Research Article

Dry eye prevalence and attributable risk factors in the eastern Madhya Pradesh

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Abstract

Background: There is increasing prevalence of dry eye in recent years. This disease is chronic and progressive and invariably leads to complications, if left untreated.

Objective: To study the prevalence, incidence, and attributable risk factors associated with dry eye syndrome in eastern Madhya Pradesh region.

Materials and Methods: This study included 1178 patients of which 114 patients were found to have dry eye. After detailed history, complete work up, and investigations patients were categorized into mild, moderate, and severe grades.

Result: In this study, the prevalence of dry eye in hospital-based population in eastern Madhya Pradesh was 9.6%. Dry eye was more common in women (66.6%). Most patients in this study belonged to rural background (60.5%). Air pollution (33.3%) was found to be the most common attributable risk factor affecting most of the farmers/laborers (33.4%). In this study 43.8% patients had moderate and 39.6% patients had mild grade of dry eye.

Conclusion: Diagnosis of dry eye is often overlooked as a possible cause of patient's complaint. Therefore, detection of disease at the earliest stage and prevention of attributable risk factors for dry eye alluded to in literature include air pollution, cigarette smoking, low humidity, high temperature, sunlight exposure, drugs, and uncorrected refractive error should be the goal so that disease progression to severe stage and serious sight-threatening complications caused by severe dry eye could be prevented. Thus prevention of attributable risk factors and early diagnosis could be the key for dry eye and offers good hope for better outcome.

KEY WORDS: Dry eye, prevalence, risk factors, occupation

Introduction

Dry eye was defined by the national eye institute industry workshop in 1993 by Lemp[1] as a disorder of tear film due to tear deficiency or excessive evaporation, which causes damage to the interpalpebral ocular surface and is associated with symptoms of discomfort. An unstable tear film inadequately supports the health of the ocular surface epithelium, promoting ocular surface inflammation and stimulates ocular pain.

Dry eye syndrome is a fairly common condition and there is increasing prevalence of dry eye syndrome in recent years. Increasing longevity of population, increasing computer use, more patients having LASIK surgery, and more people taking medication with side effects that have adverse effect on production of high-quality tears seem to result into a large number of patients with dry eye.

The study of dry eye syndrome is important because of increasing frequency of its occurrence, various risk factors with which disease is associated and difficulties in treatment of disease.

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Keeping the above facts in view, this study was carried out with aim to shed light on the dark area and to place things in true perspective. Recent advances in our knowledge of the causation of dry eye disease opens opportunities for improving diagnosis, disease management and for developing new, more effective therapies to manage this widely prevalent and debilitating disease state.

Objective

To study the prevalence and incidence of dry eye syndrome in eastern Madhya Pradesh region. To study the attributable risk factors associated with dry eye syndrome and its various subtypes.

Materials and Methods

This study included 1178 patients consecutively from outdoor and those admitted in Department of Ophthalmology, Gandhi Memorial Hospital, Rewa (MP) from July 2007 to October 2009.

A detailed history of patient including his/her name, age, address, occupation, and registration number was noted. Attributable risk factors that exacerbated the symptoms of dry eye are place of residence (rural or urban), excessive wind, sunlight, high temperature, air, pollution, drug, computer worker, office worker/shopkeeper, factory worker, myopia, hypermetropia, etc. A detailed history of medication, ocular disease, operation, treatment, occupation, and medical history was recorded in every case. After recording relevant history of case, the external examination of both eyes (using diffuse torch light and slit lamp) of each patient was conducted. All the patients were subjected to a 13 point 'Dry Eye Questionnaire' based on model suggested by Hikichi et al.[2] In selected patients a complete ophthalmological examination was carried out using a slit lamp bio microscope. Objective tests comprising blink rate, Schirmer's test, tear film break up time, rose Bengal test, and Lissamine green staining were carried out. Complete refraction under mydriasis with subjective correction was done where required.

Ocular Examination

- Visual acuity: This was tested with Snellens test type.
- Blink rate: Frequency of blink rate was noted (increased/decreased/normal) and also whether there was incomplete closure of lid or lagophthalmos.
- Palpebral fissure: Narrow/wide/normal.
- Lid margins were examined for any evidence of blepharitis, entropion, and ectropion.
- Conjunctiva was examined for hyperemia, lymphoid follicle, papillae, cicatrization, and symblepharon.
- Cornea was examined for any evidence of ulcer, epithelial filaments, mucous plaques, opacities, loss of normal luster. Corneal sensations were noted by touching the cornea with cotton wisp.
- Tear film was examined for thinning, any debris or mucous strands.
- Relevant general and systemic examination was carried out.

Investigations

Both eyes of all patients were subjected to specific investigations such as Schirmer's test, TBUT, Rose bengal, Lissamine green, and fluorescein stain. The results of tear function tests were further subjected to scoring system (Khurana (1993) scoring system)[3] to assess the severity of dry eye. According to their scores, the patients were graded to be having

1. No dry eye (0–1)
2. Dry eye suspect (2)
3. Mild dry eye (3–8)
4. Moderate dry eye (9–13)
5. Severe dry eye (14–18)

Routine and specific blood investigation for diabetes and thyroid dysfunction was done. RA factor was done in patients suspected of having Sjogren's syndrome.

Result

This study was carried out on 1178 patients selected consecutively from outdoor and those admitted in Department of Ophthalmology, Gandhi Memorial Hospital, Rewa between July 2007 and October 2009. Of the 1178 patients, 114 patients were found to have dry eye.

The age of patients ranged from 21 years to more than 51 years. We observed that the prevalence of dry eye increased with increasing age with maximum number (n=40; 35.0%) of dry eye patients belonging to the age group of more than 51 years. There were 38 men (33.4%) and 76 women (66.6%) and most of the patients (n = 69; 60.5%) belonged to rural background.

Occupation wise, farmers/laborers (n = 38; 33.4%) were most affected followed by factory workers (n = 19; 16.6%), office workers/shop keepers (n = 17; 14.9%), homemakers/students (n = 15; 13.2%), others with high exposure (n = 14; 12.3%), and those with low exposure (n = 11; 9.6%) (Table 1).

Attributable risk factors for dry eye in this study in order of decreasing frequency were air pollution (33.3%), sunlight/high temperature (16.6%), smoking (14.9%), drugs (14.9%), and others (20.3%) (Table 2). Hypermetropes were affected more (48.2%), followed by myopes (37.7%), then emmetropes (14.1%) (Table 3).

Foreign body sensation (84.2%), photophobia (37.7%), and mucous discharge (35.0%) were the most common complaints followed by burning (30.7%), ocular fatigue (30.7%), blurred vision (20.1%), itching (18.2%), pain (11.4%), dryness of eye (9.6%) and redness (7.8%), watering (6.1%), heavy sensation (4.3%), and discomfort (2.6%) (Table 4).

Table 1: Association of occupational risk factors with dry eye

S. No	Occupational groups	Number of dry eye (%)
1	Home maker/Student	15 (13.2%)
2	Other with low exposure	11 (9.6%)
3	Farmer/laborer	38 (33.4%)
4	Office worker/shopkeeper	17 (14.9%)
5	Others with high exposure	14 (12.3%)
6	Factory workers	19 (16.6%)
	Total	114 (100.0)

Table 2: Strength of association of environmental exposure factors and drug with dry eye

S. No	Environmental factor	Number of dry eye (%)
1	Sunlight/high temperature	19 (16.6%)
2	Air pollution	38 (33.3%)
3	Smoking	17 (14.9%)
4	Drug	17 (14.9%)
5	Others	23 (20.3%)
6	Total	114 (100%)

Table 3: Association of dry eye as per refractive status

S. No	Status	Number of dry eye (%)
1	Hypermetropes	55 (48.2%)
2	Myopes	43 (37.7%)
3	Emmetropes	16 (14.1%)
	Total	114 (100%)

Table 4: Distribution of cases according to symptoms

S. No.	Symptoms	No. of cases	Percentage
1	Foreign body sensation	96	84.2
2	Photophobia	43	37.7
3	Non sticky mucous discharge	40	35.0
4	Burning or stinging sensation	35	30.7
5	Ocular fatigue	35	30.7
6	Temporary blurred vision	23	20.1
7	Itching	21	18.2
8	Pain	13	11.4
9	Dry sensation	11	9.6
10	Redness	9	7.8
11	Watering	7	6.1
12	Heavy sensation	5	4.3
13	Discomfort	3	2.6

Most common signs were conjunctival congestion and presence of mucous thread in all the cases (Table 5). In this study most of the patients had dry eye of moderate grade (43.8%) followed by mild (39.6%) and severe (16.6%) (Table 6).

Most of cases had dry eye due to vitamin A deficiency (19.4%), followed by secondary Sjogren's syndrome (15.0%), idiopathic (12.4%), Stevens–Johnson's syndrome (10.5%), primary Sjogren's syndrome (7%), chronic blepharitis (7%), lid abnormality (7%), contact lens users (6.1%), postoperative patients (6.1%), diabetes (5.2%), and corneal anesthesia induced dry eye (4.3%) (Table 7).

Discussion

The morbidity associated with dry eyes is related to changes in ocular surface, giving rise to a spectrum of clinical abnormalities encompassing superficial punctate erosions, corneal filaments, coarse mucus plaques, epithelial defects and in severe cases, melting corneal ulcers.

This clinical study was carried out in 1178 patients, consecutively from outdoor and those admitted in Department of Ophthalmology, Gandhi Memorial Hospital. Rewa (MP) from July 2007 to October 2009. Of these, 114 patients were found to have dry eye.

In our study, we found that prevalence of dry eye in eastern Madhya Pradesh was 9.6%. The prevalence rate in previous studies was variable in different studies like Doughty et al.,[4] reported a prevalence rate 9.4%, Albietz[5] 10.8%, Moss et al.[6] 14.5%, and Sahai and Mallik[7] 18.4%. The vast disparity in range of dry eye prevalence stems mainly from the different dry eye diagnostic criteria employed and different cut off values for objective dry eye tests. Much of this disparity was probably because of no standardization of types of patients selected.

Prevalence of dry eye was found to be quite high in 4th to 6th decade (35.0%). Hikichi et al.[3] reported the highest prevalence of 17% and Sahai and Mallik[7] documented the highest prevalence of 36.1% in this age group in their studies and they concluded increasing prevalence of dry eye with increasing age was due to decreased lacrimal production with advancing age.

Most of the studies revealed a higher prevalence of dry eye in women than men. Our study was no exception, 66.6% (76/114) patients with dry eye were women against 33.3% (38/114) men. Increased prevalence of dry eye in women was also reported by Sahai and Mallik.[7] The possible explanation for women preponderance is that the menopause causes estrogen deficiency and a consequent change in the local hormonal milieu of the lacrimal gland, which is thought to decrease tear production and increase the occurrence of dry eye in women.

Our finding of increased dry eye prevalence (60.5%) in rural than urban (39.5%), and in farmers and laborers (33.4%) is in accordance with Sahai and Malik (2005).[7] They also found increased prevalence of dry eye in rural residents (41.8%) than urban (58.2%), and in farmers and laborers (25.3%). This was a direct consequence of the overwhelming exposure of rural residents, largely farmers and manual laborers, to sunlight, high temperature, and excessive wind.

Table 5: Distribution of eyes according to signs

Grade of dry eye	Mild	Percentage	Moderate	Percentage	Severe	Percentage	Total no. of eyes	Total (%)
No. of eyes / Signs	48		52		14			
Conjunctival congestion	48	100%	52	100	14	100	114	100
Mucous thread	48	100%	52	100	14	100	114	100
Ulcer/Opacity	0	0%	36	69.2	11	78.5	47	41.2
Superficial vascularization	10	20%	17	32.6	7	50	34	29.8
Circumcillary congestion	0	0%	20	37	6	42.8	26	22.8
Loss of luster of cornea and conjunctiva	5	10%	10	19.2	4	28.5	19	16.6
Trichiasis and Entropion	1	2%	10	19.2	0	0	11	9.6
Epithelial and mucous filaments	0	0%	5	9.6	4	28.5	9	7.8
Crust, waxy scales over lid margin	10	20%	0	0	0	0	10	8.7
Ectropion	2	4%	0	0	0	0	2	1.7

Table 6: Distribution of eyes according to grading of dry eye

S. No.	Grade of dry eye (Score)	No. of eyes	Percentage
1	Mild dry eye (3–8)	90	39.6
2	Moderate dry eye (9–13)	100	43.8
3	Severe dry eye (14–18)	38	16.6
Total		228	100

Table 7: Possible etiological diagnosis of cases

S. No.	Etiological diagnosis	No. of cases	Percentage
1	Vitamin A deficiency	22	19.4
2	Secondary Sjogren's syndrome	17	15.0
3	Idiopathic dry eye syndrome	14	12.4
4	Stevens–Johnson syndrome	12	10.5
5	Primary Sjogren's syndrome	8	7.0
6	Chronic Blepheritis	8	7.0
7	Lid abnormality	8	7.0
8	Contact lens users	7	6.1
9	Postoperative patients	7	6.1
10	Diabetes	6	5.2
11	Corneal anesthesia induced dry eye	5	4.3
	Total	114	100

Smoking, air population, sunlight, and drugs have been suggested as risk factors for dry eye. This study demonstrated that dry eye was more prevalent in patients with more exposure to air pollution (33.3%), smoking (14.9%), sunlight (16.6%), and drugs (14.9%). These findings are consistent with observations of Moss et al.[6], Sahai and Malik[7]. Smoking predisposes the eye to tear film instability by its direct irritant action on the eye and represents a modifiable risk factor in dry eye concentration and drugs too may disrupt one or more components of the tear film causing it to become unstable. Gupta et al.[8] in their study found that air pollution (24%) over a long period of time increases the prevalence of dry eye because it causes tear film abnormalities. In our study we found that air pollution is the most common attributable risk factors for dry eye and our findings matched with them.

In our study we found that dry eye was more prevalent in patients with refractive errors, with 48.2% being hypermetropes and 37.7% being myopes. Only 14.1% patients in this study were emmetropic. Our finding of increased dry eye prevalence in uncorrected refractive errors as compared to emmetropes is consistent with observation by Moss et al.,[6] Albietz,[5] Sahai and Mallik,[7] who found a higher prevalence of dry eye in hypermetropes (22.9%) and myopes (16.8%) compared to emmetropes (14%). It is postulated that persons with refractive errors have increased tendency to rub their eyes and apart from the introduction of infective material, sebum and sweat could cause the lodgment of particulate foreign substance into the eyes that predispose to tear film instability.

This study shows that foreign body sensation (84.2%), photophobia (37.7%), and mucous discharge (35%) to be the most common complaints of patients with dry eye, followed by burning (30.7%), fatigue (30.7%), blurred vision (20.1%), itching (18.2%), pain (11.4%), dryness of eyes (9.6%) and redness (7.8%), watering (6.1%), heavy sensation (4.3%), and discomfort (2.6%).

Sahai and Mallik[7] in their study found discharge (39.9%) to be the most common complaint, followed by grittiness (31.5%), irritation (29.5%), burning (28.4%), tiredness (28%),

transient blurring of vision (27%), itching (22.3%), and photophobia (5%).

In our study conjunctival congestion and mucous thread were found in all patients and in all grades. In the present series ulcer/opacity was found in 41.2%, superficial vascularization in 29.8%, circumciliary congestion in 22.8%, loss of luster of cornea and conjunctiva in 16.6%, trichiasis and entropion in 9.6%, epithelial and mucous filaments in 7.8%, crusting and waxy scales over lid margin in 8.7%, and ectropion in 1.7% eyes.

Lemp,[1] Nelson,[10] Khurana et al.,[3] Tabbara and Wagoner[11] described staging of dry eye into different grades. We have followed the scoring system of Khurana et al.[3] in our study to classify eyes into mild, moderate, and severe dry eyes. We had 100 eyes (43.8%) with moderate grade, 90 eyes (39.6%) with mild grade, and 38 eyes (16.6%) with severe grade dry eyes in our study.

We have not performed tear function index, tear clearance test because of lack of these facilities at our institute. Also due to unavailability of proper laboratory facilities we have not been able to do certain specific investigations such as conjunctival biopsy and immunologic serum antibody testing.

Etiological diagnosis in our series was as follows: 22 cases of vitamin A deficiency, 17 cases of secondary Sjogren's syndrome, 14 cases of idiopathic dry eye syndrome, 12 cases of Stevens–Johnson syndrome, 8 cases of primary Sjogren's syndrome, 8 cases chronic blepheritis, 8 cases lid abnormality, 7 cases contact lens users, 7 cases of postoperative patients, 6 cases of diabetes, and 5 cases dry eye due to corneal anesthesia induced. Similar possible etiologies were mentioned by Holly and Lemp,[12] Lemp,[5] and Tabbara and Wagoner.[11]

Five patients with dry eye due to corneal anesthesia as a result of trigeminal nerve involvement also had dry eye in contra lateral eye. There can be three explanations for this. First perhaps patients who develop neurotrophic keratitis have an underlying dry eye condition that when accompanied by decrease in 'reflex' tear production from lacrimal gland on involved side progresses to clinical disease. Another possibility is that there is crossed sensory stimulation of tear production and loss of sensory input on one side, which results in decreased aqueous tear production bilaterally with less depression on contra lateral side. A third possibility is that there is increased tear film evaporation in both eyes as a result of reduced blink rate from depressed sensory neural input.

Conclusion

Diagnosis of dry eye is often overlooked as a possible cause of patient's complaint. Therefore detecting disease at the earliest stage and prevention of attributable risk factors for dry eye alluded to in literature include air pollution, cigarette smoking, low humidity, high temperature, sunlight exposure, drugs, and uncorrected refractive error should be the goal so that disease progression to severe stage and serious sight threatening complications caused by severe dry eye could be prevented. Thus prevention of attributable risk factors and early diagnosis could be the key for dry eye and offers good hope for better outcome.

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