 1322 workers between 21 to 70 years of age presenting with various ocular problems from January 2016 to December 2016. Standard patient evaluation of eye dryness (SPEED) questionnaire, Schirmer's test and tear film break-up time (TFBUT) tests were used for diagnosis of dry eye disease (DED).

Out of total 1322 workers, 789(59.68 %) were males and 533(40.32%) were female. The DED was diagnosed in 167 (12.63%) workers. The study population was divided into six groups according to their ages. The DED in 95(56.88%) workers of 61-70 years age were highest among the age groups. Male: female ratio was 2.27:1 among workers with dry eye. The commonest symptom was dryness grittiness or scratchiness. Low Schirmer's test values (< 10 mm) were found in 132 (79.04%) workers and TFBUT value was less than 10 seconds in 141 (84.43%) workers. DED was present in 163(13.05%) workers among 1249 smokers, 158(13.75%) workers among 1149 with more than 4 hours sunlight exposure and 117 (14.74%) workers among 794 with history of frequent alcohol consumption. These factors were significantly associated with DED with p value <0.05.

The prevalence of DED was found to be significantly associated with age, male gender, smoking, more sunlight exposures and alcohol consumption.

Keywords: Dry eye disease, SPEED questionnaire, Schirmer's test, tear film break-up time

Introduction

Dry eye disease (DED) is one of the most common complaints among patients attending the ophthalmological clinics. [1] The Definition and Classification Subcommittee of the International Dry

Eye Workshop (DEWS) in 2007 created a comprehensive definition for DED, which is most widely accepted till date. DED is defined as 'a multifactorial disease of the tears 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 osmolarity of the tear film and inflammation of the ocular surface'.^[2] DED is also broadly classified as aqueous deficiency or evaporative, though clinically these categories often overlap and coexist.

The most severe form of aqueous deficient DED is Sjögren syndrome (SS) a chronic autoimmune disease which involves the lacrimal, salivary glands and other organ systems. This causes surface epithelial lesions which leads to decreased tear production by the tear gland and subsequently aggravation of the DED symptoms with induction of an inflammatory response.^[3,4] The pathogenesis of DED begins with disorder of tear circulation and subsequently tear film instability.

In the diagnosis of DED symptoms play an important role.^[5] The common symptoms of DED are dryness, grittiness or scratchiness, soreness or irritation, burning or watering, eye fatigue due to either reduced production of tears or increased tear evaporation rate.^[6] The old age, female gender, smoking, contact lens wear, lid, ocular or refractive surgery, systemic diseases, frequent exposure to dust, dry air and use of some medicines can exacerbate the symptoms of DED.^[2, 7-9] It has also been reported that both ocular discomfort and psychological stress of DED adversely affects the quality of life of a person which ultimately leads to decrease an individual's productivity.^[10, 11]

Agriculture workers are exposed to a variety of environmental hazards that are harmful for their eyes. Our hospital covers about six million rural populations, mostly agriculture workers.

The reported prevalence of DED in the literature varies from 10.8% to 57.1%.^[12-14] Considering the high prevalence and variability of symptoms, each adult subject presenting for a primary ocular

care should be considered to be a case of DED.

The diagnosis of DED is mainly based on subjective symptoms without an objective clinical diagnosis.^[15, 16] The likelihood diagnosis of DED primarily begins with a quick and selective screening with four simple questions on presence of any uncomfortable feeling in the eyes, watering, and fluctuation of vision especially in a dry environment and use of any eye drops. The suspicion of DED is raised with an affirmative response to any of these questions and necessitates a screening examination for it.

Four validated questionnaires, Ocular Surface Disease Index (OSDI)^[17], 5-item Dry Eye Questionnaire (DEQ-5)^[18], McMonnies^[19] and Standard Patient Evaluation of Eye Dryness (SPEED)^[20] are useful tools to identify subjects with DED symptoms. The SPEED questionnaire has demonstrated good validity, objectivity and consistency when compared to other questionnaires to evaluate a case of DED. The questionnaire is set up to ask patients about their symptoms up to past three months due to the variability of symptoms over time. The numeric value for each answer is simply added with scores ranging from zero to 28. Patient's education on DED should be started even if without complaints of dry eye when score is six on the SPEED questionnaire. Those with many symptoms, and score greater than eight on the SPEED questionnaire, they should get attention for better symptomatic control.

There is no consistency among symptoms and signs of DED and various test results also don't correlate with each other.^[4] Several tests can be done in subjects with suspicion of DED. There is no single objective test to diagnose DED. Schirmer's test with or without anesthesia assess aqueous production. Tear film break up time (TFBUT) evaluate lipid layer of tear film. The abnormalities of corneal and conjunctival staining give an

idea of both aqueous tear deficiency and evaporative dry eye.

The appropriate diagnosis and management of DED is crucial for eye care needs of a large segment of rural populations who spend most of the day in the agriculture fields. No previous study had been done on DED among agriculture workers in our study area. In the literature, only few articles on DED in rural populations are available from India. The present study was aimed to estimate the prevalence with risk factors of dry eye disease among agriculture workers attending outpatient ophthalmology department, to initiate early treatment for them and to formulate counter measurement of the dry eye disease in the community.

Materials and Methods

This was a cross sectional prospective study of randomly selected 1322 agriculture workers, aged between 21 to 70 years, and attending outpatient ophthalmology department of a rural medical college hospital between January 2016 to December 2016. All of them were informed about the study and their consent was taken. The Institutional ethics committee approved the research protocol. The study subjects were interviewed with SPEED questionnaires (Annexure I) to evaluate dry eye. The subjects with possible answers score of six or more with SPEED questionnaires were included in the DED group and others were included in the non-DED group. The workers outside the mentioned age group, having lid abnormalities, features of anterior segment inflammation, history of ocular surgery was excluded from the study.

A detailed history regarding age, gender, duration of field work, smoking and alcohol intake was taken. The symptomatic complaints pertaining to dry eye disease was noted. Visual acuity of all workers was recorded with Snellen's chart and if needed refractive error was

corrected. A through anterior segment examination was done with slit lamp biomicroscope and posterior segment examination was done with 90D and indirect ophthalmoscope. Tear film was evaluated with measuring Schirmer's I test and TFBUT test.

Schirmer's test was done by placing a small strip of Whatman's filter paper No 41 inside the inferior fornix. The eyes were closed for 5 minutes. Then the paper was removed and the amount of moisture part was measured. More than 15 mm in all age groups (15 - 30 mm) was normal and less than 10 mm was suggestive of moderate dry eye. The measurement of less than 5 mm was diagnostic of severe DED.

The TFBUT test measured time the tears took to breakup in the eyes. After application of fluorescein 1% dye in the lower fornix the patient is asked not to blink while the tear film is observed under a broad beam of cobalt blue illumination of a slit lamp. The TFBUT was recorded as the number of seconds elapsed between the last blink and the appearance of first dry spot in the tear film over cornea. A TEBUT under 10 seconds was considered abnormal and positive for DED.

If the SPEED questionnaire score of six or more with low Schirmer's test and /or low TFBUT test values were present in an agriculture worker, the subject was considered to be suffering from DED.

Statistical analysis was done by calculating t-test to compare means of two groups, Odd ratio (OR) and 95% Confidence Intervals (CI) were calculated to compare the relative risk of the groups for categorical variables. Statistical significance was set at $p < 0.05$. Statistical software SPSS version 20.0 was used to analyze the data of this study.

Results

A total 1322 agriculture workers were screened for DED in this study (Table-1).

Table-1: Basic characteristics of workers in the study population

		Study population (n=1322)	
		Number of workers	(%)
Age groups in years	21-30	212	16.04
	31-40	416	31.47
	41-50	318	24.05
	51-60	267	20.19
	61-70	109	8.25
Sex	Men	789	59.68
	Women	533	40.32
Smoking	Never	73	5.52
	Former	353	25.34
	Current	914	69.14
Alcohol consumption	Never	528	39.94
	Moderate	671	50.76
	Severe	123	9.30
Work duration, hr./week	<42	249	18.84
	>42	1073	81.16
Sunlight exposure hr/day	<4	173	13.09
	4-8	924	69.89
	>8	225	17.02

It included 789(59.68 %) males and 533(40.32%) female subjects. Mean age of the workers was 53 ±14.32 years. The study group was divided into six groups according to their ages from 21 to 70 years. Out of the study population of 1322, 167 workers were diagnosed to have DED. The overall prevalence of DED was

12.63%. The affected workers of dry eye were 95 (56.89%) in 61-70 years age group, highest followed by 63 (37.72%) workers in 51-60years age group (Table 2). The incidence of the DED progressively increased with increasing the age of the workers.

Table 2: Age group and gender wise workers with dry eye

		DED group (n= 167)	
		Number of workers	(%)
Age groups in years	21-30	0	0
	31-40	2	1.20
	41-50	7	4.19
	51-60	63	37.72
	61-70	95	56.89
Sex	Men	116	69.46
	Women	51	30.54

Among the DED workers, 116 (69.46%) were males and 51(30.54%) were females. The male: female ratio was 2.27:1. The male workers were more affected than female workers.

In this study, 167(100%) workers had dry eye subjective symptoms and 141(84.43%) workers were positive for signs of dry eye. Therefore, 26 (15.57%)

subjects had no signs of dry eye. Most common symptoms were dryness, grittiness or scratchiness in 29(17.36%) workers, followed by soreness or irritation in 28(16.77%) workers (Table 3). The most common sign was follicles in 42(29.79%) workers followed by conjunctival congestion 31(21.99%) in workers.

Table 3: Symptoms and signs of the workers with dry eye

Symptoms (n=167)	No. of workers having symptoms (%)	Signs (n=141)	No. of workers having signs (%)
Dryness, Grittiness or Scratchiness	29(17.36%)	Conjunctival congestion	31(21.99%)
Soreness or Irritation	28(16.77%)	Follicles	42(29.79%)
Burning or Watering	64(38.32%)	Concretions	26(18.43%)
Eye Fatigue	46(27.55%)	Punctate epithelial erosion	13(9.22%)
		Blepharitis	17(12.06%)
		Meibominitis	12(8.51%)
Total	167(100%)		141(100%)

Table 4: Association of smoking, sunlight and alcohol consumption with dry eye

Exposure factors	Exposed group		Non-exposed group		Odds ratio	P value
	Total Workers	Dry eyes (%)	Total Workers	Dry eyes (%)		
Smoking	1249	163(13.05%)	73	4(5.48%)	0.3820	0.0015
Sunlight >4 hours	1149	158(13.75%)	173	13(7.51%)	2.580	0.0029
Alcohol consumption	794		528		1.652	0.0052

Table-4 shows in the study population, positive history of smoking was present in 1249 subjects and 73 were nonsmokers. DED was present in 163(13.05%) workers among all the smokers and only in 4(5.48%) non-smoker workers. More than 4 hours of sunlight exposure was present

in 1149 subjects and out of them 158(13.75%) had DED in comparison to 13(7.51%) workers with less sunlight exposure. Out of total 794 workers who gave history of frequent alcohol consumption, 117 (14.74%) had DED and 50(9.47%) workers had DED without

history of alcohol intake in 528 workers. The odd ratio of history of smoking, more than 4 hours of sunlight exposure and frequent alcohol consumption with DED was 0.38, 2.58 and 1.65 respectively. There were strong association of various exposure factors with DED (p value <0.05).

Schirmer's test value less than 10 mm was associated in 132 (79.04%) workers and TFBUT value was less than 10 seconds in 141 (84.43%) workers out of 167 workers with positive symptoms and/or signs of DED.

Discussion

The DED is a serious but neglected health problem in ophthalmology practice with limited treatment options. It affects millions of people worldwide. In this study of 1322 agriculture workers, 167 were detected to have DED. Mean age of the study population was 53 ± 14.32 years. Among 167 agriculture workers with dry eye, 116 (69.46%) were males and 51(30.54%) were females. The male: female ratio was 2.27:1. In our study male workers were more affected than female workers and it was consistent with Bhatnagar KR et al. [21] study in western India but in contrast to Sahai A et al. [22] study from Jaipur where females were also more affected than males. The male workers were more affected in our study because they are more active in outdoor work than female workers, so are more exposed to sunlight and excessive wind.

In our study population, the prevalence of DED was found 12.63%. The prevalence of dry eye varies widely in the previous studies. Sahai et al. [22], Bhutia et al. [23], Azharchisti et al. [24], and Ranjan et al. [25] had reported prevalence of dry eye 12.7%, 14.66%, 18.5% and 45.39% respectively in their study. This disparity in DED prevalence is mainly because of different diagnostic criteria and different cut off values of the objective tests for dry eye disease.

The affected workers of dry eye were 95 (56.89%) in 61-70 years age group,

highest followed by 63 (37.72%) workers in 51-60years age group in this study. The incidence of the DED progressively increased with increasing age of the workers which corroborates with the previous studies [22-25]. The senile changes in conjunctiva, cornea with decreased tear production and unstable tear film and prolonged exposure to the environmental factors may be responsible for DED commonly in older age group in our study. More research in this aspect in the future is needed for final conclusion.

In our study, 167(100%) workers had dry eye symptoms with SDEED questionnaire and 141(84.43%) workers were positive for signs of dry eye. Therefore, 26 (15.57%) subjects had no signs of dry eye but they were positive for symptoms. Most common symptoms were dryness grittiness or scratchiness in 29(17.36%) workers followed by soreness or irritation in 28(16.77%) workers. The most common sign was follicles in conjunctiva in 42(29.79%) workers followed by conjunctival congestion 31(21.99%), concretions in 26(18.43%), blepharitis in 17(12.06%), punctuate epithelial erosion in 13(9.22%) and meibominitis in 12(8.51%) workers.

In various studies prolonged sunlight exposure, smoking and alcohol intake have been suggested as significant risk factors in the literature. [26-29] In our study, positive history of smoking was present in 1249 subjects and 73 were nonsmokers. DED was present in 163(13.05%) workers among all the smokers and only in 4(5.48%) non-smoker workers. It has been suggested that in the eye smoking induces tear film instability by its direct action. [22] More than 4 hours of sunlight exposure was present in 1149 subjects and out of them 158(13.75%) had DED in comparison to 13(7.51%) workers with less sunlight exposure. This is induced by prolonged exposure to sunlight and wind in the agriculture field. Out of total 794 workers who gave history of frequent alcohol consumption, 117 (14.74%) had

DED and 50(9.47%) workers had DED without history of alcohol intake among 528 workers. The odd ratio of history of smoking, more than 4 hours of sunlight exposure and frequent alcohol consumption with DED was 0.38, 2.58 and 1.65 respectively. These factors were also significantly associated with DED with p value <0.05. Sahai et al. [22] found odd ratio of 1.81 to sunlight exposure and 1.42 to history of smoking in his study.

In our study, low Schirmer's test values (< 10 mm) were associated in 132(79.04%) workers and TFBUT value was less than 10 seconds in 141 (84.43%) workers out of positive symptoms and/or signs of DED with 167 workers. A normal tear film is essential for corneal epithelial integrity and its transparency. A quickly breaking tear film can create discomfort to a person. These test results indicate that low TFBUT and Schirmer's test are significantly associated with DED. The decreased quantity of tear film which we observed in Schirmer's test may be an explanation of this increase incidence of DED in advance age in our study.

There is no single clinical test to accurately diagnose DED. We therefore combined subjective symptoms with SPEED questionnaire, assessed ocular anterior surface with slit lamp examination, and performed objective tests of Schirmer's test and TFBUT test for diagnosis of DED.

Conclusions

Among 1322 agriculture workers, prevalence of DED was 12.63% and it was found a good association between subjective symptoms and the DED signs. Age, male gender, sunlight exposure, smoking, alcohol consumption of the agriculture workers had impact on development of DED among them. We also found a significant association between Schirmer's test and TFBUT test with DED.

The strength of this study is that we had excluded all the proven dry eye factors in our subjects. The present study has the

limitation of small sample size and lack of follow up for a prolonged period.

Prolonged outdoor work, smoking, alcohol intake and lack of awareness of the disease were probably the contributing factors for the DED in our study population. Early detection and timely intervention along with awareness of DED among agriculture workers can prevent its vision threatening complications.

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