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Risk factors and Etiology of dry eye in senior citizens

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ABSTRACT

Objective: To study the Risk factors and Etiology of dry eye in senior citizen of a tertiary care hospital

Study Design: Hospital based prospective observational study.

Materials and Methods: 260 eyes of 140 patients of dry eye above the age of 60 years, attending OPD of tertiary eye care center were evaluate for various risk factors and etiology of dry eye. The study was being carried out during the span of 1 year from December 2016 to December 2017. All dry eye patients of age 60 years or above were evaluated in detail with reference to presenting complaints, history, personal habits, occupation, detail slit lamp examination and various investigation like schirmer's test, tear meniscus, ocular surface staining, Tear film breakup time (TBUT) and corneal sensation

Results: Mean age of study group was 68.04 year ±7.2 (60-91) years. Out of 140 patients 57 (40.71%) were male and 83 (59.28%) were female. 85.71% patients had bilateral involvement rest had unilateral involvement. Common risk factors noted in present study were age connective tissue disorders, diabetes mellitus and environmental factors. Tear deficient type of dry eye was most common among senior citizens. Age related dry eye was commonest etiology followed by dry eye associated with connective tissue disorder.

Conclusion Dry eye is common in old age, it affects women more commonly than men. Severity of dry eye in old age significantly increased if it is associated with CTD, DM, environmental risk factors and topical medications

Keywords: Dry eye, Risk factors.

INTRODUCTION

For many decades, dry eye was thought to be limited to dryness of the eyes caused by a reduction of the aqueous phase of tear film. But now we understand that this definition does not adequately describe the full clinical picture of dry eye. The modern definition of dry eye disease is based on the concept of the three layers of the tear film devised by Holly and Lemp. In recent years, dry eye is an extremely common condition that causes varying degree of ocular discomfort and disability.

Asian studies on dry eye showed that the prevalence of dry eyes is higher in Asian population than the western population and it is between 14.5%-93.2%.[1-6] The prevalence of dry eye in India is ranging from 18.4% to 40.8%.[1-3] This variation is because of lack of uniformity in the diagnostic criteria of dry eye.

There are many etiological factors for dry eye like age, sex, smoking, occupational factors, geographical factors(high altitude, hot dry air) systemic diseases like Sjögren syndrome, Meibomian glands dysfunction, air conditioning, vitamin A deficiency etc.[5,7-10]

Aging is a one of most important risk factor for dry eye. Dry eye is more frequents in individual aged 50 years or older. Age related reduction in tear production and tear flow, increased tear evaporation and decreased corneal sensitivity are the causes of age related dry eye.[7-10] Dry eye either alone or in combination with other conditions, is a frequent cause of ocular irritation that leads the patients to seek ophthalmic care. The patients with dry eye present with variety of non specific symptoms and it is often unrecognized or misdiagnosed. Reason behind this is that Information is limited on dry eyes due lack of uniformity in its definition and the inability of any single diagnostic test or sets of diagnostic tests to confirm or rule out the condition. Thus, there has been a shift towards symptom-based assessment as the key component of clinical

diagnosis. In many cases, dry eye can be a cause of significant visual morbidity, ocular surface damage and may compromise the results of cataract, corneal and refractive surgery. Dry eye is one of condition that can be managed at all levels of ophthalmic care. Only severe grades of dry eye and those with associated systemic diseases needs expert opinion as well as evaluation by other fraternities like Rheumatologist. In many cases disease is not curable so education of patients regarding nature of disease, effect of aging, personal habits, occupation and environmental conditions on the disease is also important.

As aging is one of the most important risk factor for dry eye and there is higher prevalence amongst older population. Hence this study is mainly focused on dry eye in old age with reference to risk factors, clinical presentation, severity and diagnosis.

Method & Material

In this hospital based prospective observational study 260 eyes of 140 patients of dry eye above the age of 60 years, attending opd of tertiary eye care center were evaluate for various risk factors and etiology of dry eye. The study was being carried out during the span of 1 year from December 2016 to December 2017.

The patients of age 60 years or above presenting with any complaint suggestive of dry eye or diagnosed case of dry eye were evaluated in detail with reference to presenting complaints, history, personal habits, occupation, detail slit lamp examination and various investigation like schirmer's test, tear meniscus, ocular surface staining, Tear film breakup time (TBUT) and corneal sensation. After detailed evaluation, all eyes were divided in to various groups based on etiology and severity.

Inclusion Criteria

- Patients of age 60 years or above presenting with complaints suggestive of dry eye and positive for any test for dry eye.
- All diagnosed cases of dry eye of age 60 year or above.

Exclusion Criteria

- Patients of age less than 60 years.
- Patients presenting with some other condition explaining the complaints similar to dry eye.

Results and Oberservation

The present study was carried out on 260 eyes of 140 patients of age ≥60 years. Out of 140 patients 57 (40.71%) were male and 83 (59.28%) were female. 85.71% patients had bilateral involvement rest had unilateral involvement. Mean age of study group was 68.04 year ±7.2 (60-91) years. The age of patients ranged from 60 to 91 year. Most patients belong to the 60-69 year age group.

TABLE-1: CHARACTERISTICS OF STUDY GROUP

Characteristics	Number	%
Total patients	140	
Total eyes	260	
Bilateral involvement	120	85.71
Unilateral involvement	20	14.28
Male	57	40.71
Female	83	59.28
Mean age	68.04±7.2	

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TABLE-2: DISTRIBUTION OF THE PATIENTS ACCORDING TO AGE AND GENDER

S.N.	AGE (in years)	GENDER DISTRIBUTION				TOTAL PATIENTS (in each group)
		M	%	F	%	
1	60-69	29	20.71	44	31.42	73
2	70-79	20	14.28	30	21.42	50
3	80-89	6	04.28	8	05.71	14
4	≥90	2	01.42	1	00.7	3
TOTAL		57	40.71	83	59.28	140

TABLE-3: DISTRIBUTION OF THE CASES ACCORDING TO RISKFACTORS

S.N.	Risk Factors	No.	%
1	Female gender	83	59.28
2	Smoking	42	30
3	Environmental	32	22.85
4	Connective tissue disorders	29	20.7
5	Topical Medications	28	20
6	Alcohol	24	17.14
7	DM	24	17.14
8	Ocular surgery	20	14.28
10	H/O Hormone replacement therapy	5	3.57
11	Thyroid eye disease	4	2.85
13	Systemic viral infection	4	2.85
14	Systemic chemotherapy	2	1.42

Common risk factors observed in the present study were female gender (58.27%), Smoking (30%), Connective tissue disorders (Sjögrens syndrome, rheumatoid arthritis and SLE) (20.7%), Environmental risk factors (Low humidity environment, high temperature, high air flow velocity) (22.85%), Topical Medications (Anti glaucoma medications) (20%), Alcohol intake (17.14%), DM (17.14%), Ocular surgeries (Keratoplasty and lens extraction) (14.28%).

Other less common risk factors like Thyroid disease (2.85%), H/o Hormone replacement therapy (3.57%), and Systemic viral infection (2.85%) (HIV, HBV) and chemotherapy (1.42%) were also noted.

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TABLE-4: RISK FACTORS Vs SEVERITY OF DRY EYE

Risk factors	**Present**			***P*** value
	Mild	**Moderate**	**Severe**	
Arthritis	23	22	13	0.015
DM	32	11	4	0.048
Age	50	24	1	0.062
Environmental	41	15	7	0.033
Smoking	40	30	13	0.43
Alcohol	30	14	4	0.26
Topical Medications	35	19	2	0.041
Ocular Surgery	19	11	2	0.055
TED	7	1	0	0.14

As shown in above table following risk factors evaluated for correlation with severity of dry eye. After evaluation we found that 28.4% eyes had no risk factors these cases had age related dry eyes. Age is important cause for dry eye but its correlation with severity of dry eye is statically non significant (*P-0.062*). Arthritis, Environmental factors, Topical medications, and DM significantly (*P <0.05*) associated with the severity of dry eye whereas smoking, alcohol, ocular surgery, and TED (thyroid eye disease) had no significant association.

TABLE-5: DISTRIBUTION OF THE CASES ACCORDING TO TYPE OF DRY EYE

S.N.	**TYPE OF DRY EYE**	**NO. OF PATIENTS**	**%**
1	Tear deficient	62	47.14
2	Evaporative	43	30.71
3	Tear deficient +Evaporative	35	22.14
Total		**140**	

In present study out of 140 cases 62 (47.14%) patients had dry due to tear deficiency, 43 (30.71%) patients had evaporative dry eye and 35(22.14%) patients had dry eye due to both mechanism (Tear deficiency and Tear evaporation).

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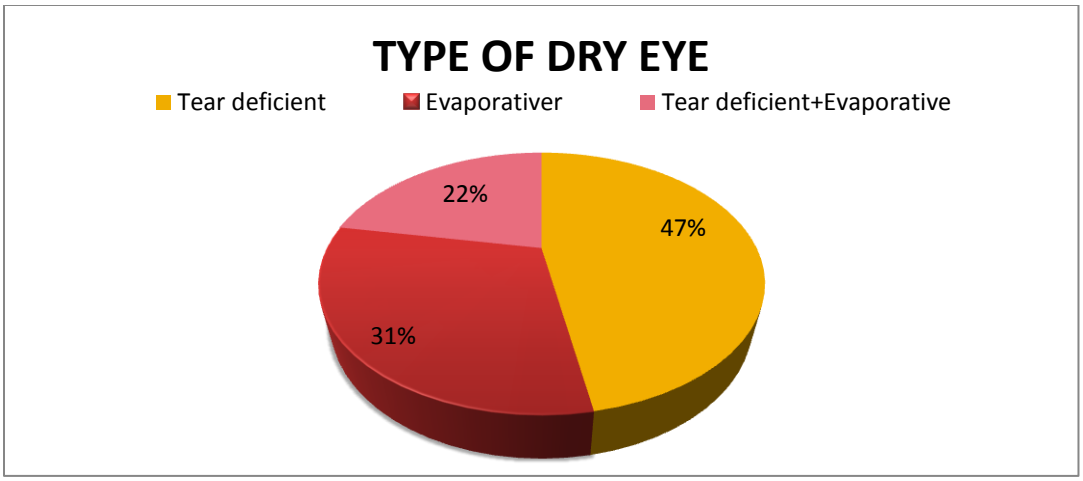

DISTRIBUTION OF THE CASES ACCORDING TO TYPE OF DRY EYE

TABLE-6: DISTRIBUTION OF THE EYES ACCORDING TO SEVERITY

S. N	TOTAL SCORE	GRADE OF DRY EYE	NO. OF EYES					%
			Male	%	Female	%		
1	3-8	Mild	51	19.61	83	31.92	134	51.53
2	9-13	Moderate	40	15.38	55	21.15	95	36.53
3	14-18	Severe	16	6.15	15	5.76	31	11.92
Total eyes			**107**	**+**	**153**	**=**	**260**	

In present study 51.53% eyes had mild grade of dry eye followed by 36.53% eyes had moderate grade and 11.92% eyes had severe grade of dry eye. Mild and Moderate grade of dry eye was more common in female as compare to severe grade of dry eye which was nearly equal in both gender.

TABLE-7: DISTRIBUTION OF THE CASES ACCORDING TO POSSIBLE ETIOPATHOLOGY

S.N.	ETIOPATHOGENIC DIAGNOSIS	NO. OF CASES	%
1	Age related dry eye	37	26.41
2	Dry eye associated with CTD	29	20.71
3	MGD	23	16.42
4	Reflex hyposecretion	19	13.57
5	Lid aperture disorders	16	11.42
6	Conjunctival scarring with obstruction of lacrimal duct	12	8.57
7	Vitamin A deficiency	4	2.85
Total cases		**140**	

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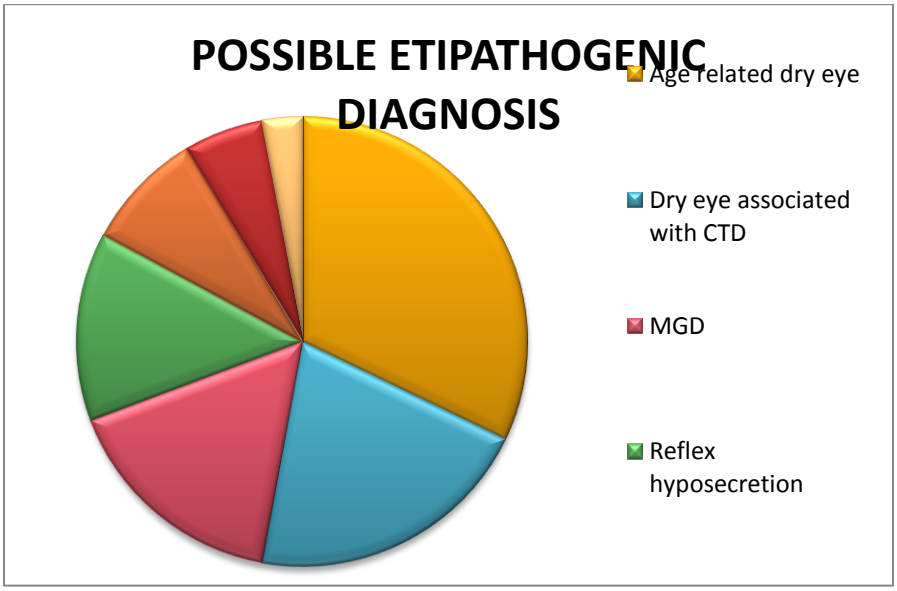
In present study Age related dry eye (26.42%) was most common cause of dry eye in old age followed by Connective tissue disorder (20.71%) like primary Sjögren syndrome & secondary Sjögren syndrome) and Meibomian gland disorder (16.42%).

Other common cause of dry eye like Reflex hyposecretion (13.57%) (Diabetes mellitus, Post viral keratitis keratoplasty and cataract extraction), Lid aperture disorder (11.42%) (TED, Lagophthalmos, Entropion & Ectropion and Trichiasis), Conjunctival scarring and Lacrimal duct obstruction (8.57%) (SJS, chemical burn) was also noted



DISTRIBUTION OF THE CASES ACCORDING TO POSSIBLE ETIOPATHOLOGY

TABLE-8 COMPLICATIONS

COMPLICATIONS	GRADE OF DRY EYE							
	Mild (134)		Moderate (95)		Severe (31)		Total no. of eyes	Total %
	No.	%	No.	%	No.	%		
Superficial vascularization	0	0	27	28.4	16	51.1	43	16.5
Corneal opacity	0	0	11	11.5	13	41.96	24	9.23
Ulcer/melting	0	0	2	2.10	5	16.1	7	2.69
Total	0		40		34		74	

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In current study superficial vascularization was noted in 16.5% cases followed by corneal opacity in 9.23% and corneal ulcer in 2.69% cases. Complications of dry eye are commonly seen in severe grade of dry eye whereas mild grade dry had no complications

TABLE-9: COMPLICATION VS SEVERITY OF DRY EYE

		Present	
COMPLICATIONS	**Absent**	**Moderate**	**Severe**
Superficial vascularization of cornea	83	27	16
Corneal opacity	102	11	13
Ulcer/melting of cornea	119	2	5
		40	34

On evaluation of correlation of moderate and severe grade of dry eye with complications we found that superficial vascularization of cornea, corneal opacity and Ulcer/melting of cornea associated with moderate and severe grade of dry eye.

Discussion

Dry eye syndrome is a multifactorial disease of the tear film and ocular surface resulting in eye discomfort and compromised visual quality. Dysfunction of any component of the lacrimal gland, ocular surface, eyelids, and nerve connecting them can cause dry eye.

In present study it was observed that in 28.4% eyes there was no associated risk factor for dry eye and hence categorized as primary age related dry eye. The probable age related changes which leads to dry eye are reduction in tear production and tear flow, increase tear evaporation and decreased corneal sensitivity.

Murube J and Tsubota K[11] reported that lacrimal production begins to descend at the age of 30 and by the age 90 all people have dry eye related to age. Ram S Mirley et al[25] suggested both tear flow rate and tear stability decrease with age and by age of 40 year tear production is reduced to 50% of that at age of 10. Relative lack androgen and Post menopausal hormone replacement therapy are the probable causes of relatively great symptoms in women. Murube J and Tsubota K (1996)[11] reported that at age of menopause almost every women develops dry eye either mild or moderate related to lowering of androgen level produced by ovaries. Men develop dry eye related to hormones less frequently. Ram S Mirley[12] noted that KCS is more common in women because in women it is related to menopause. Risk factors observed in the present study were female gender (58.27%), Smoking (30%), Connective tissue disorders like Sjögrens syndrome, rheumatoid arthritis and SLE (20.7%), Environmental risk factors (22.85%), Topical Medications like anti glaucoma medications (20%), Alcohol intake (17.14%), DM (17.14%), Ocular surgeries like Keratoplasty (PKP) and lens surgery (14.28%). Other less common risk factors like Thyroid eye disease (2.85%), H/o Hormone replacement therapy (3.57%), and viral infection (2.85%) (HIV, HBV) and chemotherapy (1.42%) were also noted. Wolkoff et al.[13] McCulley et al.[14] also reported low humidity environments, high room temperature and high air flow velocity environments as risk factor for dry eye. Similar risk factors reported in various studies.[15-21] In present study we found a statistically significant ($p<0.05$) correlation of severity of dry eye with arthritis & DM and statistically non significant correction with TED. McCarty CA[5], Gilbard JP et al.[22] also reported similar result on Arthritis & DM and differ on TED with present study. Less number of cases of TED in present study may be a cause of non significance in present study. A significant correlation between severity and topical medications (anti glaucoma medication) and environmental risk factors was observed in the present study which is consistent with other studies by Wolkoff et al[13] and McCulley et al[14] Alcohol intake and Smoking were reported as a risk factor for dry eye in old age but their correlation with

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severity is statistically non significant. This finding is similar to other studies.[42] Of all these factors age, female gender, Connective tissue disorder, Vitamin A deficiency, Thyroid disease, H/O Hormone replacement therapy and Systemic viral infection (HBV) reported as most consistent risk factors by Dry eye workshop Subcommittee (DEWS) in 2007.

Lemp MA[23], Khurana et al.[24], Murube J and Tsubota K[11] described garding of dry eye to grade the dry eye in to various grade of severity. In present study we followed grading system of Khurana et al to classify dry eye into mild, moderate and severe grades. Out of 260 eyes 51.53% eyes had mild grade of dry eye followed by 36.53% eyes had moderate grade and 11.92% eyes had severe grade of dry eye.

Murube J & Tsubdta K[11] and Lemp MA (1995)[23] classify dry eye on the basis of etiology. In present study we follow dry eye classification proposed by MA Lemp. Out of 140 cases 62 (47.14%) patients had dry due to tear deficiency, 43 (30.71%) patients had evaporative dry eye and 35 (22.14%) patients had dry eye due to both mechanism (Tear deficiency and Tear evaporation). The probable causes of tear deficiency in present study are lacrimal gland dysfunction secondary to autoimmune disorder, primary age related hyposecretion, reflex block hyposecretion and obstruction of lacrimal gland. Probable causes of increase tear evaporation are MGD, disorder of eye lids, vitamin-A deficiency and preservative containing topical medications.

In present study following possible etiopathogenic causes of dry eye in old age was found. Age related dry eye (26.42%) was most common cause of dry eye in old age followed by Connective tissue disorder (20.71%) like Sjögren syndrome and Meibomian gland dysfunction (16.42%). Other studies also reported similar finding.[104, 105] Other common cause of dry eye like Reflex hyposecretion (13.57%) (Diabetes mellitus, Post viral keratitis, keratoplasty and cataract extraction), Lid aperture disorder (11.42%) (TED, Lagophthalmos, Entropion & Ectropion and Trichiasis), Conjunctival scarring and Lacrimal duct obstruction (8.57%) (SJS, chemical burn) was also noted. Similar possible causes of dry eye in old age also reported by, Lemp MA [23], Murube J & Tsubdta K[11] The causes of age related dry eye are age related decreased tear production as a consequence of dysfunction of lacrimal gland due to ductal pathology,[104,105] age related decrease in androgen level[22] and altered reflex secretion secondary to diminished corneal sensation.

Superficial corneal vascularization was (16.5%) most common complication noted in present study followed by corneal opacity (9.23%) and corneal ulcer (2.69%). Complications commonly present in severe grade of dry eye whereas mild grade dry eye had no complications.

Conclusion

Conclusion drawn from present study are

- Dry eye is more common in old age and affects women more commonly than men.
- Severity of dry eye in old age significantly increased if it is associated with CTD, DM, environmental risk factors and topical medications.
- Tear deficiency is more common cause of dry eye than excessive tear evaporation in old age.
- Primary age related dry eye is a most common cause of dry eye in senior citizens followed by connective tissue disorder and MGD related dry eye.

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